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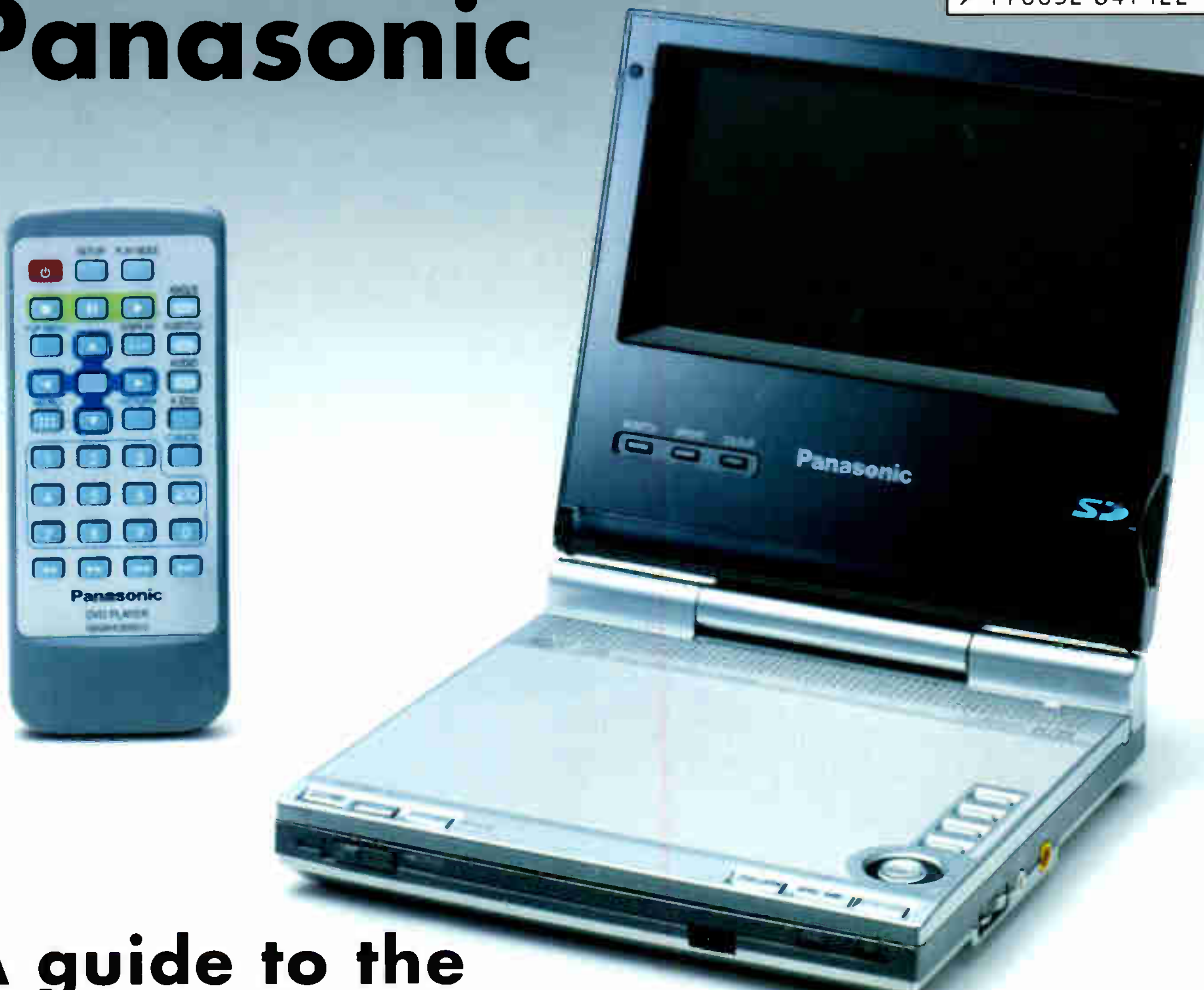

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Note that we are unable to answer technical queries over the telephone and cannot provide information on spares other than that given in our Spares Guide.

Next issue, dated August, on sale July 17

The Communications Bill

The government's draft Communications Bill was published on May 7, after an eighteen-month discussion period following publication of a White Paper. It made a brief splash, after which public interest – if we are to judge by column inches in the press – died down quite quickly. After all, it's difficult to see what one can make much of a fuss about over the Bill's contents. There is always the 'unforeseen consequences' effect however. One thinks for example – well I do, anyway! – of the famous beer orders. These split the link between the brewers and their public-house estates, the idea being that beer would be cheaper (because of increased competition on the retail side of the trade), consumer choice would be increased and the number of breweries would increase (because the 'tie' made it difficult for smaller breweries to find sales outlets). The opposite happened. Well, some cheap beer is available, if you look for it, but by and large the price of a pint has shot up. There is much less choice than twenty years ago, and the number of significant breweries (as opposed to the microbreweries that, though welcome, have insignificant overall effect) has substantially decreased. Brewing operations have been consolidated, and the pubs are nowadays mainly owned by a small number of companies whose least concern is to provide you and me with a cheap pint. That's the rule of unforeseen consequences for you!

The proposals in the Communications Bill could have a similarly perverse outcome. The primary objectives, we are given to understand, are to loosen the rules that control the ownership of the media and lighten day-to-day regulation. According to Tessa Jowell, the Secretary of State for Culture, Media and Sport, the aim is to bring the regulations up-to-date, "removing unnecessary regulatory burdens and cutting red tape, but at the same time retaining some key safeguards that will protect the diversity and plurality of our media". Give the media greater freedom and, within the economic constraints imposed by competition and a little light regulation, let them get on with it – to everyone's benefit. It could all end up in tears however, though let's hope not.

Ownership could be massively consolidated – in fact a main aim seems to be to encourage a degree of consolidation – and we could all end up paying more for less. As with beer. All right the public broadcasters, which largely means the BBC, are likely to have an enhanced role to play, ensuring a degree of diversity in the material available to viewers. But even the BBC could find itself in a weak position in a broadcasting world dominated by massive international media corporations. We shall just have to see. It's of the essence of unforeseen consequences that only time will tell. What the government should be prepared to do is to act quickly if things seem to be going wrong.

There will be plenty of opportunity for discussing the bill's proposals as the government fills in the details – the draft bill leaves much still to be decided. There is to be a three-month period for consultation and scrutiny in Parliament. A bill will then be presented to Parliament in November, with the expectation that it would receive royal assent in July 2003 and come into effect in about November of that year.

> The primary objectives are to loosen the rules that control the ownership of the media and lighten day-to-day regulation.

The main proposals set forth in the bill are as follows. All rules preventing non-European ownership of UK TV and radio licences to be scrapped. Restrictions on the ownership of more than one national TV or radio network to be lifted. Joint ownership of TV and radio stations to be allowed. Reform of regulations to make it easier for newspaper mergers. Large newspaper groups to be allowed to acquire Channel 5 or radio licences (this was what led to the headlines about Rupert Murdoch's prospective entry into the terrestrial TV field in the UK). Single ownership of ITV to be allowed. A major feature of the Bill is the creation of an Office of Communications (Ofcom) to take over the responsibilities at present carried out by the Independent Television Commission, the Radio Authority, Oftel, the Broadcasting Standards Commission and the Radiocommunications Agency. It would have some control over the BBC, a significant new departure, but the overall remit seems to be to aim for light regulation. It would have power, alongside the Office of Fair Trading, to ensure competition within the communications sector. This sounds rather vague, and could in practice depend very much on whoever has overall responsibility at any particular time.

Various concerns are beginning to be expressed as the "small print" of the Bill is examined. The main one so far is about a proposal that satellite broadcasting should be taxed. Well why not, all other broadcasting is in one way or another. But BSkyB is not at all happy about the prospect.

The government is of the opinion that changes to media control are required in order to respond "to the technological and market changes that drive modern media" (Tessa Jowell again). Well, maybe. But apart from major media consolidation, which hardly seems all that desirable, it's not easy to foresee the likely practical consequences of this Bill.

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INDEXES AND BINDERS

Indexes for Vols. 38 to 50 are available at £3.50 each from SoftCopy Ltd., who can also supply an thirteen-year consolidated index on computer disc. For further details see page 565.

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TELETOPICS

Flat-screen news

Toshiba claims to have developed the world's first 'large' flexible liquid-crystal display, which opens up the possibility of displaying images on curved screens and developing foldable LCDs. The new display has a full-colour capability, SVGA resolution, and is super-slim (less than 0·4mm deep) with a screen size of 8·4in. It uses low-temperature polysilicon active-matrix TFT (thin-film transistor) technology with an extremely thin glass substrate that's attached to a flexible sheet. Displays using the technology can be manufactured at the normal processing temperature. An added advantage is increased resistance to shock.

The new display can be flexed in all directions and bent to form a curve with a radius as high as 20cm. Toshiba points out that previous approaches to developing a flexible LCD have involved forming transistors on a plastic substrate at an extremely low temperature. The disadvantage of this is inadequate transistor quality and reliability. Possible applications of the new display include TV sets with curved screens to provide public-information displays in trains or buses. Toshiba is now developing mass-production technology for the display, and the Toshiba Matsushita Display Technology Corporation expects to launch commercial products in 2004.

Philips has announced the development of a new LCD technology that will enable ultra-thin LCD screens to be made much more cheaply. A variety of base substrate materials can be used including flexible plastic. The layers of the display are built up sequentially on the substrate. Instead of filling individual cells with the liquid-crystal material, a mixture of liquid-crystal material and a polymer precursor is 'spread' on the surface then selectively exposed to ultraviolet light. This photo-enforced stratification (PES) process splits the layer into liquid-crystal and polymer parts, with liquid-crystal cells separated and covered by polymer. No top substrate is required. The new technique could be applied to high-volume, low-cost reel-to-reel manufacturing. Initial demonstrations have been in monochrome, but Philips expects to have a colour plastic LCD screen very shortly.

Matsushita and Toray have announced a new joint venture, the Matsushita Plasma Display Panel Company Ltd., which will build a plant with an initial production capacity of 80,000 panels a month in Osaka, Japan. Construction of the new plant is to start next January, with commercial production of PDPs due to start in April 2004. Once the new plant is brought into operation, the Matsushita group will have an annual PDP output capacity in excess of 1·5 million units.

Sharp is to launch its 30in. widescreen LCD TV model, first seen at CES 2002, in the UK. It incorporates Sharp's newly-developed Advanced Super View (ASV) technology, which provides a viewing angle of 170° and improves the response time. The latter significantly reduces smearing with fast action. Resolution is WXGA, brightness 430cd/m^2 and the contrast ratio 500:1. As with Sharp's other Aquos LCD TV sets, the new model has a PC input.

Televes UK Ltd. has introduced a new range of signal distribution equipment for use in the home – it's called the atticbox range. The main unit, see photograph, combines UHF, FM radio, digital radio and satellite signal sources and provides feeds for four different rooms. There is a down-and-uplink for distributing decoded Sky satellite signals. An 'option unit' can be added to increase the number of LNB inputs and the number of outputs to rooms. Small infra-red eye remote-control extended units can be used in each room for Sky programme selection. For more information Televes UK Ltd. can be reached on 01633 875 821 (phone) or 01633 866 311 (fax). There's a website at www.televes.com

Disc developments

Canon, Fujitsu, Hitachi, JVC, Phoenix Technologies, Pioneer, Sanyo and Sharp have established the iVDR Hard-disk Drive Consortium – iVDR stands for information versatile disk for removable use. The iVDR format will make available a lightweight, compact removable hard-disk drive that suits a wide range of applications from AV to PC devices. The consortium aims to increase hard-disk capacity from the current 40GB to 200-400GB within the next two-three years. Multiple iVDR will make possible easy building of servers with TB (tera byte) capacity. Present hard-disk AV products use 3·5in. fixed hard-disk drives: iVDR will use a 2·5in. removable hard-disk drive.

The nine companies behind the Blue-ray (blue-violet laser) optical disc (see Teletopics April 2002) are about to disclose the full system specification with a view to the start of licensing for the development and manufacture of products that use the format. Basically Blue-ray is an enhanced version of the DVD using a 405nm laser to greatly increase the storage capacity of the disc.

Marata Vision has launched two TileVision units – TV sets for wall installation in the bathroom – with 26cm and 38cm LCD screens. Prices are about £1,700 and £2,150 respectively, plus VAT. The units are built into boxes 5cm deep and incorporate heating to reduce screen steam-up. For further information go to www.marata.co.uk

News from Pace

Pace Micro Technology has announced the world's first integrated twin-tuner, twin-decoder satellite set-top box range, called Puma, with an optional hard-disk drive. It has been designed to enable two separate digital programmes to be watched on separate TV sets, or enable one programme to be recorded while another one is being watched. Recording can be done with a VCR or, with a second model due to be launched later this year, an integrated hard-disk drive. The hard disk will enable features such as pause, rewind, fast forwarding and interactivity to be provided.

There is access to pay-TV channels using one or several conditional-access technologies: this is tailored to suit various markets. Puma currently uses the Mediaguard CA system, but Pace has licences to integrate other European CA systems including Nagravision, Conax, Irdeto and VideoGuard. The first model, without a hard-disk drive, is expected to go on sale in September for about £350.

Pace has also announced a new modular approach to set-top boxes. The Siblings technology will enable operators to use digital gateways that can be upgraded with voice, video and data functions. To minimise operator costs, all upgrades are designed to be customer installable, and there are common components such as power supplies and modems for broadband connections.

ITV Digital – the aftermath

There has been very limited interest in ITV Digital's broadcasting licences, which were readvertised by the ITC. The date for awarding new licences has been extended from June 13 to July 4. The BBC, ITV and Channels 4 and 5 have put forward a proposal to run the free-to-view services. Reduction in the number of channels to enable the signal strength to be improved is under consideration – the ITC is being advised by the Digital TV Group. NTL has acquired ITV Digital's customer database for 50p a head.

ITV Digital's administrators have issued guidance to dealers on selling set-top boxes for free-to-view use. A payment of £35 plus VAT is expected by the administrators for all STBs sold or otherwise disposed of, and a weekly stock reconciliation form should be completed and sent in to them. Previously an authorised dealer paid ITV Digital £112.50 for a receiver sold without a subscription. There is still uncertainty over the status of the STBs in people's homes.

OFT – Colorvision

The Office of Fair Trading is to pay £4.73m compensation and apologise unreservedly to two businessmen for a catalogue of errors that led to their company, Colorvision, being forced into receivership in 1996. This follows an investigation by the parliamentary ombudsman. The OFT has admitted to "maladministration", and says that it "has reinforced its procedures to ensure that those taking credit license revocation decisions do so only on the basis of sound evidence". Colorvision relied on consumer credit for half its business. The owners of Colorvision have rightly been compensated for their distress, but what about the 800 or so people who worked in the 76 stores?

Safe electrical testing

The Health and Safety Executive has published a new booklet, *Safety in electrical testing at work: General guidance* (INDG354), on how to reduce the possibility of injury while carrying out electrical tests. It provides basic guidance on safe electrical testing, covering all situations where tests are carried out – in homes, workshops and on production lines. There are four new documents that complement the guidance, Engineering Information Sheets 35-38. These give more detailed information relevant to the servicing and repair of domestic appliances (EIS35), the servicing and repair of audio, TV and computer equipment (EIS36), switchgear and control equipment (EIS37) and products on production lines (EIS38).

Copies of these free publications are available from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA. Phone 01787 881 165, fax 01787 313 995 or order on-line at www.hsebooks.co.uk

New digital interface specification

Hitachi, Matsushita, Philips, Silicon Image, Sony, Thomson and Toshiba have set up a working group to produce a specification for a next-generation digital interface for consumer electronic products. The High Definition Multimedia Interface (HDMI) will link high-definition video and multi-channel audio via a single cable, building on the DVI interface and including backwards compatibility.

The new system uses a small connector that's suitable for portable products such as digital camcorders. It will work with many existing AV interoperability protocols.

Spares guide update

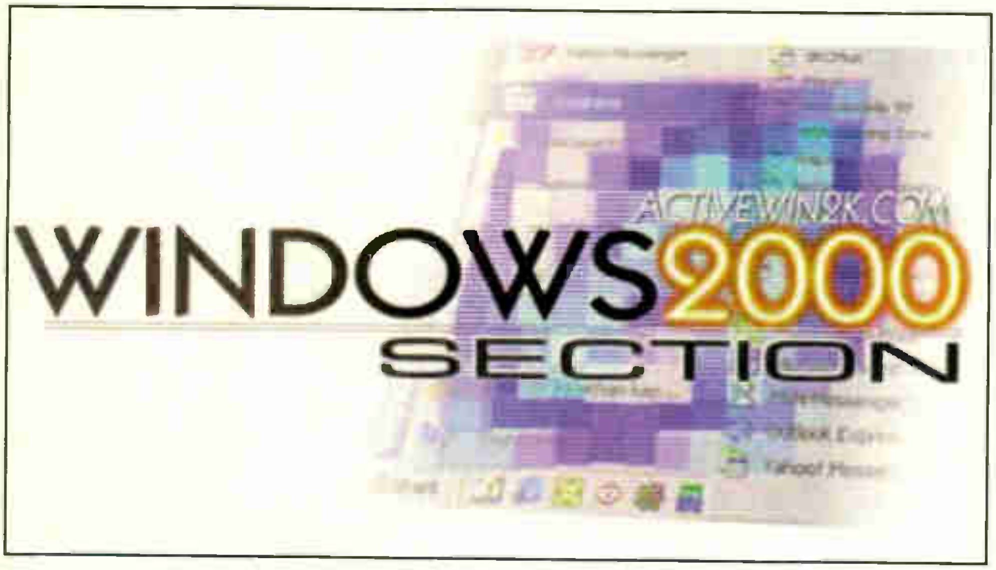
The information in our May issue Spares Guide relating to Decca and Tatung should be updated as follows:

Decca. See Tatung (UK) Ltd. Spares for chassis up to and including the 110/115 series are available from D&S Electronic Services, Building 15, Unit 4, Stanmore Industrial Estate, Bridgnorth, Salop WV15 5HR. Phone/fax 01746 766 641.

Tatung (UK) Ltd., Service Division, Stafford Park 10, Telford, Shropshire TF3 3WF. Phone 01952 290 111. Dealers only. Non-dealers should contact Wizard or www.servicebridge.co.uk

iVergent Technologies has launched the Picxand PC-DVR plus TV card for PCs. It enables a PC to receive the analogue TV channels, with full Nicam stereo sound, and record programmes on the PC's hard disk. A unique teletext-based 3Click electronic programme guide simplifies programme selection for recording, while the BlackGold Superscan Technology provides images comparable to those of the best 100Hz TV sets, free from the visual distortion that's often present with PC/TV cards. The integrated Disk Space Manager enables the user to catalogue programmes on the hard disk. The card is expected to sell for about £62. It comes bundled with Microsoft Windows Media Player, enabling the user to manage playlists and burn CDs. Teletext is brought to life, with internet-style immediate page access, keyword search facilities and dynamic links.

Even a novice PC user can install the PC-DVR Plus card in minutes, and the integrated sound card means that there are no complicated audio jacks to connect. Once it has been installed, the one-touch set-up tuning wizard automatically locates and names the five UK analogue TV channels and numerous FM radio stations. For further information apply to John Williams, iVergent Technologies, Suite 100, 7 St. Margarets Grove, London TW1 1JF, phone 7789 201 210 or e-mail johnw@ivergent.tv There's a website at www.ivergent.tv.



Windows 2000

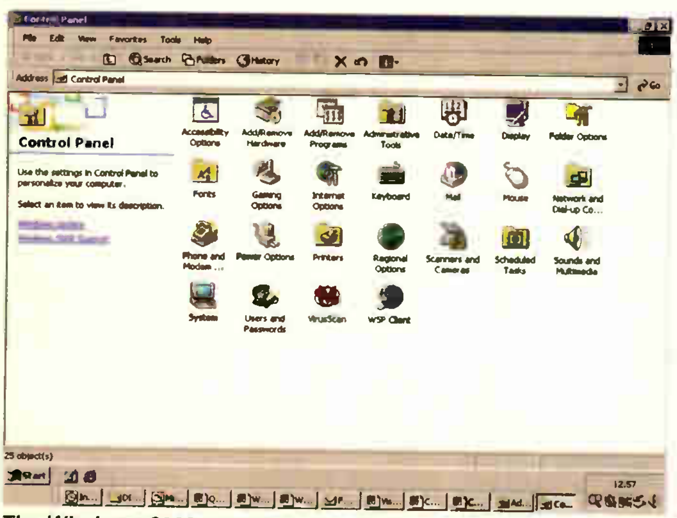
K.F. Ibrahim describes the Windows 2000 PC operating system, its boot-up sequence and some boot-up faults. There are standalone and server (used for workgroups) versions of the system: this article concentrates on the former version, which Microsoft calls Professional

There are a number of computer operating systems, such as DOS, Windows 98 and Netware 4.11. One or more may be loaded into a PC, but only one can be in use at any one time. PC operating systems have a number of characteristics, such as single- or multi-processing and being platform-dependent or -independent. Windows 2000 is a multi-processing, multi-tasking, multi-threading, platform-independent operating system. These terms require explanation.

Multi-processing: An operating system that will work with a multi-processor motherboard, i.e. a motherboard that contains more than one microprocessor chip, is known as a multi-processing operating system. DOS, Windows 3.x, 95, 98 and Novell 2.x, 3.x, 4.0 and 4.10 are all single-processing operating systems. Multi-processing systems include Windows NT, ME, 2000 and Novell 4.11 and 5.x.

Multi-tasking: A multi-tasking operating system enables more than one application to run simultaneously, one in the foreground and a second or third or more in the background.

There are two types of multi-tasking: co-operative (Windows 3.11) and pre-emptive (Windows 95, 98, ME, NT and 2000). The first relies on the application in the foreground relinquishing control to another application when requested by the system. This technique is prone to causing computer crashes – when one application refuses to yield to another. With the pre-emptive type the operating system retains control so that it can force applications to relinquish control as required.



The Windows 2000 control panel screen.

Multi-threading: A thread is a single basic unit of code scheduled for use. A number of threads form a process and a number of processes constitute an instruction. A sequence of instructions forms a program. Two threads can be used simultaneously when two ALUs (Arithmetic Logic Units) are available. This is known as multi-threading.

Up to the Intel 80486, microprocessor chips had only one ALU and could thus handle only a single thread at a time. From the Pentium onwards processors were manufactured with two ALUs to provide multi-threading. DOS, Windows 3, O/S and Novell 2.x and 3.x can recognise only one ALU and are thus single-thread operating systems. Windows 95, ME, 2000, NT and Novell 4.x and 5.x can use two ALUs and are thus refered to as multi-threading systems.

Platform dependency: An operating system is said to be platform-dependent if it can be used with only one type of processor, either an Intel-based CISC (Complex Instruction Set Code) or an Alpha-based RISC (Reduced Instruction Set Code) processor. Operating systems such as Windows NT and 2000 can be used with either CISC or RISC processors and are known as platform-independent systems. To achieve this with a RISC motherboard, a software layer known as the Hardware Abstration Layer (HAL) is inserted between the computer hardware and the operating system. With HAL present the operating system is not aware of the type of processor in use.

RISC processors are faster: they can perform fast mathematical operations using fewer (a 'reduced' number of) instructions. Examples of CISC processors are the Intel

80XXX and Pentium series. Examples of RISC processors are the Alpha and OAK type.

Fully plug-n-play cards

Modern PC adaptor cards are of the plug-n-play (PnP) type, with which IRQ (Interrupt Request), port address and any other resource requirements are allocated automatically by a software routine that checks the resources available and allocates the first available ones to the card. Three requirments must be met for successful PnP installation of a device: the device itself must be of the PnP type, the motherboard must have a PnP BIOS (Basic Input Output Services) chip and the operating system must support PnP installation. Such operating systems include Windows 95, 98, ME and 2000.

During the boot-up, the PnP BIOS chip helps to resolve conflicts as devices mounted on the motherboard and peripherals plugged into slots compete for access to limited system resources. This continues after the boot-up, with the BIOS chip providing configuration services. It enables resources to be allocated and relocated even after the operating system has been loaded.

Device Manager

The Device Manager is a utility introduced by Microsoft and used with Windows 95, 98, ME and 2000 but not NT. It provides a graphical representation of all the devices that have been configured and can be be accessed by selecting the system icon in the control panel. It lists all the hardware devices, their properties, drivers and the resources allocated to them. Problems are indicated by three red symbols:

This indicates that either a device is not present, that it's not installed or that there's a resource conflict.

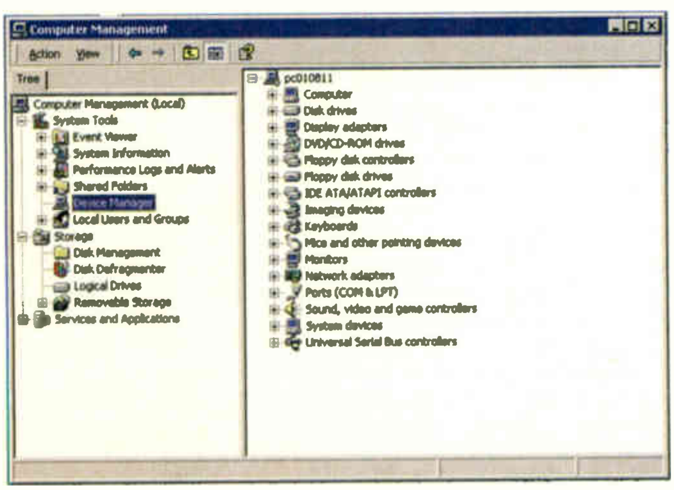
This indicates that not all drivers have been installed.

This indicates severe resource conflict, with the offending item disabled.

By double-clicking on the offending symbol, the device properties, including its drivers and resource allocation (IRQ and port address), can be examined and in some cases modified.

File systems

Three file systems are in common use: the 16-bit FAT (File Allocation Table), the 32-bit FAT32 and NTFS (New Technology File System). FAT is a basic standard that can be used by DOS and almost all other operating systems including Windows 95, 98, NT and 2000 as well as Novell systems. FAT-formatted partitions use filenames with a maximum of 11 characters (8.3 format) for DOS and 255 characters for Windows 95, 98, ME and 2000, also NT. It uses 12- or 16-bit binary numbers to identify clusters and



The Windows 2000 computer management screen.

