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Advertisement Sales Manager

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Advertisement Sales Executive

Pat Bunce 0181-652 8339 Fax 0181-652 8931

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# Japanese Dilemma

trange how situations change. It seems not so long ago that Japan and its industries, particularly electronics, could do no wrong. They taught us how to make cars and TV sets properly. They invested heavily and came up with a seemingly endless stream of desirable, innovative products. Both outsiders and insiders could see no end to this success story. We were told, by more than one leading Japanese electronics industrialist, that the 21st century would be the Japanese one, when Japan became predominant industrially and culturally.

For the last couple of years the situation has been somewhat different. Japan is still the world's second largest economy, but the previous confidence has gone. The economy has stalled, and doesn't look like getting going again for some time. Profitability has become appalling, and the talk now is all of restructuring and job losses.

Sony has announced that some 17,000 jobs will be lost worldwide, ten per cent of its workforce, while fifteen of its seventy factories are to be closed. Mighty Hitachi, whose activities span a much wider field and whose turnover is equivalent to over two per cent of Japan's gross domestic product, has launched a detailed review of its businesses. 6,500 of its 66,000 parent company employees are to be made redundant by March next year. On a consolidated basis Hitachi is Japan's largest employer, with 330,000 staff. Businesses are to be dropped or reorganised. The story from Mitsubishi Electric is similar: there is to be a "sweeping restructuring of its portfolio of businesses". In the UK, the latest manifestation of this is the closure of Mitsubishi's VCR plant at Livingston. 14,500 jobs will

go (8,400 in Japan) at Mitsubishi Electric,

nearly ten per cent of the workforce. Other manufacturers who have announced poor results and restructuring recently include NEC, Matsushita, Sharp and Toshiba. It's all a long way since the time when, it seemed, all the Japanese had to do was to get the product right and produce more and more of it.

Some of this was foreseeable. Markets reach saturation point; new products are not always a runaway success; if investment in new plant is excessive you end up with too much capacity; and so on. Then there is the fact that Japan is not isolated from economic problems elsewhere: no economy that is heavily dependent on exports can be. But there are also more specific Japanese problems. The banking system is beset by nonperforming loans that Japanese bankers are reluctant to write off. The bubble economy of a few years ago, when asset values rose to unrealistic levels, collapsed. This is part of the cause of the banking system difficulties. Then there is the practice of crossownership, with firms owning substantial stakes in each other. This can work nicely when everything is doing well: when recession looms, it aggravates the problems.

Japan's unemployment rate hit a new high of 4.8 per cent (3.39m) in March, partly because of the corporate sector restructuring. Japanese industrialists hope to improve their profitability in the second half of the year, and will be helped by improved conditions in SE Asia. But it will be hard going, particularly to improve domestic market conditions. The Japanese have always had a high propensity to save. This increases when the economic climate is poor, with unemployment a threat. Right now Japanese consumers are saving rather than buying. No one seems to know how to alter their

behaviour. There is also a demographic problem: the Japanese population is ageing.

Japanese interest rates are negligible. So borrowing is not a problem. But conversely all those savings are bringing in little income. In the Western world interest rate changes often have a considerable impact on the economy. This economic tool is not available when interest rates are negligible. The Japanese have been advised to get their banking system sorted out, but that's not the sort of thing that can be done overnight. Right now the best opportunity for Japan seems to be to export its way out of its difficulties, something that shouldn't be too difficult once worldwide expansion has resumed. But the high value of the yen is a drawback.

From the economic viewpoint it's an extremely interesting situation, one in which the laws of economics have little to offer. This could be because such laws are, basically, descriptive rather than prescriptive. In the real world you can't always initiate economic activity through monetary or fiscal means. Some commentators have gone so far as to suggest that the Japanese government should spend, spend, spend and print money to kick-start the economy. This is a dangerous course that can go badly wrong. It has already been tried by the Japanese government to a limited extent, with similarly limited success.

The one thing that we do know is that economies are not stable. Change is ever present in one form or another. The problem lies in trying to control it. This is all rather humbling, and certainly something of a comeuppance for the rather arrogant Japanese industrialists who had talked about the century of Japanese economic hegemony.

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All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", Reed Business Information, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Editorial correspondence should be addressed to "Television", Editorial Department, Reed Business Information, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

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#### A great start to the day soon came to an end. Then back to the workshop and a day's problems with sets and their owners. Donald **Bullock's servicing commentary**

t was a day in a million, warm and balmy. I knew it would be. Last night the sky was peach red in the west, and there'd been not a trace of a breeze. So I'd decided to go after a few tench in Collins waters. That's why I'd got ready and set the alarm for five.

The car hummed nicely as I set out. What's that ahead? Midnight the Milk's van, crawling and weaving across the road as though there's no one else about. Needs waking up. I'll wait till I'm just beside him, then give him a blast on the horn.

Ha, ha. That was good. Boy see him go!

The pool looked good. A carpet of mist in the sun. And the rooting tench sending up clouds of tiny bubbles. What's that sign? No fishing! But I've been fishing here for half a century! Take no notice. I'll fish in this hole, under cover of the rushes. In with a bit of groundbait first. Now set up my rod.

What a lovely bite! See that

Eh? Who are you? The bailiff!? What club? Who are all these chaps? Fishing contest this morning, here? So I've to clear off?!

Oh well. Might as well get back to the workshop and make an early start.

#### A Thorn/Philips Portable

It was cold and dark in the workshop. I picked up the first set in the pile, a Thorn P1470R 14in. portable, and saw that it contained a Philips GR1-AX chassis. Philips and Thorn in cahoots?! Times change indeed.

The set was dead with its standby light flashing. I checked the HT voltage and found it well down at 70V. So I headed for the line output transistor and hooked it out. It tested OK. Perhaps there was a shorting diode in the stage? I began to work through them, starting with the bulkier ones that live harder lives. Nothing wrong with any of them. I then gave the transformer an unfriendly look.

We didn't have a replacement, but we did have a Philips set with the same chassis. When I tried its transformer in the Thorn receiver everything was OK. So I put it back and ordered a new one.

The phone rang. At half past six! "Who could it possibly?" be I thought as I lifted it.

#### **Featherhough**

"Is that Mr Bullock? a voice whined. "I'm Mr Featherhough. Ian Featherhough. Sorry to call you so early, but I can't sleep with the worry of it all. I'm not well, and you've been recommended.'

"Mr Featherhough" I said, "I'm not a doctor. I'm a TV engineer - I think."

"I know, yes I know" he moaned, "I want you to come and repair my set. I can't see the picture.'

"Why's that?" I asked. "Because there isn't one" he snivelled.

I booked the call.

#### A 21in Panasonic

The next set was a 21in. Panasonic, Model TX3 (Alpha 1 chassis). "Only screams" said the card. It

was right. When I switched the set on the channel LED lit but there was nothing on the screen. The set, clearly in distress, was screaming its head off. I disconnected the speaker, reached for the meter and checked the HT voltage. Only 20V. Out of habit I checked the 2SD1439 line output transistor. It was leaky, not short-circuit. I fitted a replacement, reconnected the loudspeaker and tried the set again, thankful for an easy job. But it was now quite dead, well past the screaming stage.

There was no HT anywhere in the line output stage. What might I have overlooked? Yes, there's a 1A circuit protector, CP567, in the HT feed. It was open-circuit. A replacement got the set going.

#### VCR Problem

There was a rattling at the door. It was Henry Hoxton, who sometimes brings our mail. He danced in with a Philips video recorder and placed it on the counter.

"You're up bright and early

aren't you, Don?" he breezed.
"No" I replied. "Only early. And I wish I hadn't bothered. What's up with this Philips machine, apart from its chewing-gum pinch wheel? And how's the missus?

"Stopped dead last night and blew out a puff of smoke" he said.

"That's bad" I replied, "and what's wrong with the recorder?" Laughing at my excellent joke, I waved him through the door.

When I opened the VCR I saw that it contained a jammed cassette. Looking further, I saw that the puff of smoke had signalled the end of

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IC7101, which had blown its top. It's the drive chip for the loading motor, and is mounted on a subpanel at the front of the machine. The  $0.22\Omega$  fusible resistor in the supply to it had also blown. Once these items had been replaced the machine at least worked.

It was time to open the shop. As I did so a tiny fellow marched in.

#### **Granada Monster**

"It's real big, I'm tellin yuh" he boomed, in the deepest voice I've ever heard. "Come and see."

I followed him out to his estate waggon, in which a 28in. Granada receiver (Model CD66JS) sat. Between us we managed to get it in and on to the bench. He then departed, leaving me draped over it.

When I'd recovered I switched it on. Field collapse. I took the back off and got into the field timebase circuit. The voltages all seemed to be about right. When I looked about I found that the joints on the scan coil socket were dry. Resoldering them restored the field scanning, but there were horizontal red lines at the top of the picture. It took me a while to find the cause, which turned out to be C703. It sits next to the TDA8170 field output chip. This electrolytic capacitor should have a value of 100µF. The reading I obtained was 30µF.

**Grundig Trouble** 

Paul and Steven then arrived, so I decided to slip out to see Mr Featherhough, whose house is in the posh area of the town. To my surprise I found that he lived in the basement. His wife answered the door. She was pale and distraught.

"He's a great worry my dear" she said, "he's had so many nervous breakdowns I've lost count. Gets very upset when his television set doesn't work properly."

Featherhough, a tall, slender old boy, was sitting in a upright arm-chair in front of a Grundig T51-720. He was trying to follow the picture, but it rolled continuously – and was very snowy. He'd occasionally have a go at the controls. "Can't stand it, I can't" he complained, "stop it tumbling Mr Bullock, do please."

I couldn't lock the field scanning and decided I would have to take the set back to the workshop. Mr Featherhough broke down at the news. "But I need it. Can't be without it, Mr Bullock" he cried.

I explained that the set would have to be dismantled and inspect-

ed. I needed test equipment.

Mrs Featherhough came to the door with me. "He's such a trial, Mr Bullock" she said, "needs 24-hour attention, but he's my life and I adore him."

As I carried the set into the shop the phone rang. It was Mrs Featherhough. "Is it done, Mr Bullock? Only Pops is distraught without it . . ."

Steven had a go at the set. He hooked up a scope and found that there was no field sync. On further investigation the RF/IF module turned out to be riddled with dryjoints. Once these had been resoldered we had an excellent picture. I hurried back to the Featherhoughs with the set.

Mr Featherhough rubbed his hands and chuckled. He not only paid our bill but gave me the biggest tip I've ever had.

Mrs Featherhough showed me to the door. "You've made him so happy" she said, "I'll call you again if there's any need."

**Sharp Problem** 

When I returned Steven had a 20in. Sharp receiver, Model DV5103H (Euro DS1 chassis), on the bench. "Can't understand this set" he said. "It's dead with a low, varying HT supply – 10-50V. I've replaced just about everything but it remains the same."

Half an hour later he was still struggling.

Paul looked over. "Have you tried replacing the HT preset? he asked.

"Er, no, not that. Do you think it could be the cause?"

He took out the potentiometer, R755  $(2\cdot 2k\Omega)$ , and fitted a replacement. The HT supply then came up and was fully adjustable.

Steven examined the old one with a magnifying glass. Although it read correctly, there was a hairline crack in the track. "Should have checked it first" he confessed.

"We're all the same" I commented, "I've done the same thing dozens of times. We never seem to suspect the potentiometer concerned, only the rest of the components. I recall an early Philips valve set with an upright chassis. It had an inaccessible bank of three potentiometers printed on a Paxolin strip. They used to go high in value and it took me ages to find the cause the first time I had the problem."

#### Went off

Henry Chickworth called in with



The rooting tench sent up clouds of tiny bubbles

his Alba VCR7200. "Just went off" he said. "All I've got is the display flashing a 3 at me."

Paul put it on the bench while Henry waited. "I know of two ways to deal with this fault" he announced, "there's the slow way and the fast one."

"What's the slow way?" Henry asked.

"Put the machine under the bench for three weeks then plug it in. It'll be perfect."

"OK, and the fast way?"

"Disconnect the positive side of the capacitor 'battery' and reconnect it at once."

"Er, I don't wanna wait three weeks" Henry said.

A Philips Portable

Paul had a Philips 14GR2326 14in. portable (G90B chassis) on the bench. The screen was blank and there was no sound. The HT was low. This time Steven was able to help.

help.
"Had one like that the other day" he said. "Try the reservoir capacitor for the 5V supply. It's C2660, 680μF, 16V. I found that the value had fallen to about 90μF.

Paul switched the set off, discharged the capacitor and tested it. The value was down at 80µF. A replacement did the trick.

# TELETOPICS

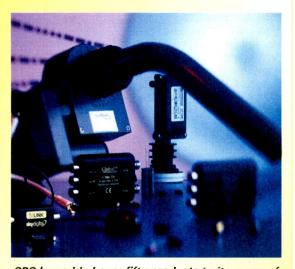
# **Digital Warfare**

In the battle to become predominant in the digital pay-TV market, gaining as many subscribers as soon as possible is obviously the number one priority. To this end BSkyB and ONdigital have launched new marketing initiatives, including free set-top decoders. With C&W Digital, which will start a phased introduction of its service in Manchester and the North West in July, and other cable digital TV providers the decoder will come as part of the monthly subscription and will thus not appear as an 'up-front'cost.

ONdigital is offering a free set-top box during May when a subscription is taken out and a TV set that costs £200 or more is bought. SkyDigital's offer is quite complex. You get the STB free (no time limit at present) but have to pay a £40 installation charge plus fees for most channels. There are other possible charges, such as £30 if you want to keep your existing analogue system or have to replace your downlead with something better. The digital transfer fee is £25, so SkyDigital can cost £65 to over £280 for starters. SkyDigital's channel subscription rates rise by £2 a month from June 1st, but will be frozen for existing subscribers till September 2001. BSkyB is providing other incentives however: free internet access (via a PC) - this is called SkyNow; and 40 per cent off phone-call costs for subscribers who use BT (cable subscribers have discounted phone calls). BSkyB expects

to generate substantial revenues from its subscriptions, advertising, and online services to be offered, but at present profits have been substantially reduced. £315m has been set aside for promotional expenditure, and dividend payments are being suspended for the foreseeable future.

Right now both SkyDigital and ONdigital see the cost of a set-top box as the biggest deterrent for prospective subscribers, hence the free box offers. The latest figures suggest that SkyDigital is pulling ahead. It claims to have had some 551,000 subscribers on May 3rd. ONdigital is understood to have secured some 160,000 subscribers by end-March. BSkyB analogue transmissions will end in 2002.



CPC has added over fifty products to its range of satellite equipment, including items from Amstrad, Grundig and Philips. The newly stocked products include a selection of universal and digital LNBs, a range of Triax multiswitches, the new BSkyB TV link remote control extender system, and the new BSkyB-approved digital satellite kit which is designed for domestic digital satellite installations and features an elliptical feedhorn. The RC extender system enables satellite and off-air channels to be distributed around the house to sets with an aerial tap. For further details check with CPC on 01772 654 455 or fax 01772 654 466.

### Interactive TV

Microsoft has provided details of the WebTV service it is currently running as a trial at 115 housholds in London and Liverpool. Users can watch TV, visit web sites, use e-mail, obtain information and explore the internet via WebTV set-top boxes that are being manufactured by Pace. Partners in the trial include Barclaycard, the BBC, Carlton, Marks and Spencer, Natwest and Teletext.

Further content suppliers have joined NTL's interactive TV-internet service, which was launched at the end of March. They include Flextech Interactive, ITN, Tesco and several on-line stores. The service is delivered via BT phone line: the plan is to add it to NTL's cable network later this year and also make it available via DTT.

NDS has demonstrated its XTV (eXtended TV) system for use with digital set-top boxes. It records video on a hard disc and uses smart software to learn and look for users' favourite types of programme material. The first XTV devices are expected to be launched this summer.

Element 14 has announced the Active 3875, an interactive digital TV set-top box. The company, formerly Acorn Computers, is named after the 14th element in the periodic table – silicon. The 3875 is designed to enable telecommunications operators to supply interactive digital TV services via copper-pair phone lines. Users will be able to use the STB for video-on-demand, web surfing, shopping, network games etc.

#### Monitor Service Data

M-House Editrice published the first volume in the Monitor Service series in 1996, in paper format. As a result of advances in technology, the publisher decided to issue the second volume, in March 1997, in CD-ROM form. The dedicated software used enables you to display, in the best way possible, the sections and subsections you require in a service manual. Each manual includes alignments, service notes, block diagrams, component details, PCB layouts, circuit diagrams and servicing advice. Amendments can be made to the manuals.

The fourth volume has now been published, again in CD form. The software, with continuous development, has become more user friendly. For further details consult the internet at www.m-house.net

The publisher is M-House Editrice, Di Morselli Luca, Via Ernesto Breda 20, 20126 Milano, Italia. Phone/fax + 39 02 2570447.

# Satellite News

According to SES one in three homes in the UK is now receiving programmes from the Astra satellites. Year-on-year growth for the year ending December 1998 was 730,000. Europe ONline has taken two Astra transponders (at 19-2°E) to provide a high-speed internet service aimed at STB and PC owners: the service started on May 15th. NTL has announced that S4C and the BBC are taking capacity in its second shared digital multiplex via Astra 2A.

Eutelsat's W3 satellite was successfully launched on April 12th. After tests it will replace II F4 at 7°E. The craft has 24 Ku-band transponders and will carry consumer and professional TV and telecommunications services.

Easynet Ltd. has started a service called EasySat via Eutelsat's Hot Bird 4. It provides internet connection at a flat rate of £49.99 + VAT a month, or £550 + VAT a year. The subscription includes a fully-featured internet account with unlimited e-mail addresses, unlimited personal web space, a news service and round-the-clock technical support at local call rates. The data is incorporated in a DVB multiplex that's uplinked by BT Broadcast Services. A 60cm dish and internal PC card are required for reception - several cards are readily available, offering plugand-play operation and features such as reception and display of over sixty free-to-air digital TV channels. The service has been launched following a year of successful trials.

The recently introduced Smart Priority switch, the latest addition to the Philex Select range, is the easy way to connect two receivers to one dish. It determines which receiver controls the LNB. When the digital receiver is turned on, it controls the LNB; when it's turned off, the analogue receiver takes over LNB control. The switch has a frequency range of 950-2,300MHz and is housed in a zinc diecast box with solder shielding bottom plate. The SLX4 'digital-ready' four-way amplifier, for TV, satellite and FM receivers, is another recent addition to the Philex Select range. It's designed to improve TV and FM reception, with a gain of 105dB at all ports. There are separate UHF/VHF inputs and the isolation between outputs is greater than 22dB. The UHF socket has provision for line powering at 25mÅ. The amplifier is of compact design, is finished in gunmetal grey and is double insulated for safety. For details of these and other Philex products, contact Philex Electronic Ltd., Philex House, 110-124 The Broadway, West Hendon, London NW9 7PP. Phone 0181 202 1919.



A new firm, Circuit Trace, that sells direct via the world-wide web has introduced the CT100 hand-held connectivity checker. It enables all interconnected points on a PCB, whether legitimate or not, to be located within seconds. You simply connect the checker's clip to the circuit point of interest, say an IC pin where the voltage is incorrect, then wipe the conductive brush over the board surface and listen for an audible tone, which indicates the presence of a connection. The edge of the brush or a separate singlepoint test probe that comes with the unit can then be used to home in on the connection's exact location. The idea is to eliminate lengthy track tracing: the checker is particularly helpful for boards with bus paths or surface-mounted components, where locating short- or open-circuits with ultra-fine tracks can be a frustrating business.

The CT100 costs £93.50 complete with test probes, circuit marker, carrying case and a comprehensive user manual. Circuit Trace is at PO Box 70, Retford DN22 0SY (phone/fax 01777 248 993),

e-mail mrbass@globalnet.co.uk

Circuit Trace's web site (www.toneohm.com) contains much useful information on the CT100, including an application note.

# Trade News

According to market research company GfK, widescreen sets accounted for eleven per cent of TV sales in the UK in January – thirty per cent of the total value. BREMA expects sales to reach 750,000 sets this year: as a result, well over a million UK homes could have a 16:9 set. This would make the UK the fastest-growing widescreen TV market in the world. BREMA also forecasts that half of UK homes will have some form of digital TV receiver, either IDTV or STB, by the year 2003.

Willow Vale Electronics has been appointed UK distributor of universal remote control units manufactured by Siel Electronics. The range is being marketed in Europe under the brand name Zapping. Models include the Universal Zapping, Cosmos, Planet and Replay, at trade prices from £4.99 to £9.99 each. The range provides a variety of control facilities and has distinctive colouring. For further details contact the Willow Vale Sales Office on 0118 987 6444. WVE has also been appointed UK distributor to the service trade for Censol aerosol products, which include freezer spray, a solvent degreaser, the Pocket Rocket switch cleaner, a foam cleaner and an air duster.

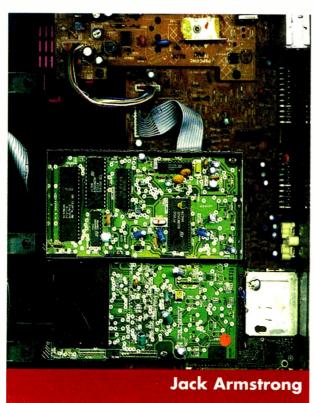
Sony and JVC have announced the joint development of an IEEE 1394 (FireWire) interface for the D-VHS system. It will enable a D-VHS machine to be connected to a suitably-equipped digital set-top box.



The Citizen ST855 is claimed to be the world's smallest LCD CTV with AM/FM radio. It's comfortable to hold and easy to use. Technical features include a UHF/VHF tuner; a high-definition, non-glare super twisted nematic screen; and an AV input so that it can be used as a monitor with a camcorder or other video source.

For trade enquiries contact GB Consultancy on 01869 233 200, fax 01869 232 746.

# Satellite WORKSHOP



#### **Amstrad SRD510**

I sometimes wonder why I bother! This morning I came into the workshop to discover that the receiver I has spent an hour 'repairing' last night now had a rolling picture and no sound. It's fortunate that I had left it on soak test.

The original fault report had been "wavy pictures". When I had first tested the machine there was sound but just a blank screen. Someone had already been inside and replaced C54 (100nF), which is a common cause of picture faults. They had also lost three screws. I should have given up right then, but I'm a glutton for punishment.

I traced the cause of the initial lack of signal to R9 (470 $\Omega$ ), which had suffered from the corrosive effects of black glue. Once this problem had been dealt with there was sufficient signal to provide weak, inverted video. The receiver was well cooked, another reason why I should simply have jumped up and down on it! But I carried on testing and measuring.

More components were replaced

before I got a brief flash of good, strong picture when I touched C54. The cause of the trouble was then clear: whoever had replaced the capacitor had broken a track nearby.

So this morning I'm faced with the choice of still more work or cutting my losses. Do you hear that satisfying sound of crunching? That's size ten Doc Martins improving the shape of a zero-value SRD510. I can use the power supply for another repair.

#### Scrambled Music

MTV transmissions destined for Europe are not scrambled but carry VideoCrypt data which tells a Sky decoder that it is! As a result a UK satellite receiver which contains a decoder will scramble the picture by routing the unencrypted video signal through the decoder circuit!

I've had lots of requests from those who want to watch this programme. The simplest solution is to disable the sync separator circuit, so that the decoder no longer works. In the Amstrad SRD510 for example you can add a switch that short-circuits the 3,300pF capacitor C292 on the little daughter board. It's connected to pin 5 of the TEA2029C chip.

In most receivers that use a PTV111 sync separator chip, for example Pace MSS variants and the Nokia SAT1700 Mk 2, you can add a switch to disconnect the  $1\mu$ F capacitor next to it. In Pace PRD-series receivers, connect one side of a switch to the central test pin labelled TST2 and the other side via a  $1k\Omega$  resistor to pin 1 of the microcontroller chip U2 (5V supply). That should do the trick!

#### Pace Apollo

You may recall Frank from the Lion and Swan, whose PRD800 I repaired recently. No more than a week after I had fixed it and made it reliable he had the urge to "trade it in for a better one" from one of his customers. This turned out to be a Pace Apollo (basically the same as the MSS200/300/500 etc.) which

apparently had a sharply-defined vertical white line on Sky Sports.

It took a long time for the fault to appear. When it did, I discovered that it affected all the decoded channels (including Sky News and Ch. 5) but not the unencrypted ones. The line was 2mm wide and approximately 100mm high (on a 14in. screen). It was about a third in from the left-hand edge of the screen and was very intermittent. Although it occurred at a specific temperature, it couldn't be brought on by using a hairdryer and freezer in the vicinity of the PTV-type decoder chips.

By replacing each IC in turn, I eventually traced the cause of the trouble to the PTV114 graphics inserter chip U9. It was, of course, the very last PTV IC I replaced. It was not possible to narrow the cause to U9 by heating/freezing, because changing the temperature of any of the PTV chips made the line appear or disappear.

#### **Amstrad SRD520**

The complaint with this receiver was "severe lines on the picture". In fact the symptoms were rather like those you get with the Pace SS9000 when the capacitor in the tuner is faulty.

My first move was to fit the capacitors in Relkit 3, but this did not help at all. In fact I now had a blank screen!

I got a weak picture (still with lines) by removing the C-band switch and fitting a wire link in its place. TR7 had glue around it, so I fitted a replacement. I was now back where I had started half an hour previously – with a picture that was heavily obscured by lines.

For good luck I replaced all the electrolytic capacitors in the power supply with low-ESR types. No good. Working blind is not the best of ideas, so I decided to do the job properly. A quick prod with the oscilloscope showed that there was serious HF ripple on the 12V supply from TR304. This transistor, in combination with the op-amp IC300, is supposed to provide a

smooth output. When the associated resistors were checked I found that R8 ( $1k\Omega$ ) was open-circuit. But fitting a new one didn't cure the ripple fault! Nor did replacing TR304. In desperation I replaced the LM392 op-amp (IC300). Success at last. The picture was clean and stable and the audio was good.

#### **Amstrad SDR510**

I don't do many customer call-outs nowadays. Since I started to charge "a pound a minute" the timewasters have stayed away in droves. A little old lady just around the corner tempted me with a cup of tea and a bun however, so I trotted round immediately.

Her receiver worked perfectly. But once it had warmed up the voltage at pin 8 of its TV scart socket wouldn't drop below IV at switch-off. Because of this the TV set stayed in the AV mode. The voltage was 12-2V when the receiver was switched on, so I felt that the TV set was being rather unreasonable in treating IV as 'high'.

I soldered a  $10k\Omega$  resistor between the TV scart pin 8 and chassis. This extra load reduced the 'off' voltage to 0.85V and the problem went away. I departed when the teapot was empty.

#### Pace PRD900

My wife was complaining again – she likes to keep in practice. "It won't record. The timer is stupid." I agreed to take our PRD900 to the workshop later to test it, but she wanted it done now. "And if it does record it plays the wrong programme, with a flashing clock, or just a blue screen."

I hate to admit it, but she was right. I tried setting a number of timed events and the results were somewhat random to say the least. Sometimes the receiver remained on the wrong channel but flashed a clock symbol on the screen and a t in the LED display indefinitely, until manually cancelled by pressing F then Standby. Sometimes it seemed to change channel but left a blue screen, as if the desired frequency had been overshot and lay outside the 'capture range' of the phase-locked loop system associated with the Nicky chip U9.

I fixed this particular fault by pressing F with the LNB menu displayed, so that the AFC was disJack Armstrong is willing to try to sort out readers' satellite TV receiver problems via e-mail. You can reach him via the Internet at:

#### jack@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.

abled. It was then a matter of retuning a few channels manually to remove the sparklies. I measured all the power supply voltages, and checked the ESR of all the electrolytics around the power supply. Everything was perfect. The timer function was still erratic however, so I replaced the microcontroller chip U2. That cured the problem.

I've never known a micro chip develop a fault like this, and doubt whether I'll ever come across the problem again. It's extremely unusual. My wife thinks it's typical.

# Test Case 438

Dave Dawson didn't like April showers. Not that they would have made him wet as he sat indoors in front of his telly. The problem was that they spoilt his viewing of the satellite channels, for which he was paying nearly thirty pounds a month. Rain made the interference to his pictures worse. It had been gradually increasing. To start with a sparkly effect had invaded brightly-coloured areas of the screen, now it was present all over the picture. Some channels were worse than others, especially when the weather was poor. Sky One was almost unwatchable during a downpour, while Channel Five for example came through relatively unscathed – at least when the weather was fine. So Dave picked up the phone and called us.

Our first-line service is generally provided by Doc Colin. Having been given details of the symptoms, he felt that his call would be a waste of time without a means of checking the outdoor equipment. He was right! A replacement receiver produced exactly the same symptoms. So Colin called in our Force Two, which actually consists of Cathode Ray, a big white van and a double-extension ladder. If the dish is too high for that, the job is put in the hands of a 'proper' aerial rigging firm – expert in the windy and salty seaside conditions here.

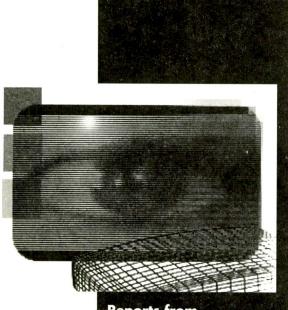
Dave Dawson's house is in an exposed and widswept location, but is not tall. It was certainly within reach of our Ray's ladder, so up he went, spanner in one hand, signal strength meter in the other. The most likely cause of the trouble was that the dish had shifted and was in need of realignment. The badly-corroded dish-fixing bolts didn't look as if

they had shifted. In fact they had seized solid, and it took time, effort and penetrating oil to slacken them. This was finally done, and the signal-strength meter was then connected to the LNB's F socket to align the dish. The meter's tone was peaked by panning and tilting the dish, after which it was clamped up again and the downlead was reconnected.

When Cathode Ray went indoors to check the picture he found, to his surprise, that the signal was not noticeably stronger than before. The sparklies were still there, and subsequent adjustment of the angle of the LNB on the boom (polar alignment) didn't help. So it seemed that either the LNB or the downlead was faulty. Our simple satellite signal checker is of little help here because it doesn't, as with most terrestrial field-strength meters, give a quantitative reading. The LNB was the easiest thing to check next. Having been there for some years, it was of the early type with a 10GHz oscillator. There was a Global channel expander behind the satellite receiver.

Ray fitted a known-good replacement LNB of exactly the same type as the original one. He's got lots of them, made redundant after being replaced by enhanced types or digital gear. Once again the results displayed on the TV screen were no different, exonerating the original LNB and suggesting that the cable was the culprit – cable deterioration often causes this sort of trouble. Could there have been another cause? Ray squinted across the face of the dish to check whether it was bent or distorted. It wasn't. Even so, the cable wasn't the cause on this occasion. Any ideas? Turn to page 583 for the solution.

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Reports from Ian Field Russ Phillips Gerry Mumford Chris Hawkins Adrian Spriddell John Edwards and Roger Burchett

#### **IBM 8515**

The complaint was "screen flooded plus flyback lines, very intermittent". The fatigued solder joint at the A1/focus block's earth pin was attended to as a routine matter during the visual inspection. When the monitor was put on soak test with a peak white display, I noticed that there were horizontal bands of ripple on the brightness. As these drifted vertically, it was difficult to estimate the number per frame – which would have provided a clue of course. I would say about 30-50.

After checking the various snubber circuits I set about the electrolytics. It was becoming apparent that the fault was temperature-sensitive. Attention should be concentrated on the cluster of electrolytics in the middle of the PCB – don't leave out the strays around the cluster. The electrolytics themselves weren't faulty: their pins had worked loose in the solder fillets. During manufacture, the tall electrolytics are 'steadied' by sticking them together with blobs of silicone sealant. The blobs are applied near the top, and thermal expansion of the PCB produces minute movement: as the capacitors are tall, the leverage is considerable. The small amount of movement pulls the capacitor leads free inside the solder fillets without conspicuous damage. As the leads remain a tight fit, most users will wait for something else to go wrong before having the unit serviced – the onset of symptoms is slow and subtle!

Only the high-voltage, small-

# Monitors

value electrolytics usually need to be replaced. The others should be scraped, including removal of silicone sealant, and refitted. If the use of sealant is considered necessary, apply it close to the PCB. I.F.

#### HIT KT46-4NLR

I had carried out a fair bit of work on shoring up the cracked PCB by the time I realised that this repair was not going to make a profit. The crack had not been visible until the chassis had been completely removed: it ran from the edge of the PCB, between the frame output chip and the front panel controls towards the middle of the board.

Where possible, 22 SWG bracing links were used to give some strength to the repair, but there were many fine tracks. The only suitable repair material was stripped from multi-strand equipment wire.

When the damaged print had been repaired, the monitor powered up with excessive width and the frame output came to an end after a couple of minutes. The cause of the width fault was Q709 (2SD669A), which was short-circuit. The frame fault disappeared after a considerable amount of rework, checking for dry-joints and double-checking the repairs to the copper print.

Once I was convinced that the repair was sound, I gave the monitor a good shake to see if it really was! The result was a new intermittent fault – a jagged yellow picture. The cause turned out to be a massive dry-joint at the CRT's blue cathode pin. I.F.

#### ICL 15505-002

This elderly VGA monitor appeared under a number of guises, including **Apricot** and **Olivetti**. Despite its low specification, it remains popular because of its reliability. Also because its push-button feature of green, amber or blue text screens makes it attractive as a DOS word-processor. This one was dead with the power LED on. It had been

dropped, the result being a crack in the PCB next to the LOPT. When the damage had been repaired, it produced a horizontal line.

R320 ( $4.7\Omega$ , 1W) was burnt, D302 (RGP15J) gave odd readings and Q301 (TDA1675 – no A suffix!) had failed. I didn't have a '1675 but a '1675A worked fine!

Some of these monitors have an electrolytic capacitor connected to the print side of the PCB beneath Q301. As there are no markings on the PCB for this component, it's easy to get the connections mixed up after replacing the frame output chip. The positive lead goes to the IC pin for which no solder pad is provided, while the negative lead goes to the chip's chassis pin (middle of the shorter row of pins). I.F.

#### **AOC CM335**

Whistling with no EHT is the symptom when the line output transistor blows. In addition you will sometimes find that D109 on the secondary side of the chopper transformer is short-circuit. Alternatively the line output transformer could be the cause of this fault. **R.P.** 

#### Crown EM1428

This monitor was dead with a short-circuit line output transistor and dry-joints at the flyback tuning capacitors. C617 (47µF, 50V) should also be checked: it can decrease in value to about 1-8µF. You'll find it on the primary side of the line driver transformer. **R.P.** 

## GoldStar StudioWorks 76i (CS770)

This monitor was dead. A few checks showed that there was a short-circuit across the 80V output from the power supply. The cause was quickly narrowed down to the relevant rectifier diode D909 (RGP10J), which was replaced. When the monitor was powered again there was a second when everything seemed to be OK. This was quickly followed by a loud pop

and a flashover around the area where the new diode had been fitted. Checks showed that it had gone short-circuit again, and had blown up a discrete pre-regulator circuit that consists of two 2SC2316 transistors (Q903/4) and an 8·2V, 500mW zener diode (D918). Once all these items had been replaced there was a perfect display. G.M.

#### ViewSonic 6E

This dead monitor made a clicking noise. As usual, the cause was a short-circuit BU2508AF line output transistor (Q310). The reason for its demise was not so usual however: someone had turned the HT preset VR601 to maximum. The correct adjustment is for 90V at pin 2 of connector M301. G.M.

### Siemens Nixdorf MCM151V

This monitor produced a vertically expanded, liney, jittery display. The cause turned out to be C619 (100nF, 100V) in the frame output stage.

If one of these monitors has no green in its display, check L805 (2.7µH) which is in the 63V feed to the green output transistor. It tends to go open-circuit.

The glue around C838 and R855 (the first anode supply connection on the tube base panel) can cause problems by becoming conductive. The first anode (G2) voltage then falls and there's no picture. Simply scrape the glue away. G.M.

#### **Dell Ultrascan 17FSEN**

Two of these Mitsubishi-made monitors came in at the same time. The first one kept blowing the 4AT fuse. The cause was the STRS6308 chopper chip IC901 which was short-circuit between pins 1, 2 and 3. A replacement restored normal operation.

The second one had no blue drive. The video amplifier/output section, on the CRT PCB, is an awesome affair. There are several ICs and transistors, including a dedicated chip (IC201, type 93804S0R), a hybrid chip (IC202, type CP267P042A30) and IC203 (LH2426S). The transistors all seemed to be OK. In theory I could have borrowed the ICs from the first monitor for substitution checking, but instead I decided to replace the LH2426S device. Fortunately my guess was right, especially as it's expensive - over £20. C.H.

#### Compaq 460

This monitor blew its mains fuse at

random. Several dry-joints were dealt with, but the real cause of the problem was the slightly overtanned degaussing posistor PTC901. Once it had been removed from the board its rattling sound confirmed the diagnosis. C.H.

#### Zenith ZM1400/Hyundai HM413

The most common faults with these monochrome monitors occur in the power supply. Replacing the following items should get you going: Q501 (BUT46A, BUT11 or BUT56A); Q502 (KN2222, PN2222, 2N2222 or BC639 - note that not all 2222 transistors have the same pin connections); optocoupler IC501 (MCT2102, CNX35, CNX36, TIL114, TIL117 or SL5500); C506 (33µF, 50V); C501  $(10\mu F, 50V)$ ; C502  $(3.3\mu F, 50V)$ ; and R514 (4.7 $\Omega$  or 6.8 $\Omega$ , 5W). Note that an IRF740 MOSFET line output transistor is fitted: the IRF840 is a suitable replacement. C.H.

#### **Belinea 104010**

This monitor had a very annoying line jitter and phase drift. Each time I attempted to locate the cause, the fault disappeared for a few days. Fortunately several of these monitors were in at the same time, so it was possible to swap components. After changing everything from the LOPT backwards I eventually found that C612 (?) was the culprit. It's a blue, 470pF capacitor that's connected to pin 2 of U602. A.S.

#### Opus CM1438T

The green power LED was alight but this monitor was otherwise dead. Checks showed that the supplies were all OK, and the line oscillator was working. But L401 was open-circuit, so there was no line scanning. A.S.

#### **Belinea 104010**

There was no display and the green LED was flashing. The monitor does this when it's in the green, standby mode. So, after initially being deceived into thinking that there were no line pulses from the computer, I looked for a possible cause of excess current and found that D152 in the power supply was short-circuit. We don't stock this UF1007 device, but the manufacturer has fortunately allowed for fitting a larger diode with fatter legs. A UF5408 drops in a treat. A.S.

#### Model 29J56N/JD156N

Another monitor with no brand name – yet two model numbers!

The green LED was blinking because the power supply was in the shut-down mode. I had to spend some time drawing out the power supply circuit from the print layout, and after the repair added important voltages. So if you come across one of these monitors, the following information should be useful.

There are four rectifier diodes on the secondary side of the chopper transformer. The output from D812 should be 83V, or 0V with no signal; the main HT rectifier D813 should produce 56V with no signal, 66V in the VGA mode and 74V in the SVGA mode; there should be 15V at the output from D814 and 8V at the output from D815.

In this particular monitor there was no HT output from the power supply because FET Q801 (2SK1917) was short-circuit between its drain and source. It acts as a variable resistor across the HT line to alter the voltage depending on the input signal's frequency/mode. Q801's gate terminal is connected to the output (pin 3) of a 555 timer chip which provides a PWM squarewave drive whose mark/space ratio is set by flyback pulses from the line output transformer – they are fed to pin 2 via Q811.

I didn't have and couldn't find a supplier for the 2SK1917, so I fitted a 2SK1036 instead. It ran cool and the monitor worked correctly. J.E.

#### CTX 1569S

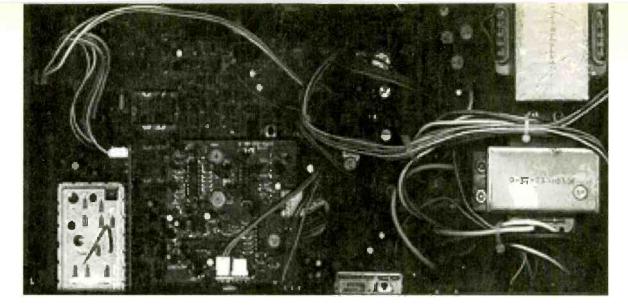
You very often find that the 25V regulator Q106 (2SB772) is dry-jointed – I now check the soldering here before powering up. In one case recently the symptoms were intermittent failure to start or stopping after a while. The fault could also apply with Model 1565D, which has a similar power supply.

In one 1569S monitor I found that Q106's base and emitter leads were bent over and touched intermittently under the board.

Many of these monitors arrive with the main board jammed half in and half out of the runners. In this event it's quite common to find that the front control panel has snapped in two. Removal of the main board, which is usually undamaged, can be quite a tussle – and you can't reach Q106 otherwise!

Bad soldering on the tube base board is also quite common, particularly at the tube base pins.

One monitor had a very bright display because R726 ( $1M\Omega$ ) in the first anode supply network was open-circuit. **R.B.** 



# Satellite Notebook

#### Pace SS9000

This elderly receiver had been kept very cool-running during its life. It even had the original Hitachi tuner and black mains transformer, which is far more reliable than its pink successor. But after some lightning it refused to come back on. There were no obvious short-circuits, and HT was present at the mains bridge rectifier's reservoir capacitor. When power was disconnected however the capacitor discharged quite rapidly, which doesn't normally happen with an inactive

chopper transistor.

When I replaced the TDA8380 chopper control chip U23 the receiver came back to life. I'd given it a major electrolytic capacitor refit a year ago, so the pictures were good and no work was required to remove the characteristic power-supply type interference from the picture! H.C.

#### **Astra Digital Frequencies**

When there are reception problems with certain digital channels it can be useful to know the frequencies

of the various Astra 2A transmissions – to possibly identify a transponder/frequency problem. Table 1 lists the current channel allocations. Future channels may of course be added, and Sky can move the frequencies around with receivers automatically tuning them in. C.H.

#### **Amstrad SRD500**

There was no reception of the vertically-polarised channels. The cause was the LA4960 LNB voltage switch IC501: its logic input

#### Table 1: Astra Digital channel frequencies.

Frequency (GHz)	Pol	Channels:
11.720	H	BBC1, BBC2, BBC Choice, BBC News 24, BBC1 NI
11.740	V	Living, Challenge, Trouble, Bravo, TVX, Travel Shop
11.758	Н	Ch 4, Ch 5, Film 4, The Box, CNBC, CNE*, Sky Sports News
11.778	V	Music Choice 1946, 1947, 1948* This is also the receiver's default frequency
11.798	V	BBC1/Choice Wales and Scotland, BBC Choice NI
11.817	V	UK Style, Horizons, Arena, UK Gold, UK Play, Screen Shop, UK Gold Classics
11.837	Н	Sports 1, Sky 1, Sky Premier, Sky MovieMax, Box Office 1-5
11.856	V	Sports 2, Premier 2, MovieMax 2, N. Geographic, Box Office 6-10
11.876	Н	Animal Planet, All Discovery channels
11.895	V	MTV, VH1, M2, Nickelodeon, Paramount Sci Fi
11.914	Н	Sports 3, Premier 3, MovieMax 3, Info Channel (999), Box Office 11-15
11.934	V	Premier 4, MovieMax 4, Retail Info Channel (997), Box Office 16-20
12.012	V	Open (was BIB)
12.032	Н	Travel*
12.051	V	Travel, CNN, Cartoon Network, Shop!, QVC, CNN Radio*
12.070	Н	Sky News, Sky Cinema, Cartoon Network+1HR, Box Office 21-25
12.090	V	Sky Cinema 2, Disney, Box Office 26-30
12-129	V	S4C Wales
12.148	H	BBC Parliament, Bloomberg, Granada Plus, Men & Motors, Box Office 31-35, Digital Info Channel (999)
12-168	V	Tara, Sky Soap, MUTV, Sky Travel, Guide Info (998), Box Office 36-40, 18+ (Ch 751 in EPG)
12-226	V	Breeze, History, Racing, Dot TV, Playboy, Box Office 41-46
12.246	V	Box Office 47/48/50, Box Office Preview, Sky Premier Widescreen, Fox Kids, Open TV Promo. Box Office 49 does not exist at present but will probably be on this frequency

<sup>\*</sup>These channels do not form part of Sky's Electronic Programme Guide but can be tuned in manually by going to the 'add channels' menu. Travel TV is in the EPG (ch. 181) but is also transmitted separately on 12-032GHz.

Reports from

Hugh Cocks

Chris Watton

Martyn Davis

Christopher Holland

Kevin J. Green and

was OK but its output wouldn't change. C.W.

#### **Amstrad SRD400**

This receiver wouldn't tune to any stations. Checks showed that the tuning voltage output at pin 2 of the UAA2001 driver and latch chip IC105 in the microcontroller section was stuck at approximately 4V. It took a lot more searching to find that C111 (0·01µF), which couples the prescaler output from the tuner to pin 11 of the PLL/microcontroller chip IC101, was almost short-circuit. **K.J.G.** 

#### Pace MSS500

A large square pattern made up of white dots in neat columns and rows overlaid every picture. The culprit was the graphics generator chip U7. M.D.

#### **Echostar DSB9800**

This Dutch digital package receiver was totally dead following recent storms and a series of power cuts.

Some care is required when removing the top of the receiver, because the Irdeto conditional access module (CAM) slots into the lower side of the case and is held in with a retaining clip which is visible only when looking at the bottom of the box! This is confusing, because the CAM has to be removed before the top will come off...

Once the top had been removed I saw that the receiver consists of the main PCB and a separate power supply PCB. I was not surprised to find that the mains input fuse F1 was open-circuit. Unfortunately the power supply PCB had totally unfamiliar component numbers and appeared to be of Far Eastern origin.

I checked the chopper device, which appeared to be OK, also the two transistors associated with it. There are several regulators on the secondary side of the chopper transformer, also an optocoupler. I was hoping there would be no problems there!

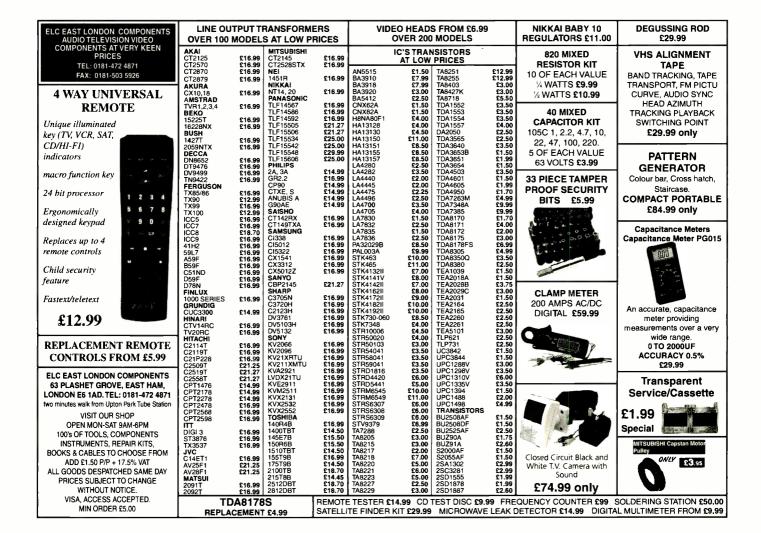
As no shorts were evident around the chopper device, which seemed to be similar to the TOP202 used in modern Pace receivers, I replaced the fuse and switched on. The fuse didn't blow,

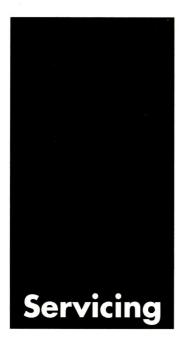
but the receiver didn't work — though there was HT across the mains bridge rectifier's reservoir capacitor. Best to look for a high-value start-up resistor I thought.

Two large  $1.5\Omega$  resistors in series by the chopper device looked slightly the worse for wear, but there was nothing in the region of  $100k\Omega$ . What did the two nearby transistors do I wondered? Then I spotted a smallish  $680k\Omega$  resistor which, when I traced the track beneath the PCB, I discovered should have fed HT to one of the two transistors. It was virtually open-circuit.

I fitted a replacement with a somewhat higher wattage rating. The receiver then came to life and said, after its digital boot-up sequence, that I might like to check the aerial as it couldn't find a signal. What a helpful receiver, especially as I hadn't connected an aerial!

Good pictures appeared when I connected the workshop Astra 19·2°E feed – the Dutch package is transmitted in the digital high band at 19·2°E. H.C.





# the Panasonic Euro-2 Chassis

Chassis that use digital signal processing present their own brand of problems – in addition to the usual power supply and timebase output stage ones. Brian Storm summarises experience with the Euro-2 chassis: several versions have been used in a variety of models

he Panasonic Euro-2 superseded the Euro-1 digital TV chassis in 1995. Sets fitted with the Euro-1 chassis first appeared in 1992. There are two main versions of the Euro-2 chassis, the advanced digital chassis which is used in models suffixed AD, and the leader or base versions which have fewer features and are used in models suffixed MD or LD.

With the Euro-2, digital signal processing came to be used in a wider range of TV sets fitted with a greater number of different tube types and sizes. All models have Nicam sound, and the standard range of features includes new on-screen menus, auto intelligence (AI) to extend the contrast range and bring out more detail in dark and light areas of the picture, and an automatic tuning and channel naming system. There are two scart connectors, one of which (AV2) accepts separate Y and C signals. The sets are capable of NTSC 3.58 or 4.43 signal processing via these AV inputs.

AD models also have a separate on-screen volume control for headphones and additional front-input AV jacks. Some are equipped with Dolby Pro-Logic facilities. Models in the extensive Euro-2 range include those listed in Table 1.

