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- OLED: Organic Light-Emitting Diode
- LCD: Liquid Crystal Display

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**Television March 1993**

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Japanese Gloom

We have for so long watched with awe the development of the Japanese consumer electronics industry that the idea of it being in considerable difficulty takes a while to sink in. But the fact is that in both its domestic and export markets the industry is in trouble. There are signs of this everywhere now. NEC for example has just withdrawn from VCR manufacture. It will continue to supply VCRs, but these will be made by Sanyo on an original equipment manufacturer (OEM) basis. Distribution will be limited to NEC's 6,000 affiliated distributors in Japan. This might offer some minor relief for Sanyo, which recently announced its first dividend cut in twenty two years. Last July Sanyo forecast a 36 per cent fall in pre-tax profits; by mid-December the forecast decline had been increased to 73 per cent. Matsushita, Sony and just about every other Japanese consumer electronics manufacturer have been reporting similar results. The situation of smaller manufacturers is probably that much worse. Shintom, a medium-sized electronics manufacturer whose main business is the production of VCRs on an OEM basis – for others to apply their brand names – recently closed one of its VCR assembly plants (outright closure of a factory is rare with listed Japanese companies). In the case of Shintom, some 90 per cent of production is exported. But the drop in the Japanese domestic VCR market is alarming: from a peak of 7.15 million units to a case of Shintom, some 90 per cent of production is exported. But the drop in the Japanese domestic VCR market is alarming: from a peak of 7.15 million units to a tax profits: by mid-December the forecast decline had been increased to 73 per cent. Matsushita, Sony and just about every other Japanese consumer electronics manufacturer have been reporting similar results. The situation of smaller manufacturers is probably that much worse. 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But it looks as if the Japanese consumer electronics industry became mesmerised by its own success, generating the same sort of false optimism that drove the property market in the UK in the late Eighties. There was of course always hope that new products would come along to keep things going. But there are few products that have the potential of hi-fi, the personal stereo, the TV receiver and the video. The Las Vegas Consumer Electronics Show reported on in a later page revealed many interesting new systems and products, but somehow they don’t seem to have the same universal appeal as those just mentioned. The extraordinary thing really was the VCR boom. In the history of consumer products there can have been few that took off so rapidly. It undoubtedly led to unrealistic sales projections and the installation of the excessive production capacity that was to have met this demand. There were other factors that fuelled the growth of Japanese production capacity in the Eighties. This column has always felt that relatively low interest rates in Japan were for one such factor. Most commentators dismissed this view. Not so they said, the Japanese success was due to the development of new manufacturing techniques. These must have played a part, but it’s interesting that a special paper just released by the Bank of Japan, Corporate Business under Economic Adjustment, states that "much of the apparent improvement in Japanese companies’ financial performance in the last decade was a reflection of cheap finance rather than improved efficiency". The report casts doubt on the theory that Japanese industrial competitiveness was mainly a result of the flexibility and efficiency of Japanese factories. It comes to something when that giant amongst Japanese consumer electronics manufacturers Matsushita decides to send about five hundred members of its staff to work with local retailers, visiting their customers at home to find out what would encourage them to spend more. One wonders what they discovered. The step was taken last November, after Matsushita had reported a 65-6 per cent drop in pre-tax profits for the half year to September.
Teletopics

NEW VHS FORMAT

JVC has announced a new VHS format, W-VHS. The W stands for wide, which according to JVC signifies (a) the worldwide penetration of VHS, (b) the ability to handle wide-screen (16:9) high-definition pictures and (c) the development of a wide range of applications for VHS! According to JVC over 400 million VHS units have been produced since the system was launched in Japan in 1976: now various developments such as wide-screen pictures and improved-definition TV systems call for an enhanced video format.

W-VHS has the following features: (1) Compatibility with Japanese Hi-Vision broadcasts, including 16:9 recording and playback. (2) Compatibility with future broadcasting systems such as EDTV-II (Japan), ATV (USA) and HD-MAC (Europe). (3) The ability to record simultaneously, and playback likewise, two high-quality conventional TV programmes or accept inputs from two cameras simultaneously to produce 3-D images. (4) Compatibility with the existing VHS and S-VHS formats. Technical details are scarce at present, but W-VHS uses baseband, two-track parallel recording, the colour signal being time compressed. HD-TV signals are split into two separate components for recording on the twin tracks. This two-track system, using metal tape, also gives the system the ability to record two separate conventional video signals simultaneously. A picture quality improvement circuit uses a noise-reduction system called temporal emphasis, and there’s a cross-jitter compensation circuit. The standard audio system is f.m. stereo, though PCM digital sound is an option. Drum diameter is 62mm, speed 1,800 r.p.m. Tape speed is 33-4mm/sec. JVC plans to launch the first W-VHS machines in Japan in the autumn, at a price equivalent to slightly over £3,000. They will be able to play VHS and S-VHS recordings.

JVC’s announcement of the W-VHS format is part of an effort to push HDTV, which has had very limited success in Japan to date. As a second contribution to encouraging the system has been taught how to identify and adjust to existing VHS and S-VHS formats. Technical details are scarce at present, but W-VHS uses baseband, two-track parallel recording, the colour signal being time compressed. HD-TV signals are split into two separate components for recording on the twin tracks. This two-track system, using metal tape, also gives the system the ability to record two separate conventional video signals simultaneously. A picture quality improvement circuit uses a noise-reduction system called temporal emphasis, and there’s a cross-jitter compensation circuit. The standard audio system is f.m. stereo, though PCM digital sound is an option. Drum diameter is 62mm, speed 1,800 r.p.m. Tape speed is 33-4mm/sec.

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JVC’s announcement of the W-VHS format is part of an effort to push HDTV, which has had very limited success in Japan to date. As a second contribution to encouraging HDTV JVC has announced a lower-priced MUSE receiver, again to be launched in the autumn. It uses a newly developed decoder with fewer i.c.s. The selling price is expected to be around the equivalent of £6,750.

NEURAL CAMCORDER

The main feature of Sharp’s new 8mm camcorder, Model VLN1H, is its Neuro auto-exposure system. Sharp says that the system has been taught how to identify and adjust to thirty different lighting conditions, selecting the optimum exposure. Other features include a x12 zoom, four fast shutter speeds with a top speed of 1/10,000th sec, a 16:9 mode, 3lux low-light capability, viewfinder menuing, a fader, a digital signal processor and remote control. Suggested price is £530.

SATELLITE TV

December seems to have been a good month for satellite TV installations, with Continental Research which runs the FT Monitor and BARB which produces the official TV ratings issuing figures that vary by around 300,000. This is not too surprising: there is no exact count of sales or of disconnections, while the end of the old BSB transmissions has further complicated the situation.

The EBU has moved its entire programme exchange network from Eutelsat I-F5 to Eutelsat II-F4, at the same time increasing the number of transponders leased from two to four. Eutelsat has also announced that Deutsche Bundespost Telekom, France Telecom and the Swiss PTT have agreed to go ahead with the Europesat I project, which will transmit fourteen DBS TV channels.

Supervision Ltd., Tower Works, 2 Globe Road, Holbeck, Leeds LS11 5QG (0532 444 195) has launched a complete range of satellite receiving equipment and accessories under the brand name Apollo. The first two products, both non-IRD receivers, are the 120-channel stereo model SR1800 and the SR1900 which has 199-channel capacity and provision for dual LN inputs. Initially aimed at the export market, deliveries of the UK manufactured receivers started in February.

The Swedish Microwave XL800 triple-band LNB, which has the exceptionally low noise figure of 0.8dB maximum, is available from exclusive supplier Satellite Solutions (UK) Ltd., 35 Quarry Park Close, Moulton Park, Northampton NN3 1QB (0604 670 900). It covers the FSS, DBS and Telecom bands over the range 10-95-12.75GHz, the gain being typically 55dB (maximum variation over the bandwidth ±2dB). As industry-standard connectors are fitted the LNB can be used for system upgrading.

Satellite Solutions is also distributing the new Philips STU909 multi-standard satellite receiver which has a 2GHz tuner, 120 preselections divided between 32 satellites and automatic 16:9 widescreen switching. It can receive D2-MAC, PAL and SECAM, with ten selectable mono sound channels and three selectable stereo channels. D2-MAC processing includes digital hi-fi sound with the option of picture blanking during radio reception. There’s an on-board Eurocrypt decoder/reader and a decoder scart that can be used with virtually all PAL/SECAM descramblers. Frequency range is 950-2,000MHz and the threshold carrier-to-noise ratio 7dB. Three scart sockets, audio phono and S-VHS connectors and inputs for two LNB inputs are provided. All three types of polariser can be used with the STU909.

IN BRIEF

The Independent Television Commission will be moving to 33 Foley Street, London W1 this summer. The ITC’s staff, including its twelve national and regional offices, has been reduced to 190. . . AT&T in the USA has developed a system that enables subscribers to receive interactive video signals via standard telephone lines for services such as placing orders and responding to advertisements. It’s regarded as a transitional technology to provide such services before installing fibre-optic cables. . . Amstrad’s technical director Bob Watkins, who joined the company in 1976 and oversaw many of its major products during the Eighties, has left to become group managing director of Binatone, heading the company’s UK and Hong Kong operations . . . Dixons and Currys have announced that a potential danger due to overheating can occur with Matsui Model 2580. 25in. receivers supplied between May 1989 and May 1991. A modification will be carried out free of charge by Mastercare Ltd, who can be contacted by owners on freephone 0500 234 558.
VCR Clinic

GEC V4007
This Philips clone had the classic one broken/clogged head symptom. A scope check at the f.m. out test point (pin 3 of plug L6) confirmed that there was no f.m. output from video head one. Cleaning the heads a few times produced no improvement so, as a rough check on the head preamplifier, I injected a signal at pins VK1 and 2 and was surprised that there was again no head 1 output. So the heads were blameless this time! A check through the signal path then brought me to C2001 (22nF) which was open-circuit. Ninety nine times out of a hundred it’s the heads that are at fault, but beware of the one in a hundred! P.B.

Toshiba DV90
This machine would play a tape but there was no display and no signals were tuned in during E-E operation. The d.c.-d.c. converter was inoperative because ZL62 (ICP-N10) was open-circuit.

Sharp VC651H
This machine didn’t record. I decided to follow the signal path through the AN3215K video signal processor chip IC201 – the signal enters and leaves at several points. All was well up to pin 19, but there was no output at pin 21 (TP203). The chip itself proved to be faulty, but fitting a replacement revealed another problem – the video heads were badly worn. Some days you just can’t win.

It’s quite common with this and related machines to find that the sound is being recorded only intermittently. The cause is usually dry-joints on the audio board. You have to unsolder this from the main panel in order to work on it. To complete the job we also solder the wires directly to the erase head. S.L.

Akai VS22
We’ve had our fair share of these nice machines in recently because of no results. The cause is invariably failure of one of the transistors on the power supply panel. I strongly recommend fitting only exact replacements, otherwise problems can arise. The numerous small electrolytics on this panel regularly fail, producing various symptoms such as dead with localised transistor overheating or display o.k. but no power up. We’ve had C6 causing interference/patterning and C20 (100µF, 16V) causing no power up. Our policy is to remove and test all the electrolytics on this board. It saves time in the long run as you avoid bounces.

After doing this recently with two of these machines and successfully repairing the power supplies we found that they would both load tapes normally but neither the drum nor the capstan motor operated. There was no rewind or fast forward drive either. In both cases the BU2735AS chip IC503 was the cause. S.L.

Hitachi Capstan Bearings
We’ve had a lot of trouble recently with gunged-up capstan bearings in Hitachi VCRs. A VTM720 would squeal on rewind and would intermittently unlace at odd intervals: the upper capstan bearing was dirty and tight. The same thing with the same effects occurred with a VTM622E. It’s not difficult to dismantle the motor to clean and lubricate the upper bearing. Use very thin oil – as much as a gnat might put in his chamber pot.

Sanyo VHR4350
A couple of these machines developed intermittent loss of drum servo phase lock – the effect is similar to that of dirty heads, but it drifts in and out of the picture. Check the internal jointing and plug/socket connections to the drum motor’s PG coil. You have to dismantle the upper and lower drum assemblies to get at the stator PCB.

Philips VR502
After running for about fifteen minutes this machine lost all TV programmes – it was as if the aerial lead had been pulled out. We found that the voltage at pin 11 of the tuner was being pulled down from within the tuner. A suitable voltage fed to pin 11 from a bench power supply showed that 22mA was being sunk inside the tuner. A new tuner restored normal operation.

Sanyo VHR3300
The audio/control head stack used in this and similar models wears at a relatively fast rate – we’ve replaced many of them. Signs of failure are: sound level fluctuation; tape fuzziness with respect to servo lock with a machine’s own recordings; and intermittent miscounting by the tape counter. The only cure is a replacement ACE head assembly.

Pioneer VR727/Philips VR6870
Failure of C2011 in the chopper power supply has been mentioned on a number of occasions. Another, nastier failure in the same area occurs when the 6.8V reservoir capacitors C2032 and C2033 dry up. They are both 6800µF, 16V. The symptoms are several: the machine may take minutes or hours to come to life after being switched on; all segments in the fluorescent display may light up; or there may be intermittent or no sound in the E-E and playback modes.

Sharp VC681
When this machine finds a blank portion of tape it switches into the video search mode and quickly skips through until it comes to the next recording. It then reverts to the play mode. We had one of these machines that would remain in the search mode however: the only way to stop it was to press the play button.

The blank detector circuit is centred around the µPC393C chip IC701. It works by detecting the off-tape line sync pulses. All was well at Q701’s collector, but although the signal at pin 3 of IC701 changed when a recording was found the signal at pin 1 didn’t change. As replacing IC701...
made no difference it seemed that R7106 and R7107 at pin 2, the operational amplifier's non-inverting input, were faulty. But their values were spot on. With no faulty component present we could only conclude that the circuit had gone out of tolerance, perhaps due to age. So a modification was called for. After some consideration we decided that the fault could be cured by reducing the voltage at pin 2 by 0.2V. The modification consisted of adding a 470kΩ resistor in parallel with R7107. A good soak test showed that this had cured the fault.

Amstrad VCR9000

This machine had no E-E or playback sound. A check at pin 6 of IC701 showed that its 8V supply was missing, though there was voltage at the other end of R735. This resistor was o.k., the cause of the problem being that C721 (100µF, 10V) was short-circuit. We fitted a replacement rated at 16V.

Samsung VI730

As the 1.252, 0.5W protection resistor (FR101) for the STK5333 voltage regulator was open-circuit the machine was dead. The cause of the failure was a loose fuse clip in the mains plug. The machine had stopped in the partially laced condition.

Philips VR6542

This machine has a Panasonic deck and suffers from the same mode-switch problems as Panasonic models.

Panasonic NVF65

This Nicam stereo hi-fi deck wouldn’t stop when search tuning, though if you tried tuning in the opposite direction the machine would usually (but not always) lock on a station. So checks were made for sync low and a.f.c. defeat switching at the pins of the demodulator pack. Normally when tuning the a.f.c. defeat voltage changes from 4.5V to 0V. In this case it remained at 2.5V all the time. The MN12C261D front panel memory chip IC7502 is directly responsible for this and proved to be the culprit, a replacement curing the fault.

Panasonic NVJ47

The mechanism was erratic to say the least; a lot of movement but rarely reaching the play position without sighing to a halt and shutting down. The cause of the problem seemed to be the capstan stator. It had very little torque and emitted strange whistling noises intermittently. When the capstan rotor was removed to gain access to the stator we found that the soldering to the stator coils could have been better. In fact resoldering the stator coils and the Hall i.c.s cured the trouble.

Panasonic NVJ42

The search tuning fault with this machine was no lock in either direction. Sync low and a.f.c. defeat were normal but because there was no a.f.c. feed from pin 6 of the plug-in demodulator pack the front panel microcontroller chip had no information to work on. Pin 6 of the demodulator pack proved to be the cause of the problem: it was open-circuit to the demodulator pack plug itself. Fitting a new socket cured the problem.

JVC HRD110/Ferguson 3V38/9

This machine would shut down after attempting to lace up. A new loading belt was fitted but made no difference. The cause of the fault was traced to the after-load leaf switch unit which is mounted close to the loading motor – one of the contacts had broken off.

Ferguson 3V35/JVC HRD120

As the thermal fuse in the mains transformer’s primary winding was open-circuit this machine was dead. Fortunately the pin-outs on the PCB are accessible. So to avoid the cost of a new transformer we added a 250mA fuse externally, soldering it across the pins in place of the internal fuse. The machine then worked well.

Hitachi VT17

Motorboating on sound during playback was caused by relay RL401 on the audio PCB. Removing the plastic cover and cleaning the contacts provided a cure.

Sharp VCA113HM

When play was selected the picture appeared for a few seconds in the pause mode then the machine went into the stop mode. The pinch wheel had fallen down its shaft because its internal grip had broken. A new pinch wheel assembly (part no. MLEV0281GEZZ) cured the problem.

GEC V4005

This Hitachi clone (VT63/4) suffered from an intermittent very loud knocking noise when playing or recording. Not the capstan bearing this time – too loud anyway – but a worn reel pulley on its pinion. A new clutch base assembly provided a complete cure.

Fisher FVHP520

The cause of low reel torque can be difficult to find on these machines. We’ve found that it’s usually due to reel spool tyre wear. Cleaning with alcohol and drying will prove the point.

Susumu XR1

The cause of tape chewing in this Clydesdale supplied machine was a faulty reel idler. It’s Panasonic part no. VXP0521. Willow Vale list it and a number of other spares for this model – the mechanism is similar to that used in the Panasonic Model NV370.

There was a second fault however – very poor playback picture quality because of poor screening around the head amplifier. The cause was that some idiot hadn’t secured the upper PCB behind the mechanism – the screws were nowhere to be seen and the board was being held down by the lid! It has a spring contact to earth the plate.

Logic VR950/Samsung VI611

This machine wouldn’t play or record – the arms didn’t lace up because the pin had dropped out of the sector gear. As a result it didn’t move when the main cam did. A new sector gear was installed and the pin, found loose in the mechanism, was fitted into it. The old gear was faulty – the hole for the pin had become enlarged.
JVC HR7200/Ferguson 3V29

This oldie had no colour playback with known good recordings and no drum lock or chroma with its own recordings – no prizes for spotting the connection. The fault could be instigated and cleared by touching anywhere on the bottom PCB. We eventually found the dry-joint on one leg of C347, which is connected to one leg of IC402. The leg had a very fine ring around it.

Osaka VCR33

It didn’t take long to find the cause of the fault in this machine – tape chewing due to a faulty reel idler. But the fact that the Panasonic mechanism it uses is similar to that in the NV370 may be of interest since the appropriate VUD kit or individual components are easy to obtain. Don’t use the Panasonic pinch roller though – a Sharp unit from Willow Vale will do. The rest of the machine is not of Panasonic origin. The whole lot looks very similar to the Susumu XR1 which was marketed by Clydesdale.

JVC HRD565

There was intermittent loss of r.f. vision, the symptom being a black raster with weak vision floating through. Wiggling either r.f. lead would instigate the fault or cure it. When I’d dismantled the r.f. modulator/amplifier I found that there was a break in the print between the input plug’s vision pin (screened lead) and its first connection about 1.5in. away inside the modulator.

Panasonic NV870

The only sign of life was an occasional flicker from the display. There was less than 1V on the Reg 5V rail due to a 10Ω short to chassis. Several plugs, sockets and links later I reached the operation display board and found that the earthed leg of C6512, which decouples the supply to IC6503, was pushed against the positive leg of the Reg 5V decoupler C6502, behind the digitron. With the leads apart life was restored to the machine. But no channels could be tuned or memorised for several minutes, after which this fault would suddenly clear. The AN5033 tuning chip was temperature-sensitive.

Panasonic NV370

The E-E picture was marred by fine horizontal lines that varied with the tuning. A.G.C. decoupler C702 on the tuner/i.f. panel was open-circuit.

Baird 8940/JVC HR7350

No erase or recorded sound prompted a gleeful leap on to the erase head connector, only to find that it had already been bypassed and removed. The cause of the problem was that the bias oscillator was receiving no supply voltage in the record mode because switching transistor Q10 was not being turned on. Its base bias resistor had risen in value from 5-6kΩ to 53kΩ.

Panasonic NVG40

The playback and E-E pictures were intermittent, but the owner said that the machine worked fine on its side! Tapping anywhere on the top main board affected the fault, so I scoped the video signal at input pin 3 of the luma/chroma subpanel. It was constant here, but at output pin 1 it fluctuated as the panel was flexed. When the subpanel was removed I saw that there were cracks around pins 1 and 2. Resoldering them provided a more permanent remedy that gravity!

Panasonic NVL25

Very intermittent servo lock caused us a few problems with this machine. It would play all right for hours then, suddenly, the capstan motor would rapidly speed up, causing sound distortion. At the same time the drum speed would go way off lock, the result on the picture being like loss of line hold. The fault would last for about ten seconds after which everything returned to normal as suddenly as the fault had appeared. After much head scratching and component changing we found that the cause of the fault was the STK5392 regulator chip in the power supply. When the fault condition was present the regulated 5V rail rose to 6-2V and became unsmoothed with h.f. pulses on it. Because of the very intermittent nature of the fault it took several days of testing and probing to find the cause.

Panasonic NVJ35

Playback was perfect, but when record was selected the machine would run for a few seconds then return to the stop mode. L4002, the choke in the i.f. feed to the audio bias oscillator, had gone open-circuit because a solder blob inside the oscillator transformer T001 had provided a short to chassis. When L4002 had been replaced and the solder blob had been removed the record function worked normally. A microcontroller chip pin monitors the bias oscillator: if no oscillation is detected the deck is returned to the stop mode.

Panasonic NVJ40

No full tape width erase was the trouble with this machine. The symptom was blue and red patterns with new recordings because the chroma from the previous recording wasn’t being erased. The cause of the fault was simple. The full width erase head plugs in. During manufacture one pin had bent over when the plug was inserted and thus failed to make contact. With these later type G decks the erase voltage is fed via a ribbon cable across the top of the cassette housing, along with the end sensor supply.

Sentra VX8400HQ/Alba VCR5000X

Playback drift is a common problem with these machines. Change D101, preferably to a TAA550 i.c. If you still have problems, remove the glue/gunge from around C133/4/5, also around R158/9/60. The glue becomes slightly conductive, causing erratic drifting – sometimes on one or two channels only!

Hitachi VT430

The mains input PCB had to be repaired because of damage caused by mains-borne lightning. This got the machine working, but in the play and E-E modes there was a blank raster. Replacing Q3301 – we used a BC640 – restored the playback luminance but we now had weak E-E. Scope checks proved that the i.f./demodulator and p-in-p modules were o.k. The video was traced to pin 7 of the LA7016 chip IC1501, but there was very little output at pin 4. Replacing this chip cleared the final fault.
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**TELEVISION MARCH 1993**
Panasonic NVM3B

This one was o.k. until you switched it off! All the normal functions worked: play, record etc. were fine. But at switch off things went seriously wrong. It would eventually switch off, but after several attempts R20 (2.2Ω, 1W) would burn out. This resistor is in the 12V supply to the loading motor drive chip IC6004. By connecting an ammeter in series with the supply we found that at switch off the current drawn by the loading motor was greatly in excess of the normal value. Hence the burn out of R20.

The clue was the fact that the excess current was the cause of the unit shutting down: it triggered the excess-current circuit in the power supply. The cause of the problem was an open-circuit link-through from one side of the PCB to the other. As a result the system micro was robbed of its supply when switch off was attempted. It reacted by driving the loading motor hard in the unload direction. The moral is that when extraordinary symptoms are present, look for all possible clues. In this particular case the clue was provided by monitoring the micro's 5V supply. D.C.W.

Sharp VCC10P

The colour was erratic in the camera mode, with bent verticals and intermittent picture roll. Playback was o.k. The customer said that if you hit the camera the fault cleared. And it did! The cause of the trouble was a dry-joint on the camera video board, where the sync subpanel is connected. It took rather longer than it should have done to find the dry-joint, because a touch almost anywhere produced the fault. D.C.W.

Philips VKR6830/JVC GRC7E

The customer complained of no functions, and indeed absolutely nothing worked. An internal inspection showed that the cause of the problem was a common one – water! Why don’t they tell us they got it wet? Carefully cleaning the operation PCB restored most of the functions, but after a short period they ceased. There was a further contaminated area on the MDA PCB. Except for these two areas everything else had been spared the flood effect.

I always give equipment that has suffered in this way an extended test run. This hopefully avoids the possibility of a further failure. As a general rule, if the fault produces various unexplained symptoms look for an ingress of liquid. When asked, the customer invariably “remembers” the circumstances of the accident! D.C.W.

Sony ACP88

This worldwide camcorder charger/power supply unit is quite expensive to replace but is eminently serviceable. This one was dead, with fuse F101 (1.25A) black. Not surprisingly the 2SC3457 chopper transistor Q101 was short-circuit all ways round, but the cause was a dry-joint on the reservoir capacitor C105 – the big black one. Its positive connection had obviously been arcing. N.B.

Sanyo VMD3P

You may recall that I wrote about failure of the silver-can, surface-mounted electrolytic capacitor in position C4011 in the system control circuit in this model. More recently this type of capacitor has been failing everywhere. With this particular machine there was loss of vision in the pause/cue and review modes because C1095 (10μF) had fallen in value. When all the other capacitors of the same type were checked I found that the vast majority of them were physically leaking. I ended up replacing the lot in the VCR section. Imagine the problems that this will cause if the trouble is widespread, with electrolyte leaking all over the densely packed PCBs. And they smell awful when you heat the area with an iron! N.B.