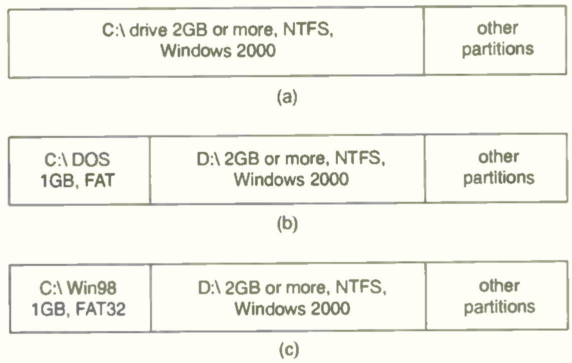


Fig. 1: Typical hard-disk configurations. (a) Single-boot configuration, (b) and (c) dual-boot configurations.

thus provide a maximum hard-disk capacity of 2GB.

Partitioning a hard disk is carried out by the DOS FDISK command, which generates a menu that enables the user to divide the hard disk into one or two partitions, a primary and an extended partition. The extended partition can be further divided into a number of logical drives (up to 25) such as D:, E: and so on. Each partition and logical drive is allocated a proportion of the total disk space.

The partition where the operating system is to be loaded, normally drive C:, must be a primary partition and must be made active. Failure to do this will result in the BIOS being unable to detect and load the operating system at start up.

FAT32 uses 32-bit numbers to identify clusters, thus increasing the maximum supported disk capacity to 2,048GB (2TB). Windows 95 onwards can use FAT32.

NTFS is faster than FAT and FAT32. It can use names up to 255 characters long and very large partitions. The other advantage is that it provides an extended list of attributes and security features compared with FAT's limited attributes. It suffers from the fact that it can be used with only two operating systems, Windows NT and 2000.

Installation

The minimum hardware requirements (microprocessor type and speed, system memory and hard-disk space) specified by Microsoft for a machine that's to have Windows 2000 Professional installed are theoretical limits. A PC that has this minimum hardware specification will be very slow – if it ever gets off the ground. In practice the following is considered to be satisfactory: a Pentium 400MHz (preferably 800MHz) microprocessor; 64MB (preferably 128MB) of memory; 1GB (preferably 2GB) of hard-disk space and a CD-ROM drive (preferably x52). Typical hard-disk configurations are shown in Fig. 1.

Microsoft supplies an installation CD-ROM disk from which the operating system can be installed. Windows 2000 is a multi-boot operating system. This means that it can be installed in a PC which already has an operating system such as DOS or a previous version of Windows installed. The two systems can coexist in the same PC. At boot-up a menu will be displayed enabling the user to select one of the two or more operating systems installed. If DOS is to be one of the operating systems it must be installed first – if it is installed last it will remove all previously installed operating systems.

To install Windows 2000 with an Intel-based DOS PC, boot up into DOS, make the CD-ROM drive (normally D:\) the working directory, change the directory to i386 and enter *WINNT* at the prompt, i.e. >D:\i386*WINNT*.

The installation wizard will then be launched and you will be asked to fill in a number of details and settings, including name and organisation (which could be anything), name of administrator (which is Administrator by default) and a password (which is case sensitive) of your choosing. You will also be asked to specify the partition where the system folder is to be located. This is normally

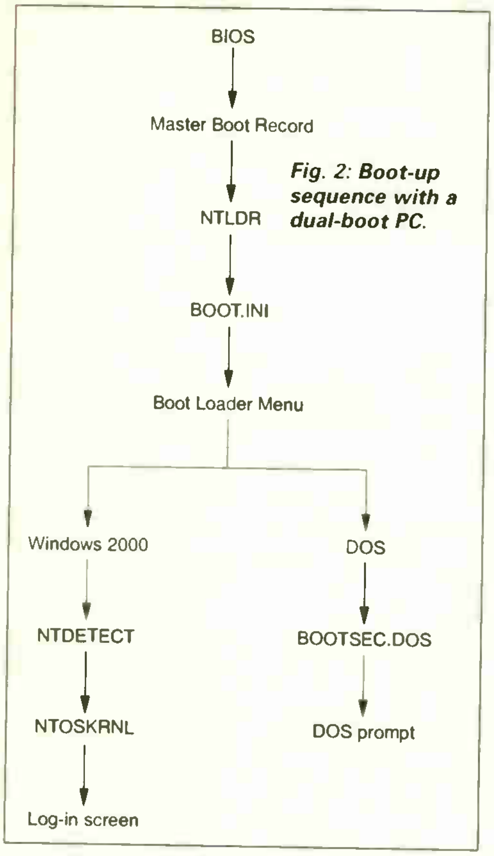


Fig. 2: Boot-up sequence with a dual-boot PC.

a folder called WINNT. If a separate partition to that used for DOS is selected, you are given the options to format it into FAT or NTFS.

At the end of the installation process you are asked if you want to log on automatically. This option is appropriate only if you have no security requirements, as in the case of a standalone PC in someone's home. Otherwise, a log-on window will appear each time the PC boots up and you will have to enter a user name and a password.

The same procedure is used to install Windows 2000 with a PC that has Windows 95, 98, ME or NT installed, except that WINNT32 must be entered in the RUN command line.

With a single-boot PC that has no previously installed operating system the Windows 2000 installation CD can be used directly as a boot CD, provided the boot sequence in CMOS is set for CD-ROM to be the first boot. The set-up Wizard will be launched and the installation process begins.

The Windows 2000 boot-up process

The PC boot-up process consists of two phases. The first is the BIOS phase, which is common to all operating systems. In this phase BIOS routines stored in a BIOS ROM chip are carried out to prepare for loading the operating system itself, be this DOS, Windows or Novell. The second phase loads the operating system and is operating-system specific. Since Windows 2000 is a multiprocessing system, there are two boot-up sequences, one for CISC and the other for RISC processors. The following is the sequence for CISC-processor PCs.

The BIOS phase of the boot-up process is as follows. At switch-on the processor is reset and BIOS is loaded. BIOS then runs the POST (Power On System Test), loads the HD driver and loads the master boot record (MBR) into memory. MBR searches the partition boot record (PBR) of the hard disk for an active partition and loads the boot sector into memory.

Phase two consists of loading five system files: NTLDR (NT loader); BOOT.INI; NTDETECT.COM; and NTOSKRNL.EXE (operating system kernel).

The following is a more detailed account of phase two.

(1) The boot sector loads and initialises the NT loader (NTLDR) which begins the boot sequence. NTDLR changes the processor memory access to a 32-bit flat (linear) memory model and starts a minifile system that depends on whether the FAT or NTFS file system is used.

(2) The NT loader reads file BOOT.INI to construct the Boot Loader Menu (BLM). This menu appears on-screen for user selection with timeout (30 seconds by default) after which the default operating system is selected. F8 may be pressed at this stage for troubleshooting purposes. In single-boot machines the menu is bypassed.

(3) NTLDR loads the operating system selected from the BLM.
(4) If Windows is selected, NTDETECT.COM is carried out. It checks the hardware and builds a hardware list.

(5) Control of the computer is now passed to the operating system kernel NTOSKRNL.EXE. This final stage of the boot-up process consists of three phases: the kernel load phase; the kernel initialisation phase; and the log-on phase. The latter normally consists of a log-on screen which asks the user to enter a user name and a password (the password may be blank). This phase is bypassed if automatic log-on is selected at the installation stage.

Those familiar with Windows NT will realise that the boot-up routine, including system file names, for Windows 2000 is identical to that for NT.

With a dual-boot PC, if the second operating system is DOS, BOOTSECT.DOS is loaded after the Boot Loader Menu, followed by the DOS prompt.

Try booting up Windows 2000 Professional. Observe the boot-up sequence as displayed on the screen. If it's a dual-boot system, the menu will appear with the default operating system highlighted and a countdown.

Fig. 2 illustrates the boot-up sequence with a dual-boot PC.

The BOOT.INI file

This is the only file, in text form, that can be changed and edited. Unlike Windows NT4, with which BOOT.INI is a read-only file (attribute R), with Windows 2000 it has attributes H (hidden) and S (system). It can, therefore, though hidden be edited without having to change its attributes.

Table 1: Typical BOOT.INI file.

```
[boot loader]
timeout=30
default=multi (0) disk (0) rdisk (0) partition (2) \WINNT
[operating systems]
multi (0) disk (0) rdisk (0) partition (2) \WINNT="Microsoft Windows
  2000 Professional"
C:\="MS-DOS"
```

A typical BOOT.INI file is shown in Table 1. It contains two sections: boot loader and operating systems. The boot loader contains two settings, default and timeout. Default specifies the path to the folder (default WINNIT) where the operating system resides. The default operating system is selected if no other operating system is present or none is selected during the timeout period. Timeout is the time (default value 30 seconds) allowed for the user to select an operating system from the boot menu. The second section, operating systems, lists the path to each available operating system that's been loaded in the PC.

Two operating systems are listed in Table 1, Windows 2000 and DOS, with Windows 2000 as default. The path for Windows 2000 is contained in the part of the line before the = sign. *Multi (0)* indicates an IDE or EIDE drive (scsi is used for SCSI drives), with (0) giving the number of the hard-disk drive. *Disk (0)* is always (0) for multi – for SCSI drives the number in brackets would be between 0-6 to specify the SCSI ID. *Rdisk (0)* indicates that the drive is master (1 is used for slave) – for SCSI it's always (0). *Partition (2)* points to the second partition of the hard disk. *WINNT* specifies the name of the folder where System32 folder and system files are placed.

The part of the line after the = sign, within the " " marks, is the text that appears in the boot loader menu to describe the operating system.

The BOOT.INI file can be edited using DOS editor or it can be opened up within Windows. Editing can be carried out in three ways:

(1) Boot up and select DOS from the boot-up menu (if DOS is available as a previous operating system). Change the working directory to C:\ and type EDIT BOOT.INI at the prompt. An editable BOOT.INI file will be displayed. Note that although BOOT.INI with attributes H and S will not be shown in directory listing DIR, it may be listed if either the ATTRIB or DIR/A command is used.
(2) Boot up into Windows 2000 and open the command line (Start > Run > enter CMD > OK). Change the working directory to C:. Carry out (1) above.

(3) From the desktop, double click on My Computer > double click on C:\ > Tools form bar menu > Folder options > View > click on Show Hidden Files > click to remove tick on Hide protected operating system files > click Yes to warning > Apply > OK. BOOT.INI will now be displayed. Double click on BOOT.INI to open. Edit as necessary, save and exit.

Boot-up process with RISC-processor PCs

Phase one is the same as with CISC-processor based PCs. In phase two, instead of the NT loader the resident ROM firmware examines the BIOS Parameter Block (BPB) to verify that it contains the FAT file system. The firmware then proceeds to load OSLOADER.EXE and passes control to it, along with the results of the hardware detection determined by the POST routine.

OSLOADER.EXE then loads NTOSKRNL.EXE followed by HAL.DLL, hardware-specific files (extension .PAL) and system files. NTOSKRNL.EXE then loads the device drivers.

Note that with a RISC processor-based PC (a) the POST routine gathers the hardware information and passes it to the operating system kernel, hence the absence of NTDETECT.COM, and (b) the Boot menu is stored in a non-volatile RAM, thus there's no need for a BOOT.INI file.

Advanced options menu

Windows 2000 provides an Advanced Options Menu for troubleshooting purposes. Use it in cases of failure to boot up caused by a missing boot file, the introduction of new hardware or a new application. The Advanced Options Menu can be brought up by pressing F8 during the boot-up process. It provides a number of options that can be used in cases where normal booting up is not possible. The options are as follows.

(1) *Safe Mode.* Enables the most basic drivers and services including VGA 4-bit colour, 640 x 480, 60Hz refresh rate; mouse; keyboard; hard disk; CD-ROM drive; PS/2 (not serial) mouse. As far as Microsoft is concerned, serial mouse, sound card and network adaptor card are non-standard devices.

(2) *Safe Mode with command prompt.* Loads standard device drivers as Safe Mode with a command-prompt interface. Note that Windows 95/98/ME Safe Mode includes only keyboard, hard disk and monitor.

(3) *Safe Mode with networking.* Loads Safe Mode devices with the drivers and services necessary for networking.

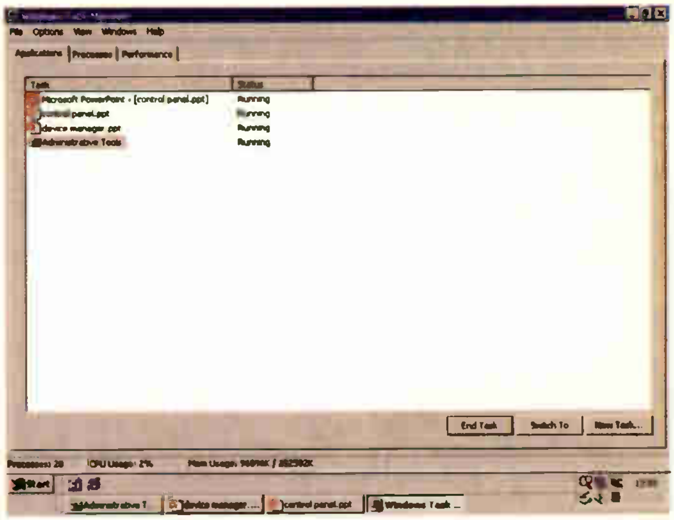
(4) *Enable VGA Mode.* Loads the VGA graphics driver only. This option is enabled with all Safe Mode boot options.

(5) *Last Known Good Configuration.* If the PC fails to boot up as a result of changes in the registry, caused by loading new drivers for example, the previous configuration can be obtained by selecting this option. This may be useful where, for example, new drivers have been loaded causing a boot-up failure.

This option is possible because Windows 2000 maintains several complete copies of the system configuration in the registry.

(6) *Directory Services Restore Mode.* Restores a corrupt directory database. This is only for servers that are Domain Controllers.

(7) *Debugging Mode.* Initiates the debugging process to gather debugging data for future diagnostics. Available only with Windows 2000 servers.



The Windows 2000 task manager screen.

Common boot-up faults

Boot-up faults mean that the system will not boot up in Windows and/or DOS or another operating system if the PC is a multi-boot one. A Windows 2000 boot-up or start-up disk may therefore be very helpful. Unlike the DOS start-up disk however, which can be used to boot up the machine independently of the hard disk, the Windows 2000 disk contains what Microsoft calls 'system files', namely NTLDR, NTDETECT and BOOT.INI, but not NTOSKRNL. The latter resides on the hard disk in the WINNT/System32 directory. It follows that a Windows 2000 boot-up disk can boot the PC into Windows 2000 only if it can correctly locate and load up the kernel NTOSKRNL file from the hard disk. As mentioned earlier, the location of the kernel file is specified in BOOT.INI. Since BOOT.INI is machine-specific, it follows that each machine must have its own specific boot-up disk.

Boot-up faults are invariably caused by missing or corrupted boot files. This is another reason for creating and keeping a machine-specific boot-up disk, which will enable missing files to be copied back from the boot-up disk as necessary.

Creating a Windows 2000 start-up disc

For a CISC-type processor PC, proceed as follows. Boot up a Windows 2000 Professional machine, insert a floppy disc and format it using the Windows 2000 format utility (My Computer > right click on floppy A:\ > select Format > enter a label such as W2K boot > Start > Warning to the effect that data on the disk will be lost > press OK to the warning > exit when finished).

Copy the following files from the hard disk (normally drive C:\) to the floppy disk: BOOT.INI; NTLDR; NTDETECT.COM; BOOTSECT.DOS (for multi-boot into DOS).

Remove the disk and label it W2K Boot or any other appropriate name of your choosing.

You can test the boot-up disk by inserting it in the floppy drive and restarting the PC. The PC should boot up in Windows 2000 Professional. If not, check that the boot-up sequence in the CMOS set-up is set to the floppy drive as the first boot-up option.

With a RISC-type processor PC, format a floppy disk as above and copy the following files: OSLOADER.EXE; HAL.DLL; *.PAL.

Recovery console

Use of a boot-up disc is not the only way in which a start up can be attempted in the event of failure to do so normally. An installation disk is a start-up CD, and can be used to boot up a PC. After installing drivers the user is asked to select a Repair option by pressing R or an install option. Selection of the Repair option will set up the Recovery Console. The user is asked to select a console (one is usually available and 1 is selected). Before you are allowed to enter the Recovery Console, a user name and password must be entered. The user name must be the administrator or any other user name with equivalent rights.

A prompt, very similar to the DOS prompt, will appear with WINNT as the working directory, i.e. D:\WINNT>

Some DOS commands can be used, including DIR and COPY, but the majority of the Recovery Console commands are different. Examples are LIST SVC to list services, and ENABLE and DISABLE to start and terminate services or applications.

The DISABLE command is very useful when a boot-up failure occurs as a result of a new application refusing to terminate, causing a crash.

Recovery Console can be used to copy missing files from say a floppy disk to the hard disk.

A full list of commands can be obtained by typing in HELP.

Boot-up error messages

The following is a list of typical boot-up error messages, their meanings and solutions.

(1) Message "NTLDR missing". The solution is to copy the NTLDR file from a Windows 2000 boot-up disk or from a known-good Professional system. Copying can be carried out in two ways. One is to boot up using a start-up disk and then copy from the floppy disc to C:\. The other is to open the Recovery Console and copy NTLDR from a floppy disc to C:\.

(2) Message "I/O error accessing bootsector file" is displayed when attempting to boot a multi-boot PC to DOS. It means that the BOOTSECTOR.DOS file is missing. The solution is to copy from a floppy disk in the same way as fault (1).

(3) Message "NTDETECT failed". The solution is to copy the NTDETECT file from a floppy disk in the same way as above. If the PC is a multi-boot one with DOS as one operating system available, you can boot up into DOS then copy the NTDETECT file from the floppy disk.

(4) Message "NTOSKRNL missing or corrupt: please install a copy". This does not normally mean that the NTOSKRNL.EXE file is actually missing or corrupted: the most likely cause is a missing BOOT.INI file or an incorrect entry in it.

The solution is first to check that the BOOT.INI file is present and that its contents are correct. This can be done by booting up in DOS if available, or booting from a Windows 2000 start-up disk, or by entering the Recovery Console. If the BOOT.INI file is missing, copy it from a boot-up disk. If the BOOT.INI file is present, check its contents and edit if necessary. It may be easier to copy the file than attempting to edit it. Remember that the BOOT.INI file is machine-specific.

To copy the BOOT.INI file or edit it, use the same procedure as used for copying the NTLDR or other boot files.

If BOOT.INI is not the cause of the problem, copy NTOSKRNL.EXE from the Windows 2000 installation disc.

K.F. Ibrahim is Technical Development Manager of the Digital Village at the College of North West London. He is author of several books, including PC Operation and Repair (second edition) and Digital Television.

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Thomson's ICC17 technology

Mark Paul begins a detailed investigation of the circuitry used in this chassis, starting with the complex dual chopper power supply arrangement

The Thomson ICC17 chassis replaced the ICC9 and TX92F in Thomson's core range of TV receivers, for both 4:3 and widescreen models. It represented a major re-engineering operation, taking into account the current trend in TV receiver technology and the latest silicon available. The ability to handle signals conforming to most TV standards worldwide, and any type of video signal fed to the scart socket, was retained. Major changes were introduced in the power supply, microcontroller, timebase and audio processing sections of the chassis.

The power consumption is less than 1W in standby, conforming to EEC legislation in this respect. The deflection stages are designed to be able to drive a wide range of CRTs, as follows: 21in. 90° 4:3 Medium Planar; 25 and 28in. 110° 4:3 Medium Planar; 24, 28 and 32in. 16:9 Super Flat; 25 and 28in. 110° 4:3 Super Flat; and 33in. 110° 4:3 Medium Planar. With Medium Planar tubes in sizes up to 28in. the display power consumption is 35W, with the 33in. Medium Planar tube it's 41W while with Super Flat tubes it's 47W. The EHT varies between 28·5-29·5kV and the maximum beam current between 1·2-1·65mA depending on tube type. Audio processing may be mono or Nicam and Virtual Dolby or Dolby Pro Logic depending on model. Audio options are 10W RMS mono, 10 + 10W RMS FM stereo/Nicam/Virtual Dolby, or 10 + 10 + 10 + 10W RMS Dolby Pro Logic. Frequency-synthesis tuning is used as standard.

As with the previous chassis, all but four alignment and service adjustments are carried out using the remote-control handset. For details of how to enter the service mode refer to the relevant ICC17 service manual.

Chassis variants include multi-standard AV decoding – 50/60Hz PAL, Secam and NTSC (3·58/4·43MHz); comprehensive AV socketry; a 3·5mm headphone socket with loudspeaker switch; and Fastext (8-page memory).

Features include automatic install; Navilight remote-control system (fast system using on-screen guidance); a 99-channel memory; automatic programming with AFC; auto naming using PDC, CNI or text station codes; multi-country selection (16 country tuning tables); multi-lingual menu languages (14 countries); child lock; full hotel menu; sharpness control; programmable auto clock and calendar function; auto volume limiting; and enhanced video processing.

Chopper power supply basics

The chopper power supply used in the ICC17 chassis is of the flyback-converter type. This has three phases during each cycle of operation, the forward, flyback and oscillation phases. During the forward phase the chopper transistor is switched on, current builds up in the primary winding of the transformer and a magnetic field is developed in its core. No current flows in the secondary windings during this phase. During the flyback phase the chopper transistor is switched off. Current flow in the primary winding of the transformer ceases and the magnetic field starts to collapse, conforming to the back-EMF principle. This collapse induces currents in the secondary windings, and the rectifier diodes connected to these charge their respective reservoir capacitors. The delay between the end of the flyback phase and the start of the next forward phase is referred to as the oscillation phase: during this phase no current flows in either the primary or the secondary windings of the transformer.

A problem that could arise in practice is interference caused by the chopper transistor between the forward and flyback phases. This can be overcome by adding a snubber network across both the primary and the secondary windings. The chopper transistor's operating parameters when it switches off and on are critical to reliability: it is during these times that the device is most likely to fail, not while it is conductive. Other factors that are of importance in practice are the switching speed of the rectifier diodes on the secondary side of the circuit and the voltage drops across them.

The main factors that have to be taken into account in the design of a chopper circuit of this type are losses when switching on at the beginning of the forward phase, the time taken by the chopper transistor to switch off, the peak voltage developed across the chopper transistor at the beginning of the flyback phase, and the oscillation that takes place at the end of the flyback phase.

Some of these factors are tackled by using 'zero-voltage switching' (ZVS). The principle here is that the voltage across the chopper transistor should be as near to zero as possible when it switches on. This brings about a considerable reduction in lost power, improving the circuit efficiency: it drastically reduces dissipation in the transistor; and it means

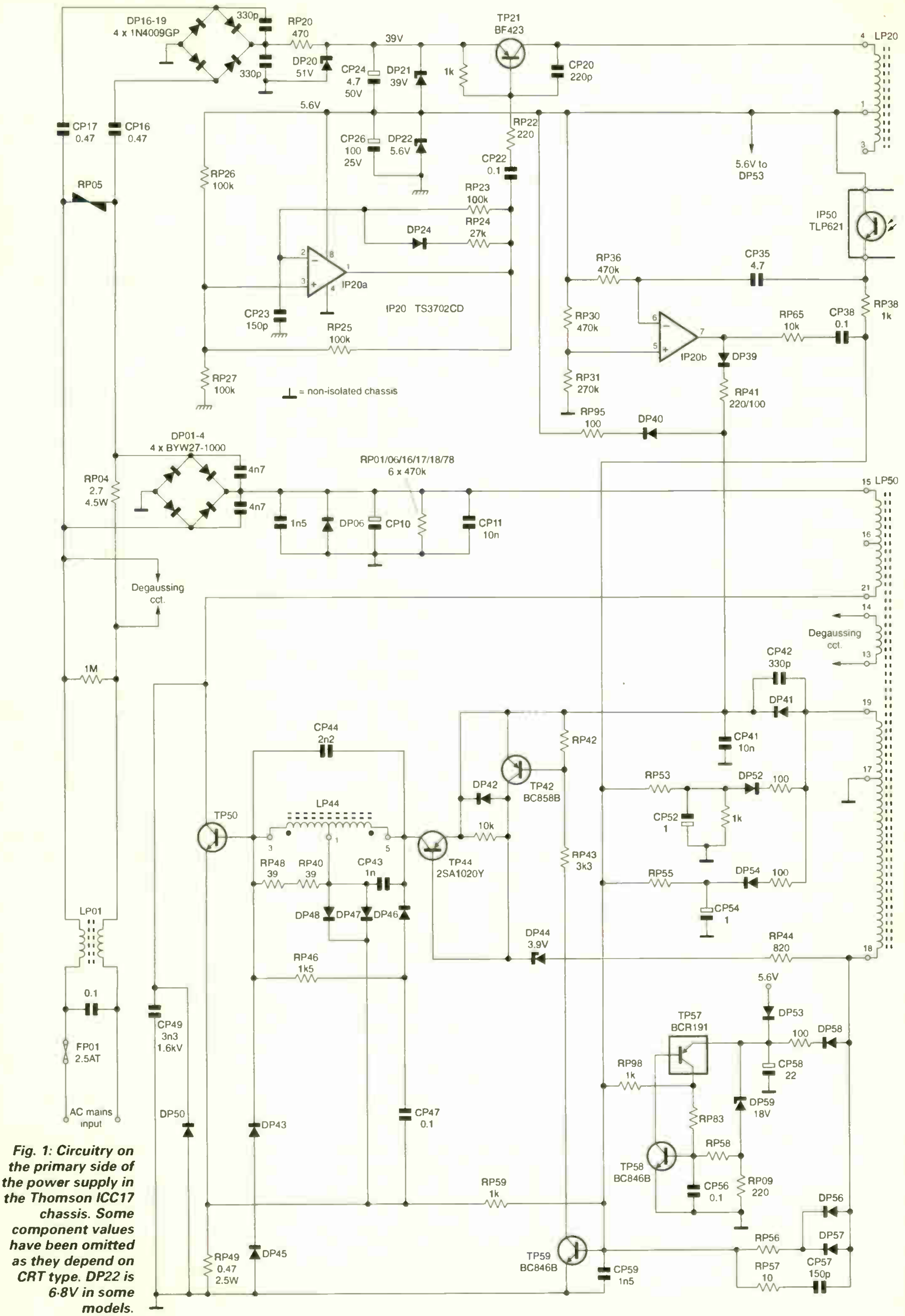

Fig. 1: Circuitry on the primary side of the power supply in the Thomson ICC17 chassis. Some component values have been omitted as they depend on CRT type. DP22 is 6·8V in some models.

that the operating frequency can be increased and the size of the transformer reduced without loss of power output.