There are 'hidden' model changes throughout the earlier ranges, a number of suffix letters indicating a CRT variation. There were at least four versions of the TX25MD1, including the TX25MD1/L, TX25MD1/B and TX25MD1/M: from the viewer's point of view they are almost identical, but from the servicing point of view it's important to note that they have chip sets with incompatible software.

**Power Supplies** 

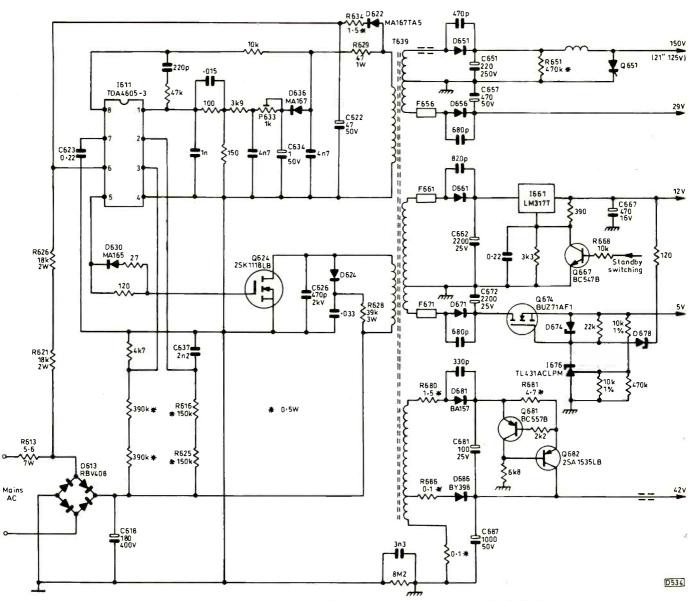
Two entirely different power supplies were used in the Euro-2 chassis. The base models (LD and MD) have a

chopper power supply based on the TDA4601 control chip. It's very similar to the power supply circuit used in the Euro-1 chassis. AD models have a completely new TDA4605-based chopper power supply. The TDA4605 IC's output stage is designed to drive a FET chopper transistor. As a FET draws almost no drive current, the control chip has reduced power dissipation and doesn't require an integrated heatsink. In fact the newer TDA4605 comes in a small dual-in-line package.

Fig. 1 shows the TDA4605-based chopper power supply circuit. A start-up feed is provided by R621 and R626, which charge C622. When the voltage at pin 6 of the IC reaches 12V it becomes active and starts to drive the chopper MOSFET Q624. Initially, drive switch-off is controlled by the input at pin 2, which is compared with the regulation feedback input at pin 1. When Q624 is switched off, the energy stored in the chopper transformer T639 is released. Rectifier diode D622 then takes over the supply to pin 6 of I611. C623, which is connected to pin 7 of the chip, helps to provide a soft-start.

Power supply regulation is controlled by the voltage at pin 1 of I611, while pin 8 is used to control the duty cycle. Increased loading reduces the switching frequency. The power supply provides regulation with load variations between 40W and 260W and mains input variations between 180V and 270V. Pin 3 of I611 is monitored internally to provide protection against overloads.

The outputs on the secondary side of the circuit are 150V (125V with 21in. models) for the line output stage, 29V for the line driver stage, 42V for the audio output stage and 12V and 5V for the digital and small-signal circuitry. Q681 and Q682 provide additional regulation for the audio output stage supply, reducing the



TX21MD1

Fig. 1: The TDA4605-based power supply circuit used in some versions of the Panasonic Euro-2 chassis. Note that R668 is omitted in later production – see text.

voltage but increasing the current flow as the audio output IC approaches maximum power. This regulation helps to protect the chip from damage while allowing it to run at its maximum rated power.

There are very few common faults with these power supplies. A common cause of a blown mains fuse is the degaussing thermistor, which is either R808 or R619. In later AD type sets R668 in Q667's base circuit is removed to prevent CRT spot burn should relay RL6101 stick when the set is switched to standby.

#### **Standby Operation**

The standby power supplies consume typically 1W in the standby mode. In fact the standby transformer T6101 is of such low power (90mA) that assistance from the main power supply's 12V output is required to sustain the outputs when current is drawn as the set emerges from standby operation. Fig. 2 shows a typical circuit.

Most Euro-2 sets use a relay to control the feed to the

#### Table 1: Models fitted with the Euro-2 chassis

21in. base model

TX21MD3	Replacement for the TX21MD1
TX21AD2	21in. model with Dolby Pro-Logic but no additional speakers (3D sound)
TX25MD1	25in. base model
TX25MD3	Replacement for the TX25MD1
TX25XDP3	25in. model with 3D sound and wood-panel trim
TX25AD1	Advanced 25in. digital model
TX25AD2	Replacement for the TX25AD1
TX25AD1DP	Advanced 25in. Dolby Pro-Logic model with four additional speakers
TX25AD2DP	Replacement for the TX25AD1DP. Has three additional speakers
TX28LD1	28in. base model
TX28MD3	Replacement for the TX28LD1
TX28XDP3	28in. model with 3D sound and wood-panel trim
TX29AD1	Advanced 29in, digital model
TX29AD1DP	Advanced 29in. digital model with Dolby Pro-Logic
TX29AD2DP	Replacement for the TX29AD1DP with three additional speakers
Note: this list	is not exhaustive.

Note: this list is not exhaustive.

main power supply. The relay is activated by the main microcontroller chip, which is IC1801 in AD models, IC1201 in base models. Some sets however, notably the TX21MD1, TX25MD1 and TX28LD1, use a switching

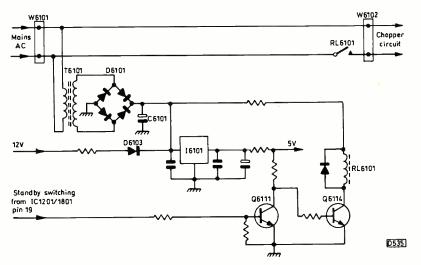


Fig. 2: Typical standby power supply circuit.

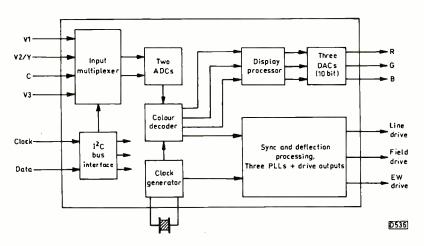


Fig. 3: Simplified block diagram of the VDP3108 video/deflection processor chip.

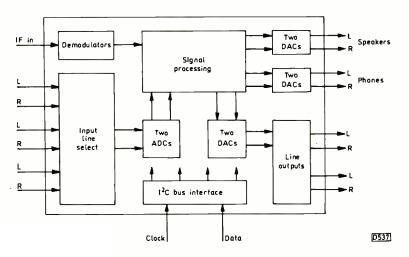


Fig. 4: Simplified block diagram of the MSP3410 sound processor chip. Two different, incompatible versions were used.

transistor, Q801, which is mains-isolated by an opto-coupler, D808.

#### Field Output Stage

The field output stage in the Euro-2 chassis is based on the ubiquitous TDA8175 chip and is again very similar to that in the Euro-1 chassis.

With base models the top of the picture is sometimes cramped, showing the CRT black-level sampling lines at the top. The cause is usually leakage in D456. An MA2160 or 0.5W 16V zener diode will usually cure the problem.

The most common field fault I've had with AD models has been intermittent black lines near the bottom of the screen. The cause of this has been D508 or D507.

Dry-joints at R464 can cause varying height with base models.

Most early circuit diagrams show an arrow coming from pin 7 of the IC: in fact this is the input.

If the field slowly rises and falls when a set comes on this is almost certainly not a field fault in the normal sense. Suspect the non-volatile memory device, which is IC1941 in AD sets, IC1203 in base sets.

#### **Line Output Stage**

The line output stage is entirely conventional but now has a BU2508AX output transistor. This has an internal diode which is not shown in the circuit, though it's hinted at by the dotted line around the component.

Intermittent failure of the line output transistor is often caused by the standby relay sticking. The line driver stage should, as standard practice, be checked for dryjoints though these are rare. It never struck me as a good idea to feed the line drive via a connector so, in AD sets, check the integrity of connector W1511.

The line output transformer occasionally causes problems. When there's an overload in the line output stage the power supply will pulse on and off.

#### **EW Drive**

The east/west drive circuitry is also fairly conventional. It uses four transistors in AD models and a TEA2031A chip (IC701) in base models.

Failure of Q593 can be lessened by connecting a 39V zener diode across its collector and emitter – this was done in later production sets. Poor or no EW correction with base models can occur when D556 is leaky.

#### The Digital Video/Deflection Processor

Video signal processing and generation of the timebase drives was initially carried out by a VDP3108-29 dual-in-line chip, IC601. Fig. 3 shows a simplified block diagram. The main operations carried out by this chip are as follows: PAL/NTSC/Secam colour signal decoding; AI processing (automatic black-level expansion); generation of a line drive output at pin 27; generation of a field drive output at pin 6; generation of an E/W drive output at pin 5; AV switching, composite and Y/C, with inputs at pins 38, 40,42 and 44; analogue RGB interfacing, with inputs at pins 61, 63 and 64; digital RGB interfacing, with inputs at pins 12, 13, 19, 20 and 21; automatic grey-scale tracking, with the sensing input at pin 53; and generation of RGB drive outputs at pins 59, 57 and 55.

IC601's working parameters are set at switch on via an I<sup>2</sup>C bus, the clock input being at pin 10 and the data input at pin 14. All customer controls and service adjustments are carried out in this way.

For fault finding the important pins are 28, which should be at 5V even in standby, the reset pin 31 and the

20.25MHz oscillator pins 16 and 17. In operation pins 15, 45, 47 and 60 are also provided with 5V supplies.

Automatic grey-scale correction is controlled by a fly-back pulse at pin 62: this sets the range of an internal AD converter. Sensing is carried out at pin 53, with reference to the current flowing via resistors connected between pins 50 and 51. This analogue voltage is converted to digital form and is then passed via the I<sup>2</sup>C bus to the main microcontroller chip where the data is compared with data held in memory. Any correction required is calculated and sent back to IC601.

The main microcontroller chip also collects data from IC601 for automatic black-level expansion (AI). The level of AI can be selected from the user menus. The microcontroller chip also monitors data from IC601 to check that the dynamic range of the video signal is within certain limits. If the range is too compressed, the contrast gain within IC601 is increased.

The digital RGB inputs (pins 12, 13, 19, 20 and 21) along with the priority codec inputs at pins 3 and 4 and the main sync signal (MSY) at pin 34 provide digital information about the main picture. This is used by the teletext processor (either IC1701 or IC3502). During text displays IC601 produces interlace suppression pulses at pin 29.

A field flyback pulse is monitored at pin 34. If there is an abnormal condition here the RGB signals are blanked.

Later versions of the Euro-2 chassis use a VDP3108APPA1 processor. This is not compatible with the VDP3108-29.

These digital signal processor chips have been pretty reliable, but some symptoms can be obscure. One of the first I came across was blue flecks that appeared in the background when the set had been working for some hours. Another symptom seen, again when the set has been on for some hours, looks almost like line drift: as the fault gets worse, the set often lapses into standby. This can also be caused by the crystal connected to pins 16 and 17. I change the crystal first (fewer pins!). It can also cause colour loss or drift, usually intermittently. The processor chip can be responsible for faint vertical green lines in the background of the picture.

A video symptom that's usually not caused by IC601 is a completely or partially blanked picture. The cause is nearly always the non-volatile memory chip (the EAROM).

It's always worth checking the voltages around the chip carefully before you condemn it, as the small capacitors connected to various pins are often the cause of faults when they develop leakage, which can be considerable. For example low brightness can be caused by C310 being leaky.

The combined RGB drive chip IC351 on the CRT's base panel can be the cause of a varying grey scale with base models.

#### **Sound Processing**

The sound signal processing is likewise highly integrated. In most sets an MSP3410-15TV digital sound processor chip carries out the following main functions: simultaneous processing of Nicam and FM sound; handling three separate left and right channel AV inputs; providing two separate left and right channel AV outputs; digital volume, bass, treble and pseudo-sound control; headphone drive; audio output stage drive.

Fig. 4 shows a simplified block diagram of the main sections used in the Euro-2 chassis. The MSP3410-15TV can demodulate a wide range of stereo and mono TV sound signals. In the UK, Nicam and 6MHz FM

sound are demodulated simultaneously. The selection of standards, features and adjustments is carried out via the I<sup>2</sup>C interface.

The sound processor's clock frequency is set by an 18·432MHz crystal at pins 62 and 63. The chip receives 5V at pins 18 and 57 and 8V at pin 39. There is a reset at pin 24. The I<sup>2</sup>C bus pins are 10 clock and 9 data.

In later versions of the Euro-2 chassis an MSP3410BPPF7 chip is used for sound signal processing. It's not compatible with the MPS3410-15TV.

The main faults caused by the sound processor chip are distorted or absent Nicam sound. Almost any sound fault can however be caused by either these devices or the associated software chips (control or memory).

#### **Dolby Pro-Logic**

The addition of Dolby Pro-Logic with some models introduced a number of problems. At least three different Pro-Logic PCBs have been used. They all have an on-board power supply for the additional power amplifier chips.

Configuration of the Pro-Logic setups varies from model to model. Some have four additional speakers (L, R, Lrear, Rrear), some three (centre, Lr, Rr) and others four again (centre, Lr, Rr and sub-woofer). Some models have 3D sound, which is supposed to simulate the surround-sound ambience.

The wary service engineer should always disconnect the Pro-Logic PCB if the set is dead or tripping – or isolate the I²C clock and data lines. Having been run at full bore for most of their lives, one of the output chips is certainly going to fail as Arnold Shwarzenegger repels yet another helicopter attack. When it has gone short-circuit, the safety resistor in its supply will have gone open-circuit – but not before a very large glitch has had time to wreak havoc throughout the Pro-Logic board. Basically this means that when one of the output chips is faulty you should not expect to have sound after replacing it: instead, check the audio paths through the various processors carefully – usually at least two of them are defective.

#### **Text Processing**

Teletext processing is carried out by a TPU3040-18 chip, with an external DRAM chip for additional page and OSD memory. Composite video is fed to pin 3 of the TPU3040-18 chip, which should have 5V at pins 4 and 11, and I<sup>2</sup>C inputs at pins 23 (clock) and 22 (data). The digital RGB connections to IC601 are at pins 6-9 and 12. The teletext chip shares IC601's 20-25MHz clock signal at pin 17, its reset at pin 16 and receives its main sync signal output at pin 20.

No text because of a dry-joint at the video input coupling capacitor C3508 was quite common with earlier base sets. The display cancel and text update facility didn't work with earlier models because of an EEPROM (IC1202 or IC1871) programming error. This was subsequently corrected.

The text processor could be responsible for the intermittently dead symptom with early Euro-2 sets.

#### **Device Control**

Digital processing is under the control of IC1801 (IC1201 in base models). This CCU30001-05 microcontroller chip is connected to all the digital processing ICs, the tuner, the IF and AV switching ICs and the non-volatile memory device (the EAROM) via three I<sup>2</sup>C bus systems (1, 3 and 4) as follows:

Bus 1 is connected to the video/deflection processor, the

sound processor, the text processor and the non-volatile memory (EAROM).

**Bus 3** is used to read and write from/to an external memory pack and some Pro-Logic processors.

**Bus 4** is connected to the tuner unit, the IF and AV switching chips and some Pro-Logic processors.

The operating conditions for the digital processor chips have to be loaded at switch on. This is carried out by the CCU chip IC1801/IC1201 under the control of the operating software, which is stored in the EEPROM (IC1871 or IC1202). The operating levels, customer settings, tuning information and service adjustments are stored in the EAROM (IC1941 or IC1203). These are first sent to the microcontroller chip which then sends them to their correct locations, i.e. the processing chips. This procedure also occurs when the set is switched out of the standby mode

#### Service Mode

The Euro-2 chassis has a number of built-in servicing features. Service mode one is used for normal service settings such as picture geometry and grey-scale tracking. To enter this mode, set the bass to maximum and the treble to minimum, then press volume down on the TV set while pressing reveal on the remote control unit. Once in service mode one, use the red and green Fastext buttons to step through the adjustments and the yellow

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and blue buttons to alter the settings as required. Press store to retain the settings.

#### Self-check

The self-check mode can be used to check the communication between the microcontroller chip and the digital signal processor chips. When the self-check mode has been left, the device control system will be reset. This can be important if the CCU, the EEPROM or the EAROM have been changed. One symptom of the need for a reset is when the receiver comes on with the sound at minimum and on channel one.

#### **Memory Problems**

The EAROM (IC1941 or IC1203) can be the cause of a number of fault symptoms, including a dead set or an intermittently dead set. This can usually be isolated by running the set with pins 5 and 6 desoldered. One thing to beware of is R558 in the beam limiter circuit going high in value or open-circuit: this can cause a dead or intermittently dead set, with the symptom apparently cured when the EAROM is disconnected. The EAROM has been the cause of some bizarre video faults, and could in theory be the cause of almost any fault in a TV set.

The EEPROM (IC1871 or IC1202) was reprogrammed for several reasons including Macrovision problems, channel naming and sorting, and text page updating in the display cancel mode.

It cannot be sufficiently emphasised that when the EAROM or EEPROM is replaced it must be the correct type for the particular set. For example, the ICs for a Model TX25AD2DP/B are not be suitable for Model TX25AD2DP/M.

After either or both of these memory ICs is/are changed, it is advisable to enter the self-check mode to reset the operating conditions.

It is not always necessary to replace these two ICs as a pair, but this is advisable when the set is an earlier AD1, MD1 or LD1 type as the Macrovision upgrades will cause instability if only the EAROM is changed.

Replacing the EEPROM and EAROM can sometimes cause field jitter. If this happens, the video/deflection processor chip IC601 must also be replaced.

#### **Fault Finding**

The main problem with high-level integration, especially with a digital set, is the unseen software content of an IC. If data has been incorrectly loaded into a digital processor virtually anything can happen. If no data is loaded because the EEPROM chip is faulty, nothing will happen and the set will be completely dead. The I<sup>2</sup>C bus protocols always check that data has been received: if there is no acknowledgement, the data will be sent again and again. If a digital processor doesn't accept data, the set will usually be dead.

If a faulty device connected to an I<sup>2</sup>C bus is pulling down the bus lines, the set will again usually be dead because data cannot be transmitted along a defective bus line. Devices that can pull down data bus lines include the EAROM and AV switching ICs: the UHF tuner is another common offender. The voltage on the bus lines should be about 5V. If not, disconnect devices until the 5V level is restored.

Also remember that a microcontroller chip must have a *clean* and *accurate* supply, i.e. with less than a fifth of a volt variation from the specified 5V. There must also be a reset and a clock feed. It is pointless, though sadly rather common, to replace a microcontroller chip before carrying out these vital checks.

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# CD Player Servicing

ield service calls to deal with CD player faults are not practical nowadays. When a collection has to be arranged, it can help if whoever brings the player in finds out whether problems like jumping or skipping, which may be intermittent, are caused by certain discs. A selection of discs that demonstrate the fault condition can also be a big help to the bench technician.

#### The Lens

The cause of failure to read the TOC (Table of Contents) can be a soiled lens. A dirty lens can also be responsible for no disc output, failure to display the track number and total music number, failure to play or jumping tracks. If the RF signal and the eye pattern are of low amplitude before the lens has been cleaned, check them again after cleaning to ensure that the laser's output has now returned to specification. If not, replace the pick-up assembly or optical block and carry out alignment. When there is a repeated dust or nicotine contamination problem it may be appropriate to suggest to the customer that the unit is placed in a housing.

On the subject of lens cleaning, Pioneer and Sony both recommend the use of isopropyl alcohol (part nos. GED-008 Pioneer, KK-91 Sony). Wipe the lens with a spiral motion from the centre outwards. If an incorrect lens cleaner is used, the result can be a cracked coating or a dim lens, with premature failure of the laser block.

#### **Laser Checks**

If the laser is suspect, check whether it emits light. Note that it is dangerous to view the lens directly. Ensure that the laser power is low (not more than about 0·25mW), view the lens from the side, at a distance of at least 30 cm, and do not watch for more than ten seconds. If the laser is not alight, check the laser current. This differs between models and manufacturers: with Pioneer players the laser power is generally about 0·13mW and the current about 30mA. If the current is lower than this, there may be an open-circuit between the control IC and the laser diode. If the current is much higher, at 60-70mA, the laser diode is faulty.

If the laser doesn't light and the laser current is correct, check that the focusing operates correctly. If these tests give normal results, suspect the optical block: check it by replacement.

Some optical units have rubber floats which, if they

perish or wear, can cause jumping or in some cases half-moon shaped scratching on the surface of the disc.

#### **Excessive Disc Speed**

If the disc rotates at excessive speed, suspect the optical block. But before replacing it, check the focus error/tracking balance, ensure that the lens is clean and that the disc is OK.

#### **Disc Faults**

Faulty discs can cause various symptoms. One of the most common problems is scratches caused by user mishandling. The direction of the scratch line tangent will determine whether the result is jumping or no playback. If the scratch is wide there is bound to be jumping.

On rare occasions you find that the disc centre is misaligned. The result is no playback. Disc damage can also result in light showing through, or the signal surface may peel off. This will distort the signal, again with jumping. A black spot can form on the surface of the disc during manufacture: this can also cause jumping.

#### **Spindle Motor Problems**

If the spindle motor is worn, the frequency of the RF eye pattern will fluctuate. As a temporary measure, remove the motor and connect a battery across its terminals. Then reverse the connections so that the motor has rotated in both directions. It will now operate correctly, but only temporarily, enabling the operation of the rest of the player to be checked for reading of the TOC.

Ensure that the disc table is fitted correctly and set at the correct height after replacing a spindle motor. If the height is incorrect, the disc may not play at all or there may be skipping.

If the spindle motor is OK, check the drive circuit.

If, with some players, the spindle motor doesn't operate, use a scope to check that the RF blip is present. If so, suspect a faulty optical block. Recheck the focus and tracking servos. If they don't work correctly, check the laser diode output power. If this is too high, the amplitude of the RF waveform will be excessive because of incorrect reflection from the surface of the disc.

#### **Ribbon Connectors**

Many CD players have very thin and sometimes insufficiently flexible ribbon connectors. These can cause

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many problems, which may be permanent or very intermittent. Incorrect laser unit operation for example, or no power or no spindle motor power.

With machines that have a multi-play unit or two-three disc turntables a ribbon connector fault may be responsible for no rotation from one disc to another or failure to operate.

#### The Drawer

A broken or fractured ribbon cable can be the cause of the drawer loading and unloading on its own, or in some cases failing to load at all. The most common cause of the drawer not going in and out is the loading belt – when one is used. If the belt is OK, check whether the grease along the runners has hardened. The resistance this introduces will cause incorrect drawer operation. If these points are all OK, remove the belt and see if the motor rotates. If it does, it may have insufficient torque to drive the loading belt and tray. If it doesn't, check whether the DC supply is open-circuit.

Incorrect limit switch operation is another cause of failure of the drawer to open or close. If this is OK, check that the logic signals are correct.

A faulty limit switch may also prevent the pick-up unit returning to the start position.

#### The Sled Motor

A faulty sled (carriage) motor can cause track jumping or juddering or sticking in one place. It may be necessary to remove the motor and clean its spindle, and the runners or cogs depending on model and make. To pre-

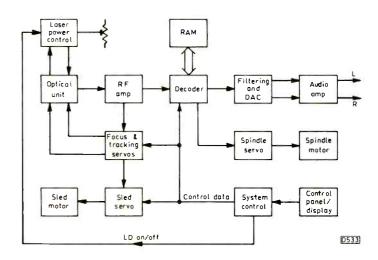


Fig. 1: Basic CD player block diagram. Models fitted with a radial optical assembly have a radial servo instead of separate tracking and sled servos.

vent binding, ensure that the unit is well cleaned and lightly lubricated.

#### **General Points**

With modern units the pick-up assembly mechanism and laser power are preset.

It may be necessary to check and adjust the tangential skew to prevent jumping. Bad wear here will prevent player operation. The same effects can be caused by incorrect grating adjustment.





J. LeJeune provides a detailed fault-finding guide for the deck and the electronics used in these popular low-cost machines

# the Daewoo V50 and V60

hese two VCRs are virtually identical, the main difference being that the V60 has the VideoPlus option enabled. They use the Daewoo FM deck, which is simple and easy to service. On the electronics side the motherboard contains the servos and system control circuitry and the interconnections. There are six modules: power supply, modulator, tuner, pre-rec (Y/C), IF/demodulator and input-output board. There is a second microcontroller chip on the front panel PCB: it's used to drive the fluorescent display and convert key-presses and IR commands into data for the main microcontroller chip on the motherboard.

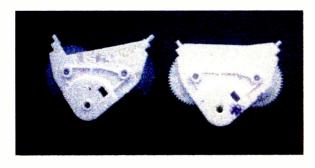
The Sony SOPS-2021 power supply module gives little trouble.

#### Dismantling the Machine

The mechanical side is responsible for most faults. Several components age, wear or can be damaged by inconsiderate use. Make sure that the mains supply is disconnected before you remove the deck from the machine. Five securing screws hold the top cover. Remove it then the brace that goes across the cassette platform at the front of the machine. The front panel can then be removed – it snaps into place.

The cassette platform is held by two screws, the deck by a further five. One of these is at the rear edge of the machine, to clamp a sheet-steel bridge plate whose other end is screwed to the deck, close to the audio-control (A/C) head. This bridge plate is useful as a handle when the deck is lifted out. There are two screws at the rear corners of the deck. Another one between them secures part of the pre-rec module. The remaining screw is along the front edge of the deck. Once the screws have been removed the deck can be lifted out, giving relatively easy access to all parts.

Fig. 1: The old (left) and later (right) idler assemblies.



**Deck Servicing** 

First take a look at the idler assembly. If it resembles the type shown on the left in Fig. 1, replace it with the later version shown on the right. Then examine the clutch, which comes out easily when the split washer that secures it has been removed. The thrust plate should be lightly greased: the clutch should feel firm, not slack. If the belt between the capstan motor flywheel and the clutch is very shiny, replace it – most of the ones I've come across in two-three year old mechanisms have been satisfactory. Check the connectors for the motors: the contacts blacken over a period of time and will always benefit from being cleaned.

Index marks for the alignment of the mechanism, in the stop mode, are shown in Figs. 2-5.

Failure of the mechanism to load properly and the brakes to operate correctly is frequently the result of relay plate distortion or a loose pin on it. The plate is shown in Fig. 6. In severe cases there will be no fast forward or rewind operation. The pin is the cam follower, which engages with the cam gear. Replace the plate. To release it, take out the relay gear on the underside of the deck, the pinch roller assembly and the loading motor and cam gear. Reassembly is easy when you have the diagrams to help you or the manual.

If you are happy with the condition of the deck, place it back on the motherboard – watch out for the connectors at the rear of the loading motor assembly: make sure that they actually connect and that there are no bent pins. Once everything has been reconnected the loading platform can be replaced. Make sure that the cassette carriage is fully retracted in the unload position. Refit the front PCB and switch on.

Run a tape past the A/C head in the cue and review modes. If the tape moves up or down, the pinch roller is probably misaligned and due for replacement.

Should rewind, particularly fast rewind, be poor the most likely cause is the small brake dragging on the take-up spool hub – it's the left-hand one of the two brakes on this assembly. A quick cure for this is use the tip of a soldering iron to heat the elbow of the brake arm and ease the shoe away from the hub by about a millimetre. Check that this is enough. It should be. If you overdo it there will be tape spillage and looping when the brakes are applied.

The FM deck is easy to service. Most problems are commonplace and easy to diagnose. Daewoo seems to

have been confused about how much grease to apply to the mechanism during production: a light application of grease is all that's required for satisfactory operation. Some decks have a heavy application, others seem to have barely enough.

The cassette loading platform gives little trouble: it's easy to service and of simple construction. If the tape loads but there is no drum or capstan rotation, check Q861 which is probably open-circuit.

The cause of no full erase in one machine turned out to be a foreign body that prevented full swing of the backtension lever. This held the tape away from the FE head! Daewoo uses foam rubber strip around the machine to prevent drumming noises. A piece of this was the culprit.

#### The Drum

These machines have no head heater. So many that are brought into the workshop have tape wrapped around the drum. Once you have freed the drum and checked that the mechanics are working correctly you might find that the machine doesn't produce pictures or sound – the screen is dark grey with noise on it, or has a jazzy black-and-white pattern on it. This is a sign that the drum needs cleaning. If at first you don't succeed, don't give up! It may take four or five attempts to get good pictures and sound.

The Blue Diamond or 'titanium' heads are vulnerable to dirt and may require several attempts at cleaning even after only normal use.

#### The Power Supply

The Sony power supply uses a TOP type chopper chip. It has three connections, for earth, feedback and output, the latter going to the primary winding of the chopper transformer. Pace used one of these devices in the MSS100 analogue satellite receiver. It makes the component count very low and the circuit almost foolproof.

The most common problem is failure to start because the  $390k\Omega$  start-up resistors R55 and R56 have gone high in value or open-circuit. They are of a very low-wattage type and take up very little space on the PCB. A metal-film type would be better able to withstand the rectified mains voltage. A less common cause of failure to start is diodes D54 and D55, which become leaky.

Sometimes the power supply fails with a blackened fuse, which usually means that the chopper device has gone short-circuit. A replacement will restore operation, but it's worwhile checking the output from the mains bridge rectifier. The reading should be about 290-310V. If the reading is low, the value of the reservoir capacitor has probably decreased. This can cause failure of the TOP device.

As a check on whether the power supply is providing what it should, Table 1 shows voltage readings to expect. They were measured in the stop mode.

A strange symptom I had with one machine was sequential flashing of the clock digits in the fluorescent display. The cause was traced to the optocoupler that's used for feedback and isolation between the secondary and primary sides of the power supply.

Should the switched 5V supply be low, check whether Q854 is running hot. The normal cause is that C857 is leaky. A neighbouring capacitor, C859, can cause problems with the switched 12V supply, including erratic motor speed and hum bars on the picture.

#### **Tuning Problems**

One of the most common problems is tuning drift. Leakage in the 33V regulator D851 is one cause of this.

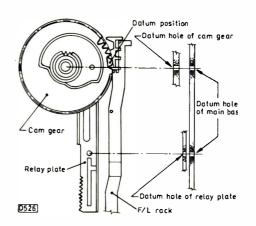


Fig. 2: Datum positions of the relay plate and cam gear.

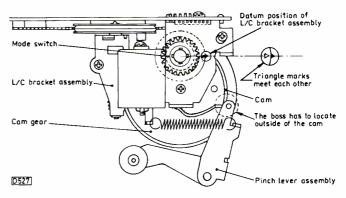


Fig. 3: Datum positions of the mode switch and cam gear.

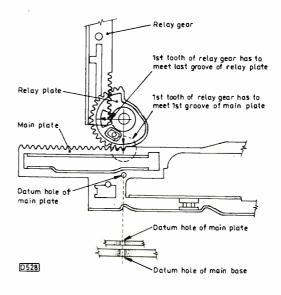


Fig. 4: Datum positions of the main plate and relay gear.

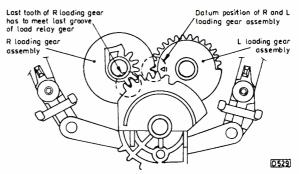
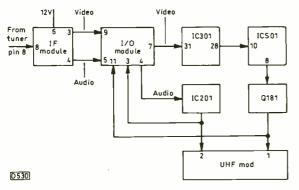


Fig. 5: Datum position of the loading-gear assembly.

Fig. 6: The relay plate.

Fig. 7: Signal flow diagram. Q181 should have OV at its collector, 2:2V at its base and 3V at its emitter.



Note that the correct type, as fitted, must be used: an ordinary 33V zener diode will not do. Another cause is poor earthing of the tuner can to the PCB. Grabbing the can and gently squeezing it will highlight this problem. The cure is to remove the covers and retension the pressed-out lugs by using a screwdriver blade to lever them away from the plate. Only a small amount is required: a millimetre will suffice to re-establish solid contact.

If you forget to connect an aerial to the VCR when auto-tuning you will end of with a blue screen.

To reset the memory, turn off the mains supply and short-circuit C623 (alternatively sort-circuit the anode of D603 to the PSU's screening can). This action may be necessary when a machine has to be retuned to a new set of channels.

Since the arrival of digital services, the auto-tune facility will log these in as well as the analogue ones. This is obviously a nuisance, and means that station deletions have to be made when tuning is complete. A colleague uses a 12dB attenuator in series with the aerial lead when auto-tuning these machines: the digital signals are then below the machine's acceptance level, but the analogue signal strength is sufficient for channels to be recognised and stored. This calls for a little trial-anderror, and can be done only at a fixed location such as a workshop.

Record and playback do not work during auto-tune, but you can wind the tape fast forward or rewind it.

#### **Electronics**

The electonic circuitry in V series machines is good, with any problems normally well defined. A good service manual would be a distinct help when trouble-shooting. Unfortunately some essential information, such as signal flow diagrams, is not provided in the manual. Fig. 7 may be of help in this respect.

**Table 1: Power supply voltages** 

L803 L804	5·9V 14·5		D851 ca D853 ca		32·25V 12·5V	D852 cathode D854 cathode	12.75V 13.75V
Transist	or	Со	llector	Base	Emitter		
Q851 Q852 Q853		14. 14. 14.	3V	12·9V 12·7V 11·4V	12⋅2V 12V 12⋅1V		

One machine I had on the bench recently showed all the signs of an early death. Multimeter checks showed that it was very much alive however. The fluorescent display was extinguished because ZD605 (3.9V) was open-circuit. When this happens the display filament pins both read -22V with respect to chassis.

Another machine, which was stuck in standby, was on the point of going through the window when I discovered an intermittent section of cabling between P603 and P701, joining the front PCB to the motherboard.

Microcontroller chip failures are rare. The main one can sometimes be the cause of apparent tape-end sensor or tape-motion sensor failure however. Before reaching for the blowlamp, check whether the 16MHz crystal oscillator is working. I've had one or two 'sticky' crystals. Also check for a reset pulse at pin 37 or, more easily done, at pin 1 of IC604.

Crystal X401 at pins 17 and 18 of IC301 can also be sticky. The symptom is either intermittent colour or no colour at all.

#### **A Warning**

As with many other low-cost machines, be wary of pressed metal parts. They can have very sharp edges and can cause deep wounds. The edges of the cabinet top and the strap across the front of the loading platform are particularly dangerous in these machines.

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#### Sharp DV5935H/ DV6635H (BCTV-A chassis)

The cause of any of the following symptoms can be that the NV memory needs reprogramming: no or intermittent FM mono, Nicam or scart sound; no Nicam and a whistling noise in the background with mono sound. The data list can be obtained from Sharp Technical or the Willow Vale technical help pages on COPS, and fed to the receiver via remote control or the front keyboard - the NVM data is not included in the service manual. Alternatively you can obtain a preprogrammed NVM from Sharp as a spare part. P.B.

# Philips 25PT4101/05 (AA5 AB chassis)

In the event of failure of the line output transistor, check for dry-joints at the rear of the connector on the scan coils. **P.B.** 

#### Tatung B Series Chassis

If the set is dead with the standby LED flashing, check D810 (BY399) for leakage. It's part of an elaborate network associated with the chopper FET Q801. **P.B.** 

#### **Grundig CUC5361 Chassis**

The beam limiting system didn't work in this set. So when the picture had a lot of white in it the set

# TV Fault Finding

switched to standby. The beam limiting voltage is fed to pin 12 of the RGB module (29504-165-55). As the beam current increases, the voltage at pin 15 of IC5150 (TDA4658) should fall. It did, but the chip took no notice. A new TDA4685 restored normal operation. **P.B.** 

### Sharp 51AT-15H (5BS-A chassis)

A neighbouring engineer had given up on this one – I found out why the hard way. The initial symptom was reduced height with the scan cramped at the top and bottom. The field timebase supplies had a lot of ripple on them, so C712 (220 $\mu$ F) and C713 (1,000 $\mu$ F) were replaced. This removed the ripple – and also the field scan! The ripple must have been producing what little scan there had been.

Cold checks in the field output stage revealed the following faulty items: Q502 (BD825), Q504 (BD828), Q509 (BC635), Q510 (BC338) and D501 (1N4148). The field scanning was correct once replacements had been fitted, but the picture was snowy and tap-sensitive in the area of the tuner unit. Resoldering the few suspect joints that could be seen in the tuner had no effect: in fact the cause of the low gain turned out to be a faulty SAWF (SF201). **P.B.** 

#### JVC AV25SX1EK

This Dolby model would come out of standby but almost immediately shut down again. Although the HT voltage was correct, during the short time the set worked the EHT was over 30kV. Capacitor C1521 (3,800pF, 1.5kV) had decreased in value. Its part no. is QFZ0117-3801S). P.B.

#### **Crown CRP21T**

These sets seem to suffer from line

driver stage faults. When the set is intermittently dead, the cause is usually the 2SC1573A line driver transistor Q579. It may test OK, but a replacement will cure the intermittent loss of line drive. If the set is permanently dead, the cause is usually the line driver stage feed resistor R599 ( $2k\Omega$ , 5W). We always replace Q579 as well. M.Dr.

## Ferguson B49F (Thomson TX90 chassis)

Loss of the tuning voltage usually means that RH04 (27k $\Omega$ ) has failed. You'll find it in front of the line output transformer. **M.Dr.** 

### Matsui 2180TT/Saisho FST212T

The complaints with this set were field jitter and intermittent field collapse. When I tested the set I found that the field drive output at pin 23 of the µPC1420CA colour decoder/timebase generator chip IC401 was varying in amplitude, but a new chip made no difference.

Because of the intermittent nature of the fault, a lot of time was spent making scope and voltage checks. I finally discovered that in the fault condition the voltage at the anode of D606 rose to about 1.5V. This diode is connected to the service switch SW601, which is used to collapse the field scanning. The anode of D606 is normally at 0V: for field collapse it rises to 12V. The rogue voltage was coming from SW601, which must have been leaky. A replacement from a scrap set cured the problem. M.Dr.

# Sharp DV5165H (4BS-B chassis)

The line output transistor in this set had blown for no obvious reason. So I fitted a replacement and switched on. The set tripped slowly for a few minutes, then the EHT

suddenly appeared and the new transistor got red hot.

While scoping around I discovered that the line drive frequency was incorrect. The line oscillator is in the MC44007 colour decoder/ timebase generator chip IC2801. Checks here showed that the 5V supply was low at 3.8V. This supply comes from a three-terminal 5V regulator, IC751 (KA7805PI). When its output pin was disconnected from the print the voltage returned to normal. This turned out to be a red herring, and resulted in a lot of wasted time. The regulator was faulty, but only under load. M.Dr.

# Ferguson T49F (TX91 chassis)

Very low sound was the complaint with this set. The cause was traced to a leaky BC858C surface-mounted transistor, TV02. M.Dr.

#### **Onwa Chassis**

The set in question was a JVC Model C14ET1EK, but we've had the same problem with a number of other sets that use these chassis. If you find the surge limiter resistor open-circuit but no obvious short-circuit is present, check the protection capacitors in the mains bridge rectifier circuit, C904-7 in this case. They are small, green disc capacitors marked 472 (4·7nF). A black pinhole in the side of the body is the give-away. M.Dr.

#### **JVC C1480EK**

This set was dead. The mains supply was present at lead connector CON3 but had disappeared by the time it should have reached the mains filter choke LF901. A hairline crack was found in the PCB where it slots into runners moulded in the case. The mains supply is routed from CON3 to the choke directly next to the chassis support at the left-hand side. I can only put the cause down to rough handling. **P.G.** 

#### Goodmans 2180

Intermittent low brightness, mainly from switch-on, was the complaint with this set. I at first suspected a first anode supply fault at the line output transformer. When the set was switched on, the first anode voltage was only 240V. After some time it rose to the normal 450V, with correct brightness levels. Further investigation revealed that the cause of the fault was on the tube base panel, where some strange-coloured glue had been

applied around the A1 feed wire during manufacture. This glue had become conductive. Its removal cured the fault. **P.G.** 

#### **Bush 2159NTX**

There was just a blank raster, with no picture or sound. Quick checks at the tuner unit's 12V supply pin produced a reading of 0V, also a short-circuit reading. Not surprisingly, the  $2 \cdot 2\Omega$  safety resistor R327 in the feed to this pin was open-circuit. The short-circuit was found inside the tuner, which I had to remove for examination. A hairline solder splash was present at the BU pin's feedthrough capacitor. Once this had been removed there was normal vision and sound. **P.G.** 

#### Matsui 209T

Two field faults are quite common with these sets. Failure of C307 ( $2\cdot 2\mu F$ , 50V) in the feedback circuit produces crossover distortion, with a bright-up across the centre of the screen. Failure of the bootstrap capacitor C302 ( $10\mu F$ , 50V) can upset the blanking circuit, the result being text data visible at the top of the screen. **C.W.** 

#### Goodmans C2043T

For low HT when the set is cold, replace the  $33\mu F$ , 160V capacitor situated close to the power supply transformer. C.W.

# Samsung CI537 (P55 chassis)

Loss of one colour is a fairly common fault with these sets. There are three  $33k\Omega$ , 2W resistors (R803/811/818) on the CRT base panel – they provide DC feedback in the RGB output stages. One is usually open-circuit. Replace them all. C.W.

# Hitachi CPT1446 (NP84CQ chassis)

The problem was field collapse. The voltages around the field output transistors were correct, but there was no scanning because the  $47\mu F$ , 160V field scan coupling capacitor C603 was open-circuit. C.W.

#### Nokia Euro Stereo 2 Chassis

This was a tricky fault. The S2000AF line output transistor would go short-circuit, and sometimes the line driver transistor would go open-circuit. Various components, including the EW diodes and tuning capacitors, were replaced and a thorough investiga-

tion was carried out for dry-joints, but the problem persisted. Replacement of the line driver transformer cured the fault. I assume that it would develop shorted-turns under load, as the DC resistances were correct and its pins were properly soldered. C.W.

# Sharp DV5150H (S3B chassis)

There was a very low-contrast picture, with various coloured flashes on the screen. The cause was one of the BF421 transistors on the CRT base panel. I felt it best to replace all three. They are in the auto grey-scale feedback circuit. C.W.

#### Tatung 180 Chassis

This set would instantly blow its S2000AF line output transistor Q403. Various items were replaced but the set kept eating line output transistors. The cause of the trouble was C433 (6·8nF, 2kV) in the EW diode-modulator network: it was open-circuit. J.S.R.

#### Ferguson TX100 Chassis

When the relay chatters the cause is usually failure of the line output transformer or transistor. Not this time. The chattering continued when the HT supply to the line output stage had been disconnected and a 100W lamp was rigged up as a dummy load. The cause of the fault was in the chopper circuit, on the primary side, where the 12V supply was low at 10V. The reservoir capacitor C119 (22µF) had fallen in value. J.S.R.

# Panasonic TX21MD1 (Euro-2 chassis)

This set's picture had very severe yellow smearing to the right of objects, much the same as you would expect from a CRT that's seen better days. The tube was blameless however, the cause of the fault being the VDP3108-25 colour processor chip IC601. S.H.

# Sharp DV5105H (Deco-4 chassis)

The set was stuck in standby with a main 5V supply problem. This supply comes from the emitter of regulator transistor Q753. The associated electrolytics were OK, and a replacement transistor made no difference. I eventually found the cause of the fault in the rectifier circuit that feeds Q753: safety resistor R751 had risen in value from  $0.33\Omega$  to about  $1\Omega$ . A Sharp expert I subsequently spoke to said

it's a fairly common fault. S.H.

#### **Tatung D Chassis**

This set produced a very green picture. The cause was loss of the tube's blue drive. The culprit was the feedback/bias resistor R922 ( $100k\Omega$ ) in the blue output stage. R932 and R912 are the corresponding resistors in the green and red output stages. **S.H.** 

#### Goodmans 2575

After switching on, this set would revert to standby within seconds. There were some strange DC readings around the TDA4601 chopper control chip IC14, so the associated electrolytics were checked. The culprit turned out to be C108. C.H.

#### Samsung Cl6844N (SCT12B chassis)

I've had two problems with these sets recently. The first one was dead: IC801 (STRS6709) and Q805 (Darlington type TIP102) had to be replaced to bring it back to life. The second set wouldn't power up, with the LED flashing in a strange, yellowish colour. If you get this symptom, check that IC901 is receiving its 5V supply. If it is, check for oscillation at pins 31 and 32. If there is no oscillation, suspect the 32.768kHz crystal X901. S.H.

#### Tatung 190 Chassis

This portable took anything from five minutes to five hours to power up after being switched on. The cause of the problem was one of the start-up resistors in the power supply, R803 ( $16k\Omega$ ). It read correctly out of circuit, but went high-resistance under load. **S.H.** 

# Samsung Cl3312Z (P58SC chassis)

There was a nasty crackle on the sound. A check at pin 12 (audio output) of the TDA8305 IF/timebase generator chip IC101 revealed that the noise was present here. Several capacitors in this area were checked before the culprits were found – C603 and C605 (both 22nF). S.H.

#### Ferguson TX90 Chassis

There was sound but no picture. All voltages at the CRT were low, including the EHT. Checks in the power supply revealed that the 'boost HT' was about twenty per cent low. When I had replaced the boost line smoothing capacitor C191 (22µF, 160V) the voltage was almost normal and there was a distorted picture that was modulated

by a hum bar. On close inspection of the PCB in the power supply area I found small cracks around the connections to the switching transistor TR107. Once these had been repaired the boost voltage could be adjusted. I thought that all was now OK, with a good picture, but when the brightness and contrast controls were advanced there was a ripple effect on the picture and a squeal on the sound. A new boost reservoir capacitor (C189 –  $22\mu F$ , 50V) completed the repair. **K.E.** 

#### Goodmans 2875

There were low-resistance readings in the collector circuit of the line output transistor in this dead set. On closer inspection a dry-joint was seen at C134, where arcing had occurred. This had destroyed the EW modulator diodes D45/47 and the pincushion chip IC18. Replacement restored normal operation. **K.E.** 

#### **Sony KV2705**

There were striations on the lefthand side of the picture. A scope check on the 135V HT supply showed that a lot of ripple was present. The two 33µF electrolytics in the power supply proved to be OK, but there's another one (C804) on the scan panel. A replacement cured the fault. M.O.

# Sanyo CTP7135 (80P chassis)

A slow ripple modulated the verticals and there was foldover at the top inch of the screen. The cause of both these faults was C322 (470μF, 100V), which is the reservoir capacitor for the 45V output from the chopper power supply. This supply is used by the LA7800 timebase generator chip IC401. **M.O.** 

#### Alba CTV55

There was an overbright picture. When the setting of the first anode control was reduced, the picture had black bars spaced about an inch apart in the background. The cause of the fault was the reservoir capacitor for the HT supply to the RGB output stages, C437 (22µF, 250V). M.O.

#### Mitsubishi CT2101TX

The standby LED was on. That was all. When the standby switch was pressed the LED went out but there was still nothing. A check on the HT supply showed that it was low at only 37V. The cause of the fault was traced to C910 and C911,

which are both  $1\mu F$ , 50V electrolytics. M.O.

# Sharp DV5105H (Deco-4 chassis)

The MJF18004C chopper transistor Q702 was short-circuit, also the TEA1039 chopper control chip IC700 between pin 9 (Vcc) and chassis – as a result R706 and R710 (both  $3.3\Omega$  safety) had blown. When the set was switched on after replacing these four items they went up in a puff of smoke. The cause of the trouble was the chopper transformer T700, which had an internal short. I've had to replace it on previous occasions. C.D.N.

#### Philips Anubis B Chassis

There was no teletext operation. Heat and freezer applied to the text panel soon revealed the cause, which was the 27MHz crystal. It had become unstable. A replacement restored the text modes. C.D.N.

#### Toshiba 1400TB

This set produced a very grainy picture. When I removed the tuner unit and opened it I saw that one of the lecher lines had become corroded, though there was no sign of liquid spillage. Part of the corrosion lay across the air gap between this and another lecher line, which it was touching. Gentle cleaning restored normal operation. C.D.N.

#### Ferguson IKC2 Chassis

This set would sometimes blow its chopper transistor at switch on. At other times the transistor would last for about fifteen minutes. The culprit was CP29 (2·2nF), which is in the snubber network. It's a box component, and had a very slightly swollen appearance at one terminal – this could be seen only when the capacitor had been removed. It measured OK when checked with two different capacitance meters. C.D.N.

#### **JVC C1480EK**

Stations wandering off tune, or failure to memorize after tuning, is quite a common problem with this model. The station select module, type SBX-M903A, is a small PCB that's covered with surface-mounted components. I find that the cost of a replacement puts most customers in a bad mood! Before you condemn it, note that there are four surface-mounted capacitors of the same type used in camcorders. Replacing all four is usually a successful cure for tuning faults. C.D.N.