Sanyo VMD6P

This camcorder came to me from Australia (some reputation, eh?). The problem was that a cassette was jammed inside and the loading motor could be heard running. When I dismantled the unit (watch the plugs and sockets which connect the assemblies to the cases) I found that two out of the four loading gears mounted on the loading motor bracket had damaged or missing teeth. A new set of four gears was fitted. I’ve since had several others in with the same problem. N.B.
Last month we saw how the transmitted signal is converted by the tuner to a constant, lower intermediate frequency. The next step is to demodulate this signal in order to recover the original “baseband” sound and vision signals.

The purpose of the filtering and selectivity incorporated in the tuner is mainly to avoid interference and spurious effects arising from the use of the superhet technique — there would be no need for image and n ± 4 rejectors if there were no local oscillator signal for these transmissions to beat with. The receiver’s main selectivity and bandpass characteristics are provided after the tuner, in the form of an i.f. filter that has a well-defined and closely-specified response curve. The response curve is especially critical with terrestrial transmissions because one of the sidebands is severely curtailed to save precious spectrum space in the broadcast bands. Vestigial sideband (v.s.b.) transmission is universal with a.m. broadcast TV.

The IF Filter

The required i.f. filter bandpass characteristics can be provided by using a fairly complex combination of L, C and R elements, either in the form of a “lumped” circuit block or by spreading the necessary acceptors, rejectors and traps throughout an i.f. amplifier that consists of several discrete component stages. These were the techniques used prior to the advent of the SAW (surface acoustic wave) filter. Aligning such an i.f. amplifier is now largely a lost art, like setting up the convergence with a delta-gun tube. Modern sets all use a SAW filter: it provides the required band shaping without any need for adjustment, setting up or operating power, can be mass produced, and comes in a tiny, cheap package.

The construction and operating principle of a SAW filter is shown in Fig. 1. The substrate consists of a slice of piezoelectric material similar to that used in a ceramic filter. A transducer printed on one end converts the incoming electrical signal into an acoustic one. This mechanical vibration is propagated across the surface of the substrate like the ripples in a pond. Some of this mechanical energy is intercepted by a second transducer at the output end, being recovered in the process to an electrical signal. Maximum output is obtained when the pitch of the comb-like transducer electrodes matches the half wavelength of the acoustic surface wave. As the input frequency varies so the efficiency of the SAW coupling varies, giving peaks and troughs in the response — a bandpass characteristic. Dampers prevent reflection of the acoustic waves at each end.

Response Curve

The most important characteristic of a SAW filter is its response curve. Fig. 2 shows a typical one for system I. The main passband is about 6MHz wide, centred on 36MHz and providing at least 40dB of rejection to signals outside the passband — in practice these consist of adjacent channel transmissions that pass easily through the relatively broadband tuner.

The crucial points in the response curve are noted in Fig. 2, the main one being the placement of the vision carrier (39.5MHz) 6dB below the peak of the response. With a v.s.b. transmission the lower sideband of the vision r.f. signal is largely suppressed at the transmitter, causing an imbalance in the modulation energy received: with video signals up to 1.25MHz there are two sidebands while for the higher transmitted video frequencies, corresponding with the fine picture detail, there is only one sideband. If this “lop-sided” spectrum was presented to the vision demodulator the low-frequency luminance components would be emphasised in its output to the detriment of the picture. The falling response of the i.f. filter at frequencies above the 39.5MHz carrier (remember the sideband mirroring effect introduced by the superhet system) balances the signal energy fed to the demodulator and equalises the frequency response of the system as a whole.

Another critical frequency is that of the sound carrier, 33.5MHz with system I. As Fig. 2 shows, the response at this frequency is about 20dB down from the peak level. This ensures that the sound carrier is too weak to cause mischief by beating with the chroma subcarrier at 35.1MHz — otherwise there would be coarse patterning on the picture at 1-6MHz and that the sound carrier is always below the level of the vision signal, whose negative-going amplitude modulation takes it to a very low point on picture highlights. So long as this condition is fulfilled there is no significant amplitude (i.e. vision) modulation of the intercarrier sound signal (see later), which is extracted as a beat product of the vision demodulator. Frequency modulation is used for the audio signal, and to prevent it being amplitude modulated by the vision it sits on a little “shelf” at one side of the SAWF’s response curve.

The other two frequency markers on the curve shown in Fig. 2 are at the rejection notches for the main out-of-band carriers anticipated: adjacent channel vision at 31.5MHz and adjacent channel sound at 41.5MHz. These are both attenuated by about 55dB. Don’t be mislead by the logarithmic

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**Fig. 1: Internal construction of a SAW filter.**

**Fig. 2: SAWF response curve for system I.**
scale (dB): 55dB represents about 500:1 and the 20dB sound carrier point about 10:1. The insertion loss of the SAWF is about 20dB, so that 0dB in Fig. 2 can be taken as –20dB in the overall scheme of things. This loss is made up by the i.f. amplifier’s gain.

**Group Delay**

Any circuit through which a modulated vision carrier passes, especially one that provides selectivity, must have a reasonably linear phase response: any phase change that occurs with the signal sidebands should be proportional to the frequency deviation from the carrier, so that all signal components, regardless of frequency, arrive at the demodulator simultaneously. Time errors greater than 100nsec cause visible preshoots or overshoots on the picture. Errors much smaller than this upset teletext decoding.

Group delay characteristics are specified by the broadcasting authorities for each transmission system and are built into the SAWF.

**Dual SAWFs**

In sets that incorporate a Nicam decoder special attention is given to the phase-modulated Nicam sound carrier, which with system I is spaced at 6-552MHz from the vision carrier, representing an i.f. of 32-948MHz. For this purpose a special “quasi-parallel” SAWF is available: it has one input transducer and separate output transducers for the vision and sound carriers. The vision channel response curve differs from the standard type in that it falls steeply in the region of the sound carriers. In the sound channel there are two quite narrow response curves: one embraces both sound carriers and is centred on 33-2MHz, the other one being sharply tuned to 33-95MHz. We’ll return to this when we come to the sound circuits.

**IF Amplifier**

The vision i.f. amplifier itself is a very straightforward wideband amplifier that generally works with a balanced (push-pull) input from the SAWF. It has high gain, typically 60dB over three or four stages, the gain being controllable over a wide range by automatic gain control (a.g.c.). The latter is based on detection of the amplitude of the demodulated sync pulse tips since these represent maximum carrier power (with negative-going vision modulation peak white represents minimum carrier amplitude and the sync tips maximum carrier amplitude). The a.g.c. loop ensures that changes in the r.f. signal level affect only the noise content of the picture, not the contrast.

The i.f. amplifier’s output is balanced. It goes three separate ways, as shown in Fig. 3: to a synchronous demodulator, to a carrier reference signal generator and to an a.f.c. demodulator.

**The Synchronous Vision Demodulator**

Synchronous demodulators work on the principle of closing a switch once per carrier cycle and storing the signal sample thus obtained in a reservoir. This is the sample-and-hold principle much used in analogue electronics. In practice because a balanced input is applied to the detector there are two switches which are closed on alternate half cycles of the carrier, giving full-wave signal demodulation.

We need a reference pulse train to control the switches. It’s derived from a “tank” coil that’s tuned to the 39-5MHz carrier frequency and is driven by an amplitude-limited sample of the signal: the limiting ensures that the phase and amplitude of the reference signal thus generated are unaffected by the modulation itself. Squaring the 39-5MHz sinewave produced by the tank coil produces the required switch control pulses.

The smoothed outputs from the switches represent the recovered baseband video signal complete with the chroma information and, where applicable, the 6MHz intercarrier sound signal.

**AFC**

For automatic frequency control (a.f.c.) a d.c. voltage that’s proportional to any tuning drift is required. It can then be added to the varicap bias voltage applied to the tuner to produce the necessary correction. Tuning is exactly right when the vision carrier is spot on at 39-5MHz. The a.f.c. voltage is obtained from a second synchronous demodulator whose reference signal input is in quadrature with that applied to the vision synchronous demodulator, i.e. there’s a 90° phase difference, equal to a quarter cycle of the carrier.
between the two reference signals. It’s generated by a
second LC tuned circuit.

Because of this 90° phase shift the a.f.c. demodulator’s
switches should close when the vision carrier is passing
through zero. Any difference from zero represents a tuning
drift. As the carrier frequency departs from 39.5MHz
because of tuning drift, the a.f.c. demodulator produces an
output that indicates by its polarity the direction of drift and
by its amplitude the degree of drift. This output is fed back
to the tuner’s varicap control system to provide the required
correction.

Because of the very stable broadcast carriers a.f.c. is not
required with frequency-synthesis tuning. It’s used with
satellite TV systems to compensate for slight LNB local
oscillator drift. A.F.C. is particularly helpful where the r.f.
signal comes from the modulator in a VCR, computer or a
video games system: in such cases drift is a real possibility.

**RF AGC**

As the TV set’s input signal steadily increases the i.f.
gain is reduced to compensate. Initially the gain of the r.f.
amplifier in the tuner is held at maximum, minimising the
receiver’s noise level. When the i.f. a.g.c. voltage exceeds a
preset level, corresponding to an r.f. input signal level of 2-
3mV, a control voltage is produced for the tuner and is
converted to a reducing current for the pin diode attenuator
inside the tuner (see last month). This is done to prevent
the risk of cross-modulation in the tuner’s r.f. amplifier, some-
thing that can occur when the stage is overloaded. The
receiver’s noise level is irrelevant when such a high signal
input is present.

**Typical IF Chip**

Let’s tie up this section by taking a look at the operation
of a typical commercial i.f./demodulator chip, see
Fig. 4. The balanced output from the SAWF is applied to
pins 1 and 16, where it’s fed to a three-stage amplifier with
over 60dB of a.g.c. To maintain the best signal-to-noise
ratio the a.g.c. is applied sequentially, starting with the final
(pre-demodulator) stage where the signal amplitude is
largest. The capacitor between pins 2 and 15 decouples the
d.c. feedback loop within the chip.

The LC circuit connected to pins 8 and 9 forms a tuned
load for the reference signal amplifier, which feeds
switching signals to the synchronous demodulator. The
a.f.c. synchronous demodulator is tuned to the carrier
frequency by the LC circuit between pins 7 and 10. Its
output at pin 5 forms a high-impedance current source that’s
converted to a control voltage by an external resistor.

The differential outputs from the vision demodulator are
converted by the video preamplifier to a positive-going
composite video output at about 2.5V peak-to-peak. This
buffered output appears at pin 12. A white-spot inverter
operates with the video preamplifier: it takes over-modula-
tion (noise) spikes and clamps them at mid-grey level:
because of the high selectivity of the carrier reference
circuit this type of synchronous vision demodulator is
particularly sensitive to pulse and spike interference.

Further feeds from the video preamplifier go to the a.g.c.
detector. An important item here is the noise
inverter/protection circuit which limits the video signal
amplitude in the presence of noise, preventing false a.g.c.
action when impulsive interference is present. The capacitor
connected to pin 14 is the a.g.c. reservoir capacitor: the
parallel RC network provides critical damping of the a.g.c.
loop. The tuner a.g.c. output is produced at pin 4, the onset
of its action being governed by the voltage applied to pin 3.

**FM Vision Demodulator**

Frequency modulation is used for the vision signal with
satellite TV transmissions. The i.f. and demodulator circuits
are broadly similar to those we’ve been considering with the
following main differences: first the SAWF has a broad
response, about 27MHz, with a centre i.f. of typically
480MHz (see Fig. 5); secondly the vision demodulator is an
f.m. type that’s immune to amplitude and pulse modulation
once the input signal level exceeds a certain threshold. Most
vision f.m. demodulators use the phase-locked loop (PLL)
principle – see block diagram shown in Fig. 6.

The principle of the PLL demodulator is simple. A linear
voltage-controlled oscillator (VCO) free-runs at the second

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*Fig. 4: Internal arrangement of a typical vision i.f./demodulator chip with major peripheral components.*
POWER SUPPLY

The power supply is the heart of any receiver and is where most of the breakdowns usually occur. On the primary side the SOPS circuit is similar to that used in the 2A chassis (see December 1992 issue of *Television*) – the same fault-finding procedure can be adopted. The component reference numbers are different however, and the modifications don’t apply (they are already incorporated). The circuit is shown in Fig. 1.

If the BUT11AF chopper transistor Tr7677 has failed Philips recommend that D6674 in its base circuit should be changed to type BYD33J. I also change D6675, fitting a BYD33J here as well. Also check transistors Tr7673 and Tr7674 and the associated diodes.

C2679 can go short-circuit and in this event usually takes D6679 with it. Use a good-quality 1nF capacitor rated at 2kV as a replacement. If a set comes in with many faulty components in the power supply pay attention to the chopper transformer T5763 which suffers from dry-joints. These should be dealt with as a matter of course. Occasionally the transformer itself can fail.

Once all suspect components have been replaced, disconnect the line output stage from the power supply by unplugging connector M6, which is by the line output transformer. Connect a dummy load (60W bulb) across the h.t. reservoir and slowly increase the voltage fed to the set. At around 70V the lamp should start to glow. Slowly advance the input to about 100V while watching the meter. With this input the meter should read 95V and the reading should not change to about 100V while watching the meter. With this input the VCO which thus faithfully tracks the vision carrier deviations. As a result the error voltage, after suitable low-pass filtering, is a facsimile of the modulating signal, i.e. the video waveform complete with the sound carriers and, where applicable, the teletext data.

Any fixed-level intervals in the video signal (porches, sync pulses, peak-white captions etc.) produce spot frequencies in the f.m. vision channel. These could cause interference to other services. To prevent this the carrier is kept on the move, frequency wise, by adding an energy-dispersal waveform to the video signal before modulation. It takes the form of a triangular wave that’s locked to the field scanning rate. Thus the whole video waveform sits on a ramp. So the first post-demodulator process required is to clamp the video signal to a fixed voltage once per TV line to prevent shading effects from the top to the bottom of the picture.

Integration

The i.f./demodulator arrangement shown in Fig. 4 is nowadays often incorporated in a large “jungle” chip along with the sound i.f. demodulator, the line and field timebase generators and/or the colour decoder. Similarly in a satellite TV receiver the i.f. and vision f.m. demodulator chip is incorporated in a complete screened module that contains the tuner: the downlead from the LNB is connected to one end, the baseband video signal emerging at the other. Tuning instructions are fed to pins somewhere around the middle! Manufacturers treat it as a black box, the internal details of which are seldom given in service literature.

The Philips CP90 chassis first appeared in 1987. There were versions to drive small and larger-screen tubes, with and without remote control and also with or without teletext. Most of the circuitry is on one main panel, the exceptions being the plug-in teletext board and the soldered-in i.f./sync module. Tuning, volume, brightness, colour and remote control are handled by a single microcomputer chip whose type varies with the features incorporated in the particular model.

The following servicing notes are intended to be used in conjunction with the official Philips circuit diagrams (code numbers 4822 727 15737 and 4822 727 15968). Particular attention is paid to the SOPS (chopper) type power supply and the control section: the rest of the circuitry follows conventional lines.

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output stage.

There's some interesting circuitry concerned with the standby function on the secondary side of the SOPS transformer. Overvoltage protection is provided by thyristor Ty6726 in conjunction with the four zener diodes that are connected to its gate. These diodes will conduct should an overvoltage condition occur, firing the thyristor and shutting down the power supply. It follows that if any of these diodes should fail the power supply will shut down. It's thus worth checking them if the set won't start up.

When the standby command is given the microcomputer chip switches on Tr7727 and D6727. Thyristor Ty6726 will then conduct, acting as a rectifier. As a result the voltage at pin 10 of the SOPS transformer rises from 8.5V to around 11.5V. This voltage is fed to Tr7730 to maintain the 6V supply to the microcomputer chip and to D6730 to supply the optocoupler and the error detector transistors Tr7701/2.

The 11.5V also increases the base bias applied to Tr7702. Thus the light output within the optocoupler is increased and the feedback to Tr7673/4 cuts off the chopper transistor Tr7677 for a longer period. All other outputs from the SOPS transformer then fall to well below their normal level.

In normal operation a pulse from pin 3 of the line output transformer is fed to D6733 which produces the 8.5V supply across C2703. This is fed to Tr7730 to provide the 6V rail.

A problem that sometimes occurred with early remote control sets consisted of a buzz in the standby mode. Its cause was the fact that the 22V supply to the audio output stage didn't fall sufficiently because of incorrect switching of thyristor Ty6726 which, in this event, should be replaced.

### Line Output Stage and EW Correction

These sections of the receiver are conventional. The only components that may cause problems are C2619 (1.5nF) and C2610 (8.2nF). Failure of either of these may result in the demise of the BUTT1AF line output transistor Tr7769. Fit a good-quality 2kV capacitor as a replacement. C2495 (33nF) going open-circuit will affect the beam limiter, the result being low contrast. It's good practice to resolder the connections to the line output and driver transformers which both seem to suffer quite badly from dry-joints.

### Sync/IF Module

This module provides line and field drive outputs, also transmission identification and sandcastle pulse outputs. It's not considered to be serviceable, a complete unit being available from Philips. If the can is opened however you'll find that standard components are used, so some repairs can be carried out. In practice because of the awkwardness of repairing the module in situ and the labour involved it's probably cheaper to replace the complete unit.

When checking for loss of line drive first make sure that the 22V start-up voltage from the power supply is present at pin 12. If not, check F1690 (400mAAT). If this has blown the
audio output chip could be faulty – this is also supplied by the 22V rail. During normal running the module receives a 13V supply at pin 8. This is derived from the line output transformer.

The Control Circuit

The microcomputer chip used in remote control sets is a Toshiba type TMP47C432. It’s fairly well known that this suffered from static problems – replacements are now supplied with a metal shield. It’s very important when replacing this chip to check the programme code stamped on the device. With a non-text or standard text set the correct type must be fitted – failure to do this will result in no text at all. The Philips part number for this chip is 8189. Either type can be fitted to a non-text set, but programme code is 8188. With a Fastext set the programme code is 8190. An extra 1N4148 diode added between pins 36 and 38 of IC7840 provides a high impedance path to the back-up battery. With non-remote control versions the microcomputer chip is able to give simple error codes should a fault develop within the control system. A list of these codes is given at the back of the service manual.

Other Circuits

The other main items on the PCB are the TDA3561A colour decoder chip, the TDA8190 intercarrier sound/audio output chip and the BD939F field output transistors Tr7571/Tr7573. These circuits are conventional. A problem with early receivers was buzz on sound. It was cured by fitting 6MHz ceramic filter modification kit part number 4822 3J0 27563. Intermittent loss of sound can be caused by a faulty headphone socket.

The RGB output stages and blanking are on the c.r.t. base. If the problem is intermittent colours, check for dry-joints here.

Non-remote Control Versions

With non-remote control versions the power supply is much simplified. The standby circuitry and the 6V supply rail are deleted and only one transistor, Tr7701, acts as error detector and optocoupler driver. The microcomputer control chip is type HA11484. It performs only the tuning operation, volume, brightness, colour and contrast being set by ordinary controls. Some models are not equipped with thumbwheel control of interpolation is available occupying only a small board area and requiring little technology to provide a high-quality 405-line picture while occupying only a small board area and requiring little power. There are up to eight selectable interpolation methods – the interpolation can be switched off to show its effect. A frame freeze facility is included. VHS replays are stable, and a circuit and EPROM programming information are available. The converter is available in two forms. As a PCB with BNC input and output connectors and DIL switches for freeze frame and interpolation selection at £249. A regulated 8V supply at 300mA is required. Alternatively the boxed version with power supply and thumbwheel control of interpolation is available at £299.
The Las Vegas Consumer Electronics Show

George Cole

This year's January Consumer Electronics Show (CES) at Las Vegas was the largest ever, reflecting the efforts by the international consumer electronics industry to come up with new products that will revive the market. While some of the products on display, such as Panasonic's electronic budget and cheque writer, were of mainly novelty interest, there was much of significance to see in such fields as multimedia and video systems. Over 1,700 exhibitors took part and the displays in the various hotels and exhibition halls covered around 905,000 square feet.

Interactive Multimedia

Many computer, video and games companies believe that the days of the TV couch potato are numbered. They claim that people want to be more actively engaged when watching the television screen. As a result a plethora of multimedia systems that allow users to interact with the TV display were on show.

Existing home multimedia systems are CD based – the discs store photographs, video, graphics, text and animation as well as sound. Users can decide what information on the disc they want to see and hear. The Philips' Compact Disc Interactive (CD-I), Kodak Photo CD and Commodore CDTV are examples. Several more interactive systems were revealed at the CES, including one developed by 3DO, a consortium of companies that includes Matsushita (Panasonic), Time Warner, AT&T and Electronic Arts.

3DO aims to establish an international standard for home multimedia – its strategy is based on JVC's success in making VHS the world standard for home video. 3DO itself will not be producing either hardware or software, though some of the member companies will. Instead it will license the technology. Hardware companies won't have to pay for the licence to produce 3DO equipment (though 3DO will presumably ensure that all products are up to standard). In some cases 3DO will pay towards engineering and marketing costs. An $8,000 developer's kit contains various production tools. Software companies will be charged around $3 for every disc distributed.

3DO Hardware

3DO showed an interactive multiplayer (IM) produced by Panasonic. It uses a 32-bit ARM60 RISC (reduced instruction set – computer) processor which was developed by a consortium that includes Acorn Computers, Apple and VLSI Technology. This provides far more processing power than the 16-bit processors used in the current generation of CD-I and CDTV players. The IM also has two custom built graphics animation processors that are claimed to be fifty times faster than existing PC and video games machines. There are chips for video processing, digital sound and data flow, twenty four direct memory access (DMA) channels and a memory management unit to allow fast data interchange. The machine uses a multi-task operating system known as Opera, and has a double-speed CD-ROM drive for faster access time and data transfer, doubling the transfer rate from the standard CD 150kbytes/sec to 300kbytes/sec.

The IM provides full-screen, full-motion video at 30 frames/sec (the US standard), though the first players will use a software-based compression system called Compact Video – this is another name for Apple's QuickTime 1.5, which enables Apple computers to play digital video clips and sound. Later machines will have an MPEG-based full-motion video plug-in cartridge.

It's also possible to feed in an analogue video signal, digitise and manipulate it, then convert it back to analogue form for copying on to tape. No details of how this is done have been released. The IM plays audio, Photo and Interactive CDs.

The IM demonstrations were very impressive, with plenty of fast graphics and clever animation, but most of these were from a hard disc that ran on a powerful Apple computer. There were also problems when running Photo CDs.

Launch Plans

Around eighty software developers now support 3DO. The company says that the first IM will go on sale in the USA this autumn, priced at the equivalent of around £470. This seems to be a rather optimistic time scale however in view of the development work that still has to be done. The system certainly won't reach Europe until well into next year at the earliest. Even so the arrival of 3DO must concern Philips, which is still trying to establish CD-I as the world standard home multimedia system. The next eighteen months or so should be very interesting.

LaserActive

Pioneer, Sega and NEC showed a hybrid system called LaserActive. It's a cross between CD-ROM, CD-I and the LaserDisc. Up to 540Mbytes of data plus an hour of full-motion analogue video with f.m. stereo sound are stored on a 12in. disc. Pioneer says that the system has several advantages over CD-based systems, including better quality video. While systems like CD-I divide their 540Mbytes of...
Virtual Vision's Sport personal projection TV system.

data between an interactive program and the sound, pictures, text and graphics, the LaserActive disc can use its 540Mbytes of data storage for interactive purposes alone, the picture and sound storage being separate.

A CD-I disc can store around 7,000 photographic images without sound while a LaserActive disc can hold 108,000 images plus an hour of sound – in addition to the interactive data program. The digital data is stored at the I.f. end of the recorded bandwidth, followed by the two stereo sound channels and the analogue video as the frequency rises (the bandwidth is 0-14MHz).

In many ways the LaserActive disc is an extension of the LaserDisc digital audio system used in the NTSC areas of the world. This adds pulse-code modulated digital sound to analogue sound and pictures.

The LaserActive player is a massive machine weighing 19.81b. It plays a wide range of optical discs. The basic player handles 3in. and 5in. audio CD and CDV discs and 8 and 12in. LaserDiscs. There are three optional packs:

1. The Mega LD pack plays LaserActive Mega-LD discs, CLV and CAV discs, and enables the user to play Sega's 16-bit games cartridges and CD-ROMs.

2. The LD-ROM pack plays 8in. and 12in. LaserActive LD-ROM discs, CD plus graphics discs, also NEC's Turbo graphics games CD-ROM discs etc.

3. The karaoke pack plays karaoke laser discs.

LaserActive is due to be launched in Japan this summer. The first player will cost the Japanese equivalent of £470. It plays a wide range of optical discs. The basic player handles 3in. and 5in. audio CD and CDV discs and 8 and 12in. LaserDiscs. There are three optional packs:

Vis

Tandy's video information system (VIS) was launched in the USA last November. The first VIS player, the Memorex MD2500, plugs into a domestic TV set and stereo system and is operated via a remote control handset. VIS discs store a mixture of text, sound and pictures, but there's no full-motion video. The operating system is called Modular Windows – it's a variant on the Microsoft Windows 3-1 system. VIS machines won't play Windows software however.

The advantage of using Modular Windows is that it's cheaper and easier for software companies to develop material for VIS as well as Windows. Tandy says that some of the first VIS titles were created using a low-end 286 PC!

The VIS deck plays audio CDs and VIS discs and includes an EEPROM cartridge for saving games points and information. The MD2500 has r.f., phono composite video and S terminals, a headphone jack, phono audio output sockets and a DIN connector for a wired remote control handset. Video resolution ranges from 320 x 200 to 640 x 400 pixels. There are at present around fifty VIS titles, mostly children's programmes, electronic encyclopaedias and how-to discs. The VIS player costs the equivalent of around £467 in the USA – again no decision has been taken on a possible UK launch.