To achieve zero voltage across the chopper transistor, the ratio between the number of turns in the primary and secondary windings on the transformer is adjusted: the number of primary turns is increased while the number of secondary turns is reduced. By altering the transformer's turns ratio in this way, the voltage developed across the primary winding will go negative during the oscillation phase, creating the right conditions for zero voltage across the transistor at the start of the next forward phase in the cycle. This calls for accurate detection and control of the point at which the transistor is switched on. Note that the increased number of primary-winding turns means that the voltage developed across the transistor at switch off, during the flyback phase, will be very high.

FROSIN circuit principles

The chopper circuit used in the ICC17 chassis employs the FROSIN (FRee Oscillating Safe INtelligent) principle. It has a good pedigree, having been used in the R5000 Hi-Fi VCR chassis and the TX807 and TX92 TV chassis. In earlier FROSIN flyback-converter designs there was a compromise between zero-voltage switching and the high voltage developed across the chopper transistor during the flyback phase. The circuit in the ICC17 chassis uses true zero-voltage switching.

In any high-power, high-frequency chopper circuit design it's important that the high voltage developed at chopper switch off is controlled. But, during the flyback phase, there are other critical factors with respect to the chopper transistor. With a mains supply voltage of 264V and an input power of 250W the peak voltage across the chopper transistor will be nearly 1·2kV. Thus a bipolar transistor with a Vces of greater than 1·5kV is required in the chopper position under worst-case conditions.

The effort to avoid such difficulties in the ICC17's FROSIN design has produced considerable advantages, as follows: a low-cost design; highly efficient power conversion; a high switching frequency (up to 100kHz at 250W); zero power-consumption snubber networks. Except for a couple of voltage comparators, the design is a discrete-component one.

Overview

There are actually two chopper power supplies in the ICC17 chassis, one to provide a standby voltage (U stby) and the other to provide most of the voltages when the set becomes operational. They are not entirely independent of one another however. The reason for using this twin design is to meet the EEC requirement for the standby TV power consumption to be less than 1W.

The output from the main power supply is 35-47W, depending on the deflection requirements, plus up to 4 x 10W audio. It has been designed to operate with inputs in the range 190-264V AC. The maximum average power taken from the mains is about 145W, with a peak of 250W.

The circuitry is shown in Figs. 1 (primary side) and 2 (secondary side). Fig. 3 shows the degaussing circuit. We'll now consider the circuit operation in detail.

The standby power supply

The mains input is capacitively coupled by CP16/17 to the bridge rectifier DP16-19. This is done to limit the power consumption to less than 500mW. At the output from the bridge rectifier there's a surge limiter resistor RP20 which is followed by the series connected reservoir capacitors CP24/26. These are in parallel with two zener diodes, DP21/22, which provide stabilised 39V and 5·6V supplies. The 51V zener diode DP20 provides protection.

The 39V supply is fed via chopper transistor TP21 to pin 4 of chopper transformer LP20. The 5·6V supply is used to power the dual voltage-comparator chip IP20 and optocoupler IP50. TP21 is driven at a fixed frequency of about 65kHz by an asymmetric squarewave generator – one half of IP20. The duty-cycle of this device's output is a fixed 3:1, so TP21's on time is kept at approximately 4μsec.

The non-inverting input (pin 3) of IP20a is connected to a potential divider (RP26/7) across the 5·6V rail and also to the feedback resistor RP25. The inverting input (pin 2) is connected to a timing circuit that consists of CP23, RP23/4 and DP24. The time CP23 takes to charge and discharge controls the frequency and mark-space ratio of the squarewave at output pin 1. This is coupled to TP21 by CP22 and RP22.

CP20, between the collector and base of TP21, acts as a snubber capacitor. It also helps to reduce interference to weak VHF/UHF signals, for example from a set-top aerial.

A bridge rectifier, DP60/3, rectifies the voltage developed across LP20's secondary winding, with CP23 as the reservoir capacitor. The U stby supply thus generated is used to power the LED in optocoupler IP50, the standby switching circuit associated with TP67 and, on the front panel, the infra-red remote-control receiver, the standby LED and the programme plus and minus keys (Pr+, Pr–). It does not power the microcontroller: see later for how this is arranged, via the wake-up circuit.

The main chopper circuit

As mentioned earlier, the main and standby power supplies are designed as separate though linked circuits. There's a sophisticated mains filter and power-factor correction circuit to comply with stringent EMS regulations and minimise mains-borne interference. It has been designed to reduce the symmetrical and asymmetrical interference generated by the main chopper circuit and fed back to the mains supply, and to limit external interference arriving at the receiver.

DP01-04 is the bridge rectifier that feeds the main chopper circuit, with CP10 as its reservoir capacitor. RP04 provides surge limiting. The resistor chain RP01/06/16/17/18/78 provides a discharge path across CP10. Chopper transformer LP50 uses slot-technology construction. The chopper transistor is TP50, which is type BUH516TH16 or type S2000N with 21in. MP tubes.

Optocoupler IP50 is used to provide voltage-regulation feedback from the secondary to the primary side of the circuit. It's also used to ensure that the main power supply remains dormant until required – we'll return to this later. So IP50 is powered by the standby 5·6V and U stby supplies.

It's convenient to consider TP50's base drive in two sections. First, a self-sustaining current supply provided by LP50, DP41 and CP41, driver transistor TP44 and the special inductor LP44. Secondly the cut-off circuit that controls the base-drive and protects TP50. In this area TP59 monitors safety inputs while TP42 controls TP50's switching.

Positive base drive

This section of the power supply is a new design developed around the contra-wound inductor LP44. The arrangement provides both positive and negative switching voltages for the base of TP50.

When the driver transistor TP44 is switched on, the voltage developed across CP41 is effectively applied to the base of TP50 via LP44. TP50's main characteristics are its collector-emitter voltage rating and the speed at which it can switch. When TP50 switches on, current flows in the primary winding of the chopper transformer LP50, pins 21-15. While this current flows, positive and negative voltages are induced in LP50's control winding (pins 18, 17, 19). The positive voltage at pin 19 is rectified by DP41, charging CP41. This voltage is applied to the emitter of TP44. The negative voltage at pin 18 is fed via RP44 and zener diode DP44 to the base of TP44, to ensure that it remains saturated.

With TP50 switched on, current continues to flow in LP50's primary winding and the voltage developed across the current-sensing resistor RP49 rises accordingly. This voltage charges CP59 via the limiting resistor RP59, providing bias for transistor TP59.

Cut-off circuit

The base of TP59 is connected to several sources that affect the charge across CP59. These are as follows. (1) A

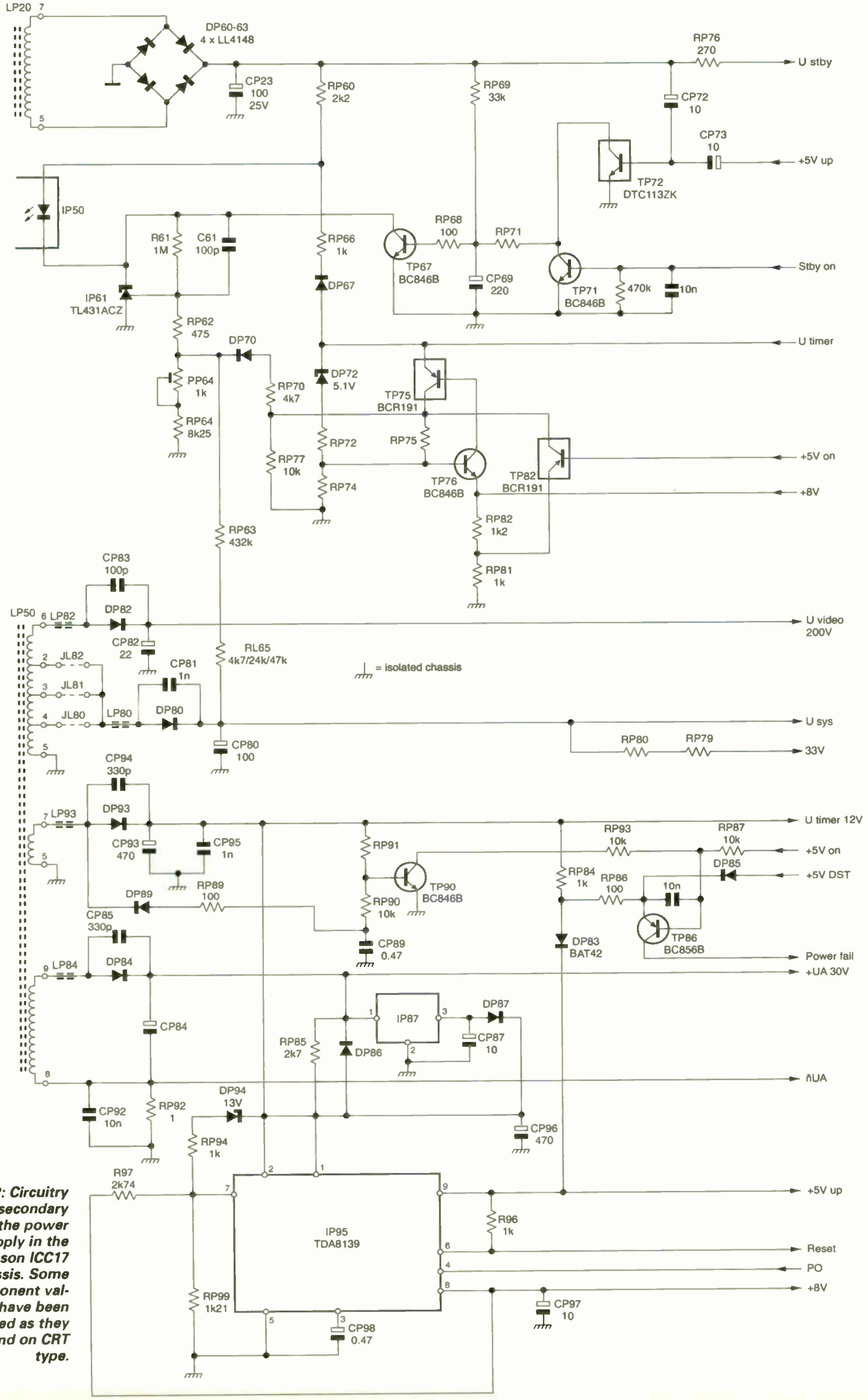

Fig. 2: Circuitry on the secondary side of the power supply in the Thomson ICC17 chassis. Some component values have been omitted as they depend on CRT type.

voltage-regulation current from the optocoupler IP50 via RP38. (2) A negative soft-start current from CP52 via RP53. (3) A supply compensation current from CP54 via RP55. (4) The FROSIN feedback current from pin 18 of LP50 via RP56 and DP56/7. (5) A switch-on current pulse from pin 18 of LP50 via RP57 and CP57. (6) The over-voltage protection circuit via RP98.

Once the voltage at the base of TP59 exceeds 0·7V it will switch on. This takes the voltage at the base of TP42 low. It switches on, short-circuiting the base and emitter of the driver transistor TP44 which switches off.

Negative base drive

When TP44 switches off. the current supply from CP41 to the base of the chopper transistor TP50 via LP44 is interrupted. This interruption to the current flow causes reversal of the EMF induced in LP44. As a result, there is current flow via two separate circuit paths from LP44's centre pin 1. Circuit path one is via DP47/8, CP47 and DP46 to pin 5 of LP44. The direction of the current flow via CP47 produces, with respect to ground, a negative voltage. Circuit path two is via DP47/8 and the emitter-base junction of TP50 to pin 3 of LP44. Resistors RP40 and RP48 are connected in parallel with this path.

As the magnetic field in LP44 collapses, the turns ratio and mutual coupling between LP44's windings produces a four-fold increase in TP50's negative emitter-base current. The two diodes DP43 and DP45 in parallel with TP50's base-emitter junction limit the negative voltage across the junction to –4V. Note that these diodes are a special type (RGP02-20) which actually consists of two diodes in series, providing a combined junction voltage drop of approximately 2V.

As a result of all this TP50 switches off. Its collector voltage starts to rise, but the snubber capacitor CP49 limits this rise to approximately 1kV. The negative voltage developed across CP47 ensures that TP50 is held off.

At this point the energy stored in the chopper transformer's ferrite core is transferred to the secondary windings, also the control winding which produces a positive output at pin 18. This is rectified by DP56/7 and applied to the base of TP59 via RP56. The voltage at pin 18 is also applied to the base of TP44 via RP44 and DP44. This ensures that TP59 is held on and TP44 off.

The FROSIN circuit

The idea of this is to ensure that TP50 isn't switched on until there is 'zero voltage' at its collector, i.e. it doesn't switch on until all the energy in LP50 has been transferred to the secondary supplies and the oscillation that takes place between LP50's primary winding and the snubber capacitor CP49 has been completed. There is also a snubber capacitor, CP81, across the HT (U sys) supply rectifier DP80 on the secondary side of the chopper circuit. In addition to limiting the peak voltage rise across the transformer's windings, these capacitors affect the oscillation phase of the cycle and the operation of the FROSIN circuitry.

During the oscillation phase the current induced in the winding between pins 17 and 18 of LP50 ensures that TP59 remains switched on. When the voltage at pin 18 swings negatively, TP59 is switched off, TP44 switches on again and the forward phase of the next chopper cycle starts.

Overvoltage protection

To protect the power supply against excessive secondary voltages resulting from failure of the regulation loop, the positive current induced in winding 17-18 of LP50 is rectified by DP58, charging CP58. If the voltage across CP58 exceeds 19V, zener diode DP59 will conduct. As a result, transistors TP58 and TP57 (a 'digital' type) will switch on. They are connected in a thyristor configuration and thus latch on.

The voltage across CP58 is now applied to the base of TP59 via RP98. This high voltage holds TP59 on and the main chopper supply switches off. The 5·6V feed from the standby chopper circuit via DP53 ensures that this safety circuit remains active until the mains supply is switched off.

Secondary-side supplies

LP50's secondary windings develop the main DC voltages to operate the receiver. These are as follows.

(1) The 200V U video supply is developed across pins 5-6, with DP82 as the rectifier and CP82 as the reservoir capacitor. It's used by the RGB output IC on the CRT's base panel.

(2) The HT supply U sys for the line output stage. This varies with the tube and is set by selecting various taps. Winding 5-4 gives 126V, winding 5-3 132V and winding 5-2 138V. The rectifier is DP80, the reservoir capacitor CP80.

(3) The 33V tuning voltage supply. This is derived from U sys via RP80/79 with zener diode DH01 for stabilisation.

(4) The 30V audio supply +UA. This is obtained from winding 8-9 with DP84 the rectifier and CP84 the reservoir capacitor. It's also fed to the 12V regulator IP87 to power IP95 (TDA8139) initially, see section headed low-voltage supplies.

(5) The general-purpose 12V supply U timer. This is obtained from winding 5-7 with DP93 as the rectifier and CP93 as the reservoir capacitor. It's used by IP95 to generate the following voltages: (a) +5V up, which is used primarily by the microcontroller chip IR01 and the audio processor chip IS40. **(b)** +8V, a widely used supply which in particular powers the video/deflection processor chip IV01. **(c)** The microcontroller chip's reset.

The low-value ceramic capacitors in parallel with DP82/84/93 reduce the interference that occurs when the diodes conduct. CP81 across DP80 is the previously mentioned secondary-side snubber capacitor. Ferrite beads LP80/82/84/93 further reduce interference. CP92 and CP95 are included to reduce interference that could cause on-screen 'spooks' with weak VHF/UHF signals.

Regulation

To provide voltage regulation the programmable zener diode IP61 senses the U sys supply via the potential-divider network RL65, whose value depends on tube type, RP63, PP64 and RP64. IP61 controls the conduction of the LED in optocoupler IP50 and in turn the voltage at the base of TP59.

IP61 works by comparing the voltage at its reference/sensing pin with an internal voltage source. In this circuit configuration, if the sensed voltage falls below 2·5V the voltage at the cathode of the LED in IP50 will rise and vice versa.

Low-voltage supplies

The +5V up and +8V supplies are derived from either the +UA or the U timer supplies, as mentioned above. Initially, they are derived from the +UA supply: when the power supply becomes fully operational, they are derived from the U timer supply.

In the timer mode the voltages on the secondary side of the circuit are all at approximately 50 per cent of their nominal value. This means that the U timer supply is too low to power IP95. Instead, IP95 is fed from the +UA supply via the 12V regulator IP87. In this mode the input to IP87 is insufficient for it to regulate: it simply acts as a voltage dropper. Diode DP87 isolates the feeds to IP95 once the U timer supply is at the operational level.

During the initialisation phase the voltages on the secondary side of the power supply rise to 75 per cent of their nominal value. The +UA supply continues to be the voltage source for IP95.

Once the set is in the on mode, all voltages on the secondary side of the power supply rise to their nominal values. IP95 then takes its supply from the U timer line. At this point the +8V supply

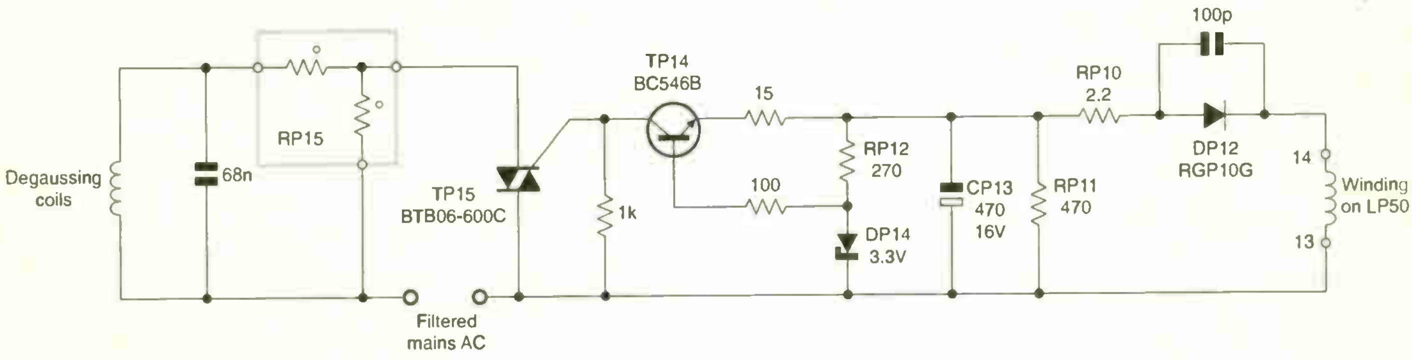

Fig. 3: The triac-controlled degaussing circuit.

(pin 8 of IP95) is switched on by the microcontroller chip IR01, which drives pin 4 of IP95 high. IP95 is a programmable regulator: its 8V output is set by RP97/99. CP97 smooths the 8V supply.

DP87 is reversed biased once the set is in the on mode, so virtually no power is taken from the +UA line by the LT circuits.

Overvoltage protection is incorporated in the +8V circuit to protect the U timer supply in the event of failure of the 12V regulator IP87. Protection is provided by zener diode DP94 and resistor RP94, which are connected in series between pins 1, 2 and 7 of IP95. If the voltage across DP94 exceeds 13V, the +8V supply will be switched off internally. The main power supply will first enter the timer mode then the standby mode.

The standby mode

In normal operation the optocoupler IP50 provides feedback for voltage regulation. It can also be used to switch the set to standby. Transistor TP67, which is connected to the cathode of the LED in IP50, controls this.

In the standby mode TP67 is forward biased via RP68/69 from the U stby supply. It shorts out IP61 so that maximum current flows in the optocoupler. TP59 switches on and the main chopper circuit switches off. TP67 is switched off to take the set from standby to on.

The wake-up circuitry

As previously mentioned, one aim in the design of the ICC17 chassis was to minimise the power consumption in the standby mode. For this reason there is no supply to the microcontroller chip IR01 in standby, so it cannot be used to bring the set out of standby. An alternative way of 'waking up' the set is therefore required. This is the reason for the wake-up circuit that controls the way in which the main chopper supply is switched on.

The U stby supply is used to generate a low-level +5V stby supply that powers the standby LED GE01 and the infra-red receiver GK01, and is used as the pull-up voltage for the programme plus and minus buttons, via RR05 and RR06. If any of the following conditions change, the STBY ON command line changes from low to high: **(a)** the front-panel programme plus or minus button is pressed; **(b)** an infra-red remote-control command is received; **(c)** pin 8 of either scart socket AV1 or AV2 goes high.

The components associated with this are RR21 and DR21 from the front panel, capacitor CR22 for the IR signal and diode DR23 and resistors RR52/3 which are connected to the scart sockets. The high on the STBY ON line switches TP71 on, switching TP67 off and discharging CP69. IP50 the reverts to the regulation mode.

The 'digital' transistor TP72 is connected in parallel with TP71 to ensure that CP69 is completely discharged. Two capacitors, CP72 and CP73, are connected to the base of TP72. Their function is to ensure that the microcontroller chip IR01 has sufficient time to take control of the STBY ON line. It is CP72 that's important when the set is switched on: it ensures that the main chopper power supply is held in the timer mode until IR01 has verified that the switch-on command is a valid one. If, after checking the remote-control code and the stored data in the EEPROM, the command is found to be false, the receiver reverts to standby after eight seconds.

The emitter of the phototransistor in IP50 is also coupled to the inverting input (pin 6) of the second voltage comparator in IP20. The connection was originally via RP35 but was changed to *RC* coupling with CP35 and RP36. The non-inverting input (pin 5) is clamped at a voltage set by RP30 and RP31. Thus, as IP50 changes from the standby switching to the regulation mode, the comparator detects an imbalance across its input pins 6 and 5. Output pin 7 rises to 5·6V (the supply voltage at pin 8), which is fed to CP41 via DP39 and RP41.

When TP67 is switched off IP61 reverts to its regulation mode. But not immediately. The junction of RP62 and RP63 in the voltage sensing circuit is also connected via DP70 and RP70 to two threshold detector circuits, one centred on TP75 the other on TP82.

Timer mode

Once the main chopper circuit has been brought into operation the voltages on the secondary side start to rise. When the U timer voltage rises to approximately 10V, zener diode DP72 conducts and current flows via RP72/74. The junction of these resistors is connected to the base of TP76, whose emitter is connected to the +8V supply. Since the +8V supply is absent at this stage, TP76 is switched on by the voltage across RP74. TP75 in turn switches on, and the U timer supply becomes the source of the control voltage for IP61, via DP70 etc. As a result, the voltage at pin 6 of IP20 falls and the voltage at pin 7 is about 5V. This voltage change is fed to the base of TP59 via RP65 and CP38. As a result the chopper transistor TP50 is switched off.

All the secondary-side voltages then start to decay. When the U timer voltage drops below the conduction point for DP72, transistors TP76 and TP75 switch off. The voltage at IP61's sensing pin falls, the conditions in IP50 change, the voltage at pin 7 of IP20 falls and TP50 switches on again. The U timer supply rises to the point where DP72 conducts again, and the whole process is repeated.

This puts the main chopper supply in the burst mode, operating at a frequency of about 120Hz. The voltages on the secondary side of the circuit are now at about 50 per cent of their nominal value, and the set's power consumption is typically 3W.

Initialisation mode

Once IR01 has validated the command to power up, it drives pin 4 of IP95 high and the +8V supply appears at pin 8. This is applied to the emitter of TP76. Thus TP76 and TP75 switch off.

The +8V supply is also fed to the emitter of digital transistor TP82, via RP82. Its base is connected to the +5V on supply, which is at this point missing. Thus TP82 switches on and the +8V supply is fed via DP70 to IP61's sensing pin as the control voltage.

The U sys voltage will also now contribute to IP61's sensing voltage, and as a result the voltages on the secondary side of the circuit will be stabilised at about 75 per cent of their nominal value.

The stabilisation/on mode

The line output stage now begins to operate, and the +5V on supply is generated. It switches off TP82, with the result that IP61 is now controlled solely by the U sys supply. DP70 is reverse biased, isolating resistors RP70/77. Normal regulation is thus established, with the voltages on the secondary side of the circuit held at 100 per cent of their nominal values.

The degaussing circuit

The degaussing circuit is shown in Fig. 3. The coils are connected across the AC input via posistor RP15 and triac TP15. The triac's gate voltage is controlled by transistor TP14.

When the main chopper circuit starts up, the winding between pins 13 and 14 of LP50 produces a negative voltage which is rectified by DP12, charging CP13. RP10 and RP11 provide surge-current and peak-voltage limiting respectively. RP12 and the 3·3V zener diode DP14, which are connected in parallel with CP13, control the voltage at the base of TP14.

When the main chopper circuit is in the timer mode the voltage developed across CP13 is about –1·5V. This is insufficient for DP14 to conduct, so TP14 and TP15 remain off. As the power supply enters its initialisation phase the voltage across CP13 rises to –2·5V, which is still insufficient for DP14 to conduct. At the transition between the start of the chopper supply's on mode and the beginning of line output stage operation the voltage across CP13 rises to –5V. DP14, TP14 and TP15 then switch on, and degaussing takes place until the posistor reaches its cut-off temperature.

Supply failure system

A power-failure circuit monitors the mains supply voltage and the outputs derived from the line output transformer.

The voltage developed across winding 5-7 of LP50 during the forward-transfer phase is rectified by DP89, which produces across CP89 a negative voltage that's proportional to the voltage across the mains bridge rectifier's reservoir capacitor CP10. This negative voltage forms part of the biasing network at the base of transistor TP90. Under normal circumstances the negative voltage is large enough to ensure that TP90 is cut off. Should the mains input fall below a certain level, the negative voltage across CP89 will be insufficient to hold TP90 cut off.