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Part	Price Part	Price	Part	Price	Part	Price		Price	Part	Price	Part	Price		Price	Part	Price	Part	Price
BC107 BC108 BC109 BC109C	8p BD434 8p BD435 8p BD436 10p BD437	30p 31p 30p 28p	BU126 BU128 BU133 BU137	65p 125p 125p 150p	BUV48AF BUV48C BUV50 BUV61	325p 250p 425p 1000p	MJ4502 MJ10012 MJ11015 MJ11016	300p 300p 250p 300p	4N35	50p	AN203 AN210	210p 165p	AN6340 AN6341 AN6342 AN6344	600p 200p 325p 440p	BA335 BA338 BA340 BA343	55p 80p 75p 60p	BA7004 BA7007 BA7021 BA7022	200p 200p 180p 350p
BC142 BC143 BC147	20p BD438 20p BD439 20p BD440 8p BD441	36p 40p 40p 40p	BU180 BU184 BU204 BU205	100p 100p 65p 70p	BUV70 BUV90 BUV93 BUW11A	200p 175p 375p 200p	MJ11032 MJ11033 MJ15003 MJ15004	800p 800p 250p 300p	BY127 BY133	8p 8p	AN211 AN214Q AN217P AN228	150p 170p 95p 280p	AN6345 AN6346 AN6350 AN6352	400p 350p 610p 450p	BA336 BA401 BA402 BA511	175p 60p 50p 145p	BA7025L BA7107 BA7212S BA7252S	100p 475p 200p 150p
BC149 BC159 BC160	8p BD533 8p BD534 30p BD535	50p 38p 38p	BU206 BU207 BU208	100p 150p 70p	BUW11AF BUW12 BUW12A	225p 125p 150p	MJ15015 MJ15016 MJ15022	250p 350p 400p	BY164 BY179 BY184 BY206	40p 35p 32p 11p	AN252 AN259 AN262 AN271	150p 250p 140p 230p	AN6356 AN6359 AN6360	300p 500p 320p	BA514 BA516 BA518	160p 150p 150p	BA7604N BA7751LS BA7752	100p 150p 250p
BC171 BC172 BC177 BC178	10p   BD536 10p   BD537 14p   BD538 14p   BD643	38p 40p 40p 50p	BU208A BU208AT BU208B BU208D	75p 200p 200p 130p	BUW12F BUW13A BUW32A BUW48	250p 200p 500p 550p	MJ15023 MJ15024 MJ15025 MJE340	400p 400p 700p 25p	BY207 BY227 BY228 BY298	20p 19p 28p 15p	AN274 AN2778 AN278	250p 400p 60p	AN6362 AN6363 AN6367NK AN6368	400p 375p 400p 275p	BA521 BA524 BA526 BA527	100p 240p 180p 95p	BA7755 BA7767AS BA8504 BA15218	150p 155p 350p 60p
BC179 BC182 BC182L BC183	14p BD645 7p BD647 7p BD649 7p BD675	50p 50p 50p 40p	BU209 BU225 BU226 BU312	90p 120p 120p 90p	BUW49 BUW50 BUW81A BUW84	550p 400p 150p 75p	MJE350 MJE520 MJE2955T MJE3055T	80p 30p 65p 65p	BY299 BY329-1200 BY448	18p 150p 20p	AN301 AN302 AN303 AN304	330p 650p 250p 360p	AN6371 AN6387 AN6550 AN6551	350p 480p 100p 50p	BA532 BA534 BA536 BA546	100p 220p 150p 160p	CA3140E CNX62A CNX82A CNX83A	38p 50p 60p 80p
BC183L BC184 BC184L BC212	7p BD676 7p BD677 7p BD678	40p 38p 40p	BU325 BU326A BU406 BU406D	55p 75p 60p	BUW85 BUX10 BUX11	85p 350p 200p	MJE 13004 MJE 13005 MJE 13007	100p 60p 100p	BYT11 BYT13-1000 BYV96E BYW96E	25p 30p 25p 36p	AN315 AN316 AN337 AN360	210p 350p 600p 100p	AN6552 AN6554 AN6555	45p 80p 50p	BA612 BA614 BA618	120p 70p 55p	CX136 CX139A CX141	600p 750p 750p
BC212L BC213 BC213L	7p   BD680 7p   BD681 7p   BD682	40p 40p 45p 45p	BU407 BU407D BU408	85p 55p 75p 60p	BUX12 BUX20 BUX21 BUX22	150p 350p 450p 450p	MJE13009 MJE15028 MJE15029 MJE15030	100p 200p 200p 250p	BYX10 BYX55/600 IN4001 IN4002	15p 25p 3p 3p	AN362 AN363 AN366 AN610	140p 150p 150p 160p	AN6605 AN6612 AN6650 AN6651	35p 60p 45p 45p	BA631 BA656 BA658 BA681A	280p 110p 350p 350p	CX145 CX150B CX175 CX187	725p 325p 325p 825p
BC214L BC214L BC237 BC238	7p BD705 7p BD707 7p BD709 7p BD711	50p 50p 50p 50p	BU408D BU409 BU412 BU413	75p 85p 175p 175p	BUX23 BUX37 BUX39 BUX40	900p 220p 450p 210p	MJE15031 MJE18004 MJF18004 MJF18204	400p 125p 175p 350p	IN4003 IN4004 IN4005 IN4006	3p 3p 3p 3p	AN3211K AN3215K AN3231K	375p 350p 300p	AN6652 AN6671K AN6676 AN6780S	45p 425p 600p 80p	BA682A BA683A BA684 BA685	300p 300p 400p 400p	CX804A CX867 CX868 CX877	775p 575p 525p 300p
BC239 BC300 BC301 BC302	7p BD736 20p BD826 20p BD828 20p BD839	50p 50p 50p 55p	BU414B BU415A BU426A BU433	250p 170p 70p 120p	BUX41 BUX42 BUX47A BUX48A	200p 200p 220p 150p	OC28 OC29 OC35 OC36	350p 250p 350p 250p	IN4007 IN4148 IN5400	4p 2p 9p	AN3236K AN3310K AN3312 AN3313	450p 325p 350p 300p	AN6870 AN6875 AN6878 AN6879	450p 150p 65p 225p	BA715 BA718 BA728 BA806	45p 45p 55p 220p	CX7925B CX20015A CX20106A CX20109	550p 600p 75p
BC303 BC304 BC327	20p BD897 25p BD899 7p BD977	50p 50p 50p	BU500 BU500D BU505	100p 225p 90p	BUX55 BUX80 BUX81	800p 180p 160p	S2000A3 S2000AF S2055A	175p 90p 175p	IN5401 IN5402 IN5403 IN5404	8p 8p 8p 8p	AN3320K AN3331K AN3792 AN3794	450p 450p 300p 325p	AN6880 AN6882 AN6884	75p 300p 200p	BA843 BA1310 BA1320	130p 160p 75p	CX20187 CXA1001AP CXA1019P	140p 700p 1600p 150p
BC328 BC337 BC338 BC441	7p BDX33 7p BDX37 7p BDX44 28p BDX47	60p 100p 100p 60p	BU505D BU505DF BU506 BU506D	90p 90p 100p 70p	BUX84 BUX85 BUX86 BUX87	50p 50p 50p 50p	\$2055AF \$2530A TIP29 TIP29A	175p 100p 15p 22p	IN5406 IN5406 IN5407 IN5408	11p 12p 12p 12p	AN3814K AN3821K AN3822K	450p 600p 600p	AN6888 AN6889 AN6913 AN700	150p 100p 60p 650p	BA1330 BA1332 BA1350 BA1355	120p 60p 130p 125p	CXA1019S CXA1044P CXA1044BF CXA1081	275p
BC446 BC477 BC516 BC537	8p   BDX54C 18p   BDX62C 22p   BDX63C 25p   BDX64C	75p 150p 175p 175p	BU506DF BU508A BU508AF BU508APH	100p 60p 60p 60p	BUX98A BUZ71 BUZ71AF BUZ72A	350p 75p 100p 100p	TIP29C TIP29E TIP30 TIP30C	25p 40p 25p 25p	RGP10 RGP15 RGP30	25p 25p 16p	AN3830K AN3990K AN3991K AN5010	800p 300p 400p 250p	AN7010K AN7025K AN7060 AN7062	250p 90p 175p 300p	BA1356 BA1360 BA1404 BA1604	100p 160p 120p 125p	CXA1081M CXA1081S CXA1082AS CXA1191M	250p 300p 1000p 250p
BC546 BC547 BC548 BC549	8p BDX65 8p BDX66C 8p BDX67C 8p BDX71	80p 175p 275p 70p	BU508D BU508DF BU508DR BU508V	75p 85p 130p 110p	BUZ72AF BUZ73A BUZ73AF BUZ76A	100p 150p 60p	TIP31A TIP31C TIP32 TIP32A	22p 27p 24p	I.C. SOCKE	50p 75	AN5011 AN2020 AN5025 AN5033	225p 80p 250p 400p	AN7072 AN7081K AN7105	250p 200p 170p	BA2266A BA3306 BA3308	250p 60p 70p	CSA1209P FT5754M FT5764M HA1124	400p 600p 250p
BC550 BC556 BC557	8p BDX77 8p BDX87C 8p BDX88C	175p 175p 150p	BU508VF BU526 BU536	100p 75p 100p	BUZBO BUZBOAF BUZB3	110p 135p 200p 200p	TIP32C TIP33 TIP33C	21p 28p 50p 60p	8 PIN 14 PIN 16 PIN 18 PIN	4p 5p 6p 9p	AN5034 AN5070 AN5071 AN5111	400p 125p 100p	AN7106K AN7110 AN7111 AN7112	135p 75p 100p 45p	BA3312 BA3402 BA3406AL BA3416BL	60p 90p 120p 80p	HA1125 HA1137W HA1151	125p 120p 150p 175p
BC558 BC559 BC560 BC637	8p BDW24 8p BDW93 8p BDW94 20p BDY29	55p 50p 50p 225p	BU546 BU603 BU606D BU608D	125p 125p 225p 120p	BUZ90A BUZ91A BY448 BYT11	180p 260p 20p 25p	TIP34 TIP34C TIP35C TIP36C	65p 60p 65p 65p	20 PIN 22 PIN 24 PIN	10p 12p 13p	AN5132 AN5135NK AN5138NK	450p 250p 400p 350p	AN7114 AN7115 AN7116 AN7117	120p 110p 90p 65p	BA3422 BA3505F BA3506A BA3516	350p 140p 70p 120p	HA1197 HA1199 HA1201 HA1202	130p 130p 225p 125p
BC639 BC640 BCY33 BCY34	20p BDY56 20p BDY58 200p BDY90 200p BDY92	225p 500p 125p 100p	BU626 BU705 BU706DF BU706F	120p 130p 175p 150p	IRF120 IRF130 IRF140 IRF230	225p 475p 550p 550p	TIP41A TIP41C TIP42A TIP42C	20p 22p 20p 22p	28 PIN 40 PIN	13p 15p	AN5150 AN5151 AN5210 AN5215	400p 200p 675p 100p	AN7120 AN7130 AN7131 AN7133N	100p 75p 90p 325p	BA3520 BA3521 BA3704 BA3706	130p 225p 200p 75p	HA 13 19 HA 13 38 HA 13 39 A HA 13 67	200p 300p 350p 300p
BCY70 BCY71 BCY72 BD115	16p   BF137 16p   BF167 16p   BF181 30p   BF183	35p 30p 18p 20p	BU724A BUB01 BU806 BU807	100p 70p 70p 60p	IRF240 IRF250 IRF330 IRF340	425p 375p 600p 325p	TIP47 TIP48 TIP50 TIP51	40p 40p 60p 80p	ZENER DIO 400 mWatt 2V7 to 39V 1.3 Watts		AN5222 AN5250 AN5256 AN5260	200p 160p 150p 300p	AN7134 AN7140 AN7141 AN7142	300p 170p 70p 80p	BA3812L BA3822LS BA3824LS BA3920	80p 80p 75p 300p	HA1377 HA1384 HA1388 HA1389	120p 600p 320p 210p
BD124P BD131 BD132 BD133	50p 8F195 25p 8F199 25p 8F200 50p 8F225	7p 8p 16p	BU807F BU808DF BU810 BU824	75p 210p 110p	IRF350 IRF450 IRF510	750p 650p 110p	TIP52 TIP54 TIP102 TIP105	80p 85p 70p	2V7 to 39V	9р	AN5262 AN5265 AN5315 AN5352	175p 80p 600p 600p	AN7145 AN7146 AN7147	195p 210p 180p	BA4110 BA4210 BA4220	75p 85p 60p	HA1392 HA1394 HA1396	120p 170p 650p
BD135 BD136 BD137	20p BF240 20p BF245 20p BF254	30p 16p 25p 15p	BU826 BU826A BU902	60p 120p 160p 110p	IRF520 IRF530 IRF540 IRF610	110p 120p 120p 120p	TIP106 TIP107 TIP110	65p 65p 65p 40p	<b>REGULATO</b> 7805 7806	18p	AN5411 AN5421 AN5429	450p 150p 420p	AN7148 AN7149 AN7154 AN7156	140p 160p 180p 240p	BA4234L BA4236L BA4402 BA4403	70p 110p 45p 220p	HA1397 HA1398 HA1406 HA11123	200p 175p 120p 350p
BD138 BD139 BD140 BD144	20p   BF255 20p   BF256 20p   BF257 90p   BF259	12p 18p 18p 18p	BU903 BU910 BU912 BU920	110p 80p 100p 100p	IRF611 IRF620 IRF630 IRF640	120p 160p 110p 300p	TIP111 TIP112 TIP112H TIP115	40p 35p 50p 30p	7808 7812 7815 781B	25p 18p 25p 25p	AN5431 AN5435 AN5436N AN5512	275p 125p 160p 100p	AN7158 AN7160 AN7161N AN7163	310p 350p 375p 175p	BA4405 BA4412 BA5101 BA5102	80p 50p 350p 140p	HA11211 HA11215 HA11219 HA11221	170p 350p 280p 180p
BD157 BD166 BD175 BD177	38p BF262 30p BF270 30p BF273 30p BF311	25p 18p 15p 21p	BU922 BU930 BU932 BU941	110p 130p 175p 250p	IRF642 IRF650 IRF710 IRF720	200p 200p 150p 150p	TIP116 TIP117 TIP120 TIP121	30p 30p 37p 35p	7824 7905 7906	25p 25p 30p	AN5515 AN5520 AN5521 AN5560	160p 550p 100p 350p	AN7166 AN7168 AN7169 AN7170	350p 200p 225p 260p	BA5115 BA5115L BA5204 BA5208AF	75p 75p 200p 110p	HA11225 HA11235 HA11244 HA11247	130p 100p 375p 375p
BD179 BD181 BD182 BD184	32p BF336 45p BF337 60p BF338 60p BF362	20p 20p 20p 30p	BU2508A BU2508AF BU2508D BU2508DF	100p 110p 130p	IRF730 IRF740 IRF820 IRF830	125p 125p 110p	TIP122 TIP125 TIP126 TIP127	30p 30p 40p	7908 7912 7915 7918	30p 30p 30p 30p	AN5601K AN5612 AN5613 AN5615	750p 200p 200p 300p	AN7171K AN7172K AN7173K	400p 325p 450p	BA5402 BA5406 BA5408	180p 180p 180p	HA11251 HA11412 HA11414 HA11423	120p 600p 300p
BD187 BD201 BD202	30p BF367 33p BF371 38p BF421	13p 17p 18p	BU2520AF BU2520DF BU2525A	120p 170p 225p 325p	IRF840 IRF9140 IRF9510	110p 110p 1000p 150p	TIP130 TIP131 TIP132	35p 30p 30p 30p	7924 78L05 78L08 78L12	30p 24p 24p 24p	AN5620 AN5622 AN5625	250p 275p 400p	AN7177 AN7178 AN7205 AN7213	375p 180p 35p 40p	BA5413 BA6104 BA6109 BA6110	225p 250p 110p 225p	HA11440 HA114B5BN HA11702	330p
BD203 BD204 BD222 BD225	42p BF422 42p BF423 31p BF455 31p BF458	21p 25p 12p 19p	BU2525AF BU2527AF BUF405A BUH315	220p 400p 200p 200p	IRF9511 IRF9520 IRF9530 IRF9531	150p 150p 200p 200p	TIP136 TIP137 TIP162 TIP141	40p 65p 110p 65p	78L15 78L18 78L24 79L05	24p 24p 24p 35p	AN5630 AN5633 AN5635N AN5640	375p 350p 330p 500p	AN7216 AN7218 AN7220 AN7222	175p 60p 85p 75p	BA6125 BA6137 BA6138 BA6146	75p 55p 130p 150p	HA11703 HA11706 HA11710 HA11713	400p 280p 500p 250p
BD232 BD233 BD234 BD235	31p   BF462 30p   BF471 32p   BF472 28p   BF479	50p 28p 28p 30p	BUH315D BUH515 BUH515D BUH517	175p 200p 250p 275p	IRF9540 IRF9541 IRF9610 IRF9620	240p 200p 120p 110p	TIP142 TIP145 TIP146 TIP147	75p 50p 70p 80p	79L08 79L12 79L15 LM309K	35p 35p 35p 100p	AN5700 AN5701 AN5710 AN5712	90p 150p 100p 180p	AN7223 AN7224 AN7225 AN7254	105p 75p 175p 150p	BA6149LS BA6154 BA6208 BA6209	700p 60p 175p 85p	HA11715 HA11716 HA1171B HA11724	250p 480p 700p 650p
BD236 BD237 BD238 BD239	30p BF494 21p BF495 24p BF595 30p BF596	16p 16p 16p 16p	BUH517D BUH715 BUT11A BUT11AF	175p 425p 35p 35p	IRF9622 IRF9630 IRF9640 IRFD9220	200p 180p 280p 100p	TIP150 TIP151 TIP2955 TIP3055	90p 60p 50p 50p	LM317T LM323K 78H08KC	100p 350p 800p	AN5720 AN5722 AN5730 AN5732	70p 140p 160p 120p	AN7256 AN7273 AN7310 AN7311	250p 75p 60p 90p	BA6218 BA6220 BA6222	85p 55p 130p	HA11741NT HA11744 HA11745 HA11749	950p 330p 330p
BD240 BD241A BD243A BD244	40p BF615 40p BF617 50p BF760 50p BF763	30p 30p 40p	BUT12 BUT13 BUT18 BUT18AF	80p 310p 80p	IRFBC30 IRFBC40 IRFP140 IRFP150	150p 250p 250p	TIPL760 TIPL762A TIPL763A	100p 200p 200p	79H12KC 79HGKC	700p 800p	AN5750 AN5753 AN5763	75p 130p 250p	AN7312 AN7315 AN7330	70p 40p 110p	BA6227 BA6229 BA6235 BA6238A	50p 130p 50p 130p	HA11751 HA11752 HA11839NT	350p 1500p 325p 375p
BD245 BD246A BD265	50p BFB70 50p BFB71 45p BF960	40p 22p 22p 38p	BUT30V BUT56A BUT76A	65p 1700p 65p 80p	IRFP240 IRFP250 IRFP350	300p 300p 280p 325p	TIPL791A 2N2369 2N2646 2N2904	80p 15p 40p 20p	Smm RED	5p	AN5790 AN5791 AN5836 AN5862K	240p 225p 450p 225p	AN7362 AN7363 AN7410 AN7411	200p 225p 150p 50p	BA6239A BA6247 BA6248 BA6259	130p 150p 140p 170p	HA11847 HA12002 HA12003 HA12005	700p 220p 150p 180p
BD267 BD269 BD27B BD311	45p BF961 45p BF964 50p BFQ232 100p BFQ252A	35p 38p 75p 60p	BUT90 BUT92 BUV18 BUV20	1300p 1200p 650p 650p	IRFP450 IRFP460 IRFP9140 IRFP9240	325p 775p 1450p 350p	2N2905 2N2906 2N2907 2N3019	20p 18p 18p 28p	YELLOW GREEN 5mm RED	8p 8p 5p	AN5900 AN608P AN620 AN6130	130p 125p 250p 130p	AN7414 AN7415 AN7470 AN8053	275p 70p 100p 200p	BA6280AF BA6290A BA6294 BA6302A	300p 200p 250p 150p	HA12010 HA12016 HA12017 HA12026	300p 120p 100p 125p
BD314 BD315 BD317 BD331	100p BFR90 150p BFR91 150p BR100 40p BR103	85p	BUV21 BUV23 BUV24 BUV25	400p 475p 350p 110p	IRFPC50 IRFRC20 IRFZ20 IRFZ42	600p 250p 65p 275p	2N3053 2N3054 2N3055 2N3055H	18p 40p 38p 50p	YELLOW GREEN	8p 8p	AN6135 AN6209 AN6250 AN6247	120p 350p 50p 200p	AN8275 AN8370 AN8377 AN8387	250p 1000p 400p 350p	BA6304 BA6305 BA6321 BA632B	120p 140p 250p 250p	HA12038NT HA12044 HA12045 HA12047	140p 350p 280p 450p
BD332 BD361 BD362	40p BR303 60p BU105 60p BU108	85p 80p 100p	BUV26 BUV27 BUV28	150p 125p 110p	IRFZ44 MJ2501 MJ2955	160p 100p 55p	2N3440 2N3441 2N3442	45p 175p 85p	RECTANGU LEDs		AN6270 AN6300 AN6306	400p 600p 380p	BA222 BA225 BA314	65p 100p 40p	BA6334 BA6410 BA6411	75p 220p 250p	HA12058 HA12088 HA12116	320p 375p 130p
BD370 BD371 BD410 BD433	30p BU109 30p BU110 50p BU111 28p BU124	90p 100p 60p	BUV37 BUV46A BUV47 BUV48A	175p 75p 120p 175p	MJ3000 MJ3001 MJ4032 MJ4035	100p 100p 175p 175p	2N3771 2N3772 2N3773 2N3819	90p 100p 29p	5mm x 2,5m RED YELLOW GREEN	nm 5p 8p 8p	AN6310 AN6320 AN6326N AN6332	200p 180p 250p 320p	BA301 BA311 BA313 BA333		BA6418N BA6435S BA6993 BA7001	100p 425p 150p 150p	HA12411 HA12412 HA12413 HA12430	175p 175p 70p 200p

K.P. HOUSE, UNIT 15, POP IN COMMERCIAL CENTRE, SOUTHWAY, WEMBLEY, MIDDLESEX HA9 0HB, ENGLAND Telephone: 0181-900 2329 Fax: 0181-903 6126 E-Mail: grandata.ltd@btinternet.com

**TELEVISION June 1999** 



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Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part		Part	Price	Part	Price	Part TA7281	Price 200p
HA13001 HA13002	650p 200p	LA2800 LA3120	350p 200p	LA7096 LA7113	200p 275p	LF353 LF355	48p 60p	MC3302 MC3401	50p 45p	SAB3029 SAB3035 SAB3036	525p 275p 725p	STK3102 II STK3106 STK3122 III	530p 2500p 725p	STK5478 STK5479 STK5481	380p 300p 470p	STR16006 STR17006 STR20005	500p 500p 450p	TA7281 TA7282 TA7210	160p 200p
HA13006 HA13007 HA13108	400p 300p 280p	LA3150 LA3160 LA3161	200p 120p 40p	LA7116 LA7123 LA7210	125p 1300p 60p	LF357 LF398 LH2426S	70p 300p 600p	MC3423P MC3488AP MC34063AP	100p 250p 300p	SAB3037 SAB3042	700p 825p	STK3152 II STK3156	900p 500p	STK5482 STK5483	285p 440p	STR20012 STR20015	450p 450p	TA7283 TA7284P	200p 400p
HA13117 HA13118	175p	LA3210 LA3226	65p 60p	LA7212 LA7214	150p	LM301 LM311	26p 35p	MN1220T MN1226	600p 450p	SAB3064 SAB3209	130p 225p	STK4017 STK4019	400p 480p	STK5486 STK5487	450p 525p	STR30110 STR30115	330p 275p	TA7288 TA7291P	220p 200p
HA13119 HA13127	140p 350p	LA3246 LA3300	75p 140p	LA7220 LA7222	125p 110p	LM319 LM324	165p 30p		600р 1300р	SAB3210 SAB6456	250p 125p	STK4021 STK4024	380p 550p	STK5488 STK5490	480p 450p	STR30120 STR30123	400p 450p	TA7292P TA7294P	325p 450p
HA13128 HA13130	400p 450p	LA3301 LA3361	110p 100p	LA7224 LA7225	150p 250p	LM335Z LM339	120p 35p	MN1280 MN3004	70р 600р	SAB8048 SAB8051AP		STK4025 STK4026	530p 480p	STK5632 STK5720	450p 400p	STR30125 STR30130	550p 250p	TA7299 TA7302P	200p 75p
HA13135 HA13139	500p 600p	LA3365 LA3370	70p 70p	LA7292 LA7294	275p 200p	LM348 LM358	50p 45p	MN3005 MN3011 MN3101	2000p 4000p 110p	SDA2003 SDA2004 SDA2005	450p 325p 700p	STK4028 STK4032    STK4034 X	550p 1050p 925p	STK5725 STK5730 STK6316	450p 450p 300p	STR40090 STR40115 STR41090	350p 600p 330p	TA7303 TA7307	70p
HA13150A HA13151 HA13403	1150p 875p 400p	LA3373 LA3375 LA3376	70p 300p 80p	LA7295 LA7297 LA7305A	160p 120p 350p	LM380 LM381 LM382	80p 150p 130p	MN3102 MN3207	110p 375p	SDA2007 SDA2008	300p 400p	STK4036 STK4038	470p 680p	STK6324B STK6327	500p 1200p	STR43111 STR44115	950p 475p	TA7310 TA7312	100p
HA13406W HA13408	400p 350p	LA3380 LA3390	300p 250p	LA7308 LA7311	70p 200p	LM386 LM387	60p 100p	MN3208 MN6030B	950p 350p	SDA2112 SDA2120	450p 200p	STK4040    STK4042	650p 800p	STK6328A STK6431	800p 850p	STR45111 STR50020	550p 350p	TA7313 TA7314	70p 175p
HA13412 HA13426	600p 500p	LA3400 LA3401	250p 90p	LA7320 LA7323	120p 325p	LM389N LM393	105p 45p	MN6163A MTA001M	700p 600p	SDA2131 SDA2208	225p 450p	STK4044 STK4046	950p 950p	STK6607 STK6722	400p 725p	STR50092 STR50103A	550p 260p 500p	TA7315 TA7317P	200p 120p
HA13432 HA13441	400p 450p	LA3410 LA3430	150p 135p	LA7330 LA7331	350p 250p	LM431 LM710	50p 45p	NE555 NE556 NE558	20p 40p 80p	SDA4212 SDA5241 SDA5243-2	775p 725p 450p	STK4048 STK4050 II STK4060	1280p 1600p 510p	STK6732 STK6822 STK6922	1000p 900p 1000p	STR50113 STR50115 STR51041	500p 500p	TA7320P TA7322	200p
HA17524 KA2102 KA2130	250p 100p 150p	LA3600 LA3605 LA3607	60р 100р 125р	LA7332 LA7340 LA7376	225p 300p 150p	LM723 LM741DIL LM741MET	40p 18p 45p	NE565 NE567	110p 115p	SDA5343 SDA5640	1450p 200p	STK4065 STK4101	650p 500p	STK6932 STK6962	525p 275p	STR50213 STR53041	500p 400p	TA7323 TA7234	80p
KA2131 KA2206	110p 150p	LA4030 LA4031	180p	LA7391 LA7520	550p 200p	LM747 LM1017	55p 200p	NE571 NE592	290p 85p	SDA5642 SGSF444	450p 500p	STK4111 STK4112	500p	STK6972 STK6981B	490p 600p	STR54041 STR55041	320p 450p	TA7325 TA7326	90p 200p
KA2209 KA2210	125p 230p	LA4032 LA4051	140p 160p	LA7530 LA7535	200p 175p	LM1035N LM1040N	350p 650p	NE5532P SAA1000	140p 350p	SGFS465 SLA4031	500p 750p	STK4121 STK4122	480p 560p	STK6982 STK6982H	600p	STR56041 STR58041	550p 250p	TA7328 TA7330P	110p 80p
KA2212 KA2213	65p 130p	LA4100 LA4101	85p 80p	LA7545 LA7550	160p 275p	LM1203 LM1203AN LM1875T	225p 225p 330p	SAA1004 SAA1005 SAA1006	650p 325p 300p	SLA7020M STA301A STA341M	450p 200p 180p	STK4131 STK4132 II STK4133 II	480p 600p 750p	STK7216 STK7217 STK7225	420p 400p 500p	STR59041 STR60001 STR80145	300p 525p 475p	TA7331P TA7333	80p 100p
KA2214 KA2224	100p 50p	LA4102 LA4110 LA4120	100p 120p 270p	LA7555 LA7620	150p 500p 675p	LM1881N LM1886	375p 250p	SAA1008 SAA1010	450p 400p	STA401A STA403A	220p 270p	STK4141 II STK4142	420p 530p	STK7226 STK7251	600p 500p	STR81145 STR90120	375p 425p	TA7335 TA7336	85p 180p
KA2244 KA2261 KA2263	75p 100p 100p	LA4138 LA4140	105p 60p	LA7681 LA7710	850p 250p	LM1889 LM1894N	300p 200p	SAA1024 SAA1025	250p 250p	STA405A STA431A	280p 250p	STK4147 II STK4151	1450p 680p	STK7253 STK7308	450p 350p	STRD1206 STRD1406	500p 600p	TA7337P TA7339P	175p 175p
KA2264 KA2284	100p 75p	LA4142 LA4145	65p 65p	LA7800 LA7801	90p 100p	LM1895N LM2901N	275p 35p	SAA1026 SAA1027	400p 400p	STA432A STA434A	220p 270p	STK4152 STK4161	650p 650p	STK7309 STK7310 STK7348	400p 470p 400p	STRD1706 STRD1806 STRD1816	360p 360p 350p	TA7341 TA7342P	250p 70p
KA2309 KA2401 KA2412	175p 150p 225p	LA4160 LA4162 LA4178	100p 110p 150p	LA7802 LA7806 LA7808	300p 260p 250p	LM2902N LM2903N LM3900	40p 40p 40p	SAA1029 SAA1042 SAA1043P	150p 325p 675p	STA435A STA441C STA451C	270p 220p 280p	STK4162 STK4164 II STK4171	550p 1175p 900p	STK7348 STK7356 STK7358	425p 440p	STRD1906 STRD3035	550p 300p	TA7343 TA7347P TA7348P	120p 120p 125p
KA2912 KA2913A	125p 175p	LA4180 LA4182	150p 150p	LA 7820 LA7823	100p 200p	LM3909 LM3911N	100p 200p	SAA1044 SAA1056	400p 300p	STA456C STA471	240p 210p	STK4172 II STK4181	680p 680p	STK7402 STK7404	560p 600p	STRD4412 STRD4420	500p 550p	TA7349P TA7354P	175p
KA2914A KA22427	200p 100p	LA4190 LA4192	300p 140p	LA7824 LA7830	130p 90p	LM3914 LM3915	160p 160p	SAA1057 SAA1058	375p 225p	STA901M STK0025	280p 420p	STK4182    STK4191	700p	STK7406 STK7408	650p 675p	STRD4512 STRD5441	400p 475p	TA7357 TA7358	340p 85p
KIA6213S KIA6210A	60p 400p	LA4200 LA4201	130p 120p	LA7831 LA7832	85p 130p	LM3916 LM8363	270p 320p	SAA1060 SAA1061	375p 250p	STK0029 STK0039 STK0040	600p 520p	STK4192 STK4211 II STK4211 V		STK7410 STK7458 STK7554	1500p 1250p 600p	STRD5541 STRD6008 STRD6009E	450p 575p 450p	TA7359P TA7361	90p
KIA6281H KIA6283K	250p 150p 210p	LA4260 LA4261 LA4265	230p 300p 125p	LA7835 LA7837 LA7838	150p 150p 200p	LM8560 LM13600 LM13700	175p 150p 125p	SAA1062 SAA1063 SAA1064	250p 250p 275p	STK0040 STK0049 STK0050	510p 440p	STK4221 II STK4231 II	1200p	STK7561 STK7562	650p 1000p	STRD6018 STRD6602	450p 475p	TA7362 TA7364P	150p 175p
KIA6299H KIA7227CF KIA7313		LA4270 LA4282	300p 350p	LA7850 LA7851	225p 200p	LM18293 M491BB1	500p 800p	SAA 1070 SAA 1073	550p 325p	STK0059 STK0060	620p 820p	STK4241 STK4241 V		STK7563 STK7573	800p 400p	STRD6601 STRM6545	650p 900p	TA7366P TA7368P	65p 35p
L149V L165V	300p 250p	LA4420 LA4422	140p 130p	LA7910 LA7913	150p 90p	M494B1 M5265P	700p 200p	SAA1075 SAA1086	350p 175p	STK0070 STK0080	1100р 1000р	STK4272 STK4273	500p 550p	STK7576 STK7703	1500p 1000p	STRM6546 STRM6549	900p 500p	TA7373F TA7374	150p 175p
L200 L272	200p 200p	LM4425A	130p	LA7930 LA7940	350p 200p	M50115P M50117P	320p 500p	SAA1089 SAA1101 SAA1124	325p 700p 200p	STK011 STK015 STK016	330p 440p 760p	STK4301 STK4311 STK4332	500p 650p 365p	STK8050 STK8250 STK8260	1600p 500p 1200p	STRS5741 STRS5941 STRS6307	800p 750p 600p	TA7376P TA7378P	100р 60р
L272M L290B L291B	110p 225p 300p	LA4445 LA4446	200p 200p 170p	LA7953 LA9200 LB1205	300p 300p 170p	M50119P M50422P M50461	525p 750p 350p	SAA1130 SAA1250	550p 280p	STK025 STK050	650p 1600p	STK4352 STK4362	500p 450p	STK8280 STK73405	1850p	STRS6308 STRS6309	600p	TA7401 TA7402P	250p 200p
L292 L293B	750p 225p	LA4460 LA4461	120p 120p	LB1216 LB1258	150p 100p	M50784 M50786	300p 500p	SAA1251 SAA1271	380p 400p	STK077 STK078	520p 1800p	STK4372 STK4392	600p 500p	STK73410 STK7340 II	350p 500p	STRS6707 STRS6708	1000p 575p	TA7403 TA7404	325p 150p
L293C L293D	325p 225p	LA4466 LA4470	225p 300p	LB1268 LB1274	70p 85p	M50790 M51014L	600p 120p	SAA1274 SAA1290	280p 750p	STK080 STK082	550p 2000p	STK4412 STK4432 STK4773	450p 600p 820p	STK73605 STK73907 STK78617	375p 700p 2400p	TA7054 TA7061 TA7062	190p 115p 200p	TA7405P TA7411AP	200p 150p
L293E L294	250p 475p	LA4475 LA4476	225p 225p	LB1290 LB1292	120p 110p	M51143AL M51161 M51161P	110p 300p	SAA1293 SAA1294 SAA1300	550p 800p 200p	STK084 STK085 STK086	600p 900p 1000p	STK4793 STK4803	800p 1000p	STR370 STR371	300p 400p	TA7066 TA7075P	120p 300p	TA7415P TA7417AP	350p 225p
L295 L297 L298	450p 525p 400p	LA4480 LA4485 LA4495	225p 300p 250p	LB1405 LB1407 LB1409	70p 130p 200p	M51162P M51164AL	250p 250p 80p	SAA1310 SAA1350	200p 275p	STK0100 STK0100il	900p 1200p	STK4813 STK4833	800p 850p	STR380 STR381	350p 390p	TA7089 TA7102P	300р 500р	TA7521P TA7607 TA7608	350p 200p 360p
L465A L482	525p 400p	LA4496 LA4498	250p 275p	LB1412 LB1415	300p 100p	M51166P M51182L	300p	SAA1351 SAA1900S	750p 475p	STK420 STK430	400p 500p	STK4843 STK4853	720p 1700p	STR383 STR384	410p 350p	TA7119 TA7120 TA7124	150p 55p	TA7609 TA7611	170p 210p
L497B L702B	525p 400p	LA4500 LA4505	200p 220p	LB1416 LB1426	85p 125p	M51191L M51231P	85p 200p	SAA3004 SAA3006P	400p 225p	STK433 STK435 STK436	400p 375p 430p	STK4863 STK4873 STK4893	700p 1100p 1000p	STR440 STR441 STR442	800p 950p 1600p	TA7130P TA7137	250p 85p 60p	TA7612 TA7613AP	300p 90p
L702N L2720 L2722	325p 150p 175p	LA4508 LA4510 LA4520	200p 100p 170p	LB1450 LB1615 LB1620	110p 270p 210p	M51308SP M51310AP M51316P	550p 900p 300p	SAA3007P SAA3008P SAA3010P	130p 200p 300p	STK437 STK439	600p 500p	STK4913 STK5314	900p 475p	STR450A STR451	700p 800p	TA7140 TA7141	100p 825p	TA7614 TA7616	170p 300p
L4960 L6203	325p 600p	LA4550 LA4555	200p 120p	LB1622 LB1630	220p 80p	M51320 M51356P	200p 400p	SAA3027P SAA3049P	375p 550p	STK441 STK443	680p 700p	STK5315 STK5322	500p 500p	STR452 STR453	600p	TA7150P TA7157	250p 100p	TA7621 TA7622	300p 420p
L6210 L6221AS	250p 300p	LA4557 LA4558	150p 125p	LB1639 LB1640	300p 150p	M51358P M51365P	150p 350p	SAA4700 SAA5000	425p 200p	STK457 STK459	470p 560p	STK5323 STK5324	600p 450p	STR454 STR455	1300p 550p	TA7172P TA7193 TA7200	150p 320p 200p	TA7628 TA7629	110p 220p
L6506 LA1130	300p 240p	LA4570 LA4571	130p 175p		75p 150p	M51366P M51381P M51384AP	360p 200p 750p	SAA5010 SAA5012 SAA5020	220p 400p 350p	STK460 STK461 STK463	660p 600p 950p	STK5325 STK5326 STK5330	370p 750p 850p	STR456 STR457 STR470	470p 600p 400p	TA7205 TA7207	1200p 150p	TA7630 TA7632	200p 400p
LA1135 LA1145 LA1150	120p 200p 150p	LA4581 LA4597 LA4620	175p 125p 400p	LB1645 LB1648 LB1649	100p 200p 190p	M51387P M51392P	600p 300p	SAA5030 SAA5040A	440p 280p	STK465 STK501	900p 550p	STK5331 STK5332	300p 180p	STR1096 STR1195	275p 350p	TA7208 TA7210	125p 200p	TA7640 TA7641	90p 140p
LA1170 LA1177	90p 130p	LA4630 LA4700	325p 350p	LB3500 LC4966	125p 65p	M51393AP M51395AP	350p 450p	SAA5040B SAA5041	400p 550p	STK561 STK563	450p 415p	STK5333 STK5335	650p 350p	STR1229 STR2005	325p 400p	TA7214 TA7217	220p 145p	TA7644BP TA76545P	480p
LA1180 LA1185	75p 150p	LA4705 LA5005	400p 90p	LC7011 LC7060	500p 600p	M51397AP M51436P M51496P	425p 350p 275p	SAA5042 SAA5050 SAA5051	425p 650p 400p	STK583 STK760 STK770	500р 600р 400р	STK5336 STK5337 STK5338	350p 500p 295p	STR2012 STR2013 STR2015	400p 300p 550p	TA7220 TA7222 TA7223	220p 90p 210p	TA7658 TA7659P	100p 400p
LA1186 LA1201 LA1205	35p 75p 75p	LA5112 LA5511 LA5512	200p 50p 50p	LC7120 LC7130 LC7131	350p 300p 260p	M51533 M51544	300p 150p	SAA5051 SAA5052 SAA5054	500p 500p	STK772 STK772B	650p 480p	STK5339 STK5340	400p	STR2024 STR2105	575p 600p	TA7225 TA7226	300p 290p	TA7660P TA7666P	325p 100p 100p
LA1207 LA1210	120p 140p	LA5522 LA5523	45p 150p	LC7132 LC7137	400p 450p	M51848 M54523P	150p 200p	SAA5230 SAA5231	850p 170p	STK780 STK795	575p 450p	STK5342 STK5343	245p 380p	STR2124 STR3105	675p 525p	TA7227 TA7230	700p 100p	TA7668 TA7672 TA7676AP	400p 450p
LA1222 LA1230	80р 130р	LA5524 LA5527	80p 150p	LC7181 LC7185	350p 350p	M54563P M58484	200p 500p	SAA5240PA	600p	STK1039 STK1040	460p 640p	STK5353 STK5361	400p 375p	STR3113 STR3115	225p 400p	TA7232 TA7233	95p 120p 300p	TA7679 TA7680AP	475p 200p
LA1235 LA1240	130p 80p	LA5530 LA5531	65p 65p	LC7191 LC7207	300p 275p 160p	M51516 M51518 M51995P	260p 200p 250p	SAA5244AI SAA5246AI SAA5246P	950p 380p 750p	STK1049 STK1050 STK1060	700p 650p 700p	STK5362 STK5372 STK5373	400p 260p 375p	STR3123 STR3125 STR3130	400p 480p 500p	TA7237 TA7238 TA7240	400p 160p	TA7681AP	425p 100p
LA1245 LA1260 LA1261	110p 75p 75p	LA5537 LA5655 LA5658	45p 175p 225p	LC7215 LC7217 LC7218	160p 350p 250p	M51977P M52307P	300p 900p	SAA5250P SAA5351	750p 750p 375p	STK1070 STK1080	850p 940p	STK5391 STK5392	375p 500p	STR3135 STR3212	250p 275p	TA7241 TA7242	165p 190p	TA7688 TA7698	150p 400p
LA1265 LA1266	125p 130p	LA5665 LA5667	250p 200p	LC7230 LC7267	700p 550p	M54646AP MB3708	400p 275p	SAA7000 SAA7020	550p 600p	STK2025 STK2028	620p 500p	STK5421 STK5422	450p 375p	STR3214 STR3215	275p 275p	TA7243 TA7245 TA7245BPC	320p 225p	TA7699 TA7705	600p 300p
LA1267 LA1354	150p 225p	LA5700 LA6339	300p 35p	LC7351 LC7364	200p 200p	MB3712 MB3713	600p 130p 225p	SAA7210P SAA7220PA SAA7274P	1300p 550p 600p	STK2029 STK2030 STK2038	480p 1000p 700p	STK5431 STK5434 STK5436	550p 570p 500p	STR3315 STR4090A STR4142	275p 650p 450p	TA7248P TA7250B	200p 575p 325p	TA7709P TA7719P	150p 200p
LA1363 LA1364 LA1365	90p 200p 120p	LA6510	50p 150p 150p	LC7432 LC7522 LC7535	425p 350p 300p	MB3714 MB3715 MB3722	250p 200p	SAA7280P SAA9050	1450p 450p	STK2048 STK2058IV	950p 1600p	STK5441 STK5443	400p 575p	STR4211 STR4512	315p 400p	TA7251BP TA7256P	325p 225p	TA7727P TA7750	125p 200p
LA1368 LA1369	220p 200p	LA6520	175p 250p	LC7537AN LC7537N	400p 450p	MB3730 MB3731	900p 220p	SAA9057 SAB0600	475p 600p	STK2101 STK2110	1050p 550p	STK5446 STK5451	350p	STR5015 STR5100	500p 550p	TA7259P TA7262P	225p 400p	TA7757 TA7769	200p 130p
LA1385 LA1503	170p 120p	LA7007 LA7011	400p 220p	LC7560 LC7565	750p 300p	MB3732 MB3735	240p 400p	SAB0601 SAB0602	525p 625p	STK2125 STK2129	580p 750p	STK5461 STK5462 STK5464	500p 500p	STR5214 STR5315 STR5412	475p 575p 280p	TA7263P TA7265AP TA7267	325p 300p 220p	TA7772P TA7784	150p 250p
LA1805 LA1810	175p 130p	LA7018	45p 100p	LC7582E LC7800 LC7815H	300p 175p 175p	MB3756 MB3759 MB3771	160p 200p 110p	SAB1009BF SAB1016 SAB1046P	225p 600p 350p	STK2139 STK2155 STK2230	675p 900p 470p	STK5466	300p 500p 400p	STR6020 STR7001	270p 600p	TA7267BP TA7269	120p 260p	TA7792P TA7796P	250p 75p
LA1851 LA2000 LA2001	300p 150p 200p	LA7033	130p 400p 280p	LC7818	280p 325p	MB3773 MB8719	110p 360p	SAB2015P SAB2016P	525p 150p	STK2240 STK2250	740p 650p	STK5471	300p 900p	STR9005 STR9012	400p 300p	TA7270 TA7271	170p 220p	TA8101N TA8105N TA8110AP	230p 140p 110p
LA2101 LA2110	270p 150p	LA7046 LA7051	300p 130p	LC7821N LC7822N	250p 160p	MC1391 MC1455	120p 45p	SAB2022P SAB3012	525p 675p	STK3041 STK3042	370p 375p	STK5472 STK5473	375p 480p	STR10006 STR11006	450p 325p	TA7272 TA7273	260p 300p	TA8119P TA8122AN	70p 250p
LA2200 LA2205	190p 150p	LA7053 LA7054	130p 350p	LC7881M	135p 325p 110p	MC1488 MC1489 MC1496	35p 35p 65p	SAB3013 SAB3017 SAB3021	200p 320p 450p	STK3044 STK3062 STK3082	950p 500p 550p	STK5474 STK5476 STK5477	500p 350p 450p	STR12006 STR13006 STR15006	450p 500p 500p	TA7274 TA7279P TA7280	210p 325p 190p	TA8127N TA8132AN	100p 200p
LA2211	350p	LA7060	150p	LF34/	ПОР	IVIC 1490	oap	1 OVDOOR !	430h	0.113002		2		12		1		1	

