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Photograph Mark swallow

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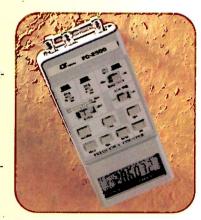
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Test Case 423

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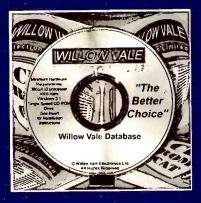


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Crunch Time Coming

t all seems so straightforward at first glance. TV is in for a glorious, digital future. Digital transmissions will mean lots and lots of channels, which is what people want, isn't it? Plenty of choice. Sport galore, popular films as and when you want them, plenty of scope for minority-interest programming and so on. Let's sit back and enjoy it, while the broadcasters rake in the shekels. But it might not turn out quite like this. In fact there are at present so many problems that many of those in the broadcasting and electronics industries may be cursing the day when digital TV was first proposed.

Not least of the worries is the fact that digital TV is quite a gamble. We are told that the analogue TV switch-off will be just a few years hence, by which time we will be enjoying a much wider choice of programmes with better quality vision and sound. But this all depends on whether the public goes for digital TV with sufficient enthusiasm. If it turns out to be a costly debacle, we could find ourselves left with the present services. The digital broadcasters will need all the marketing muscle they can gather: the fact that the digital TV set-top boxes are to be subsidised is an admission that persuading the public to go digital is not going to be that easy.

The overriding consideration is the public's likely response. People do a lot of viewing already, and must be reasonably content with what's being offered to them. The fact is that a saturation point has long since been passed. The total number of hours devoted to viewing has declined slightly in recent years. This is not surprising: there are many other demands on people's time. It is very unlikely that, however many channels are on offer, viewing will increase significantly. Especially as we've got to fit all that internet browsing

in! All this means that new services can succeed only at the expense of existing ones. BSkyB has been a remarkable success to date: is it feasible to suppose that the company can produce a repeat performance?

One factor is who gets going first, BSkyB via satellite or BDB via terrestrial transmissions? BSkyB had planned to start up first, and probably will. But the satellite is not up yet, nor are the set-top boxes in production. BSkyB has the advantage of being able to offer more prospective channels, but a new dish will be needed in addition to the set-top box - unless the 19.2°E or 19.2/13°E dish is swung to 28°E (where the digital signals will come from), losing existing services, or a motorised system is installed. More expense for prospective viewers. At least with BDB the existing aerial will suffice. Once viewers are confronted with this, will they bother with a dish change?

One thing seems reasonably certain: few people are likely to opt for both prospective services. Why should they, in addition to what they already have? Ah, but "content is king" as they say in the media world. People will sign up if the programmes are sufficiently enticing. Obviously so, but we shall see. Sport and films are the big attractions. If BSkyB or anyone else can corner the market, it's hard luck for the other broadcasters. Fortunately no one is likely to have a deep enough pocket to be able to dominate in this way.

The broadcasters have to generate the income required to finance their services, either by subscription/pay-per-view and/or advertising. People are sensitive to what they may be asked to pay, especially as broadcasting has traditionally been, in a sense, 'free'. If you can get people to pay extra to watch something special, it means they won't be

watching something else. Advertising revenue depends on the number of viewers who switch on. It will be spread more widely, and will bring in less per channel. It's a sort of no-win situation.

This may be an unduly pessimistic view, but investors don't seem to have been greatly encouraged by the prospects: at the time of writing, BSkyB's shares are trading at around 360p compared with a high of 666p or so during the past year. It's hardly a vote of confidence.

The preparations for digital TV have been a bit of a botch, with several postponements to the planned start of the services. BSkyB's satellite, Astra 2A to be more exact, has taken longer than expected to build. There have been many problems with software and getting the required clearance from the broadcasting regulatory authorities. The delays have affected set-top box manufacturers adversely, coupled with which Pace seems to have a problem with patent fees. No one, at present, is happy.

The future must lie with digital delivery eventually, since the technology is superior and offers more for less in terms of spectrum space. But it's unlikely that there will be a huge, sudden rush to acquire digital set-top boxes or receivers. One danger is that the government might be 'bounced' into forcing the issue by switching off the analogue signals prematurely. We should be left with our usual services until digital TV really does look like taking over – as 625 lines and colour did thirty years ago.

Meanwhile a lot of nail-biting is in prospect for those involved in getting digital TV started – BSkyB and BDB in the UK. They could well have a difficult time, for several years at least.

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Mitac 1564PDM

Gerry Mumford

I. Field and

The brightness was very low when this monitor was first switched on. It improved after an hour. The cause of the trouble was the line output transformer. A.S.

Royal DN1782G

This monitor was dead. Checks showed that the BU2527AX line output transistor was short-circuit. I fitted a BU2527AF as a replacement then turned attention to the line generator circuitry. One leg of the line oscillator transformer's centre-tapped winding was found to have burnt off. Fortunately there was enough of the remains of the lead-out wire for it to be reconnected.

In addition the 22Ω resistor in series with the emitter of the line output transistor had gone open-circuit. A.S.

Taxan MV789LR

There was very high brightness, the front panel control having no effect. R325 $(27k\Omega)$ in the brightness control network was open-circuit. A.S.

ICPI VGA 72G9140

This monitor was dead. It didn't take us long to discover that the $33k\Omega$, 1W resistors R603/604 in the power supply were open-circuit. A.S.

Mitac AM4050PD

This monitor was dead – its line oscillator had stopped. There was no supply to this stage because of a

Monitors

dry-joint at jumper wire JW806 in the feed to the line oscillator transformer.

We've had several of these monitors in recently with bad joints. They look OK, but when touched with a hot soldering iron the solder falls off, revealing a blackened component or jumper leg beneath. It's worth checking the six $47k\Omega$ resistors on the CRT base panel and the legs of the RGB output transistors

Another tip: to correct a poor black level, check C763 (47 μ F, 100V) by substitution before adjusting the first anode supply potentiometer. **A.S.**

Ultra UM1595

The picture was compressed at the top. A new TDA8172AP field output chip restored linear scanning. **A.S.**

Eizo 9060S

The power supply would run for only 1.5 seconds then switch off. The cause was eventually traced to C963 (33 μ F) on the power supply PCB. **A.S.**

AST VGA LR14

Changes colour after half an hour was the complaint. I didn't have to wait: this monitor did a fair impersonation of disco lighting from cold, and got worse as it warmed up! It's almost identical to the Viglen CA1426LT, but uses a conventional CRT instead of a Trinitron CRT. The CRT base is easy to work on (the Viglen version has a clamp band that secures the CRT base to the CRT neck), and there's no danger to the print lands when the tinplate screen is unsoldered - it slides on, and is secured by solder bridges to wire links at either side and a pressed out 'tongue' which is soldered to the print side through an aperture.

The soldering was sparse. With a gentle tug, the blue transistor came away from the PCB. The other two video output transistors

had clearly visible fatigue marks around all three pins. I recommend that when resoldering one of these AST or Viglen monitors the PCB is thoroughly defluxed and all weaklooking solder joints are attended to. I.F.

ADI PV448

This monitor was completely dead because of a power supply blow up. Casualties included the 2SK2038 chopper transistor Q901, R990 (0.33 Ω , 2W) and the BYV28 rectifier diode D962 on the secondary side of the power supply: O901 and D962 were short-circuit. Replacements got the supply going again, but the line output stage would shut down very quickly. This was because the HT (B+) voltage at the LOPT was high (about 140V instead of 90V). The cause of this was the 2SB649A power switching transistor Q921 which was also short-circuit. G.M.

ASTVision 4L CMC-1423B1

There was no picture, though the LED lit up and a faint clicking noise came from within the monitor. The cause was not the usual blown line output transistor but the associated resistor R516 (1Ω , 1W) which was open-circuit. **G.M.**

Commodore JD144K

This monitor displayed a white raster. When the brightness control was at its minimum setting however a very faint picture became visible. With the brightness control at maximum, the tube's G1 voltage was at less than +1V. R437 (220k Ω , 0.25W) in the brightness control circuit had risen in value to $300k\Omega$. G.M.

AOC CM335

This monitor was dead because one of the series-connected start-up resistors R907/8 (220k Ω , 0.5W) was open-circuit. As is usual with start-up resistor pairs only one of them had failed, but for reliability it's best to replace them both. G.M.

Free cover disk and reader offer

Test Equipment has come a long way over the last few years. Traditional 'benchtop' instruments such as oscilloscopes are giving way both to smaller hand-held units and more recently to PC-based instruments. Pico Technology is at the forefront of these developments and, in conjunction with *Television* magazine, gives you the chance to save 15% off the purchase price of any Pico product.

The disk on the cover of this magazine contains two programs: the first is a demonstration version of PicoScope for Windows (see screen shots below) and the second an on-line catalogue and order form that allows you to buy any Pico product at a 15% discount. Alternatively you can order either the ADC200 or osziFOX oscilloscopes using the order form below. Please note that this offer is valid until 15 April 1998.

Transform your PC

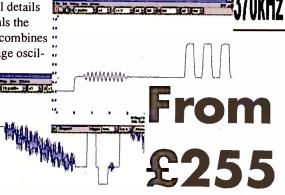
into an oscilloscope, spectrum analyser and multimeter . . .



The ADC200 range of PC-based oscilloscopes offers performance previously available only with the most expensive 'benchtop' scopes. By integrating several instruments into one unit, the ADC200 is both flexible and cost effective. There are three models in the ADC200 range (see the on-line catalogue on the floppy disk for full details and specifications). For video signals the ADC200/50 is an ideal solution. It combines a dual-channel 50MS/s digital storage oscil-

loscope with a 25MHz spectrum analyser. The screen shots of PAL video signals shown opposite were captured using an ADC200/50.

Connection to a PC gives the ADC200 the edge over traditional scopes: the ability to print and save waveforms is just one example. Advanced trigger modes, such as save to disk on trigger, make tracking down those elusive intermittent faults much easier. The ADC200 is supplied with Pico Scope for Windows (see disk for demo version) which is powerful, yet simple to use, especially with its comprehensive on-line help.





A scope at your fingertips...

Oscilloscopes were once heavy and clumsy to handle, but over the years they've got smaller and smaller. The latest development in this field has just arrived: a digital storage oscilloscope in a handy slim housing, scarcely longer than a pencil and about as thick as your thumb.

Despite its small size, its performance can match that of a service oscilloscope. With a sampling rate of up to 20MS/s even signals in microprocessor circuits can be recorded. Using its voltmeter function, numeric AC and DC voltages can be easily mea-

The low cost of the oszil-OX, together with the unit's small size, makes it ideal for any electronics engineer who needs the ultimate in portability.

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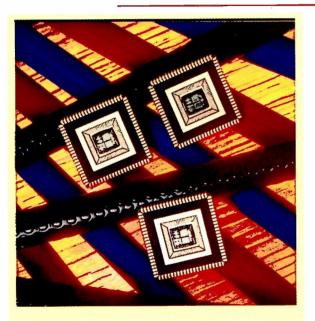
BSkyB's Digital Launch

According to BSkyB, its digital satellite TV service will start before the end of June. The company is to order one million set-top boxes which will be manufactured by Pace, Panasonic, Amstrad and Grundig. They are to be made available to viewers at a subsidised price of around £200.

The original plan was that the subsidy would be provided jointly by BSkyB and British Interactive Broadcasting (BIB). But the fact that BSkyB owns 32-5 per cent of BIB has concerned the European Commission, from which clearance is required. BSkyB has now announced that to start with it will provide the subsidy itself

Concern about regulatory clearance, delays in confirming the orders, and problems with the final specification for non-exclusive software for interactive operation have all contributed to a delay in the start of set-top box production. Some observers continue to feel that the start of the service may be delayed until the autumn.

Incidentally British Digital Broadcasting (BDB) will also be subsidising the cost of the set-top boxes required for reception of its digital terrestrial transmissions. The cost is put at some £550m over twelve years. BDB will be spending £150m on promoting and subsidising its services, which are due to start this autumn, over the next two and a half years.



A digital image filter chip, type GF2246, that provides the 75MHz performance required for HDTV operation has been introduced by GarField Microelectronics, Norfolk House, Herriard Business Park, Herriard, Basingstoke, Hants RG25 2PN (01256 384 300). It forms part of the company's range of building blocks for digital TV consumer and broadcast applications. The filter is ideal for pixel interpolation in image manipulation and filtering applications: when used with an image resampling sequencer, it can perform bilateral interpolation of an image at real-time video rates.

US TV Goes Digital

The first digital terrestrial TV (DTT) services in the USA are to start later this year – working receivers, many with HDTV capability, were on display at the Las Vegas Consumer Electronics Show in January. Broadcasters have assured the Federal Communications Commission (FCC) that transmissions will be available in the ten areas of greatest population density – New York, Las Vegas, Chicago, Philadelphia, San Francisco, Boston, Washington, Dallas, Detroit and Atlanta, which account in total for thirty per cent of the population – by May 1999. Services are to be extended to the next twenty main areas by November 1999. The digital signals will be able to provide either standard or HDTV resolution depending on the receiver being used. The FCC expects the analogue TV switch off to occur in the year 2006, when the freed spectrum space would be auctioned off for other uses.

Setmakers that are to launch digital TV receivers this year include Sony, Philips, Panasonic, Hitachi and Sharp. The industry expects sales to be around 100,000 in the first year, rising to one and a half million in 2002. A boom period is assured if things work out this way!

CRTs

The increasing amount of effort being put into flat-screen display technology doesn't mean that the CRT has reached the end of its development. Sony has come up with a new version of the Trinitron called the Wega – after the brightest star in the Lyra constellation. It has a much flatter screen and, to increase the length of the electronlens system, a longer gun. The result is a bright picture with twice the resolution of previous Trinitron tubes. Corner resolution is particu-

larly good. Sets fitted with the tube were on show at CES, Las Vegas.

Toshiba has announced, in Japan, a series of wide-screen models (32Z1P, 32Z1D, 28Z1P and 28Z1D) that are fitted with a newly-developed, virtually-flat CRT. They employ progressive as opposed to interlaced scanning, and will be compatible with the Japanese digital TV broadcasting system. Transmissions are due to begin in the year 2000. The sets will not be sold outside Japan.

News from CPC

As part of a £10m investment aimed at further increasing CPC's business capacity over the next six years the company has bought almost six acres of land adjacent to its Faraday Drive, Fulwood, Preston site. CPC is also running trials of an on-line catalogue service which the company expects to introduce later this year.

The investment project will be split into two phases, the first starting this year with the building of a 56,000 sq ft warehouse. Phase two, scheduled to start in 2000, will add a 60,000 sq ft building which will include a high-bay (20m tall) warehouse. When both phases have been completed, CPC's total storage space will be around 270,000 sq ft.

CPC has added a range of compatible repair and replacement parts for video games consoles to the computer spares and accessories the company already stocks. Because of their specialised nature, spares for games units are often difficult to obtain in the UK. CPC can now help with controller replacement pads, circuit diagrams for popular video games systems, game cartridge opening tools, replacement cables, connectors and a selection of memory cards. A ten-piece kit of compatible replacement parts for games controllers is available, containing all the commonly needed items for repairing two controllers.

CPC has also launched a new support service for customers needing assistance with its preprogrammed remote control handsets. The Remote Control Help-Line, number 0891 633 261, is



Items from CPC's new range of video games parts.

specifically designed to assist end users of universal handsets. The line goes directly to a help desk centre manned by a team of qualified technical personnel. Calls are charged at 50p per minute – the line is open from 8.30am to 5.30pm Monday to Friday. Extra capacity is being built in to serve customers requiring technical assistance with other CPC products.

Philips' Chip Developments

Philips has been investing heavily in its TriMedia processor technology – several hundred engineers have been working on the project. The stage has now been reached where Philips is in talks about second sourcing and joint industry development of the processing architecture. The TriMedia processor can be used as the basis of a number of chip sets for various consumer information and entertainment applications, and can bring consumer-quality video and audio to PCs.

The stage of the technology is the use of a very long instruction word (VLIW) central processor core, enabling five instructions to be processed per clock cycle. Thus some four billion operations per second can be carried out at the relatively slow clock rate of 100MHz. Further development aims to increase the frequency to 133MHz and then 166MHz. The TriMedia compiler can be used with C programming, and handles the VLIW scheduling as part of the compilation processing.

A single-chip TriMedia based digital TV design called TM2 is due to be released later this year. The technology is already in use in a Samsung set-top box, while Polycom's videoconferencing unit uses two TriMedia chips. Philips' aim is that the top TV manufacturers will adopt the technology for their digital TV products, opening up a huge market.

Another major development from Philips is the recently announced TDA8060 chip, which is the world's first zero-IF QPSK downconverter IC for use in digital TV tuners. Zero-IF simply means that there is no need for a mixer-oscillator and IF section: the output from the dish is processed directly, enabling receivers for DVB and DBS broadcast systems worldwide to be implemented using only three low-cost ICs instead of five. Manufacturing costs are reduced by minimising the component count and eliminating the need for IF circuit alignment. The overall saving can be as high as 30 per cent. In addition screening is simplified – intermediate frequencies are a common source of radiated interference.

There are also performance advantages. Since there is no possibility of an IF interfering with other signals in the receiver, the number of errors present in the MPEG digital video and audio information extracted from the broadcast signal is reduced, particularly under poor-signal conditions. The result is better picture and sound quality.

The TDÅ8060 covers all the frequency bands in use worldwide for digital video broadcasting (DVB) and direct broadcast satellite (DBS) systems. It is also compatible with the SMA-TV standard currently being developed in the USA.

Video Developments

JVC has developed the DualCam, which is a combined VHS-C camcorder and digital still camera. The digital camera section can store up to 44 pictures in flash memory in the standard mode, or up to 22 pictures in the fine mode. These stills can be displayed as thumbnail images on the camcorder's LCD screen or fed to a PC. They can also transferred to VHS-C tape. The DualCam Model GRX880 is due to be released in May.

Sony has developed a new videotape library system known as SmartFile. It stores information about the programmes recorded on a tape in a memory IC inside the cassette label. Stored details include programme name, channel number, date and length. VCRs for use with the system are equipped with two SmartFile

sensors to read the data and display it on the TV screen being used. One sensor is on the machine's front panel, the other inside. Sony is to launch the system in the UK later this year. More on these new technologies in next month's CES report.

The Sharp Viewcam Model VLDC3H is a highly compact $(167 \times 101 \times 73 \text{mm})$ digital video cassette system that weighs just 595g. It has a 4in. LCD screen, a 270° rotating lens and provides several special effects such as still and strobe. Maximum recording time is two hours in the standard mode, 50 per cent extra in the long-play mode. Price is around £1,500. An optional digital stills unit, Model VR3SUP, is available for an extra £300.

Test Report

The Peak DCA50 Component Analyser



The DCA50 provides a simple, fast method of determining what an unknown device is and its pin connections. Michael Dranfield finds it an invaluable aid for the service department

f, like me, you find data books a real bind when checking transistor pin connections, you need the new DCA50 Component Analyser from Peak Electronic Design Ltd. Though measuring only 13 x 6.5 x 3cms, it's a very advanced semiconductor device checker.

What it Does

The DCA50 automatically identifies the nature of almost any bipolar or MOSFET transistor, diode or LED when the device is attached to its clip-terminated, colour-coded connecting leads. You simply connect the unknown device to the gold-plated crocodile clips, any way round, then press the small, blue recessed button to start the test routine. After a couple of seconds the large, clear two-line character liquid-crystal display (6.5 x 1.5cm) presents the results. The finding is displayed for about twenty seconds – even when the device under test has been disconnected.

On Test

As a first test I connected a 2SC1815 transistor to the clips. It's a general-purpose Japanese transistor. After pressing the button and waiting briefly I was greeted with the following information: NPN transistor, Hfe 380, RGB = EBC. The latter indicates that I had connected the emitter to the red lead, the base to the green lead and the collector to the blue lead. Truly amazing!

The current gain (Hfe) finding for a bipolar transistor could be very useful for engineers who deal with audio/hi-fi equipment, where an amplifier might require a matched pair of transistors to provide optimum performance.

I must say that I was surprised to discover the extent to which the gain of a bipolar transistor can vary, even with devices that have come from the same batch. I checked ten 2SC1815 transistors taken straight off a bandoleer and found that the Hfe figure varied between 90 and 400. Presumably the Thorn T numbered transistors, such as the T9053, were gain-selected BU devices.

The DCA50 can display gain figures from 5-995. In the case of high-gain Darlington types, such as the TIP110, a small arrow is added next to the figure 995 to indicate that the gain exceeds 995.

In the unlikely event that the DCA50 cannot identify the device you have connected to it, the message "no valid part found" is displayed. This message also appears if the device is defective or its operational parameters are outside the limits listed in the User Guide.

With a diode or LED you simply use any two of the test leads. When an LED is tested its anode and cathode are identified and the device flashes on and off. No current-limiting resistor is required – the DCA50 limits the test lead currents internally to very safe levels. With a zener diode you can check the polarity but not the reverse breakdown voltage.

A useful feature is the ability to check three-terminal, surface-mounted double-diode networks. These are used extensively in camcorders but look just like a surface-mounted transistor. The DCA50 detects the two junctions and alternates its display between them, telling you whether there is a common anode or a common cathode.

Most MOSFET transistors can be checked, the DCA50 indicating the gate, drain and source connections, also whether the device has a p or an n channel. The rare depletion-mode MOSFET cannot be checked.

In General

The source of power is a PP3 (or equivalent) battery – one comes with the unit. Should the battery voltage drop below 7.8V the DCA50 displays the message "warning low battery" before it starts to carry out a test. The battery should last for up to eighteen months. There is automatic power on and power off.

The unit has two good-quality fibreglass PCBs inside. One is fitted with a custom-programmed PIC16C64 microcontroller and six smaller chips – all surface-mounted. The other one holds the liquid-crystal display and its driver chips.

This is a good-quality piece of test equipment that should provide years of service. I have found it to be invaluable.

The DCA50 does not seem to be available through any of the large distributors. It can be bought direct from Peak Electronic Design Ltd., 70 Nunsfield Road, Buxton, Derbyshire SK17 7BW at an all-inclusive price of £59. Peak's telephone number is 01298 70 012, the fax number being 01298 70 046.

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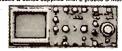
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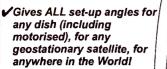
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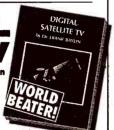
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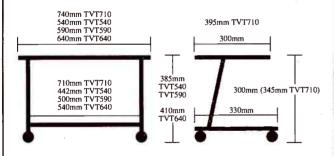
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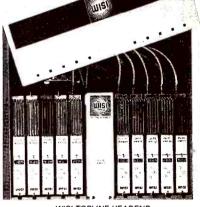
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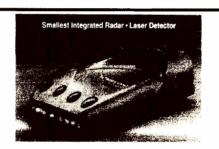


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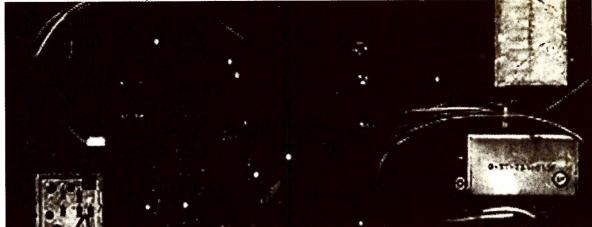
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Satellite Notebook

Amstrad SRD510

If the problem is patterning that sweeps vertically and is especially easy to see on dark scenes, first try replacing C46 (470 μ F, 10V). If this doesn't clear the fault, replace C86 (100 μ F, 16V) which is next to TR9.

If you repair Amstrad receivers on a regular basis it's worth getting a hundred $47k\Omega$ 0.75W metal-film resistors, part no. 337-377, from Farnell Electronic Components (phone 01132 636 311). These resistors are rated at 350V. Fit them and you will never get a comeback again. **M.Dr.**

Pace SS9000

The owner of this set was new to the area. After moving in he found that his receiver refused to power up with the dish connected. I was told that the power supply had been rebuilt some months previously.

After checking for feeder shorts etc. I turned attention to the power supply. With the set on the bench it was obvious that even without an LNB connection the supply line voltages were much too low - the 5V line was at nearer 3.8V. Scope checks showed that the electrolytic capacitors on the secondary side of the supply were intact, but I replaced them all anyway because they were the original ones which do tend to dry out. I then replaced the usual items on the primary side – the 100Ω resistor R5, the 1µF capacitor C11 and the potential divider that supplies pin 7 of the TDA8380 chopper control chip U23 - though their values were all correct. Further checks showed that the voltage at pins 14/15 of U23 was a little high. When the 0.22Ω fusible resistor here (R13) was checked it was found to have risen to almost twice the correct value. As a result, the power supply was in the current-limit mode. A replacement of the specified type restored correct

supply line voltages and cured the fault. **P.G.**

Hwa Lin Modulators

Pace SS9000/9200 series receivers, also the D100 and D155 MAC decoders, use Hwa Lin UHF modulators. In recent weeks I've had three separate SS9200 receivers and one D150 decoder that have produced good pictures via the scart socket but poor video quality with the UHF output. The symptoms were tearing on captions and wobbly verticals. No amount of TV receiver fine tuning helped.

The culprit is soon found when you remove the modulator's cover. A 1µF capacitor, normally green, is used for video input coupling. It's next to the preset resistor and the third modulator pin from the left-hand side of the can, looking in from the rear of the receiver (mains input socket on the left).

For good measure, also replace the other two electrolytics in the can – the adjacent green one is 0·1µF, the black one by the intercarrier sound coil 10µF.

The problem must be coming to light now that these capacitors have taken their maximum dose of heat as a result of living inside the receiver.

The modulator in Model SS9000 is slightly different, with two intercarrier sound coils. I've not as yet had the capacitor problem with this one – probably because fewer of these receivers are still in use. H.C.

Pace MSS100

One of our customers rang to complain that a flashing, unset clock was always present with radio reception. TV channels didn't display the clock. The clock display on a blank radio screen can be switched on and off by pressing the i and store buttons in quick succession – whether

or not the menus are locked with a PIN.

I've never really understood the clock feature with Pace receivers. If the mains power is removed, even briefly, the time is lost. In this part of the world (Portugal), where power supply cuts are fairly common, it's barely worth setting the clock with a new installation. It would, ideally, be nice to have the clock retain memory - even limited - in the event of a power supply failure, or to have the facility in the set-up menu to add or delete the clock. Failing this, how about replacing the flashing clock, when it's not set, with just a nonflashing "clock not set" message? H.C.

The Green Box

A few weeks ago I installed a number of Pace MSS100 receivers at holiday villas. With one exception, each villa had its own fairly recently installed terrestrial TV aerial, with good quality coaxial cable. As the cable route into the villas was a bit difficult, I decided to use the existing cables where possible, with diplexers to combine and split the terrestrial and satellite TV signals.

There was an urgent request to install a system at one of the villas late on a Friday afternoon. The two adjacent villas were to be fed from the same dish on the following Monday. As they were occupied at the time, I didn't have access to them.

I diplexed the satellite IF signal into the existing terrestrial aerial cable and was rewarded with good results. At the time I didn't take much notice, but one of the villas to be visited on the Monday didn't have a terrestrial TV aerial on the roof.

When Monday came I had access to the other two villas. My first job

Reports from Michael Dranfield Pete Gurney, LCGI Hugh Cocks Adrian Spriddell and Ian Rees

was to locate the existing cable routes. The first villa had good local TV reception, and I then recalled the absence of a terrestrial TV aerial. Eventually I found a small plastic box outside, with the feeds from the roof. This included Friday's satellite IF feed. The box's inputs and outputs were linked by simply being twisted together - for good measure the connections had corroded and gone green! It was a surprise that everything had worked so well on Friday, with no evidence of HF roll-off or the odd weak channel. The satellite IF signal was present at the TV aerial socket, along with the DC voltage for the LNB.

In the end I fed the three adjacent villas via a magic switch, with the terrestrial signals fed to it from one aerial. This worked well, and made one of the existing two terrestrial TV aerials redundant.

Another villa gave me a headache as the coaxial cable, which was in an underground pipe, provided good terrestrial reception but didn't have DC continuity. It was well and truly stuck, and couldn't be moved. A lot of drilling through thick walls was required to bring a new cable into the villa.

In another case the satellite signals ceased within a few hours. The cause was a poor connection inside the diplexer, between the F socket's inner tab and the PCB. **H.C.**

Pace \$\$9000/9200

I normally carry a Pace remote control unit with me in the car. Some customers lose their remote control units and are content to use the frontpanel controls to change channels. At one such customer's house I had to do some retuning and had left the remote control unit in the workshop. Fortunately you can, with the SS9000/9200, use the front buttons to tune and store channels.

When you press standby and channel up at the same time the normal tuning menu appears. The up/down buttons then have the same functions as when you tune via the remote control unit. To go down through the tuning menu you press standby alone — this is the same as pressing setup with the remote control unit. To store a channel you press channel up/down and standby at the same time, then select the number you want to use to store the reprogrammed channel via the up/down buttons. Store again by pressing all three buttons at once.

If standby and down are pressed at the same time the receiver will scan through the band – same as setup followed by 3, or 3, 6, 9 using the remote control unit. **H.C.**

Universal Remote Controls

Quite a few of our customers use these nowadays. They abuse them just the same. This particular one had a small green LED that should flash twice when the initial TV/sat receiver/VCR code is correctly entered, but all it did was to flash when the batteries were installed. After that it did nothing.

I cleaned up the PCB, though there wasn't much evidence of dirt on it. This made no difference. So I opened the unit again and noticed some muck between two of the pins of a large, surface-mounted IC. Once I'd carefully cleaned up around the chip and applied power, normal operation was resumed. H.C.

Cambridge RD480

All sorts of erratic operation problems with these receivers can be caused by dried out capacitors in the power supply. Known culprits are C47 (22 μ F), C58 (0·47 μ F), C39 (10 μ F), C16 and C20 (both 1 μ F) and C173 (100 μ F). We now replace all these capacitors as a matter of course. It generally makes further investigation unnecessary. **A.S.**

Panasonic TUSD200

There was no display though the power supply worked. Checks on the secondary side of the circuit showed that the voltage at the cathode of the 14V supply rectifier D14 was low. Its associated reservoir capacitor C21 (2,200µF, 25V) looked a little brown on top and turned out to be the cause of the fault.

Another problem was that the centre pin at the aerial input had moved back into the socket. It can be pushed back from the rear then secured with some Araldite. I've had several of these Pace receivers (PRD800/900 series) with this fault. I.R.

Lightning Trouble

The owner of a Pace MSS200 receiver phoned to say that his house had very nearly had a direct lightning hit. This had caused various problems one of which, unsurprisingly, was the satellite system now permanently displaying the "LNB Short-circuit" message. The telephone line enters the house near the dish. As the phone/fax no longer worked, it was likely that the LNB was indeed faulty. In addition to the lightning, a small hurricane had brought down trees in the vicinity.

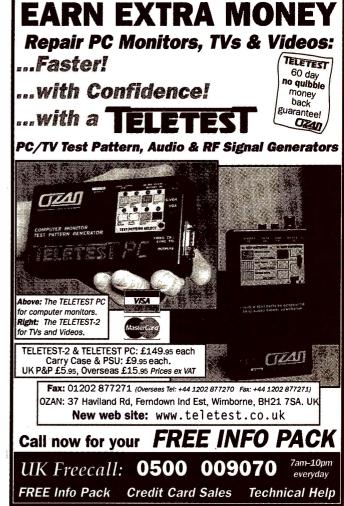
When I replaced the LNB I was greeted with the same message. A replacement receiver then produced normal results – once the dish had

been realigned (it had adjusted itself very nicely for reception of the Eutelsat bird at 16°E!).

At this point I beat a hasty retreat to the workshop with the suspect LNB and the faulty receiver. The LNB turned out to be dead. The receiver worked normally when not supplying any LNB power: the correct H/V voltages were present at the receiver's F socket, but the slightest load (in this case a satellite signal meter) reduced the voltage with the result that the overload detection circuit came into operation and the pink screen message appeared.

The culprits turned out to be R452 and R208, which were open-circuit. They are both 1-8Ω resistors and are connected in parallel between the 14V supply and the collector of Q25, at the front of the PCB – roughly in the middle.

Apart from the damage to these resistors the receiver was OK! It's interesting that R452 was added when early production receivers were found to be over sensitive to the LNB current, with the result that the warning circuit would operate.





PC Pitfalls

Personal computers can provide scope for a worthwhile extension of the service engineer's activities. Upgrades in particular are often requested, but there can be problems with these. Colin McCormick provides guidance on what can be done and the snags that can arise. The article is in two parts, to be concluded next month

t is all too easy to fall into the belief that building or upgrading a PC is simply a matter of fitting the parts and installing the relevant drivers. In a good day this can be the case, but there are many pitfalls that can result in wasted time and money and a poorly performing PC. In this article, which is not claimed to be exhaustive, some of the difficulties I've encountered will be described.

It's assumed that the reader is aware of the main items in a PC and what they do. We will be considering relatively modern machines. The intention is to provide advice on some of the main areas that cause problems for those who build and upgrade PCs, rather than to tell the reader how to build a PC.

Processors

No one would today contemplate building a PC with a processor of 486 or earlier specification. This is not to say that a high-performance 486 is of no value: it would simply not make economic sense to use one. Many people assume that an Intel Pentium is the processor to use. This is fine if finances allow, but there are alternatives worth considering. In particular the AMD K5 and K6 and the Cyrix 6X86, which is also sold under the IBM name, all fit the Socket 7 standard Pentium class motherboard. But the fact that a processor fits doesn't mean it will work: the motherboard's instructions will have to list the processor you specifically want to use.

The AMD K5 for example is a conventional Pentium equivalent. While the K5 PR133 and earlier processors are now becoming obsolete, the K5 PR166 is still widely available at a very reasonable price, offering excellent value. It runs at 166MHz internally: the motherboard is set to run at 66MHz (bus speed). The other motherboard settings you need to know are the multiplication factor and the supply voltage. With the K5 PR166 the nominal supply voltage is 3.52V, but the device will work between 3.45V and 3.6V.

The bus speed, multiplication factor and supply voltage information for each processor type will often be found in the motherboard's instructions, but not always. Sometimes the instructions merely list the various settings available, so you must know what settings are required for the processor you wish to fit. This information is often available at the processor manufacturer's web site, for which you need internet access of course.

Sometimes the settings are not as obvious as they appear to be, for example processor speed. Non-Intel processors have a PR rating, which is a Pentium equivalent performance figure. The K5 PR100 does run at 100MHz, but the Cyrix 6X86 PR200+ runs at 150MHz. Although the 6X86 PR200+ claims to have somewhat more processing power than the Pentium 200 – hence the name PR200+ – in practice this is an optimistic claim.

The AMD K5 PR166 processor has an unusual multiplication factor, 1.75, which is preset within the chip. The motherboard's multiplication factor will not have any effect on the processor's operation, but for neatness set it as though the processor is a Pentium 166MHz. Table 1 lists the settings for various processors – it has been compiled from the best information I have available. Contradictory information is sometimes issued, and manufacturing processes keep changing – so don't blame me if this list is not flawless!

MMX is one of the newer processor technologies. AMD K6 series chips and the Cyrix/IBM 6X86MX (may be referred to as M2) as well as the Pentium MMX itself are all MMX compatible. It provides a modest performance gain, but again the motherboard will have to be able to work with such a processor. These processors require dual voltage supplies, for their I/O interface and for the core. If your motherboard says it's MMX compatible, it should meet this requirement — even if the instructions on how to achieve this are less than clear.

A word of warning about Cyrix/IBM 6X86 processors: some motherboards claim to be able to work with them but won't. The reason for this is as follows. Earlier 6X86 (C028 process) versions require a 3.52V supply. Later ones (C016 process) require a 3.3V supply. Later ones again (6X86L) require dual 3.3V and 2.8V supplies. The instructions for some motherboards say that a 6X86 processor can be used, but this may not be true of all versions. Be sure that your motherboard can provide the correct supplies before you consider using one of these processors. If you obtain a 3.52V version, note that it requires a special high-power cooling fan rather than the normal Pentium type.

There have been reports that certain applications won't work with these chips. The cause may not be with the processor but with the fact that some badly written software relies on loops in the code for timing: the processor outwits these loops, so the applications fail. Ways of dealing with this are often to be found on the internet.

Because of bus driving capability, earlier versions of the 6X86 can cause problems for users of Windows NT4. For such users the 6X86L is advisable.

Some non-Intel processors, such as the 6X86 PR200+, require a motherboard speed of 75MHz. Since no Intel processors require this, Intel motherboards don't provide it. This is not as selfish as it may sound. If the motherboard is run at 75MHz, the PCI (Peripheral Component Interconnect) bus must run at

half this speed, i.e. 37.5MHz, which is higher than the 33MHz that's guaranteed to work. Some PCI devices, such as video cards, might not work properly though modern cards should be OK. Some processors require a 3.5X clock multiplier, but not all motherboards have links for this. In this case the 1.5X setting may be identical to 3.5X – you can't tell until you try it!

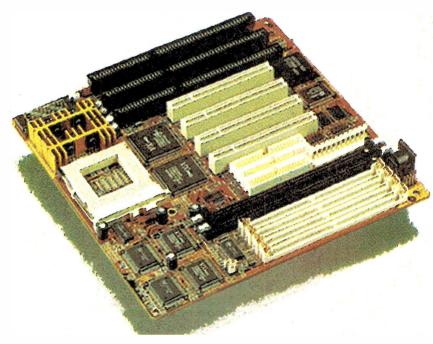
The new Cyrix MediaGX processor is not Socket 7 compatible. It incorporates much of the multimedia processing on-chip. Intel Pentium II processors require a motherboard with the Intel Slot 1 rather than (or as well as) Socket 7. The Pentium Pro processor requires a special motherboard: it's intended mostly for commercial applications that use Windows NT.

Note that Pentium class processors take a fan and heatsink that clip on the motherboard's Socket 7, whereas 486 processor fans clip on the processor itself. Use of some heatsink compound is highly recommended. The fan usually takes power via a plugand-socket arrangement which is in line with the power supply to the hard disc or suchlike.

Motherboards

From the above it may seem that selection of a motherboard is simply a matter of finding one that satisfies the requirements of all the processors you might ever want to use with it. A range of motherboards with varying performances is available however, fitted with chip sets from different manufacturers. Intel is one of the largest, and just as with selection of an Intel processor an Intel motherboard may be the way to achieve a hassle-free system, though not necessarily providing the best value for money. Intel's current offerings have either an economy chip set called VX, a higher-performance one called HX or the latest which is called TX. These chip sets may also be used with motherboards from other companies. There are alternative chip set manufacturers such as OPTi and SiS, also ranges called VXPro, HXPro and TXPro. These latter illustrate some of the good and bad points of using a board other than an Intel one.

One of the cheapest motherboards is the PCChips M537 VXPro which I have installed, with an AMD



The PCChips M537 motherboard.



Two motherboard power supply connectors (left) or a single connector (right) may be used.

K5 PR166 processor, in my own PC. It can be bought for around £50. This looks like excellent value, and within certain constraints it is. One problem is that none of the currently available tape streamers will work with its floppy interface. The reason for this is that all new tape streamers (over 1Gbytes capacity) require at least a 1Mbyte floppy interface instead of the older 500Kbytes standard. Another problem is that if a hard disc that has a previously installed version of Windows 95 is used with the motherboard the IDE (Integrated Drive Electronics) interface is not properly recognised. As a result, Windows 95 drops to a slower 'compatibility mode'. This can be overcome by installing driver software, which is very painful: the best solution is to wipe Windows 95 and reinstall it. One final problem can be failure of the board to identify the floppy drives correctly, and the A/B swap facility not working correctly. So installation can be hard work. Despite this, the board works well and fast and offers several features not normally present with Intel boards.

What all this illustrates is the effort that may be required with a non-Intel solution. But for the experienced PC enthusiast the result may be worthwhile. The PCChips M537 VXPro board can be bought from Choice Peripherals (0845 144 4444). For a description, refer to the PCChips web site (www.pcchips.com).

Other considerations when selecting a motherboard may be mechanical rather than electrical. Often there are only three ISA (Industry Standard Architecture) slots, and one of these is usually shared with the first of the PCI slots. So there can be a shortage of ISA slots. Since most PCs will use one of these for the sound card and perhaps another for a hand-scanner interface, only one is left for a tape streamer accelerator or a video capture card. One ISA slot can be freed by using a PCI sound card. But these cards are not particularly common, possibly because they cannot work with DOS applications other than Windows 95.

Another mechanical consideration can be the processor placing relative to the ISA and PCI slots. Some longer cards may clash with the processor or memory, so that fitting is difficult or impossible. With some motherboards the mounting fixtures will not be in the same place as in the case you intend to use, and occasionally you may find that a vital component such as the processor fan collides case drive bays. I even had one case where the motherboard's power supply connector was so placed that the power supply cables wouldn't reach it.

Connections

The case's front panel connectors (reset, lock and turbo switches and LEDs and the speaker) will usually fit any modern motherboard with only a modest amount of messing about. Motherboards tend to supply a signal to the front panel to indicate whether the board is in the turbo or low-speed mode, but the case's front panel sometimes doesn't have a cable for this—the signal is taken directly from the turbo switch. Care needs to be taken when fitting the fiddly front panel connectors: it is possible to short across the 5V line, which could result in track damage. I usually check everything out with a meter initially—even then it's possible to get the lock/unlock or turbo/slow conditions crossed.

Some cases have a two or three seven-segment LED display at the front. Typically this will show the processor's speed or PR rating in MHz when in the turbo position and some other parameter in the slow-speed position. Years ago this would have been something like 20 (MHz) turbo and 8 (MHz) slow. The slow position has become increasingly meaningless over the years however – modern processors still go like the wind even when asked to run with the brakes on! You can get the display to read "LO" in the slow position if you have a mind to, but fitting the links on the PCB behind this display can be very tricky to get right unless you have the appropriate instructions – or just as tricky if you have them!

Some power supplies have one motherboard connector, others have two. If there are two, they are inserted together so that the black wires to each connector are side by side. I often superglue the connectors together in this way to prevent subsequent confusion.

Testing

Each time I build a PC I am reminded that on the previous occasion I vowed "never again"! Possibly the most terrifying moment comes when you have fitted the processor, memory and video card to a brand new motherboard. You will have spent some time hoping that you have understood which links go where, and double-checking them, especially the supply voltage ones. You then switch on and hope that the BIOS (Basic Input/Output System) start-up screen will appear. Maybe it will. Or maybe you will get some ugly beeps from the speaker.

It is unlikely that the motherboard's instructions will be so helpful as to tell you what the particular bit of Morse code you have just heard actually signifies, but it may be telling you that there is an impermissible memory configuration or that the video card isn't working. The worst that an happen is that you get nothing when you switch the PC on – no beeps, no display, nothing whatsoever. Have you made a mistake that has destroyed the processor, motherboard, memory, video card or a combination of these? It can happen, but you would be very unlucky if it did.

If you have just built or upgraded a PC and you get no results or nasty sounding beeps, you must start by stripping all the non-essential items off the mother-board. Leave the board with just the processor, memory and video card. Once you have that working, add the floppy and hard discs followed by niceties such as the sound card and interfaces for scanners, tape drives etc. It might seem like hard work to have to do this stripping down, but it's the only way of getting to the bottom of a seriously unwell PC.

A good example is what happened when I added some memory to my own PC recently. After doing this there was no display and the PC wouldn't boot up. I removed the new memory and it still didn't run. The cause of the problem was the video card, which had been pushed by some cables and didn't make proper contact in its PCI slot.

The Case

Before you contemplate the upgrade of a PC's motherboard, be sure that the case is a standard one. Some manufacturers, such as Dell, Hewlett-Packard, Compaq and Packard Bell, have built PCs using their own layout. Such PCs often won't accept a standard replacement motherboard. They may also have some functions such as the video driver built on to the motherboard, so these will also have to be replaced.

Most slimline desk-top PCs have non-standard arrangements. To upgrade the motherboard in such a PC you will probably have to buy a new case and whatever other items may be non-standard, such as the memory, floppy drive, keyboard and mouse. It may be simpler to discard the lot and start afresh. For this reason I would advise against purchasing a PC of this type in the first case. Some upgrades to this type of PC might be possible however, such as the processor or hard disc. You are likely to need the motherboard instructions to be able to check for compatibility.

Memory

Most memory is these days supplied as either 72-pin SIMMs (Single In-line Memory Modules) or 168-pin DIMs (Dual In-line Memory – the other m got lost somewhere along the line!). The latter is the new, faster standard, but is more costly. A Pentium-class motherboard with 72-pin SIMM sockets can use conventional 72-pin SIMMs DRAM "fast-page mode" memory left over from a 486, but a modest performance improvement will be obtained by using the now cheaper EDO (Extended Data Out) SIMMS.