The collector of TP90 is connected to the base of TP86, whose collector is connected to pin 27 of the microcontroller chip IR01. This is the POWER FAIL line. When TP90 conducts, TP86 switches on and the POWER FAIL line goes from low to high. IR01 then switches off the +8V line by taking pin 4 of IP95 low. This shuts down the scanning and puts the main chopper circuit in the timer mode.

TP86 also monitors the +5V DST and +5V ON supplies derived from the line output transformer LL05. If the +5V ON supply falls below 4·6V because of an overload, TP86 will switch on and the main chopper circuit will be put in the timer mode as described above. The +5V DST supply is monitored at TP86's emitter. If it rises because of a problem in the line output stage TP86 will again switch on, with the same result.

Schottky diode DP83 provides protection by clamping the junction of resistors RP84 and RP86 to the +5V UP supply.

Next month

So much for the operation of this complex power supply system. Next month we'll delve into the timebase circuitry.

Test Case 475

Real Technician was not having a good day. The huge variety of technology that confronted him was getting too much – for example a MiniDisc player so tiny that he couldn't see it clearly enough to repair it, even with his new reading glasses; a DVD-Video player whose picture fragmented into squares for a few seconds at random intervals every few hours; and an audio power amplifier so old and obscure that the chances of getting any service data or spares for it were very remote. He'd left these and other things at finishing time yesterday. They were there waiting for him this morning.

RT turned with relief to an urgent job – all rental repairs here are urgent! It was a ten-year old TV set. Surely he could make good progress with that. Big enough to see easily, no lasers or mechanics, and there was a service manual on the shelf. He took the back off the set and read the job card. The fault symptom was written down as "no go – pumps", which is exactly what this Tatung T21NA60 (A series chassis) receiver did when RT switched it on. The 'pump' pulses were quiet and slow, and the fault was present permanently.

RT still prefers to use an analogue meter when it's appropriate. He used his meter, set to its ohms range, to check the line output transistor TR403 for a short-circuit or leakage – with the set now unplugged of course. There was nothing amiss here. He then turned his attention to the chopper power supply, checking each of the rectifier diodes (D808/9/10/11) on the secondary side of the circuit. None of them was shorted or leaky; neither were their reservoir capacitors. Maybe one of the three-legged regulator chips was faulty. Again no. Regulators IC802 and IC803 proved their innocence when checked. Was this going to be a hard fault to find? Was RT's morale going to sink even further, with a set and a fault as simple as this one? At this point he might normally have enlisted the help of Television Ted. But Ted was away on an Hitachi service course – and tomorrow the workshop was closed. So RT ploughed on.

What, he wondered, could be instigating the overload protection with this set. How about the line output transformer? He disconnected its HT supply at pin 5, but the fault condition was the same when power was restored. He tried connecting a 60W bulb across the 109V rail as a dummy load. Not a flicker came from it when the set was switched on, and the pumping continued as before. Still working on the assumption that some sort of protection had come into operation, RT disconnected in turn the supplies to the sound and field output ICs. In hindsight the latter was a rather pointless move, as the supply is derived from the line output transformer which had already been eliminated from the search.

RT finally turned his attention to the primary side of the chopper circuit. Maybe the mains bridge rectifier's reservoir capacitor was low in value and unable to provide enough energy to operate the set? In fact there are two reservoir capacitors, connected in parallel – C807 and C808. And there was a full 320V across the chopper transistor TR801, which is of the MOSFET type. At any rate RT was now in the right area, but the diagnosis still took him a lot more time. What was the cause of the trouble, and what was the error in RT's approach? For the solution, see page 565.

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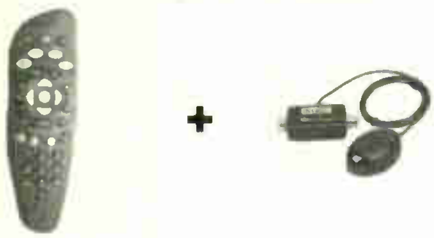

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5 +
£ 14.50 + vat each

Sky™ Digital Remote Controls

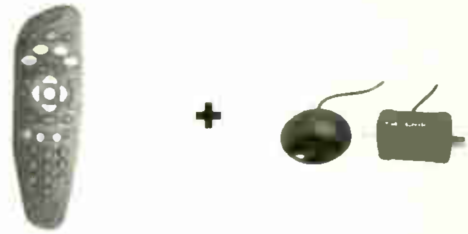
Order Code : RCSKY

1 +
£ 7.95 + vat each

5 +
£ 7.45 + vat each

10 +
£ 6.95 + vat each

Sky™ Digital Remote & SLx Link Eye Combination



Price : £ 13.00 + vat each

5 +
£ 11.50 + vat each

Fully Shielded , Foil Wrapped & Individually Shielded 21 Pin Connected Scart Lead

Length : 1.5m Width of Cable : 12mm

Order Code : PLG26

Box of 25

Special Price : £ 32.00 + vat

Fully Shielded 21 Pin Connected Scart Leads

Length : 1.5m Width of Cable : 8mm

Order Code : PLG23

Box of 50

Special Price : £ 30.00 + vat

Coax Fly Lead Plug to Socket Length : 2m

Order Code : COXCABLE

Box of 50

Special Price : £ 20.00 + vat

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The Box contains the following

25 pieces

1.5m 21 Pin Fully Connected Scart Cable

25 pieces

2m TV to Video Lead

25 pieces

1.2m 2 Phono Plug to Phono Plug Lead

Price when bought seperately £ 48.50 + vat

Order Code : AVCBLBOX Special Offer Price : £ 35.00 + vat

TV Fault Finding Guide Part 2

This book has been introduced as a supplement to issue 7 (December 1998) and contains over 2500 additional faulty entries. This edition is not intended as a replacement for issue 7 but as an addition.

Revised model/chassis listing of about 2000 models.

A5 in size with a total of 192 pages

New Arrival

Order Code : BOOK02/A
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New Arrival

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This A5 book contains vital reference information on 39,200 type on semiconductors , together with alternatives , descriptions and base connections

New Arrival

Order Code : BOOK04
Price : £ 20.00 - No VAT
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New Arrival

Semiconductor Comparison CD

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Lists transistors , diodes , thyristors and IC s
Contains pin assignments for discrete semicondutors
Permits searching ans selecting according to type , casings ...etc
System requirement
Pentium PC , 16Mb memory , Windows 3.1/95/98/NT and a CD Rom Drive

New Arrival

Order Code : VRTCDROM
Price : £ 35.00 + vat

New Arrival

Jaeger 2002 Semiconductor Comparison Large Book

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25,000 Diodes , 4,300 Thyristors
30,500 Intergrated Circuits

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New Arrival

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Grandata Ltd

distributor of electronic components

Television Repair / Mod Kits

ALBA

MAKE & MODEL	KIT TYPE	CODE
1452T	PSU	ONWAKIT
1427T	PSU	ONWAKIT
1402	PSU	ONWAKIT
1455T	PSU	ONWAKIT
1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
1499Y	STANDBY	MODKIT37
2002	PSU	ONWAKIT
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2152T	PSU	ONWAKIT
2099TX	STANDBY	MODKIT37
BTV17	STANDBY	MODKIT37
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
CTV485	PSU	ONWAKIT

AKAI

MAKE & MODEL	KIT TYPE	CODE
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
CT2863UNT	PSU	ONWAKIT

DECCA/TATUNG

MAKE & MODEL	KIT TYPE	CODE
TVC563	STANDBY	MODKIT37

GOLDSTAR

MAKE & MODEL	KIT TYPE	CODE
CF25A50F	FRAME	MODKIT36
CF25C22C	FRAME	MODKIT35
CF28A50F	FRAME	MODKIT36
CF28C22F	FRAME	MODKIT35
CF28C28F	FRAME	MODKIT36
CF29C42F	FRAME	MODKIT35

GOODMANS

MAKE & MODEL	KIT TYPE	CODE
147TT	PSU	ONWAKIT
149T	PSU	ONWAKIT
1430RA	PSU	ONWAKIT
1430RS	PSU	ONWAKIT
1430RW	PSU	ONWAKIT
1450T	PSU	ONWAKIT
1455TS	PSU	ONWAKIT
2019R	PSU	ONWAKIT

GOODMANS..Continued

MAKE & MODEL	KIT TYPE	CODE
2029T	PSU	ONWAKIT
2029TA	PSU	ONWAKIT
F16 CHASSIS	FRAME	GOODKIT1
F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1

GRUNDIG

MAKE & MODEL	KIT TYPE	CODE
CUC 7350		GRUNDIGKIT1
CUC 7301/3 (BUZ90)	PSU	GRUNDIGKIT2
CUC 7301/3 (MJF18004)	PSU	GRUNDIGKIT3

HINARI

MAKE & MODEL	KIT TYPE	CODE
HIT14RC	PSU	ONWAKIT

JVC

MAKE & MODEL	KIT TYPE	CODE
AV29SX1EK	FIELD O/P	JVCKIT1
AV29SX1EN	FIELD O/P	JVCKIT1
AV29SX1EN1	FIELD O/P	JVCKIT1
AV29SX1PF	FIELD O/P	JVCKIT1
AV29TSIE1	FIELD O/P	JVCKIT1
C14E1EK	PSU	ONWAKIT
C14T1EK	PSU	ONWAKIT
C21ET1EK	PSU	ONWAKIT
CS21M3EK	PSU	ONWAKIT

MATSUI

MAKE & MODEL	KIT TYPE	CODE
1455	PSU	ONWAKIT
1498	PSU	ONWAKIT
2086	PSU	ONWAKIT
2098	PSU	ONWAKIT
21V1N (BUZ90)	PSU	GRUNDIGKIT2
21V1T(MJF18004)	PSU	GRUNDIGKIT3
TVR180R/T/2080	STANDBY	MODKIT37

MITSUBISHI

MAKE & MODEL	KIT TYPE	CODE
AV1 SERIES	PSU	MITSKIT3
CT1M5B	PSU	MITSKIT3
CT21M5BT	PSU	MITSKIT3
CT25M5BT	PSU	MITSKIT3
CT21A2STX	TDA 8178S	MITSKIT1
CT21AX1B	PSU	MITSKIT3
CT21A3STX	TDA 8178S	MITSKIT1

MITSUBISHI..Continued

MAKE & MODEL	KIT TYPE	CODE
CT21AV1BS	PSU	MITSKIT3
CT25A2STX	TDA 8178S	MITSKIT1
CT25A3STX	TDA 8178S	MITSKIT1
CT25A4STX	TDA 8178S	MITSKIT1
CT25A6STX	TDA 8178S	MITSKIT1
CT25AV1B	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3
CT25AV1BD	PSU	MITSKIT3
CT25AV1BDS	PSU	MITSKIT3
CT28AV1B	PSU	MITSKIT3
CT28AX1BD	PSU	MITSKIT3
CT28AV1BDS	PSU	MITSKIT3
CT29AS1	TDA 8178S	MITSKIT2
CT29A4	TDA 8178S	MITSKIT2
CT29A6	TDA 8178S	MITSKIT2
CT29B2	TDA 8178S	MITSKIT2

MAKE & MODEL	KIT TYPE	CODE
CT29B3	TDA 8178S	MITSKIT2
CT29B6	TDA 8178S	MITSKIT2
CT33B3	TDA 8178S	MITSKIT2
M5 SERIES	PSU	MITSKIT3

NEI/NIKKAI

MAKE & MODEL	KIT TYPE	CODE
CE25 CHASSIS	PSU	NIKKAIKIT1
C289FTXN	PSU	NIKKAIKIT1
C28F41FXN	PSU	NIKKAIKIT1

PANASONIC

MAKE & MODEL	KIT TYPE	CODE
IC561	TDA 8175	PANKIT1
TX25XD60	VERT OUTPUT	PANKIT2
TC28XD60	VERT OUTPUT	PANKIT2
TX28XD70	VERT OUTPUT	PANKIT2
TX29XD70	VERT OUTPUT	PANKIT2
TX-W26D3	VERT OUTPUT	PANKIT2

PHILIPS

MAKE & MODEL	KIT TYPE	CODE
310.10708		PHILKIT3
310.20491		PHILKIT2
310.20496		PHILKIT10
310.31994		PHILKIT6
310.32252		PHILKIT5
310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7

PHILIPS..Continued

MAKE & MODEL	KIT TYPE	CODE
310.32262		PHILKIT8
310.62264		PHILKIT1
ANUBIS A	SOPS	PHILKIT2
CP110 CHASSIS	SOPS	PHILKIT8
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
G110 CHASSIS	SOPS	PHILKIT3
GR2.1 CHASSIS	SOPS	PHILKIT1
GR2.2 CHASSIS	SOPS	PHILKIT1
D-16 CHASSIS	SOPS	PHILKIT6
HSM VIDEO	SOPS	PHILKIT5
JSM VIDEO	SOPS	PHILKIT4
KSM VIDEO	SOPS	PHILKIT9
LSM VIDEO	SOPS	PHILKIT7

SAMSUNG

MAKE & MODEL	KIT TYPE	CODE
CI5944	FRAME	SAMKIT2
CI6844	FRAME	SAMKIT2
VIK310	PSU	SAMSUNGKIT
VIK320	PSU	SAMSUNGKIT
VIK350	PSU	SAMSUNGKIT
VI375	PSU	SAMSUNGKIT
VI395	PSU	SAMSUNGKIT
WINNER 1	PSU	SAMSUNGKIT

SHARP

MAKE & MODEL	KIT TYPE	CODE
51CS03H	PSU	SHARPKIT1
51CS05H	PSU	SHARPKIT1
59CS03H	PSU	SHARPKIT2
59CS05H	PSU	SHARPKIT2
59CSD8H	PSU	SHARPKIT2
59DS03H	PSU	SHARPKIT3
66CS03H	PSU	SHARPKIT2
66CS05H	PSU	SHARPKIT2
66CSD8H	PSU	SHARPKIT2

THOMSON

MAKE & MODEL	KIT TYPE	CODE
35029400		THOMKIT2
35065920		THORNKIT1
FV70	PSU	THORNKIT1
ICC7 CHASSIS	TDA 8178FS	THOMKIT1
ICC7 CHASSIS	FRAME	THOMKIT3
ICC8 CHASSIS	TDA 8178FS	THOMKIT1
ICC8 CHASSIS	FRAME	THOMKIT3
ICC9 CHASSIS	EAST/WEST	THOMKIT4
R3000	PSU	THOMKIT2
R4000	PSU	THOMKIT2
TX92F CHASSIS	EAST/WEST	THOMKIT4

ORDER CODE	PRICE
GRUNDIGKIT1	£ 10.50
GRUNDIGKIT2	£ 10.50
GRUNDIGKIT3	£ 10.50
GOODKIT1	£ 11.00
JVCKIT1	£ 11.00
MITSKIT1	£ 3.00
MITSKIT2	£ 15.00

ORDER CODE	PRICE
MITSKIT3	£ 6.00
MODKIT35	£ 9.50
MODKIT36	£ 5.00
MODKIT37	£ 6.50
NIKKAIKIT1	£ 12.00
ONWAKIT	£ 12.00
PANKIT1	£ 11.00

ORDER CODE	PRICE
PANKIT2	£ 9.00
PHILKIT1	£ 7.60
PHILKIT10	£ 8.50
PHILKIT2	£ 2.50
PHILKIT3	£ 4.00
PHILKIT4	£ 4.25
PHILKIT5	£ 5.75

ORDER CODE	PRICE
PHILKIT6	£ 5.50
PHILKIT7	£ 7.60
PHILKIT8	£ 4.25
PHILKIT9	£ 7.50
SAMKIT2	£ 8.00
SAMSUNGKIT	£ 16.00
SHARPKIT1	£ 11.00

ORDER CODE	PRICE
SHARPKIT2	£ 11.00
SHARPKIT3	£ 9.00
THOMKIT1	£ 7.00
THOMKIT2	£ 12.00
THOMKIT3	£ 9.00
THOMKIT4	£ 4.00
THORNKIT1	£ 12.75

Remote Controls

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Sony TV	RCUNI02M	Sanyo TV	RCUNI11
Philips TV	RCUNI03M	Sharp TV	RCUNI12
Hitachi TV	RCUNI04	Goodmans/Alba/ Bush TV	RCUNI13M
Mitsubishi TV	RCUNI05	Matsui/Hinari/Orion TV	RCUNI14M
Nokia TV	RCUNI06	Sky Digital	RCUNI15
Samsung TV	RCUNI07	On Digital	RCUNI16
Toshiba TV	RCUNI08	Satellite	RCUNI17
Ferguson TV	RCUNI09		
Grundig TV	RCUNI10		

Price : £7.50 + vat each

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Konig Electronic Spares

KONIG ELECTRONIC

To mark our new association with Konig Electronics we are glad to offer the following Konig Remote Controls at Special Prices !!!

Konig No.	Model/Part No.
	BANG & OLUFSEN
IR 9248	BEOLINK100
	BEKO
IR 9398	RC51321 , RC51331 , RC61331
	DAEWOO
IR 9840	DMQ14A1 , DMQ20A1 , DMQ2195
	FERGUSON
IR 9584	RCU1734 , RCU1742 , T742 ,T752 , T758
IR 9594	RH880 , T789
IR 9325	RH885
IR 9259	RHT01 , RHT30
IR 9639	RHT10
	FUNAI
IR 9719	30T1 , 30T2 , 31T1
	GOLDSTAR
IR 9403	105-068 , CBT2190E , CBT4902 , CBT9905
IR 9854	05-219J , 105-224V , 105-229H , 105-230C
	GRUNDIG
IR 9529	CUC5301 , CUC5302
IR 9614	CUC5200 , CUC5303 , CUC5310
IR 9749	TP715 , TP770 , TP771 , TP800 , TP900
IR 9715	TRC1 , TRC2
	HITACHI
IR 9602	CLE871A , CLE871B , CLE874A , CLE874B
IR 9476	CLE876A , CLE876B , C1405 , C1414 , C2114 C2514 , CT2116
IR 9477	CLE876C , CLE876D , CLE876E , CLE876G
IR 9982	CLE922A , CLE922B
IR 9576	CPT1556 , CPT1557 , CPT1560 , CPT1561 , CST1430 , CST1435 , CST1560
IR 9575	CPT2155 , CPT2164 , CPT2558 , CPT2564 , CPT2566 , CPT2669 , CPT2785 , CPT2870
	MATSUI
IR 9490	076L067240 , 2076R , 2092T
	NOKIA
IR 9573	FS4/1 , FS4/2 , FS5/1 , FS9 ,FS10
	ORION
IR 9640	RC37 , RC56 , RC565633 , RCQ
	PANASONIC
IR 9826	EUR37211, EUR50100 ,EUR50370 EUR51140 TNQ8E421 , TNQ8E0422 , TNQ8E0428
IR 9834	TNQ8E0461
	PHILIPS
IR 9510	RC5002 , RC5140 , RC5154 , RC5240 ,

Konig No.	Model/Part No.
	PHILIPS..continued
IR 9553	RC5410 , RC5420 , RC5801
IR 9556	RC5901 , RC5902 , RC5903 , RC5904,RC5905
IR 9710	RC7507 , RC8205 , RC9057 , RC9133
IR 9864	RC7512 , RC7535
	SAMSUNG
IR 9546	RM100
IR 9432	RM104 , CX532WT , CX534WT , CX5312W
	SANYO
IR 9457	JXBA , JXFF , RC307 , RC317 , RC318 , RC321 , RC612 , RC625 , RC628
IR 9530	JXCL , JXCR , RC258 , RC642
IR 9139	JXGA , JXGE , RC700 , RC702
IR 9460	JXGT, JXGW, JXGY, JXLB, JXLG, RC711, S02
	SHARP
IR 9487	C1421 , C2021 , CV2121 , CV3707 , CV3709 , CV3710 ,DV1416 , SV2044 ,SV2145
IR 9711	RRMCG0739BMSA ,G1014BMSA RRMCG1023BMSA , G1036BMSA
IR 9788	RRMCG1031BMSA , G1046BMSA RRMCG1048BMSA , G1050BMSA
	SONY
IR 9321	RM640 , RM641,RM641A,RM642A
IR 9336	RM650 , RM651 , RM652 , RM654
IR 9448	RM656 , RM677 , RM687B , RM687C , RM717
IR 9123	RM670 , RM671 , RM672 , RM673
IR 9442	RM681 , RM682 , RM683 , RM684 ,RM685 , RM686 , RM698
IR 9452	RM694 , RM820 , RM828 , RM834 , RM841
IR 9441	RM689 , RM816 , RM817 , RM826
IR 9443	RM830 , RM831 , RM832 , RM842
IR 9451	RM833 , RM837
IR 9511	RM615 , RM620 , RM625 , RM630 , RM631 , RM632 , RM633 , RM634 , RM635
IR 9871	RM836 , RM839 , RM883 , RM886
	TELEFUNKEN
IR 9624	FB330, FB340, FB345, FB1330, FB1340 ,
	THOMSON
IR 9639	14GM53 , 14GM56 , 14MS70 , 21DS70 , 21MG51 , 21MS76
	TOSHIBA
IR 9853	CT9493 , CT9511
IR 9953	CT9626 , CT9784,CT9785,CT9859

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Replacement Line Output Transformers

Make	Part No.	Konig No.	Our Code	Price
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Hitachi	2433291	FAT 3664	LOT172	£ 13.50
Hitachi	2434002	FAT 30095	LOT226	£ 14.50
ITT/Nokia	4515 0340 , D 059/37 , ME/6237-00	FAT 3727	LOT200	£ 12.50
ITT/Nokia	4515 0345 , 4515 0378 , D070/37 , D071/37	FAT 3790	LOT328	£ 16.00
ITT/Nokia	4515 0348 , D 076/37	FAT 3843	LOT330	£ 16.00
Panasonic	TLF 14584 F , TLF 14586 , TLF 14586 F	FAT 30106	LOT41	£ 15.50
Philips	1352.5003 , 4822 140 10544 , 4822 140 10566 , OV 2094/40	FAT 30186	LOT433	£ 12.00
Philips	3111 258 30021 , 4822 140 10474	FAT 30192	LOT562	£ 15.50
Philips	37770 , 37771 , 37772 , AT 2079/15	FAT 30184	LOT129	£ 14.00
Philips	4812 140 10294 , 4822 140 10294	FAT 3820	LOT125	£ 16.00
Philips	4812 140 10325 , 4822 140 10325	FAT 30167	LOT132	£ 15.00
Philips	4822 140 10353 , 4822 140 10356	FAT 3830	LOT284	£ 14.00
Philips	AT 2079/21 , AT 2078/21 , TFB 4090 AD	FAT 30179	LOT395	£ 12.00
Philips	AT 2079/17	FAT 30171	LOT288	£ 14.00
Philips	AT 2079/23	FAT 30170	LOT289	£ 13.00
Sony	1-439-332-42	FAT 3925	LOT100	£ 12.00
Sony	1-439-493-11 , 1-439-423-11 , 1-439-423-12	FAT 30089	LOT369	£ 15.50

This is just a selection of Konig Line Output Transformers . Please call us on 020 8900 2329 for any that are not listed.

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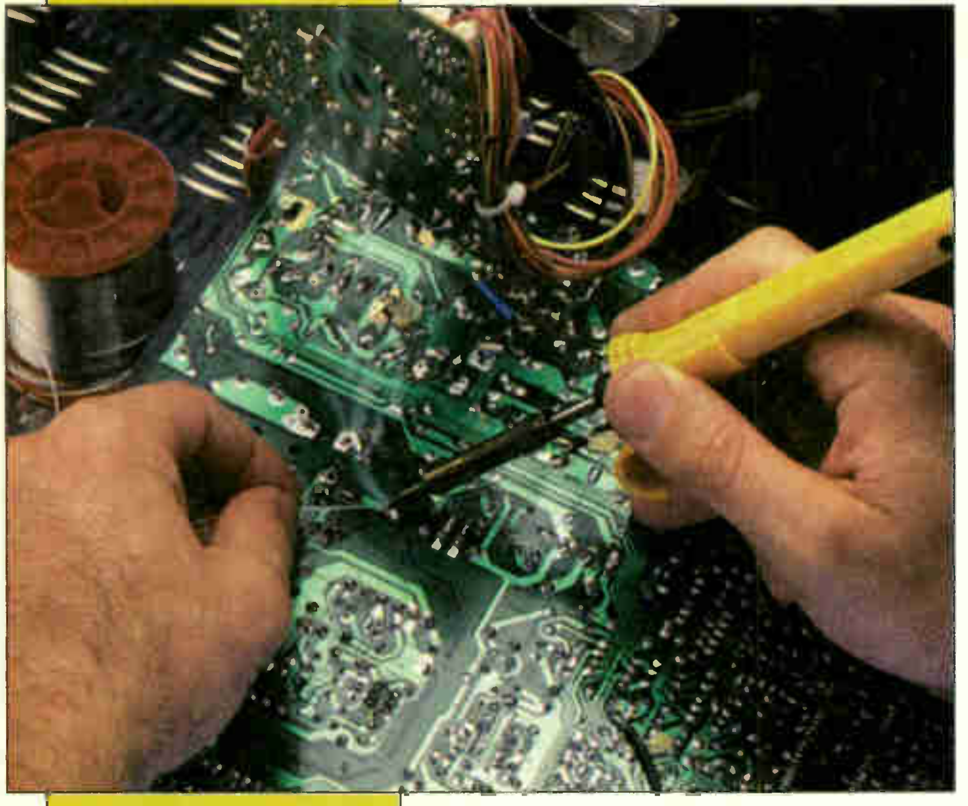
KN668800

For Daewoo
Price : £ 2.50 + vat

If you cannot find the Konig Spares you want in this advert please call us on 020 8900 2329 as this is just a small selection



JACK'S WORKSHOP

Jack Armstrong

Last month I talked about how to maximise your earnings. There is more to be said on the subject, and this month I'll discuss specialisation.

Specialise!

A lot of the TV repair shops I've visited will take on almost any work. A very good friend of mine even took in an electric trouser press. He had it in his shop for a month and, yes, he did manage to fix it eventually. But was it worth the hassle?