CD-I FMV

Motorola showed its full-motion video (FMV) cartridge for the CD-I system. It was a pre-production type that stuck out from the back of the CD-I player – the production version will be flush mounted. The chip set used in the cartridge is known as the MCD250 MPEG full-motion video decoder. It decodes at up to 5Mbits/sec, with 10Mbits/sec transfer rates, and provides refresh for 4Mbytes of video DRAM. It can also convert video sequences between PAL and NTSC. There are five display modes – play, still frame, frame advance, slow motion and scan, the output being in digital RGB form with 24-bit colour.

Motorola has also developed the MCD210 video decoder and system controller which can decode and display two channels of video graphics simultaneously, and the MV44200 triple eight-bit video DA converter.

Video

Virtual Vision's Sport, a personal projection TV system, attracted the crowds. It lets users watch large-screen TV images through a pair of lightweight eyeglasses. The system is based on the "head-up" technology used by fighter pilots. Sport consists of a pair of glasses with built-in stereo earphones: weight is just 140g. There's a wire link between the glasses and a belt pack that weighs 1kg. This pack includes a TV tuner with a 15in, retractable aerial and a Nicad battery that provides a playing time of around three hours. Video and stereo sound input sockets are provided so that signals can be fed in from a VCR, camcorder or other video source. There's also an optional radio link.

The system works in the following way. The user watches the image through his/her dominant eye. Virtual Vision says that the other eye can be closed, because the brain gives priority to the image viewed by one's dominant eye, though the image will seem to appear in front of both eyes. The display device inside the glasses is a thumbnail sized active-matrix colour LCD. A reflective lens which bounces the image from the video display so that it appears to be focused 8-15ft away – the company refers to this as a virtual image – is mounted just below the dominant eye's normal field of vision.

I tried the eyeglasses and watched images from a camcorder. The results were rather disappointing, with low-resolution images and poorly-focused pictures. The idea is a good one but more work needs to be done to improve the system. Sport goes on sale in the USA later this year at the equivalent of around £600.

Mitsubishi showed a more conventional TV receiver, though the CS40FX1 at the equivalent of around £3,333 is no ordinary set. It is the world's first mass-produced 40in. model, whose features include twin speakers, a remote control operated graphic equaliser, PIP and on-screen programming. The CS40FX1 has a specially designed scandium-oxide tube and weighs 265lb. Sharp's VLHL100U is a Hi-8 camcorder with a 4in.

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TELEVISION MARCH 1993
colour LCD screen whose variable-angle rotation system enables the monitor and lens to be rotated for shooting at various angles. The monitor can even be swivelled through 180°, allowing the user to record himself using an infra-red controller. Other features include a x8 zoom, hi-fi stereo sound, digital picture effects including snapshot and strobe, a digital image stabiliser system and "neuro" auto-exposure. The latter is claimed to work better than conventional auto-exposure systems. Size of the VLHL100U is 7.8 x 3 x 5.8-in., weight 1.9lb. Price is the equivalent of around £1,466.

Test Case 363

Now is the winter of our discontent in the Test Case workshop. We are surrounded, dominated and bunged up solid with TV sets that won’t go wrong: a Ferguson with a blue picture once in a green moon; a B and O with a sound crackle that no one’s ever heard; a triple-bounced Tatung picture once in a green moon; a...
There’s an oddity about the signal from the transponder used by UK Gold. I wouldn’t like to say whether it’s just plain weak or whether it has an odd offset, but ever since the clamour to get customers tuned in to this very popular channel I’ve had no end of complaints about poor signals in relation to those from other Astra 1B transponders. All the installations concerned have had problems – low-gain or high-noise LNBs, or dishes slightly off beam – but nonetheless UK Gold has looked much worse than the other channels. I’ve seen cases where Tele 5, the next channel down with the same polarisation, has been slightly sparkly but UK Gold has been CCIR grade 2 or worse! Has anyone else noticed this?

Sparkly Signals

I’ve had a number of installations in the last few weeks where the higher Astra 1B channels have been very sparkly – all the 1A channels have looked fine and the lower 1B channels have been passable. The fact is that the problem has always been present, but with the launch of UK Gold it’s now one of which the customer is aware.

Noisy LNBs

In most cases the complaints have been with older systems where the receiver threshold is not good – the B and OSAT LX and RX for example (not the current, superb SAT LM). Despite the use of a Fuba 85cm dish with electromagnetic polarisation and a 1.3dB maximum noise figure LNB there are problems. Is it perhaps that the Fuba LNBs were chosen on the basis of their I.f. noise performance, or is it that they’ve all become noisy? Installing an 0.8dB noise figure LNB has in every case cleared the trouble. I’ve made a point of measuring the output level, which in each case was O.K. – 86dBu, as specified on the case of the LNB. These have been the main systems that have given us this trouble, but I’ve also had problems with a couple of Salora installations. With these the problem has been cleared by using a 1.1dB LNB as rebuilt by MCES.

Manhattan LNBs

I’ve recently been introduced to the Manhattan LNB by the local (Exeter) branch of Eurosat. This device was suggested when I was specifying a fixed system for use with the Eutelsat II F2 satellite. I selected the 0.8dB version and the installer was, to say the least, enthusiastic about the results – I was too when I checked them. The LNB has better performance than the 0.8dB Sharp unit I’ve been using with the same kit for motorised installations.

I took advantage of this experience when dealing with the previously mentioned problem of LNBs with noisy I.f. performance. The results obtained are excellent, and the price of the unit isn’t bad either – £59 plus VAT trade for the 0.8dB version, £69 for the 0.7dB version. On the specification sheets so far, the 0.8dB types have had a figure of 0.7dB at the top of the band, with 0.8dB only at 10.95GHz.

Progress

LNB technology really is amazing. I remember only a few years ago being impressed by the first LNB I came across with a noise figure of less than 2dB!

Teleclub

I note that the encryption used by the Swiss/German pay TV film channel Teleclub (der kino kanal) has been changed to Nagravision, as used by Premiere. We get quite a few enquiries about decoders for this service, possibly because of the pornography content. It’s interesting that with the previous encryption system you could get a pretty good idea of what was going on when certain Sony TV sets were used with the colour turned up. So I’m told, anyway!!

Customer Difficulties

Whilst on the subject of scrambling, a recent incident comes to mind. A call came in that a customer, known to be troublesome, had lost tuning on a number of channels. His receiver is a Ferguson SRV1. There were several possibilities – loss of one polarisation due to a receiver or LNB failure, loss of Videocrypt channels due to the connector, trouble from the capacitor in the tuner, etc.

There was a suspicious note at the bottom of the card however – the customer complained that he’d never had an instruction book. As he’d had the system for over two years this seemed odd to say the least, especially as we make sure that all customers have an instruction book – which they invariably lose. He’d not said anything the previous week when I’d called because of a complaint that his system was “dead”, only to find that he’d dropped the handset and put the batteries back the wrong way round!

Having created a scene in the shop when he booked the call he repeated the performance when I called at the house. On checking through the channels I found that they were all tuned in, and told him so. He then started reading channel numbers from a list, saying that they weren’t tuned in, No. 3 for instance. We went there and found scrambled Sky Movies. He didn’t have a subscription to any channel, so I explained the situation – that the channel was tuned in but as he’d not paid a subscription he couldn’t get a picture.

“Well I’m not paying you any money until you tune it up!”

I then went through the 32 channels, one by one, explaining what was what and why. He insisted that what his neighbour had told him was true, that we were conning him by not tuning in channels.

Later that afternoon his neighbour appeared in the shop, wanting to know why his poor, elderly neighbour had been fobbed off and was being treated so badly by us. I had to go over everything with a display receiver and answer his questions. In the end he thanked me and even asked about a problem with his own set.

The Sadelta TC90 SSM

We’ve recently purchased another signal-strength meter for satellite TV service work. It seemed sensible to have one that included the TV/f.m. and CATV bands, and the Sadelta TC90 appeared to fit the bill well. After enquiries with several suppliers we eventually obtained one from BK Elec-
tronics, Southend.

The meter is well presented, in a black carrying case, though the poorly written or translated instruction book is a bit of a let down. It has built-in rechargeable lead-acid batteries, so you can top them up. The ranges are standard, from v.h.f. radio 45-110MHz to satellite TV at 950-1,750MHz (first i.f.). Satellite signals can be measured in the range -70dBm to -10dBm, v.h.f. and u.h.f. signals from 20µV to 3V. The monitor loudspeaker can be used on the latter bands for station identification etc.

The unit can power an LNB. There’s an audible finder tone that can be very helpful in avoiding the need to look at the meter when searching. Also ideal for searching the latter bands for station identification etc.

The meter scale is easy to read. A correction chart is provided to compensate for tuner nonlinearity – its use should not be overlooked. During the few weeks that I have been using the unit I’ve been well impressed with it and would recommend it without hesitation. It has been a hit in the workshop and a local installer/engineer is keen to get one. BK Electronics, Units 1 and 5, Southend-on-Sea, Essex SS2 6TR can supply it at £499.80 plus VAT.

**Correction**

There was an error in the last Satellite Notebook (January). Under the heading Ferguson SRV1/Pace SS9000 the RS part number for the 2.2µF electrolytic should have been quoted as 108-081, not 116-830. The latter will do but the former, being a higher thermal stability device (>105%), is preferable.

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**Reports from Mike Leach, Nick Beer and Philip Blundell, AMIEE**

**Crown CD80R**

There were several faults listed on the job ticket. First, that the machine would only intermittently read the TOC. Then, that when it finally did read the disc the left and right channels would go off independently. And finally that the machine would sometimes switch off and go back to the stop mode. We didn’t have the circuit diagram for this particular model but noticed that relay RL101 could be heard clicking during some of the fault conditions. The machine’s performance improved when this relay was changed, but the TOC readout was still intermittent. The cause of this fault was traced to dry-joints around the h.f. amplifier and decoder sections. When these had been attended to the machine worked quite well. After inspecting the main panel I’d advise anyone undertaking the repair of one of these machines to have a good solder up around the regulators as well.

M.L.

**Marantz CD54**

The customer’s complaint about this rather smart player was of intermittent no functions. I ran the machine for several minutes and found that it would eventually stop, after which none of the controls on the front panel had any effect on its operation. Several boards are mounted on the front panel. One of these has several beefy transistors on it. All were dry-jointed. They were QY05, QY06, QY07 and QY08. A good solder up restored normal operation.

M.L.

**Akai ACM370L**

A new laser assembly had been fitted to this midi system. It worked all right for several months and then started to play its old tricks again – reading discs intermittently and playing only some tracks. The customer reported that track four of some discs couldn’t be played while with some other discs the machine wouldn’t play beyond track two. It all depended on the length of the disc. The laser whistled constantly while the player tried to find a particular track. Basically there was a mechanical fault: the sled mechanism would travel only so far after which it came to a halt.

The cause of the fault was traced to a faulty rack that drives the laser assembly via a series of cogs from the loading/sled motor. It screws on to the laser assembly at two points and after some time can crack at the screw holes. As a result is becomes slightly warped and is unable to travel it’s full distance when driven slowly, i.e. in the play mode. A replacement rack cured the fault.

I don’t think that this item is listed as a spare part. The service manual shows it as item number 22 on the exploded view but I couldn’t find a part number. Presumably a whole CD mechanism assembly has to be ordered. Check with Akai. My spare part came from a scrap machine in the workshop.

M.L.

**Philips 70CD555**

For CD problems such as failure to read the TOC etc., before dismantling the set to get at the CDM2 try pressing the CD decoder board in the centre, then try again. If you are lucky the CD player will now work. Remove the decoder board and check for dry-joints on the wire links soldered to the component side – the dry-joints will be on the print side. It’s worth a try: removing the CDM2 is almost a morning’s work!

P.B.

**Toshiba Computer CD Unit**

This unit, from a local college, had no make or model markings on it though their engineer assured me that it was of Toshiba manufacture. It was a CD player, with audio outputs, and a parallel interface for use with computers.

The unit was dead and the 2AT, 20mm input fuse on the board and the one in the fuseholder accessed from the back were both black. The cause was a short-circuit bridge rectifier, which was replaced, but a hole had been blown in the side of the inrush current suppressor that’s in series with the live input to the bridge. This was found to be a 10Ω, 3A device that I was able to obtain from RS Components.

Interesting to see the far superior mechanical build quality of this unit in comparison with domestic ones – and the use of a switch-mode power supply.

N.B.
Long-distance Television

Roger Bunney

Prolonged high-pressure systems, with associated fog, produced several lengthy periods of enhanced tropospheric propagation during December and cheer to DXers. Reception included Band III and uh.f. signals from central Europe. Sporadic E reception was less than wonderful, but there was early morning F2 layer reception from the Middle East on the 20th! The collated SpE log for December is as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/12/92</td>
<td>DR (Denmark) ch. E3.</td>
</tr>
<tr>
<td>12/12/92</td>
<td>TVE (Spain) E2, 3; DR E3.</td>
</tr>
<tr>
<td>13/12/92</td>
<td>RAI (Italy) 1A; TVE E3.</td>
</tr>
<tr>
<td>14/12/92</td>
<td>NRK (Norway) E2, 3; DR E3; TVE E2, 3.</td>
</tr>
<tr>
<td>15/12/92</td>
<td>SVT (Sweden) E2, 3; NRK E2, 3; CIS R1.</td>
</tr>
<tr>
<td>19/12/92</td>
<td>TVE E2, 3.</td>
</tr>
<tr>
<td>31/12/92</td>
<td>TVE E3.</td>
</tr>
</tbody>
</table>

Luckily Roger Fussel (Torpoint) tuned across ch. E2 at 0845GMT on the 20th and logged Arabic signals. Initially there were script and appropriate dress. At 0850 there was a "shaded card" with captions, the signal fading at 0900. This was almost certainly Dubai.

Tropospheric Openings

But it was tropospheric reception that brought cheer to December. There were several openings. A minor lift on the 10th produced TVE ch. E7 in the south west. Conditions were much better on the 14/15th, when many Band III and uh.f. signals were received from Germany, Denmark and the Benelux countries. Highlights were CST (Czechoslovakia) ch. R10 and the ch. E48 UK forces SSVC outlet in Germany. After a lull there was more dramatic reception over the 21/22nd. Simon Hamer logged YLE-1 (Finland) ch. E6, a suspected Faroe Islands ch. E6 signal, TVP (Poland) ch. R8, Norwegian NRK/TV2 and Swedish SVT1/TV2 signals. The best tropospheric opening occurred on the 26th through to the 29th. This produced very intense signals from across Europe. Apart from the more usual signals from France, Germany and the Benelux countries, ORF (Austria) chs. E8 and 32, TVP (Poland) and CST (Czechoslovakia) chs. 29, 30 and 35 were noted, along with signals from Sweden and Norway.

Our thanks to Simon Hamer (Powys), Brian Williams (Penarth), Roger Fussel (Torpoint), Cyril Willis (King's Lynn), Frank Lumen (Ayr), David Oliver (Birmingham) and Dave Glenday (Arbroath) for sending in logs and reception reports.

Finally congratulations to Simon Hamer who was recently heard over the air from Radio New Zealand discussing, via a phone-in, various aspects of DXing, Radio St. Helena and the UK Christmas!

News Items

Sri Lanka: According to a press release sent to us by Bandula Gunasekera the Telshan service should now have begun, with ch. E3 and E4 transmitters operating in parallel with ch. E21 and E26 transmitters.

Portugal: Because the Angolan government allows transmission of only state-provided film the Portuguese SIC network has developed with IBM a digital compression system that enables telephone lines to be used for sending back dramatic footage from the crisis-ridden former Portuguese colony.

Poland: TV services are on the increase, with several private stations now in operation. Nowa Telewizja Warszawa is running a commercial entertainment channel that serves four million people in a forty mile radius of Warsaw.

Swaziland: There are plans for a second channel. The present service operates from 1800-2230 hours weekdays and 1600-2330 at the weekends, spilling over into South Africa and Mozambique. Fifteen per cent of the programmes are locally produced, the others being imported.

Radio Amateurs: There are now 82 50MHz band operators throughout Spain. Israel now allows Class A operators to use 50-52MHz and Class B operators to have part use of the band.

Satellite TV

UK Gold is seeking partners to start a pay-TV channel that would begin operations some time after 1994. Intelsat has realigned the main platform on the 502 satellite at 21.5° to give improved Ku band links with SNG units in Somalia.

Left: Can anyone identify this ch. R1 signal received by Ryn Muntjewerff? Centre: An unusual test pattern received via Intelsat 601 at 27.5°W. Right: An example of satellite TV reception by Andrew Sykes, Halifax, using an 80cm dish and an LNB with a 1dB noise figure.
The uplink is cross-strapped into a global C band downlink for reception by broadcasters throughout the world. Intelsat is negotiating for the launch of the first two of its new series of 8 craft by Ariane during 1996.

A new Earth station to look out for is the North Miami International Teleport, which should become operational at any time. Six dishes with sizes up to 13m will be used, operating between the Americas and Europe and the Middle East plus Africa.

China has purchased a used US Spacenet-1 C band (4GHz) satellite which is to be moved from 120°W to 115°E for communications and TV purposes. It can carry twenty four C band and twelve Ku band TV channels, though there’s doubt about whether all the transponders are still functional.

The new RTL-2 test pattern can now be received from Eutelsat II F2 at 13°E. Programme transmissions are awaited – delay has been caused by investigations being carried out by German media authorities into the operators. An Earth station for reception of European standards is being laid down for minimising interference problems, particularly from computer equipment.

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Test Report: Beckman AM12 Multimeter

David Botto

The Beckman Industrial AM12 is an analogue-type multimeter housed in an attractive high-impact shock-resistant case with a handy tilt stand. It weighs 500g including the batteries and measures 175 x 125 x 50mm. The mechanical and electrical design comply fully with the American UL1244 and VDE 0411 standards, which are tough. No design can provide complete protection against misuse of course, but Beckman state that the AM12 was designed with safety in mind.

The AM12 is not powered from the circuitry under test and incorporates recently patented developments in solid-state technology.

In my view, expressed in these columns on many occasions, the best type of multimeter for TV/video servicing is a digital one. Why then this review of an analogue meter? Because I still meet many engineers who say that they prefer to use an analogue meter. They like the positive swing of the needle. For such engineers the AM12 could well be their choice.

Basic Features

The heart of the meter is a balanced bridge circuit that uses field-effect transistors to drive the movement. An imbalance in the circuit caused by the applied test voltage unbalances the bridge, the result being that the meter movement produces a reading.

This circuitry along with the switching and other components gives the AM12 the advantage of being able to make a wide range of measurements with an extremely high input impedance - 10MΩ on all the d.c. voltage ranges except the 300mV range where it’s 3MS2.

Dual-f.e.t. circuitry and a 2A/250V fuse provide further protection against overloads. The meter is powered by three batteries, a PP3 and two pencil-type 1.5V AA batteries.

The internal construction is of a high standard, with the main components mounted on a top-quality phenolic PCB. Four recessed input test sockets on the panel provide insulation, protecting the user from shock due to accidental contact. The test leads have shrouded jacks and finger guard rings at the business end. It’s easy to overlook this sort of detail when choosing a multimeter. Bear in mind though that under certain circumstances voltages over 25V or even less can be dangerous.

A gently flashing green LED warns you that the meter is on, and a little picture shows the position of the electronic bridge zero adjustment knob. At first I thought that the LED might be distracting, but it isn’t. The advantage of the flashing light is that it catches your eye when the meter is not in use, prompting you to switch off to conserve the batteries.

The required range is selected by a positive-click, 24-position rotary switch. Although the switch contacts form part of the PCB they look as if they will stand up to repeated use. Clearly labelled d.c./ohms switch positions make range selection simple. Reading the a.c. settings is a little difficult however because of the red lettering used.

The AM12’ s jewelled-pivot 44μA meter has 4-5in. 90° arc scales. Being nicely damped, the needle is rock-steady in use. Multi-coloured range scales, an antiparallax mirror and the knife-edge pointer make it easy to read off the measured values. Large black figures on the ohms scale help to reduce eye strain when carrying out resistance measurements. The six ohms ranges give the AM12 an exceptionally wide coverage of resistances, from 0-Ω to 1,000MΩ.

Table 1 provides a brief electrical specification for the Circuitmate AM12. Table 2 lists test measurement readings made with precision standards. The readings were identical with negative d.c. voltages.

Beckman Industrial state that the rated accuracy is ±2.5 per cent on the d.c. voltage ranges and ±3-5 per cent on the a.c. voltage ranges. My tests confirmed these claims.

Table 1: Electrical specification.

D.C. voltage ranges: 0-3V, 1-2V, 12V, 30V, 120V, 300V, 1-2kV. At centre zero ±0-15V, 0-6V, 15V, 60V, 150V, 600V. Accuracy ±2-5%. Input impedance approximately 10MΩ, 3MΩ in the 0-3V range.

A.C. voltage ranges: 3V, 12V, 30V, 120V, 300V, 1-2kV r.m.s.; 8-4V, 33V, 84V, 330V, 840V, 3-3kV peak-to-peak. Accuracy ±3-5% at 50Hz, ±5% at 3MHz. Input impedance 1MΩ, 2-5MΩ in the 3V range.

Decibels: -10dB to +63dB at a.c. ranges.

Current: 0-12A a.c.; 0-1μA, 0-3mA, 3mA, 30mA, 300mA, 12A d.c.

Resistance: 0-1kΩ, 0-10kΩ, 0-100kΩ, 0-1MΩ, 0-10MΩ, 0-1,000MΩ. Accuracy ±2-5%.

Scales: Nine including one for a.c. r.m.s., two for a.c. peak-to-peak, one for ± d.c. V/A (centre null) and one for 12A a.c.

Operating temperature range: 25°C (75°F). Less than 4% additional error over the range 4°C (25°F) to 50° (130°F).
tolerance of ±2.5 per cent represents a reading of between 19.5V and 20.5V when measuring 20V d.c. The AM12 read 19.995V, which is good for an analogue meter.

The accuracy on the resistance ranges – this is extremely important for servicing work – is well within the specification of ±2.5 per cent, i.e. almost spot on. This is one of the many advantages of using an electronic multimeter instead of a mechanical type.

The peak-to-peak a.c. voltage ranges are ideal for service work. A special d.c. voltage scale allows you to set the pointer to a central null position, while the special dB scale enables you carry out dB measurements (0dB = 1mW at 600Ω).

When making d.c. voltage or current measurements a switch selects either positive or negative d.c. polarity. For a.c. or resistance measurements this switch has to be in the positive position. An auto-polarity circuit to eliminate the need for this switch would have been better – it’s not particularly difficult to include this circuitry in an electronic meter – but this would have increased the cost of the AM12.

On the Bench

The AM12 proved to be surprisingly easy to use. Its pointer didn’t drift off zero, which is a problem I’ve had with some electronic multimeters. The 30V d.c. range is excellent for checking voltages in the signal path circuits of TV sets and VCRs, its 10MΩ input impedance minimising circuit loading. The large, clear scales are a joy to read – this will be much appreciated by service engineers whose sight is not quite what it once was.

The x1 resistance range is effective for diode checks, but the ohms test voltage applied does not always allow in-circuit resistor checks.

Conclusion

Personally I’d always recommend a digital rather than an analogue meter. But if an engineer prefers to purchase an analogue meter I’d say that the Circuitmate AM12 is an excellent choice. The price is very reasonable at £41 plus VAT. The meter is available from Wavetek Ltd., Astec Building, High Street, Wollaston, Stourbridge, West Midlands DY8 4PG (0384 442 394).

My thanks to Wavetek for loan of the review instrument.

Table 2: Test measurements.

<table>
<thead>
<tr>
<th>Precision standard</th>
<th>AM12</th>
</tr>
</thead>
<tbody>
<tr>
<td>+2V d.c.</td>
<td>1.99V</td>
</tr>
<tr>
<td>+3V d.c.</td>
<td>3V</td>
</tr>
<tr>
<td>+5V d.c.</td>
<td>4.99V</td>
</tr>
<tr>
<td>+8.5V d.c.</td>
<td>8.5V</td>
</tr>
<tr>
<td>+12V d.c.</td>
<td>12V</td>
</tr>
<tr>
<td>+20V d.c.</td>
<td>19.95V</td>
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<tr>
<td>+24V d.c.</td>
<td>23.8V</td>
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<tr>
<td>18V a.c.</td>
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</tbody>
</table>

Next Month in TELEVISION

LOWDOWN ON THE IKC2 CHASSIS

The Thomson-designed IKC2 chassis has been used over the past two-three years in mid-range Ferguson Mids. J. LeJeune describes the main features, in particular the operation of the power supply, and provides fault-finding guidance - with coverage of some common breakdowns and notes on how to deal with complaints about poor audio performance.

EFFECT OF DISH SIZE

The most common complaint with Astra reception is of sparklies. To see whether increased dish size helps with this problem Ian Martin conducted experiments with a number of different types and sizes of dish.

ELECTROLYTIC CAPACITOR ESR METER

Although the capacitance value of an electrolytic capacitor may be correct an increase in its effective series resistance (ESR) will mean that it is unable to function correctly, the result being fault symptoms of various sorts depending on circuit position. Ray Porter presents a simple meter design to enable the ESR values of PCB-mounted electrolytics to be measured.

A DAY AT THE THICK END

Chris Watton on a typical day in the workshop, with an assortment of TV and video jobs.

TV SOUND SYSTEMS

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TELEVISION MARCH 1993
Repairing LED Clock Radios

Part 1

Millions of clock radios have been bought. Many of them, built down to a price, have not been reliable and find their way to the workshop soon after the guarantee expires. Because of their low retail price most shops and service departments turn them away as uneconomical to repair. Provided fault diagnosis is rapid however they can be turned around profitably. I find them a welcome break from hi-tech TV sets and VCRs.