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Part	Price		Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	ALL WATER	Price	Part	Price	Part	Price
TA8164P TA8184P TA8189P	100p 350p 130p	TDA1180 TDA1185A TDA1190	120p 190p 80p	TDA2760 TDA2780 TDA2791	400p 600p 275p	TDA4661 TDA4670 TDA4680	225p 475p 350p	TDA8395	675p 360p 550p	UPC1004C UPC1009 UPC1018	130p 950p 170p	2SA773	90p 50p 35p	2SA1177 2SA1179 2SA1182	25p 20p 20p	2SB561 2SB562 2SB564	30p 20p 15p	2SC738 2SC739 2SC761	15p 150p 110p
TA8200AH TA8201AK TA8205	325p 300p 220p	TDA1200B TDA1220 TDA1235	80p 50p 300p	TDA2795 TDA2822N TDA2824	150p 4 60p 85p	TDA4685 TDA4700, TDA4714		TDA8415 TDA8416 TDA8417	650p 625p 550p	UPC1020 UPC1023 UPC1024H	200p 60p	2SA778	100p 150p 25p	2SA1184 2SA1185 2SA1186	120p 200p 500p	2SB566 2SB596 2SB598	90p 50p 30p	2SC762 2SC783 2SC790	150p 85p 50p
TA8207K TA8210 TA8211AH	175p 260p 200p	TDA1236 TDA1251 TDA1270	240p 150p 150p	TDA2840 TDA3047 TDA3048	200p 100p 130p	TDA4718/ TDA4718/ TDA4725	450p	TDA8421 TDA8425 TDA8432	300р 500р	UPC1025 UPC1026	230p 95p	2SA794 2SA798	50p 30p	2SA1198 2SA1201	40p 40p	2SB600 2SB601	500p 60p	2SC792 2SC805	380p 225p
TA8214K TA8215 TA8216H	260p 300p 300p	TDA1327 TDA1405 TDA1410	200p 50p	TDA3082 TDA3083	200p 200p	TDA4800 TDA4810	300p 500p	TDA8433 TDA8440	550p 600p 300p	UPC1028 UPC1031H UPC1032	60p	2SA816	15p 60p 70p	2SA1202 2SA1204 2SA1206	25p 225p 60p	2S8605 2S8631 2S8632	25p 40p 45p	2SC828 2SC829 2SC839	20p 15p 20p
TA8217P TA8220AH	120p 500p	TDA1412 TDA1506	220p 35p 275p	TDA3190 TDA33018 TDA3310	120p	TDA4814/ TDA4850 TDA4851	475p 325p	TDA8442 TDA8443 TDA8444	200p 350p 200p	UPC1035C UPC1043C UPC1158H	125p	2SA817 2SA825 2SA836	20p 20p 20p	2SA1207 2SA1208 2SA1209	25p 70p 100p	2\$B633 2\$B641 2\$B647	80p 12p 20p	2SC867 2SC870 2SC897	900p 100p 175p
TA8221AH TA8225H TA8225L	600p 475p 475p	TDA1508 TDA1510 TDA1512	175p 170p 140p	TDA3410 TDA3420 TDA3501	150p 200p 300p	TDA4852 TDA4860 TDA4866	325p 200p 275p	TDA8451 TDA8452 TDA8453	325p 200p 350p	UPC1161 UPC1167 UPC1170	110p 125p 150p	2SA837 2SA839 2SA841	200p 110p 20p	2SA1210 2SA1215 2SA1216	120p 600p 550p	2SB648 2SB649 2SB673	45p 35p 100p	2SC9008 2SC930 2SC936	30p 15p 300p
TA8227 TA8229K TA8400P	250p 200p 200p	TDA1514A TDA1515A TDA1516Q	325p 200p 350p	TDA3502 TDA3504 TDA3505	360p 300p 275p	TDA4881 TDA4935 TDA4940	200p 300p 200p	TDA8461 TDA8490 TDA8540	950p 225p 250p	UPC1173 UPC1176C UPC1178H	200p 120p 250p	2SA844 2SA847 2SA854	20p 25p 30p	2SA1217 2SA1220 2SA1221	100p 75p 70p	2SB676 2SB688 2SB703	85p 90p 90p	2SC941 2SC944 2SC945	15p 140p 10p
TA8410K TA8410P TA8432	200p 200p 200p	TDA1517 TDA1519 TDA1519A	150p 200p 200p	TDA3506 TDA3507 TDA3510	260p 450p 200p	TDA4942 TDA4944 TDA4950	200p 175p 100p	TDA8702 TDA8703 TDA8708	275p 500p 600p	UPC1180C UPC185H2 UPC1186	200p	2SA861 2SA872 2SA872A	45p 25p 50p	2SA1222 2SA1226 2SA1227	50p 25p 250p	2\$B705 2\$B707 2\$B716	200p 200p	2SC950 2SC959 2SC980	40p 225p
TA8605N TA8606N TA8607P	350p 350p 320p	TDA1520 TDA1521 TDA1522	275p 210p 110p	TDA3520 TDA3530 TDA3540	250p 250p 200p	TDA50304 TDA51404 TDA53301	100p 200p	TDA8730 TDA8732 TDA8735	225p 300p 175p	UPC1187 UPC1188H UPC1191	150p	2SA879 2SA884	30p 100p 35p	2SA1232 2SA1237 2SA1238	180p 25p	2SB718 2SB727 2SB733	20p 60p 100p	2SC982 2SC983	40p 20p 120p
TA8611AN TA8615N TA8628N	250p 480p 350p	TDA1524 TDA1526 TDA1534	200p 225p 2000p	TDA3541 TDA3560 TDA3561	175p 260p 300p	TDA53311 TDA53321 TDA5500	200p 150p	TDA8740 TDA8741	625p 550p	UPC1197 UPC1198H	140p 200p	2SA886 2SA887	45p 20p	2SA1239 2SA1240	30p 30p 45p	2SB734 2SB737	75p 35p 20p	2SC1000 2SC1001 2SC1008	20p 950p 20p
TA8631 TA8632N TA8644N	500p 550p 425p	TDA1540 TDA1541 TDA1542	420p 500p 250p	TDA3561A TDA3562 TDA3562T	300p 260p	TDA5600 TDA5660F		TDA8808T TDA8809T TDA9045	325p 350p 300p	UPC1210 UPC1215V UPC1222	150p 125p 130p	2SA893 2SA896 2SA899	15p 25p 40p	2SA1242 2SA1244 2SA1245	80p 120p 55p	2SB739 2SB744 2SB750	22p 55p 60p	2SC1010 2SC1012 2SC1013	225p 75p 170p
TA8646 TA8653N	375p 1500p	TDA1543 TDA1552Q	200p 350p	TDA3563 TDA3564	350p 325p	TDA5700 TDA5701 TDA5708	200p 200p 275p	TDA9080 TDA9102C TDA9403	400p 250p 130p	UPC1225H UPC1227V UPC1228H	225p A 45p	2SA904 2SA907	45p 20p 650p	2SA1246 2SA1248 2SA1249	80p 35p 100p	2SB753 2SB754 2SB764	100р 80р 30р	2SC1014 2SC1030 2SC1046	140p 150p 250p
TA8659AN TA8690N TA8691N	900р 700р 450р	TDA1553A0 TDA1555Q TDA1557Q	375p 300p	TDA3565 TDA3566 TDA3567	220p 280p 350p	TDA5709 TDA5800 TDA5820	375p 850p 370p	TDA9500 TDA9503 TDA9513	750p 550p 225p	UPC1230 UPC1237H. UPC1238	200p A 70p 120p	2SA909 2SA912 2SA913	500р 70р 100р	2SA1252 2SA1253 2SA1256	20p 30p 30p	2SB765 2SB772 2SB774	70p 25p 50p	2SC1047 2SC1050 2SC1051	20p 280p 250p
TA8701AN TA8718N TA8720	275p 550p 525p	TDA1558Q TDA1560Q TDA1571	300p 675p 300p	TDA3569 TDA3570 TDA3580	300p 375p 300p	TDA5832 TDA5850 TDA5930	125p 175p 225p	TDA9800 TDA9821 TEA0652	225p 200p 150p	UPC1241H UPC1242H UPC1245V	150p 150p 130p	2SA914 2SA915 2SA916	90p 30p 30p	2SA1257 2SA1258 2SA1261	30p 70p 150p	2SB775 2SB776 2SB788	100p 110p 35p	2SC1061 2SC1069 2SC1070	85p 175p 65p
TA8739P TA8872N TAA550	450p 450p 25p	TDA1572 TDA1574 TDA1576	175p 125p 170p	TDA3586 TDA3590 TDA3591	750p 250p 360p	TDA61000 TDA61010 TDA61110	120p	TEA0653T TEA0655 TEA0665	80p 300p 300p	UPC1270H UPC1274V UPC1277	250p 250p 240p	2SA921 2SA928A 2SA933	40p 25p 30p	2SA1262 2SA1263 2SA1264	110p 280p 280p	2SB791 2SB794 2SB795	130p 40p 45p	2SC1079 2SC1080 2SC1096	300p 225p 40p
TBA120S TBA396 TBA520	40p 70p 120p	TDA1578A TDA1579 TDA1589	210p 130p 275p	TDA3592A TDA3601Q TDA3602	300p	TDA6200 TDA6600- TDA6610-	750p 700p	TEA1002 TEA1007 TEA1009	650p 120p 100p	UPC1278 UPC1288V UPC1297C	240p 230p	2SA934 2SA935 2SA937	30p 40p	2SA1265 2SA1283	200p 50p	2SB810 2SB816	15p 160p	2SC1098 2SC1106	120p 180p
TBA530 TBA540 TBA560	100р 90р 90р	TDA1591 TDA1596 TDA1598	275p 200p 160p	TDA3611 TDA3640 TDA3645	450p 350p 400p	TDA6612- TDA7000 TDA7010T	2 900p 170p	TEA1015P TEA1017 TEA1019	110p 280p 130p	UPC1298 UPC1313H UPC1316C	320p A 100p	2SA939 2SA940	20p 140p 50p	2SA1284 2SA1286 2SA1289	60p 60p 50p	2SB817 2SB819 2SB822	175p 60p 40p	2SC1114 2SC1115 2SC1116	415p 280p 290p
TBA800 TBA810AS TBA820	40p 40p 55p	TDA1600 TDA1602A TDA1670A	200p 400p 200p	TDA3651 TDA3652 TDA3652 TX	200p 500p	TDA7020T TDA7021T TDA7050	175p 200p	TEA1024 TEA1035	150p 200p	UPC1318 UPC1330H		2SA942 2SA949 2SA950	60p 70p 18p	2SA1290 2SA1293 2SA1294	150p 110p 450p	2SB824 2SB825 2SB826	60p 135p 75p	2SC1124 2SC1161 2SC1162	270p 110p 30p
TBA820M TBA920	35p 100p	TDA1675 TDA1701	200p 500p	TDA3653 TDA3654	85p 80p	TDA7052 TDA7053	100p 120p 200p	TEA 1039 TEA 1045 TEA 1060	150p 300p 225p	UPC1335V UPC1350 UPC1352C	320p 115p 450p	2SA951 2SA952 2SA953	60р 30р 60р	2SA1295 2SA1301 2SA1302	500p 260p 300p	2SB827 2SB828 2SB829	200p 200p 200p	2SC1164 2SC1165 2SC1166	600р 750р 100р
TBA950 TBA990 TC5020	100p 60p 200p	TDA1771 TDA1870A TDA1872A	200p 200p 275p	TDA3654Q TDA3710 TDA3720	85p 300p 175p	TDA7056 TDA70570 TDA7072	100p	TEA1061 TEA1062 TEA1064	175p 250p 250p	UPC1360C UPC1362C UPC1363	200p 250p 190p	2SA954 2SA957 2SA958	30p 185p 60p	2SA1303 2SA1304 2SA1306	400p 110p 110p	2SB835 2SB857 2SB861	75p 80p 110p	2SC1170 2SC1172 2SC1173	180p 150p 33p
TC5081AP TC5082P TC5090A	80p 170p 230p	TDA1904 TDA1905 TDA1908A	80p 80p 9 <b>0</b> p	TDA3724 TDA3725 TDA3730	300p 300p 400p	TDA7077 TDA7211 TDA7220	175p 100p 65p	TEA1067 TEA1068 TEA1080P	150p 350p 170p	UPC1363C UPC1364C UPC1365	300p 350p 250p	2SA963 2SA965 2SA966	120p 30p 25p	2SA1307 2SA1309 2SA1315	100p 50p 100p	2SB863 2SB865 2SB882	220p 25p 180p	2SC1195 2SC1212 2SC1213	210p 35p 10p
TC9125BP TC9130P TC9134	410p 150p 750p	TDA1910 TDA1940 TDA1941	160p 180p 300p	TDA3740 TDA3750 TDA3755	400p 400p 425p	TDA7222 TDA7230A TDA7231A	100p	TEA1087 TEA1101 TEA1330	40p 425p 65p	UPC1366C UPC1370C UPC1373	130p 300p 85p	2SA968 2SA970 2SA979	55p 25p 35p	2SA1317 2SA1318 2SA1319	30p 20p 25p	2SB885 2SB891 2SB892	45p 35p 25p	2SC1214 2SC1215 2SC1216	15p 25p 200p
TC9135P TC9137P TC9138AP	125p 500p 150p	TDA1950 TDA2002 TDA2003	175p 50p 65p	TDA3760 TDA3765V TDA3771	350p 225p 460p	TDA7233 TDA7240 TDA7241	60p 175p 250p	TEA1511 TEA2000 TEA2014A	150p 500p 80p	UPC 1377C UPC 1378 UPC 1379C	200p 1000p 170p	2SA984 2SA985 2SA988	25p 60p 25p	2SA1320 2SA1321 2SA1327	45p 80p 130p	2SB895 2SB908 2SB926	60p 70p 30p	2SC1222 2SC1226 2SC1237	15p 75p 250p
TC9142 TC9143 TC9145	320p 300p 150p	TDA2004 TDA2005 TDA2006	150p 150p 70p	TDA3780 TDA3791 TDA3800	400р 200р 250р	TDA7245 TDA7250 TDA7255	225p 400p 400p	TEA2018A TEA2019 TEA2025B	80p 600p 75p	UPC 1382 UPC 1384 UPC 1387C	110p 425p 250p	2SA991 2SA992	30p 30p	2SA1329 2SA1346	200p 20p	2SB941 2SB950	60p 180p	2SC1247A 2SC1252	35p 850p
TC9148 TC9149 TC9150	200p 225p 425p	TDA2007 TDA2008 TDA2009	120p 100p 160p	TDA3803A TDA3810 TDA3825	500p 200p 150p	TDA7256 TDA7262 TDA7272	400p 325p 170p	TEA2028 TEA2028B TEA2029A	325p 375p 650p	UPC1394 UPC1397 UPC1403CA	120p 350p	2SA993 2SA995 2SA999	50p 60p 30p	2SA1348 2SA1352 2SA1353	45p 100p 100p	2SB951 2SB953 2SB975	190p 90p 100p	2SC1278 2SC1279 2SC1308K	110p 30p 350p
TC9151P TC9152 TC9153	425p 425p 300p	TDA2010 TDA2020 TDA2030	150p 120p 80p	TDA3827 TDA3840 TDA3842	110p 200p	TDA7273 TDA7274 TDA7275	80p 45p	TEA2029C TEA2031A	270p 125p	UPC1406HA	4 70p	2SA1005 2SA1006 2SA1008	25p 90p 125p	2SA1356 2SA1357 2SA1358	100р 65р 130р	2SB985 2SB986 2SB1009	30p 40p 110p	2SC1312 2SC1318 2SC1325	40p 10p 400p
TC9154AP TC9156 TC9158P	225p 300p	TDA2030H TDA2040	100p 140p	TDA3843 TDA3845	200p 200p 225p	TDA7282 TDA7284	75p 50p 100p	TEA2037 TEA2114 TEA2117	200p 200p 450p	UPC1421CA UPC1423CA UPC1470	200p	2SA1009 2SA1010 2SA1011	200p 225p 80p	2SA1359 2SA1360 2SA1362	45p 45p 25p	2SB1010 2SB1012 2SB1015	25p 55p 60p	2SC1327 2SC1328 2SC1342	20p 15p 15p
TC9162 TC9163 TC9164	450p 275p 375p	TDA2048 TDA2051V TDA2052V	600p 450p 525p	TDA3856 TDA3857 TDA3950	300p 200p 225p	TDA7302 TDA7310 TDA7313	450p 800p 650p	TEA2130 TEA2164 TEA2260	350p 160p 225p	UPC1474HA UPC1484CA UPC1488H	300p	2SA1012 2SA1013 2SA1015	85p 100p 10p	2SA1370 2SA1371 2SA1376	50p 100p 30p	2SB1016 2SB1017 2SB1018	130p 40p 130p	2SC1343 2SC1345 2SC1346	200p 15p 100p
TC9167P TC9172P	400р 100р 300р	TDA2054M TDA2107 TDA2148	110p 250p 325p	TDA4001 TDA4050 TDA4052	250p 150p 500p	TDA7318 TDA7330A TDA7350	300p	TEA2261 TEA2262 TEA3717DF		UPC1498H UPC1505C UPC1513HA		2SA1016 2SA1018 2SA1020	30p 100p 30p	2SA1380 2SA1381 2SA1382	75p 100p 120p	2SB1020 2SB1039 2SB1066	120p 65p 40p	2SC1358 2SC1359 2SC1360	270p 15p 70p
TC9174P TC9176P TC9177P	325p 500p 225p	TDA2151 TDA2170 TDA2220	375p 1300p 200p	TDA4060 TDA4092 TDA4100	500р 250р 150р	TDA7359 TDA7360 TDA7361	300p 700p 175p	TEA3718S TEA5030 TEA5040	175p 135p 650p	UPC1514CA UPC1515CA UPC1520CA	200p 250p	2SA1021 2SA1023 2SA1026	35p 60p 90p	2SA1385 2SA1386 2SA1387	180p 400p 75p	2SB1068 2SB1077 2SB1098	160p 180p 80p	2SC1364 2SC1368 2SC1382	25p 75p 40p
TCA9940 TCEP100 TD62308AP	100p 100p 200p	TDA2270 TDA2320 TDA2501	250p 80p 300p	TDA4173AI TDA4180 TDA4190	325p 145p 180p	TDA7370V TDA7374V TDA7770	325p 350p 140p	TEA5101A TEA5110 TEA5114A	175p 175p 200p	UPC1521HA UPC1536C 2SA329	120p 550p 75p	2SA1029 2SA1036 2SA1037	60p 60p 50p	2SA1396 2SA1399 2SA1400	120p 25p 150p	2SB1099 2SB1109 2SB1123	75p 40p 50p	2SC1383 2SC1384 2SC1393	25p 20p 20p
TD62382 TD62506 TD62705	200p 200p 250p	TDA2502 TDA2503 TDA2504	175p 200p 200p	TDA4200 TDA4210 TDA4260	300p 160p 250p	TDA8114 TDA8115 TDA8116	225p 200p 350p	TEA5115 TEA5116 TEA5170	220p 220p 200p	2SA467 2SA473 2SA483	40p 29p 90p	2SA1038 2SA1048 2SA1051	40p 25p 300p	2SA1423 2SA1428 2SA1441	30p 35p 110p	2SB1133 2SB1134 2SB1135	50p 65p 60p	2SC1394 2SC1398 2SC1399	15p 55p 100p
TD6304AP TD6306P TD6350P	300p 350p 200p	TDA2505 TDA2506 TDA2507	220p 400p 450p	TDA4280 TDA4282 TDA4283T	320p 360p 450p	TDA8120B TDA8124 TDA8134	400p 250p 225p	TEA5500 TEA5501 TEA5550	325p 225p 150p	2SA484 2SA489 2SA490	80p 50p 45p	2SA1052 2SA1060 2SA1061	15p 120p 300p	2SA1442 2SA1443 2SA1450	110p	2SB1140 2SB1143 2SB1151	45p 40p 75p	2SC1400 2SC1403 2SC1407	50p 500p 50p
TD6359P TDA1001 TDA1002	300p 200p 200p	TDA2507T TDA2510 TDA2514A	450p 450p 500p	TDA4290 TDA4400 TDA4420	125p 175p 120p	TDA8135 TDA8136 TDA8137	225p 225p 200p	TEA5560 TEA5570 TEA5580	130p 85p 165p	2SA493 2SA495 2SA496	25p 40p 30p	2SA1069 2SA1073 2SA1076	150p 375p 230p	2SA1459 2SA1462 2SA1469	40p 25p	2SB1162 2SB1163 2SB1168	400p 370p	2SC1413 2SC1419	150p 50p
TDA1003 TDA1005A TDA1010A	150p 175p 80p	TDA2515 TDA2530 TDA2532	450p 300p 100p	TDA4421 TDA4426 TDA4427	300p 170p 300p	TDA8138 TDA8138A TDA8138B	200p 130p 200p	TEA5581 TEA5591 TEA5620	200p 200p 300p	2SA505 2SA509 2SA537	120p 35p 170p	2SA1077 2SA1080 2SA1081	300p 125p 80p	2SA1475 2SA1488 2SA1489		2SB1182 2SB1185 2SB1202	50p 40p 50p 45p	2SC1426 2SC1429 2SC1431 2SC1444	700p 50p 400p
TDA1011 TDA1012 TDA1013A	75p 120p 110p	TDA2540 TDA2541 TDA2542	150p 70p 110p	TDA4431 TDA4433 TDA4437	150p 100p 125p	TDA8139 TDA8140 TDA8143	200p 200p 160p	TEA5630 TEA5640E	225p 750p 650p	2SA539 2SA544 2SA550	20p 650p 150p	2SA1082 2SA1083 2SA1084	80p 20p 100p	2SA1490 2SA1491 2SA1492	225p	2SB1203 2SB1204 2SB1205	45p 45p	2SC1445 2SC1446 2SC1447	275p 350p 55p
TDA1015 TDA1016 TDA1020	85p 140p 110p	TDA2543 TDA2544 TDA2545	210p 200p 120p	TDA4439 TDA4440 TDA4442	220p 180p 240p	TDA8145 TDA8146 TDA8160	120p 200p 125p	TEA6000 TEA6100 TEA6200	400p 350p 225p	2SA562 2SA564 2SA571	30p 15p	2SA1085 2SA1091	75p 100p	2SA1493 2SA1494	500p 450p	2SB1223 2SB1243	40p 60p 40p	2SC1449 2SC1450	70p 120p 200p
TDA1022 TDA1023 TDA1024	330p 130p 150p	TDA2546A TDA2548 TDA2549	200p 200p 300p	TDA4443 TDA4445 TDA4450	250p 220p 225p	TDA8170 TDA8172 TDA8173	170p 200p 175p	TEA6300 TEA6310T TEA6414A	500p 425p 425p	2SA603 2SA606 2SA608	650p 100p 200p 15p	2SA1093 2SA1094 2SA1095 2SA1096	180p 190p 300p	2SA1516 2SA1519 2SA1523	280p 20p 45p	2SB1274 2SB1282 2SB1318	40p 300p 40p	2SC1454 2SC1470 2SC1472	250p 120p 40p
TDA 1025 TDA 1028 TDA 1029	320p 175p 200p	TDA2555 TDA2556 TDA2557	175p 230p	TDA4452 TDA4453	250p 275p	TDA8174 TDA8175	200p 300p	TEA6415B TEA6420	525p 360p	2SA614 2SA628	150p 20p	2SA1102 2SA1103	80p 130p 130p	2SA1535 2SA1538 2SA1540	55p 50p	2SB1375 2SB1382 2SB1468	45p 350p 100p	2SC1473 2SC1474 2SC1501	15p 45p 70p
TDA1038 TDA1041E	500p 250p	TDA2558 TDA2574V	225p 400p 350p	TDA4480 TDA4481 TDA4482	280p 215p 200p	TDA8178 TDA8179S TDA8185	650р 750р 180р	TEA8172 TL431 TL494	125p 45p 100p	2SA634 2SA636 2SA639	50p 50p 60p	2SA1104 2SA1105 2SA1106	140p 250p 160p	2SA1598 2SA1599 2SA1600	220p 250p	2SC182 2SC372 2SC380	75p 25p 10p	2SC1505 2SC1507 2SC1509	55p 45p 35p
TDA1041P TDA1044	180p	TDA2575A TDA2577A TDA2578A	100p 200p 200p	TDA4500 TDA4501 TDA4502	300р 280р 400р	TDA8190 TDA8191 TDA8192	200p 425p 200p	TLO61 TLO64 TLO71	40p 80p 38p	2SA640 2SA642 2SA643	60p 50p 25p	2SA1111 2SA1112 2SA1115	90p 150p 30p	2SA1601 2SA1625 2SA1626	40p 90p	2SC388A 2SC394 2SC403	25p 60p 25p	2SC1514 2SC1515 2SC1520	35p 60p 45p
TDA 1047 TDA 1048 TDA 1053	200p 200p 300p	TDA2579A TDA2582 TDA2590	210p 130p 170p	TDA4503 TDA4505A TDA4505E	325p 300p 275p	TDA8196 TDA8205 TDA8213	120p 1250p 175p	TLO74 TLO83 TLO84	80p 55p 70p	2SA673 2SA677 2SA678	15p 35p 26p	2SA1120 2SA1123 2SA1124	40p 40p 60p	2SA1640 2SA1652 2SA1667	100p 70p 175p	2SC454 2SC458 2SC460	15p 10p	2SC1541 2SC1545 2SC1567	110p 120p 40p
TDA1054 TDA1057 TDA1059B	180p 60p 40p	TDA2591 TDA2591Q TDA2593	150p 80p	TDA4505K TDA4505M TDA4510	450p 1000p 200p	TDA8214B TDA8215H TDA8217	225p 300p 225p	TMP47C-434N TPU2732 TPU2735	1250p 800p 500p	2SA683 2SA684 2SA699	25p 25p 100p	2SA1127 2SA1133 2SA1135	50p 120p 130p	2SA1668 2SA1671 2SA1673	180p 310p 425p	2SC461 2SC495 2SC496	15p 45p	2SC1568 2SC1569 2SC1570	35p 55p 40p
TDA1060 TDA1062 TDA1068	140p 140p 75p	TDA2594 TDA2595 TDA2600	200p 400p	TDA4532 TDA4555 TDA4556	200p 275p 370p	TDA8303 TDA8304 TDA8305	250p 400p 500p	UC3524 UC3842N UC3843	100p 60p 125p	2SA705 2SA706 2SA708	70p 140p 50p	2SA1141 2SA1142 2SA1143	200p 100p 15p	2SA1680 2SA1706 2SB175	40p 25p	2SC497 2SC515 2SC535	85p 100p	2SC1571 2SC1573 2SC1576	50p 25p 550p
TDA1072 TDA1074 TDA1077	280p 250p	TDA2616 TDA2630	100p 250p 300p	TDA4557 TDA4560 TDA4565	200p 270p 150p	TDA8340 TDA8341 TDA8349A	150p 250p 350p	UC3844 UPC20C UPC554	70p 220p 130p	2SA711 2SA715 2SA719	280p 50p 50p	2SA1145 2SA1146 2SA1151	40p 200p 30p	2SB324 2SB337 2SB474	40p 150p	2SC536 2SC605 2SC619	20p 100p	2SC1580 2SC1583 2SC1586	600p 25p 540p
TDA1082 TDA1083 TDA1085	275p 95p 170p	TDA2640 TDA2653A TDA2654		TDA4566 TDA4568 TDA4570	250p 225p 200p	TDA7350Q TDA8351 TDA8360N	275p 200p	UPC555 UPC556H UPC571	60p 80p 220p	2SA720 2SA725 2SA726	20p 80p 20p	2SA1152 2SA1153 2SA1154	150p 30p 22p	2SB492 2SB511 2SB525	80p 55p	2SC641 2SC644 2SC647	80p 10p	2SC1617 2SC1619 2SC1623	340p 170p
TDA 1087 TDA 1092 TDA 1097	60p 100p 475p	TDA2658 TDA2670 TDA2690	300p 150p 100p	TDA4580 TDA4600 TDA460011	400p 200p 160p	TDA8361N: TDA8362AN TDA8362N3	900p 1200p	UPC574 UPC575C2 UPC577	60p 90p	2SA733 2SA740 2SA742	15p 90p 450p	2SA1156 2SA1162 2SA1163	90p 30p 15p	2SB525 2SB527 2SB531 2SB536	130p 400p	2SC681 2SC683 2SC708	250p 35p	2SC1624 2SC1626	50p 60p 55p
TDA1151 TDA1154 TDA1170	40p 50p 85p	TDA2710-1 TDA2721 TDA2730	400p 200p	TDA4601 TDA4605 TDA4610	120p 190p 370p	TDA8366N2 TDA8372A TDA8380	1500p 1650p 200p	UPC592 UPC595 UPC596	95p 190p	2SA747A 2SA748 2SA764	425p 60p 200p	2SA1169 2SA1170 2SA1173	500p 500p 60p	2SB537 2SB544	90p 22p	2SC710 2SC711	15p	2SC1627 2SC1628 2SC1634	15p 75p 50p
TDA1170N TDA1175	85p	TDA2740 TDA2750	300p	TDA4650 TDA4660	300p 200p	TDA8385 TDA8390A	275p 650p	UPC1001 UPC1004C	220p	2SA769 2SA770	80p 200p	2SA1174 2SA1175	25p 30p	2S8546 2S8549 2S8560	50p	2SC730 2SC732 2SC735	40p	2SC1667 2SC1669 2SC1674	450p 100p 15p

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Part	Price	Part	Price	Part	Price	Part		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 2SC1683	80p 100p	2SC2267 2SC2270	90p 60p	2SC2721 2SC2724	120p 15p	2SC3264 2SC3269	390p 50p	2SC3807 2SC3808	120p 70p	2SD287 2SD291	250p 250p	2SD882 2SD889	25p 35p	2SD1328 2SD1330	60p 50p	2SD1764 2SD1765	70p 70p	2SK315 2SK320	70p 120p
2SC1684	30p	2SC2271 2SC2274	25p 15p	2SC2738 2SC2749	200p 350p	2SC3270 2SC3271	50p 75p	2SC3811 2SC3831	80p 250p	2SD313 2SD315	25p 75p	2SD892A 2SD894	75p 35p	2SD1347 2SD1348	70p 65p	2SD1769 2SD1773	110p 100p	2SK323	130p
2SC1685 2SC1729	30p 900p	2SC2275	50p	2SC2750	300p	2SC3277	280p	2SC3832	135p	2SD325	30p	2SD895	100p	2SD1350 2SD1376	150p	2SD1776 2SD1783	70p	2SK332 2SK359	175p 40p
2SC1730 2SC1735	10p 70p	2SC2278 2SC2283	70p 700p	2SC2751 2SC2752	270p 75p	2SC3279 2SC3280	30p 200p	2SC3833 2SC3851	250p 100p	2SD330 2SD348	65p 300p	2SD896 2SD898B	200p 225p	2SD1378	60p 60p	2SD1785	70p 160p	2SK363	50p
2SC1740 2SC1741	10p 35p	2SC2290 2SC2291	1800p	2SC2767 2SC2769	300p 400p	2SC3281 2SC3284	200p 600p	2SC3852 2SC3853	80p 220p	2SD350 2SD357	320p 40p	2SD900 2SD905	400p 450p	2SD1379 2SD1380	100p 100p	2SD1789 2SD1796	210p 120p	2SK364 2SK367	40p
2SC1755	90p	2SC2298	35p	2SC2773	700p	2SC3293	85p	2SC3855	220p	2SD358	40p	2SD916 2SD917	130p 300p	2SD1382 2SD1384	60p 50p	2SD1802 2SD1806	75p 75p	2SK369	30p
2SC1756 2SC1758	35p 30p	2SC2307 2SC2308	300p 10p	2SC2774 2SC2785	500p 40p	2SC3298 2SC3299	50p 120p	2SC3857 2SC3858	500p 550p	2SD359 2SD361	50p 100p	2SD921	320p	2SD1390	350p	2SD1812	45p	2SK373 2SK374	40p 45p
2SC1760 2SC1775	70p 10p	2SC2312 2SC2314	300p 70p	2SC2786 2SC2787	20p 10p	2SC3300 2SC3303	400p 100p	2SC3866 2SC3868	275p 100p	2SD362 2SD371	100p 240p	2SD923 2SD946	360p 120p	2SD1391 2SD1392	250p 85p	2SD1815 2SD1825	50p 60p	2SK386 2SK389	600p 115p
2SC1781	20p	2SC2316 2SC2320	150p 10p	2SC2791 2SC2792	500p 220p	2SC3306 2SC3307	130p 600p	2SC3870 2SC388A	200p 25p	2SD380 2SD381	650p 50p	2SD947 2SD950	100p 300p	2SD1395 2SD1396	80p 120p	2SD1827 2SD1843	120p 70p	2SK400	700p
2SC1789 2SC1809	100p 40p	2SC2324	120p	2SC2793	700p	2SC3309	150p	2SC3883	210p	2SD382	75p	2SD951 2SD957A	200p 520p	2SD1397 2SD1398	100p 120p	2SD1846 2SD1847	350p 275p	2SK405 2SK414	450p 550p
2SC1810 2SC1815	250p 10p	2SC2328A 2SC2310	50p 25p	2SC2808 2SC2810	40p 360p	2SC3310 2SC3316	125p 280p	2SC3884A 2SC3885	250p	2SD386 2SD388	150p	2SD958	60p	2SD1399	300p	2SD1849	280p	2SK415	500p
2SC1819 2SC1826	70p 60p	2SC2315 2SC2329	175p 480p	2SC2812 2SC2814	40p 40p	2SC3317 2SC3326	350p 50p	2SC3885A 2SC3886A		2SD389 2SD400	60p 14p	2SD965 2SD970	35 p 170 p	2SD1400 2SD1402	280p 120p	2SD1850 2SD1853	325p 40p	2SK423 2SK427	75p 50p
2SC1827 2SC1829	60p 500p	2SC2230 2SC2331	300p 50p	2SC2824 2SC2825	75p 900p	2SC3327 2SC3328	60p 50p	2SC3890 2SC3892	150p 250p	2SD401 2SD402	50p 120p	2SD972 2SD973	40p 60p	2SD1403 2SD1405	225p 80p	2SD1856 2SD1857	40p 75p	2SK430	200p
2SC1833	27p	2SC2333	200p	2SC2826	200p	2SC3330	20p	2SC3893	225p 325p	2SD414 2SD415	45p 55p	2SD973A 2SD982	70p 90p	2SD1406 2SD1407	60p 60p	2SD1858 2SD1863	40p 35p	2SK511 2SK513	450p 325p
2SC1834 2SC1841	50p 12p	2SC2334 2SC2335	80p 55p	2SC2827 2SC2832	130p 300p	2SC3331 2SC3333	25p 120p	2SC3895 2SC3896	400p	2SD424	350p	2SD985	120p	2SD1408	125p	2SD1864	85p	2SK526 2SK531	160p 350p
2SC1844 2SC1845	50p 15p	2SC2336A 2SC2344	125p 150p	2SC2834 2SC2837	280p 250p	2SC3345 2SC3346	100p 130p	2SC3897 2SC3907	400p 250p	2SD426 2SD427	150p 350p	2SD986 2SD998	120p 70p	2SD1409 2SD1411	170p 85p	2SD1877 2SD1878	175p 160p	2SK534	700p
2SC1846 2SC1847	35p 45p	2SC2347 2SC2353	35p 120p	2SC2839 2SC2853	40p 70p	2SC3352 2SC3353	200p 280p	2SC3927 2SC3940	250p 40p	2SD438 2SD467	35p 15p	2SD1010 2SD1012	40p 40p	2SD1412 2SD1413	75p 60p	2SD1879 2SD1880	275p 360p	2SK537 2SK538	900p 350p
2SC1855	85p	2SC2360	120p	2SC2873	60p	2SC3355	50p	2SC3943	75p	2SD468	15p	2SD1020	40p	2SD1415	190p	2SD1881 2SD1884	350p	2SK539	1100p
2SC1856 2SC1865	25p 700p	2SC2361 2SC2362	150p 50p	2SC2877 2SC2878	120p 20p	2SC3356 2SC3358	120p 50p	2SC3944 2SC3950	80p 120p	2SD471 2SD476	20p 100p	2SD1021 2SD1022	120p 250p	2SD1417 2SD1425	75p 260p	2SD1886	300p	2SK544 2SK552	30p 250p
2SC1870 2SC1871	700p 425p	2SC2365 2SC2369	280p 100p	2SC2879 2SC2882	3200p 60p	2SC3376 2SC3377	300p 50p	2SC3953 2SC3955	50p 60p	2SD525 2SD526	50p 70p	2SD1024 2SD1027	850p 850p	2SD1426 2SD1427	135p 160p	2SD1887 2SD1894	225p 300p	2SK553	225p
2SC1875	220p	2SC2371	25p	2SC2883 2SC2898	60p 200p	2SC3378 2SC3379	120p 1200p	2SC3964 2SC3972	100p 250p	2SD545 2SD549	18p 120p	2SD1030 2SD1031	75p 70p	2SD1428 2SD1430	180p 280p	2SD1895 2SD1910	225p 175p	2SK555 2SK556	320p 500p
2SC1881 2SC1890	70p 15p	2SC2373 2SC2383	210p 50p	2SC2899	50p	2SC3381	130p	2SC3973	210p	2SD551	300p	2SD1036	600p	2SD1430 2SD1431 2SD1432	200p 400p	2SD1911 2SD1913	300p	2SK557	400p
2SC1895 2SC1904	500p 125p	2SC2389 2SC2407	45p 110p	2SC2909 2SC2910	60p 25p	2SC3383 2SC3393	80p 80p	2SC3975 2SC3987	210p 160p	2SD554 2SD555	225p 500p	2SD1046 2SD1047	200p 180p	2SD1433	300p	2SD1929	50p	2SK559 2SK560	600p 580p
2SC1906 2SC1907	15p 20p	2SC2408 2SC2412K	120p 50p	2SC2911 2SC2912	80p 120p	2SC3397 2SC3399	20p 50p	2SC3996 2SC3997	600p 1250p	2SD556 2SD558	225p 200p	2SD1051 2SD1055	130p 60p	2SD1438 2SD1439	60p 165p	2SD1930 2SD1933	50p 45p	2SK566	475p
2SC1909	250p	2SC2440	200p	2SC2921 2SC2922	650p 480p	2SC3400 2SC3401	35p 50p	2SC3998 2SC4006	800p	2SD560 2SD571	50p 20p	2SD1060 2SD1062	130p 150p	2SD1441 2SD1442	220p 80p	2SD1939 2SD1941	60p 350p	2SK606 2SK612	70p 80p
2SC1913 2SC1914	90p 30p	2SC2458 2SC2459	10p 50p	2SC2923	75p	2SC3402	40p	2SC4020	150p	2SD575	530p	2SD1063	200p	2SD1445	200p	2SD1944	50p	2SK684 2SK685	950p 1150p
2SC1921 2SC1922	15p 175p	2SC2466 2SC2486	55p 275p	2SC2928 2SC2929	550p 280p	2SC3405 2SC3409	130p 400p	2SC4023 2SC4029	325p 350p	2SD592 2SD596	25p 25p	2SD1064 2SD1065	250p 160p	2SD1446 2SD1450	300p 60p	2SD1958 2SD1959	80p 210p	2SK699	100p
2SC1923 2SC1929	10p 180p	2SC2492 2SC2470	50p 65p	2SC2934 2SC2937	75p 250p	2SC3416 2SC3417	30p 90p	2SC4043 2SC4046	45p 40p	2SD600 2SD601	30p 40p	2SD1069 2SD1073	150p 350p	2SD1451 2SD1452	200p 275p	2SD1978 2SD1984	50p 60p	2SK719 2SK724	300p 500p
2SC1940	110p	2SC2481	120p	2SC2939	400p	2SC3419 2SC3420	120p 80p	2SC4056 2SC4059	200p 400p	2SD602 2SD612	60p 50p	2SD1088 2SD1094	150p 375p	2SD1453 2SD1455	140p 250p	2SD1991 2SD1994	50p 200p	2SK725	550p
2SC1941 2SC1942	27p 350p	2SC2482 2SC2483	20p 120p	2SC2944 2SC2958	300p 50p	2SC3421	45p	2SC4064	140p	2SD613	70p	2SD1110	225p	2SD1457 2SD1458	165p 50p	2SD1996 2SD2006	45p 75p	2SK726 2SK727	425p 475p
2SC1944 2SC1945	350p 350p	2SC2484 2SC2485	185p 400p	2SC2962 2SC2979	800р 160р	2SC3422 2SC3423	75p 60p	2SC4106 2SC4107	150p 175p	2SD617 2SD633	300p 70p	2SD1111 2SD1113	20p 225p	2SD1459	60p	2SD2010	250p	2SK739 2SK758	400p 300p
2SC1946 2SC1947	1500p 450p	2SC2491 2SC2498	200p 50p	2SC2987 2SC2988	250p 150p	2SC3425 2SC3446	65p 150p	2SC4123 2SC4124	230p 200p	2SD636 2SD637	10p 15p	2SD1128 2SD1133	200p 65p	2SD1468 2SD1487	40p 225p	2SD2011 2SD2012	60p 50p	2SK769	500p
2SC1953	45p	2SC2500	25p 140p	2SC2995 2SC2999	60p 50p	2SC3447 2SC3456	130p 200p	2SC4125 2SC4137	275p 40p	2SD638 2SD639	15p 20p	2SD1135 2SD1138	75p 40p	2SD1494 2SD1496	150p 300p	2SD2018 2SD2033	65p 80p	2SK786 2SK787	200p 800p
2SC1957 2SC1959	70p 10p	2SC2502 2SC2503	600p	2SC3001	1400p	2SC3457	125p	2SC4138	200p	2SD640 2SD655	350p	2SD1140 2SD1142	40p 350p	2SD1497 2SD1497-0	230p	2SD2061 2SD2066	100p 250p	2SK791	225p
2SC1962 2SC1967	175p 1300p	2SC2512 2SC2517	20p 120p	2SC3019 2SC3020	320p 1450p	2SC3459 2SC3460	180p 130p	2SC4157 2SC4159	400p 100p	2SD661	60p	2SD1145	25p	2SD1505	90p	2SD2125	180p	2SK792 2SK793	300p 300p
2SC1969 2SC1970	160p 100p	2SC2519 2SC2527	60p 300p	2SC3022 2SC3025	1850p 500p	2SC3461 2SC3466	275p 225p	2SC4161 2SC4169	125p 60p	2SD666 2SD667	25p 20p	2SD1148 2SD1153	175p 30p	2SD1506 2SD1508	50p 60p	2SD2136 2SD2144	85p 35p	2SK794 2SK796	315p 600p
2SC1971 2SC1972	400p 600p	2SC2534 2SC2535	150p 300p	2SC3026 2SC3030	450p 300p	2SC3468 2SC3481	70p 300p	2SC4199 2SC4204	400p 60p	2SD669 2SD673	35p 350p	2SD1159 2SD1160	65p 150p	2SD1509 2SD1511	100p 75p	2SD2151 2SD2255	175p 175p	2SK809	850p
2SC1973	150p	2\$C2538	100p	2SC3037 2SC3038	125p	2SC3482 2SC3486	275p 275p	2SC4231 2SC4235	250p 300p	2SD676 2SD717	250p 180p	2SD1163 2SD1164		2SD1519 2SD1521	250p 70p	2SD2331 2SD2333	250p 150p	2SK812 2SK817	150p 325p
2SC1975 2SC1980	120p 30p	2SC2540 2SC2542	1900p 300p	2SC3039	80p	2SC3502	50p	2SC4236	450p	2SD718	85p	2SD1168	270p	2SD1525 2SD1526	450p	2SD2340	225p	2SK851	550p
2SC1983 2SC1984	75p 150p	2SC2545 2SC2546	55p 25p	2SC3040 2SC3042	260p 300p	2SC3503 2SC3504	50p 120p	2SC4237 2SC4242	500p 120p	2SD722 2SD725	240p 200p	2SD1169 2SD1173	350p	2SD1541	100p 350p	2SJ48 2SJ56	425p 700p	2SK872 2SK875	650p 475p
2SC1985 2SC1986	100p 100p	2SC2547 2SC2550	65p 50p	2SC3052 2SC3057	30p 150p	2SC3505 2SC3506	240p 250p	2SC4278 2SC4288	175p A 650p	2SD726 2SD731	275p 250p	2SD1185 2SD1186		2SD1545 2SD1546	275p 350p	2SJ74 2SJ76	60p 220p	2SK903	500p
2SC2001	15p	2SC2551	70p 60p	2SC3068 2SC3070	60p 35p	2SC3507 2SC3509	650p 750p	2SC4300 2SC4301	200p 300p	2SD732 2SD734	250p 15p	2SD1189 2SD1191	55p 120p	2SD1548 2SD1554	400p 170p	2SJ77 2SJ79	350p 225p	2SK904 2SK951	500p 275p
2SC2002 2SC2003	15p 20p	2SC2552 2SC2553	200p	2SC3071	25p	2SC3514	170p	2SC4304	225p	2SD741 2SD743	120p	2SD1192 2SD1196	90p	2SD1555 2SD1556	150p 225p	2SJ103 2SJ109	75p 200p	2SK952 2SK955	275p 450p
2SC2004 2SC2022	20p 110p	2SC2555 2SC2562	120p 90p	2SC3073 2SC3074	100p 200p	2SC3518 2SC3519	120p 250p	2SC4313 2SC4381	600p 150p	2SD757	130p 120p	2SD1197	150p	2SD1565	75p	2SJ113	1050p	25K956	400p
2SC2023 2SC2026	180p 30p	2SC2563 2SC2568	200p 120p	2SC3075 2SC3077	150p 120p	2SC3526 2SC3528	45p 750p	2SC4382 2SC4386	200p 275p	2SD760 2SD762	70p 100p	2SD1198 2SD1207	60p 40p	2SD1571 2SD1572	170p 100p	2SJ114 2SJ116	1150p 1200p	2SK962 2SK1023	700p 550p
2SC2027 2SC2036	200p 50p	2SC2570 2SC2571	30p 350p	2SC3086 2SC3089	150p 130p	2SC3531 2SC3549	225p 200p	2SC4387 2SC4408	425p 50p	2SD763 2SD768	140p 180p	2SD1210 2SD1211		2SD1575 2SD1576	200p 150p	2SJ117 2SJ119	550p 700p	2SK1036	450p
2SC2037	50p	2SC2577	110p	2SC3101	750p	2SC3552	270p	2SC4400 2SC4429 2SC4431	275p	2SD772 2SD773	200p 20p	2SD1213 2SD1218	220p	2SD1577 2SD1579	250p 80p	2SJ162 2SJ175	680p 200p	2SK1057 2SK1058	600p 800p
2SC2053 2SC2055	120p 150p	2SC2578 2SC2579	170p 110p	2SC3112 2SC3114	35p 40p	2SC3568 2SC3577	200p 275p	2SC4466	90p 325p	2SD774	30p	2SD1223	75p	2SD1589	60p	2SJ182	150p	2SK1081	700p
2SC2058 2SC2060	20p 40p	2SC2580 2SC2581	175p 225p	2SC3116 2SC3117	75p 120p	2SC3584 2SC3591	200p 200p	2SC4467 2SC4468	175p 250p	2SD777 2SD784	400p 650p	2SD1225 2SD1227	40p	2SD1590 2SD1591	100p 310p	2SJ200 2SJ307	625p 175p	2SK1082 2SK1102	450p 375p
2SC2061 2SC2068	75p 60p	2SC2588 2SC2590	600p 40p	2SC3122 2SC3148	50p 145p	2SC3595 2SC3597	220p 75p	2SC4517 2SC4517	200p A 225p	2SD786 2SD787	100p 20p	2SD1229 2SD1237	250p 300p	2SD1593 2SD1595	125p 70p	2SK19 2SK33	45p 40p	2SK1117 2SK1118	250p 225p
2SC2071	140p	2SC2591	50p	2SC3149	180p 100p	2SC3599 2SC3600	140p 175p	2SC4531 2SC4532	450p 1000p	2SD788 2SD789	30p 20p	2SD1238 2SD1244	300p	2SD1608 2SD1609	210p 45p	2SK40 2SK55	50p 100p	2SK1120	550p
2SC2073 2SC2075	40p 60p	2SC2592 2SC2603	200p 10p	2SC3150 2SC3151	175p	2SC3606	100p	2SC4542	400p	2SD792	400p	2SD1246	20p	2SD1632	320p	2SK68	100p	2SK1190 2SK1191	350p 800p
2SC2078 2SC2085	95p 100p	2SC2610 2SC2611	60p 30p	2SC3152 2SC3153	130p 175p	2SC3607 2SC3608	150p 65p	2SC4742 2SC4744	350p	2SD794 2SD795A		2SD1247 2SD1251	180p	2SD1637 2SD1647	50p 40p	2SK73 2SK97	75p 200p	2SK1217	700p
2SC2086 2SC2092	60p	2SC2621 2SC2625	70p 190p	2SC3156 2SC3157	350p 200p	2SC3616 2SC3636	45p 280p	2SC4745 2SC4747		2SD798 2SD799	175p 150p	2SD1254 2SD1263		2SD1649 2SD1650	260p 150p	2SK106 2SK107	40p 40p	2SK1221 2SK1275	200p 275p
2SC2094	1200p	2SC2626	600p	2SC3158	260p	2SC3642	225p 400p	2SC4757 2SC4762	200p	2SD809 2SD811	45p 450p	2SD1264 2SD1265	55p	2SD1651 2SD1656	150p 250p	2SK109 2SK117	150p 50p	2SK1296	350p
2SC2097 2SC2099	2300p 2500p	2SC2630 2SC2631	1800p 20p	2SC3159 2SC3164	200p 270p	2SC3657 2SC36 <b>5</b> 9	600p	2SC4769	220p	2SD819	300p	2SD1266	180p	2SD1663	350p	2SK118	50p	2SK1299 2SK1317	450p 900p
2SC2118 2SC2120	1100p 10p	2SC2632 2SC2634	35p 10p	2SC3169 2SC3170	150p 300p	2SC3668 2SC3675	120p 100p	2SC4770 2SC4820	225p	2SD820 2SD821	250p 550p	2SD1267 2SD1271	55p	2SD1666 2SD1667	50p 120p	2SK125 2SK133	100p 650p	2SK1338 2SK1341	250p 500p
2SC2122A 2SC2131		2SC2636 2SC2637	40p 120p	2SC3173 2SC3175	180p 150p	2SC3678 2SC3679	280p 140p	2SC4826 2SC4891	70p 800p	2SD822 2SD826	290p 30p	2SD1271 2SD1272		2SD1668 2SD1669	90p 85p	2SK147 2SK152	160p 40p	2SK1342	500p
2SC2141	60p	2SC2640	1800p	2SC3178	125p	2SC3680 2SC3685	380p 450p	2SC4923 2SC4924	400p 250p	2SD829 2SD836	375p 50p	2SD1273 2SD1274	50p	2SD1677 2SD1680	200p 225p	2SK161 2SK163	30p 40p	2SK1350 2SK1356	200p 225p
2SC2153 2SC2166	40p 80p	2SC2653 2SC2654	100p 180p	2SC3179 2SC3180	70p 175p	2SC3687	300p	2SC4927	500p	2SD836A	50p	2SD1275	50p	2SD1683	45p	2SK168	40p 50p	2SK1357	350p
2SC2168 2SC2188	120p 70p	2SC2655 2SC2656	50p 550p	2SC3181 2SC3182	200p 120p	2SC3688 2SC3692		2SC5002 2SC5003		2SD837 2SD838	55p 500p	2SD1276 2SD1277	190p	2SD1684 2SD1706	70p 325p	2SK170 2SK184	35p	2SK1358 2SK1377	400p 150p
2SC2200 2SC2209	250p 50p	2SC2660 2SC2665	100p 200p	2SC3198 2SC3199	30p 40p	2SC3715 2SC3717		2SC5027 2SC5048	100p 300p	2SD841 2SD844	110p 200p	2SD1279 2SD1288		2SD1707 2SD1708	400p 375p	2SK192 2SK193	45p 40p	2SK1400	250p
2SC2216	50p	2SC2668	10p	2SC3202	25p	2SC3729 2SC3746	450p	2SC5044 2SC5086	250p	2SD850 2SD856	170p 48p	2SD1289 2SD1291	250p	2SD1710 2SD1718	200p 275p	2SK 195 2SK 197	150p 140p	2SK1404 2SK1461	290p 220p
2SC2221 2SC2228A		2SC2671 2SC2681	100p 170p	2SC3209 2SC3210	120p 550p	2SC3747	120p	2SC5129	300p	2SD858	250p	2SD1292	60p	2SD1729	230p	2SK212	35p	2SK1462	425p
2SC2229 2SC2230	15p 80p	2SC2682 2SC2688	70p 27p	2SC3211 2SC3212	220p 260p	2SC3748 2SC3752	250p	2SC5148 2SC5149	300p	2SD863 2SD864	23p 200p	2SD1293 2SD1297	300p	2SD1730 2SD1732	275p 250p	2SK214 2SK216	170p 200p	2SK1487 2SK1507	250p 300p
2SC2233 2SC2235	100p 60p	2SC2690 2SC2694	60p 3500p	2SC3225 2SC3242	50p 30p	2SC3781 2SC3782	150p	2SC5250 2SD188		2SD866 2SD866A	120p 140p	2SD1302 2SD1306		2SD1739 2SD1740	180p 125p	2SK223 2SK240	50p 140p	2SK1529 2SK1537	700p 400p
2SC2236	20p	2SC2705	40p	2SC3244 2SC3246	45p 50p	2SC3783 2SC3787		2SD198 2SD199	140p 195p	2SD867 2SD868	350p 260p	2SD1308 2SD1309	80p	2SD1748 2SD1756	90p 275p	2SK241 2SK246	30p 30p	2SK1544	900p
2SC2237 2SC2238	540p 45p	2SC2706 2SC2710	250p 50p	2SC3259	350p	2SC3788	60p	2SD200	180p	2SD869	150p	2SD1310	140p	2SD1758 2SD1760	60p 80p	2SK300 2SK301	25p 40p	2SK1767 2SK2038	275p 295p
2SC2240 2SC2258	15p 30p	2SC2712 2SC2714	20p 20p	2SC3261	220p 230p	2SC3789	120p	2SD201 2SD213	260p 250p	2SD870 2SD871	140p 260p	2SD1311 2SD1313	1000p	2SD1761	60p	2SK303	40p	2SK2039	750p
2SC2259	60p		50p	2SC3262	280p	2SC3795	140p	2SD234	90p	2SD879	60p	2SD1326	200p	2SD1762	50p	2SK304	25p	2SK2134	225p