One major problem with accepting all and any work that comes your way is difficulties with spares. It's quite likely that you won't have the parts required. As a result you may well keep the customer waiting for days, if not weeks. He or she may be understanding about the delay, but it isn't going to do your reputation any good. If the customer is happy to wait a week, you might as well send the equipment to a specialist repairer who has the parts and the knowledge required to do a good job. Let's consider some examples.

You've probably all tried to repair a digital satellite receiver. There are enough of them out there, and the need for repair is becoming more common. Some faults are straightforward to deal with. It's not difficult to replace a Pace or Amstrad tuner after getting it repaired, or to fit a SatCure power supply kit. But fifty per cent or so of the faults are likely to be technically demanding and/or require parts that are difficult to obtain and may be expensive. You might well require training and special equipment to carry them out.

If you are not going to be able to deal with half the digibox repairs that might come in, you should either turn them away or send them to a specialist. But a lot of you probably take them in and put them on the shelf, maybe hoping for inspiration! This won't do your business any good at all. Your customer will be phoning every day to ask when the repair will be finished. You end up with a lot of unnecessary stress and an unhappy customer.

The best course is to decide what you are good at and stick to it. Make sure that you have a good stock of spare parts for the work you intend to do, and don't attempt to repair items that fall outside your chosen field.

If you decide to specialise in a particular type of repair, make sure that everyone in the trade knows that you are good at it, and get them to bring or send you their own repairs of this type. Doing this will enable you to minimise the stock you carry and maximise your profits, because your success rate and turnover will improve significantly. For every other type of repair, find someone else who specialises in it and send repairs to them. You'll soon find out who you can trust to carry out good, fast, reliable repairs.

Specialist repair services

Here are some examples of companies that provide reliable specialist repairs. For many years MCES in Manchester has specialised in tuner and modulator repairs. Not only can the company fix these items, it will also upgrade the units and test them across the working frequency range to ensure that there are no 'dead spots'. I can't think of any other firm that offers such a comprehensive tuner repair service. More recently Kesh Electrics has entered the tuner and digibox repair market.

MCES now offers a digibox repair service by post. So do Horizon Satellites in Basingstoke, Digitech Direct near Manchester, Alan at Scan Digital Services and Michael Dranfield at Digifix in Buxton, Derbyshire.

These firms carry out specialist repairs at competitive prices, so why bother trying to do such repairs yourself? Pack your customer's unit off to one of them and add £30 to the repair cost when you invoice your customer. It will involve roughly thirty minutes of your time to pack, despatch then unpack the digibox, so there's your £60 an hour rate assured!

Accent Video Technic has specialised in camcorder repairs for many years. To compete, you would need very specialised, expensive equipment. There's no point in trying to do so. A camcorder costs several hundred pounds, so there should be no problem about persuading a customer to pay for a repair. If they object, you can tell them where they can find a cowboy to 'repair' it.

What's worthwhile?

Video recorders are, from the repair point of view, almost a complete waste of time nowadays. OK, there are a few Nicam stereo models that might be worth repairing, but quote high. Don't do three hours' work for a ten pound profit (or am I being optimistic?). For that profit you might as well buy a VCR from your nearest warehouse and sell it to the customer – with a twelve-month guarantee.

Computer repairs can still make a profit, but pass these jobs to your local expert in return for a percentage.

The same applies to dish and aerial installations, and to vacuum cleaner, dishwasher and washing-machine repairs. You can advertise this work, then pass the customer's unit on to the specialist. If you can get a tenner per job for five such jobs in a day in addition to the payments for the repairs in which you specialise, you can make a good living.

So the lesson is: specialise in what you can do best, and subcontract out everything else – for a small percentage or a fixed amount per referral. ■

New technology from Panasonic

A number of new products will be introduced by Panasonic later this year, using a variety of technologies. They include flat-screen TV sets, digital TV adaptors, IDTV sets, hard-disk recorders, DVD-RAM recorders, DVD-Audio players and SD Memory Card audio and video devices. George Cole takes a look at the company's latest developments

A recent presentation to the technical press introduced various new products that Panasonic will launch during the next few months. We'll start with the TV side of the range.

Television

The demise of ITV Digital has put the spotlight on the free-to-view services. Panasonic is to launch three new IDTV sets that cater for this market. They will be in the Tau TV range and will incorporate an analogue and a digital tuner, an accelerated MHEG decoder for digital text services and a new electronic programme guide (EPG). Model TX36DT35 features 100Hz scanning, Dolby digital, a 36in. Quintrix Flat CRT and an SD JPEG picture viewer. The latter enables users to insert an SD Memory card from a digital camera or camcorder and view the recorded pictures. Model TX32DT30 is a 100Hz Nicam set with a 32in. widescreen tube while the TX28DT30 is a 28in, version. The chassis used in these sets is the Euro-8DH. These sets have a 100-page Fastext memory, three scart sockets (full-function RGB, RGB in and S-Video in) and an RCA AV/S-video input connector.

Table 1: Official recordable DVD format characteristics

Characteristic	*DVD-RAM*	*DVD-RW/DVD-R*
Capacity	4·7/9·4GB	4·7GB
Data transfer rate	22·16Mbits/sec	11·08Mbits/sec
Recording system	Non-linear	Linear
Quick access	64 address/32kB	2 address/32kB
Rotation	ZCLV*	CLV
Cartidge	Optional	No

DVD-R is a record-once only system; DVD-RW provides about 1,000 writing cycles; DVD-RAM provides some 100,000 writing cycles.
Video recording time in the standard mode is 120 minutes with 4·7GB capacity, 240 minutes with 9·4GB capacity.
*Zoned constant linear velocity.

Panasonic's Digital Converter Box, Model TU-CT20, is a compact free-to-view digital TV decoder that can be connected to an existing TV set via an RF or scart socket and has an RF loop-through function. Installation involves little more than connecting the TV and power leads as the decoder automatically detects and stores the digital TV channels. It has an integrated MHEG decoder for digital text services and some interactive features. Price is expected to be about £99.

Panasonic is also to launch plasma panels with screen sizes 37, 42 and 50in. Later in the year Panasonic will launch a range of high-definition plasma TV sets with 42 and 50in. screens. The plasma panels use a variety of technologies designed to provide improved picture quality. An Advanced Plasma AI (adaptive brightness intensifier) gives a contrast ratio of 3,000:1 while the Real Black Drive System improves reproduction in dark areas of the picture. The pre-discharge emission intensity is reduced to improve the contrast levels. Blur and picture noise are reduced by using a False Edge Predictor circuit. This analyses the incoming signal and separates the image from video noise. A three-dimensional progressive scan system converts the interlaced signal into a full frame display.

The trend is for companies to use plasma technology for large flat-screen displays (more than 30in. in size) and LCD technology for smaller displays. Two new Panasonic LCD TV sets will have 15 and 22in screens with a contrast ratio of 400:1 and a viewing angle of 160°.

DVD recorders

Panasonic was one of the first companies to launch a DVD recorder in the UK, with the introduction on the DMR-E20 last year. Along with Toshiba and Hitachi, Panasonic has decided to adopt the DVD-RAM format, with DVD-R as a means of providing compatibility with DVD-Video players. There are 4·7GB and 9·4GB versions of the DVD-RAM disc, which can be re-recorded some 100,000 times. Standard DVD-RAM discs are kept in a protective caddy, but there are also caddyless DVD-RAM discs.

Panasonic says it supports the DVD-RAM format because the format suits both AV (sound and video recording) and PC (data, software and games storage) applications. The characteristics of the three official DVD record formats are shown in Table 1.

The advantages of the DVD-RAM format include high-speed reading and writing and fast random access, because the format uses a CAPA (Complimentary Allocated Pit Addressing) system. This records address signals in each disc sector, enabling the optical pickup to go to a sector directly. Thus data can be accessed quickly even when it's not stored sequentially. The CLV (Constant Linear Velocity) disc-drive system requires rotation speed control after data track changes, which takes time. But DVD-RAM uses a Zoned CLV system that enables data in the same zone (i.e. set of tracks) to be read at a constant rotational speed, giving high-speed access. The disc's recording area is divided into 35 zones, with 25 sectors per zone in the innermost zones and 59 sectors per zone in the outermost, see Fig. 1. Thus each sector has the same length.

The format also makes it possible to provide a 'timeslip' function, i.e. a partially recorded programme can be viewed from the beginning while the rest is being recorded. This is similar to the live pause feature provided by some hard-disk video recorders such as Sky+.

The cartridge is intended to protect discs from dust and fingerprints and thus protect the data on the disc. The DVD-RAM format uses a wobble-land-groove recording system. This combines two recording techniques, land and groove modulation and wobble-groove modulation, and the previously mentioned CAPA system, see Fig. 2. Use of both the grooves and the land between them gives high-density recording. Data is recorded as phase changes (crystalline/amorphous) in the recording layer.

The Video Recording Format (VRF) used by DVD-RAM provides real-time recording and editing. Table 2 lists the main characteristics of VRF. Its features include a play list function (for changing the track playback order), still image compatibility and text information recording for search functions. VRF is not compatible with existing DVD-Video players however, though a new generation of players will provide compatibility.

DVD-RAM uses a system called Hybrid VBR (Variable Bit Rate) that combines real-time variable bit rate and visibility modulation technology to provide long recording times. Real-time VBR allocates data bits during recording in accordance with picture content: for example static images are given fewer bits than fast-action scenes. This makes more efficient

The Panasonic portable DVD player Model DVD-LV65 has a 5in. LCD screen and can read DVD-Video, DVD-RAM, DVD-R and CD-R/RW discs.

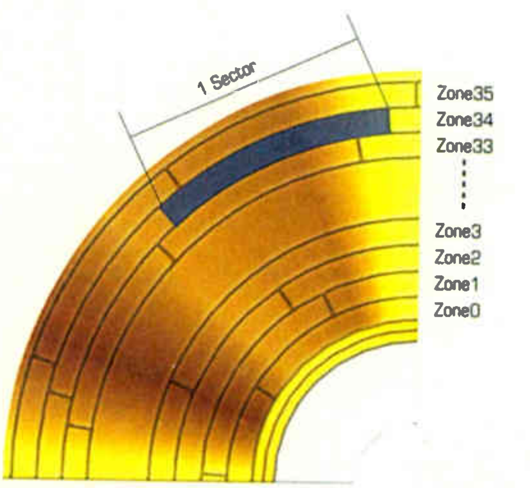


Fig. 1: The DVD-RAM's recording area is divided into 35 zones, with a number of sectors (25-59) per zone.

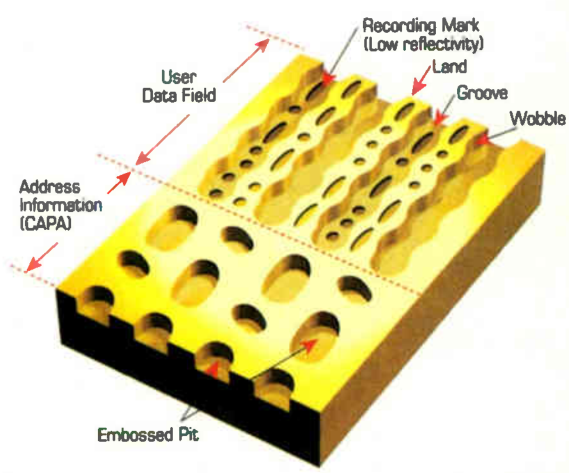


Fig. 2: The DVD-RAM recording technology uses land, groove and wobble modulation and the CAPA system.

The Panasonic DVD-player Model DVD-C52 is a changer unit that can store up to five discs.

use of the data capacity. Visibility modulation technology reduces the number of bits allocated to parts of the scene that are less noticeable to the eyes. For example an object standing in the foreground would be given less image compression than an object in the background. As a result users have a number of recording modes to choose from, with the trade-off that longer recording times mean reduced picture quality. The modes are listed in Table 3.

Panasonic plans to launch two new DVD-RAM recorders, including Model DMR-E30 which has a slimmer design than the DMR-E20 and a new remote-control unit. Model DMR-HS1, which is already available in Japan, is a combined DVD-RAM and hard-disk recorder. The hard-disk provides 8·5 hours' recording time in the XP mode, 17 hours in the SP mode, 34 hours in the LP mode and 52 hours in the EP mode. The DMR-HS1 can also be used for high-speed dubbing from the hard-disk drive to a blank DVD-RAM disc – see Table 4.

Panasonic is one of the companies committed to the Blu-ray recording format that uses blue-violet laser technology to store up to 27GB of data on a 12cm disc. It doesn't see Blu-ray as a commercially available system for another three-four years, and forecasts that in the meantime worldwide DVD recorder sales will rise from 320,000 units last year to 2·9 million next year.

DVD players

Panasonic is to launch a number of DVD-Video players this year including Model DVD-XV10, which is just 53mm high and is compatible with CD-R/RW discs and MP3 music files. The slim size has been made possible by the use of a new optical pick-up that's only 14mm high and just over a third of the weight of the current pick-up. Reduced height and weight have been achieved by using a resin instead of glass objective lens. Model DVD-RA82 is a multi-disc player that can read DVD-RAM, DVD-R, DVD-Video and DVD-Audio discs as well as recordable CDs and MP3 files.

Panasonic has decided not to follow Pioneer's lead and offer compatibility with Super Audio CD discs. Although the DVD-Audio system has been around for a while now its profile is low. Panasonic says that it plans to promote DVD-Audio this year by expanding the range of DVD products that include DVD-Audio compatibility. But only one in four new home-cinema players can read DVD-Audio discs and, of the four new portable DVD players Panasonic is to launch, only one will be compatible with DVD-Audio discs. A bigger problem however is the lack of DVD-Audio software available. Although a number of record companies have committed themselves to support DVD-Audio, at present the number of titles available worldwide is only about 120.

Model DVD-CV52 is a DVD changer that can store up to five discs. Model NV-VHD1 is a combined DVD-Video player and hi-fi VHS recorder. It can play DVDDVD-Video and DVD-R discs as well as CD-R/RW discs containing MP3 files. There is also an optical digital output and a bass plus (subwoofer output) socket. The VCR section includes Super Long Play (twelve hours' recording on an E-240 cassette), NTSC playback, Super-VHS

Table 2: Video Recording Format characteristics

Video encoding system	MPEG-1/MPEG-2
Number of video streams	One
Aspect ratio	4:3 and 16:9
Number of pixels (NTSC)	720 x 480, 704 x 480, 544 x 480, 480 x 480, 352 x 480, 352 x 240
Audio encoding system	MPEG/Dolby Digital/Linear PCM
Number of audio streams	Maximum two
Number of audio channels per stream	Mono, stereo, dual mono or multi (max. 7.1 channels)
Sub-picture encoding system	Runlength encoding
Number of sub-picture streams	One only
Multiplex format	MPEG-2 programme stream

Table 3: DVD-RAM recording modes

Mode	*4·7GB record time*	*9·4GB record time*	*Data rate*
XP (high picture quality)	About 1 hour	About 2 hours	About 10Mbits/sec
SP (standard picture mode)	About 2 hours	About 4 hours	About 5Mbits/sec
LP (long recording)	About 4 hours	About 8 hours	About 2·5Mbits/sec
EP (extra long recording)	About 6 hours	About 12 hours	About 1·7Mbits/sec
FR (flexible mode)	60-360 min	120-720 min	1·7-10Mbits/sec

The Panasonic DVD/CD player Model DVD-RV32.

Quasi Playback and 35x jet search.

Models DVD-LV50 and DVD-LV65 are portable DVD players. The former includes a 5in. LCD screen and an SD card slot for playing music encoded with MP3 or AAC (Advanced Audio Coding) compression. It can also read JPEG image files and MPEG-4 video files stored on an SD card. Both models can read DVD-RAM, DVD-R, DVD-Video and CD-R/RW discs.

Panasonic is also launching nine new DVD home-cinema systems, including the SC-DT300. This is a micro system that provides DVD-Video and DVD-Audio playback and has a built-in Dolby Digital/DTS decoder.

Interestingly, some of Panasonic's DVD players in the US can also read Windows Media Audio (WMA), a popular audio-file format, but the company is still considering whether to include this feature with DVD players for the European market.

Table 4: High-speed dubbing, hard disk to DVD-RAM disc

Rec. mode	*Prog. length*	*Dubbing time**	*Dubbing speed*
XP	1 hour	30 minutes	2x
SP	1 hour	15 minutes	4x
LP	1 hour	7·5 minutes	8x
EP	1 hour	5 minutes	12x

*Approximate

The SD Memory Card

The SD (Secure Digital) Memory Card was deveoped by Panasonic, Toshiba and SanDisk. It's designed to store a variety of media including audio, video, images and data. The card is about the size of a postage stamp, measung just 24 x 32 x 2mm. Its data rate is 2Mbits/sec and the largest-capacity card is at present able to store 256MB. This year will see the launch of 512MB versions however, with an increased data rate of 10Mbits/sec. Next year should see the first 1GB card, and there are plans for 4GB cards by 2005. SD cards incorporate copy-protection technology for both audio and video.

At the time of writing 421 companies wordwide support the SD card, representing the audio, video, computer, telecommunications, games, photographic and automotive industries. Panasonic has included SD card readers in various products such as audio players, digital cameras, digital camcorders, PCs, projectors, the Nintendo Gamecube console and in-car entertainment systems. The company has launched a series of e.wear (electronics-to-wear) products that use the SD card. Model AV10 is a concept product: it combines an audio player, video camera, still camera and voice recorder.

Camcorders

Panasonic's new camcorders are called e.cams. There are two models in the DS range of digital camcorders, the DS29 and DS30. Both include an 800,000 pixel CCD image sensor, 10x optical/500x digital zoom, a 2·5in. LCD monitor and a 0·1 lux Night View function.

There are four new models in the GS range, the GS1, GS3, GS4 and GS5. They are designed to combine the features of a traditional vertical camcorder with a palm camcorder, i.e. small size with many features. These models include an 800,000 pixel CCD image sensor, a 2·5in. LCD monitor, Colour Night View, Bluetooth compatibility, SD card compatibility, a USB link, an MPEG-4/SD voice function and DV/analogue inputs. The GS5 has a volume of 470cc, some 20 per cent less than its predecesor Model DS88.

Colour Night View changes the exposure time to about half a second, increasing the gain from around 4 times in the normal mode to 25 times. It enables colour shots to be taken with light levels as low as 0·1 lux.

Panasonic has also introduced a new free-style remote controller that makes it easier to take low-level and high-angle shots.

Model GX7 is a super-compact camcorder with a 1·2 megapixel CCD image sensor and a tele-jump function. This enables the user to press a button and get an instant 1·3x zoom with no picture deterioration.

Model MX350 has a three-CCD sensor system giving 1·8 megapixel still image recording, a Leica Dicomar lens, a USB link, an SD card slot, a 3·5in. LCD monitor, MPEG-4 video recording with voice on an SD card, DV input and output sockets and Bluetooth compatibility when used with an optional adapter kit.

Home networking

Panasonic says the home of the future will have a broadband connection to the internet, with many devices around the home networked. You will, for example, be able to shoot video with a camcorder then put the SD card into a DVD-RAM home server to transmit the video to TV sets around the home.

Wireless LANs using some form of IEEE 802.11 technology will make it easy for devices to communicate with each other. At present Panasonic's aim is to make products and devices that are interoperable, so that it's simple to transfer media material from one product (such as a digital camera) to another (say a printer). But no doubt many of Panasonic's future products will come with wireless technology built in as standard. ■

Servicing

the Mitsubishi TFS6705K monitor

This 17in. Trinitron-tube monitor's production run lasted for several years. Large numbers were sold as the Dell VC7EN. In Part 4 of his series Donald M. Henry looks at the operation of the power supply circuitry

So far we've covered the video channels and related control arrangements, the timebases and raster correction arrangements and the EHT generator. This month we'll tackle the power supply circuitry, in particular the variable +B supply. The processor board will be the subject of Part 5 in the series.

The power supply

The need for a variable-output power supply in a monitor is because a PC can provide inputs with different line-rate signals and resolutions. The user wants a display of consistent width regardless of mode: the power supply has to adjust its output to achieve this result. It's also important that other things remain constant, such as the EHT and the heater voltage, despite different signal inputs. And what better tool to adjust the variable +B output voltage than the microcontroller chip, which watches the incoming line-rate signal? As we shall see, in addition to video and scan correction, which were covered in Parts 1 and 2 in this series, the control board determines the output voltage and is responsible for protection and degaussing.

Figs. 1-4 show the power supply circuitry. The primary side consists of a fairly standard chopper arrangement. We'll return to this later.

Secondary-side outputs

Fig. 1 shows the circuitry on the secondary side of the chopper power supply, including the variable +B supply. We'll start with a description, not exhaustive, of what the various pins of the chopper transformer T901 are used for. The transformer pin numbers can just be seen with a torch while bending the plastic chassis away from the underside of the PCB.

Pin 13 is a common chassis connection for all but one of the secondary windings.

The winding between pins 10 and 11 is the only one with no chassis connection. The DC produced across C976 by D959 is taken to VR502 (100Ω WW) which is used for line shift adjustment (moving the entire raster left-right). The adjustable DC level at the wiper of VR502 is added to the variable +B and EW modulated feed to the line output stage. Lack of adjustment suggests an open-circuit fusible resistor, either R974 or R572 (both 1·2Ω).

Pin 12 feeds the rectifier circuit D958/C972 which provides the input to the –12V regulator IC954 (µPC7912HF). The –12V supply is used by IC303 on the sync panel, the op-amps IC702/3/4/6/7/10 on the PWB-DEFL-SUB panel and also the 7905 –5V regulator IC709 on this panel. Pop out the boards when tracing faults.

Pin 14 feeds the rectifier circuit D957/C967 which provides the 6·3V supply for the CRT's heaters, via R964 (2·7Ω, 2W), and the input for the 5V regulator IC953 (µPC2405HF) whose output runs all over the place, including the microcontroller chip.

Pin 15 feeds the rectifier circuit D956/C963 which provides a supply for the degaussing relay RY901 and the cooling fan, and the input for 12V regulator IC952 (L7812ML) whose output powers the timebase oscillators, the line linearity relay RY501, the video preamplifier, op-amps all over the place, front panel LEDs (except power-on) and some pull-up resistors on the microcontroller board.

Pin 16 feeds the rectifier circuit D955/C958 which provides the 27V supply for the frame output stage and the input for the 24V regulator IC951 (SI3240C) whose output powers the line driver stage. IC951 is a five-leg device, but only three connections are used, input, chassis and output.

Pin 17 feeds rectifier circuit D954/C957 which provides the 80V supply for EHT transformer T601-2 and IC203 on the video board.

Pin 18 feeds the HT rectifier circuit D953/C955 which provides 168V for the video board and EHT transformer T601-1 and the input to the +B chopper/regulator transistor Q952.

The 168V supply is set by VR951, which is connected via R975 to the SE140N error sensor IC956. This device drives the TLP732LF2 feedback optocoupler IC902, which in turn controls the operation of the STR-S6308 chopper chip IC901. IC956 uses the 80V supply as its reference voltage. This is the basic HT feedback regulation network. More later on how it affects the operation of the chopper circuit.

Protection

Protection is incorporated in the 168V supply, in the form of the TFD3125M crowbar thyristor Q953 whose gate is connected to an active-high output from the microcontroller chip. When Q953 switches on an audible whine can be heard, indicating that the power supply is in the over-current protection mode. Q953 is fired when the microcontroller chip detects failure of or a low-speed cooling fan and immediately shorts the 168V rail to chassis. All other outputs obtained from T901 are discharged to 0V. Scanning, the EHT and video drive cease, protecting the CRT from burns. The cooling fan stops

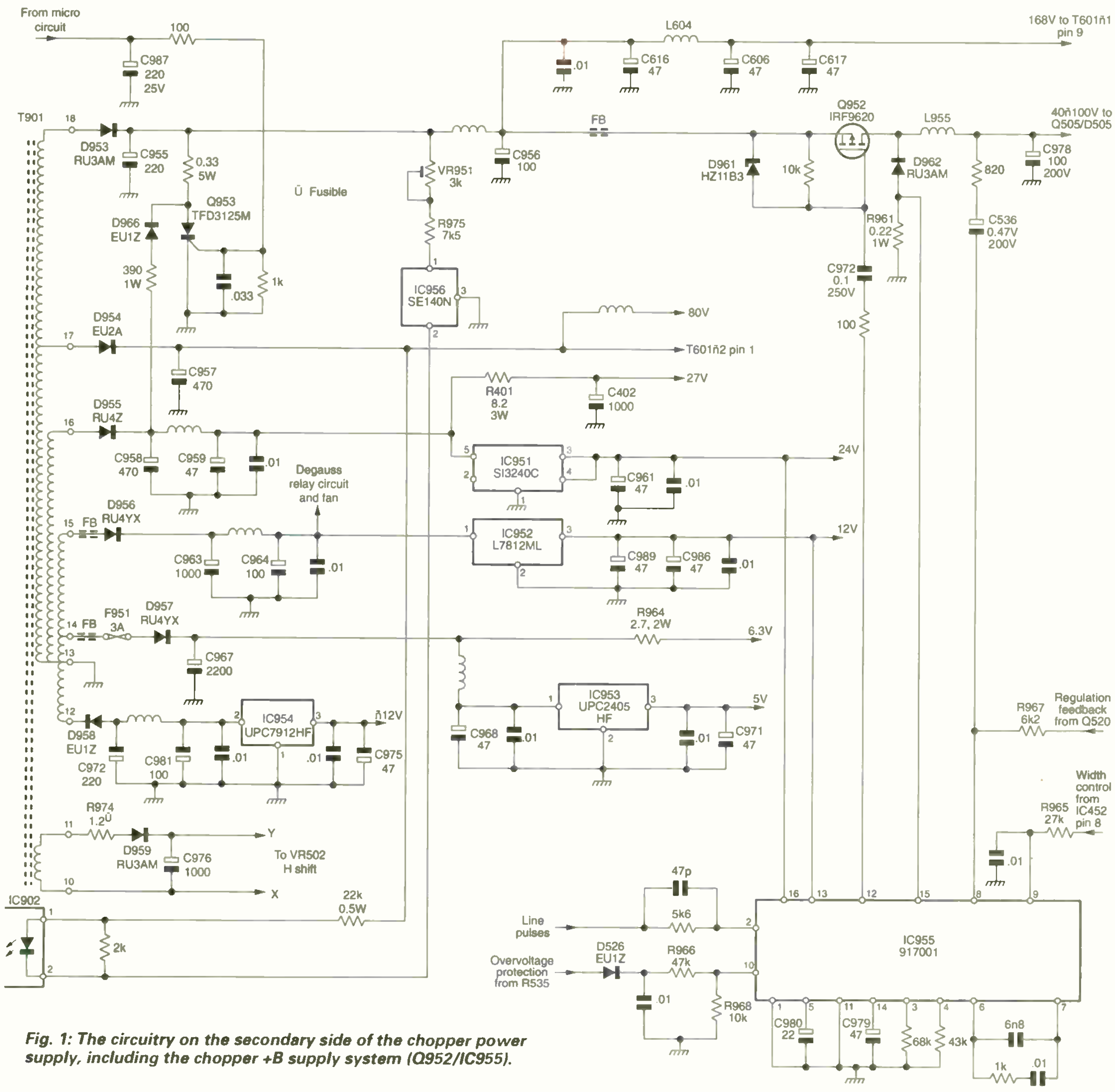


Fig. 1: The circuitry on the secondary side of the chopper power supply, including the chopper +B supply system (Q952/IC955).

but, not being powered, other components on the CRT base panel are protected from overheating (they are normally subjected to forced ventilation). The LEDs are all extinguished.