As most of them are based on i.c. manufacturers’ recommended circuits they follow similar lines. A few extra bells and whistles are added as sales gimmicks - lights, autodimmers or musical alarms for example.

Before getting too deeply involved take a careful look at the connections and component dressing. Pay particular attention to vertically mounted resistors or diodes with bare leadouts: they can get pushed over, shorting out other components.

Power Supplies

LED clock radios that use a common-cathode display have a power supply circuit similar to that shown in Fig. 1. The mains transformer has a thermal (F) that’s embedded deep in its windings. Thus in the event of a blown fuse a complete transformer is required. The fuse can fail for no apparent reason - possible causes in such cases are shorted turns in the transformer or a faulty fuse.

Diodes and reservoir/smoothing capacitors fail with monotonous regularity. The diodes in particular are often of poor quality. They are likely to be substandard, with no maker’s marking being visible. The set may still work with a leaky or shorted diode in its power supply. A nasty situation can arise if the diode in the battery back-up circuit is faulty. The PP3 battery, if fitted, can heat up and burst with a loud bang, spewing out its contents. The thermal fuse will sometimes fail before this happens. Check for this condition by seeing whether a voltage is present at the battery connector with no battery in place. Note the 1MΩ resistor in parallel with the diode - its presence may result in erroneous readings with a high-impedance meter. No back-up is generally caused by a snapped wire at the PP3 connector.

If you fit a new transformer, run the set and note the temperature rise with your hand. As a guide, a transformer connected to the mains off load for fifteen minutes will not feel warmer than one fitted to a set on load. Any rapid temperature rise should lead to an investigation. The transformer is a safety component, so a genuine manufacturer’s spare should be used - they are seldom expensive items.

In the design shown in Fig. 1, with a two-diode full-wave rectifier circuit used to produce a negative supply, the centre-tap of the transformer provides a positive supply. Sets that incorporate a cassette deck use the more familiar bridge rectifier arrangement.

The series regulator transistor is switched on by supplying base bias from the clock chip’s snooze or alarm output via an isolating diode. The manual override comes from the function switch. A.M. only radios may not incorporate stabilisation. A very common cause of not being able to turn the radio off is the ceramic capacitor between the regulator transistor’s base and collector being leaky - use a Mylar type as a replacement. Alternatively the transistor may be short-circuit. This same capacitor can be responsible for - wait for it! - the clock ticking intermittently, waking sleepers in the early hours. Occasionally the zener diode or its decoupling capacitor will be found to have gone short-circuit, the resulting being no radio or alarm output - the same symptoms will be caused by the transistor being open-circuit. Tuning drift, especially on v.h.f., can be traced to failure of this circuit to stabilise.

The 1,000pF reservoir and smoothing capacitors tend to dry out. This gives hum problems etc. Failure of the 220μF capacitor in the clock supply will result in no or a dim, flickering display. Make sure that the voltage rating is high enough when fitting replacements. As a result of cost cutting by manufacturers, or lack of quality control, you often find 10V working components for example fitted where a 16V type would be appropriate.

If time stands still don’t blame Dr. Who. Check the small
10 nF ceramic capacitor across the 50 Hz clock feed: a scope connected across this supply should display a sinewave with the tops cut off.

The common-cathode display has been superseded by a duplexed arrangement. This runs cooler and seems to be more reliable. The power supply circuit used is similar – see Fig. 2 – but with extra diodes to feed a half cycle alternately to the display through the 220\(\Omega\) series resistors. You can quickly identify the type of display used by looking at the edge connections. With a common-cathode display nearly all the thirty plus pins will be connected to the LEDs; with the duplexed arrangement there are far fewer connections with plenty of blank pins.

**Clock Circuits**

Fig. 3 shows a typical common-cathode clock circuit. The dedicated i.c. incorporates functions that are selected by links during manufacture. Several problems can arise because links are omitted or dry-jointed. If, in the UK, the 50/60Hz link is not connected the clock will lose about a minute in every hour.

When time problems are reported I soak test the unit over several days. Locked to the 50 Hz mains supply a clock is not as accurate as a crystal circuit and may suffer from transient interference. An i.c. that gains time is rare – I have never been able to confirm a fault where this was reported. Careful questioning of a customer to discover whether the unit may have been disconnected because of a mains interruption etc. can clear up a few problems. Without mains synchronisation the on-board oscillator can gain or lose several minutes in an hour. One customer who read on the bottom of the set that it had to be disconnected when not in use pulled the plug on going to work and reconnected it on his return.

Early clock chips (LM8361, MM5387 etc.) required an external RC phase-shift oscillator running at 50 Hz to maintain operation during mains supply interruptions. A small preset potentiometer was used to set the oscillator to 50 Hz on battery back-up with the mains supply disconnected. Poor timekeeping with mains operation could often be traced to a faulty oscillator or a sync feed resistor that had gone high in value. Newer chips need no setting up and incorporate the oscillator. Without battery back-up the i.c. will produce flashes to indicate an interruption.

Clock chips that require more than one link for 12/24-hour operation give some odd displays when the links are missing or dry-jointed.

A small 0.0068\(\mu\)F Mylar capacitor connected to pin 32 of the LM8363 chip can cause faulty timing or display faults if
it or its feed resistor is faulty.

With some older clocks the life of a PP3 battery is as short as an hour. With later ones the battery will last a day or two. An interesting fault that causes short battery life occurs when a supply diode on the clock side becomes leaky, allowing the battery to light the display dimly.

**Function Faults**

Function faults occur for several reasons. Apart from the chip, which is fairly reliable, any problem relating to incorrect display functions should direct attention to the switch setting circuits. To operate any i.c. function one or more connections have to be made at the same moment.

Consider for example the alarm set mode in Fig. 3. When the alarm set push-button is pressed the associated diode is forward biased and is thus connected to the fast and slow push-buttons. A leaky diode in this position will result in the alarm set mode being selected when the time set push-button is pressed. It's a simple problem that is common with this type of set. The small ceramic capacitors connected across the set switches often leak. As a result the time runs at the wrong speed. This is one of the most common faults. Fig. 4 shows a variation on this arrangement. Pull-down diodes are used in this circuit to prevent the set buttons applying a voltage to the relevant i.c. input pins otherwise than when required. Those inputs we want to select have their associated pull-down diodes switched out by the function switch, which is often incorporated with the wavechange switch.

Several different types of set switches will be found depending on the price of the unit. Many use a PCB with the complete switchbank etched on it. Each switch has a convex, sprung metal contact that's arched over the print. The contact assembly is held in place by Sellotape, which stretches during the assembly process. After a time the tape relaxes and moves back. As a result the contacts are pulled out of registration. The buttons will then be either permanently on or will not work when pressed. When you dismantle the PCB you’ll see the problem. Clean up with contact cleaner, dry off then apply some new tape deftly, i.e. without stretching. Some of the convex contacts lose their springiness and remain down.

Switches of the rubber type can become intermittent in operation. You may find that they are either coffee impregnated or have lost their carbon faces. In the former case I clean with contact cleaner. Some ingenuity is required with the latter condition. Provided there’s no sideways movement of the button, graphite from a soft pencil rubbed on the face of the contact works. A more satisfactory repair in the event of a new part not being available is to glue a circle of foil on to the carbon face. Convenient round sections can be made by using the type of hole-punch used for ring-binding paper. It’s possible to transplant contacts from scrapped remote control units.

Leaky transistors can be a problem with functions selected by touch-sensitive plates, e.g. snooze and sleep in Fig. 3. If you use an isolation transformer you may find that the touch sensors won’t work: the hum induced when the plate is touched is insufficient to turn the transistor on. Touch plates that have been linked together by the use of wet wipe across the surface of the casing will malfunction. It will take a considerable time for the film to evaporate. The action of

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**ANSWER TO TEST CASE 363**

SEE PAGE 341

Loss of the picture in a set fitted with the TDA3562A colour decoder chip can be a very difficult fault to diagnose. It's a fine chip but it's amongst the fussiest, demanding exactly correct conditions at the sandcastle pulse input and in the RGB amplifiers, which form part of an automatic grey-scale correction feedback loop. As Television Ted said, it would shut down at the drop of a hat.

Dylan had done a good job with his tests up to the point where he ran out of ideas. Though he'd not gone deeply into the RGB amplifiers, where this sort of fault often originates (with the chip in disagreement with what it sees coming back at sampling pin 18), in this case the trouble didn't lie here either. Nor was the chip itself guilty, except that it reacted strangely to the output pin 1. There should have been 12V at this point. In fact the voltage was 13-2V, with rather more hash and ripple present than there should be on a supply line.

The supply comes from the 2SD795A series regulator transistor Q655, which receives about 14.5V from a rectifier fed from a winding on the chopper transformer. This transistor was faulty, probably leaky, a replacement restoring correct operation.

Meanwhile the soak-testing TV sets continued to behave impeccably.
insensitive touch plates can be improved by connecting the frame of the mains transformer to the negative side of the radio supply.

**Alarm Problems**

The cause of no alarm operation can be easily traced by triggering the alarm and tracing the output from the i.c. A misleading fault is where the alarm isn’t triggered or triggers for only a brief moment. Before pulling the i.c., make sure that the alarm-off mode isn’t being selected by a faulty ceramic capacitor, switch or transistor.

Some sets will trigger when time and alarm or alarm and time are brought together; others will go off only when time is brought up from behind the alarm setting. Most LCD clocks will trigger only when time is brought up from behind and is released about a minute before the alarm setting, allowing it to move on to the alarm setting by itself. Few sets will trigger unless at least an hour separates the time and alarm positions before they are brought together.

The alarm tone can be generated within the chip or externally. The rasping buzz tone comes from the alarm output. All types can be modulated with the one-second pulses used to flash the colons. Musical tunes are generated by a separate i.c. of the type often found in greetings cards.

**LED Displays**

Failure of one or more segments in a LED display calls for careful tests if lengthy removal of the i.c. or display is to be avoided. The pins are likely to be hand soldered to a ribbon cable. This gives plenty of scope for dry-joints and solder shorts to be present. PCB tracks are often of poor quality. Careful examination of the print between the ribbon and the i.c. may save a lot of time. Handle the ribbon cable with care: it’s likely to be brittle and easily broken at its joints if flexed several times.

Most displays have similar pin connections. Fig. 5 shows a common-cathode display as seen from the front with the connections facing forwards. The individual segments are numbered to correspond with the pin numbering from left to right. Where a segment fails to come on it’s useful to be able to light it in order to check whether the display or its drive is at fault. A flylead connected via a 470Ω series resistor to the Vdd supply can be used to light individual segments by touching the relevant pin.

Fig. 6 shows the connections to a duplexed type display. The first two pins a and b are common to the segments shown prefixed a and b respectively. The remaining pins are numbered 1-32 as before. As a quick check for missing segments with a display of this type short pins a and b. This should light the complete display. Thus any faulty segments will be obvious. Unlike the common-cathode type of display, combinations of segments will remain until a pin is disconnected. Should one of the supply diodes fail all the associated a or b prefixed segments will remain until.

phantom segments can be seen if the display mask isn’t tight against its PCB. Otherwise suspect a leaky latch in the i.c. Extra segments alight may be caused by short-circuited pins. Display dimming may be provided by either a switched resistor in series with the supply or a transistor and LDR (light dependent resistor). If the series resistor burns out there will be total loss of the display. A dry-jointed LDR etc. will have the same effect or alternatively the display may be dim and not vary with the ambient light.

When fitting a new display make sure that you get it the right way up: it’s very easy to wire one in back to front, especially when it’s mounted upside down.

**The Nikkai Baby 10 – A Problem Solved**

It’s a safe bet that many frustrated service engineers have one or more of these widely sold colour receivers gathering dust on the awaiting spares shelf while the 12V regulator (IC402) becomes extinct. After three months on Willow Vale’s waiting list (the situation is the same with other suppliers) I decided to look for an alternative device.

As the input voltage to IC402 is less than 14V an ordinary regulator can’t be used – because of the higher voltage drop across it (yes, you’ve discovered that too!). RS Components stocks a range of regulators with a very low voltage drop however, less than 1V. The best one for the Baby 10 is type LT1084CP-12; RS stock no. 657-943, which has a similar case to the BU508A and is rated at 5A. In theory you could use the cheaper 3A version, but with a typical current of 2.6A it runs very hot. I believe that the cooler 5A version is worth the extra cost. I also decided to abandon the PCB-mounted heatsink in favour of the larger area provided by the rear of the metal chassis frame.

If a suitable hole is drilled to the left of the line output transformer, viewed from the rear, the replacement regulator can be mounted on the inside of the frame – with the usual insulation and heatsink compound of course – then wired to the original connection points on the board. The original Nikkai replacement regulator kit included a hefty diode that has to be wired in series with the regulator’s output and mounted beneath the PCB “because the set won’t work properly without it”. The purpose of this diode is not clear to me, but I fit one anyway. Without the original heatsink there’s plenty of room to mount it above the PCB. It also has to be generously rated (a 1N5401 will fry!) – the 200V, 6A RS type 2CI-823 is suitable.

This modification has proved to be efficient, reliable, readily available and cheaper than the original Nikkai kit. It also runs cooler – and has reduced the temperature of a few customers.

Chris Avis

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**TELEVISION MARCH 1993**
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See pages 8 & 9 for details of Software for use with this machine
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<td>22793</td>
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<td>22826</td>
<td>H11J1S</td>
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<td>22835</td>
<td>MCT2</td>
<td>1000</td>
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Notes:
- A: CMOS CTRL @ 1mA
- B: GULLWING
- C: FET - NO OTHER DATA
- D: AC INPUT

K845 Mixed pack containing many of the above, plus others in quantities too small to list. 25 for £2.95

(B) (i) PHOTOTRANSISTORS, INFRA RED

<table>
<thead>
<tr>
<th>CODE</th>
<th>PART NO.</th>
<th>VOLTS D.C. (RMS)</th>
<th>CONT. NOTE</th>
<th>CODE PK 100+</th>
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<tr>
<td>22766</td>
<td>TDET8000V</td>
<td>0.3</td>
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<td>22767</td>
<td>TDET8100V</td>
<td>0.5</td>
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<td>22768</td>
<td>TDET8200K</td>
<td>2.5</td>
<td>5</td>
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<td>22769</td>
<td>TDET8300</td>
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<td>22770</td>
<td>TDET8400</td>
<td>7</td>
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<td>10</td>
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All are in T061 hermetically sealed cases.

(C) LED BLOCKS

<table>
<thead>
<tr>
<th>CODE</th>
<th>PART NO.</th>
<th>SIZE MATRIX COLOUR</th>
<th>PRICE</th>
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<tbody>
<tr>
<td>22759</td>
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<td>TFB0545C</td>
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<td>22760</td>
<td>TFB0750A</td>
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<td>22570</td>
<td>TFB0755C</td>
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<td>22761</td>
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<td>TFB0757C</td>
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<td>1.60</td>
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<td>22572</td>
<td>TFB0545A</td>
<td>5X8</td>
<td>1.60</td>
</tr>
<tr>
<td>22573</td>
<td>TFB0545C</td>
<td>5X8</td>
<td>1.60</td>
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<td>22574</td>
<td>TFB0547A</td>
<td>5X7</td>
<td>1.60</td>
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<tr>
<td>22575</td>
<td>TFB0547C</td>
<td>5X7</td>
<td>1.60</td>
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<tr>
<td>22576</td>
<td>TFB0548A</td>
<td>5X8</td>
<td>1.60</td>
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<tr>
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<td>TFB0548C</td>
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<td>TFB0549A</td>
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<td>1.60</td>
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<td>1.60</td>
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<tr>
<td>22580</td>
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<td>1.60</td>
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</table>

The suffix A, B, C to the part number indicates common anode and common cathode respectively.

(D) LCD DOT MATRIX MODULES

<table>
<thead>
<tr>
<th>CODE</th>
<th>PART NO.</th>
<th>SIZE CHAR</th>
<th>PRICE</th>
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</thead>
<tbody>
<tr>
<td>Z54801</td>
<td>TCLM16100</td>
<td>16X2</td>
<td>7.55</td>
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<tr>
<td>Z54802</td>
<td>TCLM16200</td>
<td>16X2</td>
<td>7.55</td>
</tr>
<tr>
<td>Z54803</td>
<td>TCLM16201</td>
<td>16X2</td>
<td>7.55</td>
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<tr>
<td>Z54804</td>
<td>TCLM20201</td>
<td>20X2</td>
<td>7.55</td>
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<tr>
<td>Z54805</td>
<td>TCLM20202</td>
<td>20X2</td>
<td>7.55</td>
</tr>
</tbody>
</table>

A data sheet is included in the price.

Application notes: A 16 page booklet is available £2. Order code Z0841

E2.00 order code Z0841

LED's

- Z0901 Red 5mm square, Ubin type LTI1123A. Pack of 12 £1.00; 100-1000 £0.90
- Z0902 Red 7x12.5mm rectangular by Sensor type SE8511D. Pack of 12 £1.00; 100-0.98 £1 = 0.3
- Z0903 Red 5x6mm square with red connectors by Philips type HR44DL. Pack of 12 £1.00; 100-0.28 £1 = 0.03
- Z0906 Clear infra red 4x1.5mm rectangular, Honeywell type 45DL. Pack of 5 £1.00; 100-0.16 £1 = 0.04
- Z0907 Red 5x5mm rectangular for GI, type M51732. Pack of 12 £1.00; 100 = 0.23 £1 = 0.03

Traffic Light LED modules, Plastic moulding 16x10.7mm that have 2 x 3mm LED's moulded in them. Ideal for railway modellers etc.

- Z1855 Red and Orange
- Z1856 Red and Green
- Z1857 Green and Yellow

All the same price - any mix, 10 for £2.00

K5013 Panel 7.5x2.7mm with dual 7 seg LED - red and green rect LED's. Pack of 10 £2.00

K5052 Another, this time with a dual and single 7 seg LED - red and green rect LED's. Pack of 6 £2.00

(E) OPTOCOUPLES

<table>
<thead>
<tr>
<th>CODE</th>
<th>PART NO.</th>
<th>VOLTS D.C. (RMS)</th>
<th>CONT. NOTE</th>
<th>CODE PK 100+</th>
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<tr>
<td>22774</td>
<td>CN24Y8</td>
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<td>6</td>
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<td>22775</td>
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K85 Mixed pack containing many of the above, plus others in quantities too small to list. 25 for £2.95

(F) TRIAC/SCR

<table>
<thead>
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<th>CODE</th>
<th>PART NO.</th>
<th>VOLTS D.C. (RMS)</th>
<th>CONT. NOTE</th>
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<td>TFB0545C</td>
<td>7X9</td>
<td>1.60</td>
<td></td>
</tr>
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</table>

All new, fullspec devices at our

10% off and pack prices in bold type include VAT; qty prices in light type don't please add extra at the current rate. Thank you.
SURFACE MOUNT LED's

These LED's are in a SO23 package (9.2x1.1x1.4mm)

<table>
<thead>
<tr>
<th>CODE</th>
<th>PART NO</th>
<th>COLOUR</th>
<th>SPEC</th>
<th>£2 PACK 100+</th>
<th>1k+</th>
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<tbody>
<tr>
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<td>TFS055</td>
<td>Red</td>
<td>1.6mcd @ 10mA</td>
<td>12</td>
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<tr>
<td>Z2672</td>
<td>TFS059</td>
<td>Green</td>
<td>1.6mcd @ 10mA</td>
<td>12</td>
<td>0.8</td>
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<tr>
<td>Z2673</td>
<td>TLM9801</td>
<td>Orange</td>
<td>0.5mcd @ 10mA</td>
<td>15</td>
<td>0.6</td>
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<tr>
<td>Z2674</td>
<td>TLM9811</td>
<td>Red</td>
<td>1.6mcd @ 10mA</td>
<td>12</td>
<td>0.8</td>
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<tr>
<td>Z2675</td>
<td>TLM8401</td>
<td>Yellow</td>
<td>0.5mcd @ 10mA</td>
<td>15</td>
<td>0.6</td>
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<td>Z2676</td>
<td>TLM9411</td>
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<tr>
<td>Z2677</td>
<td>TLM8401</td>
<td>Green</td>
<td>0.5mcd @ 10mA</td>
<td>15</td>
<td>0.6</td>
</tr>
<tr>
<td>Z2678</td>
<td>TFS0241</td>
<td>Red/Blue</td>
<td>5.6x0.6mcd@ 10mA</td>
<td>15</td>
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<td>Z2679</td>
<td>TLM6802</td>
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<td>Z2680</td>
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<td>Z2681</td>
<td>TLM8811</td>
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<tr>
<td>K106</td>
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<td>0.6mcd @ 10mA</td>
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</table>

Z1845 Stackable red LED - white casing round 6x3.5mm. Pack of 10 for £1.00

**MINIATURE LED's**

These LED's have axial leads

<table>
<thead>
<tr>
<th>CODE</th>
<th>PART NO</th>
<th>COLOUR</th>
<th>SPEC</th>
<th>£2 PACK 100+</th>
<th>1k+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z2682</td>
<td>TFS065</td>
<td>Red 1.8mm</td>
<td>2.8mcd @ 10mA</td>
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<td>10</td>
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<tr>
<td>Z2685</td>
<td>TFS066</td>
<td>Red 1.8mm</td>
<td>2.8mcd @ 10mA</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Z2686</td>
<td>TFS068</td>
<td>Green 1.8mm</td>
<td>4.5mcd @ 10mA</td>
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</tbody>
</table>

**STANDARD LED's**

These LED's have radial leads

<table>
<thead>
<tr>
<th>CODE</th>
<th>PART NO</th>
<th>COLOUR</th>
<th>SPEC</th>
<th>£2 PACK 100+</th>
<th>1k+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z2683</td>
<td>MV8052</td>
<td>Red 5mm</td>
<td>0.7mcd @ 20mA tint/undiffused</td>
<td>25</td>
<td>0.45</td>
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<tr>
<td>Z2685</td>
<td>S30591G</td>
<td>Orange 3mm</td>
<td>16mcd @ 10mA</td>
<td>12</td>
<td>0.75</td>
</tr>
<tr>
<td>Z2685</td>
<td>HLM9850</td>
<td>Yellow 5mm</td>
<td>150mcd @ 20mA tint/undiffused</td>
<td>12</td>
<td>0.75</td>
</tr>
<tr>
<td>Z2685</td>
<td>HLM9950</td>
<td>Green 5mm</td>
<td>150mcd @ 20mA tint/undiffused</td>
<td>12</td>
<td>0.75</td>
</tr>
<tr>
<td>Z2686</td>
<td>TLM7413</td>
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<td>150mcd @ 20mA tint/undiffused</td>
<td>12</td>
<td>0.75</td>
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<td>Z2687</td>
<td>TLM7513</td>
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<td>TLM7510</td>
<td>HE Red 5mm</td>
<td>150mcd @ 20mA tint/undiffused</td>
<td>12</td>
<td>0.75</td>
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<tr>
<td>Z2689</td>
<td>LST712L</td>
<td>Orange/Green 5mm</td>
<td>4mcd @ 20mA milky/undiffused</td>
<td>10</td>
<td>0.9</td>
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<tr>
<td>Z2690</td>
<td>XS556R</td>
<td>Red 5mm</td>
<td>4mcd @ 20mA tint/undiffused</td>
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<td>0.9</td>
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<tr>
<td>Z2691</td>
<td>TLM5401*</td>
<td>Yellow/Blue</td>
<td>5mcd @ 20mA tint/undiffused</td>
<td>15</td>
<td>0.55</td>
</tr>
</tbody>
</table>

*These have an interlocking moulding incorporated to enable accurate alignment when stacked.

Z2130 Red
Z2130 Green

These excellent quality 15mm LED's are housed in a 6.2x4x5.4mm package with a built-in resistor for 5V operation (add 47R resistor for 12V). Available in Green (DP £1.73) or Red (DP £1.27) Common cathode. 4 for £1.00; 100+ 0.05.

These are 14 segment devices allowing alphanumeric display. Normally costing over £15.00 we are offering these for just £4.50.

**SUBMIN LED's**

These LED's are housed in a 4.2x2.5mm plastic housing with a build-in resistor for 5V operation (add 47R resistor for 12V). Available in Green (DP £1.05) or Red (DP £1.00) Common cathode. 4 for £1.00; 100+ 0.05.

These LED's are housed in a 2.5x2x1.5mm plastic housing with a built-in resistor for 5V operation (add 47R resistor for 12V). Available in Green (DP £0.95) or Red (DP £0.90) Common cathode. 4 for £1.00; 100+ 0.05.

Z2128 Vector Type VTL 100- IR emitter and detector can be removed from the plastic housing if required. An extremely cheap version of TIL000/TL000.

Pack of 5: £1.00 100+ 0.10 1k+ 0.07

Z2143 TIL143 Opto slotted switch. These have cropped leads and some are ex-equip, but are all working.

Price: £1.00 100+ 0.10 1k+ 0.07

Pack of 2: £1.00

Z2454 Dual 7 seg LED - type TDS09250 by TFK. Red common anode 13mm digit height. DL 1.14. Our price (we have 1000 to draw) for £1.00: 100+ 0.25: 1k+ 0.12

Z2455 Single 7 seg LED 10mm high digit. Type LS1411FX.

Common cathode. 4 for £1.00: 100+ 2.15: 1k+ 0.10

Z1846/2 pairs of infra red emitter/ receiver SD8406/ 8506 by Honeywell with comprehensive data.

Price: £1.00

Z2617 LCD display - Directed drive 3 1/2 digit with 10-BATT 12.7mm high digits. Op voltage 4-12 VRS = 30Hz type. Consumes only 25mA with all segments on. Trade price £7.97 each. Supplied with data, but no edge connector.

Price: £1.00 25+ 0.65 100+ 0.50

Z2119 8 digit LCD 12.7mm high with low battery and clock complete with edge connector.