Synchronous DRAM (SDRAM) is now available at a higher cost, and runs at the full motherboard speed. But on many boards the two types cannot be mixed.

DIMs are a bit more complicated. They come in 3.3V and 5V versions: a motherboard with DIM sockets will invariably be able to supply both voltages. There's another form of memory, BEDO (Burst EDO). This is faster than EDO when the motherboard speed is higher than 66MHz. It's relatively uncommon however, so let's not allow it to confuse us.

Modern motherboards usually come with all the cache (buffer) memory they will take (often 512Kbytes of Pipelined Burst Synchronous cache). Some older ones have a slot or DIL sockets to enable more to be added. The addition of extra cache memory once a motherboard has been purchased can be fraught with incompatibility problems: quite frankly, I don't recommend it. Performance improvements are marginal anyway, particularly if you use EDO memory which has its own cache.

Table 1: Processor settings

Processor	Motherboard speed (MHz)	Multiplication factor	Notes
Pentium-75	50	1-5X clock (50/75MHz)	
Pentium-90	60	1.5X clock (60/90MHz)	_
Pentium-100	66	1.5X clock (66/100MHz)	_
Pentium-120	60	2X clock (60/120MHz)	_
Pentium-133	66	2X clock (66/133MHz)	-
Pentium-166	66	2.5X clock (55/166MHz)	_
6X86 PR120+	50	2X clock (50/100MHz)	-
6X86 PR133+	55	2X clock (55/110MHz)	(1)
6X86 PR150+	60	2X clock (60/120MHz)	(2)
6X86 PR166+	66	2X clock (66/133MHz)	(3)
6X86 PR200+	75	2X clock (75/150MHz)	(4)
6X86MX PR166	66	2X clock (66/133MHz)	(5)
6X86MX PR200	66/75	2.5X 66MHz	(5)
		or 2X 75MHz	
6X86MX PR233	75	2.5X clock (75/187MHz)	(5)
AMD K5 PR75	50	1.5X clock (50/75MHz)	(6)
AMD K5 PR90	60	1.5X clock (60/90MHz)	(7)
AMD K5 PR100	66	1.5X clock (66/100MHz)	(7)
AMD, K5 PR120	90	1.5X clock (60/90MHz)	(8)
AMD K5 PR133	66	1.5X clock (66/100MHz)	(8)
AMD K5 PR166	66	1.75X clock (66/116.6MHz)	(9)
AMD K6 PR166		2.5X clock (66/166MHz)	(10)
AMD K6 PR200		3X clock (66/200MHz)	(10)
AMD K6 PR233	66	3.5X clock (66/233MHz)	(11)

- (1) Few boards work at 55MHz.
- (2) Same as Pentium-120.
- (3) Same as Pentium-133.
- (4) 75MHz motherboard.
- (5) 2.8-3V core. With 6X86MX PR233 see (4).
- (6) Same as Pentium-75
- (7) Same as Pentium 90.
- (8) Set multiplier links to 2X.
- (9) Set multiplier links to 2.5X.
- (10) 2.9V ±145mV 7.5A supply.
- (11) 3.2V ±100mV 9.5A supply.

Older motherboards, including some 486 ones, use 30-pin SIMMs. These are now expensive. With most systems they need to be fitted in pairs, and mixing different types or speeds can cause troubles. The 72-pin SIMMs used with Pentium class PCs need to be fitted in pairs. They can be fitted singly in a 468 PC. DIMs can always be fitted singly. Most motherboards have listed in their instructions the combinations that can or cannot be fitted to obtain various amounts of memory.

Further confusion can arise because not all 72-pin SIMMs are the same, particularly 8Mbyte ones which can be single- or double-banked (often called single-/double-sided, which is not entirely accurate). Some motherboard instructions may say that certain combinations that don't work are permissible, or that they won't work though they do! Experimentation may be the only sure way to find out: no damage should arise.

Most modern 468 and Pentium PCs do not require parity (ninth check bit) at their 30-pin or 72-pin SIMMs, but there are exceptions. Some 468 mother-boards provide selection of parity or non-parity memory in the BIOS set up.

TO BE CONTINUED

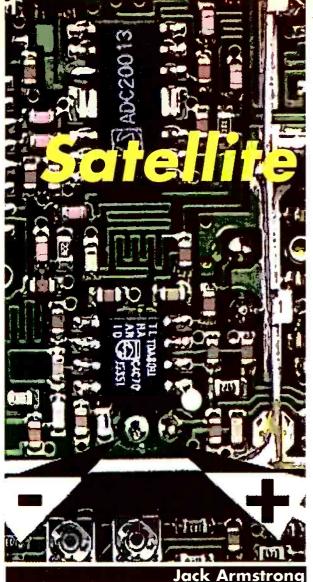


Fig. 1 (above): Positions of the pads for C41 in the Amstrad Model SR950+.

Amstrad SR950+

"I've written my diagnosis on the label" the customer said.

"That's helpful" I replied, "but I can't read it and I'd prefer to know the symptoms."

"Symptoms? Ah, symptoms. I didn't get where I am today without knowing how to describe a symptom. It's the tuner. Faulty."

As Dr Smith is getting on a bit I didn't like to press him for more information. So I filled in the ticket and handed him the receipt.

WORKSHOP

The SR950+ is actually a rebadged SRD700. Tuner faults are usually bad news with these receivers: most of the video and sound demodulation circuitry is incorporated in the tuner, which is therefore very expensive. I feared the worst when I connected the LNB cable and saw very sparkly pictures. I tried the tuning mode, but that didn't improve matters at all.

Rather than condemn the tuner outright, I decided to check whether the cause of the problem might be a faulty electrolytic capacitor. Inspection of a dead tuner from another of these receivers revealed that C41 (10µF) is mounted close to the IC, and is thus the most likely capacitor to suffer from excessive heat. As removal of the tuner takes about half an hour, I connected a new 10µF capacitor across the relevant print pads (see Fig. 1) then switched on. My guess proved to have been correct: the picture was now perfect. So I phoned Dr Smith.

"Hello, doctor. The patient has been cured and the prognosis is good – provided you keep her cool. No, you won't need an ambulance. Just bring your car – and, er, don't forget your cheque book."

Toshiba TS540

The TS540 is actually the **Pace MSS500**. This particular one had a very dim fluorescent display. When I'd replaced the 22µF electrolytic

C2 on the display panel with a 1µF, 50V multilayer ceramic capacitor, as recommended by Pace, the display was nice and bright.

In fact nowadays I cheat. It's a delicate task to remove the display panel without cracking it in half, so I solder the replacement capacitor across the pads on the back of the board instead. Since the original electrolytic capacitor goes open-circuit when it fails, I see no problem with this 'bodge'. It saves time and avoids calamities. The trick lies in knowing the exact position of C2.

When the LNB was connected to the receiver there were bad black and white sparklies on several channels. This is quite a common effect with some Pace tuners when the receiver has been in a cold place for a time. On this occasion however use of the hairdryer to warm the tuner produced no improvement. Even with the AFC set to manual some sparklies remained. I decided that the tuner was faulty.

The AFC worked nicely and the pictures were free from sparklies once a new tuner (part no. 221-2178012) had been fitted. But the picture looked decidedly streaky and, after half an hour, very strong broken white lines appeared across it. I suspected that this might happen when I saw the colour of the electrolytic capacitors in the power supply.

I dismantled the receiver again and replaced all the electrolytics in the power supply area. Experience has taught me that it's quicker to do this than to trace the two or three actual culprits. Conveniently, the parts are available in the SatCure (phone 01270 753 311) reliability kit Relkit 6: it contains the correct 105°C, low-ESR and Ultra High Reliability capacitors that Pace recommends.

The final invoice was rather high compared with say a PRD800 receiver repair, and the customer declined my offer to fit a miniature cooling fan. I didn't mind. "See you again in twelve months" I said cheerfully to the customer, who is one of those who likes to keep his equipment nice and warm.

TV, Video and Satellite Servicing

Lots of people are taking advantage of my free help service via e-mail. But some forget that I handle only satellite receiver repairs. Anyone in the TV trade who would like to join an e-mail self-help group that deals with TV sets and VCRs should contact Chris Davies by e-mail at:

dad@deathsdoor.com

or try the following Web page:

http://www.geocities.com/CapeCanaveral/Lab/

Jon Lye runs a bulletin board – phone 01275 879 005. Contact Chris Davies if you want further e-mail information.

Previous issues of Satellite Workshop are now available via the SatCure website:

http://www.netcentral.co.uk/satcure/

They are unedited and unexpergated originals, warts and all! There are also frequently asked questions (and answers) about the most common UK satellite receivers, and some 'bargain buy' electronic components, both new and surplus.

Grundig GRD150

For some reason I've had a lot more trouble with these receivers than with the average Pace or Amstrad model. Though the receiver is inherently more reliable, or was during the guarantee period, the faults that are now occurring seem to be difficult ones to trace. Perhaps this is because most of the signal processing is carried out by an "application specific integrated circuit", which is a 64-pin, surface-mounted device.

Anyway the receiver that came to me on Christmas Day (yes, people really do need to watch satellite TV that badly!) was "stuck in standby". It would light up but didn't respond to button presses. This was tricky.

After checking the power supply voltages I jumped in with both feet and replaced the microcontroller chip and its associated crystal. I was clutching at straws – and I was wrong. It had to be something that's connected to the I2C data bus. Maybe the EEPROM. But wait a minute – the tuner is also connected to the data bus. As I looked across to it I spotted a crack which had propagated from the tuner securing lugs across two

adjacent tracks. Repairing these cured the fault.

The pub owner's wife was impressed by my speedy service. Her husband was less impressed with my invoice – but he still drew me a pint.

Pace PRD800

Christmas time always brings some curious faults – and some curious people as well. In walked this fellow who was wearing a red coat with hood and sported a snow-white beard. He pulled a PRD800 out of his sack.

"Just on me way t't' school" he mumbled, "gotta give out t' presents t't' kids you know. Darn satellite won't tune above 11.573. All I get is snow. Missing me Eurosport. Faulty fuse, I'll bet. Bung us in another, ta." He then shuffled outside into the snow and disappeared.

Sure enough there were no programmes above a certain frequency. At first I thought that the power supply might be switching my universal LNB to high-band operation, but there was no sign of interference on the supply rails. Unconvinced, I fitted a new tuner. It made no difference at all. When

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

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.

I monitored the tuning voltage I found that above a certain frequency it switched from 1.6V to 4.8V and stayed there. This couldn't be caused by anything other than the Nicky IC. So I replaced it and was rewarded with normal operation.

The customer had thoughtfully put his name on the label, but there was no telephone number. Maybe I could get it from directory enquiries? He sounded local. Unfortunately the operator had no listing for "Mr S. Claws".

Test Case 423

Poor old Cathode Ray! He'd no sooner mastered phasing up a Sanyo VR150 deck than he got involved with a pumping Thomson TV set. This had to be put to one side while he pondered a mistracking problem with an urgently required Panasonic S-VHS VCR. He'd hardly found where the oscilloscope probes were to go when the wretched loudspeaker above the workshop door summoned him to the office to be sent off on some outside service calls. And all he wanted to do was to watch his Wallace and Gromit tape.

The above problems were all resolved in the fullness of time, with some help from his friends. But one of the field calls resulted in a new model to us being brought into the workshop, an Hitachi C2514TE. Though it couldn't be dealt with at the customer's home, the fault was a fairly minor one: the teletext image flickered. Ray assessed the set's performance carefully. The off-air pictures were OK, but the captions and graphics on text pages had a flickering, skimmering effect. Not vertical judder exactly, but more lively and disturbing to watch than the text displays produced by other sets in the workshop.

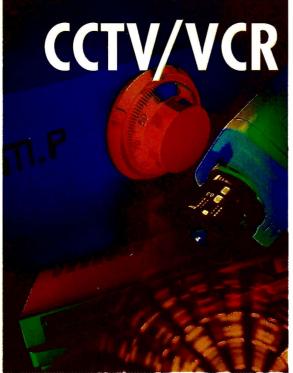
Ray kicked off by feeding a signal from another set to the Hitachi receiver's scart socket. As before, the picture was OK but the text flickered. A close examination of the text display revealed that there were no clearly visible scanning lines: with the other sets in the workshop, the text displays had a coarser but 'steady' line structure. So the problem had to be something to do with the field scanning. Off came the back, and out came the circuit diagram. Most of the circuitry in this 1996

design is contained within two 52-pin chips, an SAA5296 microcontroller (IC001) and a TDA8361 signal processor (IC201). Apart from the power sections there's very little else. IC601 provides the drive to the field scan coils: it's purely an output device, the field ramp generator and sync sections being within the mighty signal processor chip.

An oscilloscope check at pin 43 (vertical output) of IC201 showed a ramp waveform which remained the same when the set was switched between picture and text displays. It wasn't very clear to Ray which of the two big chips contained the text decoder, but this didn't seem to matter as the decoding was OK: the data on the screen was correct – but flickery. There are only two links between IC601 and IC201, the ramp output from IC201 and a feedback network that takes in the height control. Both of them appeared to be in order, and the field scanning was full and linear. Where next?

Another technician had a look at the screen and told Ray that there was an interlace fault. What he was seeing was interline flicker. The text display was interlaced: it shouldn't be. He drew Ray's attention to pin 27 of IC001 and to Q009 nearby. The IC pin passes a 25Hz squarewave to the transistor, whose collector is connected to the earthy side of the field scan coils. How could this have anything to do with interlacing, which as Ray understood it is concerned with the timing of the start of successive field scans? There was a 50Hz rampand-pulse waveform at the collector of Q009.

How does this circuit work – and why wasn't it doing so in this particular set? See page 365 for the solution.



CCTV/VCR Trigger/Timer

This simple unit, designed by lan Rees, enables a standard domestic VCR to be used with a CCTV surveillance system to make short recordings

losed-circuit TV for surveillance is now readily available and cheap. The basic camera can be connected to a scart or RF input or viewed using its own monitor. But the facility of being able to record what's going on, using a time-lapse VCR, is still very expensive. This article describes a way of using a domestic VCR to record short bites of scenes viewed by a camera. The recording process can be triggered by sensors.

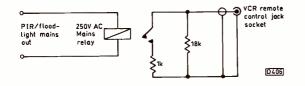
Initial System

My first attempt to use a VCR for CCTV recording was based on an old top-loading Ferguson machine which had a wired remote-control jack at the front. I used a relay to connect a $1k\Omega$ resistor across the jack input to start recording. In the stop state an $18k\Omega$ resistor was connected across the jack. The relay was controlled by a PIR set to two minutes in the 'walk test' mode. See Fig. 1. The camera's video output was fed to the VCR, while its RF output was connected to a standard monochrome TV set that acted as a monitor.

This simple system was satisfactory, but there were drawbacks. The time required to lace up the tape resulted in some loss of the recorded event. Partial compensation could be achieved by triggering from a greater distance. A potentially more difficult problem to cure was the tape coming to an end while the VCR was triggered to make a recording. As the relay held the $1k\Omega$ resistor across the VCR's jack input for the duration of the record cycle, the VCR could go into a record/rewind mode, i.e. it would try to record and rewind at the same time! To prevent this, there always had to be enough tape left to run.

But customers who came in began to spread the word about the system, and I picked up some orders from garages and shops. It soon became obvious that an improved, universal design was required.

Fig. 1: The simple wired remote-trigger system originally used.



The redesigned universal trigger unit can be used with a large number of modern VCRs, including LP and ready-lace models, and can be set off by either normally-open or normally-closed sensors.

Circuit

Fig. 2 shows the circuit diagram of the trigger/timer unit. The timer section consists of a monostable switch – IC1 and its associated components.

If either an open- or a closed-circuit is applied to the relevant input, Tr1 or Tr2 will switch on as C1 or C2 charges. Relay RLY1 then pulses once, sending a record signal to the VCR via its contacts. A low at pins 8/9 of IC1a, via R4, sets IC1 in its timing mode. When the timing period ends, a high from the output of IC1d (pin 11) is fed via C4 to the base of Tr3, which switches RLY2 on momentarily to send a stop signal to the VCR.

Power for the unit is obtained from an unregulated 1A power supply of the type that can be purchased with a mains plug as part of its moulded casing. The output from this is fed to a 12V regulator (IC2) which is attached to a small heatsink. If required, the camera and/or PIR can be obtained from the same source.

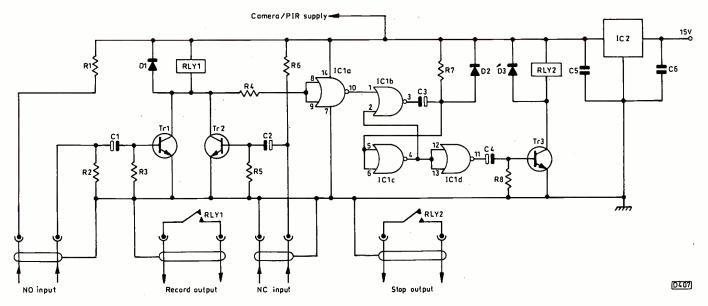
Construction

There is nothing critical about construction of the unit. I have built it in several forms, including one which contained the timer, camera and PIR. If you have to use very long leads to trigger the inputs/outputs, screen them to prevent false triggering.

The regulator's heatsink has to be positioned to dissipate its heat, which can be used to prevent fogging of the camera lens when this is mounted in the same case. If you use a bare PCB pinhole camera, you will find that it develops quite a bit of heat. One thing I learnt about these is that it's a good thing to fire the camera up to find out which way the image will be presented. It seems that little care is taken with fitting the camera mosaic during manufacture. Four-to-one odds of it being correct are not very good!

Installation

Most of my installations have been in small shops, where



a pressure mat or reed switch on the door is all that's required. A PIR detector can be switched in at night to cover areas where conventional entrance may not be gained – PIR detectors used during normal shop hours tend to be triggered by staff, which is not satisfactory. Strategically-positioned pressure mats can be avoided by staff, reducing unwanted operation.

With domestic premises the unit can be triggered by conventional PIR/floodlight circuits at night, using a mains relay in the lamp auxiliary circuit to switch the timer. Some other method will be required during daylight hours: say a switch at the front gate.

Conventional PIRs can be used in daylight, but should be of the counting type to reduce false alarms as a result of changes in sunlight intensity etc. Other types of detector, e.g. break beam, are easy to incorporate.

The small PIRs used in burglar alarm systems have a normally-closed output when powered, giving an open state when triggered. They can be connected to the unit's NC input. Reed switches give a normally-closed output when a magnet is brought into close proximity, and can be mixed with PIRs by connection in series with the NC input.

Mats are normally-open until trodden on. They should thus be connected to the NO input. A reed switch can be made to operate as normally-open by arranging for a magnet to pass it, say as a door opens. All normally-open detectors are connected in parallel with the unit's NO input.

The trigger connections to the VCR can be arranged in several ways. My original top-loader VCR, switched by the two-resistor stop/start method, is still in use in my workshop. Two other alternatives are possible. The first requires a direct connection between the VCR's record and stop buttons and the contacts of RLY1 and RLY2. If preferred, a connection could be made to the equivalent VCR remote control unit buttons. The original lace-up time shortcoming remains. If a ready-laced VCR is used, this problem will be virtually eliminated.

The unit's momenary switching action reduces the endstop/rewind/recording problem. Care is still required to ensure that a tape has plenty of run time, but rapid cycling against the end-stop no longer occurs. Note however that some VCRs just stop when the end of a tape is reached and don't automatically rewind.

The value of C3 determines the length of the recordings. Increasing its value increases the recording time: about two minutes seems adequate. In the standard play mode a four-hour tape will provide 120 triggers. With an

LP machine this number will obviously be doubled.

Results

The system in the approach to my workshop is still triggered by a PIR in the 'walk' mode. I have a switch to disable it during the day, but covertly switch it on should this seem advisable. It's left on when the workshop is unattended – and has recorded some strange happenings!

The CCTV camera is a pinhole device with six infrared LEDs to illuminate the scene in darkness. The camera's 12V supply is taken from the trigger/timer unit. Its output signal is fed directly to the VCR's video input, along with audio from an electret microphone which is mounted in the camera's case.

Clarity is excellent, and playback just as good. I feel it important that callers know there is an active camera in operation, and display notices to say so. At least one monitor is on view to callers, showing their actions at all times

Long before I fitted active CCTV I had a dummy decoy camera stolen (then thrown away outside). I continue to employ dummy cameras and, as it is accessible, camouflage the genuine one to prevent theft.

With professional systems the tapes are time stamped. This can easily be arranged by leaving a large clock in the camera's field of view.

Shops report that petty pilfering is greatly reduced. I find that dodgy characters are less inclined to hang about when faced with a monitor that displays their images.

Fig. 2: Circuit diagram of the CCTV/VCR trigger/timer unit.

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V.O.III	ATALES OF P		TALLES OF A

R1, R3-6, R8	2.2kΩ
R2	47kΩ
R7	1.5MΩ

All 0.25W, 5%

C1, C2, C4	470μF, 25V electrolytic
C3	100µF, 50V electrolytic
C5, C6	0.1µF, 30V disc ceramic

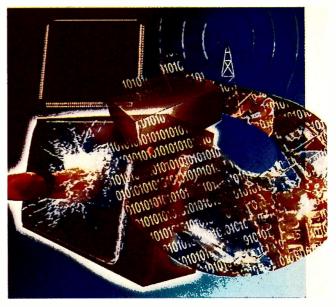
D1, D2, D3 1N4148

IC1 CD4001 quad two-input NOR gate
IC2 LM7812 12V, 1A regulator

Tr1, Tr2, Tr3 BC639

RLY1, RLY2 Sub-miniature relays. 12V coil. One pole changeover

Part 2 of Mark Paul's guide to the terminology of digital TV makes a start on definitions of commonly used terms



The Language of Digital TV

In Part 1 last month detailed explanations of the most commonly encountered abbreviations used in connection with digital TV were provided. This time a start is made on defining the terms used. The series will be concluded next month.

Definitions

Access Unit With MPEG video, the coded representation of a picture. The term is also used for coded audio data. After decoding, the units are referred to as Presentation Units.

Algorithm Rule for solving a mathematical problem in a finite number of steps: a kind of flow chart or programme, providing a set of instructions/steps for solving a problem.

Aliasing A disturbance created by spectrum mixing when the bandwidth of a signal being sampled is greater than half the sampling frequency. The term comes from the word alias, which means an assumed name.

During A-to-D conversion, the analogue signal is sampled at a fixed rate, creating a digital signal that has less detail than the original signal. Fidelity to the original signal thus depends on the sampling frequency: the higher the sampling frequency, the better the fidelity.

Analogue Signal An electrical signal produced by a sensor such as a microphone, solid-state imager or camera tube. Consists of a varying waveform that corresponds with the original sound or image.

Asynchronous Lack of synchronism or correspondence with time. In IEEE 1394 serial data interface terminology, asynchronous means the transmission of data with varying time intervals between the characters, and transmission of data as available.

B Picture Coded picture obtained from I and P coded pictures by bidirectional interpolation. The picture is coded using motion-compensation prediction from past and/or future I and P pictures.

Baseband Term used for the frequency band occupied by an analogue or data signal prior to modulation or after demodulation.

Block In JPEG or MPEG compression, an 8 x 8 pixel section to which DCT is applied.

Buffer A data storage device used to provide at its output a constant data flow rate.

Burst Errors Name given to multiple errors that occur in a short time, with relatively longer in-between, error-free periods.

Channel Coding Also referred to as Forward Error Correction. Addition of coding to a digital signal prior to transmission to enable errors to be corrected at the receiving end. The coding is matched to the characteristics of the form of transmission used.

Checksum Mathematical sum of all the bits in a sequence. Used for error checking.

Clock Synchronising signal used for all the encoding and decoding processes in a data transmission/reception path. Consider it as the digital heartbeat.

CODEC Combination of a coder and a complementary decoder.

Comb Filter Filter whose response is akin to the teeth of a comb. Used for separating signals that are part of a single transmission.

Compression Reduction of the number of bits used to represent an item.

Compression Layer With MPEG, the output from individual audio and video encoders. This is the Elementary Stream of compressed data.

Conditional Access System permitting subscriber access to programmes on a controlled basis, e.g. pay TV or pay per view.

Constant Bit Rate Coded Video Compressed video bit stream with a constant average bit rate.

Constellation Display in I/Q phase co-ordinates of all the possible states of a QAM or QPSK signal.

Convolutional Coding The inner part of channel coding for satellite and terrestrial transmissions. It provides two bit streams from the original one: this data increase is used mainly to correct random errors caused by noise in the transmission path.

Decoding Time Stamp (DTS) Field that may be present in a packetised elementary data stream packet header to indicate the correct decoding time for an MPEG Access Unit.

Delta Modulation Form of differential pulse-code modulation in which only the sign for the difference between each signal sample and its predicted value is retained and encoded.

Differential Coding Source coding (i.e. compression) method that uses the difference between the value of a sample and a predicted value.

Differential Pulse-code Modulation (DPCM) Process in which the difference between each sample of a signal and its predicted value, derived from a succession of previous samples (or quantised values), is quantised. The resulting series of quantised values is converted, by coding, into a digital signal.

Discrete Cosine Transform MPEG/JPEG conversion of a block of pixels into a series of coefficients that represent the cosine harmonic functions of the pixels.

Echo Equaliser Device used for the cancellation or attenuation of echoes (ghosting) in a transmission path. Used particularly with cable transmission.

Elementary Stream Bit stream generated by an MPEG video or audio encoder.

Elementary Stream Clock Reference (ESCR) Time stamp present with a packetised elementary stream for the control of decoder timing.

Encryption Coding of transmitted information to make it available only to those authorised by a conditional access system.

Energy Dispersal Combination of a digital bit stream with a pseudo-random binary sequence (PRBS) to obtain even energy distribution after modulation.

Entropy Coding Coding principle used with variable-length data words, whereby the encoding of information elements depends on their probability of occurrence. Also

known as variable-length coding (VLC). The best known method is the Huffman Algorithm.

Eurocrypt Conditional access system used mainly with the D2-MAC standard.

Fast Fourier Transform A fast algorithm for performing a discrete Fourier transform.

Flash Memory (EEPROM) A large, non-volatile electrically erasable and programmable read only memory. Can be overwritten only in blocks, not individual addresses or cells. Rather like an electronic hard disc.

Flicker: Disturbing periodic variation in the brightness of a scanned raster when the refresh rate is below 50Hz.

Fourier Analysis Establishing the harmonic components of a complex waveform. The result is a Fourier Series that represents the waveform.

Fourier Principle The principle which shows that all repetitive waveforms can be resolved into a series of sinewave components that consist of the fundamental frequency and a series of harmonics at multiples of this frequency. Named after the French mathematician J.B.J. Fourier (1772-1837).

Frame In reference to audio, an elementary period during which psycho-acoustical coding takes place. Corresponds to twelve times 32 pulse-code modulation (PCM) samples. The duration of the period varies between 8-12msec depending on the sampling frequency.

Generic Coding Method of digital coding for pictures, based on a specific algorithm, enabling it to be used for a number of applications. Enables the same ICs and components to be used for different applications such as TV broadcasting, computer graphics, videotelephony etc.

Granule In layer two MPEG audio this term means a definitive group of three consecutive sub-band samples, corresponding to 96 PCM samples.

Hexadecimal Numbering system with a base of 16 numbers instead of, as in decimal notation, ten. Uses a character set of 0-9 plus A-F. Employs 16 arrangements of four bits.

I Frame/Picture An intra-coded picture, i.e. one which has been coded using only information from itself (compare with B and P pictures).

Interframe Coding Predictive frame coding, where the values for prediction for a frame are taken from the previous and current frames.

Interlaced Scanning The conventional TV picture scanning arrangement in which successive fields scan out the odd and even lines of the picture.

Interpolation Technique of generating information by averaging the values of data from adjacent picture fields.

Interrupt A signal that breaks into a running digital processor program.

Intracoding Coding of a macroblock or picture using only information in that macroblock or picture.

Intraframe Coding Predictive frame coding where the values for prediction are taken from the same frame.

Isochronous Something performed in equal times, in regular periods. With IEEE 1394, means the transmission of time-critical data in the quasi-synchronous mode, i.e. real-time audio and video.

Joint Photographic Experts Group (JPEG) An ISO/IEC group that developed the image compression algorithm for continuous-tone still colour pictures.

Joint Stereo MPEG audio technique which exploits redundancy between the left and right channels. There are two sub-modes. MS Stereo means coding of L + R and L - R channels; Intensity Stereo means coding the common sub-band coefficients for high-band L and R channels.

JPEG-1 Standard, with several levels of compression, for digital still colour pictures. The levels give various resolutions in Y, Cb, Cr and RGB formats.

Latch Mechanism for temporarily storing data. Used in conjunction with shift registers so that data streams can have their format altered, i.e. SIPO (serial data in, parallel data out) and PISO (parallel data in, serial data out).

Layer With MPEG audio, the algorithm used for compression from sequence to block (there are three different layers); with MPEG video, hierarchial decomposition from sequence to block (see Fig. 1).

Level With MPEG-2, the spatial resolution of the picture to be coded.

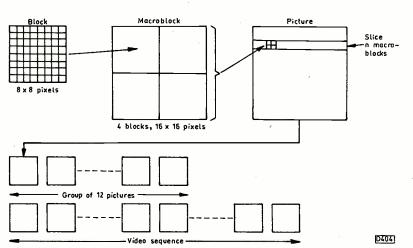
Line-locked Clock Clock synchronised to the line-scan frequency of a video signal, controlled by a phase-locked loop (PLL) circuit.

Lossless Compression Also known as Reversible Coding. The opposite of lossy compression.

Lossy Compression Compression process that discards some imperceptible information.

Macroblock Used for motion prediction. Consists of four 8 x 8 blocks of luminance data and two of chroma data (4-2-0 format), or four luminance and two each Cr and Cb blocks (4-2-2 format), or four luminance, four Cr and four Cb blocks (4-4-4 format).

Fig. 1: The MPEG video layers, from pixel blocks to a sequence of pictures (video sequence).



Masking A sound concealed by a more powerful one at a near frequency. This is a property of human hearing. The phenomenon is made use of for MPEG audio. Masking can be in terms of frequency and/or time.

Motion Compensation Use of motion vectors to improve the efficiency of motion prediction. The vectors provide offsets into past and/or future reference frames or fields (I pictures) that contain the decoded sample values used to form a prediction error signal.

Motion Estimation Process of estimating motion vectors for encoding. The term relates to the derivation of a motion vector from a previous picture, to enable conditions in an area of a picture to be deduced.

Motion Vector Two-dimensional vector used for motion compensation. It provides an offset from the coordinate position in the current picture or field to the coordinates in a reference (I) frame or field.

Motion Picture Experts Group (MPEG) The ISO/IEC group that develops compression standards for moving pictures and associated information.

MPEG Video Data Hierarchy The MPEG video structure, see Fig. 1. One pixel (picture element) is defined as the size of a scanning spot at rest, i.e. one line high and one line wide. It is used to form blocks of 8 x 8 luminance pixels plus 4 x 4 red and blue chroma pixels (the later are referred to as Cr and Cb respectively). The next step up is the macroblock, see above.

Several macroblocks are then grouped in sequences known as slices, which are positioned in the same left-to-right and top-to-bottom order as with conventional picture scanning. Slices are used as sets of data, being suitable for error detection purposes. If an error is detected in part of the data stream that makes up a slice, the decoder ingnores the data in that slice and moves to the start of the next one.

The data slices are combined to form the active picture area of a video frame – usually referred to as a picture – which can be regarded as the system's basic coding unit. Twelve of these pictures, referred to as a GOP (Group of Pictures), are combined to form the basis of interframe coding. As a result of this process, most frames are represented as their differences from a reference frame (an I or intraframe). Each twelfth frame is an intraframe. Organising the pictures in groups simplifies random access to a group and provides recognisable boundaries for interframe coding.

Finally, the MPEG system allows several groups of pictures to be gathered together in what is called a Video Sequence. This is an uninterrupted series of GOPs that have the same basic parameters. This sequence consists of a sequence header code, one or more GOPs and an end of sequence code.

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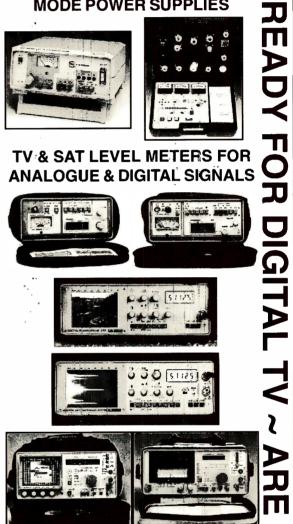
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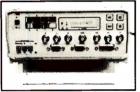
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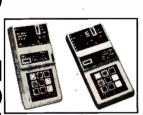
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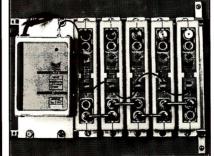
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What a Life!

Problems as diverse as wow with a Dansette record player to an hourglass picture with a recent JVC TV set came Donald Bullock's way this month

ust as I had sat down to write my *Television* article, Greeneyes came in and turned the TV on. I don't much like the TV being on at all, especially when I'm trying to write an extremely intellectual article. So I told Greeneves that she was a cretin, and we had a row about my manners and her mother. Then the TV's brightness went - it's a Sanyo CTP6256 – and I laughed nastily.

Greeneyes said I'd have to mend it right away. So I put my writing aside, took the back off the set and looked at the chassis. The brightness returned.

"How did you manage that?" asked Greeneyes.

"Cleverness and influence" I said, refitting the back.

When I'd finished and sat down again, the brightness had gone. Greeneyes shot me a withering look. Time to start all over again. I took the back off, leant it against the wall, then turned to the set which was now OK. Greeneyes' big ginger cat strolled over, looked at the screen and laughed at me. So I touched it with my foot. Greeneyes saw it shoot off, and we had a row about my wickedness and her lavishing all her affection on cats and dogs and turtles instead of me.

When we'd finished our row and agreed that she was right and I was wrong, and that the red pair of shoes in Clarks would go well with the green frock she's going to get from River Island, the brightness went again. This time it stayed off, and I started to tap around with the pen I'd intended to use for my article. As I couldn't make it come back I decided to take the set to the workshop, and put the rear cover back on. The brightness returned and I made a bit of a scene.

"Have we got to call Snoddies?"

Greeneyes asked, "or shall I ask son John to mend the set. We can't go on like this."

Then the phone rang for me, and while I was talking Greeneyes got John to take a look at the set. He went out for a soldering iron and a few minutes later had the set working – even with the back on. It didn't fail again.

I pretended not to notice that the set was now working satisfactorily, or that it had been fixed so quickly, until Greeneyes went out to fix a banquet for her cats and dogs and turtles. Then I casually asked John what the trouble had been.

'R622" he said. "It's a two-inch tall ceramic resistor stood up on end. The solder joint at the top was dry."
"Thought it would be" I said.

Harry's Dansette

There are two types of people I can't stand. Three if you count traffic wardens. One is the type of chap who concentrates so hard on making silly remarks that you can't hold a proper conversation with him. A customer of ours, Harry Quipper, is one of these. Otherwise he's a decent chap. He called in the other day with an old Dansette record player which, he said, he'd found.

"Gosh, Harry, I didn't think there was one of these left in the country" I said, "what's up with it?" "Dead" he replied.

I noticed that the cheap mains plugtop didn't secure the outer cover of the mains lead, and that the conductors were straggly. So I tugged at them and they pulled out. I remade the lead and plugged it in, then tried out the Dansette with our 33 r.p.m. record of classical piano music - there's no finer type of record for detecting turntable varia-

This one sounded awful. I frowned. "Where's that wow coming from?" I said aloud.

Harry's silly face lit up. "From the Gwamophone, of course" he quipped.

I told him to come back in a couple of hours' time then gave the record player a service, right down to oiling the motor, but the wow remained. Then I noticed that the blip occurred once per revolution of the record. I finally lifted the turntable mat and found that a little inspection label, not much bigger than a stamp, had been carelessly stuck on. So there was a ruck in it. Removing the label cured the trou-

The Other Sort

Then Mr Magic came in with a Toshiba portable, Model 1400TBT. His real name is Cyril Pipe, and he spends his spare time dressing up and doing conjuring tricks at children's parties. I can't stand conjurors.

I looked at the set. "Nice one, Cyril" I said, "what's wrong with

Cyril hunched his back and drew his head down into his shoulders. "Picture like this" he said. Then he pulled from his pocket a shabby pack of cards which he fanned out. "Pick a card, pick a card" he said.

I looked pained. "Bugger the

cards" I replied, "let's think about

I plugged it in and sure enough there was bad field cramping at the top of the picture. The set uses an AN5515 field output chip, and I recalled a similar fault with a similar model. I traced the IC's supply from pin 7 back to the rectifier circuit C311/D309/R317 which is fed from a winding on the line output transformer. When I checked the

value of the 7.5Ω surge limiter resistor R317 I got a reading of 48Ω . A replacement resistor of the correct value cured the fault. As I boxed up the set I thought that Cyril ought to be relieved of eleven pounds, a tenner for the repair and a pound for his bit of conjuring.

As I turned to him he said "Wait a minute" and drew a £1 coin from

"Put that on the counter close to me Cyril" I said, "and add another one plus a tenner. It'll get you out of debt and your conscience good."

G11 Problems

Meanwhile Paul, who spends most of each day on VCRs because he's so good at them, pulled a Philips set fitted with the G11 chassis on to the bench. "We've made some money out of these" he commented, thinking of all the BU208As, the smoothing blocks, the field timebase chips and the odd tube or two we've replaced. This one was dead, and Paul soon found that the negative side of the mains lead was connected to the plugtop loosely.

"I've had this before with these sets" he said, "but why is it always the negative connection that becomes loose in the plugtop? The little retaining screw loosens, doesn't it.'

"And how" I replied. "It's because of the thyristor power supply, which does violence to the nice smooth mains supply waveform. If you were the little screw at the top of the plug's negative lead you'd jigger about with the sudden current pulses, I'll bet.'

When he'd seen to the plugtop he found that there were intermittent outputs from the line output transformer because of dry-joints at the pins. Resoldering them restored the set to life, though the width still varied and tried to collapse now and again."What makes the line output transformer's pins go dry at their joints to the board?" he asked.

"More hammer" I said. "That transformer is vibrating at a very good lick, and producing heat. The solder joints have to contend with the rapid pulse waveforms at the pins while the heat affects the chemical makeup of the fluxes in the joints. They eventually shake loose. It's much the same with the other wound components in the line output stage. In view of the picture width variations I reckon you'll find some more dry-joints in this area.'

He did, and after some careful resoldering all round he had a good, steady picture.

"Remember" I said "any transformer that vibrates at a high frequency and has to handle spikey waveforms will tend to develop dryjoints at its connecting pins. And the next time you get intermittent brightness with a chassis that uses a tiny line driver transformer, like the old ITT Compact, check this item for dry-joints. Resolder the pins, even if you can't actually see any poor joints.

Interlude

Just then a chap with some steps poked his head through the door. Window cleaner" he called. "Who, me?" I reacted.

At this point a girl who looked like Keyhole Kate picked her way into the shop. "Yoo-hoo" she trilled, anybody home?"

I moved towards the door.

"Oh. You're somebody else, aren't you?" she said.

"No I'm not" I replied, "I'm the same chap I've always been."

"What I mean is, you're not Steven or Paul, are you?"

Steven came to the rescue.

"That Ferguson of ours you mended back last summer" she said, "the picture's got thin bands of lighter picture all over it. What will it be and what will it cost?

"Ah, your TX90" said Steven. "The cause will be C189, a 22µF 50V electrolytic reservoir capacitor, and the cost will be ten pounds, if you bring the set in.'

Keyhole Kate gulped. "Electro what . . . " she stammered.

'Ten pounds" Steven said. Then the window cleaner came

in, "Clean now?" he asked, jerking his thumb at the window.

I pushed some money into his hand.

"I suppose your sons are quite competent by now" he commented.

They're coming on" I replied. 'Of course it will take them some time to pick up all I've learnt over the last fifty years. I feed them the answers, quietly."

A JVC MXII

Then Mr and Mrs Murphy came in. Nice people, also the smallest couple we've ever seen. Steven gave them a smile.

"We've got our JVC telly in the car, Mr Blockhead" he said. "The picture's like an hourglass. Last time you did it while we waited. Can we wait for it again?"

Steven brought it in and put it in front of me. "Can you look at it quickly?" he said. "It's the modern Nicam stereo set - MXII chassis.



. . . So I touched it with my foot.

Tends to get this fault."

The Murphys smiled at me as I began to take the back off. Steven continued with his instructions.

"The chassis uses an electronic screwdriver chip, IC707, for picture geometry adjustment. The chip's cheap enough, and we've got one in stock - from Willow Vale, part number 87028M - but you'll need the manual to enter the screwdriver menu and program the new chip. The repair takes only a few minutes, as you know.

I knew nothing of the sort, and stood there trying to digest what he'd said. None of the chips looked like a screwdriver to me, and I grew increasingly puzzled. Five minutes later I was no further forward. Steven looked over and began to lick his lips

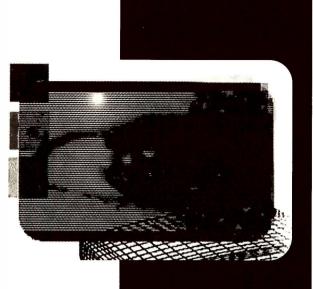
'Gosh, I'd like a cup of tea" he said. "The sort you make. How do you do it? Is it three bags or five?"

"I'll do it" I said, and he was on my stool before I'd left it.

When I brought in the tea the set had been boxed up and displayed a perfect picture.

Harry Quipper came back for his gram just as Mr and Mrs Murphy were paying Steven a few browns. He had one of his irritating smiles as he watched. As they left, he turned to us.

'Nice handful of cabbage that" he said, "talk about being grateful for small Murphies!"



Reports from
Philip Blundell, AMIEEIE
Michael J. Cousins
Keith F. Brown
Michael Dranfield
Graham Colebourn
David Smith
Glyn Dickinson
Chris Watton
Nick Beer and
Roger F. White

Thorn CI5012R (Samsung P68SC Chassis)

This set produced a picture with weak red content. When I checked the voltages at the collectors of the RGB output transistors I found that the red output transistor's voltage was at a higher level than that in the green and blue output stages. Checks on the colour-drive signals from the mother board, at plug CN901, showed that the DC bias in the red channel was low. I traced back through the circuit and found that the red drive was being dragged down by diode RD09, which adds the on-screen display to the drive from the colour decoder. This 1N4148 diode was leaky. For green channel problems check RD10, for blue channel problems RD11.

Incidentally the spares address for Thorn brand TV sets is Thorn UK Ltd., Glaisdale Drive, Bilborough, Notts NG8 4LA (01159 290 434). Trade only. P.B.

Mitsubishi CT2555STX (Euro 4Z Chassis)

Teletext was OK but the vision signal produced a weak, smeary picture. I connected a staircase test pattern and traced the path of the signal from the IF module along to PCB VC/RGB-CTI, where the video signal became low around the

TV Fault Finding

Y amplifier Q253. The 12V supply to this transistor was missing because of a break in the print at the very top edge of the PCB, where the plastic retaining bracket is connected. **P.B.**

GoldStar CIT9902F (PC04A Chassis)

This set wouldn't come out of standby. When checks were carried out around the microcontroller chip IC701 I soon discovered that crystal X701 (10MHz) wasn't oscillating. A replacement crystal was required. **P.B.**

Ferguson ICC9 Chassis

This monster (Model D78N) had no green. As I didn't fancy hauling it back to the workshop it had to be fixed on site. A tube analyser cleared the CRT, and the TEA5101A RGB output chip IB01 was OK. Tracing the signal path back brought me to the STV2160 multifunction chip IV01. This seemed to be the most likely suspect, especially as there have been reported cases of failure because of CRT flashovers (there's a modification for this - remove jumper link JV56 and fit a surface-mounted $4.7k\Omega$ resistor in its place). Needless to say a replacement chip didn't cure the fault.

Only one area remained: the buffer amplifier transistors, the relevant one being TV76 (BC858B). This surface-mounted pnp transistor had been cold checked and found to be OK, but a replacement restored the tube's green drive. If only I had a nice, compact scope or a few more muscles! M.J.C.