Note that the same whine can be heard when Q603 fails (see Part 3 last month), though the over-current protection is triggered by a separate mechanism.

The variable +B supply

The line output transformer T502 requires a variable supply (40-100V depending on the type of display called for) which is known as the +B supply. This is provided by the series chopper MOSFET Q952 (IRF9620) which is fed from the 168V supply and has as its reservoir coil L955, with C978 for smoothing. The +B supply is varied by the microcontroller chip: basically, the longer or more frequent the on times of Q952, the greater the width.

Q952's gate is driven by pin 12 of IC955 (type 917001). The drive is variable in frequency and width, its frequency depending on the mode or H-rate signal in use while its width depends on the DC width command from the microcontroller chip. IC955 is another of those proprietary, green hybrid devices. We need to pay some attention to it, and will begin by looking at its inputs.

Pin 10 is labelled OVP (over-voltage protection). It monitors the line output stage via the potential divider R966/R968 and D526, which is connected via R535 to pin 5 of the line output transformer T502. This is not to be confused with the EHT-inhibiting action, discussed in Part 2, that occurs when there is line collapse. OVP shuts down the +B supply if there is excessive activity in the line output stage.

Pin 15 (CLM–) provides current limiting should D962 (RU3AM) conduct because of an over-voltage condition at the output from Q952. (D962 does the same job as the familiar SR2M over-voltage protection diode in the Matsui Model TV1420A etc.). D511 at pin 12 of the line output transformer serves a similar purpose. I've never known D962 or D511 to short out, unlike the diode in the Matsui sets!

Pin 2 (lock) is a sync input to ensure that the gate of Q952 is triggered at the precise moment during the line period, and thus determines the chopping frequency. The lock pulses are obtained from pin 5 of

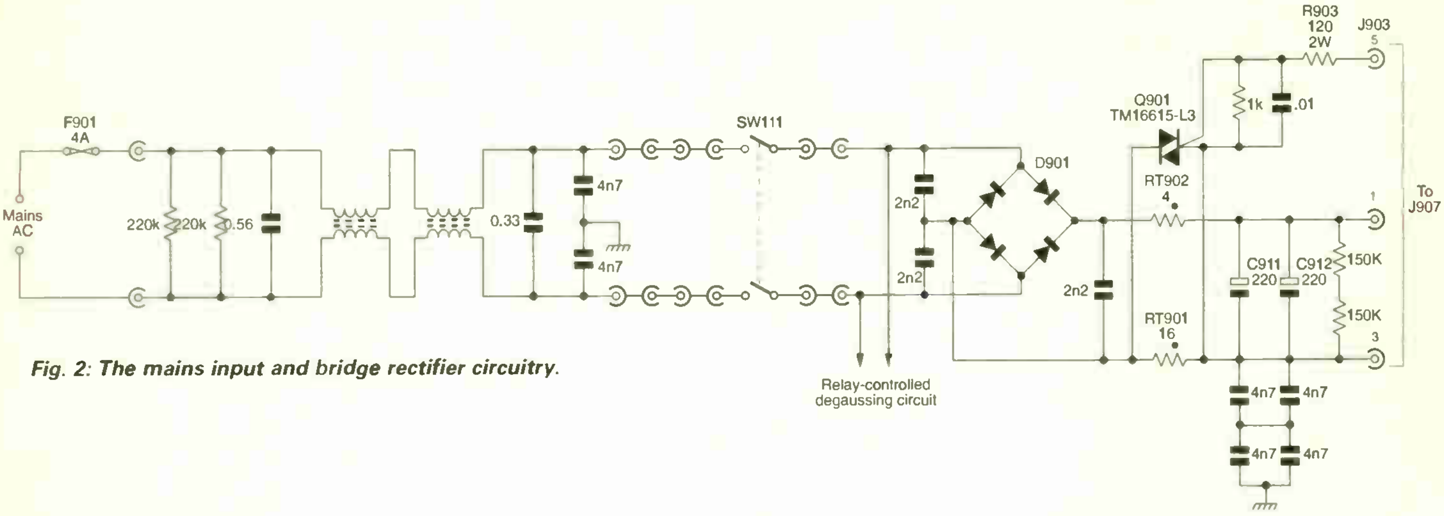


Fig. 2: The mains input and bridge rectifier circuitry.

IC305 on the PCB-SYNC-SUB panel – they are shared with the microcontroller chip.

Pins 3-7 are connected to passive components. Pin 5 (soft) provides a soft start for IC955's internal oscillator by charging C980 (22μF, 50V). As a result the +B voltage rises gradually at power-up, avoiding a 'thwack' kick-start of the line output stage. The effect can be seen with a worn tube.

Pins 8 and 9, labelled DET2 and SIZE, are where feedback is applied and where the width of the pulse to drive the gate of Q952 is controlled. In Part 2 we saw that the voltage across C533 (Fig. 7, page 409) is proportional to the line output, in other words width. Feedback from here, via Q519/520, arrives at pin 8. The input that controls the width of Q952's gate drive pulse is fed to pin 9 via R965, and is the same DC width-control voltage, derived from the PWB-DEFL-SUB panel, that's used to control the current in the line driver transformer T501.

An increase in the DC width-control voltage results in a longer on time for Q952 and thus increased width. You can see a problem here: we don't want to tell IC955 to increase the output voltage from Q952 to widen the picture only for the feedback to pin 8 to tell IC955 to put the brakes on again. So there has to be some parallel tracking operation. Apparently there's a base-emitter junction inside IC955 between pins 8 and 9 to ensure that the two operations remain in step with each other.

Mains input circuitry

There's a common-mode rejection filter network just after the AC input IEC connector, see Fig. 2. The AC is then passed to a vertically-mounted board, PWB-POWER-SUB, at the left (looking from the rear). The power switch SW111 is mounted on the microprocessor board with wired-through connectors to link it to the power sub-board. The mains bridge rectifier and its associated reservoir capacitors are easily identifiable here. A degaussing relay and posistor (RP901) should also be obvious, see Fig. 3, though it should be mentioned that the user degaussing button requests the microcontroller to operate the relay – some older monitors are more primitive, with the button connected to a timer circuit that operates the relay for a few seconds, or a more direct link to the relay. RV901 is connected across the degaussing coils to maintain a similar current whether the monitor is operated with a 110V or a 230V mains supply.

The only slightly unusual feature on this board is the TM16615-L3 triac Q901 which, when fired via D902, shunts the surge-limiting thermistor RT901 once the primary side of the chopper circuit gets going.

The chopper circuit

The term used in the Mitsubishi manual to describe the chopper circuit, see Fig. 4, is "ringing choke converter". I've not found a definition for this in my power supply 'bible' by Gottlieb, published by McGraw-Hill (ISBN 0-8306-4404-0). I do however recommend pages 380 on as valuable relevant reading. As far as I can tell, ringing-choke and resonant-mode converters are one and the same thing. Regulation is achieved by varying the chopper frequency rather than, as with PWM (pulse-width modulation), the duty cycle. A resonant-mode converter can operate at a frequency of several hundred kHz.

Nothing happens in the primary winding 1-3 of the chopper transformer T901 until the first output pulse appears at pin 1 of

Fig. 3: The relay-controlled degaussing circuit and the cooling fan supply and sensing connection.

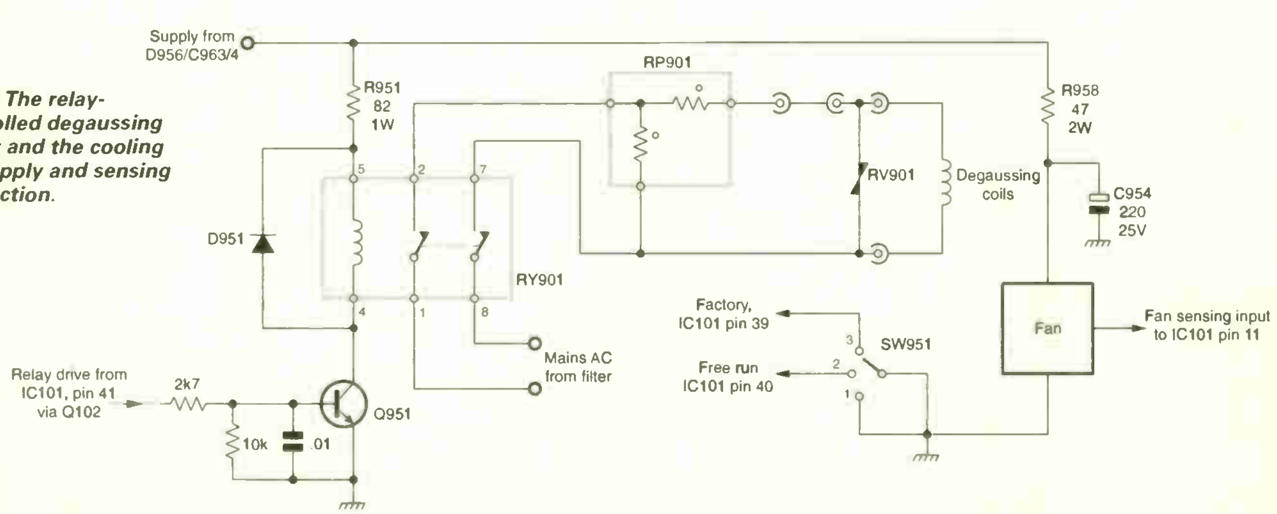
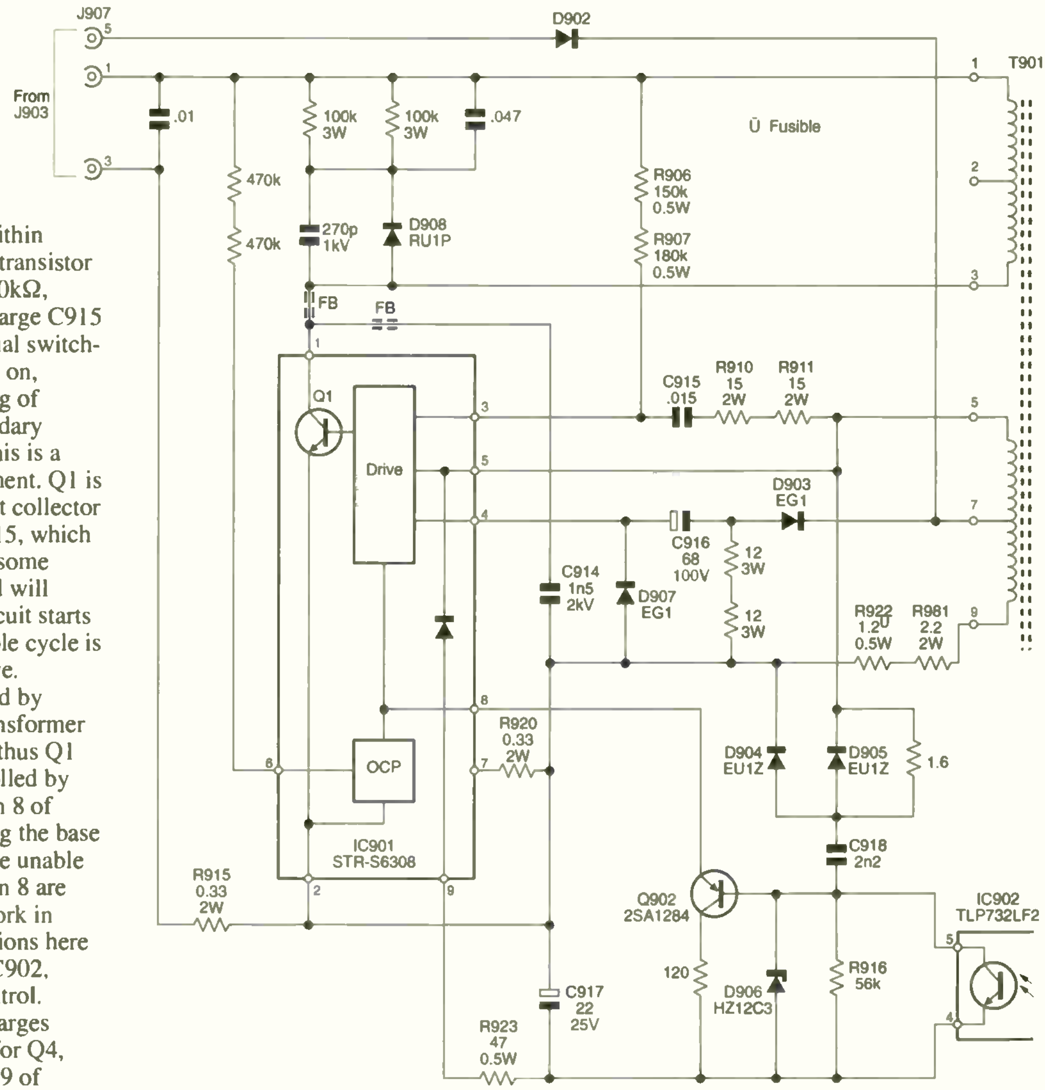


Fig. 4: The circuitry on the primary side of the chopper power supply.



IC901. Fig. 5 shows the circuitry within IC901, which includes the chopper transistor Q1. The start-up resistors R906 (150kΩ, 0·5W) and R907 (180kΩ, 0·5W) charge C915 (0·015µF, 100V), producing an initial switch-on pulse for Q1. When Q1 switches on, current flows in the primary winding of T901, inducing current in the secondary winding connected to pins 5/7/9. This is a classic blocking-oscillator arrangement. Q1 is driven to saturation. With a constant collector current there is no feedback via C915, which begins to discharge via R906/7. At some point Q1 will be forward biased and will switch on again. That's how the circuit starts up, but in normal operation a variable cycle is required to make regulation effective.

A more rapid switch on is achieved by feeding pulses from pin 5 of the transformer to pin 5 of IC901 to switch Q4 and thus Q1 on. Q1's switch-off period is controlled by feeding negative-going pulses to pin 8 of IC901 to switch on Q2, thus shorting the base and emitter of Q1 which will then be unable to conduct. The pulses applied to pin 8 are generated by the *RC* charging network in Q902's base circuit. The DC conditions here are controlled by the optocoupler IC902, which implements the feedback control.

During normal operation D903 charges C916, producing a positive supply for Q4, while the diode between pins 5 and 9 of IC901 charges C917, producing a negative supply for Q902 and the phototransistor in the optocoupler.

Having scoped the activity on the primary side of the chopper circuit I found that it was continually hunting all over the place, the rate of change depending on the mode, but basically it seems to run at about 100kHz. I'm given to understand from Gottlieb that supplies of this type never run at the actual resonant frequency of the tuning components: they are designed to run around at a rate either just below or just above the resonant frequency.

IC901 also incorporates excess-current protection. Q3 monitors, at pin 7, the current that flows via R915. Should this be excessive Q3 switches on and in turn Q2 conducts, cutting off Q1.

IC901 has proved to be reliable: I've only ever come across one failure despite having had many hundreds of these monitors in for repair.

Spares

A possible source for the fan and other spare parts is B+H Distribution. The firm is an official agent for NEC and Mitsubishi monitor spares and can be reached on 01442 828 188.

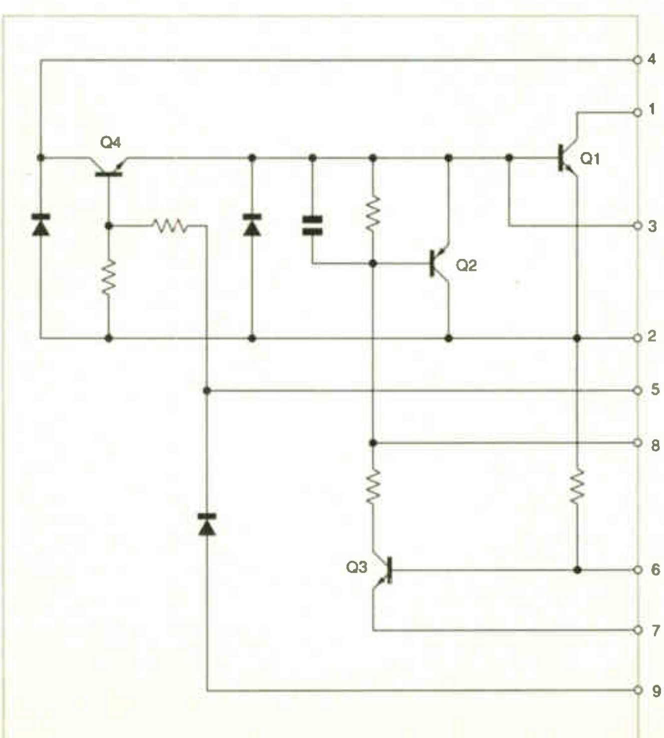


Fig. 5: Internal circuit of the chopper chip IC901.

DX and Satellite Reception

Terrestrial DX and satellite TV reception reports. News on TV broadcasting and satellite band changes. A run-down on some current interference problems. Roger Bunney reports

An aerial surveillance picture of the Kosovan countryside downlinked by Telstar-11 at 37°W for examination by US Military Intelligence.

There was very little terrestrial DX-TV reception during April. A minor Sporadic E opening occurred on the 16th, when RAI (Italy) ch. IA and an unidentified ch. R1 signal put in an appearance. An opening at this time suggests that the SpE season later in the year could be a good one. Three nights afterwards an aurora produced signal reflections in Band I. There was activity in chs. E2/3/4 from 1800 hours, and several NRK (Norway) ch. E2 signals were received prior to 2200 hours.

F2 layer reception in the UK has ceased for the time being. A TV-DX web list provides details of an amazing F2 DX Saturday experienced by Ian Roberts in Johannesburg, South Africa on April 20th. Reception included Iran ch. E2, Syria ch. E2, New Zealand ch. 1, Switzerland ch. E2, Germany ch. E2 (Grunten, Biedenkopf and Goettelborner Hohe), ORF (Austria) ch. E2a, ch. L2 AM audio from France, and TVE (Spain) ch. E2 – which incidentally confirms that TVE is still using Band I. His reception of Kenya ch. E2 was possibly via the long path, i.e. Australia and New Zealand then back to South Africa via N. America! The TV-DX weblist is at

tv@fmdx.com

I've recently heard again from Ian Beckett (Buckingham) who reported several F2 TV-DX successes during February and early March. Ian was active during the record-breaking solar cycle in the late Fifties. A comprehensive write-up of his F2 reception at that time appeared in the *Radio Constructor*, and probably introduced many enthusiasts to the possibilities.

Satellite sightings

Probably the main news story in the UK during April was the funeral of the Queen Mother. I expected to find most UK satellite feeds via Eutelsat 2F3, and was surprised when I found news coverage from Windsor Castle via Europe*Star-1 (45°E). This was from the NTL truck UKI-447, uplinking interviews etc. at 12·663GHz V (SR 5,632, FEC 3/4). Two days later the very same physical position was occupied by the Meridian Tonight (North, i.e. Thames Valley) truck, but uplinking via Intelsat 801 (31·5°W) at 10·974GHz V with the service identification "Meridian 8mBit TES-9". Meridian had previously been using its TES-43 truck at 10·988GHz V. At the same date and time pictures were being uplinked for the Anglia TV evening magazine programme via 801 at 10·983GHz V, from the BT TES-42 truck.

There was much international interest. Coverage of the laying in state at Westminster Hall was seen on April 8th via NSS K (21·5°W). Several prolonged VTR packages showed the queues of folk filing into Westminster to pay their respects. This was a news item for TV-3 (Spanish TV) at 11·550GHz H (5,632 + 3/4).

Edmund Spicer (Littlehampton) checked carefully but found few obvious satellite downlinks during the funeral, though TV pictures showed several SisLINK trucks in operation, particularly during the drive out from London to Windsor for the internment. Perhaps his 60cm dish is a little too small. He found that the BBC carried an outside broadcast FTA via Astra (28·2°E) up to 1300 hours, using the BBC Parliament channel (12·129GHz V, 27,500 + 2/3).

One great love of the Queen Mother was horse racing. On the 13th I found a Globecast sports feed to Europe via NSS K from the San Aneeda course in Seattle. This was at 11·590GHz V (20,145 + 3/4) – the Globecast package, channel 2.

There was an odd sighting via NSS K on the 17th. Colour bars inlaid "ANGLIA NAH55", with the service identification "LTP DSNG", were seen with no programming. I suspect that it was a German uplink, but the connection with Anglia is curious. Equally odd was Globecast Africa-2 via Europe*Star-1 on the 19th (2000 hours) at 11·512GHz V, with colour bars then a four-five minute montage of African folk. This slot had previously been used by Newsforce Africa for cricket from Harare.

On an indifferent Sunday afternoon I found NSS 703 (57°E) with the Star TV package at 11·185GHz V (14,000 + 3/4). Unfortunately the channels were all encrypted, but the services were clearly identified as Star Plus, Star News and Fox Sports.

Signal strength seems to be about 46dBW in the southern UK. Carriers were present at 11·004 and 11·155GHz V, with no digital or analogue video.

The Reuters NSS K lease at 11·462GHz V seemed to be much quieter in April, though a live OB on the 17th covered President Bush's visit to the Virginia Military Institute, Lexington – an army cadet training college. A presidential speech and walkabout, with unusual lack of security, were seen at about 1600 hours UK time.

TV Shqiptar Satelit (Albania) can now be seen via Eutelsat W2 (16°E) at 12·565GHz V (4,880 + 1/2). Roy Carman reports seeing an analogue OB feed via NSS K at 11·675GHz V in early April: it showed the launch of an Intelsat craft from the Baikonur site.

I commented recently on the lack of SisLINK OB horse-racing feeds. This brought the suggestion that the best time to try is during the afternoon, when Eutelsat 2F3 (21·5°E) often carries such feeds. Dave Dyson (Lancashire) reports that several SIS trucks now encrypt, though he has seen Aintree, Kempton Park, Burney v Wolves football and the "Marbles Championships from the rear of the Greyhound Inn" in the clear. 2F3 is in an inclined orbit, so the signal strength varies over the 24-hour cycle. A 90cm dish with its wider beamwidth might be better than a larger 1·5m dish, with its much sharper forward beamwidth, when trying to receive signals from this inclined-orbit satellite.

*A news feed from Windsor Castle on the Queen Mother's funeral, for German TV via Europe*Star-1. A Manhattan DigiPlaza satellite box was used for reception.*

Broadcast news

WorldSpace radio: There are suggestions that charges may be introduced for reception of the WorldSpace L-band satellite radio transmissions. This is something that those considering the purchase of a WorldSpace radio should bear in mind – the receivers are widely advertised at £149. At present the Afristar satellite's Eurobeam can be received in the UK. Launch of the Ameristar satellite is likely to be delayed for financial reasons.

Switzerland: Garry Smith of TRN reports that the present three-language transmission system throughout the country is to be scaled back, with only single-language regional services being available. In southern Switzerland for example only an Italian-language service would be transmitted, dropping the German and French offerings. The frequencies made available will provide much-needed bandwidth for the expansion of a second network and the introduction of DTT.

Russia: The licence previously held by TV6, which the authorities closed down, has been awarded to the Media-Sotsium group.

Germany: ZDF is to start a new general entertainment channel, ZDF-2, based in Mainz. There has been no indication of the on-air date, which could be a considerable while in the future.

Belgium: Flemish politicians are seeking government support and funds for an "immigrant TV channel" with a production centre at Vlaanderen. It would transmit in Dutch with subtitles in other languages, e.g. Turkish and Arabic.

Satellite news

A contract has been signed for the delivery of Eutelsat W5. Its orbital position has yet to be confirmed but the satellite will carry 24 Ku-band transponders and be capable of full data, TV and telecommunications operation. Hot Birds 5 and 7 are to be launched this summer to take up position at 13°E. Eutelsat has acquired an increased interest in the Spanish satellite operator Hispasat.

Astra 3A has been launched and is now in position at 23·5°E, previously the DFS Kopernikus slot. It will provide cable TV and internet connections across central Europe, with twenty transponders that operate in the 11·45-11·70 and 12·50-12·75GHz bands.

The Irish Broadcasting Commission (BCI) has signed contracts enabling various services to be broadcast via Astra (28·2°E) at 10·744GHz H (SR 22,000, FEC 5/6). The services include RTE-1, RTE Network 2, TV3, TG4 and the four RTE radio services Radio 1, 2FM, Lyric FM and Radio na Gaeltachta (Gaelic). RTE TV is encrypted but the radio services are FTA.

CNN has plans for a dedicated Scandinavian news channel similar to its Spanish and Turkish services. CNN is at present

Here's how to get your business known! West Wight Vision advertises on the local RSL channel TV 12. The advertisement was picked up by Roger Bunney at Romsey, Hants.

transmitted with the Swedish TV4 commercial DTT service as a filler.

A new satellite TV service across South Africa, called Vivid, was due to open in early June, providing FTA TV for rural areas where the present terrestrial services cannot be received. It will broadcast the three SABC channels plus eTV. There are also plans for data and pay-TV channels.