	REPLAC	EMENT VIDE	O HEADS	
Model Price	Model Price	Model Price	Model Price	Model Price
AKAI VS105, 112, 115, 116, 120, 125, 126, 201,	VHSAN3 800p VHSAY3 1200p	HRD750, HRD830, HRD860 1900p HRD250, HRD257 1800p	NVFS 100 4500p NVFS1 4200p	TLS1100 3100p VHR120, 130, 14, 141, 143G, 14SP, 151,
202, 205, 220, 240, 244, 245, 247, 248, 250, 301, 303, 304, VSP8, VSP82 <b>850p</b>	VHSBH1, VHSCH1 2100p VHSBP1 850p VHSBY3 2600p	3V32, 8942, HR7655 1800p HRD180, 190, 230, 610, 3V59, FV12L, FV20B, 26, 30, 32, 33, VC141L 1600p	N.E.C. N9011, 9012, 9013E, 9014E, 9014G, 9015, 9016, 901A, 902A, 9033, N9034, 9040,	15, 16, 171, 220, 23, 244, 274, VHR310, 330, 4100, 4105, 4200, 430, 4300, 4400, 4500, 5080, 5100,
VP7100, VS9300, VS9500 650p VP7200, VS9700, VS9800 900p VS1 900p	VHSD52 1600p VHSEH2, VHSDH2 1600p	HRD370, HRD430, HRD470, 3V58, FV13H 1800p	9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077,	VHR5200, 5600, 6850, 7100, 7200, 7250, 7300, 8070, 8100, 8101, 8200, VHR7800,
VS1 900p VS2 900p VS3 900p	VHSEY1, VHSEY2 1400p VHSFS1, VHSFS2 1300p VHSFG2, VHSFG4, VHSF63,	HRD530, HRD700, HRD840, HRD870,   HRD910, FV14T, FV57H   2300p   GRC1, GRC2, 3 V41   2800p	N9096, DX1000, 1600, PX1200 <b>850p</b> N911A, 914C, 915A, 916A, 917, 9110, 9120 <b>2400p</b>	7810, 8000SP, 8801SP, VHRD4400, 4410, 4500, 4600, VHRD4610, 6700, 4800 <b>3100p</b>
VS10 1350p VSP1 900p	VHSFB3 1300p VHSTJ1, VHSTJ2, VHSTJ3, VHSWJ3,	BR9060, HRD330, 337, 440, 441, 637, 641, 660, 670, 720, 730, 740, 820	PVC600, 740, 744, 754, 763E, 764, PV2300, 2400, 760, 794, 770.	TLS2000 4250p VHR5300, VHR6500, VHR7400 4500p
VS33,35, 37, 38, 38EOG MKII, 53, 55, 66, 765, 766, 767, 768, 865, 867, VSF30, 33, 4, 400, 410, 420, 430, 440, 441,	VHSVJ2 700p VHSVH4, VHSWH1, VHSXH1, VHSYH2 1600p	HRFC100, SR3300MS, FV44L 1600p HRD950, HRD960, HRD980, FV46 4500p	774 1650p N380, N381, N830, N831, N832, N833, N834, N835, N836 550p	VHR3500EX 2150p VHR16, 235, 335E, 4150, 4160, 4350, 7250, 7260, 8250 1950p
450, 455, 480, 490, 497, VSG51, 54, 55, VXS450,	VHSWJI VHSXJ3 700p GRUNDIG	HRS5000, HRS5500, 5800, 9000, FV395.BRS600, SRS368E <b>5550p</b>	82611AH1 (FOR MODEL DX3000), DX4000, N9610, NS7000 2400p	VTC3000 1400p SHARP
VS512, VS515, VS516 <b>2250p</b> VS462, 465, 467, 467EOG2, VSF12, 15EK,	VS410, 415, 435, 450, 456, 460, 500, 505, 510, 520, 521, 530, 546 <b>1600p</b> BARCELONA, MVS5400, 440, 500, 600,	FV22L	N895   1800p   N9052, N9530, DX2000   3400p   VCP1   1700p	VC390, VC393, VC496 2750p VC488 4200p VC779 1800p
15EOH, 300, 301, 310, VSF320, 330, 340, 350, VSG30,	SE5100, 6100, 6110, 9100 TVR4500, 4510, 5510, VS400, 440, 441,	FV67HV, FV68TX, FV77 3800p R2000 SERIES 4500p	PVC2300, 2400, 740, 744, 760, 764 1400p	VC789, VC790 2900p VC200, 220, 300, 381, 383, 384, 385, 386,
33, 34, 35   2300p   VS11, VS12   1000p   VS6, VS8, VS9   2400p	500, 505, 510, 518, 600, 610, VS5180, VS6190, 700, 900, 901, 902, 9091, GV200, 201, 2092,	FV61LV, FV62LV, FV67HV 4000p FV42L £101.00p VP160L, VR172L 1950p	DS6000 3500p D5600 3500p VH3, VH555, VH600, VH700, VH844,	387, 388, 471, 477, 481, 482, VC483, 486, 3300, 8381, 9100, 9300, 9400, 9500, 9600, 9700 <b>850p</b>
VSX9 2250p VSA1100, 1110, 650, VSF500, 510, 550, 560, 580, 590, 600, 650,	SE2100, 5110 1400p MADRID, SE5140, VS540,	HRJ200, HRJ205	VH900, VH1000 (ALL MODELS) <b>1100p</b>	VC108, 208, 382, 402, 405, 408, 500, 550, 571, 573, 581, 582, 583, VC5W20E, 600,
VSG60, 64, 65, VSG70, 73, 74, 75, VSX560, 580 3600p	VS5480 <b>3000p</b> MVS550, 620, VS550, 620, 630, 640, 790, 930, 940 <b>2400p</b>	HRJ300, HRJ305, HRJ315, HRJ316EG,HRJ318E 3750p	VH1, VH2A 700p D1000, D1100 1600p D1000X, D1500X, D4500, VPCD100,	651, 674, 681, 684, 6V3, 750, 780, 781, 683, 684, 402, VC500, 571, 573, 580, 584, <b>6</b> 00, 682, 693,
V\$155, V\$165 <b>2300p</b> V\$20, 22, 23, 24, 25, 26, 27, 422, 425, 426, 427, 485, V\$F10, 11, 180, 190	V\$120 2300p V\$680, GV280 4600p	HRJ615, HRJ715, HRJ815 9200p HRJ400, HRJ405, HRJ407MS, HRJ41 OEK, HRJ415, HRJ416 4500p	D1200, D2000X, D5000 1600p VR6460, VR6520, 64VR60,	700, 772, 7810, 782, 7822, VC783, 8481, 8581, VCA10, 100, 102, 103, 1031, 103,
VSF200, 210, 220, 221, 222, 230, 240, 260, 261, 262, 265, 270, 275, 280,	VS160, VS740 4400p VS170 4600p MVS660, SE6160, VERONA, VS660.	OEK, HRJ415, HRJ416 4500p MATSUI VX500E, 800A, 810A, 820, 80A, 770B,	VR6420 725p VR6711 4 HEAD 1800p VR6440 2500p	104, 105, 106, VCA111, 113, 116, 131, 140, 202, 203, 211, 234, 244, 254, 255, 30, 35, VCA40,
VSF290, 510, 550, VSG20, 204, 205, 206, VSG21, 211, 212, 215, VSG217EOG , 23, 24, 25, 405, 411, 415.	VS6690 3500p GRUNDIG	773B 1200p VCRL3, VX730, VX750 1450p	VR6441, VR6540, VR6541, VR6640, VR6642 <b>1300p</b>	VCB311N, 320, VCD801, 802, VCM73, VCT212, 310, 410, VCT510, 72, VCT1314,
417, VSP 100, 100EM, 110, VSP88, 88KC, 8111, VSP9, VSR100,	MVS710, 720, 910, SE7120, 9120, VS710, 716, 720, 800, 810, 910, 920,	VX735, VX755, VX990 1500p VX735A, VX765, VX850 1750p VX600 1100p	DV761, VR512, 522, 5229, 63SB7, VR6760, VR6761, VR6762, VR63SB7 7172 7200p	VCTS313 <b>850p</b> VC6000, 6200, 6300, 7300, 7700, 7750, 8000, 8300 <b>1800p</b>
100EDG, 100EM, 110, VSX400 1250p VSR9 1300p	VS922, 9291, GV210, 211, 220, 2292, MV2105, 2115, SE2120 1700p HINARI	VX900 2650p MITSUBISHI	VR6920 <b>2750p</b> 41DV2, 4SB11BVR412, 415, 6485, 6490,	VC793 <b>3000p</b> VC473, VC785, VC786 <b>1600p</b>
VS 109, VS603, VS606, VS607 VS75 VS965, VC967 2500p 3450p	VXL2, 3, 4, 20, 25, 35 1000p VXL5, V20H 1050p	HS303, HS304, HS320, HS700 HS306, HS318, HS710 HS307 1100p 1900p	6880 1600p VR6948 4850p 20DV1, 20DV2, 20RW7, 21DV1, 21DV2,	VC699, VCA501, VCA602 2400p VC585, VC685 1700p VC90ET 3900p
VSF400, 410, 420, 430, 440, 441, 450, 45S, 480, 490, 497, VSX450, 470 2850p	VXL6 1200p VXL7 1300p VXL8, 9, 10, 11, 19, 90, VCR34H, VTV 100,	HS319 1900 p HS330 2000 p	21DV3, 2SB01, 02, 11, 12, 30DV2, 31DVI, 31DV2, 31DV3, 3SB02, 03, 05, 11, 12, 13,	VFH815 2800p VC800, VCH851, VCH852,
VSG20, 204, 204, 205, 206, 20, 21, 211, 212, 215, 217, 225, 23, 24, 25,	200 1100p	HS400 <b>2800p</b> HS349, HSE27, 31, 32, HSB27, 31, 32, HSM33, 34, 35, 37G <b>1650p</b>	68SB4, 71SB4, 86SBI, 91SB2, 92SB2, DV186, 190, 291, 292, 468, 471, VR201, 202, 203, 2115, 212, 213, 223, 231, 232,	VCH882 2700p VCH80, VCH81, VFH815 2800p VCA33, VCA36, VCA43, VCA44, VCA46,
VSP100, 110, 88, VSR100, 110, VSX400 130 Op VSG415, VSG415EA, VSG425 280 Op	VT11, 14, 15, 16, 30, 33, 34, 330, 340, 503, 640, 5030, VTP10, 30 <b>850p</b>	HS411 2400p HSE30, HSB30 1600p	302, 303, 305, 311, 312, VR313, 3210, 3219, 322, 3229, 323, 501, 6180, 6182,	VCA49 1500p VCA55, VCA63 1800p
VS75, VSA77 2700 p VSF1000, VSF1010, VSF1030 5800 p	VT7, VT17, VT18, VT19 1600p VT35, VT350, VT38, VT39 1800p VT100, 110, 111, 112, 113, 115, 118, 120,	HS338 1600p HSE10, HSE11, HSE20, HSE21, HSE41, HSB10, HSB20 1500p	6185, 6290, 6291, VR6293, 6362, 6367, 6467, 6468, 6470 <b>4600p</b> VR3260, 6349, 6442, 663, 6448, 6449,	VC570 2800p SONY DSR-19R FOR SL-T 9ME 3100p
ALBA VDR3000, VCR4000, VCR5000, VCR6000	125, 128, 220, 225, 400, 405, VT410, 413, 414, 415, 416, 418, 510, 515,	HS300, HS301, HS302, HS310, HS273, HS550Q 1000p	6542, 6643 1250p VR601 1800p	DSR-21 R FOR SLC 8-C9 2600p DSR-35R FORC20, C30, C40, SLF1UB,
VTV10 1000p VCR7000, 7800, 8000, 8800 1100p	517, 518, 520, 525, 526, VTM625, 626, 725, 210, 211, 215, 726, 727, 728, 820, 821, 825, 920,	HS200 550p HS337, HS347 1000p HSB12, HSE12, HSE22, HSM16G, 18,	49SB6, VR6548, VR6648, VR6843 2750p	SLF1E2 PIN, SLC24PS, 33E, 34, 44PS, SLF11, 30PF, 35, 60PS, SLK85, SLT20ME, 30ME, SL100 <b>1500p</b>
AMSTRAD VCR4500, VCR5200, VCR9000,	921 1100p VT3000 550p	23, 25, 30, MX1 1700p HS411EZ, HS411GZ 2100p	<b>SAISHO</b> VR100, 605, 705, 805, 905, 1000, 1100, 1200, 1600 1200p	DSR-43R FOR SLC7 RANGE, SL5000, SL5100, SL3000 1 PIN, SLC6E, SL36ES,
TVR1 900p VCR7000 1000p VCR1000, 2000, 6000, 61000, 62000,	VT4000, VT4200, VT5000, VT5500, VT5600 1100p VT77, 680, 6500, 6700, 6800, 7000, 8000,	HSB11, HSB21 1600p HSB52, HSE50, 52G, HSM36, 50, 54, 55, 57, 58, 60 3100p	VR3300X, VR3600X, VR3650X, VR3800 1400p	\$L37E 1300p \$L3000, \$L8000, \$L8080, \$LC5E, \$LT7ME 1600p
8600, 8602, 8700, 9005, DD8900, DD8904, TVR4	8030, 8040, 8100, 8300, 8500 VT8700, 9000, 9300, 9500, 9700, 9900 850p	HSE51 <b>2600p</b> HS410 <b>3000p</b>	VR3200, VR3500 1400p VR2000, VR3300, VR3600 1400p VR2500 2650p	SLV201, SLV202 <b>1500p</b> SLK95, SLT50ME <b>2900p</b>
TVR2, TVR3, VCR4600, VCR4600 MKII, VCR400 1100p VCR8800, VCR8804, VCR9340 2100p	VT8, 9, 56, 57, 570, 575, 576, 580, 585, 588 <b>2500p</b>	HS412, HS421GZ <b>3100p</b> HS5300, HS5424, HS5600 <b>2500p</b> HSM20, HSM55 <b>1900</b> p	VRS5000X, VX6000A, VXL12X 1500p SALORA	SLV275, SLV373VB, SLV410, SLV412, SLV427, SLV474 <b>1900p</b> DSR49R, SLHF100P,
VCR8603, VCR8604, VCR8704, VCR8714 1350 p	VT65 <b>1800p</b> VT130, 135, 138, 145, 250, 255, 258, 420,	HSM40 2350 p HSM59, HSM68E 6050 p	6500, 6600 1600p SV7300, SV8200, SV8300, SV9200 1500p	SLHF100UB <b>3000p</b> SLV656, SLV715, 725, 727, 757, SLV777,
VCR9140, VCR9142 2550 p VCR9340 3650 p VCR9244 3450 p	425, 426, 428, 430, 431, 435 VT438, 535, 536, VTL30, 301, VTM630, 635, 636 <b>1400p</b>	NV300, 322, 332, 333, 340, 390, 2000, 2010, 3000, 7000, 7200.7500, NV7800, 7850, 8170, 8200, 8400, 8600, 8610, 8620	SV7400, SV8400 1600p SV8100 1200p	SLV815, SLV825 4100p SLV353UB 2100p CCDF340E, CCDF500E, CCDV90E,
UF020, 22, VCR3000, 3002, 9500 1750p	VT52, VT60, VT61E, VT62E, VT63, VT64, VT640 <b>850p</b> VT168, VT150, VT260, VT450, VT498	625p NV777, NV330 1150p	SV900, SV9900 3450p SV601, SV611, SV6910 1500p SV800, SV810 2800p	CCDV95E, CCDSP5E 4800p SLV801, SLV802 2500p
FISHER FVHP420, 510, 520, 530, 615, 618, 620, 622, 710, 711, 715, 716, 720,	(4 HEAD) 1900p VT530 1400p	NV8050, NV8051 2500p NATIONAL PANASONIC AG1000, 1050, NV250, 260, 280, 450,	SV6700, SV8710, SV8750 <b>1500p</b> 623N, SV6800, SV6900, SV8850, SV8870,	SLV310, SLV315, SLV325, SLV335 1200p SLV210, SLV212, SLV270, SLV273,
FVHP721, 722, 730, 830, 905, 906, 907, 908, 910, 911, 915, 916, 918,	VT522, VTM212, 620, 622, 720, 722, 822, 922, 925 1300p VT660E 2600p	460, 465, 470, 480, 650 1100p AG6010, AG6015 2000p	SV8970     1750p       SV88110, SV8910     2650p       823N, SV8920     3500p	SLV285, SLV300 950p SLV125, 213, 225, 252, 255, 262, 280,
FVHP5000, 5001, 5005, 5050, 5075 1100p VBS3500, 7100, 7500, 7600, 9900, VBR330	VT570, VT575, VT580, VT585, VT588, VTF70 <b>2500p</b>	AG6840 2000p NV100, NV200, NV370, NV380, NV630 675p	923N 4500p SV8600, SV8700 1550p	SLVX1, 20, 3 1150p SLV363, SLV416, SLVX50, SLVX55 2000p
VBS7000, VBS7100, VBS9000 2000p	VT540, 545, 546, 548, VTD660, 665, VTM598, 640, 645, 646, VTM730, 731, 735, 736, 740, 745, 746,	NVD80, NVH65 <b>2600p</b> AG5150, AG5250, NVF65, NVH75, NVH77	\$V8420 <b>2400p</b> \$V8620 <b>2100p</b> \$V9300 <b>2500p</b>	SLVX75, SLVX90, SLVX95 SLV282, SLVX30, SLVX35 <b>3000p</b> <b>2025p</b>
FVHP500, 711, 715, 721, 722, 730, 830, 5100, FVHD720 1100p FVHP725, FVHP830, FVHP980 2500p	748, 753, 754, 830, 831, 835, 838, 840, VTM841, 845, 930, 931, 935 <b>1800p</b>	NVF51 4200p NVGI9 2300p	\$V8830 <b>2200</b> p \$V8720 <b>2250</b> p	SLHF100P, SLHF100UB 3400p SLVE7, SLVE8, SLVE9 3600p SLVE90 5150p
FVHP990 <b>2700p</b> FVHP975 <b>2400p</b>	VTF770, 774, 775, 860, 861, 865 4100p VT85, VT86, VT88 2000p	NVJ30, NVHJ33, NVL10, 20, NVL21, NVG30, 31, 40, 130, NVJ37, 40, 42,	SV8520 1900p SAMSUNG SV8500 1500p	SLV615, SLV625, SLVE600, SLVE700, SLVE800 3450p
FVHD407, FVHD140, FVHP1, FVHP10, FVHP20 1150p FVHD230, FVHP1100, 1200, 130, 1340,	VTF780, VTF785 4800p VTF180, VTF185, VTF280 8500p VTF350, VTF351 5150p	NVJ35, NVG46 1400 p NVM1, NVM3, NVM5 4200 p	SVX301, VB900, 910, VVT510, VT320, 5600, VX510, 511, 520.616, VX626, 627	<b>TOSHIBA</b> V63 <b>1500p</b> V9680 <b>3400p</b>
1410, 2000, 200, 210, 300, FVHP310, 410, 420 <b>1800p</b> FVHD250, 270, 370, FVHP1500, FVHP250	VTM220, VTM220E, VTM220UK 3000p VTS390E 5150p	AG2100, AG2200 <b>700p</b> NV430, NV431, NV433, NVSD2, NVSD22, NVSD25, NVSD3 <b>800p</b>	717, 614, 619, 629, 710, 712, 720, 730, 970, 971, 972, SV716, 717, SVX303, 305, VB510, 520, 610, 616, 617, 619, 620, 626,	V8600, V8650, V8700 3000p V21, V31, V32, V33, V50, V51, V52, V53, V9600 1100p
FVHP132, 1400, 1440, 320,	J.V.C. & FERGUSON HR2200, 3300, 3320, 3330, 3350, 3360,	NV730, NV730F, NV770 4 HEAD 1150p	627, 629, 710, 971, V1520, 616, 621, 626, 900, 910, 1200p SVX319, VB770, V1710, 730, 731, 735,	V55, V57 <b>550p</b> V71, V73, V74, V75, V77, V80, V81, V82,
440, 445 3550p FVHP470S, FVHP475HV 4800p FVHP1250, FVHP430S 1950p	3660, 3750, 3860, 4100 3292, 8900, 8901, 8902, 8903, 8906, 8922, 8928, 3V01, 3V06, 3V22 550p	NV366 1700p NV21 HQ, NV 180, NVD48 1700p NV7881 1700p	750, 751, 770, VB750, VK8220, VX750, VX7330, VK770, VK8225, VR1730, 1735.	V83, V841V85, V86, V87, V88 1050p DV90, 96, 97, NM3, V108, 109,
GOLDSTAR 8000 3HSSDB, GHV121, RQ2011, 2031,	HR3660, 7600, 7610, 7650, 7700, HRD110, 111, 120, 121, 220, 225, HRS100, 8904, 8923, 8924, 8925, 8929,	NV810, NV8301 1800p NV850, NV950 2000p	XR20 1900p V11560, VN1560, VN1561, VX1530, VX1560, VX1561, VX1580 2200p	199, 200, 202, 205, 207, 209, 80, 93, 94 1150p
2051 1900p GVH51, GVH122, VCP4000, VCP4100, VCP4200 1100p	8935, 8941, 8943, 8944, 3V16, 3V233V24, 3V31, 3V35, 3V36, 3V38,	NV870, NV890, NV970 <b>2400p</b> AG6024, NVG33, 46, NVL23, 25, 28, NVJ47,	PL30LR, PX3031, 31R, 32R, 990, 992, 991, PXP30, PXR30, VX 1260, SVX503,	V5470, V5480 1300p V600 2350p V880MS 2600p
GHV1232, 1233, 1241, 1242, 1243, 1244,	3V39, 3V49 <b>550p</b> BR1600, HRD140, 141, 142, 143, 150, 152.	49, 700PX, NVSD20EE, 400, 44, 45 1200p	SX3230, 3231, 3260, 3261, VK30, 300, 1230, 1260, 1261, VK30R, 31R, 32R, VXK300, 301, 306, 320,	V700G <b>3700p</b> V500G, V509G <b>2500p</b>
1245, 1246, 1266, 1290, 1291 GHV1295, 1296, 1891, 8210, 8215, 1221, 1240, 1241, 1247, 1248, 2145 VCP400, VCP4130, 4300, 4301, 4305,	156, 157, 158, 160, 5101 HRS10, 8947, 8948, 3V42, 3V44, 3V45, 3V46, 3V47, 3V52, 3V54,	NVG10, 11, 12, 14, 16, 120, NV250, 280, 450, 465 1100p NVG18 1400p	321, 326, 336 1900p S11230, 1240, SVX600, SX1230, 1231,	V9680 2900p V300G, V301, V305, V306, V309G 2550p
4306, 4310, 4311, 4315, 4316, VCP4320, 4321, 4325, 4326 <b>900p</b>	3V55, 3V56, 3V57 900p HRD154, 170, 171, 210, 211, 217, 310, 320, 321, 350, 521, 522, 525, 526.	NVG20, 21, 22, 25, 28, 200, NVD48 1200p NVG50, NVG300 1600p	1260, 1261, 7120, 7121, 7220, SX7221, 7230, 7301 1900p SANYO	V61, V63 V110, V120, V130, V140, V210, V211, V212,
C211, GHV1392P, 1393P, 1900P, 1290, 1291PQ, 12931Q, 1295P, GSE1295PQ, GSE1296, 1297, 1891, 1910,	HRD527, 540, 550, 560, 590, 770, HRDX20, HRDX22, 8950, 8951,	NVG45 1100p NVH70 2400p	VTC5000, 5400, 600, 6000, 6010, 6500, VPR5000, VTC 1500, VTCM 10, 11, 20, 21	V220, V221, V222 1100p V711, V880 2700p
20005, 2000, GSEC200,   GSEC205, 211, 2301, GSEG2301,	3V64, 3V65, FV10, FVII, FV20, FV21, FV26 900p HRD565, HRD566, 3V48 1800p	NV688 1650p NV600 1050p AG6800, AH6810, AG6820 2100p	VTCM25, VTC2000, 5100, 5150, 5300, 5400, VTC5350, 5370, VTCNX10, VTCNX15, 20,	VCPB1E, VCP2C2 1000p V65, V66, V6 950p V312, V322, V412 2600p
GSEQ12, 204, 20, 22, P416P, P500P QUISY22, QUISY24, RC205P, RG11P, RG20, RG2001, RQ20,	HRD725, HRD755, 3V43, 3V53 8930, 8931, 8933, 8940, 3V29,	AG6100, AG6200, AG6300 2100p NVG7, NVG9, NV230 700p	30, VPR5800 1800p VTC5500, 5550, 9100, 9300, 9350, 9355,	V91G 4600p V609, V610V610B, V610UK, V611,
RQ204HP, RQ241, VCP100P, GSEG10 1300p	3V30 <b>550p</b> 8945 <b>2400p</b> 3V00, 8902, 8903, 8909, 8912,	NV780 2000p NVG 15, NVG400 2600p NVM7, NVMC20 3800p	9455, 9500 1700p VHR1110, VHR1150, VHR1300, VHR1700, VHR2300, VHR2370 800p	V659F, V660, V660F 2200p V312, V403T, V413G 9200p V703W, V813G 4000p
GHV4400, 4400, GSE-Q404P, QUISY40, RC405P 2350p GSEQ121, RQ2011, RQ2031,	8922 <b>1000p</b> FV31, FV41R <b>1150p</b>	NVF70 <b>5200p</b> NVJ45, NVJ47 <b>1200p</b>	VHR3200, 3270, 3100, 3110, 3150, 3300, 3400, 3310, VHRD500 1100p	V95G <b>8000p</b>
RQ2051 1950p G.E.C.	BR7000E, BR7000S, BR7030, BR7030/40H, BR7040 <b>2100p</b>	NVF75, NVF77 <b>4300p</b> NVF55 <b>2800p</b>	VHR1500, VHR2500, VHR3330 VHR2700 VHR7900 <b>1500p</b> <b>2450p</b> <b>3000p</b>	GRANDATA LTD
4000H, 4001H, 4002H V4001H, V4004, V4100 V4005H 1200p	HR7200, 7300, 7350, 2650, BR6200 600p HRD455 1600p	NVFS200, NVFS88, NVSF90, NW8000 3600p NVHD90, NVHD 100, NV HD 101, NVHF	VHR5700, VHR7700E, VHRD4710 <b>2700p</b> VHR150E, 153, 154, 1501R, 240, 250, 251,	TEL: 0181-900 2329
GRANADA CSL DS2 1600n	HRD520 1400p HRD300, 400, 580, 600, 620,	100 <b>2300p</b> NVSD1 <b>1000p</b>	27, 350, 474, 5350E, 7500, VHR7530, 7540, 8500SP, 8800, VHRD5350E, 5450E.	FAX: 0181-903 6126
VHSAH1 1100p VHSAH3 2400p	640, 650 1500p HR4100 1000p	AG7330, AG7350, AG7355, AG7450 <b>5000p</b>	6550 1800p TLS1000P, TLS1001P,	

### ALL TV & VIDEO PARTS SOLD ARE REPLACEMENT PARTS

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	V	CR BELT KIT	$\mathbf{S}$	
Model Price	Model Price	Model Price	Model Price	Model Price
AKAI	TX3650, VCR3000, VCR3002,	406, 407, 4092, 410, GV411, 412, 414, 415,	N.E.C.	V1710, 730, 750, 970, VX710, 712, 720, 730,
VP7100, VS9300, VS9500, VS9700, VS9800	VCR9500 75p	416, 417, 4192, 4200, 420, 430, 434, 435, GV437, 440, 450, 4592, 460, 464, 470, 500.	N830, N831, N832, N833 100p N895 80p	970, 971, 972 100p VX9880 110p
VS1, VS2, VS3, VS5, VS12, VS15, VP88 70p	FISHER VBS7000 245p	501, 5050, 5095,	PVC2300, PVC2400 180p	SX7121 95p
VS10 65p	VBS9000 120p	GV5105, 511, 530, 5395, 540, 560, 5695, MV4005, 4105, SE4100, 4104, 4120, 5102,	DX1000, 1600, 1800, 2000, 3000, N9012, 9013, 9014, 9016, N9033, 9034, 9053, 9054, 9055.	SANYO
VSX9, VS105, 112, 115, 116, 120, 125, 126, 155, 165, 205, 220, VS24, 240, 244, 245, 247,	FVHP520, FVHP530, FVHP420 <b>60p</b>	5104, 5106, TVR37001 70p	9056, 9066, 9096, 9110, 9120,	VTC5000, 5150, 6000, 6500, VTCM10, 11, 20, 21, 30, 31, 50 65p
248, 250, 512, 515,	FVHP615, 618, 620, 622, 710, 711, 715, 720, 721, 722, 725, 730,	HINARI	N9510, 9520, 9530, 9610 80p	VTC5300, VTC5350, VTC5400,
516 <b>200p</b>	FVHP830, 840 60p	VXL2 80p	NATIONAL PANASONIC NV300, NV330PX, NV332, NV333 NV340,	VPR5800 80p VTC5500 70p
VS22, VS23, VS25, VS35, VS37, VS38, VS53,	FVHP905, 906, 907, 908, 910, 911, 915, 916,	VXL7, VXL8, VXL9, VXL10, VXL11, VXL19, VXL90, VCR34, VTV 100.	NV366 100p	VTC9100, VTC9300 140p
VS55, VS66 80p VS4, VS6, VS8, VS9 95p	918 75p VBR330, VBS7500, VBS7600,	200 <b>100p</b>	NV777, NV788 100p	VTC1100, 1300, 1500, VHR1100, 1110, 1150,
VSA77 120p	VBS9900 100p	VXL4, VXL35, VTV300 70p VXL5, VXL6 100p	NV2000, NV2010, NV3000 80p NV7000, NV7200, NV7800 75p	1200, 1300, VHR1500, 2370, MVR220 <b>80p</b>
VSS99 105p	VBS3500 75p	VXL5, VXL6 100p VXL3, VXL20 90p	NV8600, NV8610, NV862 145p	VHR2100, VHR2300, VHR2500,
ALBA	FVHD140, FVHD40, FVHD55, FVHP1, FVHP10, FVHP20 110p	HITACHI	NV230, 250, 280, 430, 431, 433, 450, 460, 465, 470, 650, 730, NV770, 810, 870, 890, 970, AG	VHR2700 100p VHR3100, 3110, 3150, 3300, 3310, 3400, 3500, 3700,
VCR40000 130p VCR5000, VCR6000 105p	FVHD230, 250, 270, 370, FVHP1100, 1200,	VT11, 14, 16, 17, 19, 33, 330, 34, 35, 350, 38,	1 1000, 1050 85p	3800, VHRD500, 700, TLS1000, TLS1001 65p
VCR161, VCR222 100p	1250, 130, 132,	39, 88, 165, 5030 <b>75p</b> VT5000, VT5500, VT18 <b>120p</b>	NV370, NV380, NV480, NV630, NV780,	VHR120, 130, 14, 141, 143, 14, 150, 151, 153,
VCR3000X, VCR4000, VCR4000X 75p	FVHP1340, 1400, 1410, 1440, 1500, 2000, 200, 210, 250, 3, 300.	VT7000, VT8000, VT8030, VT8040, VT8300,	NV830, NV850 70p NV600, NV688, AG6010, AG6015 85p	154, 15, 16, 171, VHR194, 220, 23, 235, 240, 244, 250, 251, 274, 297, 310, 330, VHR335, 390,
VCR7000, VCR7800, VCR8000, VCR8800 110p VTV10 105p	310, 320, 2000, 410, 420, 430, 440, 445, 470,	VT8500, 8700 60p	NVG7, 9, 10, 11, 12, 14, 15, 16, 18, 30, 130,	4100, 4105, 4150, 4200, 430, 4300, 4350, 474,
AMSTRAD	475, FVSD2905 <b>85p</b>	VT680, VT6500, VT6800, VT9300, VT9500, VT9700, 9900 <b>75p</b>	400, NVH70 50p	VHR4770, 5080, 5100, 5200, 5300, 5350, 5700, 6850, 7100, VHR7200 7250, 7260, 7300, 7400,
TVR123, VCR4600, VCR4700,	FVHP5000, 5005, 5050, 5075, 5100, 975, 980, 990 95p	VT52, VT57, VT61, VT62, VT63, 64, 65, 85, 86,	NVFV1, NVM10, 3000, 3300, 40, 7, 9000, 9900, NVMS1, 4 70p	7500, 7520, 7530, 7530, VHR7540, 7700, 774,
VCR5200 80p	990 95p G.E.C.	640 60p VT3000 120p	NVM 1, NVM3, NVM5 70p	7800, 7810, 8000, 8100, 8200, 8250,
VCR7000 80p	4005 150p	VT100, 110, 111, 113, 115, 118, 120, 125, 128,	PHILIPS	8500,VHR8800, 8801, VHRD4400, 4410, 4500, 4600, VHRD4610, 4710, 4890, 6700 60p
VCR1000, 2000, 6000, 6100, 6200, 8600, 8602, 8603, 8604.	V4004 100p	130, 135, 138,	VR6460, VR6920 170p VR6540 100p	VMD66, VMD68P 80p
VCR8700, 8704, 8714, 8800, 8804, 9000, 9005,	V4007 80p	VT145, 150, 168, i70, 175, 220, 225, 250, 255, 258, 260, VTL30 60p	VR6442, VR6542 70p	VTR1000 70p
9244, 9340,	GOLDSTAR	VM500 VM600 90p	VR2025, VR2580 100p	VTC6010 75p
DD8900, DD8904, TVR4 100p TX3650, UF20, 22 24, VCR3000, 3002, 4000,	GHV1221, 1232, 1233, 1240, 1241, 1242, 1243, 1244, 1245,	J.V.C.	DV186, 190, 286, 291, 292, 468, 471, 562, 571, 761, VR201, 202, 203, 211, 2115, 212, 213, 223,	VC200, 381, 384, 385, 386, 388, 390, 393, 838,
9500 75p	GHV1246, 1247, 1248, 1250, 1266, 51, 8000,	HR3300, HR3330, HR3360, HR3660,	311, 312, 313, 3210, 3219, 322, 32, 29, 323.	9100, 9300, 9500, VC9700 80p
VS1004 105p	8200, 8210, 8215,	HR4100 130p HR7200, HR7300 50p	535, VR20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 21D, V3, 25BO1, 25BO2, 11, 12, 302, 303, 305,	VC7300, VC7700, VC7750, VC7800, VC8000
BLAUPUNKT RTV100 200n	VCP4100, VCP4130 80p GHV1290, 1291, 1295, 1296, VCP4000, 4200,	HR7350, HR7600, HR7610, HR7650,	31DVI, 31DV2, 31D, V3, 3\$B11, 3\$B12, 3\$B13,	VC8300 115p
RTV100 200p RTV200, RTV222, RTV224 90p	4300, 4301,	HR7655 50p	72SB8, VR30DV2, 35BO2, 35BO3, 635B7,	VC300, 387, 471, 473, 481, 482, 483, 486, 488, 496, 8481
RTV202, RTX200 150p	VCP4305, 4306, 4310, 4311, 4315, 4320, 4321,	HR7700 50p HR0110, 111, 120, 121, 220, 225,	715B4, 715B5, 715B8, VR865B2, 915B2, 925B3, VR6180, 6182, 6185, 6285,	VC402, 500, 571, 573, 581, 582, 583, 584, 585,
RTV322, RTV248 100p	4325, 4326 120p GRANADA	BP5000 60p	6290VR6291, VR6293, 6362, 6367,	VCSF3, VC8581 80p
RTV306, 307, 309, 310, 311, 312, 328, 414, 434, 444, 707 135p	VHSH1, VHSAH3 100p	HRD140, 141, 143, 150, 152, 157, 158, 160,	VR6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, VR6676, 6710, 6760, 6761,	VC108, 405, 408, 550, 600, 651, 674, 681, 682, 682, 684, 685, 693
RTV211, RTV214 140p	VHSVH4, VHSWH1, VHSXH1 60p	190, 250, 257, 310, HRD455, 565, 566, 725, 755, HRP50 45p	6762, 6870, 6970, 6975, VR68SB4, 86SBI,	VC700, 750, 783, VC6F3, VC6V3 70p
RTV324, RTV32565p	VHSYH2 50p VHSBH1 VHSCH 1 150p	HRD170, 171, 180, 210, 21 1, 217, 230, 300,	92SB3 75p VR445B9, VR445B920, VR445B922, VR6443,	VC208, 671, 772, 779, 780, 781, 782, 785, 786, 787, 793, 800, VC7810, 7822, VCA100, 102,
RTV315, RTV316, RTV319, RTV320, RTV317 50p	VHSBH1, VHSCH 1 150p VHSBP1 135p	320, 321, 330, 337, HRD350, 370, 400, 430, 440, 44 1, 500, 530, 700, 750.950,	6843, 6843, VR6943 100p	103, 104, 131, 140, 170, 202, 03, VCA234, 501,
RTV337, RTV333, RTV338, RTV404,	VHSAN3 110p	HRS5000, 5500, 8000, 9000, BR9060, BRS600,	VR3260, 6349, 6448, 6449, 6548, 6648,	502, 602, 5011, VCB311, 361, VCD801, 802,
RTV424 85p	VH\$DS2 125p	605, 920, 925 45p	49SB620, 644869S, 49SB6 110p VKR6850, VKR6855 70p	VCH851, 852, 882, VCM73, VCT72 65p VCA10, 103, 105, 106, 113, 11613, 211, 234,
FERGUSON	VHSAY3 125p VHSBY3 100p	HRD227, 520, 52 1, 522, 527, 600, 610, 620, 637, 641, 650, 830,	VR501 110p	244, 254, 30, 33, 35, VCA36, 37, 40, 43, 454,
3292, 3V00, 3V01, 3V16, 3v22, 8900, 8901, 8902, 8903, 8904,	VHSEY1, VHSEY2 70p	HRD840, HRDX20, 22, HRJ200, 205, 300, 305,	VKR6800, VKR6810, VKR6820 70p SE4104, VR231, 2310, 2319, 231, 232, 2329,	48, 50, 505, 51, 52, 53, 54, 55, 56, 57, 58, VCA60, 605, 615, 67, 68, 1031, VCB320,
8906, 8909, 8912, 8922 120p	VHSCC1 100p	SR330, HRS10 125p HRD840, 550, 560, 580, 590, 640, 660, 670,	237, 23, 241, 2410, 2419, 242, 243, 245, 2469,	VCBS97, VCD805, VCD806, 810, 815, VCH80,
3V23, 8923, 8924, 8929 50p	GRANADA VHSDP1, VHSFV2 80p	720, 730, 740, 770, HRD820, 860, 870, 880,	247, 2479, 251, 252, 256, 257, 258, 33, 19, 332,	81, 85, 865, 910, VC51000,
3V29, 3V30, 8930, 8931, 8933, 8940 65p	VHSTJ1, VHSTJ2 150p	910, 960, 980, HRDX20, 25, HRJ2 10,	3329, 333, 337, 339, 3419, 342, 343, 3469, 347, 3479, 35, 1, 352, 357, 358, 422, 4229, 432, 437,	VCT212, 310, 410, 610, VCT1314, VCTS312, 313, VC790ET 80r
8940 65p 3V31, 3V32, 8941, 8942 60p	VHSTJ3 65p VHSWJ1, VHSWJ2 120p	HRJ215, 315, 316, 318, 400, 405, 407, 410, 411, 415, 416, 507, HRJ6 10, 615, 715, 97,	442, 4229, 432, 437, 442, 44, 5, 4469, 447,	VCC10 70p
3V35, 3V36, 3V38, 3V39, 3V49, 8943,	VHSXJ3 85p	HRS4700, 5800, SR3200, SRS368E 125p	4479, 451, 452, 457, 458, 459, 512, 522, 5229, 6379, 642, 647, 722, 7229, 723, 7379, 747,	SONY
8944 60p	VHSYJ2 80p	HRJ600 40p	8389, 948, 9489 <b>70p</b>	SLC6, SLJ10, SLT6ME 140p SLC5, SLC7, SLJ7, SLJ9, SLT7ME 140p
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57,	VHSFJ2 140p VHSFS1, VHSFS2 130p	VR955 180p	SAISHO	SLC9, SL8000, SL8080, SLT50 165p
8945, 8947, 8948 45p	VHSFG1, VHSFG2, VHSFG3,	MATSUI	VR2000, VHL3 90p VR3800, 3200, 3300, 3500, 3600, 3650,	SL8000E, SL8080E, SL8200, SL8600 175p SLV255, 125, 213, 225, 262, SLVX1,
3V58, 3V43, 3V44, 3V59, 3V64, 3V65, 8950,	VHSFG4, VHSF63 180p	VX600, 730, 735, 750, 755, 765, 850, 6000,	VRS4400, 5000 75p	20, 3 95p
8951, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26, FV32, FV39, VC141L 45p	GRUNDIG MVS400, 440, VS400, 410, 415, 435, 440, 441,	VS888 75p	VR3400 100p	TOSHIBA
FV31R 110p	450, 456, 460 <b>55p</b>	VX1000, VX2000, VX2500, VX3000, VX6000 <b>80p</b>	SAMSUNG SV716, 717, V1616, V~621, V1626, VX616,	V55, V57 V33, V31, V32, V51, V52, V53, V9600,
FV61L, FV62, FV67, FV68, FV70, FV71, FV72,	V\$180, 200, 220, 226, 262, 265, 267, 2X40800, 0850, 0880.	VX800 70p	VX617, VX619, X626, VX627, VX629,	V9680 <b>85</b> p
FV74, FV77 50p FV43H, FV44L, FV46T, FV57H 125p	1600, 2000, 2080, 2200, 2280,	MITSUBISHI	VX714 75p	V61, V63, V65, V66, V67 150p
FV37H 80p	MVS200RC 90p VS150 160p	HS200 200p HS300, 301, 302, 307, 310, 337, 338, 347, 349,	VB520, 510, 610, 616, 617, 619, 620, 626, 627, 629, V1510, 520, V1611, 616, 621, 626, VX510,	DV80B, DV80D, V71, 73, 74, 75, 77, 81, 83, 85, 86
3V52 55p	VS310, 311, 315, 320, 326, 340, 345, 380, 385,	411, 412, 421, 480, HSB10, 20, 30, HSE10, 20,	511, 520, VT320, 5600 80p	V108, 109, 110, 120, 130, 140, i99, 209, 210,
FV41R, FV42L 100p FIDELITY	445 <b>85p</b>	30, 70 HS303, HS304, HS306, HS307, HS330, HS400,	VB900, VB910, V1900, V1910 110p PX980, 981, 982, SE9001, SV9001, SVX307,	211, 220, 221, 411,V421, 609, 610, 611, 659, 660, 711, 880 120p
HQS200, VCR1000, 2000, 600, 6000,	VS150 75p LC290N, LC295SN, SVS 180, VS 170 70p	HS700 110p	319, 322, VB750, 770, 8220, 8225, V1770, 790,	V91 G, V95G 115p
6100 180p	VS 160, BARCELONA, FLORENZ, GV4000,	HS318, HS319, HS410 110p	8220, 8225, VK8220, VPX31, VX750, VX770,	V212, 213, 22-2, 3i2, 322, 403, 412, 413, 610,
VCR100 160p VTR1000, VTR1001 100p	4000, 4001, GV4002, 400, 401, 4010, 402, 403, 404, 405,	HSM1000, 16, HSM23, 25, 33, 34, 35, 37, 54, 55, 57, 58, 59, 68 55p	790, 8220, 8225, SE9000, 9001 90p SVX301, 303, 305, SX7301, VB710, 971,	703, 813 50p VCPB1E 110p
vintou, vintou				1.1.0
	REPLACEM	IRNT IDLERS	& DITTEVS	

Make	Models	Description	Make	Models	Description
	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	Ferguson	3V39, 3V30, 3V31, 3V32, 3V353V36, 3V38, 3V39, 3V49, 8930, 8931, 8933, 8940, 8941, 8942, 8943, 8944	Take Up Clutch PU 51380
Order Code: Hitachi	VT680, 6500, 6800, 9300, 9500VT9700, 9900	Price 100p Play Idler 6861482 6861481	J.V.C.	HR7200, 7600, 7650, 7655, 7300, 7350, 7610	Take Up Clutch
Order Code:	IDL02	Price: 180p	Order Code:	· IDI 23	PU 53462A PU 51380 Price: 200p
	RTV301, 306, 307, 309, 311, 312, 315, 316, 317, 319, 320, 404, 414, 424, 434, 444, 478, 707	ldler	Philips	DB532, VR6520, 6843, 644	Reel Idler
Goldstar	GHV1221, 1232, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, GHV1248, 8000, 8200, 8210, 8215, GVHP51, VCP4100, 4130	ldler	Sharp	VC600, 651, 681, 682, 684, 685, 693, 699, 700, 783, 6FR, 6V3, 6F3	Idler Assembly NPLYV0107GEZZ
Grundig	MVS400, 440, VS400, 410, 440VS450, 460	ldier	Order Code:		Price: 615p
	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, 1810, AG2100, 2200, NVH65, 70	١,	Philips Sharp	VR6843, 6943, 44SB9, VR44SB920, 44SB922, 6943 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,	Reel Drive Unit Idler NPLTV0111GEZZ
Philips Order Code:	VR6460, VR6520, VR6920 IDL08	Idler Arm 40340162 Price 100p		VCT72, VC782MK11	
	VCR7000	Idler 150280	Order Code:	: IDL90	Price: 700p
Sharp	VC200, 381, 383, 384, 385, 386, VC388, 390, 393, 3300, 8381, 9100, 9300, 9500, 9700	Idler NIDL0005GEZZ Price: 100p	N.E.C.	N911, 915, 916, 917, 9012, 9013N9014, 9016, 9033, 9034, 9053 N9054, 9055, 9056, 9066, 9096, N9110, 9120, 9510, 9520, 9530	
	VR6540	Idler		N9610, DX1000, 1600, 2000, DX3000, PX1200	Idler Arm Assembly
	VC300, 387, 402, 471, 473, 477, VC481, 482, 483, 486, 488, 496.	Mici	Order Code: Philips	: IDL245 DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311,	Price: 270p Pressure Roller Assembly
	500, 571, 573, 581, 582, 583, 584, 585, 8481, 5F3, 5W20E	Idler NIDL0006GEZZ Price: 100p	enuips	312, 313, 3210, 3219, 322, 329, 323, 535BO, VR486, 471, 562, 582, 571, 761, 201, 202, VR203, 302, 303, 305, 6180, 6182, 6181	PS403-40205
Order Code:	VS10	Reel Idler		6285, 6290, 6291, 6293, VR6362, 6367, 6390, 6391, 6393, 6467,	
Ferguson	3V23, 3V29, 3V30, 3V31, 3V323V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942	Reel Idler PU48967		6468, 6470, 6561, 6570, 6581VR6670, 6676, 6710, 6760, 6761, 6762, 6870, 6970, 6975, 8681, 63SB7, 68SB4, 71SB4, 71SB5,	
J.V.C.	HR7200, 7300, 7350, 7600, 7610, 7650, 7655, 7700	Reel Idler PU48967		72SB8, 72SB8, 92SB31, 20DV1, 20DV2, 20RW7, 21DV1, 21DV2	
Order Code:		Price: 175p	1	2SB01, 2SB02, 2SB11, 2SB12, 30DV2, 31DV1, 31DV2, 31DV,	
	3V39, 3V30, 3V31, 3V32, 3V353V36, 3V38, 3V39, 3V49, 8930, 8931, 8933, 8940, 8941, 8942, 8943, 8944	Take Up Idler PU 51402		33SB02, 3SB03, 3SB05, 3SB11, 3SB12, 3SB13	
J.V.C.	HR7200, 7600, 7650, 7655, 7300, 7350, 7610, HRD110, 111, 120, 121, 225	Take Up Idler PU 51402A	Toshiba	V91, V95	Pressure Roller Assembly PS403-40205
Order Code:		Price 100p	Order Code:	: PR232	Price: 300p