Sharp DV5935 (BCTV-A Chassis)

When cold checks were carried out on this dead set I found that the 2SD1546 chopper transistor Q705 and the MC44602 control chip IC700 were short-circuit. In addition the 100µF chopper drive coupling capacitor C712 was low in value. On the secondary side of the circuit rectifier diode D708 and its feed resistor (not shown in the circuit diagram) were badly burnt. These items were replaced and the set was then powered. It produced outputs on the secondary side of the power supply except for D708, which supplies a 12V regulator transistor and an 8V regulator IC. In view of the previously distressed state of D708 I thought that the cause of the problem was heavy loading, but eventually found that the chopper transformer T700 was damaged. A new transformer restored the 12V and 8V supplies and the set sprang to life. M.J.C.

Mitsubishi CT2553STX (Euro 4Z Chassis)

The reported fault was no signals – scart operation was OK. An attempt to retune the set showed that while channels could be found they couldn't be stored. The EPROM chip IC702 was suspected, but checks showed that its –31V supply at pin 2 was missing. This is derived from transformer T951, via rectifier D955. The cause of the problem was an open-circuit secondary winding on T951. A replacement transformer restored IC702's –31V supply and hence the picture and sound. M.J.C.

Goodmans 1450T (Onwa Chassis)

This set was dead apart from the fact that the standby light was on, there was a click from the relay and the power supply was producing a 115V HT output. No visible damage could be seen. The cause of the problem was loss of the supply to pin 42 if the multifunction chip IC301 because R323 (6-8k Ω , 5W) was open-circuit. A replacement

restored the picture and sound. If this doesn't cure the fault check C909 and C911 (both 47µF, 50V), the 12V, 1W zener diode ZD402 and IC301 (AN5601K). K.F.B.

Tatung 190 Chassis

There was sound but no picture - no EHT in fact. The cause of the problem was that R413 (18Ω , metal film) in the supply to the line driver transistor was open-circuit. No reason for its failure could be found. M.Dr.

Hitachi CPT2174 (G6P Chassis)

This set was brought in because it made a whistling noise. We suspected a noisy inductor. Not this time however: the whistling occurred only with scene changes and bright pictures. The culprit turned out to be the HT smoothing capacitor C909 (220µF, 160V) which had fallen to a very low value. M.Dr.

Sony AE2 Chassis

This set tripped back to standby after two seconds. The manual says a two-second trip means that there's a field fault. When the set was switched on and off in quick succession there was only half a field scan - the top half. The TDA8179S field output chip in this chassis requires + and -15V supplies. The latter was missing because safety resistor R854 (0.47Ω) was open-circuit. But the replacement failed at switch on: a new field output chip was required. For good measure we also replaced the flyback boost capacitor C1505 (220µF, 50V). M.Dr.

Hitachi G8Q Chassis

If the power supply is tripping and you can't find any shorts on the secondary side of the circuit, try replacing C908 (220 μ F) on the primary side. In one case we had in recently this capacitor had fallen in value to 150 μ F. A replacement rated at 105°C cured the problem. M.Dr.

Bush 1500

Another dealer had attempted to repair this set. In the process he'd removed two transistors which he had not replaced. With the help of a similar, scrap chassis we decided that a 2SC1815 would be suitable in positions Q104 and Q611. After fitting a couple of these transistors the set came on but was off tune. In addition the automatic station search didn't stop when a station

was found. After spending a lot of time on the problem we found that replacing the vision detector coil T101 cured the fault. **M.Dr.**

Philips CF1 Chassis

For loss of field sync, replace C2377 (10µF, 63V). This will cure the problem, but for good measure C2368 and C2369 should also be replaced. They are both 4.7µF, 63V. M.Dr.

Hitachi CPT2476 (G6P Chassis)

If the set comes on with a bright white screen, there is only 20V at the tube's cathodes, and the set switches to standby after two seconds, replace the 12V zener diode ZD301 which is on the main panel. It's in series with all three RGB output transistors. M.Dr.

Ferguson ICC5/IMC Chassis

There was a very odd problem with one of these sets: no sound, no picture, and a raster when one of the tube's cathodes was earthed via a $10k\Omega$ resistor. This proved that the cause of the problem was not field collapse. When we advanced the setting of the first anode control we got a blank, unmodulated raster with flyback lines.

We thought that the set might be stuck in the AV mode. When a VCR was connected to the scart socket we got good sound but still no picture. A lot of time was spent carrying out various checks before we noticed that the power supply's 8V output was low at 5.4V. The culprit was CP37 (4,700µF, 25V, 105°C) which was open-circuit. M.Dr.

Sony KVM2170/2171

Although these sets are still quite new we have had a couple of them suddenly go completely dead. The chopper power supply was working, but one of its outputs was missing. There should be 135V at the cathode of D606, 20V at the cathode of D607 and 8.5V at the cathode of D608. In both cases the 8.5V supply was missing because ICP PS603 was open-circuit. It's rated at 1A (N25 type). The current through the replacement was between 0.4-0.5A, so all was considered to be OK. Neither set has bounced - the repairs were carried out several months ago. G.C.

Matsui 1496R

This set was dead with no power supply operation. There should be a 119V HT output at C119, which is

handy to remember! We found that R108 ($220k\Omega$) was open-circuit: as a result there was no 5V bias at pin 3 of the TDA4605 chopper control chip IC104. R109 ($330k\Omega$) was also going high in value, so this was replaced as well. As the set is still a youngster we uprated both resistors to 1W. G.C.

Sanyo CBP2576/2876 (EDO Chassis)

This set had given up, with a pungent smell of burnt plastic that lingered for days! A hole had been burnt in the PCB at the line scan end of connector K-FF. After the usual clean up and rewiring exercise the set came back to life, but there was no EW correction because ICP R756 (N20) was opencircuit.

Finally there was no sound. We got it back by carrying out the "start NVM" procedure described on page 13 of the service manual: this restores the basic digital set-up of the chassis. Very little further adjustment of the digital settings was required to obtain correct picture geometry. G.C.

Hitachi CPT1558/Luxor 18036549

These 15in. Swedish sets are ideal for kitchen use, having a sealed membrane keypad. When a Luxor example came in with a severely mangled keypad we discovered that it's no longer available as a spare part. A repair was possible however, using a keypad from a scrap Hitachi version of the set: it's marked differently but works in the same way.

Our troubles were not over yet, as keyboard operation was intermittent. We eventually traced the cause of this to a cracked joint in a very unexpected place, at one end of RD54, an 820Ω resistor which is between the base and emitter of TD12 near the keypad ribbon-cable connector. We then knew why the original keypad had been clawed to death!

If you have trouble with the microcontroller or ROM chip (ID01 and ID02) in these sets, get in touch with Chas Hyde (01759 303 068). There were several versions and sources of these chips, and they are not all compatible. G.C.

Toshiba 150R6B

This set had been given a new LOPT, a set-up, a soak test and a clean bill of health. The owner brought it back next day with the classic condemnation "it's gone

again - it lasted only fifteen seconds".

This time there was no 5V output at pin 9 of the power supply board output connector. RS05, a 15Ω , 0.5W fusible resistor, was burnt and open-circuit. It feeds a 5V regulator, QS02. We fitted a new resistor and connected a voltmeter across it to monitor the current. The reading was 0.5V running, as stated in the service manual, and 0.33V in standby. The set ran happily all day and the next. No connection between the two failures could be discerned. G.C.

Philips CP110 Chassis

This set was dead except for the display of "F1". A voice in my mind kept blaming the microcontroller chip, as it was the original one with no metal shield, but voltage checks showed that it was OK. The 1-6A Wickman fuse F1653 was open-circuit, no doubt because of excess voltage, the overvoltage protection board seeing it off. When the fuse and the CNX62A optocoupler had been replaced the set behaved impeccably during a lengthy test run. **D.S.**

ITT Monoprint B Chassis

This set was in the standby mode with the CRT's heaters lit. I found that C722 (470µF, 16V), the reservoir capacitor for the 8V supply, had gone low in value. **D.S.**

Philips G90AE Chassis

There was no focusing at all. When the top of the tube base was unclipped the reason was immediately obvious. The entire focus connector and its spark gap were covered with verdigris. A new tube base cured the fault. **D.S.**

Ferguson TX805 Chassis

This set (Model D14R) didn't do anything. When checks were carried out in the power supply we found that RP41 and RP42 had both gone high in value. The correct value is $68k\Omega$. D.S.

Philips CF1 Chassis

This set was tripping. After checking for obvious shorts I decided to disconnect the crowbar thyristor and power the set via a variac. It worked perfectly, with the HT correct at 95V. To save time (!) I replaced the three series-connected zener diodes and the thyristor, but the set still tripped. I then replaced the only other two components in the trip circuit, a resistor and a capacitor. It still tripped. Time for

some theory. The zener diodes were being switched on not by the DC voltage but by ripple, because the 47µF HT reservoir capacitor C2322 was open-circuit. **G.D.**

Philips 2A Chassis

After repairing a straightforward field fault I noticed a message which said that the set was reluctant to come out of standby when the remote control unit was used. This was true, with the set tripping instead of coming on. The set could be heard 'plopping' in standby. I traced the cause of this fault to C2681 (6.8µF, 63V) in the optocoupler circuit. G.D.

Bush 1500

This set was stuck on one channel with no response from the front controls. The usual cause is a faulty pushbutton, but not this time. There was a clue: standby couldn't be selected because a leak across the auxiliary contacts of the mains switch locked up the microcontroller chip. The cause was some nasty black glue that was used to anchor the wires. Removing this cured the fault. **G.D.**

Ferguson ICC5 Chassis

EW bowing was the not unusual fault with one of these sets (Model 59P7). After resoldering the obvious dry-joints the fault was still present with the usual suspects blameless. The width and pincushion controls worked, but not enough, while the trapezium control was inoperative. This was the clue. It receives its supply from the 23V line via a resistor and a 6-8V zener diode, DG10. This was leaky. G.D.

Salora J Chassis

A fault we are now getting quite often with these sets is variation in raster size and focusing with picture content. The culprit is the EHT tripler. Unfortunately this is rarely mentioned when the set is brought in because of another fault. It can wreak havoc with your estimates, especially as "the set never did that before you fixed it"! G.D.

Matsui 209T

This set was dead because C613 (4·7nF, 1kV) had failed, which is not unusual. It's in the HT rectifier circuit. If you don't have a handset, you can't switch the set on from the front as it comes on in standby – which is a good way of selling handsets! To get the set out of standby, short out 'switch' SW414 (not fitted) at the front of the PCB

momentarily. The set will then spring to life! **G.D.**

Sony KV2762

Tuning voltage instability was the problem with this set. Colour would sometimes be lost, but only in certain areas of the picture. At other times the sound would be lost, with the picture fluttering. My first check was at the 33V tuning voltage stabiliser D005, where only 30V was present, but a replacement didn't improve matters. The feed comes from the 40V supply, which I found to be low at only about 33V. So not enough current was flowing to operate the regulator. This 40V supply is derived from the chopper transformer, via R651 (1.2Ω) and D652. R651 had risen in value to nearly 70Ω . C.W.

Finlux 1000 Series

This was the later version with CTI (colour transient improvement). When these sets are first switched on the screen should remain blank until the TDA3505 video processing chip has checked the grey-scale levels. This set came on with a red raster, then green followed by blue. The cause was Cb38 (10µF, 63V). C.W.

Philips CP90 Chassis

The power supply was OK but there was no line drive. A check on the 19V supply produced a reading of only a couple of volts. The 330µF, 35V reservoir capacitor C2691 was the duffer here. C.W.

Hitachi CPT2178 (G6P Chassis)

Loss of sync was the trouble with this teletext set, the cause being on the text PCB. When the video signal arrives at this panel it goes to IC2101 and, via Q2104, to pin 3 of the CD4016 chip IC2108. This acts as a sync separator, but there was no output at pins 1 and 4 which are connected together. After making various checks I found that the 5V supply was low at only 2.5V, because the HA17085 regulator IC2110 was faulty. This supply is used by the logic system. Because it was low, the control applied to pins 12/13 of IC2108 was affected. C.W.

Bush 1418

If one of these sets is dead with no standby light and 320V is present across the main reservoir capacitor, check R913. This $330k\Omega$ resistor can go open-circuit. C.W.

Salora J Chassis

No picture was the complaint with

this set. A scope check on the sandcastle pulse input at pin 7 of the TDA3562A colour decoder chip ICB200 showed that the field component was missing. The field timebase was working all right, the field flyback blanking pulse being lost at the junction of RB424/5 because TB209 (BC237) was short-circuit. **N.B.**

Toshiba C2225B

The owner insisted on having this set repaired despite its tired tube. There was an arc on sound and vision from cold, but you couldn't instigate it by physical means. It could be heard anywhere around the power supply and line output sections of the chassis. I eventually discovered that the earthing screw from the core of the LOPT to the PCB was corroded. Replacing the screw and retinning the land cured the fault. **N.B.**

Panasonic Alpha 1W Chassis

This set was dead. Some quick voltage checks showed that the 12V line oscillator supply at pin 7 of IC101 was missing. It comes from

the 12V regulator IC851, which had no input because rectifier diode D855 was open-circuit. **N.B.**

Salora J Chassis

It's been a long time since we had a new fault with one of these sets. The field scan flickered and rolled intermittently. No amount of fiddling in the field timebase affected the scanning, but twisting the chassis did. The cause of the trouble turned out to be a dry-joint at the odd pin of the Ipsalo transformer — the one in the centre of the diodesplit type (so the fault would not be possible with the tripler version of the chassis). **N.B.**

Sony KVM1421 (BE2A Chassis)

There were jagged verticals when the set had warmed up. The cause of the fault was C814 (4.7 μ F) in the pincushion correction circuit. **R.F.W.**

Ferguson ICC7 Chassis

One of these sets had a strange sound fault. To start with the sound was normal, but after a while the volume and mute controls stopped working – the on-screen graphics were still present. If the set was then put into standby and brought back on there was no sound. I suspected bad joints on the Nicam board and carried out a close examination, resoldering any joints that looked dodgy. To my great relief this cured the fault. **R.F.W.**

Sanyo CTP6144

A very intermittent hum bar was present only when an aerial was connected. If I touched the aerial socket and an earth at the same time the set would go to standby. The cause of the fault was the optocoupler D331. **R.F.W.**

Matsui 1492

This set had a peculiar fault after putting right the usual results of failure of C909 and C910 in the power supply (the line output transistor, the 12V zener diode and the field output chip all had to be replaced). When the set was put into the standby mode the sound and picture went but a dark monochrome picture then appeared, with no sound. The cause was Q907 which was short-circuit. **R.F.W.**

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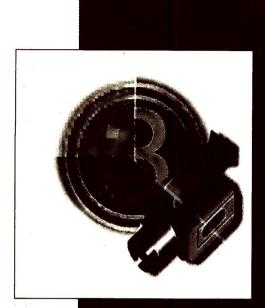


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Reports from
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Ferguson F801

This unit had a dead camera head: the VCR section was OK. Checks showed that there was an open-circuit track between D903 and pin 8 of connector CN909/PG909. This is the camera on (low) line. The cause of the open-circuit was leakage from adjacent surface-mounted electrolytics, which all had to be replaced. N.B.

Panasonic VW-AMC2B (NVMS50B etc)

There was an odd fault with this commonly-used camcorder mains unit/battery charger. Charge LED1 was permanently on, and there was no battery charging in position 2. Transistor Q3 (2SB952P) in the switching section was short-circuit. N.B.

Panasonic NVRX1

This is one of the newer 'slimline' models. The fault was ability to focus but not to zoom, which rather restricted use of the camcorder. As a result of the lens design in modern units, with everything internal, the fault condition meant that there was only one point on the focus scale where a reasonably good picture could be obtained. The zoom motor drive was present and correct, but it didn't move. A new motor, part number VEM0451, cured the fault.

We've had similar problems, caused by the gear inside the lens, with various Panasonic models that use this design. The plastic gear

Camcorner

cracks and then slips on its shaft. **N.B.**

Sony CCDTR75E

There was a "no picture" note attached to this Handycam. Chroma only was present at the AV sockets – customers don't count this as much of a signal I suppose! The cause of the fault was C318 (120µF, 6·3V) on board VS67. A replacement capacitor and service restored the unit to good working order. **D.C.W.**

Canon UC16

Playback picture intermittent was the complaint with this fairly recent model. The cause was a detached connector between the mic/jack PCB and the main VTR PCB. It's becoming quite a common failure, usually because of too vigorous fitting/removal of the AV leads. The connector is available from Canon if required – it's CN001, part number VS1-5469-016-000. D.C.W.

Panasonic NVRX1

This newish camcorder would neither focus nor zoom – its E-E picture consisted of an unfocused 'blob'. Playback was OK. Error code F52 was displayed in the EVF: the manual tells us that this means "zoom motor lock". When I inspected the motor I found a surplus of hardened grease on the actuating shaft. All was well once this had been removed and new lubricant applied.

To avoid having to reset operating data etc. it's important to refit drive assemblies to current types of lens units very accurately. Although these set-ups are easier than ever now, using automatic programming via a PC interface, life can be very frustrating if you don't have such facilities, **D.C.W.**

Sony CCDV600E

The problem with this nice (I have one!) Hi-8 model was described as "no operation". The only sign of life was a flashing DEW symbol in the camera LC display. As there was no other activity, the dew sensor was clearly not to blame.

The cause of the trouble turned out to be IC201 on the mode control PCB (FD44). Don't confuse this with the more usual syscon mode control functions carried out by PCB SS134. A replacement IC and a general service restored good operation. **D.C.W.**

Canon UC10E

There were no EVF pictures: operation was otherwise normal. The cause of the trouble was failure of C2911 ($10\mu F$, 16V) on the EVF PCB. I have since had two more of these camcorders with the same fault. **D.C.W.**

Panasonic NVR50

This VHS-C camcorder would display, very intermittently, coloured lines down the EVF's colour picture. The symptom would often be present only once a day, which made fault finding rather difficult. I have previously had to replace the viewfinder flexi-connector to cure a number of different EVF faults produced by these camcorders. So one was ordered (part number VWJ0739) and fitted, clearing the fault. When the original one was examined, the start of a split across the middle of the connector, where it bends quite sharply beneath the viewfinder, was discovered. B.S.

Sanyo VMD6P

These 8mm camcorders tend to have problems with their battery contacts, which are easy enough to replace. But after doing this there seemed to be some intermittent problems with the mechanism. When a cassette was inserted, the tape would sometimes not be loaded around the drum. The cause turned out to be the cassette-down switch, which was loose. There was still a problem when this item had been cleaned and retensioned: the mechanism would sometimes just whirr, then the camcorder would power down and sulk. The cause was a damaged gear in the rather eccentric loading mechanism. Part number is 11915RQ. Once this item had been replaced the camcorder worked normally. B.S.



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Part	Price Part		_		Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
BC107 BC108 BC109 BC109C BC140	8p BD434 8p BD435 8p BD436 10p BD437 20p BD438	30p 31p 30p 28p 36p	BU126 BU128 BU133 BU137 BU180	65p 125p 125p 150p 100p	BUV48AF BUV48C BUV50 BUV61 BUV70	325p 250p 425p 1000p 200p	MJ4502 MJ10012 MJ11015 MJ11016 MJ11032	300p 300p 250p 300p 800p	4N35 RECTIFIER DIODES	50p	AN203 AN210 AN211 AN211 AN214Q	210p 165p 150p 170p	AN6340 AN6341 AN6342 AN6344 AN6345 AN6346	600p 200p 325p 440p 400p 350p	BA335 BA338 BA340 BA343 BA336 BA401	55p 80p 75p 60p 175p 60p	BA7004 BA7007 BA7021 BA7022 BA7025L BA7107	200p 200p 180p 350p 100p 475p
BC142 BC143 BC147 BC149 BC159 BC160	20p BD439 20p BD440 8p BD431 8p BD533 8p BD534 30p BD535	40p 40p 50p 38p 38p	BU184 BU204 BU205 BU206 BU207 BU208	65p 70p 100p 150p 70p	BUV90 BUV93 BUW11A BUW11AF BUW12 BUW12A	175p 375p 200p 225p 125p 150p	MJ11033 MJ15003 MJ15004 MJ15015 MJ15016 MJ15022	800p 250p 300p 250p 350p 400p	BY127 BY133 BY164 BY179 BY184 BY206	8p 40p 35p 32p 11p	AN217P AN228 AN252 AN259 AN262 AN271	95p 280p 150p 250p 140p 230p	AN6350 AN6352 AN6356 AN6359 AN6360	610p 450p 300p 500p 320p	BA402 BA511 BA514 BA516 BA518 BA521	50p 145p 160p 150p 150p 100p	BA7212S BA7252S BA7604N BA7751LS BA7752 BA7755	200p 150p 100p 150p 250p 150p
BC171 BC172 BC177 BC178 BC179 BC182	10p BD536 10p BD537 14p BD538 14p BD643 14p BD645 7p BD647	40p 40p 50p 50p	BU208A BU208AT BU208B BU208D BU209 BU225	200p 200p 130p 90p	BUW12F BUW13A BUW32A BUW48 BUW49 BUW50	250p 200p 500p 550p 550p 400p	MJ15023 MJ15024 MJ15025 MJE340 MJE350 MJE520	400p 400p 700p 25p 80p 30p	BY207 BY227 BY228 BY298 BY299 BY329-1200	20p 19p 28p 15p 18p 150p	AN274 AN277B AN278 AN301 AN302 AN303	250p 400p 60p 330p 650p 250p	AN6362 AN6363 AN6367NK AN6368 AN6371 AN6387	400p 375p 400p 275p 350p 480p	BA524 BA526 BA527 BA532 BA534	240p 180p 95p 100p 220p	BA7767AS BA8504 BA15218 CA3140E CNX62A	155p 350p 60p 38p 80p
BC182L BC183 BC183L BC184 BC184L	7p BD649 7p BD675 7p BD676 7p BD677 7p BD678	50p 40p 40p 38p 40p	BU226 BU312 BU325 BU326A BU406 BU406D	120p 90p 55p 75p 60p 85p	BUW81A BUW84 BUW85 BUX10 BUX11 BUX12	150p 75p 85p 150p 200p 150p	MJE2955T MJE3055T MJE13004 MJE13005 MJE13007 MJE13009	65p 65p 100p 60p 100p 100p	BY448 BYT11 BYT13-1000 BYV96E BYW96E	20p 25p 30p 25p 36p	AN304 AN315 AN316 AN337 AN360	360p 210p 350p 600p 100p	AN6550 AN6551 AN6552 AN6554 AN6555 AN6605	100p 50p 45p 80p 50p 35p	BA536 BA546 BA612 BA614 BA618 BA631	150p 160p 120p 70p 55p 280p	CNX82A CNX83A CX136 CX139A CX141 CX145	60p 80p 600p 750p 750p 750p
BC212 BC212L BC213 BC213L BC214 BC214L	7p BD679 7p BD680 7p BD681 7p BD682 7p BD705 7p BD707	40p 45p 45p 50p 50p	BU407 BU407D BU408 BU408D BU409	55p 75p 60p 75p 85p	BUX20 BUX21 BUX22 BUX23 BUX37	350p 450p 450p 900p 220p	MJE15028 MJE15029 MJE15030 MJE15031 MJE18004 MJF18004	200p 200p 250p 400p 125p 175p	BYX10 BYX55/600 IN4001 IN4002 IN4003 IN4004	15p 25p 3p 3p 3p 3p	AN362 AN363 AN366 AN610 AN3211K AN3215K	140p 150p 150p 160p 375p 350p	AN6612 AN6650 AN6651 AN6652 AN6671K AN6676	60p 45p 45p 45p 45p 425p 600p	BA656 BA658 BA681A BA682A BA683A BA684	110p 350p 350p 300p 300p 400p	CX150B CX175 CX187 CX804A CX867 CX868	325p 325p 825p 775p 575p 525p
BC237 BC238 BC239 BC300 BC301 BC302	7p BD709 7p BD711 7p BD736 20p BD826 20p BD828 20p BD839	50p 50p 50p 50p 55p	BU412 BU413 BU414B BU415A BU426A BU433	175p 175p 250p 170p 70p 120p	BUX39 BUX40 BUX41 BUX42 BUX47A BUX48A	450p 210p 200p 200p 220p 150p	MJF18204 OC28 OC29 OC35 OC36	350p 350p 250p 350p 250p	IN4005 IN4006 IN4007 IN4148 IN5400 IN5401	3p 3p 4p 2p 9p 8p	AN3231K AN3236K AN3310K AN3312 AN3313 AN3320K	300p 450p 325p 350p 300p 450p	AN6780S AN6870 AN6875 AN6878 AN6879 AN6880	80p 450p 150p 65p 225p 75p	BA685 BA715 BA718 BA728 BA806 BA843	400p 45p 45p 55p 220p 130p	CX877 CX7925B CX20015A CX20106A CX20109 CX20187	300p 550p 600p 75p 140p 700p
BC303 BC304 BC327 BC328 BC337 BC338	20p BD897 25p BD899 7p BD977 7p BDX33 7p BDX37 7p BDX44	50p 50p 60p 100p 100p	BU500 BU500D BU505 BU505D BU505DF BU506	100p 225p 90p 90p 90p 100p	BUX55 BUX80 BUX81 BUX84 BUX85 BUX86	800p 180p 160p 50p 50p 30p	\$2000A3 \$2000AF \$2055A \$2055AF \$2530A TIP29	175p 130p 175p 175p 100p 15p	IN5402 IN5403 IN5404 IN5405 IN5406 IN5407	8p 8p 11p 12p 12p	AN3331K AN3792 AN3794 AN3814K AN3821K AN3822K	450p 300p 325p 450p 600p 600p	AN6882 AN6884 AN6888 AN6889 AN6913	300p 200p 150p 100p 60p 650p	BA1310 BA1320 BA1330 BA1332 BA1350 BA1355	160p 75p 120p 60p 130p 125p	CXA1001AP CXA1019P CXA1019S CXA1044P CXA1044BF CXA1081	1600p 150p 225p 550p
BC441 BC446 BC477 BC516 BC537 BC546	28p BDX47 8p BDX54C 18p BDX62C 22p BDX63C 25p BDX64C 8p BDX65	60p 75p 150p 175p 175p 80p	BU506D BU506DF BU508A BU508AF BU508APH BU508D	70p 100p 70p 95p 80p 75p	BUX87 BUX98A BUZ71 BUZ71AF BUZ72A BUZ72AF	50p 350p 75p 100p 100p 100p	TIP29A TIP29C TIP29E TIP30 TIP30C TIP31A	22p 25p 40p 25p 25p 22p	IN5408 RGP10 RGP15 RGP30 SR2M	12p 25p 25p 16p 60p	AN3830K AN3990K AN3991K AN5010 AN5011 AN2020	800p 300p 400p 250p 225p 80p	AN700 AN7010K AN7025K AN7060 AN7062 AN7072	250p 90p 175p 300p 250p	BA 1356 BA 1360 BA 1404 BA 1604 BA 2266A	100p 160p 120p 125p 250p	CXA1081M CXA1081S CXA1082AS CXA1191M CSA1209P	250p 300p 1000p 250p 400p
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BC640 BCY33 BCY34 BCY70 BCY71 BCY72	20p BDY58 200p BDY90 200p BDY90 16p BF137 16p BF167 16p BF181	125p 100p 35p 30p 18p	BU706DF BU706F BU724A BU801 BU806	175p 150p 100p 70p 70p	IRF140 IRF230 IRF240 IRF250 IRF330	550p 550p 425p 375p 600p	TIP42A TIP42C TIP47 TIP48 TIP50	20p 22p 40p 40p 60p	ZENER DIO 400 mWatt 2V7 to 39V		AN5210 AN5215 AN5222 AN5250 AN5256 AN5260	675p 100p 200p 160p 150p 300p	AN7131 AN7133N AN7134 AN7140 AN7141	90p 325p 300p 170p 70p	BA3704 BA3706 BA3812L BA3822LS BA3824LS BA3920	200p 75p 80p 80p 75p 300p	HA1339A HA1367 HA1377 HA1384 HA1388 HA1389	350p 300p 120p 600p 320p 210p
BD115 BD124P BD131 BD132 BD133 BD135	30p BF183 50p BF195 25p BF199 25p BF200 50p BF225 20p BF240	30p	BU807 BU807F BU808DF BU810 BU824 BU826	60p 75p 210p 110p 60p 120p	IRF340 IRF350 IRF450 IRF510 IRF520 IRF530	325p 750p 650p 110p 110p 120p	TIP51 TIP52 TIP54 TIP102 TIP105 TIP106	80p 80p 85p 70p 65p 65p	1.3 Watts 2V7 to 39V VOLTAGE REGULATO	9p RS	AN5262 AN5265 AN5315 AN5352 AN5411	175p 80p 600p 600p 450p	AN7142 AN7145 AN7146 AN7147 AN7148 AN7149	80p 195p 210p 180p 140p 160p	BA4110 BA4210 BA4220 BA4234L BA4236L	75p 85p 60p 70p 110p	HA1392 HA1394 HA1396 HA1397 HA1398	120p 170p 650p 200p 175p
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BD157 BD166 BD175 BD177 BD179	38p BF262 30p BF270 30p BF273 30p BF311 32p BF336	25p 18p 15p 21p 20p 20p	BU922 BU930 BU932 BU941 BU2508A BU2508AF	110p 130p 175p 250p 100p 110p	IRF642 IRF650 IRF710 IRF720 IRF730 IRF740	200p 200p 150p 150p 125p 125p	TIP116 TIP117 TIP120 TIP121 TIP122 TIP125	30p 30p 37p 35p 30p 30p	7824 7905 7906 7908 7912 7915	25p 25p 30p 30p 30p 30p	AN5515 AN5520 AN5521 AN5560 AN5601K AN5612	160p 550p 100p 350p 750p 200p	AN7166 AN7168 AN7169 AN7170 AN7171K AN7172K	350p 200p 225p 260p 400p 325p	BA5115 BA5115L BA5204 BA5208AF BA5402 BA5406	75p 75p 200p 110p 180p 180p	HA11225 HA11235 HA11244 HA11247 HA11251 HA11412	130p 100p 375p 375p 120p 600p
BD181 BD182 BD184 BD187 BD201 BD202	60p BF338 60p BF362 30p BF367 33p BF371 38p BF421	20p 30p 13p 17p 18p	BU2508D BU2508DF BU2520AF BU2520DF BU2525A	130p 120p 170p 225p 325p 220p	IRF820 IRF830 IRF840 IRF9140 IRF9510 IRF9511	110p 110p 110p 1000p 150p 150p	TIP126 TIP127 TIP130 TIP131 TIP132 TIP136	40p 35p 30p 30p 30p 40p	7918 7924 78L05 78L08 78L12	30p 30p 24p 24p 24p	AN5613 AN5615 AN5620 AN5622 AN5625 AN5630	200p 300p 250p 275p 400p 375p	AN7173K AN7177 AN7178 AN7205 AN7213 AN7216	450p 375p 180p 35p 40p 175p	BA5408 BA5413 BA6104 BA6109 BA6110 BA6125	180p 225p 250p 110p 225p 75p	HA11414 HA11423 HA11440 HA11485BI HA11702 HA11703	300p 110p 250p
BD203 BD204 BD222 BD225 BD232 BD233	42p BF422 42p BF423 31p BF455 31p BF458 31p BF462 30p BF471	21p 25p 12p 19p 50p 28p	BU2525AF BU2527AF BUF405A BUH315 BUH315D BUH515	400p 200p 200p 175p 200p	IRF9520 IRF9530 IRF9531 IRF9540 IRF9541	150p 200p 200p 240p 200p	TIP137 TIP162 TIP141 TIP142 TIP145 TIP146	65p 110p 65p 75p 50p	78L15 78L18 78L24 79L05 79L08 79L12	24p 24p 24p 35p 35p 35p	AN5633 AN5635N AN5640 AN5700 AN5701 AN5710	350p 330p 500p 90p 150p 100p	AN7218 AN7220 AN7222 AN7223 AN7224 AN7225	60p 85p 75p 105p 75p 175p	BA6137 BA6138 BA6146 BA6149LS BA6154 BA6208	55p 130p 150p 700p 60p 175p	HA11706 HA11710 HA11713 HA11715 HA11716 HA11718	280p 500p 250p 250p 480p 700p
BD234 BD235 BD236 BD237 BD238 BD239	32p BF472 28p BF479 30p BF494 21p BF495 24p BF595 30p BF596	28p 30p 16p 16p 16p 16p	BUH515D BUH517 BUH517D BUH715 BUT11A BUT11AF	250p 275p 175p 425p 40p 40p	IRF9610 IRF9620 IRF9622 IRF9630 IRF9640 IRFD9220	120p 110p 200p 180p 280p 100p	TIP147 TIP150 TIP151 TIP2955 TIP3055	80p 90p 60p 50p	79L15 LM309K LM317T LM323K 78H08KC 79H12KC	35p 100p 100p 350p 800p 700p	AN5712 AN5720 AN5722 AN5722 AN5730 AN5732 AN5750	180p 70p 140p 160p 120p 75p	AN7254 AN7256 AN7273 AN7310 AN7311 AN7312	150p 250p 75p 60p 90p 70p	BA6209 BA6218 BA6220 BA6222 BA6227 BA6229	85p 85p 55p 130p 50p 130p	HA11724 HA11741N HA11744 HA11745 HA11749 HA11751	650p
BD240 BD241A BD243A BD244 BD245 BD246A	40p BF615 40p BF617 50p BF760 50p BF763 50p BF870 50p BF871	30p 30p 40p 40p 22p 22p	BUT56A	80p 310p 80p 65p 1700p 65p	IRFBC30 IRFBC40 IRFP140 IRFP150 IRFP240 IRFP250	150p 250p 250p 300p 300p 280p	TIPL760 TIPL762A TIPL763A TIPL791A 2N2369 2N2646	100p 200p 200p 80p 15p 40p	79HGKC	800p	AN5753 AN5763 AN5790 AN5791 AN5836	130p 250p 240p 225p 450p	AN7315 AN7330 AN7362 AN7363 AN7410	40p 110p 200p 225p 150p	BA6235 BA6238A BA6239A BA6247 BA6248	50p 130p 130p 150p 140p	HA11752 HA11839N' HA11847 HA12002 HA12003	325p T 375p 700p 220p 150p
BD265 BD267 BD269 BD278 BD311 BD314	45p BF960 45p BF961 45p BF964 50p BFQ232 100p BFQ252A 100p BFR90	38p 35p 38p 75p 60p 85p	BUT76A BUT90 BUT92 BUV18 BUV20 BUV21	80p 1300p 1200p 650p 650p 400p	IRFP350 IRFP450 IRFP460 IRFP9140 IRFP9240 IRFPC50	325p 325p 775p 1450p 350p 600p	2N2904 2N2905 2N2906 2N2907 2N3019 2N3053	20p 20p 18p 18p 28p 18p	RED YELLOW GREEN 5mm RED YELLOW	5p 8p 8p 5p	AN5862K AN5900 AN608P AN620 AN6130 AN6135	225p 130p 125p 250p 130p 120p	AN7411 AN7414 AN7415 AN7470 AN8053 AN8275	50p 275p 70p 100p 200p 250p	BA6259 BA6280AF BA6290A BA6294 BA6302A BA6304	170p 300p 200p 250p 150p 120p	HA12005 HA12010 HA12016 HA12017 HA12026 HA12038N	180p 300p 120p 100p 125p T 140p
BD315 BD317 BD331 BD332 BD361 BD362	150p BFR91 150p BR100 40p BR303 40p BR303 60p BU105 60p BU108	99p 14p 37p 85p 80p 100p	BUV23 BUV24 BUV25 BUV26 BUV27 BUV28	475p 350p 110p 150p 125p 110p	IRFRC20 IRFZ20 IRFZ42 IRFZ44 MJ2501 MJ2955	250p 65p 275p 160p 100p 55p	2N3054 2N3055 2N3055H 2N3440 2N3441 2N3442	40p 38p 50p 45p 175p 85p	RECTANGI LEDs		AN6209 AN6250 AN6247 AN6270 AN6300 AN6306	350p 50p 200p 400p 600p 380p	AN8370 AN8377 AN8387 BA222 BA225 BA314	1000p 400p 350p 65p 100p 40p	BA6305 BA6321 BA6328 BA6334 BA6410 BA6411	140p 250p 250p 75p 220p 250p	HA12044 HA12045 HA12047 HA12058 HA12088 HA12116	350p 280p 450p 320p 375p 130p
BD362 BD370 BD371 BD410 BD433	30p BU 109 30p BU 110 50p BU 111 28p BU 124	80p 90p 100p 60p	BUV37 BUV46A BUV47 BUV48A	175p 75p 120p 175p	MJ3000 MJ3001 MJ4032 MJ4035	100p 100p 175p 175p	2N3771 2N3772 2N3773 2N3819	85p 90p 100p 29p	5mm x 2.5 RED YELLOW GREEN	mm 5p 8p 8p	AN6310 AN6320 AN6326N AN6332	200p 180p 250p 320p	BA301 BA311 BA313 BA333	55p 80p 60p 80p	BA6418N BA6435S BA6993 BA7001	100p 425p 150p 150p	HA12411 HA12412 HA12413 HA12430	175p 175p 70p 200p