The Indian Space Television company is seeking permission to transmit Ku-band DTH services to India and wants the import tax on imported digital STBs to be reduced.

Interference problems

Interference is the curse of DXers, radio amateurs and, often, TV viewers. DTT in the UK produced a number of adjacent-channel and, sometimes, co-channel problems as the relatively low-power digital channels were fired up between the local analogue transmissions that had, all those years ago, been carefully spaced to avoid interference problems. Here in Romsey the mega-strong ch. 31 BBC-1 transmissions from Rowridge suffer from crawling noise produced by the adjacent ch. 30 digital multiplex.

Recently developed top-hat discone aerial for use with a shared-dish TV system with retransmission in L band (950-2,500MHz). For more information refer to www.sdstv.com

Interference can come from the most unusual sources – electric fences, modern phones, timers, Nintendo Games consoles and so on. The RSGB magazine *Radio Communications* has a bimonthly column, edited by Dave Lauder, that publishes details of recently encountered problems, means of minimising them, and warnings about possible future problems. One prospective problem is tests to establish whether power lines can be used for data distribution to homes etc. Radiation levels at MW, SW and possible low VHF frequencies could well disrupt hobbyist activities. A number of companies are pushing PLT (Power Line Transmission).

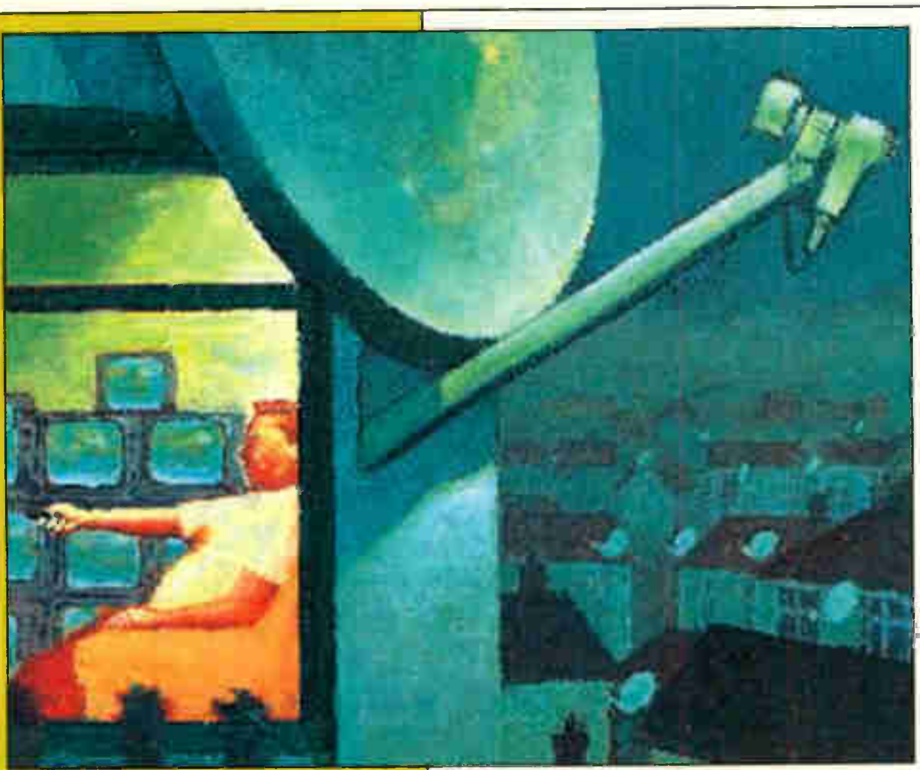
Over a year ago a reader wrote to me about a problem with domestic analogue satellite reception. The interference was spread over many channels, appeared suddenly and persisted for weeks. A substitute receiver had been tried but was similarly affected. My first thought was that perhaps the LNB was unstable, but a further letter cleared this possibility and it was then apparent that the interference was being radiated locally and picked up by the receiver. The cause of the problem turned out to be a nearby, recently-opened cellphone transmitter. L-band radiation from the mast was being picked up by the coaxial satellite IF downlead. Use of better-quality, double-screened feeder was therefore suggested. It seems to have solved the problem.

Radio car keys have caused problems for some amateur radio operators. Press the key fob to unlock your car doors from 50 feet as you walk towards the vehicle. But many of the radio lock systems operate at close to the 435MHz amateur band and use cheap, unselective receivers. When a local radio amateur fires up his 70cm transmitter, quite legitimately, a nearby car key receiver may be jammed, the key refuses to operate and the car owner can't open his doors. Bad news if the amateur is transmitting from a large Tesco car park on a Saturday morning!

An article by Richard DalBello in the April issue of *Via Satellite* magazine highlights a VSAT (Very Small Aperture Terminal) problem that's caused by radar detectors. VSAT up/downlinking equipment is used by many industrial and commercial companies. In the UK it's used by Safeway and Sainsbury supermarkets, petrol filling stations, Vauxhall garages and remote Lottery sales sites for data transference, sales training and other purposes. Radar detectors, defined as "passive devices" in the FCC book of rules, are widely used in the US and are available in the UK. When placed close to a car front window they warn a speeding driver when a police radar trap is being approached, so that he can slow down. These units are mass-produced, with a poor specification. A variety of radar speed traps that operate at different frequencies are in use. To deal with this, some car radar detectors use a frequency-sweep oscillator system that rapidly scans across several radar bands. Unfortunately the radar detector oscillator radiates interference that also sweeps over the VSAT satellite bands.

Richard DalBello mentions US VSAT users such as Texaco, Walmart, Exxon and post offices. The sites are similar to those of UK operators. In addition VSATs are used for "tele-medicine, disaster recovery, law enforcement and distance learning". Radar detector interference has also been experienced with non-VSAT applications such as satellite tracking and telemetry/control. Even Sirius Satellite Radio has complained to the FCC.

Radar detector interference is a growing problem. Use of radar detectors is not illegal in 95 per cent of the US, despite some detectors radiating at illegally high levels. Satellite companies are pressing for legislation to suppress the problem. The US Satellite Industry Association wants the FCC to act now.



SATELLITE NOTEBOOK

Reports from Michael Dranfield Christopher Holland and Pete Haylor

Grundig GDS200/2

This digibox was slow to come on. The red and green LEDs would cycle on and off for about ten minutes, after which it would work perfectly. The cause of the fault was not thermal: if the box was switched off then on again straightaway another wait of ten minutes would be required before it came on.

A useful addition to my test gear consists of a 9V PP3 battery in series with a push button switch that's connected to a modem lead. When, with the lead connected, you go to the services menu and select system test, the display should change to "telephone line is busy" on pressing the button. With this digibox it didn't: the modem didn't recognise the telephone line voltage. So the cause of the fault had been found. The most common problem with the modem panel is failure of the DSP1670TV7 microcontroller chip U7. Replacing this 144-pin IC cured the slow boot-up.

If you have any difficulty in obtaining this IC, I can supply it at £35. Please e-mail me at mdranfield@smartone.co.uk **M.D.**

Pace 2500S3

This digibox displayed the message "no satellite signal is being received". The usual cause is a faulty tuner, but not this time. A check showed that the LNB supply voltage was low at 8·74V. The cause was traced to the three surface-mounted resistors right behind D103. They are connected in parallel and are part of the LNB current-sensing network. All three were open-circuit. With three new 1Ω surface-mounted resistors fitted the fault had been cured.

Presumably the LNB supply had been subjected to a short-circuit and the excess-current switch-off circuit had failed to react quickly enough. **M.D.**

Amstrad DRX100

One of the most common problems with this digibox is failure of the tuner. But not on this occasion: the cause of the "no satellite signal" message was loss of the supply to the LNB. I found that the emitter of Q101 (TIP42C) was open-circuit.

This transistor can be unsoldered by simply heating the top side of the print. A replacement can be fitted in the same way. The board does not have to be unscrewed. **M.D.**

Pace 2500B

The picture and sound froze every couple of seconds. The cause of the trouble was traced to the LNB supply, which was pulsing on/off all the time. Removal of the LNB switch-off transistor Q138 cured the fault, but only with the vertical channels. The horizontal channels were still freezing because the 22kHz tone was now being pulsed on/off.

Checks around the LNB excess-current and overvoltage detection circuits failed to reveal anything amiss. The fault was cured by replacing the house-keeping microcontroller chip U600. **M.D.**

An F-connector problem with IF distribution

Mr Smith phoned us recently with the complaint that a lot of channels were missing, including the BBC ones, though ITV, Channel 4 and Channel 5 were OK. The horizontally-polarised signals were obviously missing. It wasn't necessarily a digibox or an LNB problem, as the digibox was connected to an IF distribution system, but none of the other people connected to the system had reported a problem.

When I arrived to check the digibox's input signal I found that there was very poor contact at the coaxial IF cable's F connector. Tightening it up cured the problem, reinstating the BBC and other horizontally-polarised channels. Despite the poor contact there must have been enough 22kHz signal at the magic switch to toggle Mr Smith's line for high- or low-band reception, thus providing Channel 4 reception, as Channel 4 is locally high-band with vertical polarisation. ITV is locally low-band with vertical polarisation.

When no LNB voltage or 22kHz switching signal is present, a magic switch's output normally provides low-band reception of the vertically-polarised channels. Had the F-connector's contact been even worse, Mr Smith would probably have seen just ITV!

With most IF distribution systems the digibox doesn't have to provide current for the LNB. Thus if Mr Smith's digibox had been connected to a dish directly he would probably have received no channels at all, because the voltage drop caused by the poor contact would have been too much for the LNB to be able to provide any useful signals. **C.H.**

Digital channel update

The latest channel additions at 28·2°E are listed in Table 1 – where allocated, the EPG number is shown in brackets after the channel name. Note that the RTE (Irish) TV channels (RTE 1, Network 2, TV3 and TG4) are blocked for UK cards, so the EPG numbers apply with Irish digiboxes only. If these channels are added manually as 'extra channels' with a UK digibox, RTE's Aertel teletext service can be obtained via the TV set's text decoder despite the "Channel Not Available" message being displayed on the screen.

The new Irish radio stations have identical EPG numbers (914/5/6) with both UK and Irish digiboxes. RTE Radio 1 continues to be on ch. 892 at present, still linked by the EPG as lowish-quality mono from transponder 33 (12·344GHz H). It is however available via transponder 43 (10·744GHz H) as high-quality stereo and can be added as an 'extra channel'. Look for '9611' when scanning transponder 43

Photo 1: The Avago channel on test via transponder D5S.

Photo 2: A Philips test card at present being transmitted via transponder 33.

Table 1: Latest digital channel changes

Channel and EPG	*Sat*	*TP*	*Frequency (GHz)/pol*
2FM (914)	2D	43	10·744/H
At the Races (418)	EB	D3S	11·508/H
Avago	EB	D5S	11·546/H
Jazz FM (917)	2B	32	12·324/V
Lyric FM (915)	2D	43	10·744/H
Network 2 (102)	2D	43	10·744/H
R na G (916)	2D	43	10·744/H
RTE 1 (101)	2D	43	10·744/H
TG4 (104)	2D	43	10·744/H
TV3 (103)	2D	43	10·744/H

TP = transponder. 2B = Astra 2B. 2D = Astra 2D. EB = Eurobird

for channels – don't forget that it uses the Astra 2D standard 22,000 symbol rate and 5/6 FEC. The radio stations are all free-to-air and can obtained using any MPEG-2 digital satellite receiver.

Transponder 21 (12·110GHz H), which was switched off after the U Direct closure last year, has been reactivated and is transmitting identical channels to transponder 3 (11·758GHz H). These include Channel 5 and Sky Sports 1/2/3. Despite these transponders being run in parallel transponder 21 seems, at the time of writing, to have taken over (from May 8th) when channels are selected in the EPG.

The Avago channel is currently testing via Eurobird transponder D5S, see Photo 1, with just this caption. It's referred to as "avo" when the transponder is scanned for extra channels. Three identical Philips test cards are being transmitted via transponder 33 (12·344GHz H), with channel labelling "spge", "vetv" and "astv". See Photo 2. **C.H.**

Grundig digiboxes

Grundig digiboxes are appearing in the workshop more frequently. The usual action required is to replace the capacitors in the power supply. Up to now I have come across three different power supply layouts. As no circuit or layout diagrams are available, I have drawn the capacitor layout in the different versions, showing their values, voltage ratings and polarity. Capacitor kits are being organised and will be made available as soon as possible. Figs.1-3 show the layouts. **P.H.**

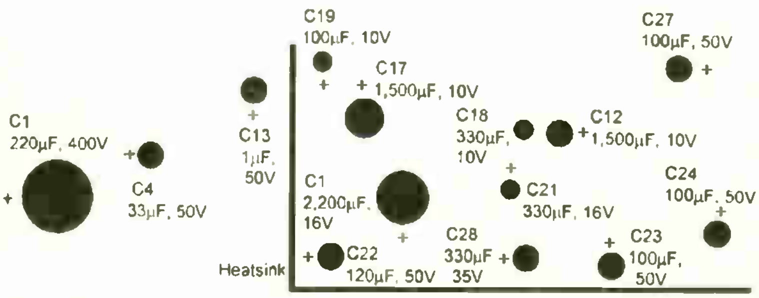


Fig. 1: Electrolytic capacitor layout in the Samsung power supply used in Grundig digibox Models GDS200 and GDS300, rev. 03.

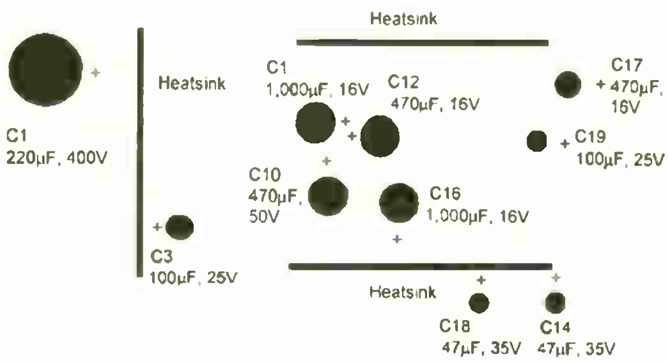


Fig. 2: Electrolytic capacitor layout in the Grundig digibox power supply type DSO-0385, rev. C.

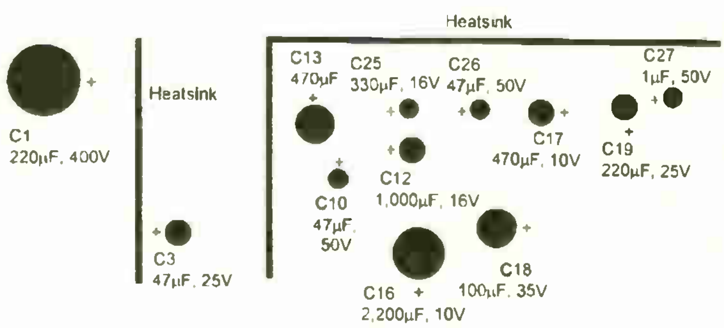


Fig. 3: Electrolytic capacitor layout in the Grundig digibox power supplies type DSO-0375 rev. A and DSO-0385 rev. F. C13 is rated at 25V.

MONITORS

Fault reports from Gerry Mumford and Ian Field

We welcome fault reports from readers – payment for each fault is made after publication.

Reports can be sent by post to:

**Television, Fault Reports,
Anne Boleyn House,
9-13 Ewell Road,
Cheam,
Surrey SM3 8BZ**

**or e-mailed to:
tessa2@btinternet.com**

Digital PCXCV-SA

This monitor was dead. Checks showed that there was no switching action in the power supply, because the smaller electrolytic capacitors on the primary side of the circuit were all low in value. Replacement of C609 (10μF, 50V), C616 (47μF, 100V) and C618 (47μF, 25V) restored normal operation. **G.M.**

Acer JD156H

There were the usual dry-joints around the line output transformer in this dead monitor, but this time the resulting damage was extensive. The 2SC2655 line output transistor Q406 and the FS10KM B+ regulator FET Q810 were both short-circuit. As a result the B+ regulator's drive circuit had blown up violently, destroying the NE555 controller chip IC802 and the associated resistors R432 (10Ω, 2W), R852 (10Ω, 0·5W), R853 and R855 (both 1kΩ, 0·5W) and R854 (470Ω, 0·5W). The B+ regulator coil L805 (2371131800) was cooked with shorted turns and the EW modulator diode D421 (FSF05A80) was leaky. Replacing all these items proved to be worthwhile: the resulting display was perfect. **G.M.**

Dell D828L

Checks on this dead monitor soon revealed that there was no start-up supply for the KA3882 chopper power supply control chip IC601, because it had an internal short-circuit. This device is similar in operational, and therefore diagnostic, terms to the far more common UC3842. But it's totally incompatible. **G.M.**

ICL/Fujitsu 840000135/ 4PTA6AB040499-3JC

This rather elegant black-cased 14in. monitor had been passed on from an 'end-user' as a subcontract repair. The complaint was "no red", but initial inspection revealed that the 2·5AT mains input fuse had a metal-sprayed glass tube. This indicated that a pretty catastrophic failure had occurred. There was no need to check the degaussing posistor or the mains filter components, as the chopper MOSFET Q101 had been destroyed. I noticed that it was type 2SK2141. Normally I replace like for like, and I had several of these MOSFETs in stock. But I have never before found this device used as a chopper transistor. It's normally used in B+ PWM regulator circuits and for line output stage tuning capacitor switching, where the current rating is high but the Vds rating is seldom higher than 250V. I doubted whether the device had any right to be where it was!

At the time I had no data on this NEC device. So I opted for a replacement that I could verify from published data was up to the job. I decided to fit a 2SK1118. It was possible that the original device had failed because it had been mounted on a roughly-finished extruded heatsink with no visible evidence that any heatsink compound had been used! Because the series-connected current-sensing resistor R108 (0·22Ω, 3W) is a thick wire-wound type, it hadn't ruptured. This would have provided considerable protection for the UC3842 control chip. The 18V gate-protection zener diode ZD101 had gone open-circuit, along with the MOSFET, but the gate-coupling resistor R105 (10Ω) had survived.

With the damaged components removed, it was possible to power the UC3842 control chip. The supply at pin 7 was pulsing, which indicated that the chip was trying to start, but the lack of any life at pin 6 proved that it had followed ZD101 into oblivion.

When replacing MOSFET gate protection zener diodes, it's worth noting that an increasing number of equipment designers nowadays use a 20V Schottky-barrier diode for this purpose. The reverse leakage of a Schottky-barrier diode provides a softer clamp voltage, with the disadvantage of slightly increased junction capacitance. Two very important advantages however are that when a Schottky-barrier diode fails it goes short-circuit more reliably, and is thus more likely to protect the control chip; and that, being a majority-carrier device, when it's driven into forward conduction by voltages generated in parasitic inductances the diode does not suffer from minority-carrier recovery delays.

Once replacement components had been fitted to repair the power supply the monitor still failed to start up! The fault was of my own making, when I had carried out some resoldering, but a description of the symptoms may be of interest. The monitor failed to start because there was no drive waveform at the base of the line driver transistor. Curiously, the monitor sprang to life when the PC was rebooted, only to shut down a few seconds later. The same effect occurred when the signal lead was unplugged then reconnected. The cause of the trouble was eventually traced to a minute solder whisker that bridged two of Q308's solder pads.

With the whisker removed, the monitor powered up. But there was no red, as mentioned in the original complaint. This was caused by dry-joints at the Class A transistors on the CRT base PCB. Although only the red output stage showed up as being faulty, all three output stages needed their output transistor connections cleaning and resoldering. **I.F.**

Ilssan ISP115M ATX PC power supply

Much time was wasted checking the primary side of this PC power supply because the customer said it had been damaged by a "voltage surge". The auxiliary chopper power supply was running but the main KA1M0880 chopper chip had 320V at its output terminal and wasn't doing anything with it. As component checks on the primary side had failed to reveal a culprit, attention was turned to the rectifiers on the secondary side. These were also blameless.

The 5V and 3·3V rails are monitored by a TL431-type programmable zener device, so it wasn't safe to attempt starting the power supply with any of the secondary feeds disconnected to see if the transformer was OK or check for shorts downstream. An alternative was to drive the transformer by 'patching' it across the primary winding in another switch-mode power supply. The chopper transformer was fine. But it's followed by a 'ringing-choke' transformer which wasn't. With any two of the ringing choke's windings connected, the driving power supply went into 'trip mode'.

Closer examination of the 'transformer-choke' revealed that the epoxy coating on the toroidal ferrite core had completely ashed. The enamel on the windings was still present (mostly!), but flaked off as soon as it was touched. As the customer had indicated that the computer was needed urgently and desperately, I attempted to rewind the choke.

It has four windings in all, three of which are fed via rectifiers from the secondary side of the chopper transformer. These are 12V (twelve turns 1mm in diameter), 5V (eight turns 1·2mm in diameter) and 3·3V (six turns 1mm in diameter). The fourth winding is connected to chassis at one end and feeds the –12V output: it has twenty turns of 0·66mm diameter. My first attempt at rewinding failed, because the charred ferrite toroid now had sharp edges that damaged the enamel. A search in the scrap box yielded a larger toroidal choke that had served a similar purpose in a somewhat bigger power supply. It had three identical windings of 1mm diameter, but too many turns. It was easy enough to unwind some of the turns to leave windings of twelve, twenty and six turns. This left room for eight turns of thicker wire for the 5V winding. The nearest I had to 1·2mm diameter was 1·5mm, but the larger toroid meant that there was ample space.

Initially the rebuilt power supply produced very low voltages on all rails – until I realised that the 3·3V output is also monitored by the TL431 device and that I'd not provided a dummy load for this output. Once this oversight had been corrected the 3·3V output was too high at about 3·8V while the 5V output was low at 4·8V (only just within specification). Taking two turns off the 3·3V choke winding produced an output of 3·29V, with the 5V output at 5·1V, which is exactly the value most commercial precision regulators are set to deliver.

During a bench test with the power supply uncased (no cooling fan!) and a full-current dummy load the replacement 'transformer-choke' didn't even get warm. I noticed however that there are three ventilation slots on the wall of the box opposite the fan. When the PCB is assembled in the box, these slots line up exactly with (and are obscured by) the power chip. Its heatsink is just about flat against the inside of the case, with two groups of three slots at either side of the chip's mounting position. As these do not line up with the slots in the case, I wondered whether the designer had intended sufficient air space between the heatsink and the inside of the case. But examination of the dust marks showed no evidence of air flow through the vents, and the edge of the fan aperture was heavily contaminated with dust and airborne pollutants, indicating that there was no air flow whatsoever except in the immediate vicinity of the fan's blades! Time to go looking for my set of Q-max punches! **I.F.**

ASTVision RM07F1B

The report said dead with the green LED very dim. The power supply appeared to be working, but nothing else was happening because there was no line drive and the reset pin of the NE555 B+ PWM control chip was being held low by a signal from the front-panel microcontroller subpanel, which fits into a 30-pin SIMM socket. As no heater glow was visible in the neck of the CRT I checked the heater voltage and found that it was only 1·8V. I then realised that the front-panel on/off switch is only a tact switch – the real on/off switch is at the back, next to the mains input. The monitor was stuck in standby.

R47 (15kΩ, 3W) feeds a bias current to a group of transistors that form part of the standby control circuit. When I checked it the reading I obtained was almost 2MΩ. Q8 is part of the standby control circuit: it switches an additional resistor (R50) in parallel with the resistor (R49) between the gate of the TL431 programmable regulator and chassis to go from standby to normal operation.

Fault-finding is made difficult by the fact that there is no way of telling whether the front-panel microcontroller chip is in the standby or operate condition. Shorting Q8's collector to its emitter will run the power supply at the 'operate' voltage and, if the front-panel microcontroller chip is set to operate, the monitor will start up and continue to run. But if R47 is open-circuit, pressing the front power button will switch the monitor to standby and none of the voltage readings will make sense! Pressing the button again will fail to switch the monitor to operate.

I suggest shorting Q8's collector to its emitter to determine the standby/operate status and then, if the front-panel microcontroller is set to standby, pressing the front button once to set it to 'operate' before removing power! If shorting Q8 brings the monitor to life, it's very likely that R47 is open-circuit and no further voltage readings are necessary.

Although a blanket resoldering had failed to alter the symptoms, the exercise was worthwhile to ensure future reliability. Several areas of the PCB are occupied by groups of power resistors. In most of these areas there were signs of the PCB beginning to delaminate in one or two places where the concentration of heat was excessive. In such areas it's best to remove the solder from the affected joints and clean off any oxide before applying fresh solder. If the lacquer is cleaned off the discoloured track, using a fibre pen, the exposed copper will quickly discolour to a dark brown/ black (copper oxide): this dull surface radiates heat much more efficiently than the original finish. It's a trick of the trade that is worth remembering, as it can sometimes solve the problem of overheating without altering the original design. **I.F.**

Dell D1428E-LS

This monitor's tube (Samsung type M34KUK35X02-VK) was beyond reviving, but the chassis was in good condition. So I put it aside for attention later. Subsequently I obtained a CRT (Samsung type M34KUN35X92J-K) from a scarp Elonex MN069. It was not marvellous, but was revivable to produce acceptable results. The coil inductances were correct, so no alteration was needed to correct the scan size. But the plug was a different type. The solution to this was to cut the plug from the old CRT and make an adaptor with a PCB connector salvaged from an A8T chassis. Initially I soldered all four wires in the same physical order. This interposed the green and yellow wires, producing an upside-down display. So the colour codes are important, not the physical position!

The replacement CRT has an additional loop of insulated wire arranged around the scan yoke. It plugs in separately. As this Dell (Samsung) chassis doesn't have the circuit to drive the extra loop it was simply left unconnected.

Several of these monitors have come in recently with poor emission tubes. Checks have shown that the heater voltage was low at about 5·9V. Replacing the 6·3V supply electrolytics hasn't improve matters, and the power supply preset can't be advanced without raising the HT voltage above specification (150V). The cure has been to replace the 6·3V rectifier with a 3A Schottky diode and add non-electrolytic decoupling capacitors in parallel with the electrolytics in the 6·3V supply. **I.F.** ■

VCR CLINIC

Reports from Eugene Trundle Ronnie Boag John Coombes Mike Leach David I. Scott Dave Gough and Nick Beer

We welcome fault reports from readers – payment for each fault is made after publication. See page 552 for details of where and how to send reports.