Price: £2.00 25+ 0.75 100+ 0.65

Z2432 8 digit LCD 10mm high. Single sided 36 way edge connector. Only £2.00 100+ 1.00 1k+ 0.80

Z265D Clock or 3 1/2 digit LCD with 40 way connector. 12.7mm character height like the H1311CC. DP 4.70. Our price £2.00

Z2655 LED module. An interesting little PCB 50x35mm that has mounted on it a 7 digit 7 segment red display, and a plastic moulding under which are 3 surface mount LED's, one each red, yellow and green. On the back of the PCB is a SMD0301 connector. Offered with data, although we are working on it. RECOMMENDED. To be listed as the LCD 21502, £1.50.

Z2659 LCD module. Probably intended for use in mobile phones. Size 44x28mm. One row of 10 digits + a load of Japanese characters. Uses 2x01655250 chips. No other data (yet) £2.50

Z2641 LCD module by Refac. Supplied with data. Uses Hitachi LMD478400 chip.

Price: £2.00

Z2532D Ambiguous alphanumeric LCD module 40x1 character type TS2207HF. Fairly large character. £1.95 in quantity.

Z2542D LCD module LM06166. 4x02. Viewing area 15x14mm with built-in driver. £8.50

Z2543D Large LCD graphics module by Hitachi, type LM225 64x40 dot 234x136mm, overall size 270x149mm. Costs the same as LM236 for which we have data (supplied). Not in stock. £20

Z2544D LCD module by Hitachi, type LM236 64x40 dot 234x136mm, overall size 270x149mm. Costs the same as LM236 for which we have data (supplied). Not in stock. £20

Z2545D LCD module by Hitachi, type LM236 64x40 dot 234x136mm, overall size 270x149mm. Costs the same as LM236 for which we have data (supplied). Not in stock. £20

Z2546D LCD module by Hitachi, type LM236 64x40 dot 234x136mm, overall size 270x149mm. Costs the same as LM236 for which we have data (supplied). Not in stock. £20

We're BIG in opto - much more in our Bargain List 85. Free with Catalogue, or any order, or send a large (A4) 26p stamped envelope for your copy.
WORDS & FIGURES
by LIFETREE

Features Include:
- 1-2-3 1A compatible WKS files
- 9999 rows by 256 columns
- Supports 1-2-3 1A functions, macros
- Protected and hidden cells
- Horizontal or vertical split screen
- Move, copy, transpose ranges
- Sparse matrix data storage
- Supports LIM'Expanded Memory
- Uses 8087, 80287 math coprocessor

Word Processor
- Include "live" spreadsheet data in document
- Two-line headers and footers
- Bold, underline shown on screen
- Global find and replace
- Right & left justify, centering
- Automatic reformat, word wrap
- Import text from ASCII files
- Supports over 200 printers

Auditor
- Toggle from worksheet to audit display with a single command
- Pinpoint circular references
- Identify source of other errors

Data Management
- Three-key data sort
- 7 database statistical functions
- Query using up to 32 search criteria, wildcard parameters

Graphics
- Line and XY graphs, scatter plots, pie, bar and stacked bar charts
- Superset of 1-2-3 1A type fonts
- High-resolution display (EGA, Hercules)
- High-resolution output to printers and plotters

Requirements:
- DOS 2.0 or higher, 256K RAM
- Windows 3.1 or later
- Supports over 200 printers

ORDER CODE: Z5445
Learn to type 5.25" disk
£3.95

ORDER CODE: Z5446
Learn to type 3.5" disk
£3.95

ORDER CODE: Z5447
Learn to type 5.25" disk
£1.95

ORDER CODE: Z5448
Learn to use DOS 5.25"
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<table>
<thead>
<tr>
<th>Type</th>
<th>Output Current</th>
<th>Size*</th>
<th>1+</th>
<th>25+</th>
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<td>£5.00</td>
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<td>2.72</td>
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£1.75 100+ 1.10
Z5279 Plug in wall type switchable non-regulated 3-6-9V
100mA. Comes complete with multiway reversible spider lead
(with clip on its own). Special Price £2.00 100+ 1.25
Z5413 Plug in power supply giving 7.5V 600mA on and on of
a 2m lead with a 2.5mm power plug. £2.50 100+ 1.90
Z975 PSU Mains input via 13A built in plug. Output 14V
600mA AC. Case 92x57x52mm £3.50
Z5292D Power on power supply. Conventional unit, 120/240V input, output 15V @ 1.5A fully stabilized. Part
enclosed size 123x102x34mm Comprehensive data supplied
£10.00
Z5293D Power Off power supply. Conventional unit, 120/240V input, outputs +12V @ 2A; -12V @ 0.4A; -5V @ 0.4A. Each output uses 1 Z523 regulator and has a preset for
adjusting voltage. With data £14.90
Z5413 KRP PCB mounting power source 90x55x23mm. 220V
ac in 15V 100mA DC out. Some of these are ex-0p. Do
around 30.00 Our price £5.00
The other item is a high quality 12V 2A power supply kit with
constant limit protection. It comprises a ready built PCB -
it just need to add the power transistors supplied. It comes
with a full circuit and instructions but you'll need a 16V
transformer and a heat sink. Order Code Z5298 Price £3.95
Z5439 Nice chunky plug in power supply (240V mains). Well
made unit 85x90x40mm. Complete with 2m lead with 2.5mm
power plug. Output 13V dc @ 1.5A. Ideal as battery charger etc
Specialdeal Price
£4.95
Z4190 Disk drive power supply kit. Idea for powering single 3.5" or 5.25" drive. Mains input, stabilized smoothed outputs, 12V 1A
and 5V 1A. Simple, easy to assemble kit with full instructions, at
an excellent price £3.95

SPECTRUM +3 PSU

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power plug. Output 13V dc @ 1.5A. Ideal as battery charger etc
Specialdeal Price
£4.95
Now! from GREENWELD - the world's most sophisticated metal detectors from We have in stock the entire range of the UK's biggest manufacturer of these fascinating instruments! A full colour brochure is available on request

Extreme lightness and compactness, combined with simplicity of operation makes the C-Scope CS550 a worthy companion offering a combination of quality and exceptional value.

Easily stored in haversack or car boot, the CS550 will ignore small iron such as nails and give a strong audio signal on good targets such as silver and gold. It is ideal for use by detectorists of all ages and will provide countless hours of metal detecting enjoyment. Do not be deceived by its appearance - it has been responsible for an array of interesting coins and artefacts equal to those found with more expensive machines.

**Order Code CS550**
**PRICE:** £79.90

The C-Scope CS770 has always been a firm favourite with metal detectorists because of its excellent performance for a reasonable price. The variable discrimination permits the user to select the desired level of junk rejection and, as well as an audio signal, a deflection of the meter needle will be seen. Balance and simplicity of operation contribute to the CS 770’s success as a firm favourite with serious metal detectorists.

**Order Code CS770**
**PRICE:** £169.90

As with all of our metal detectors, the C-Scope CS990 has recorded thousands of interesting and valuable discoveries.

The discrimination facility is preset to reject iron and silver paper - but it will track down the much sought after silver hammered coins.

In addition to the visual meter, the CS990 also has audio discrimination. This mode, unique to C-Scope detectors, gives a high tone for a target signal and a low tone for a reject making it particularly easy and accurate to use.

**Order Code CS990**
**PRICE:** £199.90

The CS2M employs an electronic process that gives easy searching on all types of site conditions with outstanding performance.

‘Turn-on-and-go’ technology - in harmony with the very latest ergonomically-designed handle ensures hours of fatigue free detection.

A single control knob is used to tune the machine on which then becomes a variable discriminator capable of ignoring ring pulls. Simplicity with high performance - a winning combination.

**Order Code CS2M**
**PRICE:** £229.90

Similar in design to the CS2M, the CS2MX offers the user two discrimination controls. These can be set in a variety of ways (all fully explained in the comprehensive operating manual) to allow target analysis. A sensitivity control permits greater site flexibility and a pinpoint button aids precise target location.

Although weighing only 1.4 kgs, the CS2MX can be taken off its stem and carried on a belt for even greater versatility.

Both of the machines in the Series 2 range are renowned for their ability to detect good finds even in the most demanding environment - like a site which is heavily contaminated with junk metal.

**Order Code CS2MX**
**PRICE:** £299.90

Finally, a metal detector KIT. A professional discriminating detector in kit form which includes all mouldings and a ready wound search head. The comprehensive 36 page construction manual gives precise building details plus troubleshooting guide and instructions for use. When completed, this detector has a specification similar to £250 models. (Manual only £5, refundable on purchase of kit)

**Order Code K5000**
**PRICE:** £129.95
For the professional who demands the highest level of technology, these detectors provide the ultimate choice

**CS 1220.**

Metal detecting's all time favourite

- Handle designed for perfect balance
- Audio and meter discrimination
- Preset memory
- Preset ground control
- Tough ABS mouldings
- Three part stem
- Battery check
- LED status and mode select

Order Code CS1220
Price: £299.90

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**CS Metadec 3.**

The professional's machine

- Handle designed for perfect balance
- Non-motion mode
- Preset memory discrimination
- Preset ground control
- Tough ABS mouldings
- Three part stem
- Battery check
- LED status and mode select

Order Code MET3
Price: £499.90

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**CS Promet 3.**

Raw power detecting

- Handle designed for perfect balance
- Non-motion mode
- Preset memory discrimination
- Preset ground control
- Tough ABS mouldings
- Three part stem
- Battery check
- LED status and mode select

Order Code PRO3
Price: £399.90

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**The C-Scope CS4ZX.**

The ultimate choice for the serious detectorist

- Handle designed for perfect balance
- Non-motion mode
- Preset memory discrimination
- Preset ground control
- Tough ABS mouldings
- Three part stem
- Battery check
- LED status and mode select

Order Code CS4ZX
Price: £549.90

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ASk for a full colour brochure on these exciting machines
Troubleshooting and Repairing VCR's

Second Edition

Gordon McComb

Order Code: MH102

£2.95

A guide to fault finding, maintenance and repair of video recorders, for non-experts. This book takes you through all aspects of modern electronics and computing. If you are involved in audio, radio, computers, or household equipment repairs, and working to budget this book will have something for you. It also contains information on the tools required, how to solder, how to make strip board circuits and PCB's.


Order Code: MH107

£15.95

Something of a Rolls Royce of the book world this one – well, you get what you pay for. Clear diagrams, photographs, and text covering all aspects of modern electronics and computing. Historical notes tracing the development of components and equipment, for example: the first fax machine was developed in 1843 (!) by Alexander Bain. Mathematical models and more technical descriptions make the encyclopedia suitable for all levels of user access. A superb text that no reference bookshelf should be without.

Advanced Television for the 1990's

K. Blair Benson and Donald G. Pink

Order Code: MH108

£13.95

Like it or not times are changing in the television world, so don’t be left behind, now that new television standards are being introduced worldwide. HDTV (High Definition Television) Advanced Television for the 1990's tells you in the new formats, their implications, transmission techniques, wavelengths and bandwidths – both terrestrial and satellite. European and American formats covered (1250 and 1125 lines). This book is necessary reading for anyone connected with the television trade, and anybody else who wants an overview of tomorrow’s TV.

Switch Mode Power Supply Handbook

Order Code: MH109

£6.95

Switch mode power supplies have a reputation for being complex, difficult to design and to work with. This book peels away much of the mystery by explaining the design principles and function of every part of a supply, from input filters to the arcane rite of high frequency transformer design. Mathematics is kept to a necessary minimum at all stages. Also included are some very useful complete power supply designs. This is an extremely helpful text if you are thinking about designing your own switch mode or are in the business of repairing them.

Regulated Power Supplies 4th Edition

Order Code: MH110

£7.50

Similar to the above text except that linear power supplies are covered in more detail. This book focus on R/C circuits and also includes an overview of techniques, components used, new devices such as the IGBT, also included are example circuits that can be adapted for many designs. Entries are reference work for engineers, technicians and hobbyists.

The Modern Oscillator Circuit Encyclopaedia

Order Code: MH111

£11.50

From the author of the popular Encyclopaedia of Electronic Circuits, this book is in much the same format, of circuit diagrams and notes, except that it focuses exclusively on oscillators. Digital, audio, RF, crystal controlled, and many other oscillator designs covered. Why all down and design an oscillator, when this book probably contains what you require?

The Secrets Of RF Circuit Design

Order Code: MH112

£25.95

If you are working on a book of complex maths and dry text, then you couldn’t be more wrong. Clear descriptions of components, how to make inducers, heaven receiver and other projects. Historical notes, antenna theory and designs, along with coverage of the whole radio spectrum, from micro-wave to microwave, make the book essential and interesting reading for radio hams. Designs of transmitters from something as simple as an ignition coil, will also make the “Secrets Of RF Circuit Design” a valuable reference work for anyone interested in experimenting with radio.

Communicating With Crosstalk XVI and Crosstalk Mark 4

Gifford A. Schaffer

Order Code: MH113

£5.95

Crosstalk communications software packages are becoming something of a standard in the world of modern users. The book takes us new comer through all the features of modern, uses, how to set them up, and of course how to get the most from the crosstalk package. Note: anyone who has recently become involved in Amstrad monitors will have been provided with the Mirror crosstalk package, Mirror is very similar and compatible with both versions of Crosstalk.

Dictionary of Computer Terms

(Secound Edition)

D. Dowling & M. Cvirlington

£18.95 PS

This highly informative book contains approximately 1,000 key terms, including the latest 'computerspeak'. In depth discussions, numerous examples, tables, diagrams and flowcharts, applications of common commands and subroutines, and sample programs in Ada, Algol, APL, Basic, C, Cobol, Fortran, Lisp, Logo, Pascal, Pli, and Prolog. This book is more than a dictionary: it is an indispensable reference book for anyone who uses computers.
Upgrade Your IBM Compatible and Save a Bundle 2nd Edition
190 x 240, 240 pages, hard cover, publication date 1991.
Aubrey Pilgrim. £15.95 Order Code: MH116

A technical guide to component level fault finding in PCs and other home computers. More advanced than the two "Save a Bundle" books, this text deals with the nuts and bolts of the electronics on computer boards, voltage levels, memory addressing, processor modes, diagnostic software, SMI, repair techniques, software, symptoms, etc. A must for the more technically able, repair technicians, and anyone who needs to know more about how computers work.

An Introduction to the Amstrad PC's
J.W. & R.A.Penfold
£5.95 Order Code: BP197

Simply PCs
150 x 220mm, 200 pages, soft cover, publication date 1992. Bob Albright. £11.95 Order Code: MH125

New to the world of personal computers? Lost amid the profusion of jargon and equipment? Then this book is a life line. A simple text that sets out to explain the basics and to help you to choose exactly what you need. Descriptions of PCs, software, disk drives, modems, faxes, printers, operating systems, etc. in plain English - something of a first for computer books.

First Look at NetWare 2.2
190 x 240mm, 140 pages, soft cover. Publication date 1992.
Gaynne Larsen and Verlene Leaburg. £9.95 Order Code: MH127

As there is a group of PCs or other computers in your office all working away with their individual software, individual printers, individual disk drives, etc. Well, it might be time for all these individual machines to become a bit more accessible. Networking your computers together can save you money on hardware and software, plus speeding up no end in free-flowing communications. If you are new to a network or are thinking of investing in one, then this book is ideal for you. It covers the principles of networking, cabling, etc. and of course an overview of one of the most common multiuser operating systems.

IBM Microcomputers - A Programmers Handbook
150 x 220mm, 500 pages, hard cover, publication date 1990.
Julio Sanchez and Maria Canton. £44.95 Order Code: MH114

If you have ever written programs on any of the IBM PC/PS series computers, you will probably have noticed a lack of instant reference texts. This book is the answer. It contains a wealth of technical data, subroutines, system descriptions, processor and coprocessor data including the 486, video hardware, etc. Everything a PC programmer will need to know.

Troubleshooting and Repairing Personal Computers 2nd Edition
190 x 240, 675 pages, soft cover, publication date 1991. Art Margolis. £18.95 Order Code: MH119

A superb hardback book with full colour dust jacket is a wonderful trip down memory lane!

This is the story of an industry which has transformed life the world over ... few developments in the twentieth century have been as important as the mass expansion of radio and television throughout the world. Within three generations a wireless trade "born in cottage industry conditions has grown into an industry of dynamic opportunities - exploiting modern technology to its limits.

The Setmakers tells all sides of the story. Packed with the results of two years intensive research - delving into the company archives, talking to the people who were there - from the apprentices to the management. Discovering the behind the scenes lifestyles of the flamboyant pace setters who built the industry - from the early struggles with valves to today's battle for the ultimate chip technology.

Superbly illustrated with nearly 500 photographs - over 100 in colour - many of which have never been reproduced before. Company archives and personal collections have been searched to find fascinating and evocative contemporary photographs, magazines and adverts. Together with the in depth research they combine to give a detailed picture of the spectacular rise of the colourful entrepreneurs and the subsequent demise of some. as the industry struggled through lean years.

464 pages 243x172mm £14.95
Switching Units
periswitch

The PERISWITCH Solution
PERISWITCH provides the solution for obtaining the benefits of SCART connection where a satellite receiver (1) and a VCR are installed with a TV having a SCART socket.

PERISWITCH provides three SCART sockets for connection to the VCR, satellite receiver (1) and TV.

PERISWITCH provides all the normally required viewing modes automatically without the need for manual or remote switching.

PERISWITCH provides stereo audio coupling between stereo satellite receivers, stereo or NICAM stereo VCR's and TV's.

PERISWITCH provides video connection between satellite receivers, VCR's and TV's and RGB connection between satellite receivers (or computers) and TV's. (1) A camcorder or computer can be connected in place of a satellite receiver.

Features
- Compatible with all TV's, VCR's and satellite receivers having standard SCART connectors.
- Operates automatically without manual or remote switching.
- Delivers audio or stereo audio from stereo VCR's and satellite receivers to twin audio channel TV's.
- Delivers RGB signals from appropriate satellite receivers or computers.
- Retains function switching of the TV by the VCR in playback and search modes.
- Maintains recording/viewing/playback options.

PERISWITCH provides the solution for obtaining the benefits of SCART connection where a satellite receiver (1) and a VCR are installed with a TV having a SCART socket.

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Features
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- Operates automatically without manual or remote switching.
- Delivers audio or stereo audio from stereo VCR's and satellite receivers to twin audio channel TV's.
- Delivers RGB signals from appropriate satellite receivers or computers.
- Retains function switching of the TV by the VCR in playback and search modes.
- Maintains recording/viewing/playback options.

Dimensions
- Periswitch: W 200mm H 40mm D 120mm
- Lead Lengths: AV1-SAT 1.0 Metre AV2-TV 1.0 Metre AV3-VCR 0.5 Metre

Price: £79.95

SCART VIDEO CONTROL

Connects up to:
1 Satellite + 2 VCR's
1 Computer + 2 VCR's
Push-button switches to select viewing.
Record from Satellite or another VCR whilst watching TV.
Phono output sockets for TV sound through your Hi-Fi System.

Order Code: BT21
Prices: £34.95 10+ 25.48

CAMERA LENS

CAMCORDER LENS
Precision ground reversible camcorder lens providing 0.6X wide angle or 1.5X telephoto magnification. Supplied with lens caps, F46 to M49 adaptor ring and leatherette pouch. Lens diameter: 40mm.

Price: £28.95 3+ 17.52

CAMCORDER LENS KIT
Two precision ground camcorder lenses providing 1.6X telephoto and 0.5X wide angle magnification. F46, 52mm and 57 threads on each lens. Supplied with lens caps and leatherette pouch. Lens diameter: 56mm.

Price: £49.95 2+ 32.47

A much wider range of video equipment is shown in our 1993 Catalogue - 6 pages of products at our usual low prices. Order your copy now - only £2 post free. Why not take out a subscription to our monthly Bargain Lists and our Newsletter, The Greenweld Guardian, at the same time? Only £6 for a year.
**NEW CAMCORDER BATTERIES**

Top quality Unisys rechargeable Ni-Cad and sealed lead acid camcorder batteries for all popular models.

**BATTERIES**

- **VP66 6V 1700mAh Ni-Cad**
  - Price: £27.00
  - Size: 103 x 31 x 105mm

- **VP752 9.6V 1500mAh Ni-Cad**
  - Price: £30.00
  - Size: 108 x 31 x 105mm

- **VP962 9.6V 1000mAh Ni-Cad**
  - Price: £30.00
  - Size: 105 x 31 x 105mm

- **VP30 12V 2300mAh sealed lead acid**
  - Price: £31.00
  - Size: 130 x 48 x 107mm

- **VP22H 6V 1700mAh Ni-Cad**
  - Price: £27.50
  - Size: 100 x 31 x 105mm

**Universal Charger/Discharger**

**TO90 CAMCORDER BATTERY AUTOCHARGER**

A universal camcorder battery autocharger capable of charging a wide range of batteries 6, 7.2 and 9V. To batteries can be consecutively charged in approximately 3 hours either at home via the AC adaptor or in the car via the DC power lead. Auto cut-off prevents overcharging.

- **Charging method:** Constant voltage with current limiting
- **Charge current:** 1A
- **Battery type:** 6V, 7.2V, 9.6V Ni-Cad pack (Sony, NP-22, NP-55, NP-77, JVC and Olympus typical)
- **Operating voltage:** 220/240Vac or 12-15Vdc 1.5A
- **Dimensions:** 153 x 150 x 63mm
- **Price:** £44.95

**TO508B CAMCORDER BATTERY CHARGER KIT**

A universal camcorder battery charger/power supply kit consisting of the charger, cigar lighter socket, connecting lead, camcorder power lead, 4 adapter plugs and a pouch. Compatible with the majority of 6, 7.2 and 9V camcorder batteries.

- **Price:** £22.95

**TO508C TRIPOD**

Table top camcorder/camera tripod. Fully adjustable for angle folds down to a small size for storage in the camcorder bag.

- **Price:** £10.95

**TO90 TRIPOD**

Camera/video tripod with sturdy 3-section legs with collect locks, 2-way pan-head with lift elevator and rubber shoes for non-slip, scuff free use.

- **Height:** 45.5 x (1.69m)
- **Packaged Height:** 15+ (0.38m)
- **Weight:** 0.75kg
- **Price:** £12.95

**Add VAT to quantity prices**
PIR SPOTLIGHT
L135
Twin spotlight PIR security lamp. The PIR detector and the lampholders are fully adjustable for aim. The detector contains a photo cell which prevents daylight operation.
Sensor range: 110° fan shaped, 20m
Max load: 300W incandescent
Auto reset time: 5 sec to 18 min (adjustable)
Power: 220/240Vac 50Hz
Price: £17.95 6x 11.67

INFRA RED SECURITY
HALOGEN FLOODLIGHT M900 Superbly styled floodlight with low power consumption. The high intensity halogen tube with a 2000 hour life provides much more illumination than conventional flood lamps.
Decorative wall mountable styling.
Simple hand wiring installation.
Separate angle adjustment between motion sensor and fitting.
Detection pattern: 50 x 60ft and 100°
Wide temperature operating range -30°C to +50°C.
Daylight sensor for auto shut off during daytime.
Manual override with existing wall switch.
110/220/240V ac operation,
Supplied with comprehensive Instructions.
Price: £39.95

PIR LIGHT/ALARM L122L Battery powered PIR light/alarms in a compact, free standing or wall mounting case. A slide switch on the side controls the function of the unit between manual on, auto light and auto light plus alarm. A light sensor prevents daylight operation.
Detection range: 4 x C cells
Dimensions: 138 x 113 x 65mm
Price: £12.95 5x 8.42

Add VAT to quantity prices

NIGHT SECURITY SENSOR F800A
Self mounted passive infra red sensor for the detection of body heat. The mounting arrangement allows horizontal and vertical swivel of 180°, allowing difficult to reach areas to be covered by the beams. A built-in adjustable photo detector prevents daylight operation. Adjustable timed on period. Provided with a walk test LED.
Detection range: 200°C (fan shaped) 15m
Auto reset time: 9 secs to 10 mins (adjustable)
Lighting load: 2kW incandescent, 1kW fluorescent
Power: 220/240Vac 50Hz
Price: £26.95 6x 17.52

PORTABLE PIR ALARM F601B Pocket size portable PIR detector with dual function sounder: two tone chime as an annunciator or a loud 90dB warble as an alarm. Self-contained operation from 3 x AA batteries (not supplied), low battery is indicated by a LED in the front panel. Supplied with ball-screw wall mounting.
Detection range: 8m (25ft)
Detection angle: 80° horizontal x 20° vertical
Power: 3 x AA batteries
Exit delay time: 30 seconds
Auto reset time: 1 minute
Dimensions: 105 x 68 x 44mm
Price: £10.95 5x 7.12

NIGHT SECURITY SENSOR F800A
Swivel mounted passive infra red sensor for the detection of body heat. The mounting arrangement allows horizontal and vertical swivel of 180°, allowing difficult to reach areas to be covered by the beams. A built-in adjustable photo detector prevents daylight operation. Adjustable timed on period. Provided with a walk test LED.
Detection range: 200°C (fan shaped) 15m
Auto reset time: 9 secs to 10 mins (adjustable)
Lighting load: 2kW incandescent, 1kW fluorescent
Power: 220/240Vac 50Hz
Price: £28.95 6x 17.52

PIR ALARM F601A
Self contained portable/wall mounting PIR sensor and alarm. IR sensor has a 89° detection arc with a 10m detection range. The built-in powerful piezo siren sounds on detection. Intelligent walk test and mode verification functions. User programmable security code. Operates from 3 x AA batteries (not supplied).
Coverage: 86°, 10m; 12 beams in 2 layers
Power: 3 x AA batteries
Dimensions: 110 x 70 x 36mm F601B SC906
Price: £28.95 3x 18.62

Add VAT to quantity prices
F653 PIR ALARM KIT
A compact kit, ideal for small home installations, garages, car, boats, etc. The kit contains a combined PIR and alarm box, 3 magnetic reed switches, compact siren and power supply. Instruction manual and fixing screws supplied. An alkaline PP3 can be added for power failure protection.