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Part HA13001	Price 110p	_	Price	Part	Price	Part	Price		Price	Part	Price		Price		Price	Part	Price		Price
HA13001 HA13002 HA13006	110p 200p 400p	LA2800 LA3120 LA3150	350p 200p	LA7096 LA7113 LA7116	200p 275p	LF353 LF355	48p 60p	MC3302 MC3401	50p 45p	SAB3029 SAB3035	525p 275p	STK31021 STK3106	2500p	STK5478 STK5479	380p 300p	STR16006 STR17006	500p 500p	TA7281 TA7282	200p 160p
HA13007 HA13108	300p 280p	LA3160 LA3161	200p 120p 40p	LA7116 LA7123 LA7210	125p 1300p	LF357 LF398	70p 300p	MC3423P MC3488AF		SAB3036 SAB3037	725p 700p	STK3122 I STK3152 I	900p	STK5481 STK5482	470p 285p	STR20005 STR20012	450p 450p	TA7210 TA7283	200p 200p
HA13117 HA13118	175p 140p	LA3210 LA3226	65p 60p	LA7210 LA7212 LA7214	60p 150p 150p	LH2426S LM301 LM311	600p 26p	MC34063A MN1220T	600p	SAB3042 SAB3064	825p 130p	STK3156 STK4017	500p 400p	STK5483 STK5486	440p 450p	STR20015 STR30110	450p 330p	TA7284P TA7288	400p 220p
HA13119 HA13127	140p 350p	LA3246 LA3300	75p 140p	LA7220 LA7222	125p 110p	LM319 LM324	35p 165p 30p	MN1226 MN1228 MN1276	450p 600p	SAB3209 SAB3210	225p 250p	STK4019 STK4021	480p 380p	STK5487 STK5488	525p 480p	STR30115 STR30120	275p 400p	TA7291P TA7292P	200p
HA13128 HA13130	400p 450p	LA3301 LA3361	110p 100p	LA7224 LA7225	150p 250p	LM335Z LM339	120p 35p	MN1280 MN3004	1300p 70p 600p	SAB6456 SAB8048	125p 225p AP 700p	STK40241 STK4025	530p	STK5490 STK5632	450p 450p	STR30123 STR30125	450p 550p	TA7294P	325p 450p
HA 13135 HA 13139	500p 600p	LA3365 LA3370	70p 70p	LA7292 LA7294	275p 200p	LM348 LM358	50p 45p	MN3004 MN3005 MN3011	2000p 4000p	SAB8051/ SDA2003 SDA2004	450p 325p	STK4026 STK4028 STK4032 I	480p 550p	STK5720 STK5725	400p 450p	STR30130 STR40090	250p 350p	TA7299 TA7302P	200p 75p
HA13150A HA13151	1150p 875p	LA3373 LA3375	70p 300p	LA7295 LA7297	160p 120p	LM380 LM381	80p 150p	MN3101 MN3102	110p 110p	SDA2004 SDA2005 SDA2007	700p 300p	STK4034 > STK4036		STK5730 STK6316 STK6324B	450p 300p 500p	STR40115 STR41090 STR43111	600p 330p	TA7303 TA7307	70p 100p
HA13403 HA13406W	400p 400p	LA3376 LA3380	80p 300p	LA7305A LA7308	350p 70p	LM382 LM386	130p 60p	MN3207 MN3208	375p 950p	SDA2008 SDA2112	400p 450p	STK4038 STK4040 II	680p	STK6327 STK6328A	1200p 800p	STR44115 STR45111	950p 475p 550p	TA7310 TA7312	100p 120p
HA13408 HA13412	350p 600p	LA3390 LA3400	250p 250p	LA7311 LA7320	200p 120p	LM387 LM389N	100p 105p	MN6030B MN6163A	350p 700p	SDA2120 SDA2131	200p 225p	STK4042 II STK4044	800p 800p	STK6431 STK6607	850p 400p	STR50020 STR50092	350p 550p	TA7313 TA7314	70p 175p
HA13426 HA13432	500p 400p	LA3401 LA3410	90p 150p	LA7323 LA7330	325p 350p	LM393 LM431	45p 50p	MTA001M NE555	600p 20p	SDA2208 SDA4212	450p 775p	STK4046 STK4048	950p 1280p	STK6722 STK6732	725p 1000p	STR50103A STR50113	260p 500p	TA7315 TA7317P	200p 120p
HA13441 HA17524 KA2102	450p 250p 100p	LA3430 LA3600 LA3605	135p 60p 100p	LA7331 LA7332 LA7340	250p 225p	LM710 LM723	45p 40p	NE556 NE558	40p 80p	SDA5241 SDA5243-		STK4050 II STK4060	1600p 510p	STK6822 STK6922	900p 500p	STR50115 STR51041	500p 500p	TA7320P TA7322	200p 130p
KA2130 KA2131	150p 110p	LA3607 LA4030	125p 180p	LA7376 LA7391	300p 150p 550p	LM741DIL LM741MET LM747	18p 45p 55p	NE565 NE567	110p 115p	SDA5343 SDA5640	1450p 200p	STK4065 STK4101	650p 500p	STK6932 STK6962	525p 275p	STR50213 STR53041	500p 400p	TA7323 TA7234	80p 75p
KA2206 KA2209	150p 125p	LA4031 LA4032	140p 140p	LA7520 LA7530	200p 200p	LM1017 LM1035N	200p 350p	NE571 NE592 NE5532P	290p 85p	SDA5642 SGSF444 SGFS465	450p 500p	STK4111 STK4112	500p 500p	STK6972 STK6981B	490p 600p	STR54041 STR55041	320p 450p	TA7325 TA7326	90p 200p
KA2210 KA2212	230p 65p	LA4051 LA4100	160p 85p	LA7535 LA7545	175p 160p	LM1040N LM1203	650p 225p	SAA 1000 SAA 1004	140p 350p 650p	SLA4031 SLA7020N	500p 750p 4 450p	STK4121 STK4122 STK4131	480p 560p 480p	STK6982 STK6982H STK7216	600p 600p 420p	STR56041 STR58041 STR59041	550p 250p 300p	TA7328 TA7330P	110p 80p
KA2213 KA2214	130p 100p	LA4101 LA4102	80p 100p	LA7550 LA7555	275p 150p	LM1203AN LM1875T	225p 330p	SAA1005 SAA1006	325p 300p	STA301A STA341M	200p 180p	STK4132 II STK4133 II	600p	STK7217 STK7225	400p 500p	STR60001 STR80145	525p 475p	TA7331P TA7333	80p 100p
KA2224 KA2244	50p 75p	LA4110 LA4120	120p 270p	LA7620 LA7680	500p 675p	LM1881N LM1886	375p 250p	SAA1008 SAA1010	450p 400p	STA401A STA403A	220p 270p	STK4141 II STK4142		STK7226 STK7251	600p 500p	STR81145 STR90120	375p 425p	TA7335 TA7336	85p 180p
KA2261 KA2263	100p 100p	LA4138 LA4140	105p 60p	LA7681 LA7710	650p 250p	LM1889 LM1894N	300p 200p	SAA 1024 SAA 1025	250p 250p	STA405A STA431A	280p 250p	STK4147 II STK4151	680p	STK7253 STK7308	450p 350p	STRD1206 STRD1406	500p 600p	TA7337P TA7339P	175p 175p
KA2264 KA2284 KA2309	100p 75p 175p	LA4142 LA4145 LA4160	65p 65p 100p	LA7800 LA7801 LA7802	90p 100p 300p	LM1895N LM2901N LM2902N	275p 35p	SAA1026 SAA1027	400p 400p	STA432A STA434A	220p 270p	STK4152 STK4161	650p 650p	STK7309 STK7310	400p 470p	STRD1706 STRD1806	360p 360p	TA7341 TA7342P	250p 70p
KA2401 KA2412	150p 225p	LA4162 LA4178	110p 150p	LA7806 LA7808	260p 250p	LM2903N LM3900	40p 40p 40p	SAA1029 SAA1042 SAA1043P	150p 325p 675p	STA435A STA441C	270p 220p	STK4162 STK4164 II		STK7348 STK7356	400p 425p	STRD1816 STRD1906	350p 550p	TA7343 TA7347P	120p 120p
KA2912 KA2913A	125p 175p	LA4180 LA4182	150p 180p	LA 7820 LA7823	100p 200p	LM3909 LM3911N	100p 200p	SAA1044 SAA1056	400p 300p	STA451C STA456C STA471	280p 240p 210p	STK4171 STK4172 II STK4181	900p 680p 680p	STK7358 STK7402 STK7404	440p 560p 400p	STRD3035 STRD4412 STRD4420	300p 500p	TA7348P TA7349P	125p 175p
KA2914A KA22427	200p 100p	LA4190 LA4192	300p 140p	LA7824 LA7830	130p 90p	LM3914 LM3915	160p 160p	SAA 1057 SAA 1058	375p 225p	STA901M STK0025	280p 420p	STK4182 II STK4191	750p 700p	STK7404 STK7406 STK7408	650p 675p	STRD4420 STRD4512 STRD5441	550p 400p 475p	TA7354P TA7357	65p 340p
KIA6213S KIA6210AH	60p 400p	LA4200 LA4201	130p 120p	LA7831 LA7832	85p 130p	LM3916 LM8363	270p 320p	SAA1060 SAA1061	375p 250p	STK0029 STK0039	360p 600p	STK4192 STK4211 II	700p	STK7410 STK7458	1500p 1250p	STRD5541 STRD6008	450p 575p	TA7358 TA7359P	85p 90p
KIA6281H KIA6283K	250p 150p	LA4260 LA4261	230p 300p	LA7835 LA7837	150p 150p	LM8560 LM13600	175p 150p	SAA1062 SAA1063	250p 250p	STK0040 STK0049	520p 510p	STK4211 V STK4221 II	800p	STK7554 STK7561	600p 650p	STRD6009E STRD6018		TA7361 TA7362	125p 150p
KIA6299H KIA7227CP KIA7313	210p 200p 45p	LA4265 LA4270 LA4282	125p 300p 350p	LA7838 LA7850 LA7851	200p 225p 200p	LM13700 LM18293 M491BB1	125p 500p 600p	SAA1064 SAA1070 SAA1073	275p 550p	STK0050 STK0059	440p 620p	STK4231 II STK4241	1050p	STK7562 STK7563	1000p 800p	STRD6602 STRD6601	475p 650p	TA7364P TA7366P	175p 65p
L149V L165V	300p 250p	LA4420 LA4422	140p 130p	LA7910 LA7913	150p 90p	M494B1 M5265P	700p 200p	SAA1075 SAA1086	325p 350p 175p	STK0060 STK0070 STK0080	820p 1100p 580p	STK4241 V STK4272 STK4273	500p	STK7573 STK7576	400p 1500p	STRM6545 STRM6546	900p 900p	TA7368P TA7373F	35p 150p
L200 L272	200p 200p	LM4425/ LA4430	A 200p 130p	LA7930 LA7940	350p 200p	M50115P M50117P	320p 500p	SAA1089 SAA1101	325p 700p	STK011 STK015	330p 440p	STK4301 STK4311	550p 500p 650p	STK7703 STK8050 STK8250	1000p 750p 500p	STRM6549 STRS5741 STRS5941	500p 800p 750p	TA7374 TA7376P	175p 100p
L272M L290B	110p 225p	LA4440 LA4445	200p 200p	LA7953 LA9200	300p	M50119P M50422P	525p 750p	SAA1124 SAA1130	200p 550p	STK016 STK025	760p 650p	STK4332 STK4352	365p 500p	STK8260 STK8280	1200p 1850p	STRS6307 STRS6308	600p 600p	TA7378P TA7401	60p 250p
L291B L292 L293B	300p 750p 225p	LA4446 LA4460 LA4461	170p 120p 120p	LB1205 LB1216 LB1258	170p 150p 100p	M50461 M50784 M50786	350p	SAA1250 SAA1251	280p 380p	STK050 STK077	1600p 520p	STK4362 STK4372	450p 600p	STK73405 I STK73410	350p	STRS6309 STRS6707	600p 1000p	TA7402P TA7403	200p 325p
L293C L293D	325p 225p	LA4466 LA4470	225p 300p	LB1268 LB1274	70p 85p	M50790 M51014L	500p 600p 120p	SAA1271 SAA1274 SAA1290	400p 280p 750p	STK078 STK080 STK082	580p 550p 540p	STK4392 STK4412	500p 450p	STK7340 II STK73605	500p 375p	STRS6708 TA7054	575p 190p	TA7404 TA7405P	150p 200p
L293E L294	250p 475p	LA4475 LA4476	225p 225p	LB1290 LB1292	120p 110p	M51143AL M51161	110p 300p	SAA1293 SAA1294	550p 800p	STK084 STK085	600p 900p	STK4432 STK4773 STK4793	600p 820p 800p	STK73907 STK78617 STR370	700p 2400p 300p	TA7061 TA7062 TA7066	115p 200p 120p	TA7411AP TA7415P	150p 350p
L295 L297	450p 525p	LA4480 LA4485	225p 300p	LB1405 LB1407	70p 130p	M51161P M51162P	250p 250p	SAA 1300 SAA 1310	200p 200p	STK086 STK0100	800p 900p	STK4803 STK4813	640p 800p	STR371 STR380	400p 350p	TA7075P TA7089	300p 300p	TA7417AP TA7521P	225p 350p
L298 L465A L482	525p	LA4495 LA4496	250p 250p	LB1409 LB1412	200p 300p	M51164AL M51166P	80p 300p	SAA1350 SAA1351	275p 750p	STK0100II STK420	1200p 400p	STK4833 STK4843	850p 720p	STR381 STR383	390p 410p	TA7102P TA7119	500p 150p	TA7607 TA7608	200p 360p
L497B L702B		LA4498 LA4500 LA4505	275p 200p 220p	LB1415 LB1416 LB1426	100p 85p 125p	M51182L M51191L M51231P	110p 85p 200p	SAA1900S SAA3004	475p 400p	STK430 STK433	500p 400p	STK4853 STK4863	730p 700p	STR384 STR440	350p 800p	TA7120 TA7124	55p 250p	TA7609 TA7611	170p 210p
L702N L2720	325p	LA4508 LA4510	200p 100p	LB1450 LB1615	110p 270p	M51308SP M51310AP	550p 900p	SAA3006P SAA3007P SAA3008P	225p 130p 200p	STK435 STK436 STK437	375p 430p 600p	STK4873 STK4893 STK4913	850p 1000p 900p	STR441 STR442 STR450A	950p 1600p	TA7130P TA7137	85p 60p	TA7612 TA7613AP	300p 90p
L2722 L4960	175p	LA4520 LA4550	170p 200p	LB1620 LB1622	210p 220p	M51316P M51320	300p 200p	SAA3010P SAA3027P	300p 375p	STK439 STK441	500p 680p	STK5314 STK5315	475p 500p	STR450A STR451 STR452	700p 800p 600p	TA7140 TA7141 TA7150P	100p 825p 250p	TA7614 TA7616	170p 300p
L6203 L6210	250p	LA4555 LA4557	120p 150p	LB1630 LB1639	80p 300p	M51356P M51358P	400p 150p	SAA3049P SAA4700	550p 425p	STK443 STK457	700p 470p	STK5322 STK5323	500p 600p	STR453 STR454	500p 1300p	TA7157 TA7172P	100p 150p	TA7621 TA7622	300p 420p
L6221AS L6506 LA1130	300p	LA4558 LA4570 LA4571	125p 130p	LB1640 LB1641	150p 75p	M51365P M51366P	350p 360p	SAA5000 SAA5010	200p 220p	STK459 STK460	560p 660p	STK5324 STK5325	450p 370p	STR455 STR456	550p 470p	TA7193 TA7200	320p 200p	TA7628 TA7629	110p 220p
LA1135 LA1145	120p	LA4581 LA4597	175p 175p 125p	LB1642 LB1645 LB1648	150p 100p 200p	M51381P M51384AP M51387P	200p 750p	SAA5012 SAA5020	400p 350p	STK461 STK463	600p 950p	STK5326 STK5330	750p 850p	STR457 STR470	600p 400p	TA7205 TA7207	150p 150p	TA7630 TA7632	200p 400p
LA1150 LA1170	150p 90p	LA4620 LA4630	400p 325p	LB1649 LB3500	190p 125p	M51392P M51393AP	600p 300p 350p	SAA5040A SAA5040B	440p 280p 400p	STK465 STK501 STK561	720p 550p 450p	STK5331 STK5332 STK5333	300p 180p 650p	STR1096 STR1195 STR1229	275p 350p 325p	TA7208 TA7210 TA7214	125p 200p 220p	TA7640 TA7641 TA7644BP	90p 140p 480p
LA1177 LA1180	130p 75p	LA4700 LA4705	350p 400p	LC4966 LC7011	65p 500p	M51395AP M51397AP	450p 425p	SAA5041 SAA5042	550p 425p	STK563 STK583	415p 500p	STK5335 STK5336	350p 350p	STR2005 STR2012	400p 400p	TA7217 TA7220	145p 220p	TA76545P TA7658	480p 65p 100p
LA1185 LA1186 LA1201	35p	LA5005 LA5112	90p 200p	LC7060 LC7120	600p 350p	M51436P M51496P	350p 275p	SAA5050 SAA5051	650p 400p	STK760 STK770	600p 400p	STK5337 STK5338	500p 295p	STR2013 STR2015	300p 550p	TA7222 TA7223	90p 210p	TA7659P TA7660P	400p 325p
LA 1205 LA 1207	75p	LA5511 LA5512 LA5522	50p 50p 45p	LC7130 LC7131	300p 260p	M51533 M51544 M51848	300p 150p	SAA5052 SAA5054 SAA5230	500p 500p	STK772 STK772B	650p 480p	STK5339 STK5340	400p 350p	STR2024 STR2105	575p 600p	TA7225 TA7226	300p 290p	TA7666P TA7668	100p 100p
LA1210 LA1222	140p	LA5523 LA5524	150p 80p	LC7132 LC7137 LC7181	400p 450p 350p	M54523P M54563P	150p 200p 200p	SAA5231	850p 170p 600p	STK780 STK795 STK1039	575p 450p	STK5342 STK5343	245p 380p	STR2124 STR3105	675p 525p	TA7227 TA7230	170p 100p	TA7672 TA7676AP	400p
LA1230 LA1235	130p 130p	LA5527 LA5530	150p 65p	LC7185 LC7191	350p 300p	M58484 M51516	260n	SAA5240PA SAA5243PE SAA5244AP	950n	STK1049 STK1049	460p 640p 700p	STK5353 STK5361 STK5362	400p 375p 400p	STR3113 STR3115 STR3123	225p 400p 400p	TA7232 TA7233 TA7237	95p 120p 300p	TA7679 TA7680AP	450p 475p
LA 1240 LA 1245	80p 110p	LA5531 LA5537	65p 45p	LC7207 LC7215	275p 160p	M51518 M51995P	200p 250p	SAA5246AP SAA5246P	380p 750p	STK1050 STK1060	650p 700p	STK5372 STK5373	260p 375p	STR3125 STR3130	480p 500p	TA7238 TA7240	400p 160p	TA7681AP TA7687AP	200p 425p 100p
LA1260 LA1261 LA1265	75p	LA5655 LA5658	175p 225p	LC7217 LC7218	350p 250p	M51977P M52307P	300p	SAA5250P SAA5351 SAA7000	750p 375p	STK1070 STK1080	850p 940p	STK5391 STK5392	375p 500p	STR3135 STR3212	250p 275p	TA7241 TA7242	165p 190p	TA7688 TA7698	150p 150p 400p
LA1266 LA1267	130p	LA5665 LA5667 LA5700	250p 200p 300p	LC7230 LC7267 LC7351	700p 550p 200p	M54646AP MB3708 MB3712	400b I	SAA7020	600p	STK2025 STK2028	620p 500p	STK5421 STK5422	450p 375p	STR3214 STR3215	275p	TA7243 TA7245	320p 225p	TA7699 TA7705	600p 300p
LA 1354 LA 1363	225p 90p	LA6339 LA6355	35p 50p	LC7364 LC7432	200p 200p 425p	MB3712 MB3713 MB3714	600p 130p 225p	SAA7210P SAA7220PA SAA7274P	550p	STK2029 STK2030 STK2038	480p 875p 700p	STK5431 STK5434 STK5436	550p 570p	STR3315 STR4090A STR4142	275p 650p	TA7245BPO TA7248P	200p 575p	TA7709P TA7719P	150p 200p
LA 1364 LA 1365	200p 120p	LA6510 LA6515	150p 150p	LC7522 LC7535	350p 300p	MB3715 MB3722	250p 200p	SAA7280P SAA9050	1450p 450p	STK2038 STK2048 STK2058IV	950p 1600p	STK5436 STK5441 STK5443	500p 400p 575p	STR4142 STR4211 STR4512	450p 315p 400p	TA7250B TA7251BP TA7256P	325p 325p 225p	TA7727P TA7750	125p 200p
LA1368 LA1369	220p 200p	LA6520 LA6531	175p 250p 400p	LC7537AN LC7537N	400p 450p	MB3730 MB3731	900p 220p	SAA9057 SAB0600	475p 600p	STK2101 STK2110	1050p 550p	STK5446 STK5451	350p 390p	STR5015 STR5100	500p 550p	TA7259P TA7262P	225p 400p	TA7757 TA7769	200p 130p
LA1385 LA1503 LA1805	120p	LA7007 LA7011	220p	LC7560 LC7565	750p 300p	MB3732 MB3735	240p 400p	SAB0601 SAB0602	525p 625p	STK2125 STK2129	580p 750p	STK5461 STK5462	500p 500p	STR5214 STR5315	475p 575p	TA7263P TA7265AP	325p 300p	TA7772P TA7784	150p 250p
LA 1815 LA 1810 LA 1851	130p	LA7016 LA7018 LA7019	45p 100p 130p	LC7582E LC7800 LC7815H	300p 175p 175p	MB3756 MB3759 MB3771	160p 200p 110p	SAB1009BP SAB1016 SAB1046P	600p	STK2139 STK2155	675p 900p	STK5464 STK5466	300p 500p	STR5412 STR6020	280p 270p	TA7267 TA7267BP	220p 120p	TA7792P TA7796P	250p 75p
LA2000 LA2001	150p 200p	LA7033 LA7042	400p 280p	LC7818 LC7820	280p 325p	MB3773 MB8719	110b	SAB1046P SAB2015P SAB2016P	525p	STK2230 STK2240 STK2250	470p 740p 650p	STK5467 STK5468 STK5471	400p 300p 330p	STR7001 STR9005 STR9012	600p 400p 300p	TA7269 TA7270 TA7271	260p 170p 220p	TA8101N TA8105N	230p 140p
LA2101 LA2110	270p 1 150p	LA7046 LA7051	300p 130p	LC7821N LC7822N	250p 160p	MC1391 MC1455	45p	SAB2016P SAB2022P SAB3012	525p 675p	STK3041 STK3042	370p 375p	STK5471 STK5472 STK5473	375p 480p	STR10006 STR11006	300p 450p 325p	TA7271 TA7272 TA7273	260p	TA8110AP TA8119P	110p
LA2200 LA2205	-190p 150p	LA7053 LA7054	130p 350p	LC7881B LC7881M	135p 325p	MC1488 MC1489	35p 35p	SAB3013 SAB3017	200p 320p	STK3044 STK3062	500p 500p	STK5474 STK5476	500p	STR12006 STR13006	450p 500p	TA7274 TA7279P	210p 325p	TA8122AN TA8127N	250p 100p
LA2211	350p	LA7060	150p	LF347	110p	MC1496	65p	SAB3021	450p	STK3082	550p	STK5477	450p	STR15006	500p	TA7280	190p	TA8132AN	200p

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8184P 8189P 8200AH	350p 130p 325p	TDA1185A TDA1190 TDA1200B	190p 80p 80p	TDA2780 TDA2791 TDA2795	600p 275p 150p	TDA4670 TDA4680 TDA4685	475p 350p 275p	TDA8395 TDA8405 TDA8415	360p 550p 650p	UPC1009 UPC1018 UPC1020	950p 170p 200p	2SA773 2SA777 2SA778	50p 35p 100p	2SA1179 2SA1182 2SA1184	20p 20p 120p	2SB562 2SB564 2SB566	20p 15p 90p	2SC739 2SC761 2SC762	150 110 150
B201AK B205	300p 220p	TDA1220 TDA1235	50p 300p	TDA2822M TDA2824	60p 85p	TDA4700A TDA4714C TDA4716C	750p 350p	TDA8416 TDA8417 TDA8421	625p 550p 300p	UPC1023 UPC1024H 2 UPC1025	60p	2SA781 2SA786 2SA794	150p 25p 50p	2SA1185 2SA1186 2SA1198	200p 500p 40p	2SB596 2SB598 2SB600	50p 30p 500p	2SC783 2SC790 2SC792	85 50 380
	175p 260p 200p	TDA1236 TDA1251 TDA1270	240p 150p 150p	TDA2840 TDA3047 TDA3048	200p 100p 130p	TDA4718A TDA4725	250p 750p	TDA8425 TDA8432	500p 550p	UPC1026 UPC1028	95p 90p	2SA798 2SA812 2SA814	30p 15p 60p	2SA1201 2SA1202 2SA1204	40p 25p 225p	2SB601 2SB605 2SB631	60p 25p 40p	2SC805 2SC828 2SC829	229 20 19
8214K 8215 8216H	260p 300p 300p	TDA1327 TDA1405 TDA1410	200p 50p 220p	TDA3082 TDA3083 TDA3190	200p 200p 100p	TDA4800 TDA4810 TDA4814A	300p 250p 300p	TDA8433 TDA8440 TDA8442	600p 300p 200p	UPC1031H UPC1032 UPC1035C	150p 60p 110p	2SA816 2SA817	70p 20p	2SA 1206 2SA 1207	60p 25p 70p	2SB632 2SB633	45p 80p 12p	2SC839 2SC867 2SC870	900 100
8217P 8220AH 8221AH	120p 500p 600p	TDA1412 TDA1506 TDA1508	35p 275p 175p	TDA3301B TDA3310 TDA3410	400p 120p 150p	TDA4850 TDA4851 TDA4852	475p 325p 325p	TDA8443 TDA8444 TDA8451	350p 200p 325p	UPC1043C UPC1158H UPC1161	125p 70p 110p	2SA825 2SA836 2SA837	20p 20p 200p	2SA1208 2SA1209 2SA1210	100p 120p	2SB641 2SB647 2SB648	20p 45p	2SC897 2SC900B	17!
8225H 8225L 8227	475p 475p 250p	TDA 1510 TDA 1512 TDA 1514A	170p 140p 325p	TDA3420 TDA3501 TDA3502	200p 300p 360p	TDA4860 TDA4866 TDA4881	200p 275p 200p	TDA8452 TDA8453 TDA8461	200p 350p 950p	UPC1167 UPC1170 UPC1173	125p 150p 200p	2SA839 2SA841 2SA844	110p 20p 20p	2SA1215 2SA1216 2SA1217	600p 550p 100p	2SB649 2SB673 2SB676	35p 100p 85p	2SC930 2SC936 2SC941	300 11
8229K 8400P 8410K	200p 200p 200p	TDA 1515A TDA 1516Q TDA 1517	200p 350p 150p	TDA3504 TDA3505 TDA3506	300p 275p 260p	TDA4935 TDA4940 TDA4942	300p 200p 200p	TDA8490 TDA8540 TDA8702	225p 250p 275p	UPC1176C UPC1178H UPC1180C	120p 250p 200p	2SA847 2SA854 2SA861	25p 30p 45p	2SA1220 2SA1221 2SA1222	75p 70p 50p	2SB688 2SB703 2SB705	90p 90p 200p	2SC944 2SC945 2SC950	140 10 40
8410P 8432	200p 200p 350p	TDA1519 TDA1519A TDA1520	200p 200p 275p	TDA3507 TDA3510 TDA3520	450p 200p 250p	TDA4944 TDA4950 TDA5030A	175p 100p	TDA8703 TDA8708 TDA8730	500p 600p 225p	UPC185H2 UPC1186 UPC1187	400p 80p 150p	2SA872 2SA872A 2SA879	25p 50p 30p	2SA1226 2SA1227 2SA1232	25p 250p 180p	2SB707 2SB716 2SB718	200p 20p 60p	2SC959 2SC980 2SC982	22! 4: 2:
8605N 8606N 8607P	350p 320p	TDA1521 TDA1522	210p 110p	TDA3530 TDA3540	250p 200p	TDA5140A TDA5330T	200p 300p 200p	TDA8732 TDA8735 TDA8740	300p 175p 625p	UPC1188H UPC1191 UPC1197	350p 300p 140p	2SA884 2SA885 2SA886	100p 35p 45p	2SA1237 2SA1238 2SA1239	25p 30p 30p	2SB727 2SB733 2SB734	100p 75p 35p	2SC983 2SC1000 2SC1001	12 2 95
8611AN 8615N 8628N	250p 480p 350p		200p 225p 2000p	TDA3541 TDA3560 TDA3561	175p 260p 300p	TDA5331T TDA5332T TDA5500	150p 400p	TDA8741 TDA8808T	550p 325p	UPC1198H UPC1210	200p 150p	2SA887 2SA893 2SA896	20p 15p 25p	2SA1240 2SA1242 2SA1244	45p 80p 120p	2SB737 2SB739 2SB744	20p 22p 55p	2SC1008 2SC1010 2SC1012	2 22 7
8631 8632N 8644N	500p 550p 425p	TDA1540 TDA1541 TDA1542	420p 500p 250p	TDA3561A TDA3562 TDA3562TF	300p 260p 300p	TDA5600 TDA5660P TDA5700	200p	TDA8809T TDA9045 TDA9080	350p 300p 400p	UPC1215V UPC1222 UPC1225H	125p 130p 220p	2SA899 2SA900	40p 45p	2SA1245 2SA1246	55p 80p	2SB750 2SB753	60p 100p	2SC1013 2SC1014	17 14 15
8646 8653N 1 86 5 9AN	375p 1500p 900p	TDA1543 TDA1552Q TDA1553AQ	200p 350p 325p	TDA3563 TDA3564 TDA3565	350p 325p 220p	TDA5701 TDA5708 TDA5709	200p 275p 375p	TDA9102C TDA9403 TDA9500	250p 130p 750p	UPC1227V UPC1228HA UPC1230	225p 45p 200p	2SA904 2SA907 2SA909	20p 650p 500p	2SA1248 2SA1249 2SA1252	35p 100p 20p	2SB754 2SB764 2SB765	80p 30p 70p	2SC1030 2SC1046 2SC1047	25 2
8690N 8691N 8701AN	700p 450p 275p	TDA 1555Q TDA 1557Q TDA 1558Q	375p 300p 300p	TDA3566 TDA3567 TDA3569	280p 350p 300p	TDA5800 TDA5820 TDA5832	850p 370p 125p	TDA9503 TDA9513 TDA9800	550p 225p 225p	UPC1237HA UPC1238 UPC1241H	70p 120p 150p	2SA912 2SA913 2SA914	70p 100p 90p	2SA1253 2SA1256 2SA1257	30p 30p 30p	2SB772 2SB774 2SB775	25p 50p 100p	2SC1050 2SC1051 2SC1061	28 25 8
3718N 3720 3739P	550p 525p	TDA1560Q TDA1571 TDA1572	675p 300p 175p	TDA3570 TDA3580 TDA3586	375p 300p 750p	TDA5850 TDA5930 TDA61000	175p 225p	TDA9821 TEA0652 TEA0653T	200p 150p 80p	UPC1242H UPC1245V UPC1270H	150p 130p 250p	2SA915 2SA916 2SA921	30p 30p 40p	2SA1258 2SA1261 2SA1262	70p 150p 110p	2SB776 2SB788 2SB791	110p 35p 130p	2SC1069 2SC1070 2SC1079	17 6 30
872N 4550	450p 450p 25p	TDA1574 TDA1576	125p 170p	TDA3590 TDA3591 TDA3592A	250p 360p	TDA61010 TDA61110 TDA6200	120p	TEA0655 TEA0665 TEA1002	300p 300p 650p	UPC1274V UPC1277 UPC1278	250p 240p 240p	2SA928A 2SA933 2SA934	25p 30p 30p	2SA1263 2SA1264 2SA1265	280p 280p 200p	2SB794 2SB795 2SB810	40p 45p 15p	2SC1080 2SC1096 2SC1098	22 12
120S 1396 1520	40p 70p 120p	TDA 1578A TDA 1579 TDA 1589	210p 130p 275p	TDA3601Q TDA3602	300p 375p 225p	TDA6600-2 TDA6610-2	700p	TEA1007 TEA1009 TEA1015P	120p 100p	UPC1288V UPC1297CA	230p	2SA935 2SA937	40p 20p 140p	2SA1283 2SA1284 2SA1286	50p 60p 60p	2SB816 2SB817 2SB819	160p 175p 60p	2SC1106 2SC1114 2SC1115	11 4 21
1530 1540 1560	100p 90p 90p	TDA1591 TDA1596 TDA1598	275p 200p 160p	TDA3611 TDA3640 TDA3645	450p 350p 400p	TDA6612-2 TDA7000 TDA7010T	170p 120p	TEA1017 TEA1019	110p 280p 130p	UPC1298 UPC1313H A UPC1316C	100p 70p	2SA939 2SA940 2SA942	50p 60p	2SA1289 2SA1290	50p 150p	2SB822 2SB824	40p 60p	2SC1116 2SC1124 2SC1161	2:
1800 1810AS 1820	40p 40p 55p	TDA1600 TDA1602A TDA1670A	200p 400p 200p	TDA3651 TDA3652 TDA3652-TX	200p 500p (10800p	TDA7020T TDA7021T TDA7050	200p 100p	TEA 1024 TEA 1035 TEA 1039	150p 200p 150p	UPC1318 UPC1330HA UPC1335V	320p	2SA949 2SA950 2SA951	70p 18p 60p	2SA1293 2SA1294 2SA1295	110p 450p 500p	2SB825 2SB826 2SB827	135p 75p 200p	2SC1162 2SC1164	6
A820M A920 A950	35p 100p 100p	TDA1675 TDA1701 TDA1771	200p 300p 200p	TDA3653 TDA3654 TDA3654Q	85p 80p 85p	TDA7052 TDA7053 TDA7056	120p 200p 200p	TEA 1045 TEA 1060 TEA 1061	300p 225p 175p	UPC1350 UPC1352C UPC1360C	115p 450p 200p	2SA952 2SA953 2SA954	30p 60p 30p	2SA1301 2SA1302 2SA1303	260p 300p 400p	2SB828 2SB829 2SB835	200p 200p 75p	2SC1165 2SC1166 2SC1170	7 1
0990 020 081AP	60p 200p 80p	TDA 1870A TDA 1872A TDA 1904	200p 275p 80p	TDA3710 TDA3720 TDA3724	300p 175p 300p	TDA7057C TDA7072 TDA7077		TEA1062 TEA1064 TEA1067	250p 250p 150p	UPC1362C UPC1363 UPC1363C	250p 190p 300p	2SA957 2SA958 2SA963	185p 60p 120p	2SA1304 2SA1306 2SA1307	110p 110p 100p	2SB857 2SB861 2SB863	80p 110p 220p	2SC1172 2SC1173 2SC1195	1
082P 090A	170p 230p	TDA 1905 TDA 1908A	80p 90p	TDA3725 TDA3730	300p 400p	TDA7211 TDA7220	100p 65p	TEA1068 TEA1080P TEA1087	350p 170p 40p	UPC1364C UPC1365 UPC1366C	350p 250p 130p	2SA965 2SA966 2SA968	30p 25p 55p	2SA1309 2SA1315 2SA1317	50p 100p 30p	2SB865 2SB882 2SB885	25p 180p 45p	2SC1212 2SC1213 2SC1214	
125BP 130P 134	410p 150p 750p	TDA1910 TDA1940 TDA1941	160p 180p 300p	TDA3740 TDA3750 TDA3755	400p 400p 425p	TDA7222 TDA7230A TDA7231A	80p	TEA1101 TEA1330	425p 65p	UPC1370C UPC1373	300p 85p	2SA970 2SA979	25p 35p	2SA1318 2SA1319	20p 25p	2SB891 2SB892 2SB895	35p 25p 60p	2SC1215 2SC1216 2SC1222	2
1135P 1137P 1138AP	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	UPC1377C UPC1378 UPC1379C	200p 400p 170p	2SA984 2SA985 2SA988	25p 60p 25p	2SA1320 2SA1321 2SA1327	45p 80p 130p	2SB908 2SB926	70p 30p	2SC1226 2SC1237	2
9142 9143 9145	320p 300p 150p	TDA2004 TDA2005 TDA2006	150p 150p 70p	TDA3780 TDA3791 TDA3800	400p 200p 250p	TDA7245 TDA7250 TDA7255	225p 400p 400p	TEA2018A TEA2019 TEA2025B	110p 600p 75p	UPC1382 UPC1384 UPC1387C	110p 425p 250p	2SA991 2SA992 2SA993	30p 30p 50p	2SA1329 2SA1346 2SA1348	200p 20p 45p	2SB941 2SB950 2SB951	60p 180p 190p	2SC1247A 2SC1252 2SC1278	8 1
9148 9149 9150	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 650p	2SA995 2SA999 2SA1005	60p 30p 25p	2SA1352 2SA1353 2SA1356	100p 100p 100p	2SB953 2SB975 2SB985	90p 100p 30p	2SC1279 2SC1308K 2SC1312	3
9151P 9152	425p 425p	TDA2010 TDA2020	150p 120p	TDA3827 TDA3840 TDA3842	110p 200p 200p	TDA7273 TDA7274 TDA7275	80p 45p 75p	TEA2029C TEA2031A TEA2037	270p 125p 200p	UPC1406HA UPC1420CA UPC1421CA	70p 450p	2SA1006 2SA1008 2SA1009	90p 125p 200p	2SA1357 2SA1358 2SA1359	65p 130p 45p	2SB986 2SB1009 2SB1010	40p 110p 25p	2SC1318 2SC1325 2SC1327	4
9153 9154AP 9156_	300p 225p 300p	TDA2030 TDA2030H TDA2040	80p 100p 140p	TDA3843 TDA3845	200p 225p	TDA7282 TDA7284	50p 100p	TEA2114 TEA2117	200p 450p	UPC1423CA UPC1470 UPC1474HA	550p 200p	2SA1010 2SA1011 2SA1012	225p 80p 85p	2SA1360 2SA1362 2SA1370	45p 25p 50p	2SB1012 2SB1015 2SB1016	55p 60p 130p	2SC1328 2SC1342 2SC1343	2
1158P 1162 1163	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	UPC1484CA UPC1488H	300p 115p	2SA1013 2SA1015	100p 10p	2SA1371 2SA1376	100p 30p	2SB1017 2SB1018 2SB1020	40p 130p 120p	2SC1345 2SC1346 2SC1358	1 2
9164 9167P 9172P	400p 100p 300p	TDA2054M TDA2107 TDA2148	110p 250p 325p	TDA4001 TDA4050 TDA4052	250p 150p 500p	TDA7318 TDA7330A TDA7350	300p	TEA2261 TEA2262 TEA3717D	185p 275p P 160p	UPC1498H UPC1505C UPC1513HA		2SA 1016 2SA 1018 2SA 1020	30p 100p 30p	2SA1380 2SA1381 2SA1382	75p 100p 120p	2SB1039 2SB1066	65p 40p	2SC1359 2SC1360	-
174P 176P 177P	325p 500p 225p	TDA2151 TDA2170 TDA2220	375p 260p 200p	TDA4060 TDA4092 TDA4100	500p 250p 150p	TDA7359 TDA7360 TDA7361	300p 700p 175p	TEA3718S TEA5030 TEA5040	175p 135p 650p	UPC1514CA UPC1515CA UPC1520CA	250p	2SA1021 2SA1023 2SA1026	35p 60p 90p	2SA1385 2SA1386 2SA1387	180p 400p 75p	2SB1068 2SB1077 2SB1098	160p 180p 80p	2SC1364 2SC1368 2SC1382	
A9940 P100 52308AP	100p 100p 200p	TDA2270 TDA2320 TDA2501	250p 80p 300p	TDA4173A TDA4180 TDA4190	7 325p 145p 180p	TDA7370V TDA7374V TDA7770	/ 325p	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	
52382 52506 52705	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	1
304AP 3306P	300p 350p	TDA2505 TDA2506	220p 400p 450p	TDA4280 TDA4282 TDA4283T	320p 360p 450p	TDA8120E 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 130p 30p	2SB1140 2SB1143 2SB1151	45p 40p 75p	2SC1400 2SC1403 2SC1407	5
5350P 5359P A1001	200p 300p 200p	TDA2507 TDA2507T TDA2510	450p 450p	TDA4290 TDA4400 TDA4420	125p 175p 120p	TDA8135 TDA8136 TDA8137	225p 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 50p	2SC1413 2SC1419 2SC1426	7
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1020 1022 1023	110p 330p 130p	TDA2545 TDA2546A TDA2548	120p 200p 200p	TDA4442 TDA4443 TDA4445	240p 250p 220p	TDA8160 TDA8170 TDA8172	125p 170p 200p	TEA6200 TEA6300 TEA6310T	225p 500p 425p	2SA571 2SA603 2SA606	650p 100p 200p	2SA1093 2SA1094 2SA1095	180p 190p 300p	2SA1516 2SA1519 2SA1523	20p 45p	2SB1274 2SB1282 2SB1318	40p 300p 40p	2SC1454 2SC1470 2SC1472	1
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	Jun	TDA2730	200p	TDA4610	370p	TDA8380		UPC596	190p	2SA764	200p	2SA1173	60p 25p	2SB546 2SB549	45p 50p	2SC730 2SC732	350p 40p		4

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2SC1984 2SC1985	150p 100p	2SC2546 2SC2547	25p 65p	2SC3042 2SC3052	300p 30p	2SC3504 2SC3505	120p 240p	2SC4242 2SC4278	120p 175p	2SD725 2SD726	200p 275p	2SD1103 2SD1173 2SD1185	350p 280p	2SD1526 2SD1541 2SD1545	100p 350p 275p	2SJ48 2SJ56 2SJ74	425p 700p 60p	2SK872 2SK875	650p 475p
2SC1986	100p 15p	2SC2550 2SC2551	50p 70p	2SC3057 2SC3068	150p 60p	2SC3506 2SC3507	250p 650p	2SC4288A 2SC4300	650p 200p	2SD731 2SD732	250p 250p	2SD1186 2SD1189	400p 55p	2SD1546 2SD1548	350p 400p	2SJ76 2SJ77	220p 350p	2SK903 2SK904	500p 500p
2SC2001 2SC2002 2SC2003	15p 20p	2SC2552 2SC2553	60p 200p	2SC3070 2SC3071	35p 25p	2SC3509 2SC3514	750p 170p	2SC4301 2SC4304	300p 225p	2SD734 2SD741	15p 120p	2SD1191 2SD1192	120p 90p	2SD1554 2SD1555	170p 150p	2SJ79 2SJ103	225p 75p	2SK951 2SK952	275p 275p
2SC2004 2SC2022	20p 110p	2SC2555 2SC2562	120p 90p	2SC3073 2SC3074	100p 200p	2SC3518 2SC3519	120p 250p	2SC4313 2SC4381	600p 150p	2SD743 2SD757	130p 120p	2SD1196 2SD1197	150p 150p	2SD1556 2SD1565	225p 75p	2SJ109 2SJ113	200p 1050p	2SK955 2SK956	450p 400p
2SC2023 2SC2026	30p	2SC2568 2SC2568	200p 120p	2SC3075 2SC3077	150p 120p	2SC3526 2SC3528	45p 750p	2SC4382 2SC4386	200p 275p	2SD760 2SD762	70р 100р	2SD1198 2SD1207	60p 40p	2SD1571 2SD1572	170p 100p	2SJ114 2SJ116	1150p 1200p	2SK962 2SK1023	700p 550p
2SC2027 2SC2036 2SC2037	50p	2SC2570 2SC2571	30p 350p	2SC3086 2SC3089	150p 130p	2SC3531 2SC3549	225p 200p	2SC4387 2SC4408	425p 50p	2SD763 2SD768	140p 180p	2SD1210 2SD1211	280p 120p	2SD1575 2SD1576	200р 150р	2SJ117 2SJ119	550p 700p	2SK 1036	450p
2SC2057 2SC2053 2SC2055	120p	2SC2577 2SC2578 2SC2579	110p 170p 110p	2SC3101 2SC3112 2SC3114	750p 35p	2SC3552 2SC3568	270p 200p	2SC4429 2SC4431	275p 90p	2SD772 2SD773	200p 20p	2SD1213 2SD1218	220p 75p	2SD1577 2SD1579	250p 80p	2SJ162 2SJ175	680p 200p	2SK1057 2SK1058	600p 800p
2SC2058 2SC2060	20p	2SC2579 2SC2580 2SC2581	175p 225p	2SC3114 2SC3116 2SC3117	40p 75p 120p	2SC3577 2SC3584 2SC3591	275p 200p 200p	2SC4466 2SC4467 2SC4468	325p 175p 250p	2SD774 2SD777 2SD784	30p 400p 650p	2SD1223 2SD1225 2SD1227	75p 70p	2SD1589 2SD1590 2SD1591	60p 100p	2SJ182 2SJ200	150p 625p	2SK1081 2SK1082	700p 450p
2SC2061 2SC2068	75p 60p	2SC2588 2SC2590	600p 40p	2SC3122 2SC3148	50p 145p	2SC3595 2SC3597	220p 75p	2SC4517 2SC4517A	200p 225p	2SD786 2SD787	100p 20p	2SD1227 2SD1229 2SD1237	40p 250p 300p	2SD1591 2SD1593 2SD1595	310p 125p 70p	2SJ307 2SK19 2SK33	45p	2SK1102 2SK1117	375p 250p
2SC2071 2SC2073	140p 40p	2SC2591 2SC2592	50p 200p	2SC3149 2SC3150	180p 100p	2SC3599 2SC3600	140p 175p	2SC4531 2SC4532	450p 1000p	2SD787 2SD788 2SD789	30p 20p	2SD1238 2SD1244	300p 300p 25p	2SD1608 2SD1609	210p 45p	2SK40 2SK55	50p	2SK1118 2SK1120	225p 550p
2SC2075 2SC2078	60p 95p	2SC2603 2SC2610	10p 60p	2SC3151 2SC3152	175p 130p	2SC3606 2SC3607	100p 150p	2SC4542 2SC4742	400p 275p	2SD792 2SD794	400p 33p	2SD1246 2SD1247	20p 40p	2SD1632 2SD1637	320p	2SK68 2SK73	100p	2SK1190 2SK1191	350p 800p
2SC2085 2SC2086	60p	2SC2611 2SC2621	30p 70p	2SC3153 2SC3156	175p 350p	2SC3608 2SC3616	65p 45p	2SC4744 2SC4745	350p 550p	2SD795A 2SD798	140p 175p	2SD1251 2SD1254	180p 55p	2SD1647 2SD1649	40p 260p	2SK97 2SK106	200p	2SK1217 2SK1221	700p 200p
2SC2092 2SC2094	1200p	2SC2625 2SC2626	190p 600p	2SC3157 2SC3158	200p 260p	2SC3636 2SC3642	280p 225p	2SC4747 2SC4757	200p	2SD799 2SD809	150p 45p	2SD1263 2SD1264	90p 55p	2SD1650 2SD1651	150p 150p	2SK107 2SK109	40p 150p	2SK1275 2SK1296	275p 350p
2SC2097 2SC2099 2SC2118	2500p	2SC2630 2SC2631 2SC2632	20p	2SC3159 2SC3164 2SC3169	200p 270p	2SC3657 2SC3659		2SC4762 2SC4769	220p	2SD811 2SD819	450p 300p	2SD1265 2SD1266	75p 180p	2SD1656 2SD1663	250p 350p	2SK117 2SK118	50p 50p	2SK1299 2SK1317	450p 900p
2SC2120 2SC2122A	10p	2SC2632 2SC2634 2SC2636	10p 40p	2SC3169 2SC3170 2SC3173	150p 300p 180p	2SC3668 2SC3675 2SC3678	100p	2SC4770 2SC4820 2SC4826	225p	2SD820 2SD821	250p 550p	2SD1267 2SD1271	55p 55p	2SD1666 2SD1667	50p 120p	2SK125 2SK133	650p	2SK1338 2SK1341	250p
2SC2131 2SC2141	550p	2SC2637 2SC2640	120p	2SC3173 2SC3175 2SC3178	150p 150p 125p	2SC3679 2SC3680	140p	2SC4826 2SC4891 2SC4923	800p	2SD822 2SD826 2SD829	290p 30p	2SD1271A 2SD1272	200p	2SD1668 2SD1669	90p 85p	2SK147 2SK152	40p	2SK1342	500p 500p
2SC2131 2SC2141 2SC2153 2SC2166	40p	2SC2653 2SC2654	100p 180p	2SC3179 2SC3180	70p 175p	2SC3685 2SC3687	450p	2SC4924 2SC4927	250p	2SD829 2SD836 2SD836A	375p 50p 50p	2SD1273 2SD1274 2SD1275	50p 80p 50p	2SD1677 2SD1680 2SD1683	200p 225p 45p	2SK161 2SK163 2SK168	40p	2SK1350 2SK1356	200p 225p
2SC2168 2SC2188	120p 70p	2SC2655 2SC2656	50p	2SC3181 2SC3182	200p 120p	2SC3688 2SC3692	550p	2SC5002 2SC5003	300p	2SD837 2SD838	55p 500p	2SD1276 2SD1277	60p 190p	2SD 1683 2SD 1684 2SD 1706	70p 325p	25K168 25K170 25K184	50p	2SK1357 2SK1358	350p 400p
2SC2200 2SC2209	250p 50p	2SC2660 2SC2665	100p 200p	2SC3198 2SC3199	30p 40p	2SC3715 2SC3717	480p 120p	2SC5027 2SC5048		2SD841 2SD844	110p 200p	2SD1277 2SD1279 2SD1288	600p 175p	2SD1707 2SD1708	400p 375p	2SK192 2SK193	45p 40p	2SK1377 2SK1400	150p 250p
2SC2216 2SC2221	50p 650p	2SC2668 2SC2671	10p 100p	2SC3202 2SC3209	25p 120p	2SC3729 2SC3746	450p 100p	2SC5044 2SC5086	250p 250p	2SD850 2SD856	170p 48p	2SD1289 2SD1291	250p 280p	2SD1710 2SD1718	200p 275p	2SK195 2SK197	150p	2SK1404 2SK1461	290p 220p
2SC2228A 2SC2229	15p	2SC2681 2SC2682	170p 70p	2SC3210 2SC3211	550p 220p	2SC3747 2SC3748	120p 100p	2SC5129 2SC5148	300p 300p	2SD858 2SD863	250p 23p	2SD1292 2SD1293	60p 70p	2SD1729 2SD1730	230p 275p	2SK212 2SK214	35p	2SK1462 2SK1487	425p 250p
2SC2230 2SC2233	100p	2SC2688 2SC2690	60p	2SC3212 2SC3225	260p 50p	2SC3752 2SC3781	250p 150p	2SC5149 2SC5250	300p 300p	2SD864 2SD866	200p 120p	2SD1297 2SD1302	300p 20p	2SD1732 2SD1739	250p 180p	2SK216 2SK223	200p 50p	2SK1507 2SK1529	300p 700p
2SC2235 2SC2236 2SC2237	20p	2SC2694 2SC2705	40p	2SC3242 2SC3244	30p 45p	2SC3782 2SC3783	300p	2SD188 2SD198	140p	2SD866A 2SD867	140p 350p	2SD1306 2SD1308	45p 80p	2SD1740 2SD1748	125p 90p	2SK240 2SK241	140p 30p	2SK 1529 2SK 1537 2SK 1544	400p 900p
2SC2237 2SC2238 2SC2240	45p	2SC2706 2SC2710 2SC2712	50p	2SC3246 2SC3259 2SC3260	50p 350p 220p	2SC3787 2SC3788	60p	2SD199 2SD200 2SD201	180p	2SD868 2SD869	260p 150p	2SD1309 2SD1310	140p 140p	2SD1756 2SD1758	275p 60p	2SK246 2SK300	25p	2SK1767	275p
2SC2258 2SC2259	30p	2SC2714 2SC2716	20p	2SC3260 2SC3261 2SC3262	230p 230p 280p	2SC3789 2SC3790 2SC3795	120p	2SD201 2SD213 2SD234	250p	2SD870 2SD871 2SD879	140p 260p	2SD1311 2SD1313	65p 1000p	2SD1760 2SD1761	80p 60p	2SK301 2SK303	40p	2SK2038 2SK2039	295p 750p
	oop	2002/10	oop	-003202	-oop	2003/30	ı+∪p	230234	aup	2308/9	60p	2SD1326	200p	2SD1762	50р	2SK304	25p	2SK2134	225p