VXP0433 VXP0463 VXP0521 VXP0581 1430662T15620 NIDL0005GEZZ NIDL0006GEZZ NPLY0107GEZZ

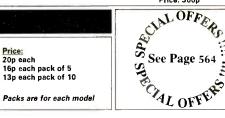
IT15 IT16 IT17 IT18 IT19 IT20 IT21 IT22

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

PU51380 PU51402A PU55373 PU55374 VXP0329 VXP0343 VXP0344 VXP0401

IT07 IT08 IT09 IT10 IT11 IT12 IT13 IT14

Sanyo Sharp



JVC

Akai

Goldstar Hitachi

M32773 MZ366960J2 VXP0521 6861471 6861482 6886971 PU48697B

IT01 IT02 IT17 IT03 IT04 IT05 IT06

Ferguson

National Panasonic

	PI	NCH ROLLER	RS	
				Model Price
Model Price	Model Price FVHP615, 618, 620, 622, 710, 711, 715, 716,	Model Price BRS600, 605, 747, 777, 920, 925 140p	NS7000 140p	681, 682, 684, 685, 693,
VS10, VS9300, VS9500, VS9700, VS9800,	720, 721, 722, 725, 730,	HRS10 140p BP5000, HRD110, 111, 120, 220, 225,	ORION VH1 VH2 140p	VC699, 700, 772, 750, 779, 780, 781, 7810, 782, 782MK2, 7822, 783,
VP7100, VP77 140p VS1, VS2, VS3, VS4, VS5, VS6, VS8, VS9,	FVHP810, 830, 840 <b>140p</b> FVHP905, 906, 907, 908, 910, 911, 915, 916,	455 1100p	VC150, 180, VH3, 33, 200, 201, 205, 212, 250,	VC785, 786, 787, 793, 800, 7810, 7822, VCT72,
VS12, VS15 VS105, 112, 115, 116, 120, 125,	918, 970, 975, 980, 990, FVHP 5000, 5005, 5050, 5075, 5100 140p	PINCH ROLLER ASSEMBLY HRD140, 141, 142, 143, 150, 152, 157, 158,	254, 288, 300, 303, 312, VH404, 555, 700, 704, 712, 770, 780, 844, 900,	VC6F3, VC6V3, VCA 100, 102, 104, 131, 140, 170, 202, 203, 211, 234, 303, 501, 502,
126, 155, 165, 205, 220, 240, 244, 245, VS247, 248, 250, 512, VS515, 516,	VBR330, VBS3500, 7000, 7100, 7500, 7600, 9000, 9900 140p	160, 565, 566, 725, 755, HRP50 1350p	1000, 2948, 3030, 3312 VHF2A, VP2948 <b>140p</b>	VCA602, 5011, VCD801, 802, 851, 852, 881, 882, VCM73, VCT73, VCT72,
VSX9 140p	FVHD230, 250, 270, 370, 2000D, FVHP3, 210,	PINCH ROLLER ASSEMBLY	COMB 15000, 16000, HV03, LVH50, NEVH,	VCB361 140p
VS201, 301, 303, 304, 603, 606, 607, VSP8, VSP82, VP58, VP82 140p	250, 300, 310, 1100, FVHP1200, 1250, 130, 132, 1340, 1340, 1400,	HRD1520, 510, 520, 521, 522, 525, 527, 560, 600, 610, 620, 637, 641,	NEVHM, NEVHML, TVP230RC, VCP, VH04, 30, 103, 300, 358, 360,	VC220 140p VCA10, 30G, 60, 103, 105, 106, 111, 113, 131,
VS125, VS155, VS165, VS220, VS240, VS250, VS512 140p	1410, 1440, 1500, 200, FVHP320410, 420, 430, 440, 445, 470, 475,	HRD650, 720, 830, 840, 910, HRJ205, HRS5800 350p	362, 400, 416, 512, VH530, 532, 535, 536, 600, 630, 635, 640, 666,	211, 244, 254, 33, 35, 36,
VS22, 23, 25, 35, 37, 38, 53, 66, 75, 422, 425,	FVSP290S, 495, 2905 140p	PINCH ROLLER ASSEMBLY BR7030, BRS600, HRD160, 170, 171, 180, 190,	730, 735, 744, 774, 790	VCA37, 39, 40, 42, 454, 46, 47, 48, 50, 505, 51, 52, 53, 54, 55, 57, 58, 505,
426, 427, 462, 465, 467, VS 485, 765, 766, 767, 768, 865, 867, 965, 967,	FVHD140, FVHD40, FVHD55, FVHP1, FVHP10, FVHP20 140p	210, 211, 217, 227,	VH800, B20, 850, 888, 893, 900, 930, 940, 942, 974, 1012, 1040, 1050,	VCA60, 605, 615, 62, 63, 67, 68, 1031, 11613.
VSA77, VSA650, VSF10, 11, 12, 15, 180, 190, 200, 210, 220,	FVHD140, 40, 55, FVHP1, 10, 25, 30, 40, 4000, FVHS10, 30 1350p	HRD230, 271, 300, 310, 320, 321, 330, 337, 350, 400, 430, 440, 441,	VH1060, 1070, VH1100, 1120, 1204, 1440, 1500, 1660, 1800, 2004,	VCB311, 320, VCBS97, VCD805, 806, 810, 815, VCH80, 81, 865, 910, VCS 1000, VCT310,
221, 222, 230, 240, 30, 33	PINCH ROLLER ASSEMBLY	HRD470, 500, 530, 700, 750, 950, HRS5000, 5500, 9000 875p	VH2151, 2308, 22042400, 2500, 2600, 2700,	VCT410, 610, VCT 1314, 5313, VC790 140p VC780, 790, VCA10, 103, 1031, 105, 106, 211,
VSF330, 4, 500, 550, VSP88, VSR100, VSX400, 450, 470 140p	GOLDSTAR GHV51, 1221, 1232, 1233, 1240, 1241, 1242,	PINCH ROLLER ASSEMBLY	VH2960, 2970, 3050, VH3060, 4000, 4008, 4010, 4012, 4015, 4015,	244, 254, 255, 30, 35,
VSF260, 261, 262, 265, 270, 274, 275, 280, 290, 340, 350, 410, 420, 43C	1243, 1244, 1245, 1246,140p GHV1247, 1248, 1250, 1266, 1290, 1291, 1295,	HRD540, HRD550, HRD580, HRD660, HRD860, HRD960 700p	4020, 4300, 5020, VP 10, 200, 220, 225, 245, VR821, 925, 1032,	VCA340, 43, 47, 50, 60, 605, 615, VCD806, 815, VCH80, 81, 83, 85,
VSF441, 440, 450, 455, 480, 490, 497, 510,	1296, 1392, 1393,	PINCH ROLLER ASSEMBLY HRJ600, HRJ605, HRJ815,	2949, 2959, 2957, 2966, 2979, 2980, VTV300,	VCH865, 87, 910, VCS 1000, VCT212, 310, 410,
560, 580, 590, 599, 600,   VSG20, 21, 23, 24, 25, 30, 33, 34, 35, 51, 54,	GHV1891, 1900, 2145, 3000, 3010, 4400, 4410, 51, 8000, 8200, GHV8210, 8215, 8430	HRS9200 875p	VXL20, 25, 30 140p PHILIPS	510, 610, VCTI314, VCTS313 <b>525p</b>
55, 60, 64, 65, 70, 73, 74, 75, VSP110, VSX560, VSX580 <b>140p</b>	GHVP1240, 1241, 1247, 1248, 1290, 1291, GHVP1295, 1296, VCP4000, 4100, 4130, 4200,	MATSUI VX6000, 730, 735, 750, 755, 765, 800, 850,	VR6460 VR6920 140p VR2020, VR2021, VR2022, VR2023,	PINCH ROLLER ASSEMBLY
VS17, 20, 22, 23, 24, 25, 26, 27, 35, 37, 38, 53,	4300, 4301, 4305, VCP4306, 4310, 4311, 4315, 4316, 4320, 4321, 4325, 4326, 4350, GSE1290,	VS888 140p	VR2024 140p	SAISHO
PINCH ROLLER ASSEMBLY	1291, 1295, 1296, 1297, 1891, 1910, 20005,	VX1000, VX2000, VX2500, VX3000, VX6000A 140p	VR6711 140p VR6540 140p	VHL3, VR1000, 2000, 2500, 3200, 3300, 3500, 3600, 3650, 3800, VRS4400, VRS5000 140p
VS422, 425, 426, 427, 462, 465, 467, 485, 498, 765, 766, 767, 768, 865,	HITACHI 140p	MITSUBISHI HS12, 5300, 5424, 5600, HSB11; 12, 16, 21, 27,	DV856, 586, VR702, 703, 6485, 6585, 6589, 6785, 6880, 6948	VR3400 140p
867, 965, 967, VSA650, VSF10, 11, 12, 14, 15,	VT7, 11, 14, 16, 17, 18, 19, 33, 34, 35, 350, 38,	31, 32, 41, 51, 52, 82,	VR445, VR6442, VR6542, VR6643, VR6843,	SAMSUNG SV716, 717, VB510, 520, 610, 616, 617, 619,
180, 190, 200, 210, 220, 221, 222, 230, 240, 30, 300, 301, 310, 320, 33,	39, 88, 330, 680, 4200, VT5000, 5030, 5500, 6500, 6800, 7000, 8000,	HSE12, 16, 17, 21, 22, 27, 31, 32, 41, 51, 52, 82, HSM1000, 110, 120, 15	VR6943, 44SB9 140p DV464, 662, VR2220, 2300, 2324, 2330, 2334,	620, 626, 627, 629, 900,
330, 4, 500, 510, 600,   VSR110, VSX100, 400, 450, 470   <b>800p</b>	8300, 8500, 8700, 930, VT9500, 9700, 9900, VM600 140p	0, 16, 170, 190, 210, 23, 25, 250, 27, 33, 34, 35,	2340, 2350, 2414, VR2480, 2485, 2486, 2489, 2490, 2498, 2840, 6462, 6463, 6464, 6560,	V910, V1510, 520, 611, 616, 621, 626, 900, 910, VX510, 520, 616,
PINCH ROLLER ASSEMBLY	VT8, 52, 57, 61, 62, 63, 64, 65, 85, 86, 88, 100,	36, 37, 370, 380, 45, 450, 5 4, 55, 555, 57, 58, 59, 68, HSMS2, 9, HSS11,	VR6660, 6860, 6861, 6862, 6863 140p	VX617, 619, 626, 627, 629 140p
VSS99 140p	110, 111, 113, 115, 118, VT120, 122, 125, 128, 130, 135, 138, 145, 150,	14, 15, 17, 19, 25, 5600, HV F125, 150, 303, 85, SV8900, 8930 <b>750p</b>	N-1700, VR2870 140p VR2025, VR6580, VR6581 140p	SVX301, 303, 305, 307, 319, 322, VB710, 713, 750, 770, 971, 8220, VB8225, V1710, 730, 750,
VCR3000X, VCR4000 140p VCR5000, VCR6000 140p	168, 170, 175, 220, 225. VT250, 255, 258, 260, 400, 405, 410, 413, 414.	PINCH ROLLER ASSEMBLY PART NO: 948D020010	49SB6, VR3260, 6349, 6448, 6449, 6548, 6648 140p	770, 790, 8220, 8225, 970, VX710, 712, VX720, 730, 750, 770, 790, 825, 8225, 970,
VCR161, VCR222 140p	415, 416, 418, 420, 425	HSE11, 12, 16, 17, 21, 22, 27, 31, 32, 41, 51,	PRESSURE ROLLER ASSEMBLY PS403-40205	971, 972, 8220, PX980, 981, 982, SE9000,
VCR7000, VCR7800, VCR8000, VCR8800 140p	VT426, 428, 430, 431, 435, 438, 450, 498, 510, 515, 517, 518, 520, 525,	52, 5300, 5424, 5600, HSB11, 12, 16, 21, 27, 31, 32, 41, 51, 52, 82, HSM1000, 110, 120, 150,	DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311, 312, 313,	9001, SX7120, 7121, 7220, 7221, 7230, SX7301, VK8220,
VTV10 140p	VT526, 530, 535, 536, 540, 545, 546, 548, 570, 575, 576, 580, 585, 588	HSM16, 170, 18, 190, 210, 23, 25, 250, 27, 30, 33, 34, 35, 36, 37, 370, 38, HSM380, 40, 45,	VR3210, 3219, 322, 3229, 323, 535BO, 486, 471, 562, 582, 571, 761,	VPX31 140p
VCR1000, 2000, 4500, 4600, 4700, 5200, 6000.	VT640, 830, VTF660, 665, 70, 770, 774, 775, 780, 785, 860, 861, 865,	450, 50, 54, 55, 555, 57, 58, 59, 60, 68,	VR201, 202, VR203, 302, 303, 305, 6180, 6182, 6185, 6285, 6290,	VX9880 140p   PX31 R, 32R, PXR30, SV80, SX3230, 3231,
6100, 6200, 8600, VCR8602, 8603, 8604, 8700, 8704, 8714, 8800,	VTL30, 1000, 2000, VTLC50, VTM598, 620,	HSMS2, 9, HSMX1, 18, 19, 2, HSS11, 12, 14, 15, 17, 19, 21, 25, 5600, HVF125, HVF150, 303,	VR6291, 6293, 6362, 6367, 6390, 6391, 6393,	3260, 3261, V\$390, VX30, 31, 32, 3560, 3561, 370, 375, 380, VXK300, 301, 306, 307, 320,
8804, 9000, 9005, VCR9244, 9340, DD8900, 8904,	622, 625, 626, 630, 635 VTM636, 640, 645, 646, 720, 722, 725, 726,	85, SV8900, 8930 140p HS200, HS300, HS301, HS302, HS303, HS304,	6467, 6468, 6470, 6561 VR6570, 6581VR6670, 6676, 6710, 6760, 6761,	VXK321, 326, 330, 331, 336, 337, 350, 351,
TVR1, 2, 3, 4 140p VCR7000 140p	727, 728, 730, 731, 735, VTM736, 740, 745, 746, 748, 753, 754, 820,	HS310, HS320, HS330, HS360, HS700 140p	6762, 6870, 6970, VR6975, 86BI, 63SB7, 68SB4, 71SB4, 71SB5,	356 140p   PX990, 991, 992, S11230, 1240, SVX4000, 503,
DD8900, DD8904, VCR6000, 6100, 6200, 8600,	821, 822, 825, 830, 831, VTM835, 838, 840, 841, 845, 920, 921, 922,	HS306, HS307, HS318, HS319, HS337, HS338, HS347, HS349, HS400, HS410, HS411, HS412,	72SB8, 72SB8, 92SB31, 20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 2SB01, 2SB02, 2SB11,	504, 600, SX1230, SX1231, 1260, 1261, 1566, V11560, VPK43,
8602, 8603, 8604, VCR8700, 8800, 900>9, 9140, 9244,	925, 930, 931, 935,	HS421, HS480, HS710, HSB 10, HSB20, 30,	2SB12, 30DV2, 31DVI, 31DV2, 31DV33SB02,	VX1230, 1260, 1261, VX1560, 1561,
9340 <b>700p</b> PINCH ROLLER ASSEMBLY PART NO: 153148	VTS80, 85, 890, 895VM200, 2300, 2380, 3200, 3280, 500, VMS7200 140p	HSE 10, 20, 30, 70 140p	3SB03, 3SB05 3SB11 3SB12 3SB13 <b>280p</b>	1850 140p
TX3650, UF20, VCR3000, VCR3002, VCR4000, VCR9500 300p	VT3000 140p VT410, 420, 428, 430, 450, 498, 518, 520, 522,	NATIONAL PANASONIC NV100, 180, 300, 330PX, 332, 333, 340, 366,	VR231, 232, 332, 422, 4229, 512, 5229, 722, 7229, 723 140p	SLC5, 6, 7, SL3000, 8000, 8080, 8200, SLJ 10,
PINCH ROLLER ASSEMBLY PART NO:	530, VTF770, 780, VTM598, 622, 722, 740, 748, 753 <b>650p</b>	600, 688, 777, 788, 3321,	VR501 PR38 140p	SLT6ME, SLT7ME 140p SLC9, 20, 24, 30, 33, 44, SLHF100, SLF1, 11,
2554966 DD9900, 9904, TX3650, UF20, 22, 24,	PINCH ROLLER ASSEMBLY	AG6010, 6015, 6100, 6200, 6400, 6800, 7450 140p	SANYO VHR1100, 1110, 1150, 1200, 1300, 1500, 2100,	20, 25, 30, 35, 60, 100,
VCR3000, 3002, 9500 <b>140p</b> VS1004 VS1104 <b>140p</b>	VTF150, 155, 180, 185, 250, 255, 260, 265, 280, 285, 350, 351, 355,	NV230, 250, 260, 280, 370, 380, 430, 431, 433, 450, 460, 465, 470, 480	2300, 2370, 2500, VHR2700, 3330, MVR220 140p	SLF200, SLF60PS, SLF90E, SLFH150, 850, SLK88, 95, SLT20ME, SLT30ME,
FERGUSON	VTF360, 365, VTM140, 141, 145, 145, 210, 211, 212, 215, 220, 221,	NV630, 650, 730, 770, 780, 810, 830, 850, 870, 890, 2000, 2010, 3000,	VTC5000, 5150, 5300, 5350, 5400, 5500, 6000, 6010, 6500, 9100,	SLT50ME 140p BMC 100, BMC200, BMC500 140p
3V00, 3V01, 3V16, 3V22, 3V23, 3V24, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909,	VTM230, 231, 235, 284, VTS390 140p	NV7000, 7200, 7800, 8050, 8150, 8170, 8200,	VTC9300, VTCM10, 20, 11, 21, 30, 31, 40, 50,	SLV201, 202, 301, 302, 401, 402, 801,
8912, 8922, 8923, 8924, 8925, 8929 <b>140p</b> 3V29, 3V30, 3V31, 3V32, 3V52, 8930, 8931,	HINARI V20H, VXL5, VXL6, VXL7, 8, 9, 10, 11, 19, 90,	8300, 8400, 8500, 8600 NV8610, 8620, NVG11, 14, 16, NVG7, 10, 12,	VPR5800 140p VHR3100.3300, 3310, 3400, 3500, 3700, 3800,	802 140p
8933, 8940, 8941, 8942 <b>140p</b>	H13V, VTV100, 200 140p VXL2, VXL3 140p	15, 18, 30, 130, 400, AG 1000, 1050, 1200, 1500, 2100, 2200, 6500,	VHRD500, 700 140p VTC3000 140p	SLV210, 270, 273, 275, 300, 353, 373, 410, 415, 474, 656, 715 300p
3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44, 3V45, 3V48, 3V49, 3V53, 3V54, 3V55, 3V56,	VXL4, VXL20, VXL35 140p	6810, 7500, 7510,	VHR120, 130, 14, 141, 143, 14, 150, 151, 153, 154, 15, 16, 171, 194, 22	SLV757,777
3V57, 3V58, 3V59, 3V65, FV10, FVII, FV12, FV14, 8943, 8944, 8945, 8947, 8948 <b>140p</b>	VTV100, VXL10, VXL11, VLX9, VXL90 700p	NVG9, NVG120 140p	OVHR23, 235, 240, 244, 250, 251, 274, 27, 297,	SLV275, 282, 315, 325, 353, 363, 373, 410, 415,
3V52 <b>140p</b> 8950, 8951, FV10B, 11R, 13H, 14T, 20B, 21R,	PINCH ROLLER ASSEMBLY V20H, VXL5, VXL6 MOD KIT 275p	AG6840, 6720, 7150, 7330, 7350, 7355, 7650, NVH65, 75, NVJ30, NVL20, 23, 25,	310, 330, 335, 350, 390, VHR4100, 4105, 4150, 4200, 430, 4300, 4350, 4400, 474, 4770, 5080,	416, 474, 625, 656, SLV715, 725, 727, 757, 777, 815, 825, SLVX30, 50, 55 140p
22L, 26D, 31R, 32L,FV33H, 39S, 41R, 42L, 50B,	J.V.C.	28, NVG300, NVF65, NVF70, NVFS1 NVFS 100, NVG 19, 20, 25, 33, 40, 50,	VHR5100, 5200, 5300, 5350, 5600, 5700, 6850, 7100, 7200, 7250, VHR7260, 7300, 7400, 7440,	SLV125, 213, 225, 252, 255, 262, SLVXI,
51R, 52L, VC141L 140p FV37H, FV44L, FV46T, FV43H,	HR2200, 3300, 3330, 3360, 3660, 4100, 7700 140p	NVV8000 140p	7500, 7520, 7530, 7540, 7700, 774, 780,	20, 3 140p SLV215, 216EE, 275, 282, 315, 325, 353,
FV57H 140p 3V35, 3V36, 3V38, 3V39, 3V49, 8943,	HR2650, 7200, 7300, 7350, 7600, 7610, 7650, 7655	NVD48, NVD80, NVG21 NVG45 140p NVJ700PX 140p	0VHR7810, 8000, 8070, 8100, 8200, 8250, 8500, 8800, VHRD4400, 4410, 4500, 4600,	363EE, 373, 393, 410, 415,
8944 1100p PINCH ROLLER ASSEMBLY	HRD110, 111, 120, 121, 140, 141, 142, 143,	NVHD100, NVHD101, NCHD90, NVSD30, NVSD40 1125p	4610, 4710, 4890, 6700, VHRS700 140p VCR100 140p	SLV416EE, 474, 494EE, 555UC, 559, 575UC, 579, 585HF, 595HF, SLV60W, 615, 625, 656,
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54,	150, 152, 156, 157, 158, HRD160, 220, 225, 250, 257, 445, 455, 565,	PINCH ROLLER ASSEMBLY AG5150, 5250, 5700, 6024, NVD38, 48, 80,	VHR120, 135, 150, 190, 4150, 4160, 4350, 5200, 5240, 5350, 7200, 7250, 7260, 7700,	676UC, 686HF, 696HF, 715, 725, 727, 757, SLV767B, 777, 815, 825, SLVE7, 8,
3V55, 3V56, 3V57, 8945, 8947, 8948 <b>1350p</b> PINCH ROLLER ASSEMBLY	566, 725, 755, HRP50, BP5000, BR7000, BRS611, 811 140p	NVF55, 65, 70, 75, 77,	VHRD4410, 4610, 4710, 4890, 5450.	9SLVX30AS,
FV37, FV57, FV58 350p PINCH ROLLER ASSEMBLY	HRD520, 540, 550, 560, 580, 600, 610, 620,	NVFS1, 100, 200, 88, 90, NVG 19, 20, 21, 22, 25, 28, 300, 33, 40, 45, 46,	VHRS700 975p PINCH ROLLER ASSEMBLY	SLV X35AF, SLVX50AS, SLVX55DH, SLVX65BR, SVO140, 160 1250p
FV31R 140p	637, 640, 641, 650, 660, HRD670, 720, 730, 740, 770, 820, 830, 840,	NVG50, NVH65, 75, 77, NVJ30, 33, 35, 37, 40,	VHR3100, 3200, 3300, 3310, 3400, 3700, 3800, VHRD500, 7000 1350p	PINCH ROLLER ASSEMBLY PART NO:
FV41L, FV42L 925p PINCH ROLLER ASSEMBLY	860, 870, 880, 910, 960, HRD980, HRDX20, 22, 25, HRJ200, 205, 210,	42, 45, 47, NVL20, 23, 25, 28, NVW 1 300p	PINCH ROLLER ASSEMBLY	X37277701 SLV210, 212, 270, 273, 275, 285, 300, 310, 335,
3V58, 3V59, 3V64, 3V65, FV10, 11, 12, 13, 14,	215, 300, 315, 316, 318	PINCH ROLLER ASSEMBLY  N.E.C.	SHARP VC200, 381, 383, 384, 385, 386, 388, 390, 393,	425, 427 350p
20, 21, 22, 26, 30, 32, 33 FV39, VC141L 875p	HRJ400, 405, 407, 410, 411, 415, 416, 507, 600, 605, 610, 615, 715, 815	N830, 831, 832, 833, 895 140p	800, 2300, 3300, 6000,	PINCH ROLLER ASSEMBLY SV6700.8750, 9700, VHR3100, 3200, 3300,
PINCH ROLLER ASSEMBLY FV43H, FV44L, FV45X, FV46T 700p	HRJ97, HRS4700, 5800, 5900, 6800, 6900, SR3200, 330, 368	PVC2300, 2400, 740, 744, 746, 760, 764, 766 140p	VC6200, 6300, 7300, 7700, 7750, 7800, 8300, 838, 9100, 9300, 9400,	3310, 3400, 3700, 3800, VHRD500, 700 <b>1350p</b> PINCH ROLLER ASSEMBLY
PINCH ROLLER ASSEMBLY FV61, FV62, FV67, FV68, FV70, FV71, FV72,	HRD170, 171, 180, 210, 211, 217, 230, 300, 320, 321, 330, 337, 350,	DX1000, 1600, 1800, 2000, 3000, N9012, 9013, 9014, 9016, 9033	VC9500, 9600, 9700, 9800 <b>140p</b> VC300, 387, 402, 471, 473, 477, 481, 482, 483,	SL100, 200, SLC20, 30, 33, 34, 40, 44, 80, 88,
FV74, FV77 775p	HRD370, 400, 430, 440, 441, 470, 500, 530,	N9034, 9053, 9054, 9055, 9056, 9066, 9096,	486, 488, 496, 500, 571, 573, 581, 582, 583, 584, 585, 8481, VC5F3,	9, SLF1, 20, 25, 30, 35, 45, SLF60, 65, 73, 90, SLHF100, 150, 950, SLK85, 95, SLO1700,
PINCH ROLLER ASSEMBLY FISHER	700, 750, 950, HRS5000, 5500, 8000, 9000, BR7030, 7040,	9110, 9120, 9510, 9520, N9530, 9610, PX 1200 140p	VC5W20E, VCA1031 140p VC108, 208, 405, 408, 550, 600, 651, 671, 674,	SLS550, SLT0, 30, 50 300p PINCH ROLLER ASSEMBLY
FVHP420, 520, 530 140p	9060,	DS6000G, DX4000, N9077		TOTAL TO CONTROL
		VIDEO LAMP		

١	V	D	B	О	Ŋ	Ā	V	VI	P	5

Models & Description O	rder Code	Price	Models & Description Ord	er Code	Price	Models & Description	Order Code		Models & Description	Order Code	Price
UNIVERSAL VIDEO LAMP 9V	VL01	25p	AIWA, AKAI, ALBA, AMSTRAD,	VL05	100p	AKAI, GRANADA (VHSTJ2),	VL01	25p	AUTHENTIC (N850), DECCA	VL07	40p
80mV (310mm WIRES)			BLAUPUNKT, FERGUSON, FIDELITY	′.		HITACHI (VT3000), ITT (VR3912	,		(VR8300), GRANADA (VHSTJ3,		
PANASONIC VIDEO LAMPS	VL02	30p	FISHER, FUJITSU, FUNAI, G.E.C., GOLDSTAR, GRANADA, GRUNDIG.			VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI (HS20	าก)		144 14 144 163 177 (V/D2042 2044		
SHARP VIDEO LAMPS	VL02	30p				TELEFUNKEN (VR510, 519, 610			WJ1, WJ3), ITT (VR3913, 3914,		l'i
HITACHI 5381682 (VT63, VT64)	VL04	135p				THOMSON (VK300, 305, 306, 33			3963) JVC (HT7200, 7300, 7350	,	
VIDEO LAMPS			NEC, ORION, NATIONAL,			FERGUSON (3V00, 16, 22, 24, 3			7700) TELEFUNKEN (VR450, 52	20.	
AKAI IVS10),GRANADA (VHSXJ3), TT (VR3993,3994), JVC	VL06	40p	SAMOUNTA, SAMO, SHAM,			8900, 8901, 8902, 8903, 8909, 59 8922, 8925)	912, 		529, 540, 549, 620, 640, 920, 19		
(HR2650, 7600, 7610, 7650, 7655), TELEFUNKEN (VR530, 535, 539, 5			SIEMEN, SONY, TELEFUNKEN, THOMSON,TOSHIBA			BLAUPUNKT, ORION (VH1, 2A) NATIONAL (NV200,2010, 3000,		30p	THOMSON (V4100, VK308, 309	, 312,	
630, 650), THOMSON (V309, 316,			GRANADA (VHSAY3), SHARP	VL08	45p				410), FERGUSON (3V23, 29, 30	,	П
VK309, 411,TX8000), FERGUSON			(VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700)			8620), SHARP (VC2300, 6000, 6 6300, 7300, 7700, 8300)	200,		8923, 8924, 8929, 8930, 8931, 8	940)	

		VIDEO SERVICE KIT	TS	
AMSTRAD VCR700 Contents BELT SET. PINCH ROLLER. REEL IDLER. VIDEO LAMP Order Code: SK41 £5	5.50	HITACHI VT11/VT33 Contents BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES Order Code: SK08	€5.00	NV500/NV588
FERGUSON & JVC 3V42/43 HR0455/HR0725 Contents Economy Kil Contents BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION SUPPLY CLUTCH, TAKE UP		VT11/VT33  Contents BELT SET. T/UP REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER, FF/REW IDLER. CLUTCH PATE. TABLE TYRE TABLE TYRE TABLE TYRE TABLE TYRE TABLE TYRE TABLE TYRE	:	Order Code: SK25         £12.00         Order Code: SK26         £6.00           NV730/NV770         *** *** *** *** *** *** *** *** *** **
BAND   CLUTCH     Order Code: SK37   £16.00 Order Code: SK38   £9	9.00	Order Code: SK45 £13.00 Order Code: SK46	£3.75	Drder Code: SK19 £5.50 Order Code: SK20 £3.00
3V58/59/64/65 HRD170/180/210/230/300/320/370/400/430/530/700/750 HRSS0000 Contents BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND		VT52/61/62/63/64/65/85/86/640  Contents  Economy Kit Contents  BELT SET, PINCH ROLLER,  BELT SET, PINCH ROLLER  FF/REW IDLER  TENSIDN BAND  Order Code: SK49  E14.00  Order Code: SK50	£3.00	NV370
3V29/3V30 HR7200/7300/7350 Contents BELT SET, PINCH ROLLER, TENSION BAND, IOLER TYRES	5.00	VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/ 510/520/52/52/530/35/36/540/545/46/48/570/75/576/580/85/88 Contents TIMING BELT. PINCH RDLLER. FF/REW ARM. CLUTCH BASE. TENSION BAND Order Code: SK\$2	£9.75	NV777/NV788
3V35/36, 38/39/49 HR0110/111/120/225 Contents BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES	,	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.		Contents
	5.00	TENSION BAND Order Code: SK51	£14.00	
3V31/3V42 HR760Q761Q7650/7655 Contents Ecanomy Kit Contents BELT SET, T/U REEL TABLE TYRE. PINCH ROLLER. REEL TYRE. PINCH ROLLER. REEL		PANASONIC  NY2000:NV2010NV7000:NV7200:NV7800  Contents  Economy Kit Contents  BELT SET. PINCH ROLLER.  TENSION BANO. IDLER TYRES  TENSION BANO. IDLER TYRES		\times \text{VCS03/VC582/VC582/VC584/VC5F3} \\ \text{Contents} \\ \text{Economy Kit Contents} \\ \text{BELT SET. PINCH ROLLER} \\ \text{BELT SET. PINCH ROLLER} \\ \text{BELT IDLER TENSION BAND} \\ \text{REEL IDLER TENSION BAND} \\ \text{Order Code: SK60} \\ \text{\$6.90} \\ \text{Under Code: SK61} \\ \text{\$6.00} \\ \text{\$6.00} \\ \text{\$1.00} \\ \
IDLER T/U CLUTCH. T/U IDLER   TENSION BAND. VIDEO LAMP	5.00	Order Code: SK03 E5.00 Order Code: SK02  NV300/NV330/NV333/NV340/NV366  Contents  BELT SET. PINCH RDLLER. TENSIDN BAND. IOLER TYRE Order Code: SK01	£5.00	VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/ VCA100/VCA102/VCA104/VCA202  Contents  BELT SET. PINCH ROLLER  REEL DRIVE UNIT. TENSION  REEL DRIVE UNIT. TENSION  BANO
Contents	5.50	NV2000/NV2010  Contents  BELT SET. PINCH ROLLER. FF  BELT SET. PINCH ROLLER.  BAND. VIOED LAMP  Order Code: SK13  Economy Kit Contents  BELT SET. PINCH ROLLER.  BELT SET. PINCH ROLLER.  BLET SET.	£3.50	Order Code: SK64         £13.50         Order Code: SK65         £3.75           VC681/VC682/VC684/VC885/VC689/VC699/VC6F3/VC700         Contents         Economy Kit Contents           BELT SET. PINCH ROLLER         BELT SET. PINCH ROLLER         REL ORIVE UNIT. TENSION           BAND         REL ORIVE UNIT. TYRE
3V29/3V30 HRO7200/7300/7350 Contents Economy Kit Contents		NV7000/NV7200/NV7800  Contents Economy Kit Contents  BELT SET, PINCH ROLLER  IDLER UNIT, PLAY IDLER  IDLER TYRE. CLUTCH TYRE		Order Code: SK62         £13.50         Order Code: SK63         £5.00           FOR MORE DETAILS OF OVER 500
BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. REEL TYRE. PINCH ROLLER. REEL IDLER. T/U CLUTCH. T/U IDLER. IDLER TYRE.		TENSION BAND Order Code: SK11 £8.50 Order Code: SK12  NV300/NV330/NV333/NV340/NV366	£3.25	TYPES OF SERVICE KITS  PLEASE RING US!
3V44/45/48/53/54/55/57 HRP50/HR0140/150/158/160	5.00	Contents         Economy Kit Contents           BELT SET, PINCH ROLLER         BELT SET, PINCH ROLLER           IOLER UNIT. PLAY IOLER.         IOLER TYRE. PLAY IOLER           TENSION BAND         TODGE Code: SK15           Order Code: SK15         £7.00           Order Code: SK16	£3.25	SERVICE KIT & UPGRADE FOR ONWA TV CHASSIS
HR0250/25/765/565/755  Contents BELT SET. PINCH ROLLER. CLUTCH MECHANISM. TENSION BANO		NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/ NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/ AG1810 (P/K) Contents Ecanomy Kit Contents		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
	9.50	LOADING BELT, CAPSTAN         LOADING BELT, CAPSTAN           BELT, PINCH ROLLER, IDLER         BELT, PINCH ROLLER, IDLER           TENSION BANG         TYPE           Grder Code: SK27         £6.00         Order Code: SK28	£3.00	POWER SUPPLY.  THE KIT CONSISTS OF ALL THE REQUIRED COMPONENTS AND COMES COMPLETE WITH FULL INSTRUCTIONS AND
Contents Economy Kit Contents BELT SET. PINCH ROLLER IDLER, GEAR IDLER UNIT. TENSION BAND  ECONOMY KIT CONTENT BELT SET. PINCH ROLLER. IDLER TYRE TENSION BAND		NV332  Contents  Economy Kit Contents  BELT SET, PINCH ROLLER,  BELT SET, PINCH ROLLER		CIRCUIT DIAGRAM  THE KIT IS DESIGNED TO FIT THE FOLLOWING MAKES AND MODELS.
	5.00	PLAY IDLER. FF/REW IOLER.         PLAY IDLER TYRE.         FF/REW           TENSION BAND. FF/REW TYRE         IDLER TYRE.         IDLER TYRE.           Order Code: SK29         £12.00         Order Code: SK30	£5.10	*ALBA / BUSH *AKAI
FVHP615/618/620/622/710/711/715/716/720/721/722/725/ 1730/830/840		NV230/250/260/280/430/450/460/470/650/810/890/	13.10	* GOODMANS * HINARI
Contents Economy Kit Contents BELT SET. PINCH ROLLER IDLER. GEAR IDLER UNIT. TENSION BAND IDLER LER LER LER LER LER LER LER LER LER		AG1209PK/AG1509PK  Contents  Economy Kit Contents  BELT SET, PINCH ROLLER, BOLLER PINCH ROLLER  IDLER, TENSION BAND IDLER TYRE		* JVC * MATSUI  ORDER CODE: ONWAKIT PRICE: 1200p  * SOME MANUFACTURERS HAVE ALREADY TAKEN STEPS TO UPGRADE THE POWER SL PPI Y
	300	Order Code: SK23 £6.00 Order Code: SK24	£3.25	SOME MATURAL LUKERS HAVE ALKEAUT TAKEN STEKS TO UPOKADE THE POWER SUPPLY

1	XCEM	VIDEO (	CASSEII	OUSIN	

Name	Models	Code	Price	Name	Models	Code	Price	Name	Models	Code	Price
AKAI	VS35, VS53, VS55,				FV31R	CH19	4300p		VCA103, 103GV, 106, 106GVM,		
	VS56, VS75	CH18	3200p		HRD515, 520, 527, 540, 550, 580,				254GVM	CH23	2500p
GRANADA	VHSDP1	CH05	1100p		600, 610, 620, 660, 670, HRD830,				VCS211, 244, 5055, 605, VCB230,		
	VHSYJ2	CH01	2800p		840, 850, 860, 4050, 6600, FV37H	CH20	2200p		VCD806G, 810G, VCT212, 310,		
GDLDSTAR	GHV1290P, 1291P, 1295P, 9400,				HRD540, 580, 830, 860, 910, 960,				410G, 610	CH24	2500p
	73401, GSE1295P, GSE1891P,				HR0970, HRDX20,			TELEFUNKEN	VR2970	CH02	2800µ
	20001Q, 20051Q, VCP4200, 4300,			FERGUSON	FV57H	CH27	2400p	THDMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	430+, 4305, VCP4306, 4311, 4315,			I.T.T.	VR3605, VR3905	CH01	2800p		V342, 343, 352, 353, 360, 364, 368,		
	4316, 4320, 4321, 4325	CH25	2000p		VR3916, 3926, 3946, 3948, 3976,				4210, 4230, 4260, 4400, V5500,		
	GHV51, 1221, 1232, 1240, 1241,				3986, 3995, 3997, 6948	CH02	2800p		6000, 8540	CH02	2800p
	1242, 1244, 1246, 1248, GHV8000,				VR3916, 3926, 3946, 3948, 3976,			TOSHIBA	V55, V57	CH01	2800p
	8200	CH26	2900p		3986, 3995, 3997, 6948	CH02	2800p		V65, V66	CH02	2800p
FERGUSDN & J.V.C.	3V38, 3V39, 8943, 8944, 8951,			NATIONAL PANASONIC	NV730	CH06	4300p				
	3V35, 3V36, 3V49, HRD 110, 111,			N.E.C.	N830EG, N831EG, N831EG, N832,			الم علم علم علم عل	***	bo make m	ماد ما
	120, 121, 225	CH01	2800p		N833EG	CHOI	2800p	MMMM		A M E	NA
	3V42, 3V43, 3V44, 3V45, 3V48,				N895	CH02	2800p	AMS'	TD AD MOD I	ZIT	太
	3V53, 3V54, 3V55, 3V57, 8945,			PHILIPS	CASSETTE LIFT ASSEMBLY (691203)	66)		AIVIS	TRAD MOD I	111	FAI
	8947, 8948, HRD 140,				DV186, 190, 286, 471, 562, 761,			4			*
	141, 150, 157, 158, 160, 250,				VR6180, 6182, 6185, 6285, VR6290,						PA
	HRD257, 455, 565, 566, 725, 755	CH02	2800p		6291, 6293, 6362, 6367, 6393, 6467,			FITS:			大
	8948, 8950, FV10B, 12L, 13H, 14T,				6468, 6470, VR6561, 6670, 6760,			CR 4500 , 4	600, 4700, 5200, TVR 1	,2,3	
	208, 21R, 22L, 26, 395, HRD230,				6761, 6870, 6970	CH05	1100p	古			A
	430, 530	CH03	2800p		VR6443	CH22	2900p	1 5516	D 00.05 . NAME		
	3V58, 3V59, 3V64, 3V65, FV11R,				VR6448	CH23	2500p	* PRIC	E : <b>£2.25</b> + VAT ea	ach	*
	8950, 8951, HRD170, HRD180,				49SB6	CH24	2500p	A A A A A	A A A A A A A A A A A A	A	A .
	HRD370	CH04	2800p	SHARP	VCA100, VCH851, VCH852	CH22	2900p	T W W W W	T T T T T T T T T T T T T T T T T T T	TATE	7 7

#### MODESWIK

NV2000, 2010, 7000, 7200, 7800 (VS50048)

NV230, 260, 430, 810, 870, 2300, 4300

(VSS0110)

NV830 (VSS0091)

NV300, 333, 340, 366, 688, 777, 778

NVG21, 25, NVH65, NVD80 (VSS0175A)

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, FUNAL HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM ORDER CODE: AH01 PRICE: 1350g

AMSTRAD ORIGINAL NO: 153134

£2.25

£2.10

£3.75

£2.00

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, SCHNEI-DER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

Replacement Audio Control Video Sound Head for National Panasonic

CONTROL HEADS

PART NUMBER	MODELS	PRICE
VBR 0091	NVG7 etc	875p
VBR0050	NV300, NV340 etc	875p
VBR0061	NV777 etc	875p
VBR0103A	NV250, NV450 etc	6 <b>2</b> 5p
VBR0125		625p

**SET OF 8 ALLEN KEYS** 

0.90mm

1.50mm

2.00mm

3.00mm

0.7**7**mm

1.27mm

1.60mm

2.40mm

#### TOOLS

#### VIDEO CLEANING STICKS

Price 17p each 15p each pack of 10pcs 13p each pack of 25pcs 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. Order code: TOOL 8, Price 600p

#### 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

**3 REVERSIBLE SCREWDRIVERS SPRING HOOK** 

**CIRCLIP PLIERS** 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

#### BATTERIES

#### PHII IPS

Part Nos: 138 - 101138, 138 - 10313 1.2v 90mAH

Order Code: BB01

Part Nos: 138 - 10229, 2.4v 100mAH

Order Code: BB02

Price: 70p

Price: 135p

Part No: 00E6 - 067 - 001 1.2V 100mAH

Order Code: BB03

**FERGUSON** 

Part Nos: 00E6 - 606 - 8001 2.4V 100mAH

Order Code: BB04

Price: 90p

I DOLOS

Price: 150p

#### TIDIPS REPAIR

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	<b>60</b> 0p
AMSTRAD SRX340, SRX345, SRX350	SATPSU5	600p
PACE D100/150	SATPSU6	650p
CHURCHILL D2MAC	SATPSU7	650p
PACE MSS100	SATPSU8	1100p

#### **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

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	650p

#### **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
- \*Detection Range: -60 to -10 DBM \* Power amplifier: 18db
- \* Max. input signal: -10 DBM

**ORDER CODE: TOOL22** PRICE: 8500p

#### REPROCEMENT

#### **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

A		FUSES		
	TIME LAG	(20mm)	QUICK BLOW (20mm)	
CURRENT RATING	ORDER CODE	PRICE	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 I

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A terminal screwdriver incorporating continuity & voltage with Euroslot

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#### SERVICE AIDS

VIOEO HEAD CLEANER         75ML         SP01         145p           SWITCH CLEANER         176ML         SP02         155p           SILICONE GREASE         200ML         SP03         180p           FREEZE IT         170ML         SP04         295p           FREEZE IT         400ML         SP05         180p           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         280p           TUBE SILICON GREASE         50 GRAMMES<	DESCRIPTION	VOLUME	CODE	PRICE
SILICONE GREASE         200ML         SP03         180p           FREEZE IT         170ML         SP04         295p           FREEZE IT         400ML         SP16         580p           FREEZE IT         400ML         SP05         580p           FOAM CLEANER         400ML         SP05         180p           ANTI-STATIC         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         280p           TUBE SILICON GREASE         50 GRAMMES         SP11         225p	VIOEO HEAD CLEANER	75ML	SP01	145p
FREEZE IT	SWITCH CLEANER	176ML	SP02	155p
FREEZE IT	SILICONE GREASE	200ML	SP03	180p
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	FREEZE IT	170ML	SP04	295p
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         280p           TUBE SILICON GREASE         50 GRAMMES         SP11         225p	FREEZE IT	400ML	SP16	580p
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         280p           TUBE SILICON GREASE         50 GRAMMES         SP11         225p	FOAM CLEANER	400ML	SP05	180p
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	ANTI-STATIC	200ML	SP06	180p
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	AEROKLEANE	200ML	SP07	200p
PLASTIC SEAL         200ML         SP09         280p           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	AERO DUSTER	200ML	SP08	340p
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         280p           TUBE SILICON GREASE         50 GRAMMES         SP11         225p	AERO DUSTER	400ML	SP17	580p
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         280p           TUBE SILICON GREASE         50 GRAMMES         SP11         225p	PLASTIC SEAL	200ML	SP09	250p
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	GLASS CLEANER	200ML	SP10	160p
ADHESIVE 120         500ML         SP19         250p           LABEL REMOVER 130         200ML         SP20         260p           REFURB 140         400ML         SP21         260p           TUBE SILICON GREASE         50 GRAMMES         SP11         225p	COLDKLENE	200ML	SP13	220p
LABEL REMOVER 130         200ML         SP20         260p           REFURB 140         400ML         SP21         260p           TUBE SILICON GREASE         50 GRAMMES         SP11         225p	EXCEL POLISH 80	200ML	SP18	160p
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TUBE SILICON GREASE 50 GRAMMES SP11 225p	LABEL REMOVER 130	200ML	SP20	260p
	REFURB 140	400ML	SP21	260p
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DX-990A, DX-DIA	KSS152A	1600p
CXL60, CXL66G, CXL80, CXN3100, CXN320, CXN3300, CXN360, CXN400, CXN430, CXN540, CXN550G, CXN990, CXN999, CXNV20, CXSL70, DXZ9100M, FDN636, FDN636, 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	KSS 152A	1600p
CXAP1, CXL7, CXL8G, CXLC50P, CXZ58, DXM740, DXM75, DXM76, DXM77, LCX50, LCX7,	400-400	
LCX8G, LCXAP1, XC002, XC004, XC005, XC777	KSS210B KS220A	2000p 2500p
XP31, XP33, XP55, XP80G	KSS331A	3400p
XP6.XP7	KOOOO IA	5450p
AKAI	KSS151A	1900p
CD73, DC93 CD25, CD26, CD27, CD32, CD36, CD37, CD52, CD55, CD57, CD650, CD670, CD69, CD750, CD79,	110010111	
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,	Manarat	
DCD825, DCD890, DCD895, DN2000F	KSS240A	2000p
GOLDSTAR		
CD952A, CD952AJ, CD952LJ, CD952SJ, FFH101KL, FFH101WL, FFH222A/L, FFH272L,	KSS210A	1300p
FFH333L, FFH373K, FJ606, FR606L	KSS210B	2000p
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GRUNDIG	нормз	2150p
CD360, CD435 CCD300, CD101MCD904, MC10, NEW ORLEANS CD	KSS210A	1300p
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CDP60, CDP90	KSS220A	2500p
CDP65	KSS331A	3400p
CD905	OPTIMA5	1600p
HITACHI		2450-
DAW560	KSS210A	2150p 1300p
FX-10	KSS210B	2000p
	11002100	2000
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
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XL-M504BK, XL-M505TN, XL-M508, XL-M509, XL-M705TN, XL-V131BK, XL-V151TN, XL-V221BK,	OPTIMA	1600p
XL-V241TN, XL-242BK, XL-V251TN, XL-V252BK, XL-Z1050TN, XL-Z551TN, XL-Z552BK	OPTIMA5	10000
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, DP509, DP7030, DP7040, DP7050, DP730, DP920, DP930, DP950, DPM650,DPM6630,		
DPM7730, DPM850, DPM991, DX6620, M225, M25, M450, M850, PD3030, PDM991, RDX25,	KSS210A	1300p
RXDC3, RXDC3L, UD202, UD302 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
SEPJETM, SEPJEOM, SEPJSESM, SEPJSESM, SEPJSTM, S		

Models & Description	Order Code	Price
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SLP370G, SLP400C, SLP555, SLP777, SLP999, SLPA10, SLPC20, SLPC25, SLPJ25,	SOAAD70A	2350p
SLPJ26, SLPJ27, SLPJ37, SLPJ45, SLPK25, SLPK26, SLPS50, SLPS70, SLPS700, SLPS840, SLPS900	SUAAU/UA	23300
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,	4022 001	01000
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,	CDM10.1	1800p
FW26, FW330, FW36, FW360, FW3801, FW40, FW41, FW46, FW56, FW66, FW68	CDM12.1 CDM12.4	2200p
CD1210/40	KSS210B	2000p
FW11	OPTIMA6S	1600p
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PDM400, PDM410, PDM500, PDM510, PDM600, PDM610, PDM700, PDM710, PDM730,		
PDT303, PDT403, PDT503, PDX940M, PDX950M. PDZ560T, PDZ72T, PDZ73T, PDZ81M,		
PD782M, PD783M, PDZ960M, XDZ53T, XDZ54T	KSS151A	1900p
N32, N90M, PD101, PD201, PD32, PD41, PD4500, PD4700, PD52PD5700, PD65,I 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	PEA 1030	4400p
PDM400, PDM410, PDM500, PDM510, PDM600, PDM610, PDM700, PDM710, PDM730,	7 2711000	
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.	614218	2300p
PART No. 6142186855	614220	5600p
DCFS5, MCD450K, 660K, MCDZ30L, 60F. PART No. 6142205006 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-877, DX-8770, DX-8820, DX-8840, 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	VCC0404	2000
KSS240A	KSS240A KSS121A	2000p
KSS121A	KSS121A KSS151A	1900p
KSS151A	KSS210A	1300p
KSS210A KSS210B	KSS210B	2000
K\$\$210B	KSS220A	2500
ROULEVA	KSS331A	3400
KSS331A		
KSS31A KSS360A	KSS360A	2600g
KSS360A	KSS360A	2600
	KSS360A SOAD70A	2600p

#### REMOTE CONTROLS

						OTTOLE			The second second	A.	11. 1
Description	Code	Price	Description	Code	Price	Description	Code	Price	Description	Code	Price
AKAI RC-V10A	RC876	650p	A512120/230 A514790	RC900 RC901	650p 650p	PANASONIC EUR51200	RC200	650p	SONY RM604, RM605, RM606	RC140	650p
RCV 37 B V25A	RC891 RC896	650p 650p	A5088470 A518612	RC902 RC903	650p 650p	TC2200 VSQ0357/NV730	RC204 RC202	650p 650p	32 CHANNEL RM613	RC140 RC141	650p 650p
DECCA RC70	RC894	650p	SCL002 C2096	RC904 RC905	650p 650p	TNQ1621 PHILIPS	RC203	650p	RM632, RM636 TATUNG	RC160	600p
FISHER RC905B	RC879	650p	A511940 655602H	RC906 RC1920	650p 650p	RC5002,5154 KT3 NON TEXT 69117032	RC134 RC135 RC178	650p 650p 650p	FXA RC70	RC877 RC883	650p 650p
GRANADA UNIVERSAL TEXT	RC309	650p	ITT IFB13, 14, 15 FS4	RC143 RC148	650p 650p	69117194 RC5991-UNIV	RC180 RC300	650p 550p	FX70 FASTTEXT TELEFUNKEN	RC894	650p ST 650p
MK4 TEXT, 70155G, 70115G, 70133G 95288E	RC880 RC882	650p 650p	RG305 RG306	RC305 RC306	650p 650p	RC38 KT3 TEXT	RC301 RC5301 RC5352		FB632 FB639 THORN/FERGUSON	RC639	650p
94490D GRUNDIG	RC884	650p	FS9/1-10/1 VS5 RUK	RC307 RC308	650p 650p	RC5352 RC5375 RC5 STANDARD	RC5375 RC300		3V35-42	RC342 RC344	600p 650p
TP160E TP200, TP300	RC107 RC380	650p 650p	VS4-1 MULTICONTRDL (17C20)	RC308 RC311	650p 650p	RC5903	RC5903		3V31-32 3V57-58	RC628	650p
TP400 TP590-600	RC401 RC600	600p 650p	LOEWE DC11	RC146	650p	SALORA SERIES L 86173	RC190 RC882	650p 650p	TX10 TEXT TX10 STEREO TEXT	RC732 RC738	575p 575p
TP390, TP610 TP621	RC610 RC612	650p 650p	MATSUI			SANYO RC218, RC222, RC228, RC238	RC140	650p	TC9-90-100 3V55, FV11	RC740 RC783	600p 650p
TP630, TP650 TP666	RC650 RC660	650p 650p	010270601 VX770	RC889 RC892	650p 650p	JXGE JXDE	RC878 RC884	650p 650p	TX100 FASTTEXT TX100 ST, FASTTEXT	RC789 RC789	650p 650p
TP661 HITACHI	RC661	650p	<b>NOKIA</b> SATELLITE	RC550	650p	VHR2300 RC628	RC890 RC865	650p 650p	PROFESSIONAL TOSHIBA	RC790	650p
CLE800-CLE830 A617402/655602	RC140 RC1920	650p 650p	ORION RC53	RC892	650p	SHARP G0121CESA, 123CESA, 204, 251	RC140	650p	CT937 CT9117	RC950 RC951	650p 650p