PIR coverage
Exit delay
Entry delay
Alarm reset time
Power
Size

PRICES: £49.95 3x3.95

DOOR ANNUNCIATOR
T072B
Self contained wall mounting or free standing door annunciator. Requires no external contacts, switches reflectors etc. Two tone chime sounds three times when the beam is broken. Requires four AA batteries (not supplied).

Sensing distance
Dimensions
Price

Add VAT to quantity prices

MESSAGES RECORD AND PLAYBACK
T072A ANNUNCIATOR
A stand alone PIR message annunciator on which your own message, up to 20 seconds long, can be recorded onto a microchip and played back every time someone is detected by the PIR. Message can be slowed or speeded as required, and can be overwritten at any time, but will be lost when power is switched off. Size 136x92x46mm. Power 4xAA cells or external 6V.

PRICES: £29.95 3x19.70

Lots of small piezo and other buzzers in our main catalogue - Only £2 post free

WIRELESS DOORBELL
T071D
Two part wireless doorbell. The transmitter is mounted by the front door and the receiver can be mounted or carried up to 16m (50 feet) away. Provided with self-adhesive pads and screws for mounting (If required). Transmitter requires a PP3 battery, receiver requires two AA batteries.

Dimensions
Price

A370 Gold coloured horn with fixing plate. Emits high powered wailing note of varying pitch. Output 115dB(A) at 3m. Power 12V DC, 1.5A. 130mm dia x 160mm. 160 cycles per minute.

Prices
£9.95
10 + 8.06
25 + 6.65

A375 Extremely high powered piezo electric siren which emits an expiring, warbling sound. White plastic body, with mounting bracket. Internal IC circuitry. 300mm dia. Black plastic body.

Dimensions
Fixing centres
Price

K510 Siren 12V DC, very loud. Black plastic body.
50mm dia x 42mm with metal bracket.

Prices
£6.95
10 + 5.70
25 + 4.56

SIRENS

PIR Automatic Light Switch

• Automatically switches light on when you enter the room, and off when you leave.
• Flashes the lights on and off rapidly when an intruder is detected.
• Switches the lights on and off at random periods while you are out or on holiday.
• Also acts as a conventional light switch.

F602 The PIR1000 is an automatic hands free light switch. It turns the light on automatically when you enter the room by detecting your body heat and comparing it from the light will gradually dim over 12 seconds and finally switch off. This avoids any potential hazard from the room suddenly being plunged into darkness. In addition to its main function as a automatic light switch the PIR1000 offers, manual override, in which it will perform like any ordinary light switch, security function in which it will act as an alarm, flashing the light on and off and auto function which will act as a burglar deterrent, switching the light on and off at random times for random periods, simulating occupancy of the house.

The PIR1000 offers convenience, safety, energy savings and security in one package.

Price
£27.95
5 + 21.24

A370 Gold coloured horn with fixing plate. Emits high powered wailing note of varying pitch. Output 115dB(A) at 3m. Power 12V DC, 1.5A. 130mm dia x 160mm. 160 cycles per minute.

Prices
£9.95
10 + 8.06
25 + 6.65

A375 Extremely high powered piezo electric siren which emits an expiring, warbling sound. White plastic body, with mounting bracket. Internal IC circuitry. 300mm dia. Black plastic body.

Dimensions
Fixing centres
Price

K510 Siren 12V DC, very loud. Black plastic body.
50mm dia x 42mm with metal bracket.

Prices
£6.95
10 + 5.70
25 + 4.56

SIRENS
CLOCKS

(a) Quartz movement

V1101 Kienzle Model W716. Facility for hour, minute and second hand. Takes single AA cell. Typ current 80µA. Accuracy to within 1 sec/day. Size 58 x 50 x 16mm weight without battery 26g. Spindle length 12/16/21.5mm (H/m/s). Prices £3.50 10+2.34 25+1.87 100+1.50

DIGITAL CLOCK

Large LCD digital alarm clock with snooze control and LCD illuminating light. The snooze control silences the alarm for 7 minutes before re-sounding it. Compact and easy to use. Batteries included.
Power 2 x AAA batteries
Dims 95 x 65 x 68mm
Price £7.99 10+6.19

COUNTDOWN TIMER

Simple to use electronic countdown timer with 10 hours, 59 minutes countdown capability. The internal alarm sounds when the set period has timed out. Hundreds of applications from process control to the kitchen. Free standing, spring clip and magnetic mounting.
Timing period 19 hours 59 minutes
Power POOH button cell
Price £4.25 10+2.76

DIGITAL CLOCK/TIMER

V137W
Free standing digital clock with built-in timer. The timer functions initially as a countdown timer, counting down from up to 23 hours 59 minutes, and then sounding the alarm. Immediately the alarm sounds the timer switches to count-up mode, indicating the period since the alarm sounded. A separate countdown timer function is provided for general timing. Batteries provided.
Power 1 x AAA battery
Price £9.30 10+6.18

MAX/MIN THERMOMETER

V137R
Dual channel In/Out thermometer with digital clock. The In-built memory can record inside or outside minimum and maximum temperatures and a temperature alert will sound an alarm if the temperature rises to or falls to a preset level. Free standing or can be mounted to a wall with the self- adhesive pad or bracket provided. Battery included.
Temperature range -50 to +70°C
Resolution 1°C
Power AA battery
Price £12.95 5+8.42

DIGITAL THERMOMETER/CLOCK

Y137Q
A dual sensor digital thermometer for comparative temperature measurement, for example in/outside and aquarium. The thermometer will display temperature in °C or °F, and includes a digital clock. The remote sensor can be mounted up to 3m away from the unit. The backlit LCD display makes it ideal for in-car use. Battery supplied.
Temperature range -50 to +70°C
Resolution 1°C
Power 1 x AAA battery
Dims 107 x 25 x 13mm
Price £8.50 10+5.52

AQUARIUM THERMOMETER

Y137P
A dual sensor digital thermometer designed for comparative temperature measurements between water and room temperature. The external sensor can be attached to the glass within the tank with the sucker provided. The internal sensor measures room temperature. The thermometer can be attached to the aquarium with the strips provided.
Temperature range -50 to +70°C
Resolution 0.1°C
Power POOH button cell
Price £7.99 10+5.19

See our main Catalogue for details of clock accessories - hands, dials, chapter rings, pendulums etc
The Ultimate Laser Copy Paper

After trying dozens of different papers to obtain the best possible copy quality, we've found a superb paper from one of the larger paper merchants. It's called Huntsman Silk, and its 115gm weight just oozes quality. You need to see and feel it to appreciate its worth, so ask for a sample sheet if you're interested in buying some.

<table>
<thead>
<tr>
<th>Quantity</th>
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<tr>
<td>50 sheets</td>
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<tr>
<td>200 sheets</td>
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<tr>
<td>Ream of 500 sheets</td>
<td>£16.00</td>
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</table>

(See overleaf for cheaper copylaser paper)

BARGAIN BRIEFCASE

Black plastic briefcase by Helix, model W89 - many uses, e.g. samples, documents, tools, hobbybox, sewing box - even sandwiches! Size 400x270x90mm. Comfortable carrying handle and secure fastenings. Original selling price £9.99

£3.95

BULK BUYS

One of our suppliers is overstocked on some goods - so if you buy in quantity, we can pass these savings on to you!

<table>
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<tr>
<th>Product</th>
<th>Description</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>AT55</td>
<td>Self-coiled telephone extension lead, extends to 5m. White. £2 each, but buy 12 for £10 + VAT, or 48 for £35 + VAT</td>
<td></td>
</tr>
<tr>
<td>PI740</td>
<td>Co-ax splitter. 87p each, but buy 50 for £22 + VAT or 250 for £82 + VAT</td>
<td></td>
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</table>

Add VAT to quantity prices
A new range of dry transfer lettering in two handy sheet sizes. Decadry Standard 100x200mm (Nos. 1-88) and Decadry Super 125x250mm (Nos. 201-250). All those shown are available in Black; we also stock Nos. 1-20 in White (for our ABS boxes); Red & Gold. Please use the number as the Order Code and specify the colour required. Lettering is shown slightly smaller (93%) than actual size.

**PRICES:**
- Standard (1-88) 70p per sheet; 12+ 0.45; 144+ 0.36
- Super (201-250) 95p per sheet; 12+ 0.60; 144+ 0.48

Quantity Prices exclude VAT. Any mix for qty discount.
(a) Paper & Labels
80gsm high grade copier paper, sold in reams (500 sheets)

**Code** | **Description** | **1+** | **10+**
---|---|---|---
A701 | A3 size 420x297mm | £9.95 | 5.73
A702 | A4 size 297x210mm | £3.70 | 2.51

**Laser Copier Paper**
A high quality paper giving excellent results with all laser printers. Price per ream.

A703 | A4 size 297x210mm | £4.50 | 3.30

**COPIER LABELS**
C4 Copy/laser labels slvedge (margin round all 4 sides for copiers that won’t copy edge to edge) 100 sheets to a box.

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<td>5588</td>
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<td>5590</td>
<td>67.0 x 67.7</td>
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</table>

**A4 Transparent Pockets**
Open at the top and multi punched to fit most files.

**Pack of 100 £4.40; 10+ 2.81**

**Adhesive Tape**
A731 | 1" wide clear adhesive tape, polypropylene 30 micron. 60p; 12+ 0.36; 72+ 0.29
A735 | 2" wide buff packaging tape, polypropylene 30 micron. £1.30; 12+ 0.63; 36+ 0.66

**Ballpoint Pens**
Low cost ball pens with ventilated caps, in 3 popular colours:

<table>
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<td>HP02</td>
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<td>HP03</td>
<td>Red</td>
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<tr>
<td>HP05</td>
<td>Box of 50, any assortment</td>
<td>£3.96</td>
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</tbody>
</table>

**Flip Chart Markers**
Low cost, long life, non-shove through felt tips.

**MBA** | 4 pens, red blue black & green | £1.33 |

**Add VAT to quantity prices**
## ORDER FORM

### Send your order to:
**GREENWELD ELECTRONIC COMPONENTS**

27 Park Road, Southampton, SO1 3TB  
(A different postcode is correctly shown on reply paid envelopes)

### Customer No: Date: 

**Name:** 

**Address:** 

**Post code:**

### Office Use

<table>
<thead>
<tr>
<th>ORDER CODE</th>
<th>QTY</th>
<th>No of Packs</th>
<th>Description</th>
<th>Price</th>
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</thead>
</table>
| Z9999      |     |             | Bargain List Subscription Service - See Page 30  
Our next 12 lists with reply paid envelope | £6.00 £12.00 |
| Z9999      |     |             | 1993 Catalogue | UK/BFPO inc Post晃 Overseas inc Post | £2.00 £4.00 |

### Important: Please fill in the following information. Thank you

1. **Did you receive this Catalogue (Tick all that apply):** 
   - [x] with your previous order 
   - [x] Unsolicited 
   - [x] As a Bargain list subscriber 
   - [ ] with Everyday Electronics 
   - [ ] with ETI 
   - [ ] with Electro 
   - [ ] with Television 
   - [ ] Other (Please state how) 
   - [ ] With Practical Wireless 

2. Please let us know if you want this order: 
   - [x] Standard Postage* £2.75  
   - [ ] Next day delivery† £9.50

   Sub-Total

3. Have you ordered from us before? [ ] YES [ ] NO  
   - [ ] Are you already a Bargain List Subscriber? [ ] YES [ ] NO 

4. Please tick method of payment: Cheque [ ] PO [ ] Cash [ ] Credit Card [ ] Other [ ]  
   - [ ] Credit Card No (Visa/Access/Connect): 
   - [ ] Ex Date: 

   [ ] CQ/PO:  
   [ ] EX?: 
   [ ] C/N 
   [ ] C/C 
   [ ] CASH 
   [ ] B/T 
   [ ] G/V 
   [ ] ST 
   [ ] CO:  
   [ ] CH:  
   [ ] P: 
   [ ] D: 

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**IMPORTANT:** All orders are accepted under our terms and conditions on page 162 of our 1993 catalogue. A copy of this page will be sent on receipt of an SAE.
1993 CATALOGUE

Our main Catalogue, 164 pages of regular products, is available now for just £2 UK/BFPO, £4 overseas. Amongst the many new items this year are a greatly expanded car equipment section, 7 pages devoted to graphic and stationery supplies featuring goods from Staedtler, Helix and Kuretake amongst others; a radio, TV and tape section with personal stereos, CD players and mini-TV's from Casio; a large increase in the space devoted to Security & Surveillance with many new PIR products; a much bigger video section with lots of camcorder accessories; no less than 17 pages of books, and the complete range of metal detectors from C-Scope, including a kit available only from us. So don't delay, Order today - there's a space on the Order Form overleaf.

Thank you for ordering from GREENWELD - we appreciate your custom. This space is for any suggestions or messages. Please feel free to comment on any aspect of our goods and service.
G205 HAND HELD MICROPHONE SYSTEM
A portable diversity receiver with tone squelch and noise reduction circuitry. The antenna A-B indicators indicate the switch in channels as the performer moves about. The microphone has an intermediate mute position on the on/off switch to eliminate switch-on pop. Output from the receiver is via a 6.35mm unbalanced socket. Note: the receiver is 12Vdc powered. Recommended power supply: P007D.

PRICE: £190.00  2+ 144.72

Add VAT to quantity prices

G206 DIVERSITY SYSTEM
A professional diversity radio mic system consisting of a hand held radio mic and a 19+ rack mounting (or free standing) receiver. The receiver has balanced and unbalanced outputs, LED bargraph audio out indicators, antenna A-B indicators and output gain control. The microphone features a high sensitivity cardioid capsule and special noise absorption parts to eliminate switch shock and handling noise.

PRICE: £399.00  2+ 308.00

G206A DUAL CHANNEL SYSTEM
A professional dual channel radio mic system consisting of two hand held radio mics and a 19+ rack mounting (or free standing) receiver. The receiver has unbalanced outputs, LED bargraph audio out indicators, gain and squelch controls for each of the channels. The microphones feature high sensitivity cardioid capsules and special noise absorption parts to eliminate switch shock and handling noise.

PRICE: £435.00  2+ 335.00

G206B SINGLE CHANNEL SYSTEM
A professional single channel radio mic system consisting of a hand held radio mic and 19+ rack mounting (or free standing) receiver. The receiver has unbalanced outputs, LED bargraph audio out indicators, gain control and squelch controls. The microphone features a high sensitivity cardioid capsule and special noise absorption parts to eliminate switch shock and handling noise.

PRICE: £229.00  2+ 174.20

STOP PRESS!! - Just arrived!

Y123PA 10MΩ PROBE MULTIMETER
3.5 digit 8mm LCD display
Full auto-ranging
Display hold facility
Probe styling
Auto polarity and zero

PRICE: £19.95

In our current Cat at £34.95

SPECIAL DEAL

Complete with extended probe, fully shrouded test leads and vinyl carrying wallet
AC volts 0-2-20-200-500Vac ± 1.2%
DC volts 0-200µ-2-200-2000µ-200-500µ @ 1.0%
Resistance 0-200-2k-20k-200k-2MΩ ± 1.0%
Dims 160 x 35 x 20mm

G205A TIE CLIP MICROPHONE SYSTEM
A portable diversity receiver with tone squelch and noise reduction circuitry. The antenna A-B indicators indicate the switch in channels as the performer moves about. The belt-clip transmitter has an intermediate mute position on the on/off switch to eliminate switch-on pop. Output from the receiver is via a 6.35mm unbalanced socket. Note: the receiver is 12Vdc powered. Recommended power supply: P007D.

PRICE: £175.00  2+ 132.66

G205B GUITAR TRANSMITTER SYSTEM
A portable diversity receiver with tone squelch and noise reduction circuitry. The antenna A-B indicates the switch in channels as the performer moves about. The belt clip transmitter has an intermediate mute position on the on/off switch to eliminate switch-on pop. Input is via a short lead fitted with a 6.35mm plug. Output from the receiver is via a 6.35mm unbalanced socket. Note: the receiver is 12Vdc powered. Recommended power supply: P007D.

PRICE: £175.00  2+ 132.66

G206/A/B SPECIFICATIONS
Receiver
Receiving frequencies 173.8, 174.1, 174.5, 174.8 and 175.0MHz
RF sensitivity 12dB/µ for 60dB/S ratio
S/N ratio over 108dB
De-emphasis 50µS
Audio output levels Unbalanced: 0 - 0.5V
Balanced (G206 only): 0 to ±0.2V @ 600Ω
Power 12Vdc or 220/240Vac
Dims 484x44 (1U) x 140mm
Weight 2.7kg
Microphone RF output power 2mW
Spurious emissions 40dB below carrier level, 50dB typical
Pre-emphasis 50µS
Power 9Vdc
General 227g
Frequency response 40Hz to 20kHz
THD less than 0.5%
Audio dynamic range over 100dB, over 118dB with limiting

In our current Cat at £34.95

SPECIAL DEAL

Complete with extended probe, fully shrouded test leads and vinyl carrying wallet
AC volts 0-2-20-200-500Vac ± 1.2%
DC volts 0-200µ-2-200-2000µ-200-500µ ± 1.0%
Resistance 0-200-2k-20k-200k-2MΩ ± 1.0%
Dims 160 x 35 x 20mm
6 STUNNING METER OFFERS!!

**10MΩ MULTIMETER**
- 3,999 count resolution
- 40 segments bargraph
- Maximum, minimum, and average function
- Ratio measurement function
- Error correction function
- Relative magnitude function

**NORMAL SELLING PRICE £120.00!!**

**Y130**
- £49.95

**Y130A**
- £89.95

**10MΩ Order Code M818B**
- 40 point analogue bargraph display
- 3.75 digit 17mm LCD display
- Autoranging voltage and resistance
- High and low frequency ranges
- True RMS AC voltage and current
- Diode and continuity test
- Data hold switch
- Built and tested to IEC 348
- Fully shrouded test leads

**SPECIAL PURCHASE!!**
In our 93 Cat at £75!
Now offered at less than half price!

**£34.95**

**10A PANEL METER**

**Y123AC**
- 3.75 digit 25mm LCD display (2999 count) with 40 point bargraph
- True RMS measurement
- Auto/manual ranging
- 20A current measurement capability
- Frequency measurement
- Memory mode for relative measurement
- Data hold
- Diode test
- Full overload protection

**NORMALLY SELLS AT AMAZING DEAL £89.95**

**£39.95**

**10MΩ Order Code MX190**

**10A PANEL METER**

25335 Very smart panel meter by Hobart, brand new and boxed. 72x72mm, scaled 0-10A AC (can be used on DC - readings will be approx 20% low). Moving Iron model no D72SD. List Price 12.51

**OUR PRICE £4.00**

**10A PANEL METER**

**10MΩ**

- 19 ranges
- 3½ digit 12mm LCD display
- Signal injector function
- Diode test
- Fuse protection
- Automatic polarity and zero
- Test leads with 4mm plugs

**BATTERY, INSTRUCTION MANUAL AND CARRYING CASE INCLUDED.**

**SUPERDEAL PRICE £16.95**

**£15.95**

**AC volts**
- 0-20-200-700Vac ± 1.2%
- 0-30-300-750Vac ± 0.5%

**DC volts**
- 0-200m-2-20-200-1000Vdc ± 0.8%
- 0-300m-3-30-300-1000Vdc ± 0.5%

**AC current**
- 0-200-2k-20k-200k-2MS ± 0.8%
- 0-300-3k-30k-300k-3M± 0.8%

**DC current**
- 0-200m-2-20-200mA ± 1.5%
- 0-300m-3-30-300mA ± 1.2%

**Resistance**
- 0-200-2k-20k-200k-2MS ± 1.0%
- 0-300-3k-30k-300k-3M± 1.0%

**Frequency**
- 10Hz to 20kHz ± 0.5%
- 50Hz square wave, 5V peak to peak

**Dims**
- 126 x 70 x 24mm
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**We Supply Lynk**

**I.F. DISTRIBUTION PRODUCTS FOR SATELLITE TV**

Lynk supply a range of products to enable simple, trouble free installation of these types of systems:

- Passive active and combined FM/UHF/VHF satellite multi-switch boxes available from stock. Ideal for installation in retail shop or repair department. All radio, TV satellite signals from one satellite down one cable. Prepare now for the future multi-switch system in your premises. The sales of video recorders and TV sets will increase in year to year. Most systems will be installed without a need to meet the demand.

Send a self addressed envelope for 13 page booklet and price lists.

**TRADE COUNTER OPEN DAILY 9am-5pm**

**FAX NUMBER: 0902 229 052**
Quite a lot of jobs came in last weekend. So on Monday morning, bright and early, I breezed off towards the workshop, determined to make good headway.

As I got there the Reverend Goode’s ancient chariot swung into the drive and out he struggled. So did his young curate, the Reverend Blande. Between them they brought in a television set and a VCR.

“The Curate’s picture rolls, my son” boomed the Reverend. Then he turned to Curate Blande, who handed me the recorder. “I think it’s the valve, my son” he piped, pointing at the TV set. “The vicar’s video doesn’t record properly.”

Then they beamed at me, patted my shoulder and clambered into their wagon. As they left they passed old Mr Simper, who was bringing his TV set along in a pram.

“Everything’s deep purple Mr. Bugner” he whined. “It can’t be much, ’cos we’re old age pensioners and the wife’s got housemaid’s knee and gout. So we’ll let you do it.”

Then the phone rang. I answered it.

“This is Reginald Rongun, Mr. Butt. I’ve accidentally dropped my old video recorder down the stairs. Pop me a letter into the post to say it’s finished, will you?”

“Bring it in with £20, Mr. Rongun, then we’ll assess the damage and give you a quote. If you say no we retain the deposit for our trouble.”

The phone spluttered and went dead. All we had to think about now were the three jobs that had just come in – and the mountain that had built up last week. Steven settled down to the backlog and I pulled the Reverend’s VCR on to the bench.

The Akai DX4

It was an Akai DX4. While it played all right the recordings made on it were distorted and pulled for five seconds in every fifteen. It was the same in the SP and LP modes. With this type of trouble the first thing I do is to give the machine a thorough clean, paying particular attention to the tape path, the heads, the idler and the pinch wheel. But the fault was still present after I’d done this. I then checked the mechanics, particularly the back tension. This didn’t improve matters at all, so I studied the deck with my illuminated magnifier. I soon saw a thin trace of deposits that my spirit cleaner wouldn’t shift it, and in fact removing it was no easy task. It was only as I finished that I saw the well-eyed me carefully as she handed me a Nikkai colour portable. It had a silver-grey cabinet with a black back, but nowhere could I see a model number.

“Rolls” she said. “And I might as well tell you that Gumboils have had a go at it. Kept it for a month, said they couldn’t get spares, charged me a fortune then kicked me out they did. I don’t want none ’o that with you. I’m an old age pensioner, and my husband’s got Anne Joiner.”

There was an excellent picture but, as she said, it was life! It had a silver-grey cabinet with a black back, but nowhere could I see a model number.

“Good work Donald” boomed the Reverend. “You’ll go to heaven I’m sure.”

“Good work Donald” piped the curate. “You’ll go to, er, heaven I’m sure.”

I looked at them earnestly. “But not yet awhile, I hope?”

A Nikkai Portable

My next caller was Mrs. Pysener. Shifty and sallow, she eyed me carefully as she handed me a Nikkai colour portable. It had a silver-grey cabinet with a black back, but nowhere could I see a model number.

“Rols” she said. “And I might as well tell you that Gumboils have had a go at it. Kept it for a month, said they couldn’t get spares, charged me a fortune then kicked me out they did. I don’t want none ’o that with you. I’m an old age pensioner, and my husband’s got Anne Joiner.”

There was an excellent picture but, as she said, it was rolling. I opened up the set and saw that just about every component in the field timebase had been unsoldered and replaced. My confidence dropped from its usual low to zero minus. I didn’t have a circuit diagram and could see no sign of a field hold control. Automatic field hold circuits are not amongst my favourites. I made my way around the field timebase as best I could, looking for anything amiss, and gradually got the feeling that I’d had a set like this before, with the same fault. I pondered, then turned the front of the set towards me. It sat there on its difference. A more careful examination of the tube base panel then showed that the green output transistor’s collector connection was loose in its soldered joint. Remaking this restored the green output but the picture was uncertain. I took off the panel and carefully cleaned and reflected the side-contact connections to the tube. This resulted in a good, stable picture.

After a search I found the half-inch dry paintbrush I use for this purpose. I switched the set on again and brushed away amongst the components. Perhaps I’d find a clue to the cause of the trouble whilst tidying up the chassis. The 2SC3715 line output transistor Q404 has no heatsink in this model: it’s free-standing, and leant forward a little as I brushed around it. Immediately the camera twisted and writhed. I found that by moving the transistor to and fro I could control the set’s antics. So I switched off and studied the joints under the transistor carefully. They appeared to be perfect. Then I tried, gently, lifting the transistor’s legs one by one out of their holes. The base and collector leads held firm, but the emitter lead lifted out easily, leaving its solder blob looking intact. Cleaning it off and resoldering cured the trouble.

As I put the back on again the reverend gentlemen returned and gathered up their equipment.

“Good work Donald” boomered the Reverend. “You’ll go to heaven I’m sure.”

“Good work Donald” piped the curate. “You’ll go to, er, heaven I’m sure.”

I looked at them earnestly. “But not yet awhile, I hope?”