Sign of 1975 1975	Price 3100p 141, 143G, 14SP, 151, 3, 244, 274, VHR310, 200, 430, 4300, 4400, 350, 7100, 7200, 7250, 8101, 8200, VHR7800, 1SP, VHRD4400, 4410,
Segon 1, 11, 15, 16, 10, 20, 120, 120, 120, 120, 120, 120,	141, 143G, 14SP, 151, 3, 244, 274, VHR310, 200, 430, 4300, 4400, 350, 7100, 7200, 7250, 8101, 8200, VHR7800, 1SP, VHRD4400, 4410,
Sign of 1975 1975	200, 430, 4300, 4400, 350, 7100, 7200, 7250, B101, 8200, VHR7800, 1SP, VHRD4400, 4410,
Vietable 1900	8101, 8200, VHR7800, 1SP, VHRD4400, 4410,
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560, 580, 580, 600, 560, 173, 74, 75, 75, 750, 750, 750, 750, 750, 750,	102, 405, 408, 500, 550,
Vickide Sept	, 6V3, 750, 780, 781,
VS201 22, 22, 24, 25, 46, 76, 22, 22, 23, 24, 25, 46, 77, 22, 22, 22, 24, 25, 46, 77, 22, 22, 22, 24, 25, 46, 24, 24, 24, 24, 24, 25, 25, 25, 26, 27, 27, 28, 28, 28, 28, 28, 28, 28, 28, 28, 28	80, 584, 600, 682, 693, 2 7822 VC783 8481
95767 270 220 271 222 230 240, 260, 120 271 272 275 286, 260 275 286 2	102, 103, 1031, 103,
957-290, 150, 250, 95620, 204, 205, 204, 205, 204, 205, 204, 205, 204, 205, 204, 205, 204, 205, 204, 205, 204, 205, 204, 205, 205, 205, 205, 205, 205, 205, 205	131, 140, 202, 203, 255, 30, 35, VCA40,
VSERY 1956 2: 32, 22, 24, 05, 06, 111, 105, 110, 110, 110, 110, 110, 110	D801, 802, VCM73, VCT510, 72, VCT1314,
\(\sigma_{\text{CR}}\text{SRKC}_{\text{SR}}\text{VSF100}_{\text{VSF2}}\text{VSF100}_{\text{VSF2}}\text{VSF100}_{\text{VSF2}}\text{VSF100}_{\text{VSF2}}\text{VSF100}_{\text{VSF2}}\text{VSF100}_{\text{VSF2}}\text{VSF100}_{\text{VSF2}}\text{VSF100}_{\text{VSF20}}\text{VSF100}_{\text{VSF20}}\text{VSF100}_{\text{VSF20}}\text{VSF100}_{\text{VSF20}}\text{VSF100}_{\text{VSF20}}\text{VSF200}_{\text{VSF20}}\text{VSF200}_{\text{VSF20}}\text{VSF200}_{\text{VSF20}}\text{VSF200}_{\text{VSF20}}\text{VSF200}_{\text{VSF20}}\text{VSF200}_{\text{VSF20}}\text{VSF200}_{\text{VSF20}}\text{VSF200}_{\text{VSF20}}\text{VSF200}_{\text{VSF200}}	1100p 00, 7300,
VS 75 (9, VS 600, VS 600) VS 600, VS 600) VS 75 (9, VS 75 (9, VS 75 (9, VS 600) VS 75 (9,	8300 1800p 3000p
9576 (1986) (198	CA602 2800p
VXLEST V	2000p 3900p
2800 (VSC20, 204, 204, 205, 206, 20, 21, 211, 212, 212, 225, 224, 255, 254, 265, 267, 267, 267, 267, 267, 267, 267, 267	2800p /CH852,
1212_15_277_125_23_24_25_ 255_075_100_100_055_000_0	2700p FH815 2800p
VS-6115 VS-6415 VS-6	CA43, VCA44, VCA46, 1500p
VSF100, VSF1010, VS	2200p 2800p
ALBA VORDROOD, VCR4000, VCR4000, VCR6000, VC	T 9ME 3100 p
VTV100	C 8-C9 2600p , C30, C40, SLF1UB,
VCR7000, 7800, 8000, 8900 1100p 727, 728, 820, 821, 825, 920, 920 1400p V73000 0500 1400p V73000 0500 1400p V74000, V74200, V75000, V75500 1100p V767000 V767000 V770, 880, 5500, 6700, 6800, 7600, 80	14PS, 33E, 34, 44PS, 60PS, SLK85,
VCR7000	SL100 1500p C7 RANGE, SL5000,
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B800, 8602, 8700, 9005, DB9900, DB9904, B100, 8309, 8909, 8900 TVR4	1600p
VCR400	2000p 2900p
\[\cdot \cd	SLV474 2200 p
VCR914Q, VCR9142	3850n
VCR9244 3450 VGR9244 3450 VGR92	4600p
UF202 22 VCR3000, 3002, 1750p FISHER 1750p FISHER FVHP20, 510, 520, 530, 615, 618, 620, 520, 717, 715, 716, 720, FVHP210, 510, 520, 530, 615, 618, 620, 505, 5050, 5050, 5075 1100p VB5300, 710, 7500, 7600, 9900, VBR330 1800p VHP500, 711, 715, 721, 722, 730, 830, 915, 918, 910, 911, 915, 916, 546, 546, 548, VTD660, 665, 510, 510, 520, 530, FVHP500, 711, 715, 721, 722, 730, 830, 910, 910, 910, 910, 910, 910, 910, 91	2600p 500E, CCDV90E,
FISHER FVHP420, 510, 520, 530, 615, 618, 620, FVHP721, 722, 730, 330, 905, 906, 907, 908, 910, 911, 915, 916, 918, FVHP5000, 5001, 5005, 5050. 5075 VBS5500, 710, 7500, 7500, 7600, 9900, VBR330 VBS7000, VBS7100, VBS9000 VBS7000, VBS7100, VBS9000 VBS7000, VBS7100, VBS9000 VBS7000, FVHP1500, 711, 715, 721, 722, 730, 830, FVHP5000, FVHP1500, 711, 715, 721, 722, 730, 830, FVHP5000, VBS7100, VBS9000 VBS7000, VBS7100, VBS9000 VBS9000, VBS9000 VBS9100, VBS900, VBS9300 VBS9000 VBS9100, VBS900,	3550p
\$22, 710, 711, 715, 716, 720, 720, 720, 722, 730, 830, 905, 906, 907, 908, 910, 911, 915, 916, 918, FVHP5000, 5001, 5005, 5050. \$100p\$ VBS7500, 7100, 7500, 7600, 9900, VBR330 VBS7000, VBS7100, VBS9000 FVHP5000, 711, 715, 721, 722, 730, 830, 905, 906, 907, 910, 910, 910, 910, 910, 910, 910, 910	1600p
927, 917, 917, 918, 918, 918, 918, 918, 919, 917, 917, 918, 918, 918, 918, 919, 917, 917, 917, 918, 918, 918, 918, 918, 918, 918, 918	1150p
1100p VBS3500, 7100, 7500, 7600, 9900, VBR3300 VBS3500, 7100, 7500, 7600,	1750p
VBS7000, VBS7100, VBS9000 2000p VFM730, 731, 735, 736, 740, 745, 746, 745, 756, 746, 747, 747, 775, 867, 874, 874, 874, 874, 874, 874, 874, 87	2750p
FVHP500, 711, 715, 721, 722, 730, 830. R35, 831, 835, 835, 835, 835, 835, 835, 835, 835	SLVX35 2025p
FVHP725, FVHP830, FVHP980 2700 PVHP975 PVHP980 2400 PVHP975 PVHP9	.VE9 5150p 5150p
FVHP975	SLVE600, SLVE700, 3450p
FVHP20 FVHP210, 1200, 130, 1340, 140, 240 T180, VTF350, VTF351, VTF280 VTF350, VTF351, VTF351, VTF351, VTF351, VTF351, VTF351, VTF352, VTF3520, VTF	1500p
1410, 2000, 200, 210, 300, FVHP310, 410, 420 T800p VTM220, VTM220E, VTM220E	3400p
FVHD250 270 370 FVHP1500 FVHP250 V1530 E16 621 626 V3000	33, V50, V51, V52, V53, 1450p
2700p J.V.C. & FERGUSON NV730, NV730F, NV770 NV730F, NV770 NV730, NV730F, NV770 NV730F, NV730F, NV770 NV730F, NV770 NV750F, NV770 NV750F, NV770 NV750F, NV750F, NV770 NV750F, NV750F	700p 75, V77, V80, V81, V82,
1870 18	36, V87,
EVHP14705, FVHP479FV 9828, 3V01, 3V06, 3V22 900p W7981 2500p VX7330, VK770, VK8225, VR1730, 1735, DV90, 96, 97, NN PVHP1305, VKP70, V	3, V108, 109, 5, 207, 209, 80,
3000 3HSSDB, GHV121, RQ2011, 2031 H1510, R904 8923, 8924, 8925, 8929. NV870, NV890, NV970 NV890 NV970 NV	1450; 1300;
IGVH51, GVH122, VCP4000, VCP4100. Lovide avide a	2350; 2600; 3700;
VCP4200 11009 3V39 3V49 625p 49,700PX, NVSD20EE, SX3230, 3231, 3240, 3251, 3260, 3261, 3260, 3260, 3261, 3260, 326	2500r
1245, 1246, 1266, 1290, 1291 V838R, 31R, 32R, VXK300, 301, 306, 320, V9680 (RV1295, 1296, 1891, 8210, 8215, 1221, 156, 157, 158, 160, 5101 (VXF) (RV1295, 1296, 1891, 8210, 8215, 1221, 156, 157, 158, 160, 5101 (VXF) (RV1295, 1296, 1891, 1296	2900; 05, V306,
1240, 1241, 1247, 1248, 2145 VCP400, VCP4130, 4300, 4301, 4305, 3V56, 3V57 3V46, 3V47, 3V52, 3V54, 3V56, 3V57 1150p NVG20, 21, 22, 25, 28, 200, 1260, 1261, 7120, 7121, 7220, SX7221, 200, 1260, 1261, 7120, 7121, 7220, SX7221, 200, 200, 200, 200, 200, 200, 200,	2550; 1700;
4306, 4310, 4311, 4315, 4316,), V140, V210, V211,
1291PQ, 1293TQ, 1295P, VPR5000, VTC 1500, VTCM 10, 11, 20, 21 V711, V880	1500p 3850p
GSE 1299-74, GSE 1299, 1297, 1691, 1910, 3V64, 3V65, FV10, FV11, FV20, FV21, FV26 NV688 2400p VTCM25, VTC2000, 5100, 5150, 5300, VCPB1E, VCP2C 20005, 2000, GSEC200, GSEC200	1200p 1250p
GSEC205, 211, 2301, GSEG2301, GSEG23	4600r
RG2D, RG2001, RG2001 RG	3, V610UK, V611, 0F 3200 p
GSEG10 4400 CSE C404B CHISV40 3V00, 8902, 8903, 8909, 8912, NVM7, NVMC20 3800p VHR2300, VHR2370 1200p V703W, V813G	OF 32001
COSCA12 PO2014 PO2024 FV31, FV41R 1500p NVJ45, NVJ47 2000p 3400, 3310, VHRD500 1500p	3G 9200 5200
G2051 1950p	3G 9200 ₁ 5200 ₁ 8000 ₁
4000H, 4001H, 4002H 1200p HR7200, 7300, 7350, 2650, NVFS88, NVSF90, VHR5700, VHR5700, VHR7700E,	3G 9200j 5200 j 8000 j
14005H 1500p HRD455 2000p NVHD90 NVHD 100, NV HD 101, NVHF VHR150E, 153, 154, 1501R, 240, 250, 251, 1	DATA LTD
GRANADA HRD520 HR	DATA LTD 81-900 2329
VHSAH1 1100p 640, 650 2000p AG7330, AG7350, AG7355, 6550 3850p VHSAH3 2400p HR4100 1000p AG7450 5000p TLS1000P, TLS1001P,	DATA LTD

ALL TV & VIDEO PARTS SOLD ARE REPLACEMENT PARTS

Model Price Model		\	CR BELT KIT	S	
## 19 1		Model Price	Model Price	Model Price	Model Pric
Part			406, 407, 4092, 410, GV411, 412, 414, 415, 416, 417, 4192, 4200, 420, 430, 434, 435.		V1710, 730, 750, 970, VX710, 712, 720, 730,
\$\frac{\text{Y}}{\text{\$\text{Y}}} \text{\text{Y}}{\text{\text{Y}}} \text{\text{Y}}{\text{Y}} \text{\text{Y}}{\	120p	FISHER	GV437, 440, 450, 4592, 460, 464, 470, 500,	N895 80p	VX9880 110
92.50, 152.16, 12.16, 12.16, 12.10, 12.16 92.10, 12.16, 12.10, 12.16 92.10, 12.16, 12.10, 12.10, 12.10 92.10, 12.10, 12.10 92.10, 12.10, 12.10 92.10, 12.10, 12.10 92.10, 12.10, 12.10 92.10, 12.10, 12.10 92.10, 12.10, 12.10 92.10, 12.10 92.10, 12.10, 12.10 92.10 92.10, 12.10 9	VS10 65p		GV5105, 511, 530, 5395, 540, 560, 5695,	DX1000, 1600, 1800, 2000, 3000, N9012, 9013	
242 252, 175, 185, 177, 178, 177, 178, 177, 178, 178, 178	VSX9, VS105, 112, 115, 116, 120, 125, 126,	FVHP520, FVHP530, FVHP420 60p	MV4005, 4105, SE4100, 4104, 4120, 5102, 5104, 5106, TVR37001	9014, 9016, N9033, 9034, 9053, 9054, 9055,	VTC5000, 5150, 6000, 6500, VTCM10, 11, 20,
182 12 12 12 12 12 12 12 12 12 12 12 12 12	248, 250, 512, 515,	FVHP615, 618, 620, 622, 710, 711, 715, 720, 721, 722, 725, 730,	HINARI	N9510, 9520, 9530, 9610 80p	21, 30, 31, 50 65 ₁ VTC5300, VTC5350, VTC5400.
958 1959 195		FVHP830, 840 60p	VXL2 80p VXL7, VXL8, VXL9, VXL10, VXL11, VXL19		VPR5800 80 ₁
150 (1995) 150 (1995)	VS55, VS66 80p	918 75p	VXL90, VCR34, VTV 100,	NV366 100p	VTC9100, VTC9300 140:
VSSS90 1996 VSSS90					VTC1100, 1300, 1500, VHR1100, 1110, 1150, 1200, 1300.
VEMOND (VEMOND 196) VEMOND (VEMOND VEMOND VEMOND VEMOND VEMOND VEMOND VEMOND 196) VEMOND (VEMOND VEMOND VEMOND VEMOND VEMOND VEMOND VEMOND 196) VEMOND V	VSS99 105p	VBS3500 75p	VXL5, VXL6 100p	NV7000, NV7200, NV7800 75p	VHR1500, 2370, MVR220 80p
VICHOSON, CYRESON, CY				NV230, 250, 280, 430, 431, 433, 450, 460, 465,	VHR2700 100r
VEHISLANCE PROPERTY OF THE PRO	VCR5000, VCR6000 105p	FVHD230, 250, 270, 370, FVHP1100, 1200,	VT11, 14, 16, 17, 19, 33, 330, 34, 35, 350, 38,		VHR3100, 3110, 3150, 3300, 3310, 3400, 3500, 3700
VETTYPODE CATEGORY CA			VT5000, VT5500, VT18 120p	NV370, NV380, NV480, NV630, NV780,	VHR120, 130, 14, 141, 143, 14, 150, 151, 153
AMSSTRUCK PURISELY CURRISON, VCR4700, VCR5200 Supplementary Currison, 2000, 5000, 5005, 50	VCR7000, VCR7800, VCR8000, VCR8800 110p	210, 250, 3, 300,	VT7000, VT8000, VT8030, VT8040, VT8300,	NV600, NV688, AG6010, AG6015 85p	244, 250, 261, 274, 297, 310, 330, VHR335, 390
TWIT22, CFT202 (1900), 2000, 6100, 6200, 6800, 6			VT680, VT6500, VT6800, VT9300, VT9500,	NVG7, 9, 10, 11, 12, 14, 15, 16, 18, 30, 130,	4100, 4105, 4150, 4200, 430, 4300, 4350, 474,
VCHS002 00.00, 610, 6200, 6800, 8800, 900, VCHS002 100, 900, 910, 6200, 8800, 8800, 900, 900, 910, 6200, 8800, 8800, 900, 900, 800, 800, 800,	TVR123, VCR4600, VCR4700,	FVHP5000, 5005, 5050, 5075, 5100, 975, 980,		NVFV1, NVM10, 3000, 3300, 40, 7, 9000, 9900,	6850, 7100, VHR7200 7250, 7260, 7300, 7400,
VCH1000, 2000, 6000, 6100, 6200, 600			640 60p		7800, 7810, 8000, 8100, 8200, 8250
VCMSP00, 2704, 2714, 8906, 8904, 9006, 9005, 8904, 9006, 9005, 2904, 2914, 9140, 9006, 9006, 8904, 9006, 9006, 8904, 9006, 9006, 8904, 9006, 9006, 8904, 9006, 9006, 8904, 9006, 9006, 8904, 9006, 890	VCR1000, 2000, 6000, 6100, 6200, 8600, 8602,	4005 150p	VT100, 110, 111, 113, 115, 118, 120, 125, 128,	PHILIPS	8500,VHR8800, 8801, VHRD4400, 4410, 4500,
9244, 9349, 1742, 1747, 1742, 1741, 1742, 1742, 1744,				VR6540 100p	VMD66, VMD68P 80p
1000 1000	9244, 9340,	GOLDSTAR	258, 260, VTL30 60p		
5500				DV186, 190, 286, 291, 292, 468, 471, 562, 571	SHARP
195 100 100 100 100 100 100 100 100 100 10	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
111/100 200 6HV1/290, 1291, 1295, 1295, (1296, (1296, 4200,				535, VR20DV1, 20DV2, 20RW7, 21DV1, 21DV2	VC7300, VC7700, VC7750, VC7800,
THY 702. HTY 702. HTT 702. HTY 702. HTY 702. HTT	RTV100 200p	GHV1290, 1291, 1295, 1296, VCP4000, 4200,	HR7350, HR7600, HR7610, HR7650,	31DVI, 31DV2, 31D, V3, 3SB11, 3SB12, 3SB13,	VC8300 115p
11732, 117328 117036, 307, 309, 310, 311, 312, 328, 414, 329, 414, 329, 414, 329, 414, 329, 414, 329, 414, 329, 414, 329, 414, 329, 414, 329, 414, 329, 414, 329, 414, 329, 329, 329, 329, 329, 329, 329, 329			HR7700 50p	715B4, 715B5, 715B8, VR865B2, 915B2	
133, 44, 707 134, 707 1350 134, 707 1350 1350 1350 1350 1350 1350 1350 1350	RTV322, RTV248 100p			92583, VR6180, 6182, 6185, 6285, 6290VR6291, VR6293, 6362, 6367	VC402, 500, 571, 573, 581, 582, 583, 584, 585,
HTV211, FTV214			HRD 140, 141, 143, 150, 152, 157, 158, 160	VR6390, 6391, 6393, 6467, 6468, 6470, 6561.	VC108, 405, 408, 550, 600, 651, 674, 681, 682,
111315, 111316	RTV211, RTV214 140p	VHSVH4, VHSWH1, VHSXH1 60p	755, HRP50 45p	6762, 6870, 6970, 6975, VR68SB4, 86SB1,	VC700, 750, 783, VC6F3, VC6V3 70p
10 11 13 13 14 15 15 15 15 15 15 15	RTV315, RTV316, RTV319, RTV320,		HRD170, 171, 180, 210, 21 1, 217, 230, 300, 320, 321, 330, 337, HRD350, 370, 400, 420	92SB3 75p	VC208, 671, 772, 779, 780, 781, 782, 785, 786.
SEROLISON PROPERTY	RTV317 50p		440, 44 1, 500, 530, 700, 750.950,	6843, 6843, VR6943 100p	103, 104, 131, 140, 170, 202, 03, VCA234, 501
## 1289 SHERGUSON 12892 300 3,001 3,176 3,322 8900, 8901 1289 302 300 3,001 3,176 3,322 8900, 8901 1289 300 3,8904 1289 300 3,8904 1289 300 500 500 8,8901 1289 30		VHSDS2 125p		49SB620, 644869S, 49SB6 110p	VCH851, 852, 882, VCM73, VCT72 85p
VALUE VALU	FERGUSON		HRD227, 520, 52 1, 522, 527, 600, 610, 620,		VCA10, 103, 105, 106, 113, 11613, 211, 234,
RANADA R	3292, 3V00, 3V01, 3V16, 3V22, 8900, 8901, 8902, 8903, 8904,	VHSEY1, VHSEY2 70p	HRD840, HRDX20, 22, HRJ200, 205, 300, 305,	VKR6800, VKR6810, VKR6820 70n	48, 50, 505, 51, 52, 53, 54, 55, 56, 57, 58,
M29, 3V30, 6930, 6930, 8937, 8943, 8943, 8943, 8943, 8944, 3V44, 3V45, 3V48, 3V44, 3V45, 3V48, 3V44, 3V59, 3V54, V55, 3V57, V55, V57, V571, FV71, FV		GRANADA	HRD840, 550, 560, 580, 590, 640, 660, 670.	237, 23, 241, 2410, 2419, 242, 243, 245, 2469.	VCBS97, VCD805, VCD806, 810, 815, VCH80.
14 15 13 13 13 13 13 13 13	3V29, 3V30, 8930, 8931, 8933,		720, 730, 740, 770, HRD820, 860, 870, 880,	247, 2479, 251, 252, 256, 257, 258, 33, 19, 332, 3329, 333, 337, 339, 3419, 342, 343, 3469, 347	81, 85, 865, 910, VC51000, VCT212, 310, 410, 610, VCT1314, VCTS312
VISS_3036_3036_3048_3049_3049_3049_3049_3049_3049_3049_3049		VHSTJ3 65p	HRJ215, 315, 316, 318, 400, 405, 407, 410,	3479, 35, 1, 352, 357, 358, 422, 4229, 432, 437,	313, VC790ET 80p
MAZ 3.474, 3V45, 3V55,	3V35, 3V36, 3V38, 3V39, 3V49, 8943,	VHSXJ3 85p	HRS4700, 5800, SR3200, SRS368E 60p	4479, 451, 452, 457, 458, 459, 512, 522, 5229,	
V65, 3V57, y645, 8947, 8948 45p, 45p, 45p, 45p, 45p, 45p, 45p, 45p,					
NSB, 3V43, 3V43, 3V58, 9S96, 3V65, 9S96, 9S96, 9S96, PT-100, FV11, FV12, FV13, FV14, FV20, FV13, FV14, FV20, FV13, FV14, FV20, FV17, FV14, FV20, VV11, FV12, FV13, FV14, FV20, VV14, FV26, FV77, VV14, FV77 VV14, FV77 VV21, FV77 VV23, FV74, FV77 VV21, FV71, FV12, FV13, FV14, FV20, PV11, FV12, FV13, FV14, FV20, PV13, FV14, FV21, PV13, FV14, FV22, PV13, FV14, FV23, PV14, PV14, FV24, FV24, PV14, FV24, FV24, PV14, FV24, FV24, FV24, PV14, FV24,	3V55, 3V57,	VHSFS1, VHSFS2 130n		SAISHO	SLC9, SL8000, SL8080, SLT50 165p
951, FV10, FV11, FV12, FV13, FV14, FV20, V21, FV22, FV32, FV39, VC111, L 459, V318 V21, FV22, FV32, FV35, FV36, FV37, FV36, FV36, FV37, FV36, FV36, FV37, FV36, FV37, FV37, FV37, FV37, FV37, FV37, FV37, FV38, FV37, FV37, FV38, FV	3V58, 3V43, 3V44, 3V59, 3V64, 3V65, 8950,		MATSUI	VR3800, 3200, 3300, 3500, 3600, 3650,	
V31R 1109 450, 466, 460 729 1109 450, 466, 460 729 1109 450, 466, 460 729 1109 450, 466, 460 729 1109 450, 466, 460 729 1109 450, 466, 460 729 1109 450, 460, 460 729 1109 450, 460, 460 729 1109 450, 460 729 110	8951, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26, FV32, FV39, VC1411		VS888 75p	VRS4400, 5000 75p VR3400 100n	20, 3 95p
Vol. F. Vr2, FV77, Vol. FV72, FV79, Vol. FV71, FV72, Vol. FV74, FV77 Sopp 1950, 200, 220, 226, 222, 282, 282, 282, 283, 284, 283, 283, 283, 283, 283, 283, 283, 283	FV31R 110p	450, 456, 460 55p	VX1000, VX2000, VX2500, VX3000,	SAMSUNG	
V33H, FV46T, FV57H V37H MV520MC S56 V51 V5150 S67 V52 V5150 S68 V52 V5150 S69 V5303 S69 V5303 S69 V5304 V52 V5304 V52 V5305 V530		0850, 0880,	VX800 70p	SV716, 717, V1616, V~621, V1626, VX616, VX617, VX619, X626, VX627, VX629	V33, V31, V32, V51, V52, V53, V9600,
937 930, 310, 310, 510, 517, 517, 518, 38, 55, 50, 58, 59, 68 931, 322, 323, 322, 323, 323, 347, 349, 519, 519, 520, 518, 519, 519, 520, 526, 527, 519, 520, 519, 510, 510, 510, 510, 510, 510, 510, 510	FV43H, FV44L, FV46T, FV57H 125p			VX714 75p	V61, V63, V65, V66, V67 150p
V41B, FV42L 100p V451B, FV42B, FV4	COP	VS150 160p	HS300, 301, 302, 307, 310, 337, 338, 347, 349	629, V1510, 520, V1611, 616, 621, 626, VX510,	86 80n
1052200, VCR1000, 2000, 600 6000, 105220, VCR1000, VCR1000, 105220, VCR1000, 105220, VCR1000, 105220, VCR1000, 105220, VCR1000, VCR1000, 105220, VCR1000, VCR1000, 105220, VCR1000, VCR10000, VCR100	FV41R, FV42L 100p	445 85p	30, 70 80p	511, 520, VT320, 5600 80p	V108, 109, 110, 120, 130, 140, i99, 209, 210,
100 180p VS 160, BARCELONA, FLORENZ, GV4000, HS18, HS319, HS410 110p 8220, 8225, VK3201, VB730, 770, 8220, 8225, VK770, 790, VB731, VX750, VX770, HSM1000, VTR1001 100p GV4002, 400, 401, 4010, 402, 403, 404, 405, 55, 57, 58, 59, 68 55p SVX301, 303, 305, SX7301, VB710, 971, VPB1E 110p	HQS200, VCR1000, 2000, 600, 6000,	VS150 75p	HS303, HS304, HS306, HS307, HS330, HS400,	PX980, 981, 982, SE9001, SV9001, SVX307,	660, 711, 880 120p
HSM1000, VTR1001 100p GV4002, 400, 401, 4010, 402, 403, 404, 405, 55, 57, 58, 59, 68 55p SVX301, 303, 305, SX7301, VB710, 971, 90, 8220, 8225, SE9000, 9001 90p 703, 813 VCPB1E 110p	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,
Trop			HSM1000, 16, HSM23, 25, 33, 34, 35, 37, 54, 55, 57, 58, 59, 68 55p	790, 8220, 8225, SE9000, 9001 90p	703, 813 50p
REPLACEMENT IDLERS & PULLEYS					1100
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	TIEL ELICE			RS & PULLEYS	
Make Models		Description	Make	Models	Description
Hitachi VT11, 14, 17, 19, 33, 3 86, 330, 350, 640, 16S Order Code: IDL01	4, 35, 38, 39, 52, 57, 61, 62, 63, 64, 65, 85, 5030	FF Rew Idler 6886792 Price 100p	Ferguson	3V39, 3V30, 3V31, 3V32, 3V353V36, 3V38, 3V39, 3V49, 8930, 8931, 8933, 8940, 8941, 8942, 8943, 8944	Take Up Clutch PU 51380
Hitachi VT680, 6500, 6800, 93 Order Code: IDL02		Play Idler 6861482 6861481 Price: 180p	J.V.C.	HR7200, 7600, 7650, 7655, 7300, 7350, 7610	Take Up Clutch PU 53462A PU 51380
Blaupunkt RTV301, 306, 307, 309 414, 424, 434, 444, 47	, 311, 312, 315, 316, 317, 319, 320, 404,	ldler	Order Code Philips	DB532, VR6520, 6843, 644	Price: 200p Reel Idler
Goldstar GHV1221, 1232, 1240, GHV1248, 8000, 8200,	1241, 1242, 1243, 1244, 1245, 1246, 1247, 8210, 8215, GVHP51, VCP4100, 4130	, Idler	Sharp	VC600, 651, 681, 682, 684, 685, 693, 699, 700, 783, 6FR, 6V3, 6F3	Idler Assembly NPLYV0107GEZZ
Grundig MVS400, 440, VS400,	410, 440VS450, 460 370, 380, NV430, 431, 433, 450, 460, 465,	idler	Order Code		Price: 615p
470, 480, 630, 650, 73 9, 10, 11, 12, 14, 15, 16 1500, 1810, AG2100, 2), 780, NV810, 830, 850, 870, 890, NVG7, 5, 18, 30, 130, 400, AG1000, AG1050, 1200 200, NVH65, 70		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,	Reel Drive Unit Idler NPLTV0111GEZZ
Philips VR6460, VR6520, VR6 Order Code: IDL08	020	Idler Arm 40340162 Price 100p		VCA602, 5011, VCD801, 802, VCH851, 852, VCH882, VCM73, VCT72, VC782MK11	
Amstrad VCR7000 Sharp VC200, 381, 383, 384, 9100, 9300, 9500, 9700 Order Code: IDL10	385, 386, VC388, 390, 393, 3300, 8381,	Idler 150280 Idler NIDL0005GEZZ Price: 100p	Order Code: N.E.C.	N911, 915, 916, 917, 9012, 9013N9014, 9016, 9033, 9034, 9053, N9054, 9055, 9056, 9066, 9096, N9110, 9120, 9510, 9520, 9530,	Price: 700p
500, 571, 573,	473, 477, VC481, 482, 483, 486, 488, 496,	ldler ldler	Order Code: Philips	DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311,	Idler Arm Assembly Price: 270p Pressure Roller Assembly
581, 582, 583, 584, 589 Order Code: IDL11	, 8481, 5F3, 5W20E	NIDL0006GEZZ Price: 100p		312, 313, 3210, 3219, 322, 3229, 323, 535BO, VR486, 471, 562, 582, 571, 761, 201, 202, VR203, 302, 303, 305, 6180, 6182, 6185,	PS403-40205
8931, 8940, 8941, 8942	1, 3V323V35, 8923, 8924, 8929, 8930,	Reel Idler Reel Idler PU48967		6285, 6290, 6291, 6293, VR6362, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581VR6670, 6676, 6710, 6760, 6761, 6762, 6870, 6970, 6975, 86B1, 63SB7, 68SB4, 71SB4, 71SB5,	
J.V.C. HR7200, 7300, 7350, 7 Order Code: IDL20	600, 7610, 7650, 7655, 7700	Reel Idler PU48967 Price: 175p		72SB8, 72SB8, 92SB31, 20DV1, 20DV2, 20RW7, 21DV1, 21DV2,	
	2, 3V353V36, 3V38, 3V39, 3V49, 8930.	Take Up idler PU 51402		2SB01, 2SB02, 2SB11, 2SB12, 30DV2, 31DV1, 31DV2, 31DV, 33SB02, 3SB03, 3SB05, 3SB11, 3SB12, 3SB13	
J.V.C. HR7200, 7600, 7650, 7	, 6342, 6343, 6344 555, 7300, 7350, 7610, HRD110, 111, 120,	Take Up Idler PU 51402A		V91, V95	Pressure Roller Assembly
Order Code: IDL22		Price 100p	Order Code:	PR232	PS403-40205 Price: 300p

		R	EPLA	ACEM	EN	r ID	LER TY	/RE	S
Akai	M32773	IT01	Ferguson	PU51380	IT07		VXP0433	IT15	
	MZ366960J2	IT02	-	PU51402A	1T08		VXP0463	IT16	Price:
Goldstar	VXP0521	IT17		PU55373	IT09		VXP0521	IT17	20p each
Hitachi	6861471	IT03		PU55374	IT10		VXP0581	IT18	16p each pack of 5
	6861482	IT04	National	VXP0329	IT11	Sanyo	1430662T15620	IT19	13p each pack of 10
	6886971	IT05	Panasonic	VXP0343	IT12	Sharp	NIDL0005GEZZ	IT20	Top Call page 2
JVC	PU48697B	1T06		VXP0344	IT13	•	NIDL0006GEZZ	IT21	Contra con Constitute on Ald
				VXP0401	IT14		NPLY0107GEZZ	IT22	Packs are for each model



		NCH DOLL D	D.C.	
	<u> </u>	NCH ROLLEI	<u>KS</u>	
Model Price				Model Price
AKAI VS10, VS9300, VS9500, VS9700, VS9800,	FVHP615, 618, 620, 622, 710, 711, 715, 716, 720, 721, 722, 725, 730,	BRS600, 605, 747, 777, 920, 925 HRS10 140p	NS7000 140p ORION	681, 682, 684, 685, 693, VC699, 700, 772, 750, 779, 780, 781, 7810,
VP7100, VP77 140p VS1, VS2, VS3, VS4, VS5, VS6, VS8, VS9,	FVHP810, 830, 840 140p FVHP905, 906, 907, 908, 910, 911, 915, 916,	BP5000, HRD110, 111, 120, 220, 225, 455 1100p	VH1, VH2 140p VC150, 180, VH3, 33, 200, 201, 205, 212, 250,	782, 782MK2, 7822, 783,
VS12, VS15 140p VS105, 112, 115, 116, 120, 125,	918, 970, 975, 980, 990, FVHP 5000, 5005,	PINCH ROLLER ASSEMBLY HRD 140, 141, 142, 143, 150, 152, 157, 158,	254, 288, 300, 303, 312,	VC785, 786, 787, 793, 800, 7810, 7822, VCT72, VC6F3, VC6V3, VCA 100, 102, 104, 131, 140,
126, 155, 165, 205, 220, 240, 244, 245,	VBR330, VBS3500, 7000, 7100, 7500, 7600,	160, 565, 566, 725, 755,	VH404, 555, 700, 704, 712, 770, 780, 844, 900, 1000, 2948, 3030, 3312	170, 202, 203, 211, 234, 303, 501, 502, VCA602, 5011, VCD801, 802, 851, 852, 881,
VS247, 248, 250, 512, VS515, 516, VSX9 140p	9000, 9900 140p FVHD230, 250, 270, 370, 2000D, FVHP3, 210,	HRP50 1350p PINCH ROLLER ASSEMBLY	VHF2A, VP2948 140p COMB 15000, 16000, HV03, LVH50, NEVH,	882, VCM73, VCT73, VCT72, 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,	VC220 140p
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	TVP230RC, VCP, VH04, 30, 103, 300, 358, 360, 362, 400, 416, 512,	VCA10, 30G, 60, 103, 105, 106, 111, 113, 131, 211, 244, 254, 33, 35, 36,
VS22, 23, 25, 35, 37, 38, 53, 66, 75, 422, 425,	FVSP290S, 495, 2905 140p	PINCH ROLLER ASSEMBLY	VH530, 532, 535, 536, 600, 630, 635, 640, 666, 730, 735, 744, 774, 790	VCA37, 39, 40, 42, 454, 46, 47, 48, 50, 505, 51,
426, 427, 462, 465, 467, VS485, 765, 766, 767, 768, 865, 867, 965, 967,	FVHD140, FVHD40, FVHD55, FVHP1, FVHP10, FVHP20 140p	BR7030, BRS600, HRD160, 170, 171, 180, 190, 210, 211, 217, 227,	VH800, 820, 850, 888, 893, 900, 930, 940, 942, 974, 1012, 1040, 1050,	52, 53, 54, 55, 57, 58, 505, 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 VSF330, 4, 500, 550, VSP88, VSR100, VSX400,	PINCH ROLLER ASSEMBLY GOLDSTAR	HRD470, 500, 530, 700, 750, 950, HRS5000, 5500, 9000 875p	VH2151, 2308, 22042400, 2500, 2600, 2700,	VCT410, 610, VCT 1314, 5313, VC790 140p
450, 470 140p	GHV51, 1221, 1232, 1233, 1240, 1241, 1242,	PINCH ROLLER ASSEMBLY	VH2960, 2970, 3050, VH3060, 4000, 4008, 4010, 4012, 4015, 4015,	VC780, 790, VCA10, 103, 1031, 105, 106, 211, 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, 560, 580, 590, 599, 600,	1296, 1392, 1393, GHV1891, 1900, 2145, 3000, 3010, 4400, 4410,	PINCH ROLLER ASSEMBLY HRJ600, HRJ605, HRJ815,	2949, 2959, 2957, 2966, 2979, 2980, VTV300, VXL20, 25, 30 140p	VCH865, 87, 910, VCS 1000, VCT212, 310, 410,
VSG20, 21, 23, 24, 25, 30, 33, 34, 35, 51, 54, 55, 60, 64, 65, 70, 73, 74, 75,	51, 8000, 8200, GHV8210, 8215, 8430 GHVP1240, 1241, 1247, 1248, 1290, 1291,	HRS9200 875p	PHILIPS	510, 610, VCTi314, VCTS313 525p
VSP110, VSX560, VSX580 140p	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
VS 17, 20, 22, 23, 24, 25, 26, 27, 35, 37, 38, 53, 55, VSA77 775 p	4300, 4301, 4305, VCP4306, 4310, 4311, 4315, 4316, 4320, 4321, 4325, 4326, 4350, GSE1290,	VS888 140p VX1000, VX2000, VX2500, VX3000,	VR2024 140p VR6711 140p	SAISHO VHL3, VR1000, 2000, 2500, 3200, 3300, 3500,
PINCH ROLLER ASSEMBLY VS422, 425, 426, 427, 462, 465, 467, 485, 498,	1291, 1295, 1296, 1297, 1891, 1910, 20005, 2000 140p	VX6000A 140p	VR6540 140p	3600, 3650, 3800, VRS4400, VRS5000 140p
765, 766, 767, 768, 865, 867, 965, 967, VSA650, VSF10, 11, 12, 14, 15,	HITACHI	MITSUBISHI HS 12, 5300, 5424, 5600, HSB11, 12, 16, 21, 27,	DV856, 586, VR702, 703, 6485, 6585, 6589, 6785, 6880, 6948 140p	VR3400 140p SAMSUNG
180, 190, 200, 210, 220,	VT7, 11, 14, 16, 17, 18, 19, 33, 34, 35, 350, 38, 39, 88, 330, 680, 4200,	31, 32, 41, 51, 52, 82, HSE12, 16, 17, 21, 22, 27, 31, 32, 41, 51, 52,	VR445, VR6442, VR6542, VR6643, VR6843, VR6943, 44SB9 140p	SV716, 717, VB510, 520, 610, 616, 617, 619,
221, 222, 230, 240, 30, 300, 301, 310, 320, 33, 330, 4, 500, 510, 600,	VT5000, 5030, 5500, 6500, 6800, 7000, 8000, 8300, 8500, 8700, 930, VT9500, 9700, 9900,	82, HSM 1000, 110, 120, 15 0, 16, 170, 190, 210, 23, 25, 250, 27, 33, 34, 35,	DV464, 662, VR2220, 2300, 2324, 2330, 2334, 2340, 2350, 2414, VR2480, 2485, 2486, 2489,	620, 626, 627, 629, 900, V910, V1510, 520, 611, 616, 621, 626, 900,
VSR110, VSX100, 400, 450, 470 800p PINCH ROLLER ASSEMBLY	VM600 140p VT8, 52, 57, 61, 62, 63, 64, 65, 85, 86, 88, 100,	36, 37, 370, 380, 45, 450, 5	2490, 2498, 2840, 6462, 6463, 6464, 6560,	910, VX510, 520, 616,
VSS99 140p	110, 111, 113, 115, 118,	4, 55, 555, 57, 58, 59, 68, HSMS2, 9, HSS11, 14, 15, 17, 19, 25, 5600, HV	VR6660, 6860, 6861, 6862, 6863 140p N-1700, VR2870 140p	VX617, 619, 626, 627, 629 140p SVX301, 303, 305, 307, 319, 322, VB710, 713,
VCR3000X, VCR4000 140p	VT120, 122, 125, 128, 130, 135, 138, 145, 150, 168, 170, 175, 220, 225.	F125, 150, 303, 85, SV8900, 8930 750p PINCH ROLLER ASSEMBLY PART NO:	VR2025, VR6580, VR6581 140p 49SB6, VR3260, 6349, 6448, 6449, 6548,	750, 770, 971, 8220, VB8225, V1710, 730, 750, 770, 790, 8220, 8225, 970, VX710, 712,
VCR5000, VCR6000 140p VCR161, VCR222 140p	VT250, 255, 258, 260, 400, 405, 410, 413, 414, 415, 416, 418, 420, 425	948D020010 HSE11, 12, 16, 17, 21, 22, 27, 31, 32, 41, 51,	6648 140p PRESSURE ROLLER ASSEMBLY PS403-40205	VX720, 730, 750, 770, 790, 825, 8225, 970,
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,	DV 186, 190, VR211, 2115, 212, 213, 223, 286,	971, 972, 8220, PX980, 981, 982, SE9000, 9001, SX7120, 7121, 7220, 7221, 7230,
VTV10 140p	VT526, 530, 535, 536, 540, 545, 546, 548, 570,	31, 32, 41, 51, 52, 82, HSM1000, 110, 120, 150, HSM16, 170, 18, 190, 210, 23, 25, 250, 27, 30,	291, 292, 311, 312, 313, VR3210, 3219, 322, 3229, 323, 535BO, 486,	SX7301, VK8220, VPX31 140p
AMSTRAD VCR1000, 2000, 4500, 4600, 4700, 5200, 6000,	575, 576, 580, 585, 588 VT640, 830, VTF660, 665, 70, 770, 774, 775,	33, 34, 35, 36, 37, 370, 38, HSM380, 40, 45, 450, 50, 54, 55, 555, 57, 58, 59, 60, 68,	471, 562, 582, 571, 761, VR201, 202, VR203, 302, 303, 305, 6180, 6182,	VX9880 140p
6100, 6200, 8600, VCR8602, 8603, 8604, 8700, 8704, 8714, 8800,	780, 785, 860, 861, 865, VTL30, 1000, 2000, VTLC50, VTM598, 620,	HSMS2, 9, HSMX1, 18, 19, 2, HSS11, 12, 14, 15, 17, 19, 21, 25, 5600, HVF125, HVF150, 303.	6185, 6285, 6290, VR6291, 6293, 6362, 6367, 6390, 6391, 6393,	PX31 R, 32R, PXR30, SV80, SX3230, 3231, 3260, 3261, VS390, VX30, 31, 32, 3560, 3561,
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	370, 375, 380, VXK300, 301, 306, 307, 320, VXK321, 326, 330, 331, 336, 337, 350, 351,
TVR1, 2, 3, 4 140p	727, 728, 730, 731, 735, VTM736, 740, 745, 746, 748, 753, 754, 820,	HS310, HS320, HS330, HS360,	VR6570, 6581VR6670, 6676, 6710, 6760, 6761, 6762, 6870, 6970,	356 V 140p
VCR7000 140p DD8900, DD8904, VCR6000, 6100, 6200, 8600,	821, 822, 825, 830, 831,	HS700 140p HS306, HS307, HS318, HS319, HS337, HS338,	VR6975, 86BI, 63SB7, 68SB4, 71SB4, 71SB5, 72SB8, 72SB8, 92SB31, 20DV1, 20DV2,	PX990, 991, 992, S11230, 1240, SVX4000, 503, 504, 600, SX1230,
8602, 8603, 8604, VCR8700, 8800, 900>9, 9140, 9244,	VTM835, 838, 840, 841, 845, 920, 921, 922, 925, 930, 931, 935,	HS347, HS349, HS400, HS410, HS411, HS412, HS421, HS480, HS710, HSB 10, HSB20, 30,	20RW7, 21DVI, 21DV2, 2SB01, 2SB02, 2SB11, 2SB12, 30DV2, 31DVI, 31DV2, 31DV33SB02,	SX1231, 1260, 1261, 1566, V11560, VPK43, VX1230, 1260, 1261, VX1560, 1561,
9340 700p 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 280p	1850 140p
TX3650, UF20, VCR3000, VCR3002, VCR4000, VCR9500 300p	VT3000 140p VT410, 420, 428, 430, 450, 498, 518, 520, 522,	NATIONAL PANASONIC	VR231, 232, 332, 422, 4229, 512, 5229, 722,	SONY SLC5, 6, 7, SL3000, 8000, 8080, 8200, SLJ 10,
PINCH ROLLER ASSEMBLY PART NO:	530, VTF770, 780, VTM598, 622, 722, 740, 748, 753 650p	NV100, 180, 300, 330PX, 332, 333, 340, 366, 600, 688, 777, 788, 3321,	7229, 723 140p VR501 PR38 140p	SLT6ME, SLT7ME 140p
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,	SLC9, 20, 24, 30, 33, 44, SLHF100, SLF1, 11, 20, 25, 30, 35, 60, 100,
VCR3000, 3002, 9500 140p VS1004 VS1104 140p	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,	VTC5000, 5150, 5300, 5350, 5400, 5500, 6000,	SLT50ME 140p
3V00, 3V01, 3V16, 3V22, 3V23, 3V24, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909,	VTM230, 231, 235, 284, VTS390 140p	890, 2000, 2010, 3000, NV7000, 7200, 7800, 8050, 8150, 8170, 8200,	6010, 6500, 9100, VTC9300, VTCM10, 20, 11, 21, 30, 31, 40, 50,	BMC 100, BMC200, BMC500 140p SLV201, 202, 301, 302, 401, 402, 801,
8912, 8922, 8923, 8924, 8925, 8929 140p 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 3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44,	H13V, VTV100, 200 140p VXL2, VXL3 140p	15, 18, 30, 130, 400, AG 1000, 1050, 1200, 1500, 2100, 2200, 6500,	VHRD500, 700 140p	SLV210, 270, 273, 275, 300, 353, 373, 410, 415, 474, 656, 715 300p
3V45, 3V48, 3V49, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 3V65, FV10, FVII, FV12,	VXL4, VXL20, VXL35 140p VTV100, VXL10, VXL11, VLX9,	68 10, 7500, 7510,	VHR120, 130, 14, 141, 143, 14, 150, 151, 153,	SLV757, 777 140p
FV14, 8943, 8944, 8945, 8947, 8948 140p	VXL90 700p	NVH70 140p NVG9, NVG120 140p	154, 15, 16, 171, 194, 22 0VHR23, 235, 240, 244, 250, 251, 274, 27, 297,	SLV255 140p SLV275, 282, 315, 325, 353, 363, 373, 410, 415,
3V52 140p 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
22L, 26D, 31R, 32L,FV33H, 39S, 41R, 42L, 50B, 51R, 52L, VC141L 140p	J.V.C. HR2200, 3300, 3330, 3360, 3660, 4100,	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,
FV37H, FV44L, FV46T, FV43H, FV57H 140p	7700 140p HR2650, 7200, 7300, 7350, 7600, 7610, 7650,	NVV8000 140p NVD48, NVD80, NVG21 NVG45 140p	7500, 7520, 7530, 7540, 7700, 774, 780, 0VHR7810, 8000, 8070, 8100, 8200, 8250,	20, 3 140p SLV215, 216EE, 275, 282, 315, 325, 353,
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944 1100p	7655 140p	NVJ700PX 140p NVHD100, NVHD101, NCHD90, NVSD30,	8500, 8800, VHRD4400, 4410, 4500, 4600,	363EE, 373, 393, 410, 415,
PINCH ROLLER ASSEMBLY	HRD110, 111, 120, 121, 140, 141, 142, 143, 150, 152, 156, 157, 158,	NVSD40 1125p	VCR100 140p	SLV416EE, 474, 494EE, 555UC, 559, 575UC, 579, 585HF, 595HF, SLV60W, 615, 625, 656,
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947, 8948 1350p	HRD160, 220, 225, 250, 257, 445, 455, 565, 566, 725, 755, HRP50, BP5000, BR7000,	PINCH ROLLER ASSEMBLY AG5150, 5250, 5700, 6024, NVD38, 48, 80,	VHR 120, 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,
PINCH ROLLER ASSEMBLY FV37, FV57, FV58 350p	BRS611, 811 140p HRD520, 540, 550, 560, 580, 600, 610, 620,	NVF55, 65, 70, 75, 77, NVFS1, 100, 200, 88, 90, NVG 19, 20, 21, 22,	VHRD4410, 4610, 4710, 4890, 5450, VHRS700 975p	9SLVX30AS, SLVX35AF, SLVX50AS, SLVX55DH,
PINCH ROLLER ASSEMBLY FV31R 140p	637, 640, 641, 650, 660, \HRD670, 720, 730, 740, 770, 820, 830, 840,	25, 28, 300, 33, 40, 45, 46, NVG50, NVH65, 75, 77, NVJ30, 33, 35, 37, 40,	PINCH ROLLER ASSEMBLY VHR3100, 3200, 3300, 3310, 3400, 3700, 3800,	SLVX65BR, SVO 140, 160 1250p
FV41L, FV42L 925p PINCH ROLLER ASSEMBLY	860, 870, 880, 910, 960,	42, 45, 47,	VHRD500, 7000 1350p	PINCH ROLLER ASSEMBLY PART NO: X37277701
3V58, 3V59, 3V64, 3V65, FV10, 11, 12, 13, 14,	HRD980, HRDX20, 22, 25, HRJ200, 205, 210, 215, 300, 315, 316, 318	NVL20, 23, 25, 28, NVW 1 300p PINCH ROLLER ASSEMBLY	PINCH ROLLER ASSEMBLY SHARP	SLV210, 212, 270, 273, 275, 285, 300, 310, 335, 425, 427 350p
20, 21, 22, 26, 30, 32, 33 FV39, VC141L 875 p	HRJ400, 405, 407, 410, 411, 415, 416, 507, 600, 605, 610, 615, 715, 815	N.E.C. N830, 831, 832, 833, 895 140p	VC200, 381, 383, 384, 385, 386, 388, 390, 393, 800, 2300, 3300, 6000,	PINCH ROLLER ASSEMBLY
PINCH ROLLER ASSEMBLY FV43H, FV44L, FV45X, FV46T 700p	HRJ97, HRS4700, 5800, 5900, 6800, 6900, SR3200, 330, 368 140p	PVC2300, 2400, 740, 744, 746, 760, 764, 766 140p	VC6200, 6300, 7300, 7700, 7750, 7800, 8300, 838, 9100, 9300, 9400,	SV6700.8750, 9700, VHR3100, 3200, 3300, 3310, 3400, 3700, 3800, VHRD500, 700 1350p
PINCH ROLLER ASSEMBLY FV61, FV62, FV67, FV68, FV70, FV71, FV72,	HRD170, 171, 180, 210, 211, 217, 230, 300,	DX1000, 1600, 1800, 2000, 3000, N9012, 9013,	VC9500, 9600, 9700, 9800 140p	PINCH ROLLER ASSEMBLY
FV74, FV77 775p	320, 321, 330, 337, 350, HRD370, 400, 430, 440, 441, 470, 500, 530,	9014, 9016, 9033 N9034, 9053, 9054, 9055, 9056, 9066, 9096,	VC300, 387, 402, 471, 473, 477, 481, 482, 483, 486, 488, 496, 500, 571,	SL100, 200, SLC20, 30, 33, 34, 40, 44, 80, 88, 9, SLF1, 20, 25, 30, 35, 45, SLF60, 65, 73, 90,
PINCH ROLLER ASSEMBLY FISHER	700, 750, 950, HRS5000, 5500, 8000, 9000, BR7030, 7040,	9110, 9120, 9510, 9520, N9530, 9610, PX 1200 140p	573, 581, 582, 583, 584, 585, 8481, VC5F3, VC5W20E, VCA1031 140p	SLHF100, 150, 950, SLK85, 95, SLO1700, SLS550, SLT0, 30, 50 300p
FVHP420, 520, 530 140p	9060,	DS6000G, DX4000, N9077	VC108, 208, 405, 408, 550, 600, 651, 671, 674,	PINCH ROLLER ASSEMBLY
		VIDEO LAMPS		