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  Simple key arrangement
  Set-up by library review
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PRICE: 925p

		D	MDT	A CIEI		NTII	NIA			T TD	A	NSFO	D M		OC		
		IX.	MIL	ACL	VID	NIL	ND	U	UTPU	IIK	A	Noru	KIV	ועו	(2)		
Part No.	Code	Price	HITACHI			4515 01 19	LOT169	1500p	TLF 14520 F	LOT40 150		094-01020/0.7	LOT59	1400p	1-439-303-31	LOT94	1300p
AKAI			2424593	LOT44		4515 01 24	LOT137		TLF 14521 F	LOT39 188		094-01021/0.6	LOT59	1400p	1-439-303-32	LOT94	1300p
45150344	LOT56	1650p	2432101		1600p	4515 01 46	LOT136		TLF 14567 F	LOT39 185		094-01027/0.0	LOT186	1825p	1-439-311-00	LOT95	1550p
101-214017-03	LOT278		2432461	LOT169		4515 03 01	LOT169		TLF 14568 F	LOT40 150		094-01038/0.7	LOT245		1-439-311-11		1550p
101-220005-03A	LOT72	1600p	2432611		1800p	4515 03 02	LOT180		TLF 14584 F	LOT41 170		094-01052/0.8	LOT186		1-439-311-13	LOT95	1550p
D 050/37	LOT27	1450p	2432651		1800p	4515 03 04	LOT169		TLF 14586 F	LOT42 170		094-01057/1.1	LOT285		1-439-311-31		1550p
D 053/37	LOT207		2432761		1500p	4515 03 05	LOT180		TLF 15606 F	LOT256 200		610.018.6620	LOT189		1-439-311-32		1550p
D 056/37	LOT56	1650p	2432981		1200p	4515 03 06	LOT168		TLF 70012	LOT78 150		610.018.6637	LOT215	1800p	1-439-331-22		1550p
D 059/37	LOT200		2432981 2432982		1200p 1200p	4515 03 08 4515 03 09	LOT22 LOT178		TLF 70012 F TLF 70012A	LOT78 150		SHARP	10700		1-439-331-41		1550p
D 069/37	LOT56	1650p	2432962		1600p	4515 03 10	LOT168		TLF 70012A	LOT78 150 LOT274 155		RTRNF 1220 CEZZ RTRNF 1783 BMZZ			1-439-332-00		1600p
FCM 2015 AL FERGUSON	LOT78	1500p	2433012	LOT171		4515 03 10		1250p	TLF 70018 F	LOT274 155		RTRNF 1783 CEZZ			1-439-332-11		1600p
00 D-3-508-001	LOT38	1250	2433014	LOT 171		4515 03 14	LOT174		TLF 70161	LOT278 130		RTRNF 1786 BMZZ			1-439-332-21		1600p
00 D-3-508-007	LOT38	1250p	2433212	LOT168		4515 03 15		1250p	TLF 70162	LOT72 160		RTRNF 1786 CEZZ			1-439-332-41	LOT100	
00 D-3-508-002	LOT276		2433291	LOT172		4515 03 18	LOT192		TLF 70162A	LOT72 160		RTRNF 2000 BMZZ			1-439-332-42 1-439-332-52	LOT101	
00 D-3-505-003 00 D-3-515-001 PL1			2433301	LOT246		4515 03 19		1250p	TLF 70162B	LOT72 160		RTRNF 2002 BMZZ		1450p	1-439-332-52	LOT100	
00 D-4-208-001	LOT79	1600p	2433441	LOT188		4515 03 20	LOT190		TLF 70162G	LOT72 160		RTRNF 2002 CEZZ		1450p	1-439-333-11	LOT270 1	
00 D-4-208-002	LOT79	1600p	2433442	LOT191	1600p	4515 03 22	LOT196	1550p	TLF 77001 B	LOT274 155		RTRNF 2003 BMZZ			1-439-333-12	LOT270	
00 D-4-235-002	LOT240		2433451		1350p	4515 03 24	LOT 194	1550p	PHILIPS		٠ ا	RTRNF 2004 BMZZ			1-439-363-11	LOT268	
00 D-4-235-002 HTI		1350p	2433452		1250p	4515 03 25	LOT22	1250p	4822 140 10142	LOT142 180	Юр	RTRNF 2005 8MZZ			1-439-363-21	LOT268	
00 D-4-235-00201G		1350p	2433453		1250p <sup>*</sup>	4515 03 26	LOT 198		4822 140 101145	LOT134 145		RTRNF 2006 BMZZ			1-439-387-11	LOT311 '	
00 D-4-260-004 HTI		1250p	2433455		1600p	4515 03 28		1450p	4822 140 10146	LOT112 170		RTRNF 2007 BMZZ			1-439-387-21	LOT311	
00 H-0-701-2400	LOT182		2433521		1600p	4515 03 29	LOT193		4822 140 10151	LOT102 170		RTRNF 2023 BMZZ	LOT310	1500p	1-439-416-11	LOT255	
06 D-3-083-001	LOT82	1250p	2433581		1250p	4515 03 30	LOT179		4822 140 10161	LOT103 125		SONY			1-439-416-12	LOT255 1	
06 D-3-083-002	LOT82	1250p	2433721		1400p	4515 03 31	LOT207		4822 140 10171	LOT104 150		3753100	LOT275		1-439-416-21	LOT255	
06 D-3-084-001	LOT23	1400p	2433751		1300p	4515 03 34		1650p	4822 140 10176	LOT114 115		1-439-243-00		1600p	1-439-416-23	LOT255	
06 D-3-087-001	LOT23	1400p	2433752 2433752		1300p 1350p	4515 03 35	LOT193		4822 140 10194	LOT105 150		1-439-243-11		1600p	1-439-416-41	LOT255	1600p
06 D-3-088-001	LOT84	1450p	2433752		1400p	4515 03 38 4515 03 40	LOT27 LOT200	1450p	4822 140 10198 4822 140 10201	LOT116 160 LOT104 150		1-439-243-12		1600p	1-439-416-51	LOT255	1600p
06 D-3-093-001	LOT204		2433892		1450p	4515 03 40	LOT56	1650p	4822 140 10236	LOT118 155		1-439-243-31 1-439-243-32	LOT229 LOT229		1-439-430-21	LOT271 1	1550p
06 D-3-095-001	LOT87	1000p	2433893		1400p	4515 03 43	LOT196		4822 140 10246	LOT111 150		1-439-243-41	LOT229		154125A	LOT275 '	1550p
06 D-3-095-002	LOT87	1000p	2433952		1000p	4515 03 44	LOT56	1650p	4822 140 10247	LOT105 150		1-439-244-00		1600p	TOSHIBA		
06 D-333-512-001	LOT204		2434002		1400p	4515 03 46	LOT201	1550p	4822 140 10254	LOT107 145		1-439-244-11		1600p	37010	LOT131 1	
FETX 100 90 DEG	LOT04	1500p	2434141		1000p	4515 03 50	LOT27	1450p	4822 140 10263	LOT117 155		1-439-244-21		1600p	37011	LOT131 1	
FETX 90 WHITE	LOT06	1650p	2434141		1000p	4515 03 51	LOT27	1450p	4822 140 10269	LOT210 135		1-439-244-31		1600p	37012	LOT131 1	
FETX 100 100 DEG	LO134	1500p	2434274	LOT44	1050p	4515 03 75	LOT56	1650p	4822 140 10271	LOT208 165		1-439-256-00		1650p	37013	LOT131 1	
GRUNDIG			2434274	LOT44	1050p	4516 16 01	LOT22	1250p	4822 140 10274	LOT123 145	50p	1-439-256-11	LOT45	1650p	37014		1450p
29201.008.01 29201.014.01	LOT153		2434453		1600p	MITSUBISHI			4822 140 10282	LOT122 130	10p	1-439256-21	LOT45	1650p	37015		1450p
29201.015.01	LOT140 LOT149		2434455		1600p	731003		1550p	4822 140 10283	LOT104 150		1-439-256-22	LOT45	1650p	37016	LOT131 1	
	LOT60	1250p	2434593		1050p	276-16399	LOT49	1500p	4822 140 10294	LOT125 <b>215</b>		1-439-276-21	LOT230	1700p	37017		1450p
29201.017.01 29201.018.01	LOT163		2435062	LOT296	950p	334 B 07803		1450p	4822 140 10306	LOT110 120		1-439-280-00		1600p	37018		1450p
29201.018.02	LOT61	1700p	2435121		1000p	334 B 078030	LOT50	1450p	4822 140 10325	LOT132 150		1-439-280-13		1600p	37019		1450p
29201.019.01	LOT62	1250p	2435131	LOT251		334 B 08104	LOT74	1600p	4822 140 10326	LOT122 130		1-439-286-00		1300p	1810951		1400p
29201.019.02	LOT62	1250p	2435141		1300p	334 B 08108	LOT295		4822 140 10328	LOT124 145		1-439-286-11		1300p	2433751 2433752		1300p
29201.079.02	LOT63	1700p	2435301		1450p	334 P 18506	LOT51	1550p	4822 140 10349	LOT106 125		1-439-286-12		1300p	23236023		1350p 1300p
29201.022.01	LOT166		2435671		1600p	334 P 18507		1500p	4822 140 10353	LOT284 140		1-439-286-13		1300p	23236052	LOT131 1	
29201.022.02	LOT165		2436201 2436202		1200p 1200p	5908-05008A-AA D 108/37	LOT70 LOT49	1500p 1500p	4822 140 10356	LOT284 140		1-439-286-21		1300p	23236052	LOT288 1	
29201.022.04	LOT165		2430202		1200p	D 108/37 DCF 1577	LOT273		4822 140 10367 4822 140 10369	LOT286 140 LOT109 120		1-439-288-00 1-439-288-12	LOT228 LOT228	1750p 1750p	23236198	LOT288 1	
29201.022.04A	LOT165		2432101-2 2433451H		1350p	DCF2077A	LOT273		4822 140 10381	LOT128 130		1-439-289-00		1/50p 1400p	23236255		1500p
29201.024.01	LOT65		2433451H		1250p	KFS 60226B	LOT272		4822 140 10381	LOT128 130		1-439-289-00		1400p 1400p	23236424	LOT129 1	
29201.024.04	LOT164		2433891H		1400p	MSH-1FBW08		1500p	4822 140 10395	LOT116 160		1-439-289-22		1400p	23236425	LOT288 1	
HINARI			2433892G		1450p	NIKKAI	200	.000	4822 140 10406	LOT73 115		1-439-289-31		1400p	23236428	LOT289 1	
154 138 K	LOT24	1500p	I.T.T.	22.04		BABY10	LOT67	1450p	4822 140 10421	LOT109 120		1-439-294-00		1450p	3122113837011	LOT131 1	
51 13914 1	LOT24	1500p	4515 01 08	LOT113	1400p	ORION			4822 140 17078	LOT103 125		1-439-294-11		1450p	150F6D		1450p
51 14184 1	LOT24	1500p	4515 01 15	LOT136		3714002	LOT02	1500p	SANYO		٠.	1-439-294-21		1550p	TFB 4039 AD		1550p
CF 44 A	LOT24	1500p	4515 01 16	LOT139		PANASONIC			094-00020/0.9	LOT113 140	Юр	1-439-303-00	LOT94		TFB 4048 AD	LOT281 1	
HM51-1411834-1	LOT24	1500p	4515 01 17	LOT139	1675p	TLF 14512 F	LOT39	1850p	094-00035/0.2	LOT162 135	iOp	1-439-303-11	LOT94		TFB 4048 BD	LOT281 1	
								-									

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FAST BLOW           RATING         ORDER CODE         PRICE           0.04A         FUSE53         60p           0.05A         FUSE54         35p           0.063A         FUSE55         35p           0.08A         FUSE56         35p           0.1A         FUSE57         30p           0.125A         FUSE58         30p           0.16A         FUSE59         30p           0.2A         FUSE60         30p           0.25A         FUSE61         30p           0.315A         FUSE62         30p           0.4A         FUSE63         30p           0.5A         FUSE64         30p           0.63A         FUSE65         30p           0.8A         FUSE65         30p           1A         FUSE67         30p           1.25A         FUSE68         30p           1.6A         FUSE69         30p           2A         FUSE70         30p           2.5A         FUSE71         30p           3.15A         FUSE72         30p           4A         FUSE73         30p	TANK BULLETING		
0.04A         FUSE53         60p           0.05A         FUSE54         35p           0.063A         FUSE55         35p           0.08A         FUSE56         35p           0.1A         FUSE57         30p           0.125A         FUSE58         30p           0.16A         FUSE59         30p           0.2A         FUSE60         30p           0.25A         FUSE61         30p           0.315A         FUSE62         30p           0.4A         FUSE63         30p           0.5A         FUSE64         30p           0.63A         FUSE65         30p           0.8A         FUSE66         30p           1A         FUSE67         30p           1.25A         FUSE68         30p           1.6A         FUSE69         30p           2A         FUSE70         30p           2.5A         FUSE71         30p           3.15A         FUSE72         30p		FAST BLOW	
0.05A         FUSE54         35p           0.063A         FUSE55         35p           0.08A         FUSE56         35p           0.1A         FUSE57         30p           0.125A         FUSE58         30p           0.16A         FUSE59         30p           0.2A         FUSE60         30p           0.25A         FUSE61         30p           0.315A         FUSE62         30p           0.4A         FUSE63         30p           0.5A         FUSE64         30p           0.63A         FUSE65         30p           0.8A         FUSE66         30p           1A         FUSE67         30p           1.25A         FUSE68         30p           1.6A         FUSE69         30p           2A         FUSE70         30p           2.5A         FUSE71         30p           3.15A         FUSE72         30p	RATING	ORDER CODE	PRICE
0.063A       FUSE55       35p         0.08A       FUSE56       35p         0.1A       FUSE57       30p         0.125A       FUSE58       30p         0.16A       FUSE59       30p         0.2A       FUSE60       30p         0.25A       FUSE61       30p         0.315A       FUSE62       30p         0.4A       FUSE63       30p         0.5A       FUSE64       30p         0.63A       FUSE65       30p         0.8A       FUSE66       30p         1A       FUSE67       30p         1.25A       FUSE68       30p         1.6A       FUSE69       30p         2A       FUSE70       30p         2.5A       FUSE71       30p         3.15A       FUSE72       30p			
0.08A         FUSE56         35p           0.1A         FUSE57         30p           0.125A         FUSE58         30p           0.16A         FUSE59         30p           0.2A         FUSE60         30p           0.25A         FUSE61         30p           0.315A         FUSE62         30p           0.4A         FUSE63         30p           0.5A         FUSE64         30p           0.63A         FUSE65         30p           0.8A         FUSE66         30p           1A         FUSE67         30p           1.25A         FUSE68         30p           1.6A         FUSE69         30p           2A         FUSE70         30p           2.5A         FUSE71         30p           3.15A         FUSE72         30p			'
0.1A       FUSE57       30p         0.125A       FUSE58       30p         0.16A       FUSE59       30p         0.2A       FUSE60       30p         0.25A       FUSE61       30p         0.315A       FUSE62       30p         0.4A       FUSE63       30p         0.5A       FUSE64       30p         0.63A       FUSE65       30p         0.8A       FUSE66       30p         1A       FUSE67       30p         1.25A       FUSE68       30p         1.6A       FUSE69       30p         2A       FUSE70       30p         2.5A       FUSE71       30p         3.15A       FUSE72       30p	0.063A		•
0.125A       FUSE58       30p         0.16A       FUSE59       30p         0.2A       FUSE60       30p         0.25A       FUSE61       30p         0.315A       FUSE62       30p         0.4A       FUSE63       30p         0.5A       FUSE64       30p         0.63A       FUSE65       30p         0.8A       FUSE66       30p         1A       FUSE67       30p         1.25A       FUSE68       30p         1.6A       FUSE69       30p         2A       FUSE70       30p         2.5A       FUSE71       30p         3.15A       FUSE72       30p	0.08A	FUSE56	35p
0.16A       FUSE59       30p         0.2A       FUSE60       30p         0.25A       FUSE61       30p         0.315A       FUSE62       30p         0.4A       FUSE63       30p         0.5A       FUSE64       30p         0.63A       FUSE65       30p         0.8A       FUSE66       30p         1A       FUSE67       30p         1.25A       FUSE68       30p         1.6A       FUSE69       30p         2A       FUSE70       30p         2.5A       FUSE71       30p         3.15A       FUSE72       30p	0.1A	FUSE57	30p
0.2A       FUSE60       30p         0.25A       FUSE61       30p         0.315A       FUSE62       30p         0.4A       FUSE63       30p         0.5A       FUSE64       30p         0.63A       FUSE65       30p         0.8A       FUSE66       30p         1A       FUSE67       30p         1.25A       FUSE68       30p         1.6A       FUSE69       30p         2A       FUSE70       30p         2.5A       FUSE71       30p         3.15A       FUSE72       30p	0.125A	FUSE58	30p
0.25A       FUSE61       30p         0.315A       FUSE62       30p         0.4A       FUSE63       30p         0.5A       FUSE64       30p         0.63A       FUSE65       30p         0.8A       FUSE66       30p         1A       FUSE67       30p         1.25A       FUSE68       30p         1.6A       FUSE69       30p         2A       FUSE70       30p         2.5A       FUSE71       30p         3.15A       FUSE72       30p	0.16A	FUSE59	30p
0.315A       FUSE62       30p         0.4A       FUSE63       30p         0.5A       FUSE64       30p         0.63A       FUSE65       30p         0.8A       FUSE66       30p         1A       FUSE67       30p         1.25A       FUSE68       30p         1.6A       FUSE69       30p         2A       FUSE70       30p         2.5A       FUSE71       30p         3.15A       FUSE72       30p	0.2A	FUSE60	30p
0.4A       FUSE63       30p         0.5A       FUSE64       30p         0.63A       FUSE65       30p         0.8A       FUSE66       30p         1A       FUSE67       30p         1.25A       FUSE68       30p         1.6A       FUSE69       30p         2A       FUSE70       30p         2.5A       FUSE71       30p         3.15A       FUSE72       30p	0.25A	FUSE61	30p
0.5A       FUSE64       30p         0.63A       FUSE65       30p         0.8A       FUSE66       30p         1A       FUSE67       30p         1.25A       FUSE68       30p         1.6A       FUSE69       30p         2A       FUSE70       30p         2.5A       FUSE71       30p         3.15A       FUSE72       30p	0.315A	FUSE62	30p
0.63A       FUSE65       30p         0.8A       FUSE66       30p         1A       FUSE67       30p         1.25A       FUSE68       30p         1.6A       FUSE69       30p         2A       FUSE70       30p         2.5A       FUSE71       30p         3.15A       FUSE72       30p	0.4A	FUSE63	30p
0.8A     FUSE66     30p       1A     FUSE67     30p       1.25A     FUSE68     30p       1.6A     FUSE69     30p       2A     FUSE70     30p       2.5A     FUSE71     30p       3.15A     FUSE72     30p	0.5A	FUSE64	30p
1A FUSE67 30p 1.25A FUSE68 30p 1.6A FUSE69 30p 2A FUSE70 30p 2.5A FUSE71 30p 3.15A FUSE72 30p	0.63A	FUSE65	30p
1.25A       FUSE68       30p         1.6A       FUSE69       30p         2A       FUSE70       30p         2.5A       FUSE71       30p         3.15A       FUSE72       30p	0.8A	FUSE66	30p
1.6A     FUSE69     30p       2A     FUSE70     30p       2.5A     FUSE71     30p       3.15A     FUSE72     30p	1A	FUSE67	30p
2A FUSE70 30p 2.5A FUSE71 30p 3.15A FUSE72 30p	1.25A	FUSE68	30p
2.5A FUSE71 30p 3.15A FUSE72 30p	1.6A	FUSE69	30p
3.15A FUSE72 30p	2A	FUSE70	30p
	2.5A	FUSE71	30p
4A FUSE73 30p	3.15A	FUSE72	30p
	4A	FUSE73	30p



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ı	0.125A	FUSE78	35p
	0.16A	FUSE79	35p
	0.2A	FUSE80	30p
	0.25A	FUSE81	30p
l,	0.315A	FUSE82	30p
J	0.4A	FUSE83	30p
	0.5A	FUSE84	30p
î	0.63A	FUSE85	30p
	0.8A	FUSE86	30p
	1A	FUSE87	30p
	1.25A	FUSE88	30p
1	1.6A	FUSE89	30p
	2A	FUSE90	30p
	2.5A	FUSE91	30p
	3.15A	FUSE92	30p
	4A	FUSE93	30p
	5A	FUSE94	30p

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^^^								
	50 - 10 - 1 - 1 T	GH VOLTAG	E CE	RAMIC CA	PACITO	RS		
VALUE	VOLTAGE	ORDER CODE	PRICE	VALUE	VOLTAGE	ORDER CODE	PRICE	
220 pF	2000v	CAP01	90p	1200 pF	3000v	CAP08	225p	
330 pF	2000v	CAP02	90p	1500 pF	2000v	CAP09	130p	
470 pF	2000v	CAP03	90p	1500 pF	3000v	CAP10	225p	
680 pF	2000v	CAP04	95p	2200 pF	2000v	CAP11	130p	
820 pF	3000v	CAP05	150p	3300 pF	2000v	CAP12	145p	
1000 pF	2000v	CAP06	110p	4700 pF	2000v	CAP13	180p	
1000 pF	3000v	CAP07	225p	212				

	SM	D ELECTRO	OLYTIC	105° CA	PACITO	RS	
VALUE	VOLTAGE	ORDER CODE	PRICE	VALUE	VOLTAGE 25v	ORDER CODE CAP22	PRICE 300p
22 μF 47 μF	6.3v 6.3v	CAP14 CAP15	110p 110p	100 μF 1 μF_	50v	CAP23	110p
100 μF 10 μF	6.3v 16v	CAP16 CAP17	130p 110p	2.2 µF 4.7 µF	50v 50v	CAP24 CAP25	110p 110p
22 µF	16v	CAP18 CAP19	110p 130p	10 μF 22 μF	50v 50v	CAP26 CAP27	130p 180p
47 μ <b>F</b> 470 μF	16v 16v	CAP20	320p	47 µF	50v	CAP28	300p
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- \* AC VOLTAGE: 200mV/2V/20V/200V/700V
- \* DC CURRENT A: 200µA/20mA/200mA/2A/20A
- \* AC CURRENT A: 200µA/20mA/200mA/2A/20A
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- 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 CURRENT A; 2mA/20mA/200mA/20A AC CURRENT A: 200mA/20A
- RESISTANCE Ω: 200Ω/2kΩ/200kΩ/2MΩ/20MΩ/
- 200MΩ CAPACITANCE: 2nF/20nF/200nF/2\*F/20\*F

ORDER CODE: CM3920 **PRICE: 4100p** 

★★★ PLEASE NOTE THAT POSTAGE ON ALL THE ABOVE METERS IS CHARGED AT £3 ★★★

## HELP WANTED

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

Wanted: The following in any condition for spares: Panasonic NVW1 and NVV8000, Sony SLHF950 Super Beta. Also require Pro-X Beta tapes. Phone Graham on 01604 843 536.

Wanted: Circuit diagram for the Amstrad fax Model FX7000. Does anyone know about a dead machine fault that blows the input circuit protector? Laurie Watkinson, Telesonic, Week St. Mary, Holsworthy, Devon EX22 6UJ. 01288 341 254.

Wanted: A LOPT for the Nikkai Tara 10 portable, also a circuit diagram. A second-hand LOPT would be OK and a photostat circuit. R.J. Long, 70 Bonfields Crescent, Havant, Hants PO9 5ER. 01705 479 678.

Wanted: LOPT part no. TLF700-24A for the Nikkai Model TLG010 and LOPT part no. BSC-24-10A for the Huanyu Model 37-C3. John McCallan, 72 Mullinslin Road, Omagh, County Tyrone, N. Ireland BT79 9PQ.

Wanted: Mechanical channel selector for the Grundig CUC42 (series 816). D. John, Central Electronics, 6 Queen Street, Stirling FK8 1HN. 01786 451 230, fax 01786 949 830.

Wanted: Any Thorn/Ferguson 3000 series chassis PCBs, especially working. Also LOPTs for the GEC dual-and single-standard hybrid colour chassis (Models 2038 and 2040) and an external teletext converter. Pat Hildred, 56 Theydon Street, Walthamstow, London E17 8EL. 0181 988 0310.

Wanted: Philips car record player, circa 1960. Any parts, service information or complete units, working or faulty. Martin Randall, 3 Ashcroft Road, Cirencester, Glos. 01285 658 715

Wanted: Service manual and circuit diagram for the Pace MSS200 satellite decoder, photocopies OK. Also a PTV113 chip for this machine, second-hand OK. Wayne Brill, 31 Parnell Road, Ipswich, Suffolk IP1 6SP. 01473 742 568.

Wanted: Used electronic test equip-

ment such as an oscilloscope with component tester, Fluke digital meter and used service manuals for TV sets, VCRs etc. Allah Rakha, New Diamond Electronics, 21 Bell Street, London NW1 5BY.

Wanted: Line output transformer for the Decca 30 series (Bradford) chassis, or complete set. D. Newman, phone 01202 730 935 or e-mail

Newdave07@aol.com

Wanted: LC display for the AVO DA116 test meter. Also any service information on the Farnell DM131 digital meter. B. Senior, 1 Bedale Close, Coalville, Leicester LE67 3BA. 01530 832 088 or 01530 810 962.

Wanted: Remote control handsets for the Grundig Model GT1402 and Osaki Model P145R. Also start-up disks for the Amiga A1200 computer. M. Payne, 66 Nevinson Avenue, South Shields, Tyne and Wear NE34 8WP. 0191 536 3744.

Wanted: Panasonic NV430B VCR in working order or not. P. Ward, Petgra Forest Corner, Ringwood, Hants BH24 3JW. 01425 475 445.

For sale: Many back issues of *Television*, 490 in all, from the years 1950-1997. Phone or send for details. B.A. Milne, 149 Pleckgate Road, Blackburn, Lancs BB1 8QR. 01254 240 315 or 0973 510 295.

Wanted: Remote control unit for the Proline Model 3200. Also help with no sound after a power supply blow up. H. Foyne, 7 Ennerdale, Tanhouse, Skelmersdale, Lancs WN8 6AG.

For sale: Finlandia 25in. stereo Nicam model (Salora M chassis) with field scan fault. Also working Philips G11 chassis panels. R. Berwick, 493 Romsey Road, Maybush, Southampton SO16 9GN. 01703 787 033.

Wanted: Following copies of *Television*: Aug 1988, July 1989, Oct 1989, Jan 1993, Sept 1995, Oct 1995, May 1998, Aug 1998. Have one surplus Sept 1993 copy. L.C. Dilke, 106 Coldbath Road, Kings Heath, Birmingham B13 0AH.

Wanted: Any service information for a Philips projection TV/radio Model 799 dating from the Fifties, or any details of Philips projection TVs using EF50s. Steve Taylor, 11 Charnborough Road, Coalville LE67 4SF. 01530 832 695 or 07977 805 308.

For disposal: Over 700 valves from AC/VP1 to X65. Please write for details to R.W. Noake, 69 Hazelhurst Road, Kings Heath, Birmingham B14 6AB.

Wanted: Diagrams for building a scratch filter circuit for use when playing worn vinyl or 78 r.p.m. records. A working unit at a reasonable price would be considered. David Evans, 70 Dallow Street, Burton-on-Trent, Staffs DE14 2PQ. 01283 573 177.

Wanted: Teletext PCB for the Ferguson Model D51ND. W. Simmons, 24 Standhill Crescent, New Lodge, Barnsley S71 1SU. 01226 238 204.

Wanted: I would like to build the Test Card Generator featured in the May/June 1979 issues of *Television*. Does anyone have the PCBs (D062/3 I think) or any part-built or faulty ones? C. Williams, 32 Aylesborough Close, Kings Hedges, Cambridge CB4 2HH. 01908 568 745 daytime.

Wanted: Decade resistance and capacitance box. Peter Antcliff, 63 Chester Road, Stevenage, Herts SG1 4JY. 01438 225 602.

Wanted: Circuit diagram for the Protech 3743 14in. CTV (photocopy OK). C. Rayner, 39 Northway, Lymm, Cheshire WA13 9AT. 01925 822 673 after 6 p.m.

For disposal: Service department clearance. Large quantity of service manuals, modern types, Sony, Panasonic, Technics, JVC etc. Test gear (scope, signal generators etc.). Large assortment of serviceable CTV sets, VCRs, audio equipment and spares. All very cheap as space is needed for other things. Jolly's Radio Ltd., 128-130 Hawthorn Road, Kingstanding, Birmingham B44 8QA. 0121 382 1312.



Reports from
Philip Blundell, AMIIE
Chris Watton
Gerald Smith
Ken Rigby
Martyn Davis, MIIE
Pete Gurney, LCGI
Graham M. Colebourn
and Colin J. Guy

#### **Grundig GV420**

If the drum motor is noisy, don't immediately order a new one. Take a few minutes to remove the cover at the base of the motor and check whether the grease on the spindle thrust pad has hardened. Regreasing the pad sometimes cures the noise. P.B.

#### Mitsubishi HSB12

If the picture obtained via the RF and scart sockets is poor, i.e. with weak contrast and poor sync, check C2B4 (10µF, 50V) which tends to go low in value. **P.B.** 

#### **JVC HRDX22**

This machine had no control track operation, no playback colour and the tape counter ran very fast. It was all the result of power supply problems. The cure was to replace C24, C25 (both  $680\mu F$ ) and C32 ( $470\mu F$ ). C.W.

#### Hitachi VTF350

A long list of fault symptoms was attached to this not too old machine: intermittent stops in record, intermittent lines on the picture, picture pauses during playback, sound distorts, mains fuse blows every two months. I suspected the power supply, because of the tell-tale sign of a change in luminance level during eject – this is when the power supply is most heavily loaded and the voltages

## VCR Clinic

drop. Many of the electrolytic capacitors read low when checked with our tester. So I decided to replace the lot: nine on the secondary side of the power supply, two on the primary side. After that the machine worked correctly. C.W.

#### **Amstrad VCR400F**

There was no sound with this machine's recordings. E-E and playback of prerecorded tapes were good, and the erase bias was OK. A check at pin 21 of IC201 showed that the audio was lost here even though rec H at pin 24 was present. A replacement chip restored normal sound. C.W.

#### Sanyo VHR251

There were various intermittent faults – speed changes and failure to eject were the most the most frequent. The cause was a row of dryjoints in the power supply. C.W.

#### GoldStar T161

This machine was dead with no clock and no functions. Checks in the power supply showed that the primary side was not running or even trying to start. I replaced the start-up resistor and the 33µF electrolytic capacitor but the situation was no better. The diodes on both sides of the circuit were OK, also ICP01 and FEP01. The cause of the trouble turned out to be optocoupler ICP02. G.S.

#### Ferguson FV62L

This machine was dead with the mains fuse blown and the chopper transistor TP08 short-circuit. After fitting a power supply repair kit the machine loaded but there was no display and no front-key operation. There was also no –25V output from the power supply, at pin 1 of socket BP02. The negative supply rectifier DP51 was open-circuit.

Once this diode had been replaced the display requested the code to be entered. Everything then functioned correctly. **K.R.** 

#### Akai VSG470

This machine would load and play tapes only when the lid was off and light fell on the left-hand tape sensor. It's usually the other way round I thought. The central lighthouse assembly had of course been knocked, possibly because a cassette had been inserted backwards. Resoldering it cured the fault. M.D.

#### Samsung SI1260

According to its owner this machine had made a whirring noise all night, followed by a burning smell. Why did he leave it on all night? Needless to say there was a tape (nothing interesting!) jammed inside. The KA8301 motor drive chip IC206 had died. A BA6209 from a scrap deck cured the fault. M.D.

#### Aiwa HVFX2800

The head-switching point was misadjusted, the result being an unsightly line at the bottom of the playback picture. To set it up in this machine you play back an alignment (or good quality) tape, centre the tracking by pressing the auto-tracking button for more than two seconds, then set the switching point by holding down the play button for more than three seconds. Quite simple really – as long as you know which buttons to press! M.D.

#### Amstrad DD8900

The complaint was no play with one deck, fortunately the top one of the pair for a change. While checking I found that fast forward/rewind worked correctly but in play the

take-up reel refused to rotate. The belts were obviously intact, as the only function that didn't work was play, and I initially suspected a drive clutch problem.

Closer examination after inserting a transparent dummy cassette revealed the cause of the trouble: the felt pad on the soft damper to the take-up reel had fallen off. This left only the remnants of the glue that had held it in place on the damper arm. Because direct drive is applied in fast forward/rewind, there was little effect on these operations. But in play the drive is applied via a clutch. This was enough to stall the take-up reel.

A replacement pad, made from a suitable back-tension band, cured the problem when securely glued. **P.G.** 

#### Matsui VX1105

This budget centre-deck VCR intermittently failed to load a cassette: either the cassette would be rejected or the machine would fail to complete loading then shut down. In every one of these machines I've come across the cause of this fault is a dirty mode switch. The switches seem to have some sort of lubricant in them from manufacture. After a time it becomes quite viscous. In each case stripping the switch down and cleaning has cured the trouble.

Before you dismantle the switch and deck, make a careful note of the timing marks. They are quite prominent and easy to spot.

While the deck is out, clean the switch/deck edge connectors and their corresponding contacts on the main board. They rely on pressure to make contact and tend to suffer from oxidisation problems. Doing this will improve reliability. **P.G.** 

#### **Amstrad VCR6000**

This old timer was apparently dead. It had no clock display and refused to accept a tape. A check at the power supply output connector produced correct readings however, but the voltages around the main microcontroller chip were low. Further investigation brought me to the nearby 78L05 5V regulator IC651. Its input was correct, but its output was low at 3.5V. As I didn't have a replacement in stock I decided to fit the higher-rated 78M05. This restored the display and normal operation. **P.G.** 

#### **Bush VCR177**

This 1996 machine was extremely slow to load or eject a cassette and

play, record or spool a tape. A check at the capstan motor connector showed that the 12V supply was weak – the voltage fell perilously whenever there was a load. The main items in the 12V regulator are a zener diode and an npn emitter-follower transistor, Q802. They are on a little heatsink near the front. The transistor was too busy oscillating at HF to attend to its proper job. Its emitter decoupling capacitor C806 (47 $\mu$ F, 16V) was in a poor state.

The heatsink is wrapped neatly around the components and gets nice and hot. So all the 85°C-rated electrolytics can be expected to fail sooner or later. G.M.C.

#### Panasonic NVG40/NVG45

There was no front panel fluorescent display because C1020 (330 $\mu$ F, 6V) on the power supply PCB had leaked. It's the reservoir capacitor for the display's heater supply. A 220 $\mu$ F replacement will suffice, as it's an HF supply, but the rating should be 105°C.

I was not sure but wondered whether the original had been fitted back-to-front. The leakage from C1020 had corroded the track between D1009 and the -29V supply's reservoir capacitor C1018 (10μF, 50V). It's worth checking this capacitor as well. G.M.C.

#### Mitsubishi HSB82

There was poor E-E picture quality and recordings tended to improve as the machine warmed up. At its worst the picture was very blurred, frizzy and in black-and-white only. "Out of tune!" we declared, but it wasn't. "Dried up surface-mounted electronytics" we roared. Not so. The cause of the problem was cracked solder joints at the vision IF SAW filter inside the IF can. G.M.C.

#### Hitachi VTM740/VTF770

The playback pictures were fractured, with horizontal bands of noise. Fortunately the machine's owner had declined a quote to replace the heads, because they were perfectly OK.

Repeated tests revealed that the bands of noise and the headswitching point moved to new positions whenever the drum was stopped between tests, indicating loss of the drum-phase signal. The culprit was C1656 (10µF, 25V), which passes on the drum-phase pulses at pin 11 of the 15-pin connector PG1643 on the main PCB. G.M.C.

#### Samsung VIK320

The power supply was pulsing gently because of a short across the PC12 output. This rail follows a long and tortuous route all over the PCB. I eventually found that the cause of the trouble was C502, a 100µF electrolytic which is mounted next to the audio chip IC501. C.J.G.

#### Goodmans VP2350

This Philips clone wouldn't record in colour. The expensive LA7437A luminance/chrominance processing chip was the cause of the fault. **C.J.G.** 

#### Panasonic NVL20

The picture would break up into lines in forward search only. In these machines the cause is often lower drum wear. Not this time however. In fact there was more or less normal operation when the control head pins were shorted together. The culprit was the servo/syscon chip IC2001. C.J.G.

#### Philips VR6185

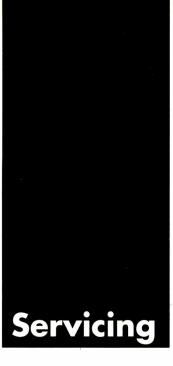
This Charlie deck machine slammed the tape against the endstop on rewind, as often as not breaking the tape. The infra-red LED in the centre of the deck was open-circuit. There is obviously no safety circuit as there used to be when bulbs were used for this job. **C.J.G.** 

#### Samsung VI710

These old machines can still give a good account of themselves when in good order, and are therefore worth repairing. This one worked all right in the E-E and playback modes, but when record was selected the E-E picture disappeared. The record 9V line was found to be low, in turn because the PC12V line went low when record was selected. The cause of the trouble was Q105 (2SB772) which was open-circuit base-to-collector. C.J.G.

#### Mitsubishi HSB12

The carriage continued to try to eject when fully out, followed by shut down. If a tape was wound in manually it would be played normally. The cause of the trouble became obvious when I rewound the tape: it hit the endstop then broke. The infra-red LED at the centre of the deck was faulty. It was conductive and wasn't short-circuit, but didn't emit any IR radiation. A replacement cured the carriage problem. C.J.G.



As a follow-up to last month's article on the Indiana 100/200 chassis, Alan Dent provides fault notes on the different tuning/control PCB used in the 200 version

## the Indiana 200 chassis

his chassis is very similar to the Indiana 100, which was covered in detail last month. The exception is the TCR (tuning control) panel, which also contains the colour decoder and, where incorporated, the teletext decoder chips – some models don't have teletext. The remote control handsets are also different. Some versions made in Romania have an electronically-switched AV board.

For fault conditions not covered below, refer to the Indiana 100 chassis.

#### TCR Panel

This panel houses the PCA84C640/030 microcontroller chip IC300, which has I<sup>2</sup>C bus connection. It provides the following functions: key panel control; tuning and analogue memory control; AFC; on-screen display (OSD) generation; and teletext control. The device has proved to be fairly rugged – unless there's a serious CRT flashover.

Tuner band switching is used in Irish and continental models only. The OSD displays the band selected and auto-switches at the end of each sweep. The band-switching components are deleted in UK models – a 12V supply is hardwired via link J1 to the tuner and the OSD band switching is disabled by fitting link J2.

Fault conditions experienced with this panel have been as follows.

No tuning but the OSD progresses: Check the output at pin 1 of IC300. There should be a 5V peak-to-peak squarewave whose mark/space ratio changes as the tuning progresses. Check the 33V tuning voltage supply: if low replace D001 (ZTK33) and C001 (the CRT may have flashed over). Q300 could be faulty or R312 opencircuit.

Tuning drift outside AFC: The gain of Q300 could be changing; the value of R312, R313, R314 or R364 could be varying; C304, C306 or C322 could be leaky; the connector pins of K300 or the PCB tracks to the tuner could be intermittent. The mark/space ratio of the squarewave output at pin 1 of IC300 could be changing: this is unlikely, but if so check X300 and IC300.

AFC drift: Check whether the tuning voltage is changing (1V = 15MHz). If the voltage is stable, set up the AFC – follow the method laid down in the manual. If drift is still experienced, check R327/8, Q307 and C309 which could be leaky.

Will not stop sweep tuning: Ident at pin 29 of IC300 missing when a video signal is passed. Cause may be pin 6 of K300 open-circuit or any components associated with Q310/1.

Slow tuning and slow function operation: Scope the SDA and SCA lines. If there are bursts of pulses, not continuous, IC900's 12V supply is missing (text only models). This upsets the data and clock lines. Check where the tracks go via the small interface PCB: the 12V line is likely to be broken here.

**Keyboard matrix faulty:** The cause is usually K301 or the ribbon wire broken at the control PCB. If, with Turkish produced models, only one button is faulty it can be removed, rotated through 180°, and refitted. With Romanian produced models the button must be replaced if cleaning does not cure the fault.

No OSD or wrong colours: The outputs at pins 22/23/24 of IC300 are fed to IC500 via a resistive network and IC302. If one of the colours is/are missing, check IC302 and the resistor matrix. Check the V synch or sandcastle inputs at pins 26/27 of IC300 if there is no OSD.

**OSD display cramped:** R362 sets the OSD timing oscillator. C315 is the timing capacitor.

OSD jittering: The V sync signal is missing.

The microcontroller won't come out of standby unless the mains button is held in: IC300 has been damaged by a CRT flashover. For protection, fit a 100nF capacitor between pins 36 and 41.

TV starts up without start-up contacts: D308 is short-circuit.

Memory will not store and fast sweep on first pass: R391 is open-circuit.

**Memory will not store:** Check whether R390, R369 or R370 is open-circuit. IC302 could be faulty.

Fusible resistor R1329 (33 $\Omega$ ) open-circuit: This can occur with non-text sets. Some batches of IC1300 with date codes 5W or 5WX can cause large currents to flow when C1323, which is fitted to protect IC1300 in the event of a CRT flashover, is 100nF. Reduce the value of C1323 to 4.7nF – it will still provide protection.

#### **Teletext**

The text chip set is totally different from that used in the 100 chassis. It's controlled by IC300 via an I<sup>2</sup>C bus. While various options could be fitted, i.e. Fastext, Tops Text or different languages, in production the chassis was fitted with only a standard four-page text option.

The text contrast is not set by the microcontroller chip: it's set by a resistor network around IC302.

Text faults are as follows.

**No text, bar at top left of screen when text is selected:** The SCL line to IC901 travels around three-quarters of the PCB at the edge. In some cases this track may have been broken or badly etched around the corner, where there is a mounting hole.

**No text, blank raster:** Check the RGB outputs from IC901. Check the sandcastle pulse input at pin 11 of IC901. Check the I<sup>2</sup>C clock and data lines to IC901.

Corrupt text: Check the alignment of the video detector coil L102 on the main PCB: try turning its core a quarter of a turn each way to correct. IC900 could be faulty; C917/1917 (1nF) could be leaky; C916/1916 (470pF), C914/1914 (270pF) or C913/1913 (100pF) could be open-circuit.

The problem can also be caused by RAM (IC902) address or data failure: the display will be random, i.e. the symptoms may change each time text is selected.

No text, headers and page no. OK: C915/1915 (22nF) is open-circuit.

No text, page no. only: X901/1901 (13.875MHz) could be faulty. Any of the following could be open-circuit: C909/1909 (27pF), C912/1912 (15pF), L900/1900 (15µH).

**Text not synchronised:** No video input via K900 or X900/C908 misaligned.

#### **Striations**

In its unmodified form this chassis can show unacceptable striations because of excessive radiation from the line output transformer and the long leads that connect the main PCB to the TCR panel. Several modifications, as follows, are required to cure the problem:

- (1) Fit a screening can around the LOPT.
- (2) Remove connector K501 from the main PCB. If it has not been modified, remove the ribbon wires to pins 8 and 9 and make the same disconnection at the connector on the TCR panel. Fit a small DIMS screened lead to the connector at the TCR end: connect the other end to a hole adjacent to R508 and the luminance delay

line (only the centre wire is connected at this end).

(3) Change the value of C009 from  $10\mu F$  to  $100\mu F$  or replace the Telefunken 3010 tuner with a Philips type U910.

#### **Flashovers**

Quite a number of 20in. sets were fitted with an Orion 22mm mini neck tube. This is prone to flashover, which can destroy IC300 (PCA84C640/030), D001 (ZTK33) and IC500 (TDA3561). These components can be protected, without need to replace the tube, by carrying out the following modifications:

- (1) To protect IC300, add a 100nF capacitor between pins 36 and 41, on the rear of the PCB.
- (2) To protect D001, increase the value of C001 from 1nF to 100nF.
- (3) To protect IC500, add a 100nF, 250V capacitor across C709 on the tube base panel.

#### **Remote Control Units**

The handset contains an SAA3010 chip with a matrixstyle keyboard and a pair of IR diodes. If there's no operation, check the output from the IR detector. If there's no output, check the battery voltage, the battery contacts, the ceramic resonator and the IC.

#### Make sure you get your copy of

## TELEVISION

It can be difficult finding a copy of *Television* at local newsagents. The number of magazines being published keeps on increasing, which means that newsagents have less shelf space for the display of different publications. Specialist magazines in particular get crowded out.

There's a solution to the problem. Most newsagents provide "shop-save" and/or homedelivery services. There's no charge for a shop save. You simply ask your newsagent to order a copy for you: it will be kept on one side each month ready for you to collect. Home-delivered copies are ordered in the same way, but often incur a delivery charge.

A newsagent can order any magazine for you, whether or not the shop normally stocks it.

If you buy your copies of *Television* from a newsagent and want to make sure you get every issue, just ask at the counter.



Part 3 of K.F. Ibrahim's series tells you everything you need to know about the various types of memory devices and the way in which computer memory is used

# **Operation & Repair**

computer requires memory devices to store programs and routines. These consist of sequences of instructions and related data. Memory is also used to store temporary or permanent data that's used or created by the program. When a program is being run, the CPU will need access to the memory store at a rate of 10-50MHz.

In theory any type of memory store can be used, including a disk drive, provided it's large enough to store the program instructions and associated data. But because disk drives are extremely slow in comparison with the speed at which the CPU operates, use of them as the main processor memory is impractical – the processor would spend more of its time waiting for access to the disk drive than carrying out program instructions. Thus the main memory, where application and other support programs are loaded, must operate at a speed comparable to that of the CPU. This means a memory store that consists of integrated circuits. A small amount of memory is also provided in the processor itself.

Memory chips

Two main properties determine the use of particular types of memory chip: these are the storage capacity (size) and access time (speed).

A memory chip contains a number of locations, each of which stores one or more bits of data (the bit width). Storage capacity is the product of the number of locations multiplied by the bit width. For example a chip with 512 locations and a 2-bit data width has a memory size of  $512 \times 2 = 1,024$  bits. Since the standard unit of computer data is a Byte (8 bits), this storage capacity is normally expressed as  $1,024 \div 8 = 128$ Bytes.

The number of locations depends on the chip's address width. For example a 2-bit data width chip with 10 address lines has  $2^{10} = 1,024$  locations. This is referred to as 1K locations. Given an 8-bit data width, a 10-address width chip has a memory size of  $1,024 \times 8 = 1 \text{K} \times 1 \text{Byte} = 1 \text{KByte}$  or 1 KB.

In practice a number of chips are usually connected in parallel to form what is known as a memory bank.

Access time is the speed at which a location within a memory chip can be made available to the data bus to which the chip is connected. It's defined as the time interval between the instant when an address is sent to a memory chip and the instant when the data stored at the address location appears on the data bus. Access time is specified in nanoseconds (ns). It varies between 20ns and the relatively slow 200ns. Table 1 compares the characteristics of various types of memory chip.

#### Chip markings

The marking on a memory chip indicates its size and speed. A typical configuration is

XXXYZZZ-S

where XXX is the manufacturer's identity, Y the bit

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.

K.F. Ibrahim is a

Table 1: N	lemory o	hip com	parison			
Property	DRAM	SRAM	ROM	<b>EPROM</b>	EEPROM	Flash
Capacity	MB	КВ	KB	KB	KB	KB
Speed (ns)	60-120	20-40	200	400	400	100
Life span	Long	Long	Long	Short	Short	Short

(data) width, ZZZ the number of locations in K and S the speed in ns. A speed indication of -60 means a speed of 60ns. Sometimes the last digit is missing, e.g. -10. This indicates a speed of 100ns, since the fastest access time is 20ns. The number of locations (two or three figures) is a standard size, e.g. 64K, 128K, 256K and 512K. One Mega Byte (MB) is usually indicated by 1000, 1024, 100 or 10, 4MB by 4000 or 400. The number to the left of the location specification is the data width, in bits. Hence TMS841128-7 indicates a chip with 128K 1-bit locations and an access time of 70ns.