TV Sets

Time to look at the Curate’s TV set. It was a Toshiba 140R4B colour portable. He’d attached a note which said that after an hour the picture went small, distorted and pulled. So I switched it on, flung a blanket over it and put it aside.

I then put Mr. Simper’s set on the bench. It was an 18in. Zanussi, Model 20ZA374-16B, BS7000 chassis. We don’t get many of these and the sight of it frightened me. The sound was all right but sure enough the screen was bright purple, which meant that the green gun was asleep.

Checks on the tube base panel suggested that the red, green and blue output transistors were all right, so I moved back to the TDA3301B colour decoder chip. As the voltages here were haywire I fitted a replacement. This made no difference. A more careful examination of the tube base panel then showed that the green output transistor’s collector connection was loose in its soldered joint. Remaking this restored the green output but the picture was uncertain. I took off the panel and carefully cleaned and reflected the side-contact connections to the tube. This resulted in a good, stable picture.

Just as I boxed up the Zanussi the Curate’s Toshiba started to twist and writhite. It also groaned in sympathy. When I pulled off the back the picture became normal. So I played the hairdryer on to the PCB. The fault eventually returned, but no amount of freezing or flexing would alter it. I decided to dust off the board completely before studying it for hairline cracks or dry-joints.

After a search I found the half-inch dry paintbrush I use for this purpose. I switched the set on again and brushed away amongst the components. Perhaps I’d find a clue to the cause of the trouble whilst tidying up the chassis. The 2SC3715 line output transistor Q404 has no heatsink in this model: it’s free-standing, and leant forward a little as I brushed around it. Immediately the camera twisted and writhed. I found that by moving the transistor to and fro I could control the set’s antics. So I switched off and studied the joints under the transistor carefully. They appeared to be perfect. Then I tried, gently, lifting the transistor’s legs one by one out of their holes. The base and collector leads held firm, but the emitter lead lifted out easily, leaving its solder blob looking intact. Cleaning it off and resoldering cured the trouble.

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I looked at them earnestly. “But not yet awhile, I hope?”
Still looking at the front of the set I crouched down so that my eyes were level with the front of the hidden plinth. The rims of three thumb-edge knobs could just be seen. Two of them adjusted the colour and brightness. When I stroked the third one the picture stopped spinning. Yes, I’d had the same palaver before with a similar set and had been fooled again. Gumballs had also been fooled. I put the set back together again and reflected on the time I’d spent on it. And I remembered the time when I had a good memory. I wish I could remember where it went.

Microwaves and Mice

Since Steven’s microwave course with Jim Garrod on the Isle of Wight we’ve been fairly busy with repairs. Last week we had two microwave ovens in, a Zanussi and a Tatung – so they were from totally different parts of the globe. When we opened them up we found in each the skeleton of a mouse. Both had met their ends by getting themselves across the mains input. There were other similarities. In both cases there were a few tiny maggots in the debris of the skeleton and some odd-looking beetle things – blunt and grey-brown, as big as houseflies.

Steven couldn’t see how the mice could have got into either of the ovens. There simply wasn’t any access. We came to the conclusion that they must have got in during factory assembly.

The Amigo A500

Finally does anyone know anything about the Amigo A500 computer? I don’t. Jamie, my eleven year old son, had one given to him on his birthday. It’s developed a fault: there’s brightness but nothing else on the screen – and the power light doesn’t come on. What can it be? He’s blaming a chip that he calls Fat Agnes, but it’s all Greek to me. I peeped into the keyboard and frightened myself to death.

“When I was his age” I said to Greeneyes “I had a wind-up metal fire engine for my birthday. It was called the Electronic Miracle, the electronics being two torch bulb headlights which I often broke. My father would moan and the power light didn’t even come on. What can it be? He’s blaming a chip that he calls Fat Agnes, but it’s all Greek to me. I peeped into the keyboard and frightened myself to death.

“Then when I was his age” I said to Greeneyes “I had a wind-up metal fire engine for my birthday. It was called the Electronic Miracle, the electronics being two torch bulb headlights which I often broke. My father would moan and the power light didn’t even come on. What can it be? He’s blaming a chip that he calls Fat Agnes, but it’s all Greek to me. I peeped into the keyboard and frightened myself to death.

“The latest thing in hi-tech mousetraps?”

RECESSION – RECESSION – TIRES – TIRES

HEY LOOK, its 1993 and the recession is still with us – so why not contact J.J. Components to increase your profits on Idler tires?

EXAMPLE: 10 x Sharp tires cost £1.80 + P&P + VAT. That repairs 10 videos each at £20 – Totals to £200.

1 x Sharp original Idler cost £2.85 + P&P + VAT. That repairs 1 video at £30 – Totals to £30.

Most Popular Tires Available: Pack of 10 Each: Minimum 3 Packs Order

AKAI

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Expertise at MCES

A recent visit to Manchester Colour Engineering Services (MCES) at Davyhulme to see their operations was particularly interesting. I’ve used the company’s services for many years and have always found them to be nothing short of excellent – and keenly priced.

MCES has concentrated on repairs that no one else attempts on a commercial scale. Without the know-how built up by those at MCES the repair of tuners, modulators and video heads would neither be practical nor economically viable. Others have tried and failed, through not having the right approach and/or methods. But having the necessary expertise and equipment is not enough to ensure a marketable service, i.e. one that meets a trade demand at an appropriate price. MCES has managed to do this through its excellent research and detailed knowledge of the consumer electronics industry.

With its new video heads MCES provides a product rather than a service. In this field it has much competition: success has been achieved through applying the same standards as with repairs – quality materials and attention to detail.

The Tour

I was taken on a conducted tour of the building by managing director John Ayriss who was familiar with the tasks being carried out at each workstation and the need for them. There are in every area jigs that have been purposely designed and built in-house. As no one else provides such repair services no one else makes the equipment required. We thus find control boxes that switch inputs and outputs between tuners/modulators, test equipment and monitors. There’s standard equipment as well of course – sweep generators, monitors, scopes etc. – and in addition some equipment that’s not commonplace in servicing workshops. Such applications have been discovered and developed by MCES. John Ayriss was able to carry out as well as explain the operations being undertaken at every point – often using jigs he had himself designed. Clearly he’s no average MD!

I was continually struck by the fact that a standard service regime is applied no matter what the particular fault with an item sent for repair. For example all the electrolytic capacitors in Grundig i.f. cans are replaced and known likely dry-joints are resoldered. Instead of simply rectifying found faults, units are brought up to a standard which ensures that they won’t fail again. Quite often, as with certain LNBs, this results in a unit with a superior performance, reliability and capability than the original.

Tuner and Modulator Repairs

Tuners and modulators all go through standard servicing procedures based on experience of fault conditions built up over a number of years. Once a unit is connected to a power supply, tuning voltage where appropriate, a generator and a monitor its alignment is checked and set. The output from a tuner is fed to a monitor and viewed using off-air signals – reliance is not placed solely on what the test equipment tells you. The unit is tested for mechanical intermittinges under these conditions – by means of a series of sharp taps!

A weak point with modern tuners and modulators is the built-in socket. On an average unit the mounting is best described as flimsy, with the centre pin often simply wave soldered to the PCB. MCES replaces broken sockets with a strong, solid alternative, making a very strong mechanical bond between the socket and the case.

VCR Drums

Many have questioned the wisdom of fitting new heads to video drums. The need seems to be less these days since very reasonably priced new drums are readily available both from third-party manufacturers such as MCES and the original manufacturers. The price of Panasonic heads has fallen dramatically for example. One has to be careful however. Using third-party drums of inferior quality can be a false economy – their life can be appallingly short, with the result that frequent replacement is required, while the alignment quality can be poor, necessitating extensive deck realignment for correct performance to be achieved. Apart from anything else short life can create bad feeling with customers. The benefits of fitting new heads are greater with complex assemblies that have more than the standard two heads.

The re-heading process starts with the stripped drum being thoroughly cleaned using an ultrasonic bath. Some drums are not suitable for rebuilding of course – those with digs or scratches or those that are heavily burred. In such cases MCES can usually supply an equivalent drum.

The replacement heads are obtained from the original equipment manufacturer rather than being generic replacements. This fact, in conjunction with the highly accurate alignment that follows, means that the end product is as good as the original. MCES also stocks drum spares such as relay pins and leads. These are again obtained from the original manufacturer. Some items such as small PCBs are salvaged from damaged drums, enabling a drum with a problem in this area – a crack in the PCB for example – to be rebuilt.

Head Tip Alignment

When it comes to the processes used to align the head chips on the drum one really begins to appreciate the magnitude of the investment that has been made by MCES. Two large alignment jigs dominate the video head laboratory. The older one, which cost MCES £33,000, allows both height and the projection to be aligned. The newer one, which represents an investment of £60,000, carries out projection alignment only but is much faster.

The experts at MCES carry out projection alignment with consummate ease. Monitors show the head in incredible detail, using camera microscopy. The drum to be aligned is clamped on a turntable with the microscope camera lenses diametrically opposite each other at each side of the head. Each image of the tip is fed to a separate monitor along with vertical and horizontal cursors. Digital readout counters are used for each of the three alignment adjustments.

All this enables MCES to claim with confidence that they never supply damaged heads. With this degree of precision monitoring damage of even tiny proportions is immediately evident. When alignment has been completed and the heads have been boxed they are inductance tested using Hewlett-Packard equipment that cost £9,500.

Head projection alignment starts with the tips being...
moved out of view of the camera lenses so that these can be focused on the drum surface. At this point the projection counter is zeroed. The head tip is then brought back into view – this is the reason for using a turntable – and focused using a vernier adjuster. Correct tip projection beyond the rim of the drum, 45µm, is indicated by the use of a moire (interference) pattern: this occurs when the relative focus of the drum surface and tip projection are correct. The turntable then brings the second head round for alignment in the same way.

The next process is 180° differential adjustment. This ensures that the two heads are positioned on the drum exactly opposite each other diametrically, to within 1µm. The vertical cursors are used for this purpose, the heads being moved so that they sit within the tramlines.

The third adjustment is for head height. Height difference is established by first setting one head’s lower edge to the horizontal cursor on one monitor. The opposite head is then brought round, the height counter is zeroed, and the lower edge of the head is focused by moving the lens to align it with the same cursor. This movement is indicated on the height counter. The difference between the heads is kept to within 0-2µm, the pair being to within 5µm of the 0µm reference.

The laboratory has a large collection of reference drums from the manufacturers. These represent, for each part number, what research has proved to be the manufacturer’s average in terms of tip height and projection. This allows MCES to work to the standard thus established. The extremely close tolerances employed by MCES mean that minimal realignment is required when the drum is fitted in the VCR – assuming that a good quality head was previously fitted and that the VCR was correctly aligned. Naturally checks should be carried out to see whether adjustment is required. MCES produced a head height wall chart (No. 3) in 1990 detailing the importance of height alignment. It was distributed to all customers at the time but is unfortunately no longer available.

Once the heads have been correctly positioned, one side at a time, using the micrometer jig and checking with the monitor and counter to confirm correct alignment, they are locked in place with a single screw while still in the jig. They can then be rechecked.

New Drums

The production of new video head drums follows the same process as the latter part of re-heading. New drums obtained from Japan have new head tips inserted and aligned. The same checks are made in the box.

Guarantee

MCES provides a 12-month guarantee with both new and re-headed drums. Drums returned with damaged heads are not covered however. Such damage is caused by clumsy fitting and can be clearly seen using the MCES equipment described above. MCES offers to replace damaged head tips at half price.

LNB Rebuilding

Virtually all the LNBs rebuilt by MCES are of Marconi origin. So this is the process we’ll describe here. MCES can however repair various standard LNBs: the range includes Maspro and Nokia, all Marconi types, NJRC, Continental and Amstrad. A great deal of thought and research went into designing the LNB rebuilding process. The result is units that have greater gain and lower noise than the originals, also a closer tolerance figure and better reliability.

MCES currently receives over 800 units a week for rebuilding – yes, 800! They are first stripped and the PCB is cleaned. The case is usually stripped and resprayed and the gasket is disposed of.

PCBs are manually cleaned to remove what can be a lot of corrosion – the result of weathering, water ingress and damage from various sealants. Cleaning in an ultrasonic bath follows – any badly damaged boards are discarded. A computer running PCB-test software is next engaged to diagnose any PCB problems, which are then rectified.

Lower noise figure, higher gain f.e.t.s (three) are then fitted at the front end. MCES has worked in close collaboration with Marconi and other LNB manufacturers to secure the right parts for the job – most are not available through normal/traditional outlets and require infra-red reflow soldering to ensure consistent results.

Reassembly

Since we are dealing with microwave devices reassembly is not just a matter of popping the PCB into the case and screwing it up. Case shape and internal volume tolerances affect the operation of the unit – not least the local oscillator frequency. A specific internal bolt tightening sequence is required to ensure correct seating of the mouldings. Strategically placed pieces of foam add to the accuracy.

The original gasket rightly comes in for criticism from MCES, which has designed its own larger, more flexible type. It’s not the absolute ideal, says John Ayriss, but the silicone rubber tube type he would prefer to use simply couldn’t be made to the high standard required at an acceptable cost. When you consider the results of pressure tests with the version that is used this seems to be a minor point.

The case and gasket are compressed for sealing at a force of 12.5 p.s.i. The LNBs are then tested for leakage, measurement being in c.c.s per hour. This test takes about 14 seconds and is the equivalent of the LNB sitting in two feet of water for an hour. Whilst I was present randomly selected units showed 0:00 c.c. For this test the LNB is placed on the jig by means of a probe inserted into the feedhorn. Furness Controls manufacture the test equipment used for measuring leakage – gas companies use it extensively and it cost MCES a modest £1,600. The jig to interface this equipment with LNB testing was designed by MCES. Another example of the company’s ability to adapt equipment for its own special requirements.

TELEVISION MARCH 1993
Alignment

The next process is local oscillator adjustment – this is set to the very close tolerance of –1MHz, +1.5MHz. MCES points out that the tolerance of the original local oscillator setting is not at all close – units received for repair vary wildly. One does experience this, particularly with the blue-cap type, when aligning a receiver’s i.f. offset to match the LNB – switch LNBs a few times and see how much adjustment is required. The fact that MCES sticks to a close tolerance standard means that when the customer receives LNBs back some alignment/tuning and i.f. offset adjustment may be required.

Ferguson ICC7
Chassis Fault Notes

Alex Mason

The ICC7 chassis is of Thomson design and is used in several current Ferguson models. We have had the following faults to date. Note that the LED mounted on the front control panel shines red for standby, green for go. It can be seen from the rear of the set with the chassis out and can help a lot when fault finding. Another point is that you can’t use a bulb as a dummy load for the chopper power supply in place of the line output stage because the chopper circuit requires a 13V supply that’s derived from the line output transformer and won’t run unless this is present.

Dead set, no light from the LED: Check the voltage at supply pin 16 of the TEA2261 chopper control/driver chip I1P01. If low at 1.6V the BA157 rectifier diode DP28 is short-circuit.

Dead set, LED red for about ten seconds then no light: Scope the line drive waveform at pin 39 of the TA8659 colour decoder/timebase generator chip IVO1. If o.k. next check at the base of the BSR51 line driver transistor TL17. If there’s no waveform here or a low-amplitude one check whether TL17 is short-circuit, also diodes DF16 (BA157) and DL18 (1N4148). DF16 is in the field output stage: when it goes short-circuit the 24V line rises to 65V before the set shuts down.

Top foldover: Check the 65V rail. If it’s sitting at 32V either DLO9 (BA157) is leaky or IF01 (TDA8178F) is faulty.

Field collapse: Check whether surge limiter resistor RL11 (15Ω) is open-circuit and/or rectifier DL11 (BA157) is short-circuit. These components are in the 200V rectifier circuit – this supply is used by the field driver stage as well as the RGB output stages. If they are o.k. IF01 (TDA8178F) has probably failed.

No NS correction: Check for –26.8V at the emitter of TG38 or TG84 (both type BD137). If this supply is missing check whether RG87 (2-2Ω) is open-circuit or TG84 is short-circuit or leaky. These components are mounted on the NS correction panel that sits at the right-hand side of the chassis.

Gain/Noise Measurement

LNBs are tested for gain and noise figure at four spot frequencies across the band – a Hewlett-Packard noise measurement system is used. With spares backing, the cost of each of the three equipped benches is around £90,000. The idea is first to confirm that the unit performs to the broad specification MCES requires. LNBs are then classified by gain and noise figures as A or G types – A-type devices are supplied south of Stoke on Trent, G-type devices north. Both types are within specification, the subdivision ensuring that equal results are obtained from the Astra satellite’s different footprint field strengths.

Testing

Every unit is run for a minimum of twenty hours in one of the numerous test bays in the MCES workshop before being released to the customer. This ensures that, as with MCES’s other products, the rebuilt LNBs have an assured quality and reliability.

In Conclusion

The MCES philosophy is to provide a service of the highest standard: this is achieved by careful design of its own processes, using them to a high standard and phenomenal quality control. This doesn’t mean that there are never any complaints. According to John Ayriss there’s a return rate of one per cent of which over fifty per cent are faultless or have been damaged by the customer – he quotes as an example a ‘faulty on fitting’ video head with a damaged tip and a finger print on the drum around it.

A visit to MCES confirms its commitment and professionalism.

Dead set, no LED light, power supply tripping: Check whether DP17 (BA157) is short-circuit. This rectifier produces the error voltage for pin 6 of IFO1.

Dead set, LED red for about ten seconds then no light: Scope the line drive waveform at pin 39 of the TA8659 colour decoder/timebase generator chip IVO1. If o.k. next check at the base of the BSR51 line driver transistor TL17. If there’s no waveform here or a low-amplitude one check whether TL17 is short-circuit, also diodes DF16 (BA157) and DL18 (1N4148). DF16 is in the field output stage: when it goes short-circuit the 24V line rises to 65V before the set shuts down.

Top foldover: Check the 65V rail. If it’s sitting at 32V either DL09 (BA157) is leaky or IF01 (TDA8178F) is faulty.

Field collapse: Check whether surge limiter resistor RL11 (15Ω) is open-circuit and/or rectifier DL11 (BA157) is short-circuit. These components are in the 200V rectifier circuit – this supply is used by the field driver stage as well as the RGB output stages. If they are o.k. IF01 (TDA8178F) has probably failed.

No NS correction: Check for –26.8V at the emitter of TG38 or TG84 (both type BD137). If this supply is missing check whether RG87 (2-2Ω) is open-circuit or TG84 is short-circuit or leaky. These components are mounted on the NS correction panel that sits at the right-hand side of the chassis.
**TV Fault Finding**

**Decca/Tatung 160 Series Chassis**

Picture rolls when hot said the report with this set. Sure enough only a few seconds with the hairdryer were needed before line lock was lost. Beside the TDA4503 chip we found a tower of ceramic capacitors connected in parallel, giving a total value of 2,400pF. Fitting the correct 2,700pF Suflex type capacitor in position C113 restored temperature stability.

P.B.

**Hitachi CP14P216 (G7P Mk. 2 Chassis)**

The picture on this colour portable would occasionally blank out, leaving a white raster. C711 was dry-jointed – it’s by the line output transformer.

P.B.

**Philips G11 Chassis**

For no line driver operation on a cold morning check that the line drive coupling capacitor C3110 hasn’t dried up.

P.B.

**Philips CTX Chassis**

If one of these sets comes in dead check whether R3394 or R3395 is open-circuit. These 271c0 resistors are rated at 2.5W.

P.B.

**Grundig Remote Control Handsets**

When a customer brings in a remote control unit for reassembly and you find yourself faced with the task of establishing the correct home for 29 press-buttons without another one to compare it with, you’ll be glad if you have a Konig remote control book. The nice people at Konig have detailed where the buttons go on most Grundig handsets. This may apply to other makes as well.

P.B.

**Panasonic TX2 (Alpha 1 Chassis)**

This set was dead because the 2SD965R standby switching transistor Q802 in the power supply was short-circuit.

N.B.

**Ferguson TX9 Chassis**

The line frequency was incorrect – just lines across the picture. When the hold control was adjusted the best that could be achieved was an incorrectly phased picture with a bar down the centre. If the phase control was then adjusted line lock was lost again. A new TDA9503 timebase generator chip (IC54) restored correct operation.

N.B.

**B and O 7702 (7XXX Chassis)**

The original fault with this set was that it would sometimes be dead with no standby LED display. A colleague had called to see it but on that occasion the fault wouldn’t put in an appearance. So he resoldered the e.h.t. transformer and various other connections that can cause problems. Now the fault was permanent. The cause of the trouble was a dry-joint at pin 1 of the standby transformer T2 – one of the primary connections. Open-circuit windings are quite common with these transformers, especially where dry-jointed connections to the pins have been allowed to arc.

N.B.

**Grundig CUC120 and CUC220 Chassis**

A Grundig Model A7400 (CUC220 chassis) came in with a field fault. When it was very cold there was lack of field scan at the bottom of the screen – the top was o.k. There was no foldover at the bottom. The cause of the fault was C2768 on the deflection PCB being rather less than the specified 100μF.

Two different deflection PCBs were used in these chassis. One has a TDA1770 field output circuit, the other one using a TDA2655B chip. We’ve had field distortion with the TDA1770 circuit on a number of occasions, the causes having been the chip itself, D2761 (SKE4G1/04) or R2761 (6-8Ω, 0-75W).

N.B.

**Sony KV2704**

The customer’s complaint was that the set didn’t always start when it was switched on – he would have to operate the switch several times before the set would come on. Resistors R605 and R606 were both o.k., but the h.t. was low at only 80V. The cause of the fault was traced to C623 (33μF, 250V).

J.S.R.

**Philips CP90 Chassis**

There was only half an inch of field scan, in the centre of the screen. The voltages around the field output transistors were all o.k. and the drive from the TDA2579 chip was correct. Chassis return resistor R3582 (3-3Ω) was open-circuit.

J.S.R.

**Sony AE1 Chassis**

This set could be tuned in perfectly but you couldn’t store the channel. As soon as the preset button was pressed the picture would be lost. Replacing the M58655P chip IC003 made no difference. I then discovered that there was only -14V instead of -33V at pin 2. Coil L807 was open-circuit (the -14V was coming via a 10kΩ resistor in parallel with the coil). Incidentally the M58655P is an expensive device – the latest quote I had was £17-10 plus VAT.

J.S.R.

**Sony KVX2521U (AE1 Chassis)**

This set failed with a violent flash on the screen and an ominous fizzing noise. When I powered it via a variac and an isolating transformer it tried to start then cut out. I was relieved to hear the rustle of collapsing e.h.t.: at least the line timebase seemed to be o.k. While manipulating the variac I noticed a small, twinkling spark beneath the power transformer T601. Its removal didn’t reveal anything imme-
Matsui 1460
To start with the set was dead, with open-circuit mains and supply fuses. Checks showed that the STR451 power supply chip was short-circuit between pins 1, 2 and 3, the SR2M avalanche diode was short-circuit, and the 2SD869 line output transistor was low-resistance between its base and emitter. When these items had been replaced the set was powered up. It came on with normal field scanning but there was reduced width and line foldover at the left-hand side of the screen.

After checking the scan-correction circuit I found that the scan coils were arcing to the tube at the top left. Examination of the scan coils after removing them showed that the insulation had burnt with the result that the line scan coils were shorting to each other. In the past I've had noisy coils and open-circuit tag connections to windings: this is the first time I've had windings shorting to each other and arcing to the tube.

Panasonic TC21M1R (Z4 Chassis)
We've had two of these sets in recently with the same fault, a slow but sure increase in brightness, culminating in uncontrollable brightness with flyback lines. When the first one came in we carried out checks on the RGB output stage and C.R.T. first anode supplies but found no variations here. A check on the grid network on the C.R.T. base panel however showed that R380 (680kΩ) was open-circuit. In both cases removal of this resistor showed that one end had not been properly inserted through the PCB.

Panasonic TX25T2 (Alpha 2 Chassis)
We've had a batch of these sets in recently with the same complaint – dead with no power supply operation. The cause of the fault was in each case that D851 (C2408M) was either short-circuit or leaky. It provides the 160V supply for the line output stage.

Incidentally does anyone know of a cure when these sets lose the channel 0 or 1 tuning memory, in all cases the tuning memory being reset to 00?

Panasonic TXC74 (Alpha 1 Chassis)
After about twenty minutes the top of the picture would brighten and drop down about two inches, badly distorting the field scan as it did so. We could find nothing amiss in the field drive and output stages despite extensive tests. So attention turned to the scan coils which are unfortunately bonded to the A59EAK00X01 tube and are not available separately. Fortunately a local dealer was able to supply a tube from a scrapped set. Carefully removing this and fitting it to the faulty set solved the problem.

Mitsubishi CT2531 (Euro 4 Chassis)
Here was a case of gross deception by a TV set! The picture was covered with black dots and dashes – not unlike the "darklies" you see on satellite TV displays. They led us to investigate the tuner and i.f. departments first. At high brightness levels however the interference changed to a woodgrain pattern. This led us to suspect a beat effect between the line scan rate and the switch-mode power supply oscillator, and so it was. There was a dry-joint at pin 3 (earth) of IC902, the 12V regulator in the power supply.

Pioneer SD26
If the power supply section of this set doesn't work, possibly squealing, squawking or ticking, with bizarre waveforms in the chopper drive and output stages, check the 2.2uF electrolytic capacitor C852.

Hinari CT11
The fault with this set was tripping. It came to life (minus the tuning voltage) when any one of the plugs from the front panel was disconnected from the main PCB. We then discovered that if the base of transistor Q17 was disconnected the set would work normally. Not having the circuit diagram we don't know what this transistor does for a living, but we've since had several of these sets with the same fault. They seem to work happily without Q17 being in operation.