Models & Description (Order Code	Price	Models & Description	Order Code	Price	Models & Description	Order Code	Price	Models & Description	Order Code	Price
UNIVERSAL VIDEO LAMP 9V 80mV (310mm WIRES)	VL01	25p	BLAUPUNKT, FERGUSON	, FIDELITY,	100p	AKAI, GRANADA (VHSTJ2), HITACHI (VT3000), ITT (VR3912,	VL01	25p	AUTHENTIC (N850), DECCA	VL07	40p
PANASONIC VIDEO LAMPS	VL02	30p	FISHER, FUJITSU, FUNAI, GOLDSTAR, GRANADA, G			VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI (HS20	0)		(VR8300), GRANADA (VHSTJ3,		
SHARP VIDEO LAMPS	VL02		HINARI, HITACHI, ITT, JVC	(HRD		TELEFUNKEN (VR510, 519, 610)	,		WJ1, WJ3), ITT (VR3913, 3914,		
HITACHI 5381682 (VT63, VT64) VIDEO LAMPS	VL04	135p	SERIES), MATSUI, MITSUI NEC, ORION, NATIONAL,	BISHI,		THOMSON (VK300, 305, 306, 33 FERGUSON (3V00, 16, 22, 24, 33			3963) JVC (HT7200, 7300, 7350	•	
AKAI IVS10), GRANADA	VL06	40p	PHILIPS, SAISHO, SALORA SAMSUNG, SANYO, SHAI			8900, 8901, 8902, 8903, 8909, 59 8922, 8925)	12,		7700) TELEFUNKEN (VR450, 52	.0,	
(VHSXJ3), TT (VR3993,3994), JVC (HR2650, 7600, 7610, 7650, 7655).			SIEMEN, SONY, TELEFUN			BLAUPUNKT, ORION (VH1, 2A),	VL02	30p	529, 540, 549, 620, 640, 920, 19		
TELEFUNKEN (VR530, 535, 539, 5	550,		THOMSON, TOSHIBA			NATIONAL (NV200,2010, 3000,		ЗОР	THOMSON (V4100, VK308, 309	, 312,	
630, 650), THOMSON (V309, 316, VK309, 411,TX8000), FERGUSON			GRANADA (VHSAY3),SHA (VC200, 381, 384, 385, 386,		45p	7000, 8150, 8200, 8400, 8600, 86 8620), SHARP (VC2300, 6000, 62			410), FERGUSON (3V23, 29, 30	,	
(3V31, 8941, 8942)			390, 393, 9300, 9500, 9700)		6300, 7300, 7700, 8300)			8923, 8924, 8929, 8930, 8931, 8	940)	

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AMSTRAD VCR700 Contents BELT SET, PINCH ROLLER, REEL IDLER, VIDEO LAMP Order Code: SK41 £		HITACHI VT11/NT33 Contents BELT SET. PINCH ROLLER. TENSION BANO. IOLER TYRES Order Code: SK08	£5.00	NV600/NV688
FERGUSON & JVC 3V42/43 HR0455/HRD725 Contents BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND ECONOMY Kit Contents BELT SET, PINCH ROLLER CLUTCH CLUTCH, TAKE UP CLUTCH CLUTCH	4	VT11/TT32 Contents BELT SET. T/UP REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. FINCH ROLLER. FF/REW IDLER. CLUTCH PLATE. TENSION BANO Chder Code: SK45 E13.00 Order Code: SK45 E13.00 Order Code: SK45	£3.75	NV730/NV770
Order Code: SK37	£9.00	VT52/61/62/63/64/65/65/65/65/640	£3.00	NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK E-Conomy Kit Contents E-ECONOMY Kit Contents E-ECONOMY Kit Contents E-ELT SET, PINCH ROLLER ELT SET, PINCH ROLLER ELT SET, PINCH ROLLER ELT SET, PINCH ROLLER
3V23/3V30 HR7200/7300/7350 Contents BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES		VT400/405/410/13/14/15/18/420/25/25/28/430/31/35/48/450/498/ 510/520/25/28/330/35/38/540/545/46/48/570/75/576/580/85/88 Contents TIMING BELT. PINCH ROLLER. FF/REW ARM. CLUTCH BASE. TENSION BAND Order Code: SK\$2	£9.75	NV777/NV788
3V35/36, 38/39/49 HRD110/111/120/225 Contents BELT SET, PINCH ROLLER, TENSION BANO, IOLER TYRES	E5.00	VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/ 175/220/225/250/255/258/260/VTL30 Continuis BELT SET. PINCH ROLLER. FF/REW ARM. CLUTCH PLATE. TENSION BAND Order Code: SK\$1	£14.00	Contents Economy Kit Contents BELT SET. PINCH ROLLER BELT SET. PINCH ROLLER REEL IDLER, TENSION BANO. REEL IDLER TYRE VIDEO LAMP C8.00 Order Code: SK47 £8.00 Order Code: SK48 £3.25
3V31/3V42 HR7600/7610/7650/7655 Contents BELT SET, T/U REEL TABLE TYRE. PINCH ROLLER, REEL IDLER. T/U CUTCH. T/U IDLER. TENSION BANO. UIDEO LAMP Order Code: SK33 E11.00 Order Code: SK34	£5.00	PANASONIC	£5.00	\(\text{VCS0V/C51} \text{VC582/VC582/VC584/VC5F3} \) \(\text{Contents} \) \(\text{BELT SET. PINCH ROLLER.} \) \(\text{REEL IDLER.} \) \(\text{TEMIOLER.} \) \(\text{TEMIOLER.} \) \(\text{TEMIOLER.} \) \(\text{C95.00 Order Code: SK61} \) \(\text{VC781/VC781/VC782/VC785/VC783/VC90/VC4102/VC4104/VCA202} \) \(\text{VCA100/VCA102/VCA104/VCA202} \) \(\text{Contents} \) \(\text{Economy Kit Contents} \)
3V3S/36/38/39/49 HRD110/111/120/121/225 Contents		Contents BELT SET. PINCH ROLLER. TENSION BAND, IDLER TYRE Order Code: SK01 NV2000/NV2010 Contents BELT SET. PINCH ROLLER. FF BELT SET. PINCH ROLLER. IDLER. PLAY IDLER. TENSION BAND, VIDEO LAMP Order Code: SK13 E5.00 Order Code: SK14	£5.00	BELT SET, PINCH ROLLER REEL DRIVE UNIT. TENSIDN REEL DRIVE UNIT TYRE BAND Order Code: SK64 £13.50 Order Code: SK65 £3.75 VC681/VC682/VC684/VC685/VC693/VC693/VC697/VC700 Contents Economy Kit Contents BELT SET, PINCH ROLLER REEL DRIVE UNIT. TENSION REEL DRIVE UNIT. TENSION REEL DRIVE UNIT. TYRE
3725/3730 HR072007300/7350 Contents BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. REEL TYRE. PINCH ROLLER. REEL TYRE. PINCH ROLLER. REEL TIRE. TYRE. PINCH ROLLER. REEL TIRE. TYRE. PINCH ROLLER. TREE	£5.50	NV7000/NV7200/NV7800 Economy Kit Contents	63.25	BAND Order Code: SK62 £13.50 Order Code: SK63 £5.00 FOR MORE DETAILS OF OVER 500 TYPES OF SERVICE KITS PLEASE RING US!
3V44/45/48/53/54/55/57 HRP50/HRD 140/150/158/160 HRD250/25/7565/566/755	£5.00	Contents Economy Kit Contents	£3.25	AUNIVERSAL REAL
BELT SET. PINCH ROLLER. CLUTCH MECHANISM. TENSION BAND	£9.50	NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/ AG1810 (P/K) Contents LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER TENSION BAND TYRE		NEW
IPVIP905/906/907/908/910/911/916/918 Contents BELT SET. PINCH ROLLER. IDLER. GEAR IDLER RUNT. TENSION BAND IDLER TYRE IDLER TYRE IDLER TYRE	£5.00	Order Code: SK27 £6.00 Order Code: SK28 NV332 Cartients BELT SET, PINCH ROLLER, PLAY IDLER. FF/REW IDLER. TENSION BAND. FF/REW TYRE IDLER TYRE Order Code: SK28 Reconsity Kit Contants BELT SET, PINCH ROLLER PLAY IDLER TYRE. FF/REW IDLER TYRE	£3.00	See Page 350
FVHP815/618/620/622/710/711/715/716/720/721/722/725/ 730/830/840 Contents BELT SET. PINCH ROLLER. BELT SET. PINCH ROLLER. IDLER. GEAR IDLER LUNIT. TENSION BAND Order Code: SK68 E11.00 Order Code: SK69	£300	Order Code: SK29 £12.00 Order Code: SK30 NV230/250/280/280/450/450/450/470/550/810/890/ AG 1200PK/AG 1500PK Contents Economy Kit Contents BELT SET, PINCH ROLLER, IDLER, TYRE IDLER TYRE IDLER, TENSION BAND IDLER TYRE Order Code: SK23 £6.00 Order Code: SK24	63.25	TOTARRIVED!!!

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	Ì	600, 610, 620, 660, 670, HRD830,				VC\$211, 244, 5055, 605, VCB230,		
	VH\$YJ2	CH01	2800p		840, 850, 860, 4050, 6600, FV37H	CH20	2200p	.1	VCD806G, 810G, VCT212, 310,		
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400,				HRD540, 580, 830, 860, 910, 960,				410G, 610	CH24	2500p
	73401, G\$E1295P, G\$E1891P,				HRD970, HRDX20,			TELEFUNKEN	VR2970	CH02	2800p
	20001Q, 20051Q, VCP4200, 4300,			FERGUSON	FV57H	CH27	2400p	THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	4301, 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		V85, V66	CH02	2800p
FERGUSON & 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,			4444	***	A 4	♣
	120, 121, 225	CH01	2800p		NB33EG	CH01	2800p	AAAA		NM	AM
	3V42, 3V43, 3V44, 3V45, 3V48,				N895	CH02	2800p	* AMS	TRAD MOD I	ZIT	会
	3V53, 3V54, 3V55, 3V57, 8945,			PHILIPS	CASSETTE LIFT ASSEMBLY (691203	66)		A -	I KAD MOD I	711	
	8947, 8948, HRD 140,				DV186, 190, 286, 471, 562, 761,			*			黄
	141, 150, 157, 158, 160, 250,				VR6180, 6182, 6185, 6285, VR6290,						
	HRD257, 455, 565, 566, 725, 755	CH02	2800p		6291, 6293, 6362, 6367, 6393, 6467,			FITS:	.coo 4700 5300 TT ID 1	2.2	*
	8948, 8950, FV10B, 12L, 13H, 14T,			Į.	6468, 6470, VR6561, 6670, 6760,			A VCK 4500, -	1600,4700,5200,TVR 1	,2,3	
	20B, 21R, 22L, 26, 395, HRD230,				6761, 6870, 6970	CH05	1100p	*			*
	430, 530	CH03	2800p		VR6443	CH22	2900p	A DDIC	E: £2.25 + VAT e	aah	
	3V58, 3V59, 3V64, 3V65, FV11R,				VR6448	CH23	2500p	🏂 PRIC	E: 22.25 + VAI e	acil	故
	8950, 8951, HRD170, HRD180, HR 0 370				49SB6 VCA100, VCH851, VCH852	CH24 CH22	2500p 2900p	4444	***	A-A-	A - A -
		CH04	2800p	SHARP							

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

NV230, 260, 430, 810, 870, 2300, 4300 £3 50

(VSS0110) £2 25 NV830 (VSS0091) £2.10

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

£3.75 (VSS0060

NVG21, 25, NVH65, NVD80 (VSS0175A) £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 ORDER CODE: AH02 PRICE: 1450r UNIVERSUM

Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKH, 4700

FUNAL VS2, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000 Also fits: FIDELITY, FUNAL, HINARI, PROLINE, SCHNEIDER,

Replacement Audio Control Video Sound Head for National Panasonic

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

SET OF 8 ALLEN KEYS

0.77mm 1.27mm

1.60mm

2.40mm

0.90mm 1.50mm

2.00mm

3.00mm

VIDEO 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

AUDIO CONTROL HEADS

CONTAINS: SET OF 7 HEAD & TAPE PATH ALIGNERS

• RCA TYPE AUDIO & CONTROL HEAD POSITIONING TOOL

ORDER CODE: AH01

- RCA ADJUSTMENT TOOL FOR TAPE GUIDE POSTS • RCA TYPE BACK TENSION TOOL
- TENSION ADJUSTMENT TOOL FOR VARIOUS USES
- VCR ADJUSTMENT TOOL

Price: 75p

Price: 135p

AMSTRAD ORIGINAL NO: 150751

AMSTRAD ORIGINAL NO: 153134

TOWADA UNIVERSUM

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

BACK UP BATTERIES

PHILIPS

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

Order Code: BB01

Part Nos: 138 - 10229, 2.4v 100mAH

Order Code: BB02

FERGUSON

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

Order Code: BB03

MAKE & MODEL

PACE MSS500/1000

FERGUSON SRD4

ECHOSTAR SR5500

AMSTRAD SRD600

MIMTEC (Surensen)

PACE MSS200/300 APPOLL

ECHOSTAR 6500/7700/8700

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

Order Code: BB04

Price: 90p Price: 150n

PRICE

900p

1230p 650p

1600p 2750p

2600p

700p

650p

CODE

SATPSU9

SATPSU10

SATPSU11

SATPSU12

SATPSU13

SATPSU14

SATPSU15

SATPSU16

SATELLITES

MAKE & MODEL	CODE	PRICE
PACE PRD800, PRD900	SATPSU1	600p
PACE SS9000, 9200, 9010, 9210, 9220	SATPSU2	550p
AMSTRAD SRD510, SRD520	SATPSU3	600p
AMSTRAD SRD500	SATPSU4	600p
AMSTRAD SRX340, SRX345, SRX350	SATPSU5	600p
PACE D100/150	SATPSU6	650p
CHURCHILL D2MAC	SATPSU7	650p
PACE MSS100	SATPSU8	730p

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

AMSTRAD SRD700, SR950, SRX100, 301, 501, 502, 1002, 2001, SRD2000 SAT250

SATMETER

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

Through operation with satellite RX powering the LNB.

- * Acoustical signal: On signal strength *LED indicator: Vert/Hori
- * Frequency Range: 900 to 2050 Mhz *Input impedence: 70 Ohm
- * Power amplifier: 18db

*Detection Range: -60 to -10 DBM

Max. input signal: -10 DBM

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

REPLACEMENT

GRUNDIG

PART No: 29703, 29102

USED ON:

C7500, C8500. C8502, C8712 . . .ETC

PHILIPS

Order Code: SW1

Price: 140p

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: 150p

USED ON: KV1400, KV1440, KV2040, KV2060 (POWER SWITCH 26mm)

Order Code: SW12 Price: 125p

SONY

USED ON:

(POWER SWITCH 21mm +Remote) Order Code: SW6 Price: 200p

SONY 2 PIN FUNCTION SWITCH

Order Code: SW9

Price: 35p

		FUSES		
	TIME LAG (20mm)		QUICK BLOW (20m	
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 typ

VOLTAGE TESTER

A terminal screwdriver incorporating continuity & voltage with Euroslot

ORDER CODE: TOOL11 PRICE: 220p

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					
5.4	FUSE43	85n					

38mm CER	AMIC TIME	LAG		
CURRENT RATING	ORDER CODE	PRICE		
10A	FUSE48	825p		
** ALL THE ABOVE PRICE	CES ARE FOR PACKS C	F 10 FUSES **		

SPRING HOOK

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

ORDER CODE: TOOL20

COMPARISON BOOKS FAULT FINDING

Satellite Fault Finding Guide Issue 1. Listing about 1,000 faults for over a range of 24 different brands. Order Code: BOOK05.

Price £8.50 - No VAT.

Video Recorders Edition 5 1997

Over 300 pages packed with more than

5500 faults for different brands

Price £15.00 - No VAT. Order Code: BOOK01

TELEVISION **Edition 6**

Lists more than 8.450 faults with 460 pages covering 58 different brands Price: 1600p only - no VAT. Order Code: BOOK02

Satellite Repair Manual Edition 4

A comprehensive guide to receiver reviewing, featuring stock faults and installation tips.

Price £15.00 Only No VAT Postage 100p Order Code: BOOK03

SEMICONDUCTOR COMPARISONS 1997/8 Listing more than 31.600 Semiconductors with suitable alternative complete with descriptions and base information.

PRICE: 265p

Price: £15.50 - No VAT. Order Code: BOOK04

semiconductors in much greater detail plus mar-

keting data on SMD devices and a separate

generic table of all type designations.

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SEMICONDUCTOR COMPARISONS 1997 The new 1997 Jaeger Semiconductor with 952 pages packed with information on over 80,000

SOLDERING

ACCESSORIES

I.C. PROTECTORS

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

PRICE: 30p EACH ONLY

SERVICE AIDS

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	125p
SWITCH CLEANER	176ML	SP02	140p
SILICONE GREASE	200ML	SP03	, 170p
FREEZE IT	170ML	SP04	280p
FREEZE IT	400ML	SP16 /	570p
FOAM CLEANER	400ML	SP05	155p
ANTI-STATIC	150ML	SP06	155p
AEROKLEANE	135ML	SP07	185p
AERO DUSTER	150ML	SP08	290p
AERO DUSTER	400ML	SP17	550p
PLASTIC SEAL	200ML	SP09	230p
GLASS CLEANER	250ML	SP10	_155p
COLDKLENE	250ML	SP13	225p
EXCEL POLISH 80	250ML	SP18	145p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	200p
TUBE SILICON SEALANT WHITE	75ML	SP22	250p
TUBE SILICON SEALANT CLEAR	75ML	SP23	250p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	140p
DRIVE CLEANER	200ML	SP24	130p
SCREEN CLEANER	200ML	SP25	145p
COMPUTER CARE KIT		SP26	2100p

All the above items are manufactured by Servisol If you purchase more than one Servisol Product, postage & package will be charged as follows:

300p for 2-5 cans 500p for more than 5 cans

CDDE PRICE DESCRIPTION ANTEX SOLDERING IRONS 25 WATT 240 VAC (XS25W 240V) 15 WATT 240 VAC (XS15W 240V) 25 WATT SPARE ELEMENT 15 WATT SPARE ELEMENT S102 S103 SOLDERING STAND & SPONGES SOLDERING STAND (MADE BY ANTEX) SPARE SPONGE S109 SOLDER 18 SWG 500 GRAMMES 20 SWG 500 GRAMMES 22 SWG 500 GRAMMES DESOLDERING AIDS SOLDER MOP STANDARD GAUGE 1.2MM X 1.5M SOLDER MOP 1.2MM X 10M DESOLDERING PUMP SPARE NOZZLE



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CASSETTE DC MOTORS

6V MOTOR 9V MOTOR 12V CW MOTOR 12V CCW MOTOR 13.2V MOTOR

170p 170p 170p 170p 290p

CASSETTE TAPE HEADS

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

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Iodels & Description	Order Code	Price ,	Models & Description
(WA			SAD30, SLCH9, SLP150,
C007	KSSS151A	1900p	SLP370G, SLP400C, SLP
X-990A, DX-DIA	KSS152A	1600p	SLPJ26, SLPJ27, SLPJ37,
KL60, CXL66G, CXL80, CXN3100, CXN320, CXN3300, CXN360, CXN400, CXN430, CXN540,			PHILIPS
KN550G, CXN990, CXN999, CXNV20, CXSL70, DXZ9100M, FDN636, FDN636, FDN939, IX60, LCX66G, LCX70M, LCX80, M7400, M75, NSX320, NSX360, NSX400, NSX430,			AZ8304, CD070, CD080, 6
KS990, NSX992, NSX999, NSXD636, NSXD939, NSXV20, SXFN550,SXFN520, XC300,			CD100, CD130, CD1380,
3550, XC750, XC900, XC950, XCN992, XG320, XG360, XG400, XG990, ZD3000M, ZD3100M	KSS152A	1600p	CD480, CD482, CD500, C
(AP1, CXL7, CXL8G, CXLC50P, CXZ58, DXM740, DXM75, DXM76, DXM77, LCX50, LCX7,	NOO IDEM	10000	CD781, CD782, CD840, C
X8G, LCXAP1, XC002, XC004, XC005, XC777	KSS210B	2000p	AS440, AS445, AS540, A
31, XP33, XP55, XP80G	KS220A	2500p	CD690, CD710, CD720, C
6.XP7	KSS331A	3400p	FW26, FW330, FW36, FV
(AI	NOCOOTA	- 0.100p	CD1210/40
73, DC93	KSS151A	4000-	AZ8006
25, CD26, CD27, CD32, CD36, CD37, CD52, CD55, CD57, CD650, CD670, CD69, CD750, CD79,	KOSISIA	1900p	FW11
M480, CDM600, CDM670, CDEM770, CDM959, MX550, MX570, MX650, MX670, MX750, MX950	KSS210A	1800p	PIONEER
	NOOZ IVA	1800р	PDM400, PDM410, PDM5
NON	·		PDT303, PDT403, PDT503
21500II, DCD1520, DCDE3520	KSS151A	1900p	PDZ82M, PDZ83M, PDZ9
1400, DCD600, DCD800	KS152A	1600p	N32, N90M, ,PD101, PD20
1420, DCD520, DCD610, DCD620, DCD660, DCD810, DCD820, DCD860, DCD910, DCD920	KSS210A	1800p	PD7700, PD8700, PD970, P
1015, DCD1290, DCD2060, DCD2060G, DCD315, DCD480, DCD580, DCD615, DCD715,			PDM430, PDM450, PDM55
825, DCD890, DCD895, DN2000F	KSS240A	3000p	PDP920M, PDS501, PDS60
DSTAR			PDZ84M, PDZ970M, PXA1
52A, CD952AJ, CD952LJ, CD952SJ, FFH101KL, FFH101WL, FFH222A/L, FFH272L,			S707DTM, S909DM, S990DT
331, FFH373K, FJ606, FR606L	KSS210A	1800p	PDM400, PDM410, PDM5
OA/L, CD630S/L, FFH212A/L.FFH212E	KSS210B	2000p	PDT303, PDT403, PDT503
NDIG			PDZ82M, PDZ83M, PDZ9
io, CD435	нормз	2150p	SAMSUNG
00, CD101MCD904, MC10, NEW ORLEANS CD	KSS210A	1800p	CD20
100, RR1900CD, RR3100CD, RR4000CD, RR610CD, RR700CD	KSS210B	2000p	CD1200, CD1310, SCM-6
D, CDP90	KSS220A	2500p	RCD1200, RCD1300, RCD
5	KSS331A	3400p	SANYO
5	OPTIMA5	3000p	DCFS3, DCT55, DCX502,
CHI			PART No. 6142186855
60	нормз	2150p	DCFS5, MCD450K, 660K,
	KSS210A	1800p	DCX1000MD, DCX1003, I
)	KSS210B	2000p	DCD10, DCD11U, DCD20
			DCX210, DCX220, DCX99
992, LATE 1987-1988 - XLE300BK, XLE31BK, XLE51BK, XLE900BK, XLME91BK, XLV101BK,		i i	MCDZ2L, MCDZ3L. PART
BK, XLV222BK, XLV311BK, XLV333BK, X:Z1010TN, XLZ411BK, XLZ444BK, XLZ555BK, XLZ511BK	OPTIMA3	4000p	DCD12, PART No. 64500
IO CASSETTE, MINI SYSTEMS - MDDELS 1990-1992	OPTIMA4S	5000p	MCDZ31L, MCDZ41L, MC
, CA-MX30BK, CA-MX33BK, UX-A5, UX-A6, XL-M309, XL-M403BK, XL-M408, XL-M409,	OF THEFT		SHARP
4BK, XL-M505TN, XL-M508, XL-M509, XL-M705TN, XL-V131BK, XL-V151TN, XL-V221BK,			CD-111, CD-301, CD-302,
ITN, XL-242BK, XL-V251TN, XL-V252BK, XL-Z1050TN, XL-Z551TN, XL-Z552BK	OPTIMA5	g000E	CD-X12, CD-X15, CD-X16
NWARDS - CAE48BK, CAMCG7, CAMXG9, CAS20BK, CAS30BK, VAS50, CAS60RBK,			DX-460, DX-461, DX-650,
MXS30, MXS60, PCX105, PCX130, PCX95, RCX230, RCX320, RCX520, RCX620,			DX-R77, DX-R770, DX-R8
, UXA4, UXA5, UXA55, UXC7, UXT1, UXT3, XLF115, XLF116, XLF215, XLF216,			QT-350CD, QT-37CD, QT-
10/M, XLMXG7, XLMXG9, XLV163TN, XLV164BK, XLV174, XLV263TN, XLV264BK,			SG-W1CD, SG-W2CD, SY
3K, XLZ463TN, XLZ464BK, XLZ574, XLZ674, XTMXG7, XTMXG9, XTS60	OPTIMA6S	3300p	QT-50CD, QT-60CD, QT80
100			DXR-840B, PART No. RC
P660SG, DP8020, DP87, L1000D	KSS152A	1600p	CDS360E, 360H, 370, 450
DP1510, DP2010, DP2030, DP3010, DP3030, DP3050, DP4030, DP491, DP5010, DP5030,	ROOTSEA	_,000	PART No. RCTRH8136AF
DP520, DP7030, DP7040, DP7050, DP730, DP920, DP930, DP950, DPM650, DPM6630,			SONY
), DPM850, DPM991, DX6620, M225, M25, M450, M850, PD3030, PDM991, RDX25.			KSS240A
\$XDC3L, UD202, UD302	KSS210A	1800p	KSS121A
PC72, DPC77, DPC80, DPC92	KSS220A	2500p	KSS151A
DP2050, DP3060, DP501, DP5060, DP722, DP76, DPB5, DPB9, M77A, PD3060,	.10022011		KSS210A
D70, UD701, UD90, XE5	KSS240A	3000р	KSS210B
DPC521, DPC531, DPC631K, DPC721, DPC731	KSS331A	3400p	KSS220A
P2060, PART No: RCTRH8136AFZZ	RH8136A	4500p	KSS331A
			KOCOCOA