#### RAM

The Random Access Memory (RAM) is a volatile memory chip that can be used to read data from or write it into – it's also known as a read/write memory. Data is held in the device for as long as DC continues to be applied to it. There is random access to locations by putting the selected location address on the chip's address lines. Fig. 1 shows RAM chip connections. In addition to the address lines and the data input/output connections there are three control lines, which are all active low: write enable  $(\overline{WE})$  goes low when the CPU wishes to write (insert) new data at the selected location; output enable  $(\overline{OE})$  goes low when the CPU wishes to read (extract) data from the selected location; chip select  $(\overline{CS})$  goes low when the selected location is within the address range allocated to that particular chip.

There are two main types of RAM, dynamic (DRAM) and static (SRAM). DRAMs store information in the form of a charge on a MOS capacitor. Because of leakage, the charge is lost and thus has to be restored at frequent intervals – between 2-4ms. This process is known as refreshing the memory cells. The advantages of a DRAM are high storage density and very low power consumption. SRAMs use flip-flops as the basic storage cell and require no refreshing. They are very fast: the access time is 20ns or less, compared with a DRAM's 60ns. But they are more expensive than the dynamic variety. This inhibits their use as the main memory store in a computer system.

#### **Multiplexing**

Because of their low cost and high storage capacity DRAM devices provide the bulk of computer memory – a few Mega Bytes. As the number of address pins that would be required to accommodate this memory size is physically inhibitive for manufacturing purposes, address multiplexing is used. Fig. 2 illustrates this.

A multiplexer chip receives the full complement of twenty address lines from the address bus. The address is then fed to the memory chip in two stages, first A0-A9 then A10-A19 – to the same memory chip pins. Two memory chip control pins, /CAS (Column Address Strobe) and /RAS (Row Address Strobe), route the two address sets to two internal latches. The full address is then held within the memory chip for long enough to give access to data at the selected location.

#### **NV-RAM**

The data stored in a RAM chip can be preserved when the mains supply is disconnected by using a back-up battery to maintain the DC supply. To avoid the need for back-up batteries the non-volatile RAM (NV-RAM) can be used. In an NV-RAM chip each memory cell has a shadow non-volatile storage transistor. Data is fed to the cells in the normal way, but can be transferred to non-volatile storage cells when an enable signal is applied. The main disadvantage of this type of device is its reduced component density – about five times the chip

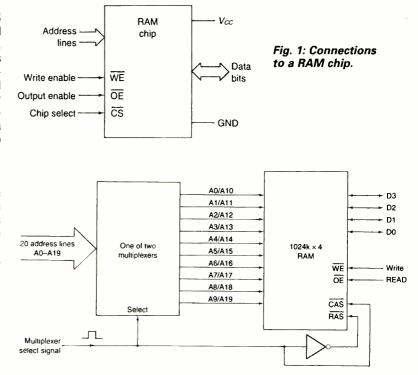


Fig. 2: Principle of multiplexing.

area of a normal RAM is required to provide the same storage capacity. Another disadvantage of the NV-RAM is its relatively long access time.

#### ROM

Although computer memory consists mainly of RAMs, ROM (Read Only Memory) devices are also required. They store the start-up program, configuration details, input/output routines and conversion tables. Compared with RAMs, ROM devices are slow, with a typical access time in excess of 200ns. This makes them unsuitable for applications, such as video graphics, where fast memory access is required. There are several types of ROM device.

Mask ROM is a non-volatile memory that stores data permanently. The stored data can only be read: new data cannot be written into the device. A ROM of this type is programmed by the manufacturer in accordance with a preset specification, and once entered the data cannot be altered.

PROMs (Programmable Read Only Memories) fulfil the same basic function as a ROM device but can be programmed by the user, a process known as 'blowing' the chip. Once it has been programmed, a PROM cannot be altered.

The EPROM (Erasable Programmable Read Only Memory) overcomes this limitation, enabling the user to delete or erase the stored data and thus change the program. The program stored in an EPROM can be erased by exposing the memory cells to ultra-violet light via a 'window' in the IC package. This process takes 20-30 minutes, after which the IC is in a 'blank' state ready to be reprogrammed.

The EEPROM (Electrically Erasable Programmable Read Only Memory), which is also known as an EAROM (Electrically Alterable Read Only Memory), can be programmed and erased while still in circuit by the application of suitable electrical signals.

Continued on page 580

## A Run-on Timer Circuit

## This delayed switch-off arrangement, devised by Keith Cummins, could find several uses. The basic aim was low cost with reliability

here are situations where something needs to be switched off, but not immediately. My problem arose with an extractor fan that vented steam from the shower: it was a nuisance to have to get up and switch it off after going to bed. Hence this run-on timer, which had to be inexpensive but reliable.

**Design Considerations** 

The power supply is often the most costly part of a piece of equipment, so I decided to investigate the feasibility of a design that didn't require a mains transformer. As the idea developed, it became clear that the unit could be used to replace a switch connected by a two-core cable. This opened up a further application: it could be retro-fitted to control lighting.

The delay time often needs to be quite lengthy, up to say fifteen minutes. While a 555 timer chip can provide such a delay, the time-constant has to be correspondingly long, involving high resistance and large capacitance values. I've always tried to avoid this, believing it preferable to use a binary divider to count down clock pulses generated at a higher frequency. This is the technique used in the design presented here.

Use of a counter is also helpful in that it can provide an output to drive a flashing LED. The unit employs two industry-standard CMOS ICs that are readily available and cost a matter of pence.

Fig. 1 shows the basic switching and power supply arrangement. It operates by 'stealing' voltage from the load. In the 'off' state the switch is open. Mains voltage is fed via the load, in my case the fan motor, to a bridge rectifier which produces an output that consists of unidirectional peaks. As a result capacitor C is charged via resistor R, the potential thus developed being held at 12V by zener diode D. The CMOS circuit used requires only a small current, so the value of R can be high. The small current (2mA) is insufficient to affect the load.

In the 'on' state the switch is closed, shorting out R. The output from the bridge rectifier is clamped at 12V by the zener diode, and the rest of the mains voltage appears across the load.

Mains AC NO C D 12V

In the circuit to be described, the switch in the basic circuit is replaced by a set of relay contacts.

#### **Full Circuit**

Fig. 2 shows the complete circuit. In this practical arrangement a fuse is included and a VDR provides protection when an inductive load is being switched. The relay contacts are arranged as two sets in series to provide adequate voltage-handling capability.

IC1, a 4001 device, contains four two-input NOR gates. Two are used as a LF oscillator to provide clock pulses for the 4020 counter IC2. The other two NOR gates are used as a latch.

In the load-off state, rectified mains pulses, attenuated by R2 and clamped by D2, are applied to the latch (pin 1), which is thus held in its reset mode. Pin 4 is high, so Tr1 is off. Thus no voltage is applied to the relay coil or Tr2 and the relay contacts are open.

When SW1 is closed, 12V is applied to pin 6 of IC1. Pin 4 goes low and Tr1 turns on. Although the current via R1 is insufficient to energise the relay, C1 has sufficient charge to pull it in, closing its contacts. When the contacts close, the much larger current flow provides enough energy to keep C1 charged and the relay energised.

Closing SW1 also resets IC2 (pin 11). Its outputs, including the ones which we are using here (Q4 pin 7 and Q14 pin 3), are low. As Tr2 now has voltage at its emitter and Q4 is low, Tr2 switches on and D4 lights up.

When SW1 is open-circuited, the supply to pin 6 of IC1 (set) and pin 11 of IC2 (reset) is removed. The latch does not reset, because Q14 is still low and there are no attenuated mains pulses via R2 – as the relay contacts are closed, the input end of R2 is at 12V instead of receiving 340V peaks.

IC2 now starts to count each input from the clock oscillator, which runs at about 5Hz. Output Q4 pulses high and low, switching Tr2 off and on. The LED thus flashes to indicate that the unit is timing out. This is especially useful if a pull-cord switch is used.

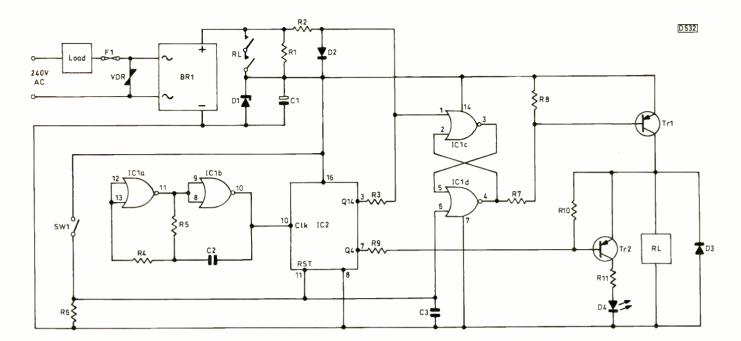
Once IC2 has counted 8,192 transitions, output Q14 goes high. This resets the latch. Tr1 switches off, the relay and consequently the load are de-energised, and the LED goes out. The mains-derived reset pulses ensure that the latch cannot set 'by accident', and the unit awaits the next 'on' instruction.

#### **Delay Time**

The clock oscillator frequency determines the delay time. It can be adjusted by altering the value of R5. The frequency of a complete cycle, i.e. two transitions, is given by

 $f = 1/(2.2 \times R5 \times C2)$ .

Fig. 1: The basic switching and power supply arrangement.



With the values used here, this works out at 4.54Hz. When I checked this I found that the actual frequency with the prototype unit was 5.2Hz, presumably because of component tolerances. The number of transitions per second is thus 10.4 and the total delay is  $8,192/(10.4 \times 60)$  = 13 minutes.

If you want a different time, just change the clock frequency. For example, if R5 is  $470 k\Omega$  instead of  $1M\Omega$  the delay time will be about 6.5 minutes. Increasing the value of R5 to  $2\text{-}2M\Omega$  will provide a delay of nearly half an hour.

#### **Design Detail**

If you need to be able to cancel the run-on, simply connect a push-to-make switch in parallel with D2. The latch can then be reset manually.

I would like to be able to claim that the circuit worked perfectly first time. It didn't! At the end of the time-out the sequence would sometimes immediately restart. The cause was a transient induced on the latch set line when the switch was off and the opening relay contacts interrupted the inductive load. The problem was cured by adding C3.

#### **Construction and Testing**

Stripboard is suitable for constructing the unit. A point to watch is the clearance between the high-voltage part and the rest of the circuit. It's best to cut away unused strips and provide a clearance of at least 3mm. The stripboard panel can be housed in a small plastic box: I used a small Maplin project box that cost about £1.50.

Because of the lack of mains isolation, you need to be careful when testing the unit. I used a mains isolating transformer and, as the load, a 15W bulb. You can then connect the scope's ground to the notional 0V line with relative safety – though you still don't want to place a finger across the open relay contacts!

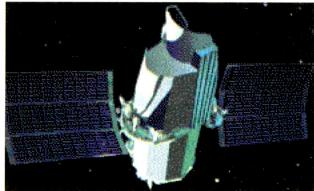
The current switching capacity of the unit is determined by the ratings of the bridge rectifier, the relay and D1, which is a 5W device permitting approximately 400mA. The quiescent dissipation is about 500mW, mostly in R1, costing possibly 30p a year. I see no reason why these components shouldn't be 'beefed up', except perhaps that the energy 'stolen' from the load and dissipated in a large zener diode could be considered excessive.

Lastly, beware: C1 has to charge via R1 before the circuit will work. So, when power is initially applied, allow about twenty seconds to elapse before switching on. Should the power fail while SW1 is closed, i.e. in the permanent-run state, switch off to enable C1 to charge fully when power is restored. Under normal conditions, with power constantly applied, the switch can be operated without any limitations.

If the unit is to work in the run-on mode only, without the permanent-run facility, replace the switch with a push-to-make button or a biased-toggle type.

Fig. 2: Circuit diagram of the complete unit.

C1	2,200µF, 16V electrolytic
C2	0·1μF, 63V polyester
C3	10nF, 63V ceramic
BR1	KBPC104 400V, 1A
D1	1N5349B 12V, 5W
D2, 3	1N4148
D4	LED not critical
IC1	4001B
IC2	4020B
Tr1, 2	ZTX550
VDR	275V AC transient voltage suppressor
R1	120kΩ, 1W 5% carbon film
R2	2·2MΩ, 0·5W 5% high-voltage metal film
R3/6/7/9	10kΩ
R4	100kΩ
R5	$1M\Omega$
R8/10	3·3kΩ
R11	1kΩ
All 0.25W 59	% metal film unless otherwise stated
F1	500mA quick fuse
SW1	Switch as required
RL	Maplin BT47/6 relay, 12V 750Ω



# DX and Satellite Reception

Terrestrial DX and satellite TV reception. UK transmissions update and latest satellite TV news. Eclipse '99. The bookies TV channel. Roger Bunney reports

rior to the start of the 1999 Sporadic E season in this hemisphere the first SpE signals were received by Ryn Muntjewerff in the Netherlands on March 13th. He logged RAI (Italy) ch. IA for over half an hour, in the morning. RTS (Serbia) ch. E2 was also present during this period. Two Czech Republic transmitters, operated by TV Nova, are possible SpE catches: Cukrak ch. R1 at 25kW and Ceske Budejovice-Klet ch. R2 at 10kW - these are transmitter powers, so the ERPs should be several times greater. There has not been any F2 activity to date, and I don't expect reception of this type until the autumn. Tropospheric propagation at UHF lifted slightly in mid-March, but produced only Benelux signals in SE England.

A letter from Todd Emslie

(Ryde, NSW, Australia) mentions late-season SpE reception from New Zealand during February/ March. His TE (transequatorial) skip reception of signals from China and other Asian sources was perhaps more dramatic. Late afternoon/evening TE reception appears in his log from March 7th onwards. It includes Chinese reception in chs. C1 (49·75MHz) and C2 (57·75MHz), with video and audio carriers plus offsets. Other TE reception includes Thailand and Malaya ch. E2.

It's interesting that Todd heard the 'Russian Woodpecker' at 43.65MHz on several occasions. This is a mega high-power jammer. I thought that it had long since ceased to operate – it was the curse of short-wave listening!

Most of these signals were picked up by Todd's Icom R7000 scanner rather than a TV set, but it does show that the maximum usable frequency (MUF) is on the way up. In a final comment Todd says that he is not too happy about the move from analogue to digital TV. He asks whether there is a chance of digital DX?

Enthusiasts have in general been cautious about the advent of digital satellite TV. It has been somewhat painful, with most of us experiencing a sharp learning curve. The ideal digital satellite receiver for 'DXing' has still to appear: most models seem to have odd quirks and operating problems. But we are slowly coming to grips with digital

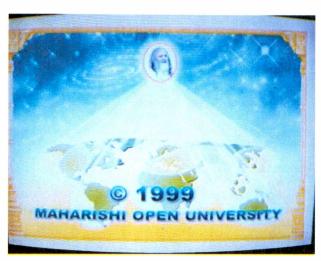
sat zapping. Perhaps we will be successful with digital terrestrial DX-TV, though I suspect that this will be a much more frustrating matter, and that terrestrial DX-TV will largely come to an end with the cessation of analogue TV. Maybe I'll be proved wrong.

#### **Satellite Sightings**

There has been much about the Kosovo crisis from the Clarke belt. Unlike earlier conflicts (Bosnia, Baghdad) when satellite uplinks continued to operate in the war area, the Serbs quickly kicked out most journalists/TV crews who departed to Italian air bases or neighbouring countries. Lack of coverage initially concealed the full extent of the ethnic cleansing horror, but the refugees who appeared at the borders soon confirmed what was going on. As I write this at 2100 on 30/3/99, the APTN feed (11-684GHz H, SR 5632, FEC 3/4) is uplinking from Skopje with depressingly familiar pictures of the refugees. The UK Sislink 29/UKI-148, with ident flagging as '9MHz 2PAL', is at Gioa Del Colle (11.580GHz H, SR and FEC same as APTN).

Jim Scofield (Lake, IW) has provided an update of Yugosalv zone uplinks via Eutelsat II F3, which is now at 36°E. CNN has moved its uplink to the Italian airfield at Monte Negro, though the flag indicates that a Newsforce (Farnham) uplink unit (NewsforceCNN) is being used. Jim mentions an RTV





June 1999 TELEVISION

Moscow feed that carries BBC newslinks at 11-6GHz H, again 5632, 3/4. Other sightings include Belgacom digital at 11-173GHz H, and a weaker feed at 11-096GHz H that causes digital breakup with ITV and Channel 4 inserts (both 5632, 3/4). Amongst all these Jim noted a Russian programme, suspected as being Armenian, at 12-578GHz H and the unusual 4338 SR, 1/2 FEC.

Most of these were present when I checked with my RSD ODM300, though several of the signals were dancing tantalisingly at half strength on the signal-strength scale, with the FEC etc. in lock but picture sync refused. It's clear that in times of conflict 'emergency' news feeds will be digital, the advantages being lower power, smaller dishes etc. Satellite enthusiasts will have to make the move to digital sooner rather than later. I've seen no analogue feeds from the Yugoslav conflict region yet.

It was interesting to monitor the RTS satellite programme from Belgrade via Eutelsat II F2 at 10°E (11.596GHz H in clear PAL): the bombing has been reported with no mention of the plight of the Albanians. Programming included many repeated video inserts that feature a montage of Serb jets in a clear sky, army personnel running and firing weaponry, the navy patrolling empty seas etc., all for morale boosting.

A couple of readers report seeing Yugoslav news/war material via Intelsat 801 at 31.5°W, so it's worth checking across the Clarke belt. Eutelsat W2 at 16°E is another news bird: it operates in the Telecom band – check the 12.5-12.6GHz H spectrum. Hugh Cocks (Algarve) has sent a long listing of Yugoslav feeds – all digital!

Eutelsat II F3 at 36°E is a busy craft. Most mornings feature live inserts for the Channel 4 Big Breakfast programme (try 11.674GHz H, analogue) while the BBC's SNG unit UKI-234 starts early with Scottish input. On the 30th, at 11-010GHz H PAL with 6.6MHz sound, there was coverage of Alexander Ferguson, MBE, being given the freedom of Aberdeen. This was from 1800 onwards and included a trip around the town in an open-deck bus. Tesco's car park at Northampton was the scene of an event on the 28th, with CITV uplinking live material for a children's programme at about 0900 (11-636GHz H); then, at 1110, SIS18 UKI-45 came up (on the same frequency) with *It's Your Shout* live from Winson Green prison.

A test transmission for Kurdish TV appeared earlier in the month via Eutelsat W2 at 16°E. The smudgy VHS-quality pictures relating to hostilities were in clear PAL from 1700-1900 at 11·163GHz H.

In all a busy month. Perhaps the most unusual sighting was via PAS-3R/6 (43°W) on March 12th at 12.698GHz V PAL when extracts from the American Robin Byrd Show, produced in "midtown Manhattan", presented several minimally-clad ladies doing remarkable things, then with equally minimally-clad males participating – hard porn in fact, with music and in clear PAL. The Sound of Music was never like this! Uplinked by the SITN facility in New York, the transponder's carrier was subsequently cut and the screen went to noise . . .

#### The Bookies TV Channel

Several trade readers have queried whether domestic customers can subscribe to the SIS TV racing feeder service that can be seen in high street bookie shops. The SIS coverage is clearly marked in the horse-racing sports pages of daily newspapers.

I checked with Gordon Smith of SIS who confirmed that the service is for licensed bookie shops only and is not available to domestic viewers, even if they consider themselves to be professional gamblers and are prepared to pay the subscription fee and for the installation (via 27.5°W), decoder etc. The bookie SIS service includes other sports such as greyhound racing. SIS also produces the Racing Channel via Astra. This is intended for the viewing/gambling public.

#### Terrestrial Matters - UK

NTL has recently signed contracts with the ITV companies, including Channel 4, to maintain analogue transmissions throughout the UK until 2012, in effect confirming that the present analogue system will remain in operation for the next decade at least. But there are optout clauses should the government of the day decide on an earlier close down in favour of total digital terrestrial transmission. The total contract is worth over £500m.

The use of SRBR (Short Range Business Radio) equipment in the



49MHz and 461MHz bands for paging is to be discontinued from December 31st 2003. The issue of SRBR licences will end in September. Eight new channels for speech/paging will be provided between 446·00625-446·09375MHz, with 500mW maximum ERP, under the PMR446 authorisation code.

There have been murmurings

The Jordan TV second service is in part in English.





Jordan TV test pattern via the Eutelsat Hot Bird slot at 13°E.

about digital transmissions causing interference to established analogue transmissions. My domestic terrestrial TV reception is from Rowridge, IW (group A). BBC-1 on ch. 31 has digital transmissions on the adjacent chs. 30 and 32. As a result my previous noise-free (Sky News quality) picture has become grainy, the effect being similar to that produced by a weak signal. An ex-TVS colleague near Eastleigh has been suffering from Nicam noise problems with BBC-1 since the start of the digital transmissions from Rowridge. The digital transmissions seem to ignore the normal channel guard spacing for minimal adjacent channel interference. Have other readers been experiencing interference to their local signals? Perhaps someone from the broadcasting side would like to comment.

#### Eclipse '99

On August 11th there will be a total eclipse of the Sun across the South West (Cornwall, S. Devon, Portland and part of the Channel Islands) between 1012-1018 GMT. The path of darkness will then track south east to Le Havre (1020), Munich (1038) and the Hungarian/Austrian border (1053). When the sun's radiation is removed, partial night-time propagation conditions will be present. For example E-layer reflection will occur in the MW band because of loss of the absorbent daytime D layer. Unusual fading effects will occur along the path of the eclipse.

In theory August will still be within the '99 SpE season, so unusual sitings may occur in Band I. Unfortunately it will be a

working day for most of us, but if you are at home that morning I hope you will take advantage of this once-in-a-lifetime opportunity – the next total eclipse will be in 2090. I suggest you start monitoring about half an hour before the eclipse, to be able to assess 'normal' conditions. Monitor Band I (ch. E2/R1 if clear of interference) and, for interest, perhaps a MW frequency. Please let me know of any unusual signal propagation. Don't sit indoors throughout the event, and pray for clear skies!

The Antipodes

Wenlock Burton (Victoria) reports that during the HSV-7 digital test transmissions on ch. A6 he lost his reception of VTV-6 Ballarat under digital white noise. The digital test transmissions were subsequently suspended because of concern, from the Epworth hospital, over possible interference to heart monitors. The suspension was announced by GTV-9 and has been confirmed by Robert Copeman.

This solar cycle may present the last opportunity for us in the northern hemisphere to receive low-VHF TV transmissions from Australia and New Zealand via F2 reflection. So let's hope for good conditions this autumn.

A few Australian ch. A0 (45·25MHz) and New Zealand ch. 1 (46·25MHz) transmitters are still on air. In Australia there are just ABNM-0 Wagga Wagga, New South Wales, and RTQ-0, Northern Queensland. In New Zealand there are TV-1 transmitters at Invercargill (South Island), Wellington and Hamilton (both North Island). In addition there's a ch. 1 transmitter in the Cook Islands, 2,000 miles to the NE of New Zealand (for Cook Islands Television).

#### Satellite News

New slot: Eutelsat has established 12.5°W as its "Atlantic Gate" for transatlantic operation, with TV, data and internet carriage. It will use Tele-Globe's teleport and terrestrial fibre-optic cable in North America. The old Eutelsat I F5 and TV-SAT-2 craft have been positioned at 12.5°W and are in operation – downlinks have been monitored in the UK. It's possible that these old craft may be subject to a degree of inclined orbit movement as their on-board sta-

tion-keeping fuel stocks dwindle. Launches: AsiaSat-3S should be in orbit by the time this is read: it's to be slotted in at 105.5°E. Orion-3 will shortly be at 139°E, carrying the usual Ku-band load and transponders that give extended C-band coverage of 3.4-4.2GHz with linear polarisation. New channels: BBC Worldwide Pay-TV recently launched an expanded service to North/Central Africa as part of a major expansion of its MultiChoice digital package, offering eighteen hours of programming daily. Next stop in the expansion of regional coverage will be the Middle East. Summer 2000 should see BBC Worldwide extended to India/S. Asia

A new digital satellite news service from the German PRO-7 group, called N24, is due to commence next January, providing financial coverage. Canal Plus plans to launch a rolling news service in November to rival TF1's La Chain Info.

Zone Vision, a Polish entertainment channel, started on April 1st. It plans to extend to Romania and Russia. A version of The History Channel to cover Japan will be launched later this year. Music channel MTV Networks Europe is to open three new round-the-clock digital music channels by September for the UK/Ireland - VH1 Classic, MTV Base and MTV Extra. News gathering: NTL has merged with the Swedish Teracom AB SNG group, forming one of Europe's largest newsgathering operations. The move will provide access to over twenty SNG/OB units and to teleports in the UK, Sweden and the USA. France: The TPS digital service now includes several terrestrial channels, TF1, France 2, France 3 and M6. Rival Canal Satellite Digital already carries these channels as part of a ten-year agreement.

Nasty story: It seems that while PAS-8 (166°E) was being prepared for launch by a Russian Proton rocket a faulty Ku-band PCB was discovered. A replacement was fitted, but an error was made when the aerial feeds were reconnected. As a result the footprints are far from correct: the expected west spot beams look east while the east spots point west. Ooops. Information from SatFACTS, NZ, March 1999.

# John Edwards' Casebook



#### Matsui 209R

The owner of this set was a formidable woman. "Look" she said, pointing at the set. I obeyed immediately. "Those twinkling dots are ruining the picture". Teletext lines extended from the top of the picture to half way down. I told here what they were. "Well, I don't know about that" she said, "but in case you hadn't noticed it, this is not a teletext set." I decided to say no more and just fix it.

In any set the cause of this problem is usually a capacitor in the field timebase drying up or changing value. I got out my 'useful capacitor box', which contains a couple of each type of electrolytic ranging from 10µF to 470µF and from 63V to 400V working. Once the PCB had been slid out from its retaining grooves, I had easy access to all parts. The field output circuit was easy to identify - there are two Lshaped heatsinks attached to the output transistors Q302 and Q303. All the electrolytic capacitors in this area looked tired. I decided to replace a few and check the results.

I ended up with a perfect picture. When I got back to the workshop I used my scope's built-in component tester to check the capacitors I had removed from the set. Over the years the tester has proved to be a really useful tool, especially with transistors and diodes that appear to be OK when checked with a meter but prove to be faulty when checked with a tester/scope display.

The results were quite interesting. In fact I was surprised that the only symptom was teletext interference. C301 ( $100\mu F$ ), the reservoir capacitor for the supply to the field output stage, was very leaky and measured  $12\mu F$ . The bootstrap capacitor C302 ( $10\mu F$ ), and C303 ( $4\cdot7\mu F$ , 160V) which is connected between the collector of Q302 and

chassis, were both open-circuit. And C316 ( $10\mu F$ , 100V), which is actually the reservoir capacitor for the supply to the RGB output stages, measured about  $2\mu F$ .

#### Matsui 1465

This was a classic case of multiple failure. The set's owner, an old boy, said "it's working of sorts: I can hear fizzing inside, but no matter how long I waits it don't do nuthin' else." I removed the back cover and, in view of his description of the fault, was not surprised to find a puncture hole in the line output transformer's case, adjacent to the focus control. So I took the set back to the workshop and ordered a new transformer.

When it arrived I set about removing the original one. While doing so I noticed, towards the front right-hand side of the PCB, the remains of a small electrolytic that had once occupied position C240. The now empty case, which I found in the corner of the cabinet, was marked 2·2µF, 50V. So it seemed that there was an excessive voltage problem. As further proof, R416 and R328 were burnt to a cinder. Time to investigate the power supply.

An external winding (three turns) on the LOPT feeds pulses back to the power supply. Would the power supply work without this feedback? I guessed that it should still provide an HT output and connected a 100W bulb as a dummy load. With a meter to monitor the HT voltage, I slowly wound up the mains input via a variac. At about 150V AC the power supply shrieked and howled in a most frightening manner. The meter read 140V and rising!

There are only a few components in the power supply, so I disconnected and examined each of them. The cases of the two 4,700pF, 1kV pulse capacitors C808 and C811 were split, but

everything else seemed to be in order. So I took a chance, left the STR5412 chip alone and simply replaced the two capacitors. The power supply then rewarded me with a silent 103V HT supply. But what surprises lay in store for me when I fitted the new LOPT?

I installed the transformer and its overwinding, and replaced R416  $(7.5k\Omega)$ , R328  $(10k\Omega)$  and C240. When I switched on there was field collapse. The cause turned out to be no 12V supply at pin 2 of the TA7698AP colour decoder/timebase generator chip IC501 because D406 was shortcircuit and R435  $(2\Omega)$  open-circuit. When these items had been replaced there was still field collapse, plus a very loud, high-pitched whistle. The voltages around IC501 were all over the place and it felt warm. To restore the field scanning I had to replace IC501 and D242 (1N4148), which was short-circuit - it's in parallel with the previously replaced C240. There was now a normal snowy raster and sound.

When I tuned in a station there was a good picture and sound – but the set wouldn't store! Checks around the M58655P memory chip IV02 failed to reveal anything amiss. The all-important –31V supply was present, the CS pin went low and so on. A new memory chip finally restored normal operation. As you will have guessed, this was another break-even/no-profit job.

#### Philips K30 Chassis

There was no field scanning and no 32V supply. I soon found that the surge-limiter resistor R1590 ( $1.2\Omega$ ) was open-circuit, but a replacement immediately failed. Further checks showed that the field scan coupling capacitor C1521 ( $1.500\mu F$ ) was short-circuit. Once this had been replaced there was a superb picture. Relief all round!



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

#### **DTT Reception**

There were several references to digital terrestrial TV reception problems in the May issue. The cause of most problems is the quality of the installation, in particular the feeder, rather than the signal. A very high-quality screened cable is required.

As in the rest of our industry, the tendency over the past twenty years has been to achieve an acceptable picture and that's it! All too many people have ignored the need for quality aerial equipment. It's only in the UK that you find cheap contract aerials without a balun to maintain the  $75\Omega$ impedance. The attitude has been that if the picture is OK with a cheap aerial and cheap cable, why pay more?

We are now finding out why. The problem is not only with flats where mains and aerial cables are run close together. You get just as much trouble at individual houses from any electrical appliance within 50 yards. Even next door's lawnmower firing up on Saturday just as the match starts!

The causes of these problems

- (1) Cheap imported cable with very poor screening properties, even though the loss per foot meets the required specification.
- (2) Cheap contract aerials that have a wide acceptance angle and poor

# Letters

front-to-back ratio.

(3) Cheap or poorly fitted coaxial plugs.

In our experience the most common remedial work required at an ONdigital installation is to fit a quality aerial head with a balun, Volex CT100 screened cable and a high-quality plug that must be crimped or soldered to the cable where practical we use a one-piece crimp-on plug. Dave Cooper,

www.bud-1.demon.co.uk

#### Hitachi 46TN Series

In connection with the article on servicing these sets (May issue) it is important to note that the HT should be 110V with 21in. sets and 146V with 25 and 28in, models. ZD950 is not a 10V zener diode, it's a voltage reference diode (see comments on page 499, April issue, editor). If a 10V zener diode is fitted in this position the HT will be very high (about 180V) and the set will go into the protection mode. If the protection is then disabled, as many engineers tend to do in desperation, the result is damage in the power supply and line output stage.

With issue 5 and later PCBs Q902 and Q951 are type 2SA1390 and Q953 is type 2SC3413. The pin leadouts are different, and the print layout was changed accordingly. BC series transistors cannot be used as replacements.

B.S. Rahelu, Hitachi Spare Parts.

#### PC Operation and Repair

A few points are worth making in connection with Part 1 of this series. At the bottom of page 389 it says three or four five-way connectors: Fig. 4 above shows, correctly, four-way connectors. There have been other types of disk drives and expansion slots. The PCI type expansion slot has now become predominant. Table 4 is correct, the text under Modern Motherboards

incorrect (female and male serial and parallel port connectors). Many PC manufacturers, not just IBM, use six-pin keyboard connectors. Alan Knight,

The Open University, Oxford.

#### Taxan

I note a request for information on a Taxan monitor in the May help wanted page and would like to take the opportunity to draw readers' attention to our web site address, which is

http://www.taxan.co.uk

There is much useful information here. Technical assistance is available at our e-mail address. taxan@taxan.co.uk

Keith Caley, Engineering Supervisor, Taxan Engineering, Bracknell.

#### Anyone know the answer?

I had two problems with an Osaki P1420R portable. First, there was a raster but no picture or sound, as if the set was in the external-input or AV mode with no signal input. Secondly, the on-screen display corresponded with all the remote-control selections but, when the set's up/down buttons were used for channel change, there was always default to channel '32'. Thereafter the buttons had no further effect. The channel OSD could be changed by remote control only.

I didn't have a circuit diagram, and it was made clear to me that the set had been bought cheaply and the owner wasn't prepared to spend much on it. But I decided, out of curiosity, to attempt repair. The nopicture symptom seemed to be a logical place to start.

I noticed that the set uses a

TA7698AP colour decoder/timebase generator chip (IC201). I've had to replace this type of chip on many occasions, in various sets, for a wide variety of timebase and video faults. Fortunately I had a second-hand one in stock. So in it went. When I switched the set on again there was a good picture and sound. I confidently pressed the

front-panel channel button, then sank back into depression - the screen filled with snow and the onscreen channel number flashed 32 at me. Selecting channels by remote control restored normal operation.

I decided that the cause of the problem must be to do with the microcontroller chip's input scanning circuit, or possibly the chip itself. When I scoped the control buttons I found that there were scanning pulses across each one: they altered when the button was pressed. After checking a number of 1N4148 diodes that seemed to be part of the channel-change circuit I came to the conclusion that the TMP47C434N-3147 microcontroller chip was probably the cause of the trouble. Repair was rapidly becoming uneconomic, but I just had to know.

I ordered a new chip from SEME and, true to form, it arrived next day. I fitted it, then had to admit that I was beaten. The fault was still present. There was little more I could do, and after all the owner had said that it didn't matter - he only used

remote control. But I still want to know the answer. Does anyone out there know? John Edwards. 30 Wendoyer Way, Welling, Kent DA16 2BN.

#### **Digital Repairs**

People are beginning to ask me about digital receivers, which I don't repair. There are several reasons for this. First, most of them are still under warranty. Secondly, although Pace provides training courses for repairing its Sky digiboxes the investment in equipment required is quite high for a one-man business such as mine. In addition, I understand that the diagnostic software copyright belongs to BSkyB and cannot be released. Thirdly the other manufacturers of digiboxes don't at present offer training courses. Fourthly the digibox is so heavily subsidised that customers regard it as a £50 rather than a £300 product. As a result they expect very cheap repairs - despite the fact that a single memory chip can cost up to £40!

Fifthly some digital receivers are "grey imports" for which no service information or parts are available.

I could of course plunge in without a circuit diagram, as I have in the past. But although power supply repairs would be feasible, very little else would. The basic problem with a digital receiver is that there's no video or audio path to follow. The signal from the tuner disappears inside a very fast computer board with bus signal paths, then reappears as video and audio after digital-to-analogue conversion. No one repairs PCs at component level nowadays - it's not cost-effective when a complete motherboard can be bought for £50 or less.

It's my view that digital receivers will, for the next couple of years at least, be dealt with like phones: a faulty unit is returned to a local dealer who sends it to a central repair depot. Very few small businesses will find repair work worthwhile.

Jack Armstrong, Middlesbrough.

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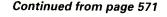
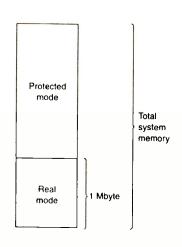
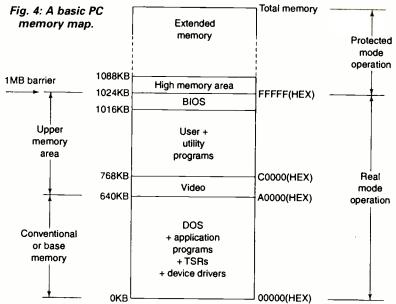


Fig. 3: The real and protected modes.





Furthermore individual locations can be erased and programmed without affecting the rest of the data pattern. As a result of location over-writing, the EEPROM has a comparatively short life span.

#### Flash RAM

The Flash RAM is an advance on the EEPROM. Once again all locations can be erased and reprogrammmed, this time using normal voltages that are available in the PC. Flash RAM also suffers from a short life span, and has a long access time of 60-150ns.

#### Real and protected modes

The original XT PC used an Intel 8086 microprocessor and had a total RAM space of 1MB. DOS was therefore designed to work within a 1MB limit. When AT PCs were introduced with the Intel 80286 microprocessor, 16MB of memory was provided for the processor to address. But to ensure backwards compatibility, i.e. ensure that adaptors and application programs designed to work with the XT could continue to be used with the AT system, the 1MB limit was retained. A computer that operated within the 1MB limit was said to be operating in the real mode. See Fig. 3.

In order to address memory locations beyond the 1MB boundary a special device driver (or program) was required. A PC was then said to be operating in the protected mode. The commercial need for backwards compatibility assumed by MS-DOS designers perpetuated

this unhelpful dual mode of operation. Other operating systems, such as OS/2, were designed without this 1MB limit. Windows incorporates a memory manager to cope with protected-mode operation.

#### Software requirements

PCs carry out their operations by following software programs. The main software program is an application program such as a wordprocessor routine, a database or a football or other game. To bring an application program into operation, DOS is instructed to load a file with an .EXE or a .COM extension from a disk drive, CD-ROM or other mass storage device into the system's RAM. Additional program data files may be loaded into RAM to enable the application program to be run, and as long as the application package is running these files must continue to be present in RAM.

In addition to the application program a PC requires a number of other programs so that it can perform tasks such as generating a video display, controlling a mouse, and executing DOS commands. These programs, known as memory-resident software, are loaded into the system memory (RAM) at the boot-up stage.

Utility software includes such routines as system BIOS, the video/graphics display program and other programs that control optional devices such as a mouse, a CD-ROM drive or a sound card.

Where these programs are provided in ROM or PROM packages they still require and must be allocated space within the total system memory.

#### **Memory map**

When DOS was designed, with the introduction of the XT PC, it accommodated both application and memory-resident programs within the 1MB limit. Furthermore, DOS software requires that application programs must occupy contiguous memory locations, i.e. a memory space without any gaps in the entire range from the beginning to the end.

The original IMB of real-mode memory was divided into two parts: a lower 640KB, known as the conventional or base memory for the application program and the transient programs; and an upper 384KB, known as the upper memory area (UMA), for utility programs. Backwards compatibility made it necessary for this division to be continued and, until the advent of modern memory-management techniques, DOS applications were limited in size so that they fitted within the 640KB of contiguous base memory. Memory space above IMB is known as extended (protected-mode) memory. Fig. 4 shows a basic PC memory map, Fig. 5 an allocation of memory addresses and locations to various programs.

Although in theory 640KB is available for software applications, in practice a large chunk of conventional memory may be occupied by memory-resident programs such as device drivers and TSRs (Terminate and Stay Resident programs). One way of maximising the memory space available for DOS application programs is by loading device drivers and TSRs into unused upper memory spaces, thus freeing precious base memory space.

#### **Extended Memory System (XMS)**

The memory of a system based on a 286 or higher processor can, as previously mentioned, extend beyond the 1MB boundary for processor operation in real mode. With a 286 processor the memory limit is 16MB: with 386-, 486- and Pentium-based systems the limit is 4GB (4,096MB).

Such a system enables programs to use any part of the

extended memory area. The result could be that different programs use the same memory space. To prevent this happening Microsoft, Intel, AST Corporation and Lotus developed an Extended Memory System (XMS) specification.

XMS is introduced by loading into the system RAM an extended memory-manager driver such as HIMEM.SYS. As mentioned earlier, such memory-management techniques are irrelevant with a system such as OS-2 because it is a protected-mode operating system that's designed to use extended memory.

#### **Memory packaging**

Earlier computer systems used discrete memory chips. An alternative is memory packets or packages with individual chips mounted on a PCB in 16- or 32-bit format. There are two versions, the single-in-line memory module (SIMM) and the dual-in-line memory module (DIMM), see Fig. 6.

Because of their large capacity, small size and the ease with which they can be replaced, SIMMs and DIMMs are universally used in modern PCs.

#### **Wait states**

When the speed of the processor is faster than the access time of the memory devices, one or more wait states may have to be introduced to slow down the CPU. A wait state causes the processor to suspend its activities for one or more clock cycles to allow slower memory to catch up. The number of wait states required depends on the speed of the memory and the type of CPU in use.

Some computer systems provide automatic wait state detection and settings. Wait states curtail computer performance drastically. With one wait state a PC operates at two-thirds of its potential speed. Two wait states reduce the performance by a half.

#### **Cache memory**

The only way to avoid wait states as processor speed is increased is to use faster memory devices. The most straightforward way of increasing the speed of a computer memory is to use fast SRAM devices. But the cost of SRAM chips and their low packing density make extensive use of them prohibitive. Use of SRAM devices has to be more targeted and specific to make economic sense.

To this end the cache memory technique was introduced. Motherboards that can incorporate cache memory have a set of IC sockets, holders or a SRAM module slot available into which SRAM chips or a SRAM module can be inserted, as outlined in the manufacturer's user handbook.

The cache memory technique involves the use of a block of a few KB (8-512KB) of fast SRAM to store the contents of the most frequently accessed RAM locations and the part of the program that the CPU is most likely to call for. Identification of these instructions and data, and loading them into the cache memory block, is carried out by a cache controller that continuously updates the contents of the cache memory as required.

The processor will first attempt to obtain instructions or data from the fast cache memory. If they are not available, wait states will be introduced and the processor will turn to the slower DRAM locations to obtain the information required. With a hit rate, i.e. the likelihood of the processor finding what it wants in the cache, of 95 per cent the net effect is that the system acts as though nearly all its memory consists of very fast SRAM.

The cache controller has to keep a record of the information inserted in the cache and where it is stored. A

small memory known as a tag memory is used for this purpose.

A faster and more effective cache memory was introduced with fourth-generation processors (486 upwards). These processors have between 8-16KB of built-in cache memory known as Level 2 (L2) cache. The result is a very fast access time of 5-10ns.

Cache memory location reading can be speeded up by using the burst-mode technique introduced with the 486 processor. This technique makes use of the fact that programs usually access locations in sequence, enabling the processor to carry out four sequential data transfers without an intervening address cycle.

The cache technique described above speeds up the process of reading memory locations by going to a cache memory location instead of a main memory location, but writing into memory continues to take place at the slower speed of the DRAM chips in the main memory. This is because of the synchronous operation of a cache memory, to ensure that a cache memory location has the same content as the corresponding location it mirrors in the main memory. Cache and main memory locations must therefore be updated, i.e. written into, simultaneously, with all the waste-

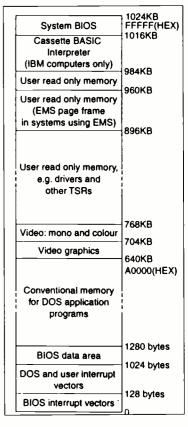
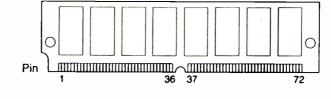


Fig. 5: Allocation of addresses and locations to various programs.



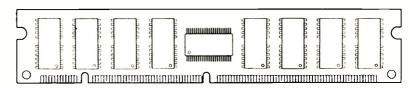


Fig. 6: SIMM (top) and DIMM (bottom) packages.

ful wait states this entails. The process is known as write-through.

A new technique, known as write-back, enables the processor to write changes in cache memory, speeding up the process. The changes made in the cache memory are subsequently transferred to the corresponding main memory locations by the cache memory controller when some spare time becomes available.

#### **Special DRAM chips**

Modern computers use special DRAM devices known as extended data out (EDO) to improve the system memory speed. The use of EDO can save one wait state, in comparison with the page-mode technique, at no extra cost

Another special DRAM chip that provides fast access time is the video RAM (VRAM). VRAM chips have two independent data paths, for input and output. Memory locations can thus be read and written at the same time. This is essential for fast video/graphics displays.

RDRAM (Rambus DRAM) is a very fast, high-density memory chip that uses a dedicated bus known as a Rambus. Capacities of up to 64Mbits per chip are available, with operation at 100MHz or more and a data transfer rate of 500Mbits per second.

#### Making more memory available

The amount of memory available for a computer to use determines the programs it can operate and how fast they run. More memory can be made available in several ways:

- (1) By deleting unnecessary files. This makes more conventional memory available.
- (2) By loading MS-DOS into the high-memory area. This again saves conventional memory space. It's carried out by including DOS=HIGH in CONFIG.SYS.
- (3) By using memory-management routines. There are two of these, HIMEM.SYS and EMM386.EXE. The former manages the use of extended memory and provides the first chain for DOS to use the upper memory area. The latter provides access for relocating device drivers from conventional memory to the upper memory area. It also simulates expanded memory, by allocating a section of extended memory space for

expanded memory applications.

When expanded memory is not required, NOEMS is added to the device driver. Conversely RAM is added to the driver for expanded-memory operation.

EMM386.EXE works in conjunction with HIMEM.SYS and must be entered into CONFIG.SYS after HIMEM.SYS. A typical entry in CONFIG-SYS for an MS-DOS operating system is:

DEVICE=C:\DOS\HIMEM.SYS DEVICE=C:\DOS\EMM386.EXE

Memory management is essential for Windows 95. The following lines are included in CONFIG.SYS:

DEVICE=C:\WINDOWS\HIMEM.SYS DEVICE=C:\WINDOWS\EMM386.EXE

(4) By relocating TSRs (Terminate and Stay Resident programs) and device drivers from conventional memory to upper memory. This is carried out by the DEVICEHIGH command in CONFIG.SYS and LOAD-HIGH (LH) in AUTOEXEC.BAT. The number of relocations possible depends on the size of the programs and the free space available in the upper memory. Optimum relocation is achieved with the larger programs located in the larger spaces in upper memory.

#### **Next Month**

In the concluding instalment next month we will outline logical procedures for PC fault-finding.



Il training establishments face the challenge of bridging the gap between old and new technology. When it comes to digital TV, launched last year and now becoming a major consumer product, the College of North West London got off to a flying start. The College is based in Willesden, with other centres at Wembley Park and Kilburn. Last September it invested £20,000 on twenty fully-equipped digital TV work stations. Each station has a digital storage oscilloscope, a spectrum analyser and a logic probe. The College has digital set-top decoders from various major manufacturees, including Philips, Nokia and Pace. Students are trained to test and fault-find with all

# Technical Training for Digital TV

of them, both satellite and terrestrial.

Because the technology is so new, the College of North West London is still the only FE college in the country able to provide digital TV training courses. It attracts lecturers and engineers from employers throughout the UK, including the BBC, IBM, the Comet chain and other FE colleges.

One-day courses for the servicing industry are offered either at the college premises or on site. They can be either off-the-shelf or customised for service engineers who need a specific updating or upgrading programme. The aim is to bridge the gap between analogue and digital technology and to familiarise engineers with microprocessor-based systems.

Three one-day courses are held at the college approximately once a month, leading to a College certificate. They are: (1) Digital TV Broadcasting and Reception; (2) Servicing Digital TV Decoders; and (3) Microprocessors for TV Service Engineers.

A member of the College staff has special responsibility for industrial liaison and retraining. He is available to visit individual clients to assess their needs and devise appropriate training programmes.

The College has recently gained approval from City & Guilds to run courses on digital television at Level 3 of the 2240 Electronics Servicing Programme. Students can thus gain a qualification which is recognised throughout the country. The courses are available on a dayrelease or evening basis. The syllabus will be made available to other colleges

Places are currently available. Applicants should contact Ana Boyland on 0181 208 5117 or the course information hotline 0181 208 5050.

For more details about the courses, anyone with internet access can call up the College website – www.cnwl.ac.uk

## Answer to Test Case 438 - see page 531 -

Cathode Ray did in fact connect a temporary cable between the dish and the receiver to check whether the existing downlead was the cause of the trouble. But the low-signal symptom was still present as sparkly interference on the picture. This, added to what had already been established, suggested that the dish itself was the cause of the problem – provided it had a clear line-of-sight to the satellite. As there were no visible obstructions, the dish was condemned. Its surface turned out to be badly rusted and corroded. Because of this the reflected signal was being scattered, thus reducing the gain of the dish system.

We've noticed that other rusty and corroded dishes, mainly of the earliest perforated type, tend to produce a lower signal level than a 'clean' dish. It's quite likely that dishes deteriorate faster at our coastal location than in other areas.

Dave Dawson decided to update to SkyDigital, and thus had a completely new dish, LNB and receiver. He then complained about loss of the cheeky late-night German programmes! What concerns us is that the new 46cm digidish looks to be as vulnerable to rust attack as its predecessor.

#### **NEXT MONTH IN TELEVISION**

#### Servicing the NEI E5 Chassis

Alan Dent continues his series on NEI sets with a detailed fault rundown on the E5 chassis.

#### **DTT Explored**

Ian Martin decided to obtain an ONdigital set-top box and find out what could be received – at several locations from different transmitters. He provides a detailed assessment of reception prospects.

#### **Auto Power-off Circuit**

This circuit was designed by Alan Willcox as an update for his ESR meter. It's a handy circuit that can be used with other low-power, battery-operated equipment.

#### Nokia 9600 Blue Menus

The 'blue' menus available with Nokia 9600 series digital satellite receivers are not as well known as the 'red' ones. They enable new satellite signals to be entered into the electronic programme guide directly, while adjustments can be made to receiver settings in more ways than with the standard installation menu. Hugh Cocks explains it all.

#### **Multiple Output Plates for TV**

With the increasing complexity of many domestic TV installations there's a need for a neat and tidy multi-pole coaxial wall plate with good electrical performance. Finding nothing suitable on the market, Bill Wright came up with a DIY solution.

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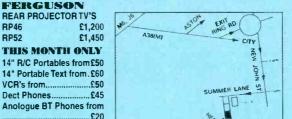
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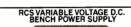
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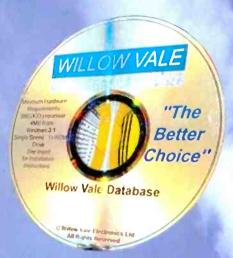
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