Sony KV1820UB
This one came in as a dead set. Because of its age we were in some doubt as to what the condition of the tube would be, but we decided to have a go at repairing it. A check in the power supply showed that the chopper transistor Q607 and the two resistors R628 and R639 in series with its emitter were all open-circuit. We replaced these items, using a BU208A in the Q607 position, then went straight to the line output stage tuning capacitor C813 (0.016µF, 1.5kV) which was o.k. The gate-controlled switch line output device was also o.k. The 330pF, 1.5kV capacitor C901, which is connected across it, was open-circuit however. When this was replaced normal operation was restored – with, I might add, an excellent picture.

Rediffusion 365138 (SP2 Chassis)
The complaint with this set was "a line down the screen and no colour". I'd not come across one of these sets before and didn't have the circuit diagram. It appears to use a Sharp chassis. I found that the fault could be cleared by tapping around the line oscillator and eventually discovered that C605 was dry-jointed.

Philips G90AE Chassis
This set would shut down with a ticking noise from the power supply. We found that the PCB around R3668 (150Ω) was scorched while Tr7652 (BC557C) was leaky. After fitting replacements I checked the set and found that although the h.t. was correct at 95V R3668 was still under stress, while under certain conditions the verticals were ragged. A scope check on the h.t. line showed that there was a lot of noise. The h.t. reservoir capacitor C2630 (47µF) was warm, a replacement finally putting everything right.

Philips FL1-0 Chassis
I sometimes think that the protection circuits in modern sets cause more trouble than the circuits they are supposed to...
The problem with this 21in. text set was no tuning from Tatung TUV9731 (170 Series Chassis) the thyristor and put the supply into the standby mode. R.N. mute circuit, to prevent plops in the standby mode. Sufficient voltage was being passed back via the diode to trigger the thyristor and put the supply into the standby mode. R.N.

Philips 2B Chassis
Another 2B set with the power supply stuck in standby. This one could be made to function only when the gate of thyristor 6727 was disconnected. While checking around the standby control circuit I eventually discovered that D6729 had reverse leakage. The set worked normally when this standby control circuit I eventually discovered that D6729 thyristor 6727 was disconnected. While checking around the one could be made to function only when the thyristor and put the supply into the standby mode. R.N.

Tatung TUV9731 (170 Series Chassis) The problem with this 21in. text set was no tuning from cold. When it had warmed up a bit the tuning would start to work and a normal picture would appear. In the fault condition there was no tuning voltage: the 33V supply was present at pin 17 of the SAB3035 tuning chip but there was no tuning output at pin 15. The chip itself turned out to be okay, the culprit being the associated 4MHz crystal X001. I used a replacement from a Ferguson satellite TV receiver that was looking rather unwell after mains transformer failure (it uses the same chip and crystal). When this crystal had been fitted the set worked perfectly whether cold or warm. M.L.

Samsung CL3312Z There were signs of a burn up in the line output stage. After replacing various components here we switched on. A loud bang and a bright flash from two of the resistors we’d replaced woke us up. The set continued to work, but the picture was oversized and there would occasionally be arcs from the two resistors previously mentioned. A check on the h.t. produced a reading of 157V at the minimum setting. The manual specifies 125V at D821. The cause of this high voltage was that R807 had increased in value from 111Ω to 19kΩ. A replacement restored normal operation. M.L.

Panasonic TX1752 (U5 Chassis) The complaint with this set was that there was no picture for thirty minutes after switch on. It then worked perfectly. On the bench we found that this was so – there was no luminance. A lot of time was wasted freezing and testing components in this area. To cut a long story short the cause of the fault turned out to be hardly visible dry-joints on the pins of the line output transformer. Resoldering provided a complete cure. J.K.P.

Panasonic TX24A1 (Alpha 2W Chassis) This set had an overloaded power supply: it was squealing and the h.t. line was very low at only 25V. A fault in the line output stage was suspected, and indeed disconnecting the supply to it and connecting a dummy load in its place produced the correct h.t. voltage. No obvious shorts could be found, and the line output transistor seemed to be fine. So the line output transformer was suspected – we’ve had it fail on a few occasions in this chassis. Before replacing it however we thought it a good idea to fit a new output transistor, just in case. When checked out of circuit the old transistor gave the same readings as the new one. But they do give odd readings – about 100Ω across the base-emitter junction, presumably because of an internal resistor. Anyway after fitting the new 2SD1441 the set sprang to life, with the correct h.t. voltage etc. This didn’t provide a complete cure however. According to the set’s owner it went off again an hour after being returned.

It came back with the same symptoms – low h.t. and squealing. When another 2SD1441 line output transistor had been fitted the set worked all right, and once again the old transistor compared perfectly with a known good one. I assumed that the cause of the fault was base-emitter junction breakdown, but why? – with the internal resistor you can’t check the junction in the normal manner. Tracing the base print connection back to the line driver transformer solved the problem; the chassis side of the winding was dry-jointed. Resoldering the transformer connections provided a complete cure. S.C.

Panasonic TC21R1 (Alpha 2 Chassis) “Colour fault” it said on the job card. When I switched the set on I was surprised to see running through the picture the horizontal green and magenta bars you get when the reference oscillator is misadjusted. So I adjusted the trimmer, C637. This altered the frequency but the oscillator wouldn’t lock.

To set the oscillator, pin 11 of IC601 must be shorted to chassis. As many an engineer knows, when you do this the effect is as described above.

Now what component is connected between this pin and chassis? Something that could perhaps become leaky? Who said a 10nF ceramic capacitor? Full marks to that person. Yes, the 10nF ceramic capacitor strikes again in yet another position. C642 was the culprit, a replacement soon restoring colour to everyone’s cheeks.

These little items seem to be everywhere in Panasonic sets, just waiting to become faulty and give the unwary service engineer a real headache. As I’ve said before, if in doubt check your 10nFs. A faulty one usually measures between 100Ω and 1kΩ. But the force used to get the capacitor out can result in the short disappearing, thus adding to the confusion. S.C.

Sony KV2096 The line output transistor was short-circuit and the 1.25A fuse had blown. As no obvious faults were found these items were replaced. At switch on the transistor instantaneously went short-circuit, the power supply making no attempt to trip. I removed the transistor and checked the h.t. voltage, using a 60W bulb as a load. It was correct at 115V. The line drive was then checked. There seemed to be plenty of oomph, though the waveform was misshapen due to the absence of the line output transistor. The flyback tuning capacitor and the various protection capacitors around the line output stage were next checked but no faults could be found. Changing the line output transformer finally provided a cure. P.H.

Ferguson 16A2 (TX90 Chassis) This set had terrible field linearity. The cause was the 68V zener diode D137 between the collector of TR105 and chassis – it was leaky. This zener diode is not present in the smaller-screen versions of the chassis. P.H.
“It won’t play at all now” complained the lady owner, “and it had been going so well.” The machine was a Solavox Model NCVR5000. When I unscrewed the case the machine looked like certain Sentra and Alba models, and I noticed a familiar Panasonic 777-type reel idler.

I loaded a cassette and, guess what? – the machine played perfectly. So I left it playing while I sorted out another machine. When I returned to it the test tape was almost at the end. I pressed rewind and left it running, but it stopped sooner than I expected. This time the tape was right at the end. Thinking that I must have selected fast forward by mistake, I pressed rewind again. Nothing happened. I ejected the cassette, loaded a different one and pressed the fast forward button. As the tape wound forwards normally I stopped it and once more selected rewind. The machine had other ideas however; it still wound forwards!

**Fault Finding**

I managed to borrow a service manual from Vic down the road. It bore the model number VCR-30DAP but no brand name. The “servo-logic” PCB is under the PIF (tuner/i.f.) PCB on the right-hand side. After consulting the “U501 logic circuit” I eyed with suspicion the PU4310 reel motor drive chip IC606, which is near the rear heatsink. I decided to start at the other end however and stuck my digi meter across pins 7 and 8 (see Fig. 1) of the large MN1522-0231 microcontroller chip IC601.

As expected, in fast forward I got a positive voltage at pin 8 with respect to pin 7. In rewind however there was a positive voltage at pin 7 with respect to pin 8 but it was only about 2V instead of the 3-8V shown on the circuit diagram. When I checked from pin 8 to chassis in this mode the reading was over 1V instead of zero or 0-1V.

I disconnected the 10kΩ resistors R636 and R641 that apply bias to the KTC1815 polarity switching transistors Q609 and Q610 and checked the voltages again in both modes. This time the voltages at pins 7 and 8 were normal, the appropriate pin being pulled up to the positive supply line voltage by R663 or R664 when the other one is taken to zero or 0-1V by the switching action of the chip.

Q609 is obviously leaky I thought as I unsoldered and removed it. But no, it was o.k. Maybe something was wrong with Q610 then. It tested o.k. however. I refitted the transistors, reconnected R636 and R641 and then unsoldered the control pins 2, 4, 6 and 8 of the reel motor drive chip IC606. This made no difference. Lots of other tests on components and sections of the circuitry were then carried out, proving conclusively that IC606 was blameless. I finally removed C606 (0-01µF). Bingo! It had a 7kΩ leak. I then checked C607 which read 17nF instead of 0-01µF on the capacitance meter.

To be on the safe side both capacitors were replaced with nice new 0-01µF, 350V types. Fast forward and rewind were then o.k. but a bit sluggish. So a new reel idler was fitted. A deck service completed the repair.

**Chewed Tapes**

This was not to be the end of the story however. A fortnight later the machine was back with two damaged tapes. Why always two? I checked fast forward and rewind, and the take-up torque in the play mode. As the latter seemed slightly weak the idler was again changed. This improved matters a bit, but I was still not happy.

Suspecting the reel motor, I noticed that it was a special “fat-looking” type. The day was saved however when I discovered that the manual mentions a “reel motor current” (torque) adjustment. So I connected the meter’s positive lead to TP601 and its negative lead to TP602, i.e. across the 1Ω, 1W reel motor and drive circuitry current sampling resistor R644 on the servo-logic PCB, put the machine in the still mode and adjusted R649 for a reading of 190mV.

This must be a sort of “quiescent current” state. At last the drive was right!

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**Fig. 1: Reel drive circuitry used in the Solavox Model NCVR5000.**

Dave Mackrill
was rewarded with good take-up torque plus powerful fast forward and rewind. Potentiometer R649 is at the right-hand edge of the board and can be tweaked without removing the tuner/i.f.

Presumably the reel motor had been a bit tired after all the excitement, though its spindle seemed free enough. Or perhaps its commutator had become sooty. So I made a note to warn the owner that a replacement motor might be needed before very much longer.

As the two damaged tapes were new I cut out the mangled sections, unwound the tape back to the take-up spool leaders and respliced them. The lady was pleasantly surprised to get them back, albeit with labels attached warning that they were no longer three-hour cassettes.

**Letters**

**CUSTOMERS WE COULD DO WITHOUT**

I seem to get more than my fair share of customers with silly or unusual requests. Here are some examples.

The phone rang and I answered it. “Do you repair videos?” a voice said. “We do, what make is it sir?” “VHS” he replied. When I tried to explain that VHS is a system, not a brand, he just replied “well it says bloody VHS on the front” and put the phone down.

A customer came into our shop and bought two 3.15A fuses. He came back ten minutes later and demanded a refund. When I asked why, he placed two blown fuses on the counter and said “they’re faulty - they keep blowing”. I pointed out that fuses do tend to blow when there’s a fault. He said something I dare not type and left the shop.

A customer came into the shop, looked around and approached the counter. When I said “good morning, sir, can I help you?” he replied “do you sell radio paint?” I stood there and thought why me? but replied “I’m sorry sir, we don’t have any in stock”. The customer thanked me, left the shop, stopped, turned around and came back in. “Do you know anyone who might have some?” This was too good to miss, so I sent him to the butcher’s down the road. I learnt later that he’d gone there and asked for some purple radio paint.

A customer bought a pair of headphones and returned next day complaining that there was no sound. When I asked him how he was using them he placed them on his head and held the 3.5mm jack plug up, saying “there - it still doesn’t work”.

I was serving in the shop one day when a rather scruffy bloke came in, walked up to the counter and said “do you have any Calor gas portable TVs for my caravan?” When I told him I didn’t he asked “well have you got a car exhaust centre piece for my hot-air balloon?” I tried to explain that he was in the wrong shop but he threw a fit and left.

Radio paint came back on another occasion. He pointed at a short-wave radio on display and said “they’re Japanese, aren’t they?” When I confirmed that they were he asked “can they receive foreign English?” “Yes” I said, “do you want to buy one?” He said no and promptly left. never to be seen again.

I keep thinking why me?! P.J. Roberts, Fishponds, Bristol.

**COULD DO BETTER**

What’s wrong with our industry? Last week I had occasion to send away to Akai UK Ltd. for some parts. The order was sent on the appropriate letterhead paper with clear instructions as to the parts required and the customer’s cheque for the correct amount. I waited and waited, then phoned and was assured that the parts would be sent on receipt of the order. Then lo and behold a letter came from Akai to say “sorry, but we don’t supply members of the general public”. Result, one angry technician and one very irate customer.

When I enquired further I was told that the letterhead was printed by a computer and not a printer. I explained that I’d bought the computer for business use to save me money and time. Therefore I print my own letterheads, photocopy them and save god knows how much. Not good enough said Akai. Moral, don’t believe that a computer will save you money, or that ordering parts is easy, quick and efficient.

Another thing I’ve noticed is that when phoning about or ordering the cheaper (special offers) ranges of spares or test equipment all too often you can’t get them. A recent encounter was with Willow Vale. I phoned about a capacitance meter at £32.50, order code 12168. “Yes” I was told, “we’ve eight in stock.” So I hot-footed it over to Reading, with the cash in my hot, grubby fingers. When I got there half an hour after phoning I was told not only that they didn’t have any but that they don’t sell them! I was offered one at £82.

Tut, tut, boys! It wasn’t the first time, in dealings with many firms, that this sort of thing has happened.

D. Maitland Hill, DMH Electronics, Basingstoke, Hants.

**ANY SUGGESTIONS?**

You’ve published several informative articles (e.g. September 1992) on removing and replacing surface-mounted devices. I can’t however recall having seen anything on removing conventional components from plated-through-hole (PTH) PCBs. I’m involved in servicing car radio-cassette players and it’s a problem I come across quite often.

One way to remove say a DIL chip is to remove the solder from the holes, around the component legs. I’ve tried desoldering braid, an Oryx pump and a combined pump and soldering iron of the type supplied by Willow Vale. They all work quite well - sometimes! If the solder is removed at the first attempt all is well. If not, repeated applications fail to remove the solder cleanly. I’ve tried using extra flux (RS 555-869, which is very good for normal purposes) but this often makes matters worse. I intend to try using a hot-air tool, which I feel will be successful where the device concerned is mounted so that it can be heated without damaging other components.

This won’t however provide solutions to two of the most intractable problems I come across when working on some Philips car radio-cassette players (22DC681 for example). It’s often necessary to replace lamps in these. This involves removing the front, vertically-mounted PCB from the main, horizontally mounted PCB. There are many interconnections between the two - the front unit contains the LC display and push-buttons and is very difficult to remove. It’s not possible to use a hot-air tool here as there are plastic parts that would...
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be damaged in the vicinity. The connecting pins are of square section: the problem is in getting the solder from between the four corners of the square and the hole. The job would be easier if the pins were a loose fit in their holes. But they are usually a fairly tight fit.

The other problem is removal of the output chips, which are mounted on a plastic frame before insertion into the PCB. This frame spaces the leads accurately and makes fitting them into the board easy, but the frame fits right down on to the PCB, effectively blocking the plated-through holes. This makes it difficult to remove solder from the other side because air can’t enter. When a pump is placed on the other side and its plunger is released the latter rises only very slowly, as air leaks in. There isn’t enough “suck” to remove the solder.

I’d be very interested to hear from anyone who has solutions to these problems – ones that give good, clean results and don’t require investment in expensive equipment.

G. Davies, Geoff Davies Radio, Rugby, Warwicks.

THOSE BRASS BUSHES

With reference to Chris Watton’s note on Sharp/Orion decks (December issue, page 96), the brass bushes are available from Willow Vale Electronics (stock no. 27998KT) and cost around 80p. The kit comes with a black washer and knurled brass bush. As the bush is a loose fit on the motor shaft I use a very small amount of fast-drying Araldite to secure it. I always replace the bush and fit a new reel idler (genuine type only) and find that this provides a one hundred per cent cure with no comebacks. The bush will fit Orion/Sharp/Amstrad and any other similar decks.

S.J. Caine, SJ C Electronics, Chippenham, Wilts.

AN UNUSUAL FAULT

A customer recently brought us a Boots Model CTV1410 (Tatung 160 chassis) with a most unusual fault. The picture geometry was correct from top to bottom but was cone shaped between the sides of the screen, absolutely symmetrical and with straight sides. The picture width at the top was almost correct, but at the bottom it was only half the width of the screen.

All the waveforms in the line and field output stages were correct. We replaced various capacitors in the line output stage, more in desperation than anything else, to no avail. When contacted Mr. Tatung thought that it might be the scan coils, but admitted that he didn’t know. Nor did I. Eventually, while showing a visiting engineer the fault, the set emitted a fizzing sound and a dark brown smell! The picture corrected itself except for a slightly ragged right-hand edge and an unlocked frame. The line output transformer was cooking, a very small amount of fast-drying Araldite to secure it. As this was such a strange performance I thought others might like to know about it.

P. D’Alquen, D’Alquen and Blackburn, Reading, Berks.

POLARISER MODIFICATION

The bit about the ITT Nokia SAT1100 modifications in the January Satellite Notebook caught my eye. I’ve just modified a receiver as follows. By placing a low-value resistor in series with the 17V d.c. applied to the LNB, horizontal channels available from the handset. I used P0 for vertical polarisation, P4 for horizontal. Fig. 1 shows the circuit.

Mark Adlington, Sawtry, Cambs.

Nick Beer comments: A simple and effective idea. The design lacks regulation, and in production terms has the disadvantages of the mechanical unreliability introduced by the relay and the heat dissipation introduced by the resistor. But as a personal modification it’s great!

A BBC B COMPUTER FAULT

Thank you for Arthur Rumbelow’s article on the BBC Model B computer (January). The following power supply fault I had recently may be of interest to others. At power up the computer sometimes just beeped continuously, with all the LEDs flickering. Eventually the fault became so bad that my son demanded action! On investigation I found that in the fault condition all the power supply lines were low. The cause of the fault was C9 in the power supply going low in value. It’s mounted next to a resistor that runs quite warm, so the fault could become a common one as these power supplies age.

Paul Hardy, Reading, Berks.

CAMCORNER

With reference to the problem with a Ferguson GRC7/Ferguson 3CO3 described by David Woodnott (January), JVC have available a Focus Helicoid Kit for this model. Its cost is very small compared to that of a new lens. If the focus assembly of a lens is crossthreaded because of impact damage it’s not good practice to reverse the situation by further application of force. The focus drive is very light, and damage to the focus assembly threads often causes intermittent lens jamming.

Steve Beeching, Newark, Notts.

CAMCORDER BATTERY PROBLEMS

I was very interested in the Test Case 361 (January) reference to failure of an auxiliary 6V supply to operate a camcorder. Early last year I purchased a Panasonic NVS5B palmcorder in a bit of a rush for a particular purpose. Many others will know what I am about to say – that the batteries are a pain in the er... neck. It says quite clearly “6V DC batt operation” on the base of this camcorder, under the model number, and at the rear where the battery clips on it says “DC IN 6V” – I feel sure that this refers to the d.c. input socket from the mains power pack. Neither of the two camcorders that I have had (one was exchanged because of a fault) will operate with a 6V supply however. As a nicad battery let me down I purchased and fully charged a 6V 7Ah lead-acid battery but was again thwarted.

On investigation I found that the camcorder requires something like 6-1V to operate, consuming about 1-1A in the record mode. By monitoring the voltage (7-2V) produced by

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a fully-charged 6V, 1.8Ah battery I was able to establish that the camcorder shut down at just over 6V. A check with a nicad battery, discharging it through a fixed wire resistance at the same current (1-1A), showed that it took about fifteen minutes for the output voltage to drop from 7.2V to 6-1V, the camcorder's cut-off point. The voltage then stayed at 6V for just about the length of time that it should have done. Had one been able to reduce the camcorder's cut-off voltage to say 5-9V then, all things being equal (temperature, battery properly discharged/charged and so on), it would have been possible to get a full 45 minute recording with the battery supplied instead of the ten minutes that was all I was able to get. In view of this wouldn't it have been better to specify a 7-2V nicad battery instead of a 6V one?

With any type of battery for which there is a stated Ah discharge rate, surely if it won't give the stated voltage while delivering the stated current for the stated time it shouldn't claim to be able to do so?

A further point with nicad batteries is the so-called memory effect, caused by topping up the charge after a short period of use. The instruction on my spare battery states "fully discharge before recharging". To me this suggests that the battery should be discharged using a suitable bulb until this fails to glow. With my Panasonic camcorder however the automatic mains charger/power supply, which has a built-in automatic discharge and recharge feature, has 5-62V as the quoted discharge point, which I wouldn't call anywhere near "fully discharged". So who is right?

I resolved my battery problems by purchasing another 6V 7Ah lead-acid battery, connecting the two batteries in series then using a regulator to supply 7-2V, which is the starting point with a charged nicad battery. The lead-acid batteries can discharge to approximately 9V before the regulator action fails. This has enabled me to spend all day filming without having to worry about battery failure. If I need to do so I can recharge direct from my car cigar lighter. The only problem is the extra weight I have to carry, but this can be put down whilst filming.

I would welcome other people's views on these points. John F.J. Kendall, Herne Bay, Kent.

HELP WANTED

Can anyone supply a scrap Ferguson 1790 chassis or alternatively the sound demodulator can (part no. 06D0-214-002)? Roger Burchett, 12 Ormonde Road, Hythe, Kent (0303 267 969).

Wanted, Philips VR2022/05 VCR, working or non-working. G. Angelini, 853 Govan Road, Glasgow G51 3DL (041 445 2663).

Wanted, TV coin-operated meter boxes, preferably Smiths or Coinmechs, £1 or at least 50p type, or any other make as long as they are supplied with keys. G.H. Jones, Einion Electric, Bridge Street, Llanfair Caereinion, Powys SY21 0RZ (0938 810 539).

Can anyone supply a front control panel - on/off switch, tuning, etc. for the Rdifusion Mk 4 chassis type 564058 (teletext)? H.S. Downing, 16 Mayfield Crescent, Lower Stondon, Hertford, Beds SG16 6LJ. 0462 850 244.

Wanted: A service sheet or photocopy of the manual for the Hitachi TV-7400G. H. Moore, 51 Pembury Road, Reading, Berks RAO 6JG. 0118 958 745.

Wanted: ROC2022/05 VCR, working or non-working. G. Angelini, 853 Govan Road, Glasgow G51 3DL (041 445 2663).

Can anyone supply new or secondhand a front panel (operation panel) for the Amstrad SRX200 satellite TV receiver? The Amstrad part no. is 240068 - it's apparently no longer available. Philip Pick, Sight and Sound, 1 Stonewall Cottage, Hill Top Farm, Caythorpe Heath, Caythorpe, Lincs NG32 3EU (0400 73448).

Required, an oil-filled LOPT for the Murphy V310 dating from circa 1957. N.F. Plant, 3 Arthur Moody Drive, Carisbrooke, Newport, Isle of Wight (0983 520 087).

Can anyone supply Module CMR800 (the r.f./i.f. unit) for the ITT Model 1600/1? Also loan of a manual for the set would be appreciated. V. Jeremy, 7 Tai Penyad, Penyad, Mether Tydfil, Mid-Glamorgan, S. Wales.

Wanted: Circuit diagram or other service information for the Network 14 FRE colour portable. E.J. Edwards, FFF, 7 Field House, 2A Low Wood Road, Birkenhead, Merseyside L41 2SR. 051 647 5156.

Wanted: A service sheet or photorecopy of the manual for the Sony Model KV2782 multistandard TV set. Will pay reasonable price. D. Benyon, Marshland View, St. Anne's Hill, Bude, Cornwall EX23 0LT. 0288 353 373.

Wanted: 50MHz bandwidth oscilloscope. G. Cannon, 16 St. Cuthbert's Road, Holy Cross, Wallingford, Tyne and Wear NE28 7JF. 091 262 0712.

Has anyone a circuit diagram for the Akura CX10 colour TV receiver? D.J. Long, 15 Wellholme, Brighouse, W. Yorkshire HD6 4AF.

Can anyone supply a rear cover for a Philips G6 series TV receiver? Model G2K502 or similar - and perhaps some salvaged parts? Brian Renforth, 174 Helmsley Road, Sandyford, Newcastle-upon-Tyne NE2 1RD.

Wanted: Modules for a Philips P3225 oscilloscope. D. Benyon, Marshland View, St. Anne's Hill, Bude, Cornwall EX23 0LT. 0288 353 373.

Has anyone a stock of LOPTs for the Panasonic U3 chassis? Roger Burchett, 12 Ormonde Road, Hythe, Kent CT21 6DN. 0303 267 969.

Does anyone know of a source of remote controls and/or AV adaptors for Philips V2000 series VCRs? S. Sheppard, 12 Bedford Road, Harrow, Middx HA1 4LZ. 081 863 5150.
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<th>Quantity</th>
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#### COMPUTER SPARES
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#### TOOLS & ACCESSORIES
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### TV/MONITOR LINE OUTPUT TRANSFORMERS
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### AUDIO SPARES
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### VIDEO SPARES
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<td>74HC113</td>
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<td>TX10</td>
<td>14&quot; 8 Push Button</td>
<td>£14</td>
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<tr>
<td>TX86</td>
<td>20&quot; White Spot</td>
<td>£14</td>
</tr>
<tr>
<td>TX90</td>
<td>14&quot; 8 Push Button</td>
<td>£14</td>
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