AD30, SICH9, SUP190, SIP170, SIP200, SIP202, SIP220, SIP230, SIP230, SIP233, IP2706, SIP2006, SIP595, SIP770, SIP936, SIP3010, SIP5700, SIP5700, SIP5840, SIP5900 SOAAD70A 235 IP272, SIP127, SIP137, SIP438, SIPK18, SIPK26, SIP580, SIP570, SIP5700, SIP5840, SIP5900 SOAAD70A 235 IP272, SIP127, SIP137, SIP438, SIPK26, SIP580, SIP570, SIP5700, SIP5840, SIP5900 SOAAD70A 235 IP272, SIP127, SIP137, SIP438, SIPK26, SIP580, SIP570, SIP5700, SIP5840, SIP5900 SOAAD70A 235 IP272, SIP127, SIP137, SIP138, SIPK26, SIP580, SIP5800, SIP5700, SIP5840, SIP5900 SOAAD70A 235 IP272, SIP127, SIP137, SIP138, SIP138, SIPK26, SIP580, SIP5700, SIP5700, SIP5840, SIP5900 SOAAD70A 235 IP372, SIP138, CIP127, SIP138, SIP1380,	Models & Description	Order Code	Price
ILPJ26, SIP1927, SIP1937, SIP1945, SIP1963, SIP1963, SIP5960, SIP5700, SIP5700, SIP5840, SIP5900 SOAAD70A 235** MILIUSP Z8304, CD076, CD080, 690, 910, 920, PART IN 0., 4822-691-20768 310** D100, CD130, CD1300, CD1300, CD1300, CD0300, CD0303, CD304, CD380, CD300, CD1300, C	SAD30, SLCH9, SLP150, SLP170, SLP200, SLP202, SLP222, SLP230, SLP250, SLP333,		
### ### #### #########################	SLP370G, SLP400C, SLP555, SLP777, SLP999, SLPA10, SLPC20, SLPC25, SLPJ25,		
\(\text{Z}\) (2007), (CD08), 699, 310, 320, PART NO. 4822-691-20768		SOAAD70A	2350
D100, CD130, CD1380, CD1482, CD200, CD204, CD210, CD200, CD300, CD300, CD380, D280, D280, D280, D281, CD500, CD502, CD503, CD508, D280, CD508, CD581, CD500, CD502, CD503, CD780, D281, CD782, CD840, CD832, CD832, CD840, CD833, CD850, CD780, CD782, CD782, CD833, CD830, CD780, CD780, CD782, CD782, CD740, CD750, CD901, CD902, CD903, CD165, D290, CD710, CD720, CD732, CD740, CD750, CD901, CD902, CD903, FW17, FW21, FW25, FW350, FW360, FW	PHILIPS		
DABBO, CD482, CD500, CD502, CD582, CD583, CD583, CD580, CD780, CD780, CD780, DD780,		4822-691	3100
D281_CD782_CD840_CD830_CD830_CD890_CD704_CD080_CD091_CD183_CD165_ D690_CD710_CD720_CD732_CD740_CD750_CD090_CD091_CD183_CD165_ D690_CD710_CD720_CD732_CD740_CD750_CD091_CD093_CD093_FW17_FW21_ W28_FW330_FW36_FW360_FW389]_FW40_FW41_FW41_FW46_FW56_FW56_FW56_FW56_FW56_FW56_FW56_FW5			
S449, A544, A5540, A5640, A28048, A28040, CD970, CD980, CD991, CD183, CD165, DB90, CD710, CD730, CD732, CD730, C		601 20200	EEOO.
DE99, CD710, CD720, CD732, CD740, CD750, CD910, CD920, CD925, FW17, FW21, W28, FW360, FW360		091-30209	5500
TW26, FW330, FW350, FW360, FW360, FW460, FW41, FW46, FW56, FW56, FW58 CDM12.1 120 CDM12.4 220 CDM12.4 CDM12.5			
D1210/40		CDM12.1	1800
W11	CD1210/40	CDM12.4	2200
NAMED NAME	AZ8006		2000
DIAMOR POMATO P	FW11	OPTIMA6S	3300
\[D1303, PDT403, PDT503, PDX940M, PDX950M, PDZ560T, PDZ72T, PDZ73T, PDZ51M, \[D228M, PD236M, P	PIONEER		
D282M, PDZ580M, PDZ580M, XDZ53T, XDZ5AT	PDM400, PDM410, PDM500, PDM510, PDM600, PDM610, PDM700, PDM710, PDM730,		
132, N90M, PD101, PD201, PD32, PD41, PD4500, PD4700, PD59267D5700, PD6930, PD69500, PD6700, PD			
D7700, PD8700, PD970, PDCP420, PDCP5207, PD49520T, PD4900T, PD4900M, PD4900M, PD4900M, PD4900M, PD4900M, PD4900M, PD4900M, PD4900M, PD5901,		KSS151A	1900
DM430, PDM450, PDM50, PDM50, PDM50, PDM50, PDM70, PDM710, PDP710T, PDP720T, PDP910M, PDP920M, PDS010, PDM500, PDM510, PDM600, PDM510, PDM600, PDM510, PDM600, PDM510, PDM600, PDM510, PDM600, PDM510, PDM700, PDM700, PDM730, DDM730, DDM300, PDM510, PDM600, PDM510, PDM600, PDM510, PDM700, PDM710, PDM720, DDM720, DDM720, DDM300, PDM510, PDM600, PDM510, PDM500, PDM510, PDM700, PDM710, PDM720, DDM720, DDM700, PDM510, PDM500, PDM510,			
DP920M, PDS301, PDS501, PDS701, PDS701G, PDS901, PDT310, PDT510, PDZ PDZ5701, PDZ771T, DZ28M, PD2700M, PX1349S, 1252DC, 13152CT, S0302CDM, S0302DT, S595DM, S595DS, S595DM, S595DS, S707DM, 707DTM, S9892M, S989DM, XD2810, PX1349S, 1252CD, 13152CT, S0302CDM, S0302DT, S995DM, S705DSD, S707DM, 707DTM, S9892M, S989DM, XD281M, DDX630, PDM310, PDM3100, PDM310, PDM310, PDM310, PDM310, PDM310, PDM310, PDM310, PDM			
DZBMM, PDZ970M, PXA1349, \$12ECD1, \$13ECD1, \$303CDM, \$303CDT, \$305DM, \$505DT, \$707DM, \$707DM, \$707DM, \$809DT, XCP10M, XCP10TM, \$505BM, XCP10TM, \$809DM, XCP10TM, \$809DM, XCP10TM, \$705BM, XCP10TM, \$705MM, XCP10TM, XCP10T			
1707TM, \$599DM, \$599DM, \$299DT, XCP410M, XCP410T, XDZ54T, XDZ56T, XDZ56M, XDZ84M, XD284T, XRP310, XRP320 PEA 1030 440			
DM400, PDM410, PDM500, PDM510, PDM600, PDM510, PDM700, PDM710, PDM730, DDM730, DT030, PDM400, PDM500, PDM510, PDM700, PDM710, PDM730, DDM500, PDM500, PDM500, PDM500, PDM510, PDM730, DDM500, PDM500,		PEA 1030	44001
D282M, PD289M, PD289M, XD259T, XD259T, XD259T, XD262, XD262M, XD2630, XR282 PWY1009 480 JAMSUNG HOPM3 218 D1200, CD1310, SCM-6000, SCM6900 KS\$10A 180 CD1200, RCD1300, RCD1350, RCD1550, RCD9600, RCD990, RCD995, SCM6900 SS\$10A 180 ANYO SCFS3, DCT55, DCX502, DCX701, DCX702, DCX802, DCX891, DCX891N, MCDZ10. S14218 230 ART No. 6142186855 S14218 230 S60 CK1000MD, DCX1003, DCX900MD, DCX903, DCX915 KS\$210A 180 CK1000MD, DCX1003, DCX900MD, DCX903, DCX915 KS\$210A 180 CK210, DCX210, DCX920, DCX994, MCDM5401, MCDMS601, MCDX10, DCX120, DCX210, DCX210, DCX210, DCX93, DCX996, DCB8U, DCMS1, DCX110, DCX120, DCX210, MCDZ411,	PDM400, PDM410, PDM500, PDM510, PDM600, PDM610, PDM700, PDM710, PDM730,		
AMSUNG HOPM3 215	PDT303, PDT403, PDT503, PDX940M, PDX950M, PDZ560T, PDZ72T, PDZ73T, PDZ81M,		
D20	PDZ82M, PDZ83M, PDZ960M, XDZ53T, XDZ54T, XDZ55T, XDZ62, XDZ62M, XDZ630, XRZ82	PWY1009	4800
D1200, CD1310, SCM-6000, SCM8900 CD1200, RCD1300, RCD1300, RCD1300, RCD2600, RCD960, RCD995, SCM8900 SOH9074N 360 CPS3, DC155, DCX502, DCX701, DCX702, DCX802, DCX891, DCX891N, MCDZ10. ARYNO CPS3, DC155, DCX502, DCX701, DCX702, DCX802, DCX891, DCX891N, MCDZ10. ART No. 6142188855 GFS5, MCD450K, S60K, MCDZ30L, 80F, PART No. 6142205006 GFS5, DCX506, S60K, MCDZ30L, 80F, PART No. 6142205006 CD10, DCD110L, DCD20, DCD30, DCD30AT, DCX60, DCX81, DCX110, DCX120, CD10, DCD110L, DCD20, DCD30, DCD30AT, DCX60, DCD81, DCMS1, DCX110, DCX120, CX210, DCX202, DCX993, DCX894, MCDMS40L, MCDMS50L, MCDMS60L, MCDZ1L, CD212L, MCDZ31L, PART No. 6142391303 G10231L, MCDZ31L, MCDZ3	SAMSUNG		
CD120, RCD1300, RCD1350, RCD1600, RCD2600, RCD999, RCD995, SCM6900 ARIT No. 614218835 CFS3, DC550, DCX502, DCX701, DCX702, DCX802, DCX891, DCX891N, MCDZ10. ARIT No. 614218835 CX1000MD, DCX1003, DCX900MD, DCX903, DCX915 CX1000MD, DCX1003, DCX900MD, DCX903, DCX915 CX210, DCD110, DCD110, DCD30, DCD30, DCD50, DCD801, DCX110, DCX120, DCX210, DCX910, DCX900MD, DCX900MD, DCX903, DCX900MD, DCX903, DCX915 CX210, DCX220, DCX993, DCX994, MCDM5401, MCDMS501, MCDMS601, MCDZ11, CDC211, MCD211, PART No. 6142391033 CD112, PART No. 6450055986 CD112, PART No. 6450055986 CD12, PART No. 6450055986 D111, CD-301, CD-302, CD-304, CD-310, CD-C3, CD-L700, CD-L800, CD-U1, CD-U10, CD-X10, DX12, CD-X10, CD-X10, CD-X11, CD-X10, DX12, CD-X11,	CD20		2150p
IANYO	CD1200, CD1310, SCM-6000, SCM6900		1800g
CES3, DCT56, DCX502, DCX701, DCX702, DCX802, DCX891, DCX891N, MCDZ10. ART No. 6142188855	RCD1200, RCD1300, RCD1350, RCD1600, RCD2600, RCD990, RCD995, SCM6900	SOH90T4N	3600p
ART No. 6142188895 CKSS, MCD496K, 680K, MCD230L, 60F, PART No. 6142205006 514220 5600 CK1000MD, DCX1003, DCX900MD, DCX903, DCX915 CK210, DCX210, DCX20, DCX903, DCX90, DCBQL, DCMS1, DCX110, DCX120, DCX20, DCX923, DCX939, DCX904, MCDMS40L, MCDMS60L, MCDZ1L, MCD22L, MCD21L, PART No. 6142391303 CD12, PART No. 6450055966 645005 370 CD12, PART No. 6450055966 645005 370 CD231L, MCD241L, MCD271L HARP D-111, CD-301, CD-302, CD-304, CD-310, CD-C3, CD-L700, CD-L800, CD-U1, CD-U10, CD-X10, DX-150, DX-	SANYO		
CFSS, MCD480K, 580K, MCD230L, 80F.PART No. 6142295006 514220 560 CFC1000MD, DC10103, DC1900MD, DC1803, DC281915 KSS210A 180 CD10, DC1011U, DC120, DC130, DC1304 DC1304 DC181, DCX110, DCX120, CX210, DC1820, DC283, DCX894, MCDMS40, MCDMS60L, MCDMS60L, MCDZ1L, MCD23L, MCD23L, PART No. 6142391303 514239 330 CD12, PART No. 6450955986 645005 370 CD12, PART No. 6450955986 645005 370 CD1231L, MCD231L, MCD231L, MCD271L KSS210B 200 PARP D-111, CD-301, CD-302, CD-304, CD-310, CD-C3, CD-L700, CD-L800, CD-U1, CD-U10, CD-X10, D-X12, CD-X10, CD			
CX1000MD, DCX1003, DCX900MD, DCX90, DCX915 CX5010, DCT0110, DCT0110, DCT0110, DCX20, DCX90, DCX904, DCX90, DCX904, DCX90, DCX904, DCX904, DCX904, MCDMS40L, MCDMS60L, MCDZ1L, CX220, DCX993, DCX994, MCDMS40L, MCDMS60L, MCDZ1L, M			2300p
CD101, DCD20, DCD30, DCD30A, DCD30AT, DCD8, DCD8U, DCMS1, DCX110, DCX120, CX210, DCX20, DCX93, DCX994, MCDMS40, MCDMS50L, MCDMS660L, MCDZ1L, CX121, DCX210, DCX20, DCX93, DCX994, MCDMS40L, MCDMS50L, MCDMS660L, MCDZ1L, CX121, PART No. 6142391393 330 CD12, PART No. 6142391393 645005 370 645005 650 645005 370 645005 650 65005 650 645005 670 70 70 70 70 70 70 70 70 70 70 70 70 7	DCFS5, MCD450K, 660K, MCD230L, 60F, PART No. 6142205006		
CX210, DCX220, DCX929, DCX994, MCDMS40L, MCDMS60L, MCDMS60L, MCDZ1L, MCDZ1L, MCDZ21L, MCDZ21L		KSSZIVA	1000
CCD2ZI, MCDZ3L PART No. 6142391393			
CD12_PART No. 6450659598 CD231_MCDZ31_MCDZ31_MCDZ71_ KS\$210B AVAID AVAI		614239	3300
HARP	DCD12, PART No. 6450055966		3700p
D-111, CD-301, CD-302, CD-304, CD-304, CD-10, CD-L30, CD-L30, CD-L30, CD-L30, CD-L30, CD-L30, CD-L30, DX-160, DX-1700, D	MCDZ31L, MCDZ41L, MCDZ61L, MCDZ71L	KSS210B	2000p
D.X12, CD-X15, CD-X16, CD-X17, CD-X20, CD-X9, CKLE50, CMS9SCD, DX-180, DX-180, DX-450, X450, X450, X451, DX-450, DX-4500, DX-2100, DX-2100, DX-2100, DX-2100, DX-2100, DX-2100, DX-2100, DX-2500, CT-30CD, CT-33CD, CT-33CD, CT-35CD, DX-2500, DX-25	SHARP		
X-460, DX-461, DX-660, DX-660, DX-990, DX-43, DX-N45, DX-R75, DX-R75, DX-R75, DX-R75, DX-R75, DX-R750, X-R77, DX-R70, DX-R30, DX-R480, DX-R480, DX-Z100, DX-Z100, DX-Z100, GCD-55, GT-30CD, GT-33CD, GT-33CD, GT-33CD, GT-33CD, GT-33CD, DT-33CD, GT-33CD, DT-33CD, GT-33CD, GT	CD-111, CD-301, CD-302, CD-304, CD-310, CD-C3, CD-L700, CD-L800, CD-U1, CD-U10, CD-X10,		
X-R77, DX-R780, DX-R840, DX-R840, DX-Z100, DX-Z1000, DX-Z1000, DX-Z1000, CT-30CD, CT-33CD, CT	CD-X12, CD-X15, CD-X16, CD-X17, CD-X20, CD-X9, CKL650, CMS95CD, DX-150, DX-160, DX-450,		
17.350CD, Q1-37CD, Q1-38CD, Q1-CD20, Q1-CD33, RS95, SC-77CD, SC-99CD, SC-RS95, SG-A1, GMVCD, SG-M20CD, SYG-M20-CD-CD-ART No. RCTHR9122AFZZ RH812AAF 290C MR-840B, PART No. RCTHR9130AFZZ RH8130AF 290C MR-840B, PART No. RCTHR9130AFZZ RH8130AF 290C MR-840B, PART No. RCTHR9130AFZZ RH8130AFZ			
G-WICD, SG-WIZCD, SYS302, ZCD7CD, PART No. RCTRH8122AFZZ RH8122A 578 T-500C, DT-500C, DT-500C, DATR No. RCTRH812AFZZ RH8122A 290 XR-8408, PART No. RCTRH8130AFZZ RH8130AF 290 XR-8408, PART No. RCTRH8130AFZZ RH8130AF 290 SS3061, 360H, 370, 456HE, CMS 150CDH, CMSR400CDH, CP150, CPR400, CPS360, 370. ART No. RCTRH8136AFZZ RH8136AF 450 ONY SS240A KSS240A 300 SS240A KSS121A 390 SS210A SS511A (SS121A 390 SS210A (SS510A 190 SS210B (SS510A 190 SS220A (SS510A 190 SS220A (SS510A 190 SS220A (SS520A 250 SS231A (SS520A 250 SS231A (SS531A 340) SS331A (SS531A 340) SS331A (SS530A 260 SS331A (SS530A 260) SS331A (SS530A 260) SS330A (SS530A 260)			
T-59CD_OT-59CD_OT-59CD_PART No. RCTRH8124AFZ RH8124AF 2900 RR5480B_PART No. RCTRH8120AFZ RH8124AF 2900 RR5480B_PART No. RCTRH8120AFZ RH8130AF 2900 RR5480B_PART No. RCTRH8130AFZ RH8130AF 2900 RR5480B_PART No. RCTRH8135AFZ RH8136AF 4500 RR5480B_PART No. RCTRH8135AFZ RR5480B_PART NO. RC			
XR-8408_PART No. RCTTRH8130AFZZ RH8130AF 2900 DS306D_\$30H, 370, 450ME, CMS150CDH, CMSR400CDH, CP150, CPR400, CPS360, 370. ART No. RCTRH8136AFZZ ONY SS240A KS240A KS240A SS210A SS210A SS210A SS210B KS511A SS210B SS210B KS510B KS510B KS510B KS510B SS210B KS510B KS510B KS510B SS210B KS510B KS510B KS510B SS20B KS520A KS520A KS520A KS531A Z604 CMS10CB KS531A Z604 CMS10CB KS530A KS530A KS530A KS530B KS50B			
DS390E, 360H, 370, 450HE, CMS150CDH, CMSR400CDH, CP150, CPR400, CPS360, 370. ART No. RCTRH9136AFZZ ART No. RCTRH9136AFZZ SS240A SS240A SS210A SS151A SS210A SS210A SS210B SS210B SS210B SS220A SS220A SS220A SS220A SS231A SS331A SS350A KSS310B KSS310B KSS310B KSS310B KSS310B KSS310B SS330A KSS30A KSS30B KSS3BB KSSBB KSBB K			
ART No. RCTRH9136AFZZ RH8136AF 4500 ONY \$5240A KS\$240A 3000 \$5121A \$505 \$5121A \$505 \$5210B \$5210A \$5210A 1900 \$5210A \$5210A \$5210A 1900 \$5220B \$5220A \$5220A 1800 \$5220B \$5220A \$5220A 1800 \$5220A \$5220A \$5220A 2500 \$5231A \$605 \$5231A \$605 \$5236A \$605 \$5236A \$605 \$606 CFMICS CFUNICS C		HIDIOVAL	23006
ONY KSS240A 300° SS240A KSS240A 300° SS121A KSS121A 350° SS151A KS5151A 190° SS210B KSS210B 190° SS220A KSS210B 200° SS220A KSS220A 250° SS331A KSS331A KSS331A ECHNICS FUP20, SLP250, SLP250, SLP333, SLP555, SLP777, SLP999,SLPA10, SLPC20, SLP215, SLP225, SLP325, SLP333, SLP555, SLP777, SLP999,SLPA10, SLPC20, SLP215,		RH8136AF	4500p
SS240A SS240A 300			
\$5121A \$50 \$5151A \$50 \$5151A \$50 \$55151A \$50 \$55151A \$10 \$55151A \$10 \$55151A \$10 \$55151A \$10 \$55151A \$10 \$55210A \$10 \$55210A \$10 \$55210B \$10 \$10 \$55210B \$10 \$10 \$10 \$10 \$10 \$10 \$10 \$10 \$10 \$10	KSS240A	KSS240A	3000p
\$S151A KS515A 1900 \$S210A KS5210A 1900 \$S210B KS5210B KS5210B KS5210B 2000 \$S220A KS5210B KS5220A 2500 \$S331A KS5331A KS5330A KS5330A KS5330A KS5330A KS530A 2600 ECHNICS P200, S1P230, S1P250, S1P333, S1P555, S1P777, S1P999,S1PA10, S1PC20, S1P325, S1P335, S1P356, S1P737, S1P999,S1PA10, S1PC20, S1P325, S1P336, S1P3	KSS121A		3500p
\$\$210B	KSS151A		1900;
\$\$220A K\$\$20A 250 \$\$331A K\$\$31A 340 \$\$350A K\$\$350A K\$\$350A Z604 ECHNICS \$PLP300, \$LP250, \$LP250, \$LP333, \$LP555, \$LP777, \$LP999,\$LPA10, \$LPC20, \$LP215,	KSS210A		1800
\$S331A K\$S331A 3406 \$S386A K\$S386A 2606 ECHNICS LP200, \$LP230, \$LP250, \$LP333, \$LP555, \$LP777, \$LP999,\$LPA10, \$LPC20, \$LP225,	KSS210B		2000p
SS380A KSS360A KSS360A 2604 ECHNICS IP200, SIP230, SIP250, SIP333, SIP555, SIP777, SIP999,SIPA10, SIPC20, SIP325,	KSS220A		2500g
ECHNICS LP200, SLP230, SLP250, SLP333, SLP555, SLP777, SLP999,SLPA10, SLPC20, SLPJ25,			3400p
LP200, SLP230, SLP250, SLP333, SLP555, SLP777, SLP999, SLPA10, SLPC20, SLPJ25,		KSS360A	2600p
	TECHNICS		
LFJ45, 5LF5/UU, 5LF59UU SOAD70A 2350		0045744	
	517345, 5175700, 5175900	SUAD70A	2350p

INIC	IFZZ			RH8136A	4500p	KSS331A KSS360A				KSS331A KSS360A	2600j
SLP202A, SLP212A, SLP222A, A, SLPG200A, SLPG400A, SLPG SLPJ28A, SLPJ325A, SLPJ325	500AK, SLP	3500AS, SLI	PJ24A, SLPJ26A, BLPJ46A	691-30209	5500р	TECHNICS SLP200, SLP230, SLP250, SLP333, SLP5 SLPJ45, SLPS700, SLPS900		SL P99 9,SLF	PA10, SLPC20, SLPJ25,	SOAD70A	2350
			RE	MOT	E	CONTROLS					
ion	Code	Price	Description	Code	Price	Description	Code	Price	Description	Code	Price
<u> </u>	RC876 RC891 RC896	650p 650p 650p	A512120/230 A514790 A5088470 A518612 SCL002	RC900 RC901 RC902 RC903	650p 650p 650p 650p	PANASONIC EUR51200 TC2200 VSQ0357/NV730 TNQ1621	RC200 RC204 RC202 RC203	650p 650p 650p 650p	SONY RM604, RM605, RM606 32 CHANNEL RM613	RC140 RC140 RC141	650 650 650
	RC894	650p	C2096 A511940	RC904 RC905 RC906	650p 650p 650p	PHILIPS RC5002,5154	RC134	650p	RM632, RM636 TATUNG	RC160	600
	RC879	650p	655602H	RC1920		KT3 NON TEXT 69117032	RC135 RC178	650p 650p	FXA RC70 FX70 FASTTEXT	RC877 RC883 RC894	650 650 650
DA SAL TEXT T, 70155G, 70115G, 70133G	RC309 RC880 RC882 RC884	650p 650p 650p 650p	IFB13, 14, 15 FS4 RG305 RG306 FS9/1-10/1	RC143 RC148 RC305 RC306 RC307	650p 650p 650p 650p 650p	69117194 RC5991-UNIV RC38 KT3 TEXT RC5352	RC180 RC300 RC301 RC5301 RC5352	650p 550p 650p 650p 650p	TELEFUNKEN FB632 FB639 THORN/FERGUSON	RC632S RC639	T 650
G P300	RC107 RC380	650p 650p	VS5 RUK VS4-1 MULTICONTROL (17C20)	RC308 RC308 RC311	650p 650p 650p	RC5375 RC5 STANDARD RC5903	RC5375 RC300 RC5903	550p	3V35-42 3V31-32 3V57-58	RC342 RC344 RC628	600 ₁ 650 ₁ 650 ₁
10 P610	RC401 RC600 RC610	600p 650p 650p	LOEWE DC11 MATSUI	RC146	650p	SALORA SERIES L 86173 SANYO	RC190 RC882	650p 650p	TX10 TEXT TX10 STEREO TEXT TC9-90-100	RC732 RC738 RC740	575p 575p 600p
 P650 	RC612 RC650 RC660	650p 650p 650p	010270601 VX770	RC889 RC892	650p 650p	RC218, RC222, RC228, RC238 JXGE JXDE	RC140 RC878 RC884	650p 650p 650p	3V55, FV11 TX100 FASTTEXT TX100 ST, FASTTEXT	RC783 RC789 RC789	650p 650p 650p
1 5000	RC661	650p	NOKIA SATELLITE	RC550	650p	VHR2300 RC628	RC890 RC865	650p 650p	PROFESSIONAL TOSHIBA	RC790	650
CLE830 [655602	RC140 RC1920	650p 650p	ORION RC53	RC892	650p	SHARP G0121CESA, 123CESA, 204, 251	RC140	650p	CT937 CT9117	RC950 RC951	650 ₁ 650 ₁

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Part No.	Code	Price	HITACHI			4515 01 19	LOT169		TLF 14520 F	LOT40		094-01020/0.7	LOT59		1-439-303-31		1300p
AKAI			2424593	LOT4			LOT 137		TLF 14521 F		1850p	094-01021/0.6		1400p	1-439-303-32		1300p
45150344		1650p	2432101	LOT7			LOT136		TLF 14567 F		1850p	094-01027/0.0	LOT186		1-439-311-00		1550p
101-214017-03	LOT278		2432461		69 1500 1		LOT169		TLF 14568 F		1500p	094-01038/0.7	LOT245 LOT186		1-439-311-11		1550p 1550p
101-220005-03A		1600p	2432611	LOTE			LOT180		TLF 14584 F	LOT41 LOT42		094-01052/0.8 094-01057/1.1	LOT285		1-439-311-13 1-439-311-31		1550p
D 050/37	LOT27	1450p	2432651	LOTE	0 1800 69 1500		LOT169 LOT180		TLF 14586 F TLF 15606 F	LOT256		610.018.6620	LOT189		1-439-311-32		1550p
D 053/37		1550p	2432761 2432981	LOTS			LOT168		TLF 70012		1500p	610.018.6637	LOT215		1-439-331-22		1550p
D 056/37		1650p 1400p	2432981	LOTS			LOT22		TLF 70012 F		1500p	SHARP			1-439-331-41		1550p
D 059/37		1400p 1650p	2432982	LOTS			LOT178		TLF 70012A	LOT78		RTRNF 1220 CEZZ	LOT39	1850p	1-439-332-00		1600p
D 069/37 FCM 2015 AL		1500p	2433011		71 1650		LOT168		TLF 70018	LOT274		RTRNF 1783 BMZZ	LOT202	1800p	1-439-332-11		1600p
FERGUSON	LO176	тооор	2433012		71 1650			1250p	TLF 70018 F	LOT274		RTRNF 1783 CEZZ			1-439-332-21		1600p
00 D-3-508-001	LOT38	1250p	2433014		71 1650		LOT174	1400p	TLF 70161	LOT278		RTRNF 1786 BMZZ			1-439-332-41	LOT100	1500p
00 D-3-508-002		1250p	2433212		68 1500 7		LOT22		TLF 70162	LOT72		RTRNF 1786 CEZZ			1-439-332-42	LOT101	1450p
00 D-3-508-003	LOT276		2433291		72 1350 7		LOT192		TLF 70162A	LOT72		RTRNF 2000 BMZZ			1-439-332-52	LOT100	
00 D-3-515-001 PL1			2433301		46 1600 7			1250p	TLF 70162B	LOT72		RTRNF 2002 BMZZ			1-439-333-00	LOT270	
00 D-4-208-001		1600p	2433441		88 1900 1		LOT190		TLF 70162G	LOT72		RTRNF 2002 CEZZ			1-439-333-11	LOT270	
00 D-4-208-002	LOT79	1600p	2433442		91 1600 1		LOT196		TLF 77001 B	LOT274	1550p	RTRNF 2003 BMZZ			1-439-333-12	LOT270	
00 D-4-235-002	LOT240	1250p	2433451	LOTE			LOT194		PHILIPS	LOT142	1000-	RTRNF 2004 BMZZ RTRNF 2005 BMZZ			1-439-363-11	LOT268	
00 D-4-235-002 HTI	LOT81	1350p	2433452	LOTE			LOT22 LOT198		4822 140 10142 4822 140 101145	LOT 142		RTRNF 2006 BMZZ			1-439-363-21	LOT268	
00 D-4-235-00201G	LOT81	1350p	2433453	LOTE			LOT27		4822 140 101145	LOT 112		RTRNF 2007 BMZZ			1-439-387-11	LOT311	
00 D-4-260-004 HTI		1250p	2433455 2433521	LOT2 LOTE			LOT193		4822 140 10140	LOT 102		RTRNF 2023 BMZZ			1-439-387-21	LOT311	
00 H-0-701-2400		1450p	2433521	LOTZ			LOT 179		4822 140 10161	LOT103		SONY	201010	Посор	1-439-416-11	LOT255	
06 D-3-083-001		1250p	2433721	LOTE			LOT207		4822 140 10171	LOT104		3753100	LOT275	1500p	1-439-416-12	LOT255	160Up
06 D-3-083-002	LOT82	1250p	2433751	LOTO				1650p	4822 140 10176	LOT114		1-439-243-00	LOT91		1-439-416-21	LOT255	
06 D-3-084-001	LOT23	1400p	2433752	LOTO			LOT 193		4822 140 10194	LOT105		1-439-243-11		1600p	1-439-416-23 1-439-416-41	LOT255 LOT255	
06 D-3-087-001	LOT23	1400p	2433752	LOT			LOT27		4822 140 10198	LOT116		1-439-243-12	LOT91		1-439-416-51	LOT255	
06 O-3-088-001		1450p	2433891	LOT2			LOT200	1400p	4822 140 10201	LOT104		1-439-243-31	LOT229		1-439-430-21	LOT271	
06 D-3-093-001	LOT204 LOT87	1600p 1000p	2433892	LOTE				1650p	4822 140 10236	LOT118		1-439-243-32	LOT229		154125A	LOT275	
06 D-3-095-001 06 D-3-095-002	LOT87	1000p	2433893	LOT2			LOT196		4822 140 10246	LOT111		1-439-243-41	LOT229		TOSHIBA	2012.0	
06 D-333-512-001		1600p	2433952	LOT				1650p	4822 140 10247	LOT105		1-439-244-00		1600p	37010	LOT131	1450p
FETX 100 90 DEG	LOT04	1500p	2434002	LOT2			LOT201		4822 140 10254	LOT107		1-439-244-11		1600p 1600p	37011	LOT131	1450p
FETX 90 WHITE	LOT06	1650p	2434141	LOTS			LOT27	1450p 1450p	4822 140 10263 4822 140 10269	LOT117 LOT210		1-439-244-21 1-439-244-31		1600p	37012	LOT131	1450p
FETX 100 100 DEG		1500p	2434141	, FOL			LOT27 LOT56	1450p 1650p	4822 140 10269	LOT208	1650n	1-439-256-00		1650p	37013	LOT131	
GRUNDIG			2434274 2434274	LOT4			LOT22	1250p	4822 140 10274	LOT123		1-439-256-11		1650p	37014	LOT131	
29201.008.01	LOT153	1750p	2434453	LOTE			20122	поор	4822 140 10282	LOT122		1-439256-21		1650p	37015	LOT131	
29201.014.01	LOT140	1500p	2434455	LOT			LOT51	1550p	4822 140 10283	LOT104		1-439-256-22		1650p	37016	LOT131	
29201.015.01	LOT149		2434593	LOT			LOT49	1500p	4822 140 10294	LOT125		1-439-276-21	LOT230	1700p	37017	LOT131	
29201.017.01	LOT60		2435062	LOT			LOT50	1450p	4822 140 10306	LOT110		1-439-280-00		1600p	37018	LOT131	
29201.018.01	LOT163		2435121	LOTE	7 1000	334 B 078030	LOT50	1450p	4822 140 10325	LOT132		1-439-280-13		1600p	37019	LOT131	1400p
29201.018.02	LOT61		2435131	LOT			LOT74	1600p	4822 140 10326	LOT122		1-439-286-00		1300p	1810951 2433751	LOT55 LOT01	
29201.019.01		1250p	2435141		82 1300			1600p	4822 140 10328	LOT124		1-439-286-11		1300p	2433752	LOT250	
29201.019.02		1250p	2435301	LOTE			LOT51	1550p	4822 140 10349	LOT106		1-439-286-12		1300p	23236023	LOT281	
29201.022.01	LOT63		2435671	LOTE			LOT75	1500p	4822 140 10353	LOT284		1-439-286-13		1300p 1300p	23236052	LOT131	
29201.022.02	LOT166 LOT165		2436201	LOT			LOT70	1500p	4822 140 10356	LOT284 LOT286		1-439-286-21 1-439-288-00		1750p	23236098	LOT288	
29201.022.03 29201.022.04	LOT165		2436202	LOT			LOT49	1500p 1700p	4822 140 10367 4822 140 10369	LOT109		1-439-288-12		1750p	23236198	LOT288	
29201.022.04A	LOT165		2432101-2	LOT				1300p	4822 140 10383	LOT128	1200p	1-439-289-00		1400p	23236255	LOT289	
29201.022.04A 29201.024.01	LOT65		2433451H 2433453H	LOTE LOTE				1550p	4822 140 10381	LOT128		1-439-289-21		1400p	23236424	LOT129	
29201.024.04	LOT164		2433453H 2433891H	LOT				1500p	4822 140 10395	LOT116		1-439-289-22		1400p	23236425	LOT288	
HINARI	201104	Посор	2433892G	LOT			20170		4822 140 10406	LOT73		1-439-289-31		1400p	23236428	LOT289	1500p
154 138 K	LOT24	1500p	I.T.T.	2011		BABY10	LOT67	1450p	4822 140 10421	LOT109		1-439-294-00		1450p	3122113837011	LOT131	1450p
51 13914 1	LOT24	1500p	4515 01 08	LOT	13 1400				4822 140 17078	LOT103		1-439-294-11	LOT93	1450p	150F6D	LOT131	
51 14184 1	LOT24	1500p	4515 01 15		36 1600		LOT02	1500p	SANYO		-	1-439-294-21		1550p	TFB 4039 AD	LOT293	
CF 44 A	LOT24	1500p	4515 01 16		39 1675	PANASONIC			094-00020/0.9	LOT113		1-439-303-00		1300p	TFB 4048 AD	LOT281	
HM51-1411834-1	LOT24	1500p	4515 01 17	LOT	39 1675	TLF 14512 F	LOT39	1850p	094-00035/0.2	LOT162	1350p	1-439-303-11	LOT94	1300p	TFB 4048 BD	LOT281	130 Op

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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: New or good used LOPT (type FEA214) for a 17in. CTX monitor, CPS-1760 Proscan. Colin McCormick. Please call 01752 405 201 evenings or e-mail colinmc@mail.eurobell.co.uk

Wanted: Service manual or circuit diagram (photocopy OK) for the Sharp PA-W1410 word processor. Bill Young, Foxgloves, Church Lane, Redmire, Leyburn, N. Yorkshire DL8 4EQ. 01969 622

Wanted: Mullard DG7-5 CRT for a Mullard valve tester, and a Cossor 807 valve (or Air Ministry A/M II0E/8) for a Cossor 339 oscilloscope. H. Fenn, 111 North Walsham Road, Norwich, Norfolk NR6 7QG. 01603 425 557.

Wanted: Circuit diagram (photocopy OK) for the Ayr Viewdata/ teletext add-on unit Model T1, or any service information. R.E. Holt, 46 Osborne Parc, Helston, Cornwall TR13 8NZ.

Wanted: MB88536 IC for the Sanyo TV Model CTP6135-00. Alfred Moores, 14 Edward Street, Norwich, Cheshire CW9 7DQ. 01606 331 006.

Wanted: Philips/Pye Model 24CE3270/05B Fastext set for spares. Will pay cash and collect. A. Watt, Bryn Gelli, Unch Y Maes, Dolgellau, Gwynedd. 01341

Wanted: Complete upper and lower drum assembly for the Mitsubishi HSM34, or alternatvely a complete scrap machine. James Burch, 9 Groveland Road, Beckenham, Kent BR3 3PU. 0410

For disposal: Many copies of Television going back over the last 25 years. Please send for list. R.W. Moxon-Groves, 22 High Tree Close, Ongar Hill, Addlestone, Surrey KY15 1BT. 01932 854 122. Wanted: Service manuals or circuit diagrams for the JVC KS-

RT404 car radio-cassette unit and the Murphy CD200 stereo compact disc player. Photocopies OK. W. Craig, 15 Windsor Crescent, Rothwell, Leeds LS26 0LN. 0113 282 4743.

Wanted: LOPT for the Goodmans Compact 100 PCTV. Michael Pope, 76 Barkby Thorpe Lane, Thurmaston, Leicester LE4 8GS. 01162 602 270.

Wanted: Instruction manual (photocopy OK) for a Grundig VPS550 VCR. Also a Maplin UHF tuner kit (code no. LP09K) built or not. David Roberts, No. 5 Pendower, Lloyd Street West, Llandudno, N. Wales LL30 2BE. 01492 877 952. Vintage Equipment: I repair vintage wireless sets and associated equipment and also collect old radio receivers. I would be happy to hear from anyone who wishes to dispose of any old sets or has a service/spares requirement. Steve Farley, 128 Hawthorn Road, Kingstanding, Birmingham B44 8QA. 0121 382 1312, fax 0121 382 1558.

Wanted: SDA2011 microcontroller chip or complete front panel for the Grundig CUC2410 chassis, and an MAB8441P front-panel microcontroller chip for the CD player in a Philips FCD565/35 hifi system. Owen O'Reilly, Belfield, Gay-brook, Mullingar, Co. Wesymeath, Ireland. Wanted: Fairly up-to-date set-up chart for the B & K 467 CRT tester (my one, 497-022-0-586, 1986, is out of date). Loan or sale, photocopies OK. Also 510ABCB22P tube for the Mitsubishi Model 2027; circuits or an IC list for the SAFT fast-charge Mk II; and a colour tube data/equivalents book. Michael J. Levy, 19 Totternhoe Close, Kenton, Harrow, Middx HA3 0HS. 0181 907 3620.

Request: Because of a mail deliv-

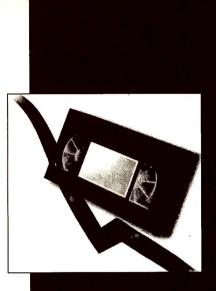
ery problem while I was away, some replies to my request for valve radio/TV spares (January issue, page 186) may have gone astray. Could anyone who didn't receive a reply from me please write again? Steve Taylor, 11 Charnborough Road, Coalville LE67 4SF.

Wanted: Working power supply for the Panasonic NVL28 VCR. M. Shafiq, 4 Leighton Road, Old Trafford, Manchester M16 9NX. 01706 621 015 or 0956 668 524. For disposal: Copies of Radio and Television Servicing from 1953-62 for sale at £5 per volume plus postage or collect. Phone Nick Hunter on 01162 872 397. Wanted: Any information - circuit diagram, service manual, instructions, parts list - for the floor-mounted Pye studio video projector dating from about 1980. Thanks to all who contacted me about TDA chips - I now have plenty. Richard Gifford, 4 Gipsy Lane, Needham Market, Suffolk IP6 8DY, 01449 723 009. Wanted: VPT PCB, working or not, for the Salora SV9900 VCR. I have for disposal service manuals, counting tubes, semiconductors (including older US types), video and TV parts, some 200 ICs in oriinal packs and other electronic goodies, all at a reasonable price. Please fax Greg Strange, I.Eng., G8IWJ on 0151 327 5971. Wanted: Line hold control, circuit reference L404, for the JVC Model 3040UKC 5in. portable mono TV/FM radio receeiver. David Parkinson, 84 Abbotsbury Road, Broadstone, Poole, Dorset BH18 9DD, 01202 255 103. For disposal: CD-ROM edition (PC) of Electrotech's Service and

Repair Encyclopaedia of Domestic Electronic Equipment. Send SAE

for details to Mrs R.A. Thomas, 52

Forge Close, Caerleon, Gwent.



Reports from Philip Blundell, AMIEEIE Richard Flowerday **Eugene Trundle** David Smith Maurice Kerry Roger Burchett and Pete Gurney, LCGI

Goodmans VN6000

If one of these machines comes in dead with no blown fuses, check the E 5.8V line at plug P801 in the power supply - the PCB has the voltages marked on it. If the voltage is low, check C822 (330µF) by replacement. P.B.

Philips VR268

This machine was faulty from new. When a recording was made then played back, the picture would fade to snow – as if the heads were becoming dirty. The picture would return when the tape was rewound.

All became clear when an LP recording was tried. The machine didn't sense that it was an LP recording, playback being in the SP mode. A problem with the control track? Yes, the machine was intermittently failing to record the control track. Link 9604, which is by the threading belt pulley, was broken. A new wire link restored normal operation. P.B.

JVC HRJ610EK

For a dead power supply with no blown fuses, check C12 (2·2μF) by replacement. P.B.

Grundig GV540

This machine worked all right mechanically, but with playback and E-E operation there was no sound or video (just a blank screen) from the modulator. Scope checks showed that the TDA8540 video switching chip IC7770 was

VCR Clinic

not switching the signal to the modulator.

A look through the on-screen menus and the special features revealed no reason for this, so a new TDA8540 was fitted. It made no difference. Fortunately by this time we had a new GV540 in stock, so comparisons could be made. By using both traces of a double-beam scope, I found that the I2C bus signals to IC7770 differed between the two machines. But why? I was about to swap the main boards over when I spotted an IC with a socket. Replacing it restored the signals. The chip was IC7250, the operating system EPROM. P.B.

JVC HRD580EK

The only thing this machine would do was to display a flashing clock and a hyphen where the channel indicator should be. Checks showed that the standby voltages were all present, correct and clean. Scope checks on the clock oscillators proved that they were all working normally. With this in mind I decided to replace the memory chip IC602, which cured the problem.

Note that the machine will play without IC602 being present - a useful test if you suspect it. R.F.

Daewoo V21 (V215, V415)

'Extreme tiredness' would best sum up the trouble with this machine. The cassette was stuck inside because there was not enough 'urge' to eject it. Tape threading was very slow. Unthreading was equally slow, after which the deck would go back to sleep. This was all because the voltage on the ever-14V line had fallen to 7V. The 14V supply reservoir capacitor C818 in the

power supply section was cuit. E.T.

Panasonic NVL28

We've had two cases rece the fluorescent display par ming or extinguishing inte ly. The cause was traced t joints, in one case at pin 7 chopper transformer T110 the other at the componen jointing of the links conne pins 12 and 13 of P1001 c main PCB. E.T.

JVC HRJ200

At random times in the Erecord modes the picture a would be lost, with a coars on sound and patterning of vision. Playback was OK times. Prolonged scope ch because of the intermittent of the fault – proved that t module TNR2 was going 1 A new module cured the p E.T.

Philips VR813

The intermittent fault with e of these machines took the f of cassette ejection, deck sh wn, clock readout pulsing and ny other symptoms. The inte between the symptoms a ring would sometimes be sev Someone had apparently ady replaced the microcontroller chip. We traced the cause to dry-joints between P1 and the power supply PCB. The mode switch on the Panasonic G deck used in this machine was also changed. E.T.

Hitachi VTF860E

There had been a mains power failure: when the power was restored this machine remained dead. Replacing C6 (1µF, 250V, 105°C) restored normal operation. To ensure reliability we also replaced

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the $180k\Omega$ start-up resistors R3 and R4. **D.S.**

Mitsubishi HSB27

When this machine was powered it worked perfectly except for the fact that in the play mode loops of tape were left. There was no take-up. Once I'd got the tape out I noticed that the felt pad had fallen off the half-loading arm. Don't be tempted to refix it without removing the arm, as the rubber washer beneath it may be decomposed, leaving a sticky mess — I've had this with the last two of these machines that came in.

Once the gunge had been removed, a little grease applied, a new washer fitted and everything reassembled the machine produced immaculate pictures. **D.S.**

Aiwa FX2500/FX3500

These two machines both had clock update problems. The time could be set correctly in the evening. The next day it would be one hour fast or slow.

While observing one machine in the workshop I noticed that at 12:00 noon there was no change but at 12:01 the PDC flashed off and on and the time changed to 13:01. By 12:02 it was at 13:03.

The microcontroller chip uses teletext data to set the clock at certain times during the day and night. The PDC and time signals are decoded by the SDA5649 chip IC106. Replacing this item in both machines cured the timer problems. M.K.

Soundwave VCR961

This machine is identical to the Alba VCR7310 and the Orion D1096. Very low playback audio was the symptom. As a buzz could be induced in the speaker by touching the back of the ACE head, a new head was fitted. This failed to cure the fault. Neither did replacing the LA7286 chip IC5001. After much checking the culprit turned out to be C5028 (1µF, 50V), which was very low in value and leaky. It's connected to pin 8 of IC5001. A replacement restored the sound level. M.K.

Aiwa HVF3500

There was a tape stuck in this machine, but it would still lace up. To sort out the cause of the problem I had to dismantle the machine to get at the underside of the main PCB – you have to do this with machines from more and more manufacturers nowadays. A careful

examination of the power supply area then revealed a bad dry-joint at the emitter of Q601. Once this and other suspect joints had been resoldered and the machine had been reassembled it worked perfectly.

We've had intermittent mechanical and electrical faults, such as no drum rotation, because of poor contact with the flexible PCB links that connect the drum and capstan motors to the base PCB. Modified parts are available from Aiwa: DM lead CB part no. 58 065 130 120 and CM lead CB part no. 58 065 130 111.

I also clean the base PCB spring contact pads with a pencil eraser and the spring contact on the main board, finishing off with alcohol. This mechanism (TN6500) is used by other manufacturers. M.K.

Toshiba V209

The symptoms were as follows: the carriage would shuffle in and out; the cassette symbol was permanently lit; and no functions would operate though the correct symbols would light up in the display. The cause of all this was the front loading switch S122, which was permanently closed. It should open when eject is completed. The lever that operates it moved correctly, but the clear plastic cover-cumoperating block was missing. A new switch restored correct operation. **R.B.**

Ferguson 3V48

A quickie on this machine: the cause of intermittent drum rotation was found to be a dry-joint at the 2SB1052 transistor Q1. R.B.

Sony SLV625

Rewind and fast forward were particularly noisy, and there was a slight but noticeable rhythmic knock during playback. When I watched the toothed drive belt in the play mode it was obvious that the tension was varying. The machine was considerably quieter in all modes when the belt has been removed and cleaned, also the drive gear on the capstan shaft.

There's a temptation to strip out the reel drive gears and look for problems here when the fault is more fundamental and easier to cure. **R.B.**

Goodmans VP2300

This machine uses the Philips Turbo deck. It was unable to load a cassette – and for good measure a coin was rattling around inside it. There was only 1.2V at the loading/mode motor, also at its drive chip IC7402. R3483, a 2.2Ω safety resistor which is connected to the 15V rail and is next to the chip, was open-circuit. A replacement cured the fault. **P.G.**

Amstrad TVR3

There was no take-up. The usual belts, also the soft brake on the take-up reel, had fallen off. In addition, this time the take-up brake rubber had decomposed and coated the reel turntable with a ring of sticky gum which had eventually seized up the whole assembly. A new take-up reel table and brake assembly restored normal operation.

Another of these machines came to us from a local dealer. It would shut down after six seconds of play. The machine had been stripped and cleaned, after which the present fault had appeared. My first thought was the take-up rotation sensor, as the counter was erratic to say the least - when it worked at all. But I was told that it had already been replaced. After a lot of head scratching I discovered that the spacer washer had been left off the take-up spool. As a result the sensor was almost saturated. A replacement washer cured the fault - it had obviously fallen off when the machine had been stripped. P.G.

Goodmans GVR4500

I've had a number of these machines, which use a Daewoo deck, with no tape take-up because of a bent idler unit. This time the idler unit was straight, the cause of the problem being the cassette tray which was bent down slightly. As a result the idler couldn't move. Straightening the tray cured the fault. **P.G.**

Goodmans PD1700

Patterning on the playback picture, more noticeable with a dark background, is a problem I've had with several of these machines. It seems to affect only some of them however. If the screws are left out of the rear of the upper case, or the upper case is removed, there's no earth connection to the bottom cover plate. This picks up radiation from the power supply and transfers it to the lower drum and head amplifier. To prove the point, remove the plate. My cure is to add a soldered lead between the power supply can and the plate instead of relying on multiple screws to make good contact. P.G.

Thomson TX805 Technology

In this concluding instalment J. LeJeune describes the combined chopper/line output stage, which is known as the Wessel circuit, also the drive and protection arrangements

ast month we covered most of the circuitry used in the Thomson TX805 small-screen TV chassis. We left for separate consideration this month the combined chopper/line output stage, which uses an arrangement called the Wessel circuit.

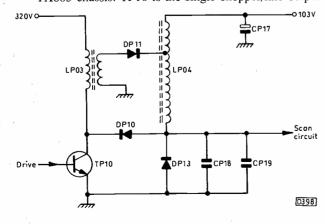
It's not the first time that this circuit has appeared in TV sets in the UK. The TX80E chassis, predecessor to the TX805, used it. Older readers will recall the Ferguson 9000 series chassis, which was introduced in 1975. It used the same basic circuit, which Ferguson refered to at the time as the Syclops (synchronous chopper and line output stage) circuit. Shortly after that, in 1978, Rank Radio International imported a small-screen Saba chassis that featured the circuit. This chassis was used in the Bush BC6004 and one or two other RRI models.

The basic idea is to use a single switching transistor, in the TX805 an S2000AF, as both the chopper and line output transistor, with separate chopper and line output transformers in its collector circuit. An isolating diode separates the driven end of the two transformers' primary windings. There are advantages to operating the chopper circuit at the line frequency, including the fact that a single drive system is required.

The chopper transformer is used solely to generate the HT supply for the line output side of the circuit. With the exception of the supplies required for standby operation, all the other supplies are derived from the line output transformer.

Basic Circuit

Fig. 1 shows the basic elements of the Wessel circuit with component reference numbers that relate to the TX805 chassis. TP10 is the single chopper/line output



transistor and LP03 the chopper transformer. This transformer's primary winding is fed with some 320V which is produced by the mains bridge rectifier circuit.

TP10 is switched on about half way through the line scan. Current then flows through the chopper transformer's primary winding and also, via the isolating diode DP10, the line output transformer's primary winding (LP04). When TP10 is switched off, rectifier diode DP11 switches on, charging CP17 to produce an HT supply of some 103V to power the line output circuit.

When TP10 is switched off DP10 also switches off. The line output side of the circuit then operates in the conventional manner to produce the flyback followed by the first half of the line scan. To recap on this, tuning capacitors CP18/CP19 produce, with LP04, a positive half-cycle of oscillation during which the scanning beam is returned to the left-hand side of the screen. When the oscillation tries to swing negatively, the efficiency diode DP13 conducts and the first half or so of the forward scan is produced. TP10 is then switched on to complete the forward scan and drive the chopper transformer.

The squarewave drive at the base of TP10 is timed to meet the requirements of the chopper action and the line output stage operation.

Drive Circuitry

Fig. 2 shows the mains rectifier, standby switching and Wessel drive circuitry. Bridge rectifier DP26-29 produces some 320V across its reservoir capacitor CP31. This is the feed to the primary winding (pin 12) of the chopper transformer. In addition, RP44/42/41/DP02 bias the base of the 12V regulator transistor TP15, which supplies the standby switching transistors TP11/12 and also, via LED DK01, the microcontroller circuitry (see Fig. 8 last month). When TP12 is switched on by the microcontroller circuit – its emitter is controlled by pin pin 20 of IR01 while its base is connected to the 'start' line – TP11 in turn switches on and the Wessell drive circuit comes into operation.

For regulation, we need a variable mark-space ratio pulse waveform to drive the base of the chopper/line output transistor TP10. The origin of this is the charging circuit RP12/CP03 – both are close-tolerance components. CP03 is charged via RP12 from the voltage at the junction of RP12/RP03. This voltage is controlled by the conduction of the error sensing transistor TP03,

Fig. 1: Basic elements of the Wessel circuit as used in the TX805 chassis.

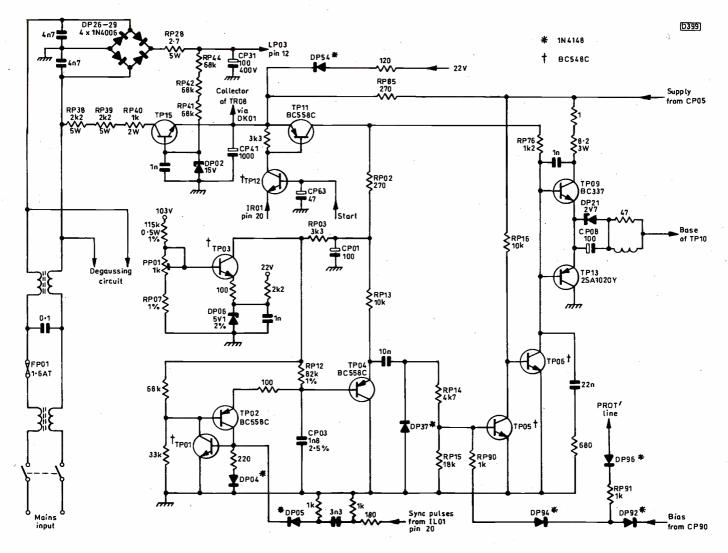


Fig. 2: The mains bridge rectifier, standby switching and Wessel drive circuitry. TP15 is type BUT11AX or ON4843, part no. 16004610. RP07 is $6.8k\Omega$ in 14in. sets, $6.19k\Omega$ in 20in. sets.

whose emitter voltage is stabilised by the 2% tolerance zener diode DP06 while its base is fed via a potential divider network that's connected across the line output stage's 103V supply (see Fig. 1). Should the latter vary, the voltage at the junction of RP03/RP12 will vary, altering CP03's charging time. PP01 enables the HT and the voltages derived from the line output transformer to be set up.

CP03 is discharged at line frequency intervals by TP02/TP01. When the amplitude of the voltage developed across CP03 as it charges, and thus the voltage at the emitter of TP02, exceeds the voltage at the base of this transistor it will switch on. TP01 in turn switches on, and CP03 is discharged. These transistors then switch off, since TP02 is once more reverse biased. The free-running frequency is slightly lower than the line frequency. So positive-going line sync pulses from pin 20 of IL01 (see last month) are fed to the base of TP01 to switch the discharge transistors on.

The net result of all this is a sawtooth waveform, whose rise time is controlled by TP03, at the base of TP04. The output from this buffer transistor is AC coupled (to provide a DC block) to the base of TP05, with DC restoration by DP37. RP14/15 attenuate the sawtooth waveform. TP05 acts as a pulse-width modulator – Fig. 3 illustrates its action. It switches on when the sawtooth voltage waveform at its base rises to 0.7V. TP06, which had previously been forward biased via

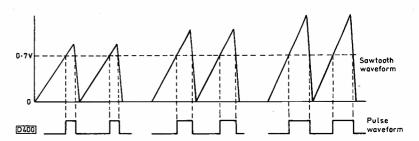


Fig. 3: How the pulse-width modulator transistor TP05 generates a variable mark-space ratio pulse waveform at its collector. The ratio depends on the amplitude of the sawtooth waveform applied to its base.

RP16, then switches off. TP09 in the line driver circuit is now forward biased via RP76, while TP13 is reverse biased. TP10 is then switched on.

When TP05 switches off, TP06 switches on, TP09 switches off, TP13 switches on and TP10 switches off. TP10's base drive network is interesting. When TP09 is on and TP13 off (TP10 is then forward biased and thus on), CP08 is charged to a maximum of 2.7V (set by zener diode DP21). When TP09 is switched off and TP13 switches on, CP08's positive plate is effectively earthed. The base of TP10 is thus driven negatively as CP08 discharges. This ensures a rapid turn off for TP10.

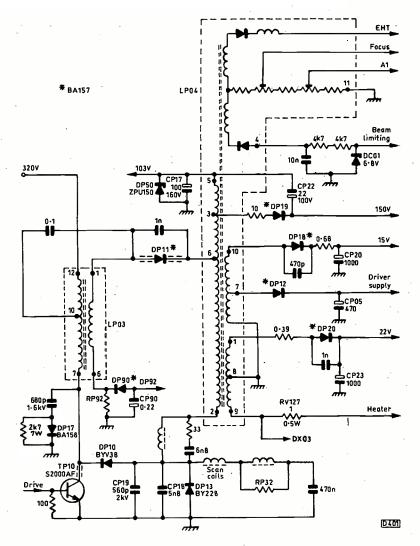
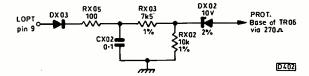


Fig. 4: The chopper/line output stage circuitry. RP32 is a jumper lead in 14in. sets, $1 \text{k} \Omega$ in 20in. sets. RP92 is 0.68 Ω in 14in. sets, 0.56 Ω in 20in. sets.

Fig. 5: The excess voltage protection circuit. RX03 is 9.09kΩ in 20in. sets.



Wessel Circuit

Fig. 4 shows TP10 and the circuitry it drives. We have already described the circuit action (in connection with Fig. 1). Note however that while the efficiency diode DP13 is conductive during the initial part of the forward scan DP10 is held non-conductive. Thus TP10 can be turned on early in the cycle for the sole purpose of energising the chopper transformer LP03. Once DP13 switches off, TP10 can also drive the line output transformer LP04, via DP10.

Circuit Protection

There are several protection arrangements in the TX805 chassis. Some of the actions were described last month, in connection with Fig. 8.

The earthy end of LP03's secondary winding is connected to chassis via the low-value resistor RP92. DP90 produces a negative voltage across CP90. This is applied to the base of the pulse-width modulator TP05, via DP92/DP94/RP90, as bias. The aim of this feedback

is to provide current limiting so that LP03 doesn't saturate, with loss of regulation. There is also a link to the PROT' line, via RP91 and DP96.

The line output transformer's heater winding is also connected to DX03, see Fig. 5, which develops a positive voltage across CX02. This is monitored by the 2%, 10V zener diode DX02. Should the outputs from the line output transformer rise because of failure of circuit regulation, DX02 will conduct applying a positive voltage to the base of TR06 (Fig. 8 again, last month). The start line then goes low, switching TP12 (Fig. 2) off, and the receiver reverts to standby.

Fault Finding

The chassis suffers from a common fault that results in a virtually dead set. One or more of the resistors (RP44/42/41) that bias the base of transistor TP15 goes open-circuit. The usual culprit is RP41. There is never any other reason for the failure of these resistors. You won't find any signs of overheating or any other indication of trouble. It could be that the resistors are damaged by leadout wire preforming prior to insertion in the PCB. A replacement resistor should be all that's required to restore normal operation.

Reliability is otherwise good. There are one or two other points worth noting however, as follows.

The front LED, DK01, can develop a high-resistance state. There is then a reduced voltage feed to the 5V regulator TR08. If this can't switch on, there is no supply to the microcontroller circuitry so the set will again produce the no results symptom. As a quick check, short across DK01. This can be a tricky fault to diagnose if you are not familiar with the chassis.

For intermittent colour dropout, replace the 4-43MHz crystal QC01.

Finally there are several BA157 rectifier diodes in the power supply circuits. This device tends to be unreliable and is a prime suspect in the event of a fault condition.

My thanks to Mark Paul for these fault notes.

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Servicing

The Toshiba 2505/2805DBT

John Coombes provides a fault-finding guide for these complex receivers, which helped start the 'home cinema' market

The Toshiba Model 2805DBT came on the market some eight years ago. It was one of the first 'home cinema' receivers. There are numerous features including a large, 28in. CRT with a special lavender coating, Fastext and Nicam. The thick plastic cabinet has a slim double baffle to give powerful (20W per channel), good quality stereo sound. Frequency-synthesis tuning provides selection of a hundred stations. With the aid of two external speakers you can have Dolby Surround Sound. A 25in. version, Model 2505DBT, was also marketed.

Power Supply Faults

The chopper power supply is quite complex, with two control chips, master and slave. The master chip is on the secondary side of the circuit, the slave on the primary side. Fig. 1 shows the basic arrangement in greatly simplified form. On the secondary side of the full circuit there are two 5V regulators and a 12V regulator. The L78MR05 regulator Q806 provides the supply for the microcontroller circuit.

Fortunately these sets have proved to be very reliable. There is one misleading condition that can occur in the power supply, giving the no results symptom, when several faulty components have been replaced. Under certain fault conditions C828, which is connected to pin 3 of Q803, will charge to some 3.8V: the receiver will not come to life until this voltage has been discharged – assuming that the fault has been cleared.

If the set is dead, check the voltage across the mains bridge rectifier's reservoir capacitor C818. No voltage here could mean that the surge limiter resistor R805 or the mains fuse F801 is open-circuit. In this case the chopper transistor Q804 (2SC4288A) could be short-circuit. If so, the two chopper control chips Q803 (TEA2164) and Q807 (TEA5170) should also be replaced. These chips can be ruined when Q804 is dryjointed. Set failure because of a fault in this area can also occur when D817 (RU4A) in the snubber network is short-circuit.

If the voltage across C818 is OK at some 320V, check the start-up resistor R810 ($82k\Omega$, 3W). It may be open-circuit or could have gone high in value, though the latter is a rare occurrence. If there has been an excessive overload you might find that resistors R822 and R824

(both 0.39Ω , 1W) are open-circuit.

Sometimes the receiver will go into the trip mode when switched on. In this case check R816 $(12k\Omega)$ whose value may have changed. If the power supply is tripping in the standby mode, check the switching transistor Q817 (2SC2120Y). If this is OK, check the voltage across the 13.7V supply reservoir capacitor C824. The items to check if this voltage is low or missing are D810 (BYD33J) which could be short-circuit, R814 (0.33Ω) which could be open-circuit and C424 itself which could be short-circuit or leaky. If all these items are OK, the slave chip Q803 is suspect.

The master control chip Q807 (TEA5170) can be powered by a 9V battery to check its operation. If it is OK when so powered its output weaveform at pin 3 will be in the maximum on-time state. Check whether the supply is in the burst mode. If so, check the standby control circuit (Q809, Q810, Q811, Q814 and associated components).

If there is no drive output at pin 14 of the slave control chip Q803 (TEA2164) but the LT supply is present at pin 16 (13.7V across C824), check whether C828 is charged which may indicate that there's an excess current fault

On the secondary side of the circuit, the first item to check is the HT rectifier D818 (RU4AM) which may be short- or open-circuit. If necessary check for shorts across the LT lines provided by diodes D819, D826, D828 and D829 (all type RU4Z). The chopper transformer T803 could have shorted turns, in which case the audio output chips Q608 and Q609 (type TDA2030A) could have blown up – D828 will probably have suffered.

An item to check on the primary side of the circuit is D809 (BYD33J) which sometimes goes open-circuit.

If the HT voltage developed across C833 is low at about 65V, check for a fault in the line output stage.

If necessary, check the operation of the L78MR05 5V regulator Q806. There should be 20V at pin 1. If this voltage is missing, check D826 (RU4Z) and R861 (0·22 Ω , 1W). If the 20V supply is very low, check whether the 12·5V regulator transistor Q813 (2SD717Y) is short-circuit – also whether zener diode D827 (04AZ13X) is short-circuit.

If everything seems to be OK so far, suspect the chop-

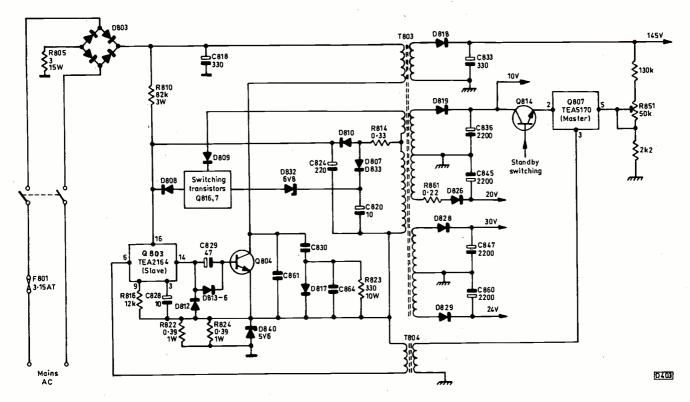


Fig. 1: The basic chopper power supply arrangement, simplified, used in the Toshiba Models 2505/2805DBT, showing the master-slave control chip system. The 10V supply feeds a 5V regulator; the 20V supply feeds 5V and 12.5V regulators – the former provides the microcontroller chip's supply.

per transformer T803 (part number TPW3186).

Sometimes there's a memory problem rather than a power supply fault. If the set goes back to standby after switch on though pin 37 of the CX80424-107S microcontroller chip QA01 drops to a low state then quickly rises back to 5V, the µPD6254CX memory chip QA07 is faulty. Its replacement will restore normal operation.

Line Timebase Faults

If there is no sound or picture and the voltage across C833 (HT reservoir capacitor) is low, check the line output stage. The ON4408 output transistor Q404 or either/both of the EW modulator diodes D440 (BY228) and D441 (BYW95C) could be short-circuit. If not, suspect shorted turns in the line output transformer T461. If Q404 goes short-circuit as soon as the set is switched on, D440 is probably faulty – check it by replacement.

If the HT is OK but is not present at the collector of Q404, check the feed resistor R444 (0.82Ω , 2W). This resistor may have to be replaced if the line output transistor and/or transformer have gone short-circuit. If R444 is OK, check the voltage at the collector of the 2SC1569/FA5 line driver transistor Q402. No voltage here means check the driver transformer T401 for dryjoints, Q402 for being dry-jointed or open-circuit, and the $3.6k\Omega$, 7W feed resistor R416 which could be open-circuit or, sometimes, dry-jointed.

If the line driver stage is OK, check that there is 9.2V at pin 40 of the TA8783N colour decoder/deflection chip IC501. If the voltage here is correct or low, IC501 is suspect: if it is missing, check whether the 04AZ9.1Z zener diode D401 is short-circuit or R867 (100Ω) in the power supply is open-circuit.

If there is excessive width, L423 could have shorted

turns - check it by replacement.

For sound but no picture, see if the CRT's heaters are alight. If not, check whether R920 (5·1 Ω , 1W) is open-circuit or pin 9 of the line output transformer is dryjointed. It's just possible, though this is rare, that the CRT heaters are open-circuit.

Loss of Sync

If there is no line or field sync, replace IC501 (TA8783N).

Field Faults

For field collapse, first check that the 27V supply is present at pin 2 of the TDA8170 field output chip Q303. If it's OK, check Q303 by replacement; if the voltage is missing, check R327 (4·7 Ω , 1W) and D302 (BYD33J) either of which could be open-circuit, also C314 (2,200 μ F) and C322 (220 μ F) which could be short-circuit or leaky. If necessary check the flyback boost diode D305 (BYD33J) which could be open-circuit.

It's possible that the scan coils are open-circuit, though dry-joints or open connections at pins 5 and 6 of plug/socket P570 are more likely.

A DC bias is applied to the scan coils. If this is missing, check whether R334 (560 Ω , 2W) is open-circuit.

The field ramp is generated by IC Q371 (TA8739P), which also produces the EW correction drive. If there is field collapse with a few scanning lines visible above the centre line, check for a ramp waveform at pin 15 of this chip. Its absence could mean that the chip or C372 (2·2µF) has failed.

Tuner Faults

The tuner unit can be responsible for a flickering picture and/or more often the picture just going to blue mute. In either case the remedy is to replace the tuner.

Tuning drift can be caused by the tuner unit but is more often caused by the μ PC574JL 33V stabiliser D108. If there is no tuning voltage, R829 (10k Ω , 2W) in the power supply is probably open-circuit.

Video Faults

If there is a blank raster with no sound, check whether the back terminal cover plate is pressing on QV22 – remove and resolder all connections if necessary.

For RGB problems, check the voltages at the RGB output pins of IC501 (TA8783N), 41/2/3 respectively. There should be about 3.75V here. If these voltages are incorrect and the voltage at pin 53 is more than 0.5V, replace IC501.

On a few occasions we have found that there is a blank raster, the remote control unit works but there's no on-screen display. The cause of this has been the TDA8170 field output chip Q303: check at pin 3, where the voltage should be 0.7V.

No picture could mean trouble with the voltage regulation transistors Q514 (BC327) and/or Q516 (BC547A) on the tube base panel: check the DC conditions here carefully.

We've traced the cause of dark lines across the screen to dry-joints at C319 ($0.22\mu F$) in the field output circuit.

Sound Faults

The sound section does not give much trouble – most of the problems occurred in the early years, before modifications were introduced. A motorboating noise from all speakers with the set in the standby mode was caused by a poor earth connection to the heatsink for ICs Q609 and Q610. This was a very intermittent fault. For further details, refer to Toshiba Technical Bulletin CDH41 (March 1992), which also deals with the problem of a ticking noise from the right-hand Surround speaker, present only when using Dolby Surround and noticeable when the Surround speakers go quiet with no signal. To overcome this problem, remove R610 and jumper link J109 which is under the heatsink for ICs Q608/Q611. Fit R610 in the J109 position and fit a link in the R610 position.

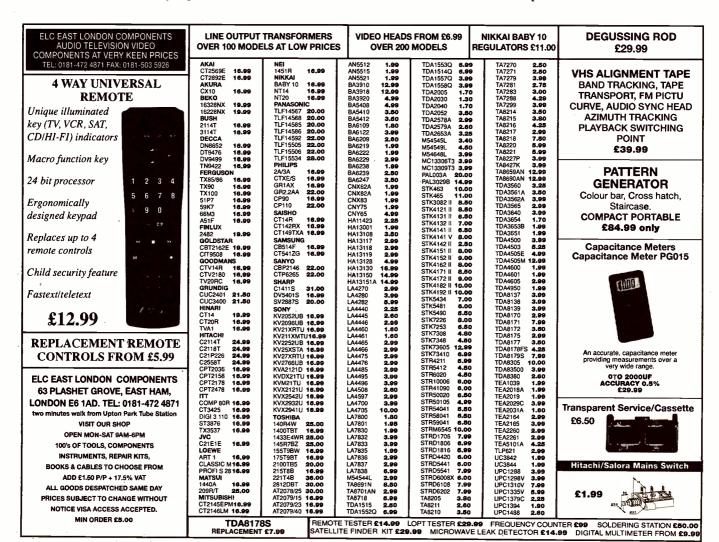
A third problem covered by bulletin CDH41 is a low-level hum from the left-hand Surround speaker in all modes, more noticeable at minimum volume. The cause is earth loops induced in the Surround sound chip Q610. Check the bulletin for the correct position of the green wire and cutting the earth print.

If there is motorboating in standby that's not caused by the problem mentioned above, check for a short between pins 4 and 5 of IC Q608 (TDA2030A).

For no sound from either or both main channels, check that the 30V supply is present at pin 5 of the relevant chip(s), IC Q608 and Q609. If the supply is present, suspect the chip(s). If the supply is missing, check D828 (RU4Z) in the power supply.

If the main channels are OK but the Surround channels are not, check the 24V supply at pin 5 of ICs Q610 and Q611. If the supply is correct, check the chip(s) by replacement. If the supply is missing or incorrect, check D829 (RU4Z) and pin 15 of the chopper transformer where there may be a dry-joint.

If there's a Nicam problem, such as Nicam dropout or crackle on sound, it's usually best to replace the Nicam PCB complete. Repair can be very expensive, in terms of both time and component costs.



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1.5s sample, 200Hz resolution 0.75s sample, 500Hz resolution

0.5s sample, 1000Hz resolution

Range 2

Span Sensitivity

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≤50mV, 35-350MHz

≤120mV, 351-450MHz

Gating 0.75s sample, 100Hz resolution 1.5s sample, 50Hz resolution

5s sample, 20Hz resolution 6s sample, 10Hz resolution

Range 3

10MHz

Span

10Hz-10MHz

Sensitivity

≤50mV

Gating 0.5s sample, 10Hz resolution 1.25s sample, 1Hz resolution

6s sample, 0.2Hz resolution 11s sample, 0-1Hz resolution

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Long-distance Television

Terrestrial DX and satellite TV reception and news, UK restricted TV broadcasting licences to be awarded, co-channel interference filtering techniques for Bands I/II. Roger Bunney reports

s this column is being written Aduring the first week in January, it is time to reflect on the past year's TV-DXing. There was an improvement in Sporadic E activity compared with 1996, also in autumn tropospheric openings. The mid-November Leonids meteor shower period was an active one. With the rapidly increasing sunspot count we can look forward to some early evening TE (transequatorial skip) reception, while next winter could bring the first signs of F2 layer propagation for some years. It has also been suggested that the Leonids meteor shower next November could bring record activity.

Unfortunately there has been a decline in the number of active DX-TV enthusiasts. There are several probable reasons for this. First, conditions have not been very good in recent years. Secondly the number of low-band VHF TV transmitters in Europe has declined as services have moved to UHF, while interference levels across Band I have increased. Then there is the lure of satellite

reception. There's always something to be seen from the Clarke belt, and dishes can sit at ground level. The number of those interested in multisatellite reception has grown, more than offsetting the decrease of interest in terrestrial DX-TV reception.

The future lies with digital TV – the technology has already taken a firm hold in the satellite field. Fortunately there are still many analogue signals available from the satellite belt but, looking to the future, we need to grasp the digits!

Sadly there was little terrestrial DX-TV activity during the last month of 1997. Low-level SpE signals were received on the 7th, 14th and 27th of December, all in chs E3 and E4. The signals were all unidentified and were present during the mid to late morning period.

Now back to TE reception. Robert Copeman in Victoria, Australia reports mid-evening reception from China (ch. C1, 49·75MHz vision carrier) on several occasions. During late November he received Malaysian signals in chs. E2 and 3 (at 2105-2200 local time), and on two occasions during the month he received ch. A2 (55·25MHz vision carrier) signals from American Samoa. This is encouraging news.

Satellite Sightings

Dean Rogers (Abbeywood, London SE2) mentions in his report that he's a satellite sports enthusiast. Checking through his log, I am struck by the fact that certain satellites seem to carry predominantly sporting feeds. Eutelsat II F4 (7°E) is a favourite, with clear PAL. Eutelsats II F2 (10°E) and II F3 (16°E) are frequently used. With signals that originate in

the UK/Ireland, Telecom 2C (3°E) is most popular. East-bound sports programmes from the USA are commonly found via PAS-3R (43°W), Orion (37.5°W) and the Intelsat birds at 27.5 and 21.5°W.

I have previously commented on the lack of signals from Eutelsat I F5, an elderly bird at 25.5°E in a heavily inclined orbit. This had been the favourite for UK horse racing (cheaply leased) and GMTV breakfast TV feeds. The horses seem to have gone digital, as there have been no reports for months. Breakfast TV has reappeared via Intelsat K (21.5°W).

The snow falls on December 17th resulted in a flurry of SNG activity. GMTV used UKI-264 (SISlink 27) atop an M3 motorway bridge and its own OB Unit no. 1 (UKI-149), the feed being at 11-497GHz (horizontal). UKI-264 was also used for a horse racing programme insert at 0730 on the 16th, signing as "G00065G-OB FEED-XMAS". It's well worth checking Intelsat K in the early morning period – there's a lot of analogue TV here.

Later that morning (17th) something seemed to be afoot in Russia. From 0900 there appeared, via an Intelsat K Brightstar lease (11·532GHz), shots of a space control room with orbital tracks on the monitor screens. One screen displayed the familiar 0167 test pattern. Subsequently there were shots of TV cameras etc. being set up, white balance adjustments, mic tests etc. Then the feed cut to Brightstar colour bars. We shall never know what was up.

A reader asks what the "Pegasus Test" via Intelsat K (11.4985GHz horizontal) was on December 11th at 1830GMT. Anyone know?

Signals from Iran are now available via Hot Bird 3 at 13°E.



More sport. While checking Orion 1 (37.5°W) at 1700 GMT one day I came across "UKI-77 TEST" alternating with "BT TES 9 + 00044 802852221" via the 12.668GHz vertical transponder. At 1705 the caption "ITV Sport Turin" appeared followed by several two-way interviews. The caption then returned until 1930, when a Manchester United v. Juventus match started. Low-level audio subcarriers were present at the usual 7, 7.2 and 7.4MHz.

I'd not seen the NTSC "US TV Pool Sarajevo" test pattern since the end of hostilities in the former Yugoslavia. But there it was, on December 22nd at 0835, via the 12.584GHz vertical transponder aboard Orion. Later "US TV Pool TUSLA" came up. The reason for this activity then became clear: President Clinton was meeting the US troops and extending Christmas greetings to them. A camera shot of the camp notice board proclaimed "Eagle Base Tuzla, Tuzla, Bosnia".

Roy Carman (Sandown, Isle of Wight) also watched this but feels it's high time he went digital "as analogue feeds are drying up". He's considering the Nokia 9600. Nevertheless his log for December 19th lists six active analogue feeds via Kopernikus 2 (28.5°E) at 1730.

Cyril Willis (King's Lynn) saw the BBC South West SNG truck (UKI-231) providing Christmas programme inserts from Chadford, Devon at 1830 onwards on December 23rd. The truck usually transmits via Orion 1 but on this occasion the feed was via the Intelsat bird at 27.5°W.

Finally, I've found the new Iran TV service via Hot Bird 3 at 13°E (12.434GHz horizontal) of interest. Material seems to consist of video offerings from the state broadcaster IRIB and, for much of the evening, the University of Sahar. It's certainly different, and I've seen some beautiful video sequences.

Terrestrial TV News

Spain: Deregulation of the TV broadcasting system is to take place on January 1st 1999. Two further national TV networks will be added to the present ones (two from RTVE, Antena 3, Canal Plus and Tele 5). Retevision will distribute and transmit the two new networks. Future plans envisage numerous channels in large towns, the limiting factor being channel availability.

Ireland: CanWest Global Communications has signed an agreement with the government to set up and run the TV3 network. Services are due to

start this autumn. The government has insisted on a complex ownership arrangement.

USA: A new network, Pax-Net, is to open this summer with 73 TV stations across the country. There will initially be three hours of "family orientated" programmes a day.

France: The start of the Canal Plus news channel has been postponed indefinitely. Canal Plus is urging the EU to impose a common European digital decoder standard. The company believes that this would ensure the stable development of satellite and terrestrial digital services.

New Zealand: Satellite dishes are being used in Auckland for terrestrial reception of internet data from the Sky Tower. The transmissions are at 12.366GHz, power being 4W.

It's common to see normal 45cm offset dishes mounted upside down, i.e. with the LNB uppermost, for reception from the tower. The LNB's output is connected to either a conventional receiver or a custom-made, PC-slotting receiver card, thence in either case to a PC. Once the required information is located, it's sent via the PAS-2 satellite to the Sky Tower then to the customer.

The wide bandwidth means that information which would take nearly two hours to be received via a telephone line can be downloaded in five-ten minutes. Other satellites now have internet hook-up capability, e.g. Zak-Net via AsiaSat-2 at 3.940GHz vertical.

Transmitter News

A 600kW ERP, ch. E59 transmitter at Jihlava near Javorice is now being used by Prima TV in the Czech Republic.

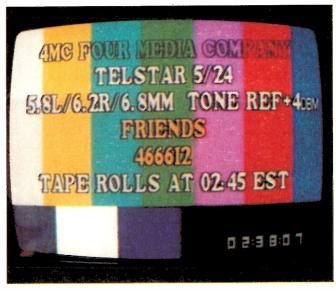
To make provision for DAB expansion, the 100W transmitter at Flensberg, Germany, is now using ch. E10 instead of E12 for the NDR-1 service. The local Rugen-TV service at Garz is on ch. E26 at 5kW ERP: programmes are transmitted from 1730-0530 local time, text pages being transmitted at other times.

The Hungarian MTV-2 service has moved to satellite transmission. The TV-2 network has taken over the transmitters previously used for MTV-2.

Lublin-3 TV is now in operation on ch. R39, with 100kW ERP. The mast is 200m high.

Noord TV in the Netherlands is transmitted on ch. E36 with 100kW.

RTP (Portugal) has been given financial assistance by the EU to experiment with 16:9 transmissions.



RSL-TV

The ITC has received applications for Restricted Service TV Licences (RSL-TV) in the following areas: Birmingham, Greater London, West London, Oxford, Isle of Wight, Derry, Stirling, Bristol, Coventry, Edinburgh, Dundee, Perth, Leeds (one applicant each), Manchester

Comedy material is often sent to European networks via Intelsat K at 21.5°W.

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(three applicants) and Leicester (two applicants).

Final licence approvals are expected in the spring, with the services likely to start this summer. The licences will last for two years.

Because no suitable channel is available, the ITC has decided not to offer licences in Glasgow, Nottingham, Tyneside, Liverpool, Cardiff, Cambridge, Motherwell and Newcastle.

Co-channel Interference Filtering

In the January column (page 212) I mentioned a co-channel interference filter marketed by the New Zealand company Tennatron. Since then I have received from Steve Fogerty of Tennatron detailed information on the subject. Interesting that he is a long-time reader of *Television* – and remembers when Charles Rafarel wrote the DX-TV column back in the Sixties!

Steve points out that when TV transmitters in adjacent areas use the same channel there is usually a line offset to minimise visual interference effects. These offsets are at typically one third, one sixth or one half the line frequency.

The one-third line offset is used where there are three stations (two possible sources of interference). A typical offset frequency would be 10-425kHz, giving offsets of -10-425kHz, 0kHz and 10-425kHz. The interference pattern is three lines wide.

The half-line offset is used with two stations. Offsets should be 23.4kHz (one and a half lines), i.e. 0/-23.4kHz or 0/23.4kHz. The interference pattern is two lines wide.

The one-sixth line offset (13kHz) is used between stations with one-third line offsets. The interference pattern is six lines wide and is quite noticeable with large-screen TV sets.

Any multiple of one twelfth of a line can be used as an offset frequency, a half-line offset (±7.8kHz) for example.

At the transmitter, the frequency tolerance with non-precision offsets is ±500Hz. For improved results, precision offset tolerance should be used, typically ±1Hz. The latter, with a one third or one sixth offset, locks the line structure within the picture.

Precision locking implies a very stable transmitter, i.e. one whose oscillator is locked to a high-stability source such as a GPS frequency standard or a rubidium oscillator.

Broadcasters suffer co-channel interference because of frequency sharing and congestion. With small

transmitters that use the RBR (off-air rebroadcast) technique, using high receiving aerials, the potential for interference is considerable – even when stacked and screened aerials are used. The problems can increase during high-pressure weather conditions, when tropospheric propagation enhances weak, distant signals.

The electronic co-channel filter provides superior and more versatile cancellation. The broadcaster uses the filter at IF rather than the RF input frequency, so that the filter can be used with any channel – assuming that the transmitters involved are precision stable. Domestic receivers are far from stable, and are thus not suitable for IF precision offset operation.

Tennatron have an RF input version however (for connection in series with the aerial feeder) for Bands I/II, for both domestic and professional use. The price of the former in New Zealand is the equivalent of about £120UK. A baseband video input model is to be introduced later this year at roughly the same price. It's essential to quote the wanted and unwanted frequencies, RF or IF, or with the video baseband unit the unwanted offset frequency (10.425kHz, 23.4kHz etc). The ITC or BBC can provide information on nominal and offset frequencies for UK transmitters.

My thanks to Steve for all this information. Trade/cable enquiries about these co-channel filters should be sent to Tennatron Industries (NZ) Ltd., 283 High Street, PO Box 218, Motueka, New Zealand – phone/fax 03 528 8707 (international +64 3 528 8707).

Satellite News

Bad news for SE Asia: the AsiaSat-3 launch on December 25th was a failure. The second firing came to an end after one second, with the result that the satellite is now in an elliptical orbit with no possibility of being recovered. This could delay the launch of the Astra 2A satellite - and the start of BSkyB's digital services - since the same type of Russian rocket is to be used. Incidentally SES-Astra has bypassed Eutelsat's claim to the 28°E slot by doing a deal with Deutsch Telecom for about 250MHz of the little-used Kopernikus (28.5°E) spectrum – in effect Astra 2A will replace DFS-2 at 28.5°E.

Kirch and Bertelsmann have agreed to an EU demand to cease marketing the Kirch D-box decoder for Premiere subscribers – about 100,000 have been sold. Premiere

will now await an EU decision on an all-Europe digital standard.

The Australian digital TV group Optus-Vision expects to have its pay-per-view/video-on-demand services in operation across Australia by the end of the year and might then enter the UK market.

Two pan-African TV services are being downlinked by Intelsat at 27.5°W. Minaj Africa Network has been on test recently and hopes to have services in operation this summer. African Independent Television International has been transmitted to Nigeria and neighbouring countries since last autumn. These are all C-band services.

MTV is to start its M2 European music channel this summer. Existing services will become "regionalised", with separate feeds to Scandinavia/ Eastern Europe and the Netherlands.

Ango-Dutch Shell has put out for tender an order for 11,000 VSATs (Very Small Aperture Terminals) – these are transmit/receive terminals intended for commercial use. They would link the company's retail and administrative operations across Europe, forming by far the largest such network.

Intelsat 704 (66°E) is now being used full time for video/TV traffic across Asia - a new satellite at 64°E has taken over telecoms/data distribution. Intelsat's APR-1 craft is to be launched in July, providing highlevel (up to 39dBW) C-band links at 83°E for single-hop Europe/Asia hook-ups. K-TV will be launched in spring 1999, providing Ku-band signals at up to 55dBW across India/SE Asia. 605's telemetry problems have been sorted out and the satellite has been moved to 27.5°E. 806 is to be launched in March, to orbit at 40.5°W. 804 was launched on December 21st at 64°E for Indian Ocean service. Intelsat has confirmed with Ariane launches for future IX series satellites - 902/3/4. Columbia is to take over the ancient 515 craft at 37.5°W and lease several transponders back to Intelsat: use of the C-band TDRS-4 craft at 41°W will cease.

Echostar has introduced a new digital receiver, Model DSB9800, which offers free-air/conditional access operation and is claimed to be an "enthusiasts receiver". The specification has many useful features, but the m/symbol rate coverage is only 18-5-30 – there are many signals that run at lower ms rates.

Future frequency bands being discussed are K 18-27GHz, Ka 27-40GHz, Q 36-46GHz and V 46-56GHz.

Answer to Test Case 423 - see page 325 -

To start with we need to clarify the set's field scanning. With an ordinary picture the lines of alternate fields are interlaced, i.e. the lines of any given field occupy screen positions midway between the lines of the immediately preceding and succeeding fields. This is normal practice. The result is good picture resolution with a relatively fast large-area flicker rate of 50Hz. With a text display the line and field scan rates are the same as with an ordinary picture, but to prevent interline flicker (25Hz) while maintaining the same display-repetition rate (50Hz) the lines of successive fields are overlaid. The result is a coarser display – which is no disadvantage with the large elements in a text display – that sits steady on the screen.

In this particular chassis design text de-interlacing is carried out not by changing the start time of successive fields but by passing a switched vertical shift current through the scan coils on alternate fields. This current is just sufficient to move the raster by one line width. Hence the 25Hz feed to inverter transistor Q009 and the resistive link between its collector and the scan coils. The vital clue was right at the end this time: the waveform at the collector of Q009 should have been at 25Hz.

Transistor Q009 wasn't working because the PC land at its emitter was not connected to chassis. A wire link had been omitted during production.

NEXT MONTH IN TELEVISION

TV/VCR Spares Guide

This essential reference material is included free with our next issue. The updated, 8-page pull-out 1998 Television TV/video Spares Guide provides addresses and ordering phone/fax numbers for brands, manufacturers and spares distributors in the consumer electronics field.

Servicing the Panasonic NVJ35/J35/F65/F70

These VCRs are now some years old but are still capable of providing superb picture quality and performance, and are thus worth servicing and maintaining. Brian Storm provides an authoritative fault-finding guide.

Las Vegas CES Report

The Las Vegas winter Consumer Electronics Show is an important international event for introducing the latest in CE equipment. This year is particularly significant, with digital TV to the fore. George Cole reports on the latest products and developments.

What's Cooking?

The microwave oven is a common enough domestic item which is partly electronic, partly an appliance. Repairs are often required, and this is something you should be able to handle. J. LeJeune describes the basic operation and features of microwave ovens and the relevant servicing procedures.

Service Notebook

John Edwards on tackling various types of TV and video repairs.

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

Electrical Safety

Colin McCormick's letter (January, page 175) continues the discussion started by C.N. Cory in the November issue. In such a serious matter as electrical safety we need to stick to facts: these are in the British Standard (European and, with a few differences, international) BS EN60065:1994.

First, 'double insulated'. The standard calls for two or more layers of insulation, 'basic' and 'supplementary', that meet specific requirements, or 'reinforced insulation' which is a single layer that meets more stringent requirements. Either basic or supplementary insulation may be provided by means of an air gap of specified minimum dimensions.

The CD player mentioned by Colin McCormick seems to have only one layer, the air gap. So the question is whether an air gap can provide 'reinforced insulation'? Clause 9.3.4 b) in the standard specifies the width of an air gap in this situation. For reinforced insulation, with mains voltage, the minimum width is 6mm, which must not be reduced to less than 4mm when an external force of 50N (Newtons - 50N is about 5kg force) is applied simultaneously with an internal force of 2N applied to wiring or any live part. The product is expected to meet

Leffers

these requirements. If it doesn't, maybe there should have been a cover over the live parts or an insulator fixed to the inside surface of the cover – either of which might not have survived previous work carried out by an unskilled or careless person.

Next, 'floating' circuitry. The values used in a resistor and capacitor combination that bridges a mains isolation barrier are determined by the requirements laid down in clause 9.1.1 of the standard. In effect, the impedance of the parallel RC combination must be not less than $415k\Omega$, which allows a maximum current of 0.7mA peak (0.5mA RMS with a sinewave current). The voltage, with respect to earth, at which the circuitry sits depends on the capacitance of the whole product to earth. There is nothing to say that it will be 110V or any other value less than 230V. It doesn't matter, because to most people 0.7mA is only just perceptible as a 'touch current' and is not dangerous even if it can be felt.

The requirements are stricter for aerial terminals. The impedance must exceed $463k\Omega$, and the stored charge must be less than 4.5μ C (microcoulombs). At 325V peak, i.e. a 230V AC mains supply, this represents a capacitance limit (Q = CV) of 13.9nF.

I am surprised to hear that there was a problem with the brand of receiver mentioned: once upon a time I supplied the company with radio receivers, and its technical surveillance was exacting. But 13.9nF (if the actual capacitance was anywhere near the maximum value, I would be surprised) charged to 325V does produce a fat spark.

The current and the stored energy values that are permitted were determined by experience and have not been changed for a very long time. They are certainly in

BS415:1967, and I don't think they were new even then.

What is new is that many more items of Class II equipment are nowadays being connected together. Each of them has a capacitance, intentional or more often just stray, between the live mains and the isolated circuitry. When several pieces of equipment are connected together, the total capacitance can create a 'touch current' that's far from comfortable, though such currents are a long way from being dangerous in themselves.

Aerial riggers should be aware of the problem however, and should take extra safety precautions – the use of insulating boots and, if possible, gloves. The problem has been recognised, and an international team of experts is attempting to draw up measures to control the effect. Unfortunately there is no easy solution.

John Woodgate, B.Sc.(Eng.), C.Eng., M.I.E.E., F.A.E.S., F.Inst.S.C.E., Rayleigh, Essex.

Back Injury

Readers may recall my back injury case, which started in 1981. In 1990 I won £20,000 in court from Radio Rentals/Thorn EMI (liability). But I was advised to "settle in order to get our (Radio Rentals') personal injury insurance from Sun Alliance". It didn't work out like that, and I've had to continue the battle ever since.

Now, after all these years, a new judge has reviewed the case and the truth of the matter is likely to emerge – he has called for a full enquiry this year at higher legal level. Wish us luck, and our thanks to all of you who have written to us about your injuries and lifting experiences.

Incidentally I find that Radio Rentals (now Homeserve) still relies on one-man TV set lifting. If readers in other areas can confirm this and let us know, it will add to our evidence.

Harry Todd and Family, clo 12 Oakhurst Close, Snaresbrook, London E17 3PZ.

A Tale of Two Tellys

How about this? Set A required a remote control unit, a front flap and a Nicam crystal. By strange coincidence, set B required the same.

Not being an account holder with manufacturer A, a major multinational which won't even speak to us, a call was made to the company's distributor to place the order. "Special Parts Order, it'll take seven to ten days" the distributor said.

We don't have an account with manufacturer B either. This is a much less well known brand, but the company was most helpful when we phoned to ask about spares. A cheque was sent with the order, in the post on Tuesday night. Bright and early on Thursday morning the parts arrived. Brilliant. They were fitted and, within 48 hours of our first parts enquiry, a delighted customer paid his £60.91 bill and collected his set.

Set B is still awaiting parts. In due course we expect that it will be returned to the customer with an anticipated bill for £142.36.

OK, let's not be mealy-mouthed about it. Manufacturer A is Sony, manufacturer B Beko and the difference for the same job is over £80. There seems to be something wrong somewhere. Adrian Spriddell, Diss, Norfolk.

Pace Apollo Upgrade

My father has a Pace Apollo satellite receiver which, though a very good performer, has only 120-channel capability. As it is part of a motorised system this limited its usefulness. The Pace Apollo and MSS200/300 series receivers all have a 24C32 EEPROM and all use the same PCB, but the MSS300 has 250-channel capability. So I decided to make a copy of the contents of the 24C32 EEPROM in a Pace MSS300 receiver.

I have built myself a serial EEPROM programmer, but instead of using one of these you can tackle the problem in the following way. Remove the EEP-ROM from the Apollo receiver and put it aside. Then install a socket and a new EEPROM in an MSS300 receiver: at power up, the microcontroller chip will download its ROM programme to the new memory chip. Fit this chip in the Apollo model and it will now have 250 channels, as if it was an MSS300, making it a very useful receiver. Finally put your old chip back so that the customer settings are retained. A point to note however: if for any reason you do a factory reset, the Apollo receiver will revert to 120 channels. So it's best to fit the chip in a socket.

If you wish to have the same information in both receivers, fit the original EEPROM from the MSS300 in the Apollo receiver then use the download facility to clone the MSS300 with the new chip.

K.Ē. Prior, Weymouth, Dorset.

Regulator Decoupling

While reading the interesting article on null-method dish alignment by John Pitt-Francis (January 1998 issue) I noticed that the 7812 regulator shown in Fig. 2 has no decoupling capacitors.

78 and 79 series regulators are

78 and 79 series regulators are industry-standard devices that are available from various manufacturers. They all look much the same. Their internal arrangements are not identical however, and some become horribly unstable when operated without decoupling.

I guess that John used a tolerant one. But to guarantee successful results every time it's best to connect an 0·1µF capacitor to ground at the input and a 1µF capacitor to ground at the output. They should be mounted as close to the regulator as possible.

Keith Cummins, Chale Green, Isle of Wight.

Panasonic TX25AD1DP

In my fault report on one of these sets (Euro 2 chassis) in the

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December issue I suggested that R668 on panel E should also be replaced when there has been trouble with relay RL6101. In fact R668 should be removed, not replaced. This is important. The CRT could again be damaged if there was further relay sticking. Brian Storm, Harpenden, Herts.

Beat This!

A customer came in and asked whether we could provide a non-working modern TV set free. He wanted to make a false insurance claim "because my set is too old". This was openly said in the shop. Words fail me.

Rex Webb, KTV Electronics,
Camborne, Cornwall.

Published on the third Wednesday of each month by Reed Business Information Ltd., Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Filmsetting by Marlin Imaging Ltd., 2-4 Powerscroft Road, Sidcup, Kent DA14 5DT. Printed in England by BPC Magazines (Carlisle) Ltd., Newtown Trading Estate, Carlisle, Cumbria CA2 7NR. Distributed by MarketForce (UK) Ltd., 247 Tottenham Court Road, London WIP 0AU (0171 261 7704). Sole Agents for Australia and New Zealand, Gordon and Gotch (Asia) Ltd.; South Africa, Central News Agency Ltd. Television is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed by way of Trade at more than the recommended selling price shown on the cover, excluding Eire where the selling price is subject to currency exchange fluctuations and VAT, and that it shall not be lent, resold, hired or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

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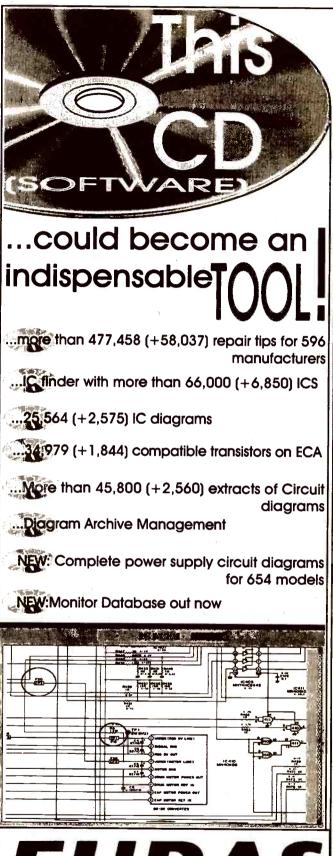
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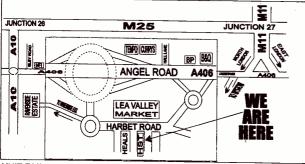
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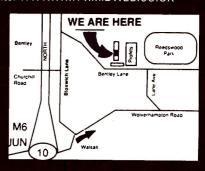
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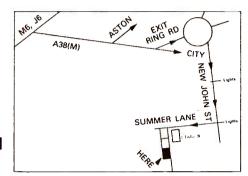
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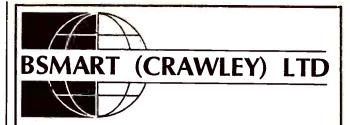
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