Panasonic NVHD660

There was a very elusive fault with this machine: it took two visits to the workshop to find the cure. Very intermittently the cassette cradle would pull back in and jam after eject, then the machine would switch off. A new mode switch was tried, but this didn't help. I eventually discovered that the cassette-centre LED was dry-jointed to the PCB. The tape-end photosensor diodes were also resoldered. **E.T.**

Samsung SV23B

This fault was cured without us ever seeing or hearing the symptoms! The complaint was about an intermittent crackle on E-E and recorded sound, apparently from a stray digital transmission. Samsung has available an improved UHF tuner that's more resistant to digital co-channel interference. Fitting one cleared the problem. **E.T.**

Panasonic G deck

Machines that are fitted with this deck are now quite old, but many of them are still in use. We increasingly find that they turn up with intermittent faults like no play, tape chewing etc. because pole P5 is stiff on its shaft. Remove and lubricate it, then carefully reset its height. **E.T.**

Toshiba V856B

The fault was no playback sound or picture, E-E operation being OK. The cure was to replace the LA7447BM chip IV001 – a scope check showed that there was no video output at pin 11. **R.B.**

Sanyo VHR899

This machine was brought in because it was dead. The power supply worked normally once D5012 on the primary side had been replaced, but I then found that the machine was slow to accept tapes. A new loading motor cured that. **R.B.**

Toshiba V710

There was intermittent loss of the E-E sound. The cause was traced to a dry-joint at crystal XT4N01 on the sub-board. **R.B.**

JVC HRJ270

Intermittent cutting out and a tape dragging noise were the complaints. The problem was cured by replacing the idler arm assembly. **R.B.**

JVC HRJ205

The initial complaint had been about a jammed tape. But when I tried the unit the display was odd. The customer said there had been a slight bang when it had gone off. A check in the power supply revealed that circuit protector CP1 (N20) had blown in half, because C36 (470μF) was short-circuit. C33 (470μF) should also be checked, for leakage. **J.C.**

Sony SLV715

This machine had been brought in with the complaint no results. A look at the power supply revealed that several of the electrolytic capacitors had split and leaked their contents over the PCB. There's a Service Kit to deal with this problem, part no. A-6759-574-A, with twelve electrolytic capacitors. Clean both sides of the PCB before fitting the replacements. **J.C.**

LG K1-20U72X

There was no playback sound with this combi unit. The E-E and TV sound were OK. The cause of the trouble was IC401 (BA7797) which had to be checked by replacement. **J.C.**

Philips VR6490

The complaint with this machine was no results. I checked C638 (1μF) first as it causes many problems when open-circuit. The items to check for this fault if C638 is OK are R534 (3·3Ω) and the start-up resistor R102 (330kΩ), both of which can go open-circuit. **J.C.**

NEC N895

Fuse F6 blew when play was selected. I found that C3 (33μF, 6·3V) on the video board O3 was short-circuit. It smooths the 5V supply. **J.C.**

Akai VSF33

The cassette jammed on insertion or eject. The usual cause is a faulty cassette lifting unit, but not this time. The retainer ring that holds the pinch roller in place was incorrectly positioned. **J.C.**

Sony SLV-AV100UX

This monster of a machine produced no video output from either the RF or the scart socket. Video from the tuner reached the switching/scart PCB I056, but the ±5V supplies that should have been present here were missing. I spent over half an hour chasing voltages and supplies to and from various different panels before I realised that the source of these supplies is board T012 on the secondary side of the mains transformer. It had been staring me in the face all along! There are two 0·47Ω safety resistors here, and both were open-circuit. Check them first! **M.L.**

GoldStar RC7051

The symptom with this machine was very poor E-E with playback OK. For this fault check C707 (4·7μF, 50V) on the top panel. It's almost at the centre of the board. **M.L.**

C+5V supply at pin 39 was low – it was only 2·1V. The source of this supply is Q607 on the main PCB. I found that this transistor's collector connection hadn't been soldered properly and was high-resistance. A touch with the soldering iron put matters right. **M.L.**

Akai VSA650EK

"Sort of working" was the unhelpful though fairly typical report that accompanied this impressive-looking VCR. On initial inspection it seemed to me that the machine was completely dead. But I was wrong. Although there was no display, all the deck functions worked correctly. Voltage checks revealed that the 20V supply was very low, suggesting electrolytic capacitor trouble. As there were clear signs of leakage, I decided to play safe and replace all those in the power supply. This restored the display and the 20V supply, but there was still work to be done before the machine could be returned to the customer.

Sluggish rewind/fast-forward operation and a tendency to snag tapes during eject called for a belt change. **D.I.S.**

Panasonic NVG40

When the owner of this machine had disconnected the RF link cable he'd pulled off the output socket as well. The RF booster had to be removed to reconnect the socket, a straightforward though tedious task. Replacement of the worn pinch roller and back-tension band, followed by a clean up of the mechanics and readjustment, restored normal operation.

The machines in this series have long been favourites of mine, but it's not the first time I've had to refit a broken-off RF output socket. This does seem to be a weakness of the design. **D.I.S.**

Sony SLV-E730UX

I'd not come across one of these machines before. It was inoperative, though the mains fuse on the power board was intact. The fault was likely to be on the primary side of the power supply, where I found that C153 (47μF) and, in particular, C154 (1μF) had dried up.
Replacements restored correct operation, but the job was complicated by difficult access to the components. In addition to removing the power supply board from the VCR, the screening can and the power module have to be unsoldered from the mother board. As testing can be carried out only when this lot has been reassembled, I was relieved to find that everything then worked correctly. **D.I.S.**

Aiwa VSG240EK

This machine came in dead with no display. Cold checks in the power supply soon revealed the cause of the fault: R204 (270kΩ) was open-circuit. **D.G.**

Sony CCDF455E

The problem with this elderly camcorder was vertical bars over the viewfinder image and a graduated brightness change from left to right. Otherwise it worked well. The cause of the viewfinder fault was a couple of surface-mounted electrolytic capacitors, C904 and C915 (both 1μF, 50V). Unfortunately most of the capacitors of this type in the rest of the unit were starting to leak, but at least the two replacements fitted cured the viewfinder fault. **N.B.** ■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AUDIO FAULTS

Reports from Geoff Darby and Ivan Levy, LCGI

We welcome fault reports from readers – payment for each fault is made after publiation. See page 552 for details of where and how to send reports.

Sony HCD-MD5

If you get one of these units that won't accept a MiniDisc, the cause will almost certainly be the loading motor drive chip IC431, part no. 1-242-013-98. It fails at its control side, responding only to the unload command. You will also require modification kit A-4672-837-A, and technical bulletin no. AU02000 to tell you how to fit it. The kit is basically a small PCB with a regulator IC and a couple of support parts on it. This reduces and regulates the supply to IC431, presumably to reduce the possibility of a repeat failure. **G.D.**

Technics SA-EH60 tuner/amplifier

When this unit was switched to any Dolby Surround mode by using the matching SH-EH600 sound processor unit the sound level from the main and centre channels became very low, also distorted. The simple but horrifically expensive cure was to replace the Dolby Pro-Logic processor chip IC801. **G.D.**

Kenwood RXD-NV301

The CD player fitted to this equipment is of the three-disc carousel type. This particular one had a disc in the works: I don't know how this had occurred, as I can't see any reason why a disc should have jumped off the carousel and lodged itself at the side of the disc clamp. The point of this story however is that a considerable amount of dismantling has to be carried out to get to the CD player, including the disconnection of many plugs and two earthing wires, one either side at the front, which are secured under screws that hold the CD player chassis to the upper metalwork. They look just like the standard 'belt-and-braces' earthing bonds that you often find between areas of units to keep them hum-free. With this equipment however you get no audio, and a relay pulses, if you don't reconnect the one on the right before retesting prior to full assembly. If the speakers are connected, they produce a good bang with each pulse. **G.D.**

Sony TC-EX66/660

If you get one of these with a weak or poor display, possibly with the heater wires glowing anywhere between just visible and a torch bulb, replace C161 and C162 (both 100μF, 100V) with the upgraded type, part no. 1-111-167-11. They are located at the rear left corner.

You will almost certainly find that the display itself, part no. 1-517-317-21, has been damaged and will need to be replaced. Experience has shown that it is advisable to replace C163 and C164 (both 470μF, 16V) at the same time. These are series-inverse connected, forming a crude bipolar electrolytic capacitor, and are also in the display's heater circuit. They go open-circuit/high-ESR, and can be the cause of a glowing heater and early failure of the display tube. **G.D.**

Sony HCD-MD313

This was a curious fault. There was no VFD activity for a start, and there was a disc that wouldn't eject in the MiniDisc section. At power up the laser would hunt around but never seemed to get as far as reading the TOC. This couldn't be confirmed however because of the blank display. I decided that the first thing to concentrate on was the blank display, as the cause was likely to be straightforward and, once it had been fixed, I would be able to see what was going on with the MiniDisc section.

A few voltage checks revealed that the VFD's negative supply was missing at pin 12 of connector CN901 to the front panel. This supply is derived from the raw negative supply via regulator transistor Q530. There was voltage at the collector of this transistor but none at its emitter. Cold checks on the transistor and its associated components revealed that the 33V zener diode D534 was short-circuit and its 470Ω feed resistor R531 open-circuit.

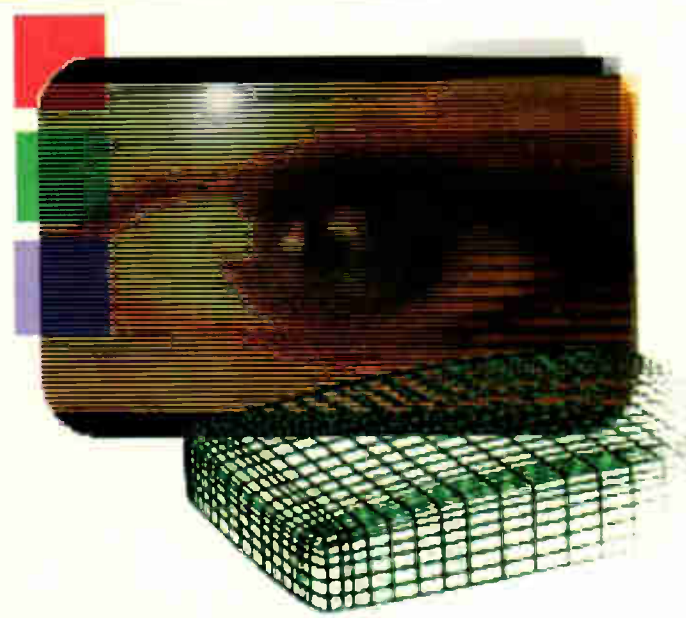
Replacement of these two components restored the –VG supply and the display. But here's the curious bit. The MiniDisc now ejected and, when it was reinserted, the TOC was read and the disc was played. In fact the whole unit now worked correctly. The reason for this is strange, as the –VG supply is used only by the display circuitry and I can see no reason why its absence should have upset the MiniDisc operation. Any ideas? **G.D.**

Pioneer F202L

This radio was brought in because there was no tuning. Tests showed that the LM7001 tuning PLL chip IC101 wasn't producing an output, though the voltages and signal conditions around it were correct. A replacement chip cured the problem. **I.L.**

Otari MTR10 recorder

This professional half-inch tape reel-to-reel recorder came from a recording studio. The complaint was that the ready LED on the selector reproduce unit was oscillating on and off. Some checks showed that there were 100Hz spikes on the +5V rail. The cause was C4 and C5 in the power supply – they were open-circuit. **I.L.** ■



TV FAULT FINDING

Reports from
Michael Dranfield
Philip Salkeld
Dave Husband
Michael Maurice
Nick Beer
John Wragg
Martyn S. Davis
Graham Richards
and
Robin Beaumont

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Schneider STV2802T

This set was brought in because it was tripping. A check on the S2055N line output transistor showed that it was leaky. As no reason for its failure was apparent, I fitted a replacement. At switch on the line output transformer arced to chassis and the new transistor blew. A replacement transformer (HR8320) is available from SEME, but differs mechanically. You have to do the following. Break off the three plastic fixing lugs, remove the heatsink assembly for the line output transistor and the field output chip, and file out a longer hole above the focus control so that adjustment can be made.

When refitting the heatsink assembly, make sure that you don't lose the plastic fasteners and the insulating strip. This is most important, as the two heatsinks are isolated electrically and must remain so. **M.D.**

Sharp DV5131H (S3B chassis)

For ragged verticals, worse when the set is cold, replace C613 (220µF, 16V) even if an in-circuit ESR test suggests that it is OK. It smoothes the supply to the line driver stage. **M.D.**

Mitsubishi CT1535TX (Euro 7 chassis)

For intermittent failure of the line output transistor, replace the STR54041 chopper chip IC901 in the power supply **M.D.**

Bush 1495N

If the set is dead, check R806 (22kΩ) which is connected to the optocoupler IC801. In this set it was open-circuit. **M.D.**

Mitsubishi C14M7B (Daewoo chassis)

This colour portable had a rainbow effect on the screen. I found that a hole had blown open in the field output chip I1301. When a replacement had been fitted it started to get red hot. The cause was loss of the differential drive from the TDA8374 jungle chip, at pins 46 and 47. A new TDA8374 restored normal operation. The replacement field output chip that had become so hot hadn't, fortunately, been damaged. **M.D.**

Bush 2571NTX

There was no blue content in the picture. I decided not to mess about and replaced the TDA6108JF chip IC901 on the tube base panel. This restored a good picture. **P.S.**

Toshiba 14T01B

This set produced a negative picture and there was tuning drift. These multi-system portables have a habit of going to the wrong system. The cure is to call up the service menu, scan down until you come to system and alter it to CI. **P.S.**

Sony KV28FX20U (BE3E chassis)

This widescreen set was stuck in standby. I noticed that a buzzing noise came from the line output transformer T803 and decided to order a replacement (part no. 145330831). Once it had been fitted the set worked normally. **P.S.**

Toshiba 28WD98B

There was a strange problem with this set: the brightness level was changing. I phoned Toshiba Technical for help and was told to go into the service menu and change S (Service) to D (Design). You need to phone Toshiba for the relevant instructions, which were faxed to me. They worked a treat. **P.S.**

Daewoo GB2898ST

This set was dead apart from a ticking noise. The line output transistor Q401 was short-circuit and there was arcing from the line output transformer. When these two items had been replaced I discovered that there was field collapse. The TDA8351 field output chip had a crack in it. All was well once a replacement had been fitted. I obtained the replacements from a scrap chassis, which certainly kept the cost down. It's rare that a scrap chassis comes in handy. **P.S.**

Sharp 56FW-53H (DA100 chassis)
This set was stuck in standby with the power supply closed down. To cut a long story short, I discovered that the avalanche diode D735, part no. RH-EX0875BMZZ, was short-circuit. It's on the print side of the PCB, across C720. I was advised by Sharp Technical to replace optocoupler IC705, part no. RH-FX0110BMZZ, as well. This restored normal operation. Since then I've had two more sets with the same fault, and have also noticed that Chas Hyde do a kit. So it must be a common fault. **P.S.**

Sharp 66DS-03H
Stuck in standby is becoming quite a common fault with these sets. The S2000AFI line output transistor goes short-circuit because of a dry-joint at the storage capacitor C608. **P.S.**

Bush 2868NTX (11AK19 chassis)
After replacing a faulty line output transformer I was greeted, at switch on, with severe geometry errors. The service mode could be entered, nut none of the adjustments would alter the display. Suspecting the 24C08 EEPROM, I tried at least two from my little plastic drawers without success. Then, in desperation, I replaced the microcontroller chip, also without success. What I should have done is to look in the manual, where it tells you that the EEPROM contains a "4-bit unique identification code". The fault was cured by ordering the correct IC (ALB488) from Chas Hyde. **D.H.**

Mitsubishi CT25M3TX (Euro 14 chassis)
This set would go off after 15-20 minutes – the fault had apparently developed after a lightning strike. When I checked it in the workshop I found that the HT was very high at 180V instead of 145V. I suspected a fault in the feedback regulation circuit and, when I found that the error detector/amplifier transistor Q953 was a JC501, I jumped in and replaced it. The HT was then correct. A BC639 proved to be a suitable replacement for the JC501, which is a rather unreliable transistor. **M.M.**

Amstrad CTV3128N
A common fault with these sets is that they are dead at switch on. The cause is R103 (47kΩ), which is part of the start-up arrangement. It goes open-circuit. **M.M.**

Panasonic TX25A3 (Euro-1 chassis)
This set was dead and there appeared to be a dead short across the line output transistor. In fact D536, the upper EW modulator diode, had gone short-circuit, placing the full HT across C593 (4·7μF, 63V) in the EW drive circuit, so this had also gone short-circuit. Replacing these two components restored normal operation. **M.M.**

JVC AV28S1EK (MX II chassis)
This set would revert to standby. Checks showed that the cause of the problem was field collapse, but a previous engineer had replaced the field output chip. Further investigation showed that there was no 12V supply to the jungle chip IC201 because of dry-joints at the line output transformer. **M.M.**

Sanyo CBP2865 (E3-A28 chassis)
After about ten minutes the picture would start to roll horizontally, the field scanning would decrease and the picture would go white. When I measured the voltage across the 12V line in this condition I found it low at only 7V. The cause was the SI3122P 12V regulator IC780 in the power supply. It looks like a BU508A and is rated at 3A. The correct device must be used in this position. Once a replacement had been fitted the set worked normally. **M.M.**

De Graaf D59HZ5 (Nokia N chassis)
This set was dead with the mains fuse intact. Checks showed that there was a 12V supply at the TDA4605 chopper control chip but nothing else. Once I had replaced this IC and the 2SK1118 MOSFET chopper transistor the set worked normally. I checked the original MOSFET and found that it had a 20Ω leak between its gate and source connections. **M.M.**

Grundig ST70-660/8FT (CUC5360/61 chassis)
There was intermittent loss of colour. This is usually caused by either a lazy crystal or an intermittent trimmer capacitor. Replacing the 8·8MHz crystal Q5073 and the associated 4·5-20pF trimmer C5073 cured the fault. As I was unable to obtain part numbers for these items, I used a Sony crystal and a suitable trimmer obtained from RS Components. **M.M.**

Panasonic TC14S3R (Z7 chassis)
Despite having sold hundreds of these sets we have had little trouble with them. This one was dead however. Unusually for such a modern set, it has a separate, fairly large standby supply transformer (T1201). It was the cause of the fault, with an open-circuit primary winding. **N.B.**

B&O MX7000
This monster 28in. set with active speakers was stuck in standby, which usually means that the power-fail protection circuit is in operation. There is more than one way to find out what's the cause of this – there could be a short-circuit or a heavy load. Having found nothing obvious, e.g. a shorted line output transistor or dry-joints, I shorted the service link to see if the set would then start. It did, but with no sound.

This led me to the rear AV switching PCB, where I found that R118 was open-circuit because regulator transistor Tr2 and C111 (a 100nF surface-mounted ceramic capacitor) were short-circuit. The capacitor is across Tr2's output, and had made it overheat and fail. **N.B.**

Panasonic TX25MD1 (Euro-2 chassis)
This set appeared to be dead except for standby LED illumination that lasted for approximately four seconds after switch on. But the power supply was up and running, with HT present. There was no line drive however, because the 27V supply to the line driver stage was missing. I found that the Wickman fuse F851 in the supply was open-circuit, and a cold check revealed a short-circuit to chassis from the cathode of the rectifier (D852). This short seemed to be in the line driver stage rather than the field output stage, which shares the 27V supply, but none of the obvious items in the line driver stage was short-circuit. In addition the short remained when the line driver transistor Q501 was removed. The only remaining possibility was an interwinding short in the driver transformer T501. This proved to be the case, and normal operation was restored once T501 had been replaced. **N.B.**

B&O MX3000
There was no sync with text or on-screen displays – the display just rolled through. I traced the cause to dry-joints at the connections to the little sub-board that's soldered to the text board via wire links. **N.B.**

Toshiba 2805DBT

The symptoms with this set were reduced height, distorted field linearity and lines at the top of the picture. The cure was to replace the ramp capacitor C372 (2·2μF, 50V), which is connected between pins 5 and 15 of the TA8739P field generator/ EW correction chip Q371. It's on the print side of the panel, beneath Q371. Also replace C317 (2·2μF, 50V) in the field linearity feedback network. Use replacements rated at 105°C. I've had this fault on several occasions. **J.W.**

Schneider STV1401

The symptom with this colour portable was field collapse, with the line oscillating up and down at one second intervals in the bottom half of the screen. I found that R718 (4·7Ω, 1W) was open-circuit. It's next to C707, near the field output chip. **J.W.**

Ferguson T59N (TX92 chassis)

This four-year old set was 'dead' with the standby LED pulsing slowly. It seems to be quite common with these sets for the line output transformer to fail in such a way that the 10kΩ surface-mounted resistor RL08, which is on the underside of the board, burns out. A new LOPT, line output transistor and 10kΩ resistor brought the set back to life. RL08 is actually in the beam-limiting network, at the earthy end of the transformer's EHT section. I recommend a general resoldering of all the dry-joints around the line output stage. Part numbers are transformer 104 52520, transistor 104 01110. **M.S.D.**

Hitachi C2874TN

The LA7838 field output chip IC601 in this set had failed. The cause was the flyback boost capacitor C603 (100μF, 50V) which was faulty. **M.S.D.**

ITT ST35767 (Digi 3 110° chassis)

For low or intermittent sound, though sound via the scart socket is OK, suspect the U828B sound demodulator chip. **G.R.**

Toshiba 210T6B

This set had suffered as a result of a lightning strike. Once the STR54041 chopper chip IC801 and the TLP631GB optocoupler DR10 had been replaced, and a new mains fuse had been fitted, it worked. But there was an obscure side-to-side picture wobble. Scope checks revealed that the power supply was radiating something it shouldn't have been. The cause was transistor Q806 (2SA1020Y), a replacement curing the fault. **G.R.**

Panasonic TXG29

The picture would disappear after a few minutes, leaving a blank raster. Finding the cause of the trouble was a marathon job, so I'll cut to the chase! The lower porch section of the sandcastle pulse was slightly misshaped, the distortion being sufficient to trigger video circuit blanking. The TDA8350Q field output chip was the cause, producing incorrect field scan feedback pulses, though the field scanning was in no way affected. A check on the sandcastle pulses after replacing the IC showed that they were now perfect. **G.R.**

Sanyo CBP2180 (A5 chassis)

If the problem is field collapse and the 24V supply is missing at pin 6 of the LA7832 field output chip IC451, check for a dry-joint at L451. It's near the line output transformer. **G.R.**

Philips 32PW6332/05 (MD1.2 chassis)

This set would intermittently trip to standby, but only when the picture format was 4:3, never when it was widescreen.

There are several protection circuits in this chassis. Zener diode D6482 (56V) monitors the voltage across the EW driver transistor. This voltage varies with the picture format, being greatest (39V) with a 4:3 display. Because the zener diode was slightly leaky, it would shut the set down in this mode. A replacement cured the problem.

The voltage across the EW driver transistor is about 31V in the 14:9 mode, 21V in the 16:9 mode and only 14V in 'super zoom'. The diode's leakage was insufficient to cause a problem in these modes. **R.B.**

B&O LX2502

This set had a faulty line output transformer but used the rather less common grey type (as opposed to black). No spare part was available, so B&O offered to supply an exchange power/timebase board. The estimate was accepted – on reflection it was cheap compared with a new B&O receiver! **R.B.**

Panasonic TX32PK2 (Euro-4 chassis)

We've had several of these sets with picture problems – going dark and out of focus. Usually the cause is low first anode voltage, because one of the yellow ceramic disc capacitors on the tube base panel is leaky. Diagnosis is helped by putting the set into the service mode for A1/G2 adjustment. As a very slight leak will affect the A1 supply, it's not normally possible to measure the leakage. Replacement is the best way of confirming the diagnosis.

These sets can also suffer from spurious failure of the 3·15A mains fuse. Panasonic has approved an uprating to 5A which seems to solve the problem. **R.B.**

Philips L6.3 chassis

The 5V supply to the microcontroller chip was varying because the regulator transistor Tr7505 was faulty. Use only a BC337-40 in this position. Fuse F1502 can cause a similar fault. Be careful, because the fuse may go only slightly high-resistance and a casual meter check may suggest that it's OK.

All sets fitted with this chassis are prone to these problems. Symptoms include tripping when placed in standby and stuck in standby with the LED on the front panel at half brightness. The chassis is also used in some **Goodmans** sets, e.g. Model 256NS. **R.B.**

JVC AV29SX1EK (JA chassis)

There was a normal picture but no sound. I traced the signal around the Dolby processor board and eventually found that the 5V supply to the board was low. A new 7805 regulator (IC952) solved the problem.

The same fault in another of these sets had a totally different cause. This time the signal was getting lost in the source selector switching. But the cause of the trouble lay elsewhere: a new memory chip was required. As this item is pre-programmed for this model it had to be ordered from the manufacturer. **R.B.**

Philips 24PW6005/05 (A10E chassis)

This set's brightness and contrast varied at random. By checking the tube's first anode voltage with a high-impedance 100:1 scope probe I was able to prove that variation here was the cause of the problem. A new line output transformer was required. **R.B.**

Samsung CI14F1Z

There were no signals because the tuner's VT pin was stuck at 33V. I traced the circuit back through the PWM drive system and found that the relevant pin of the microcontroller chip was being held at chassis potential by a leaky 150pF capacitor. Replacement of this item cured the fault **R.B.** ■

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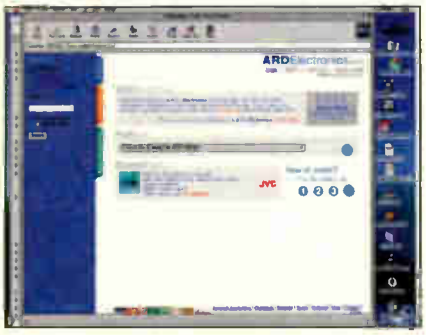

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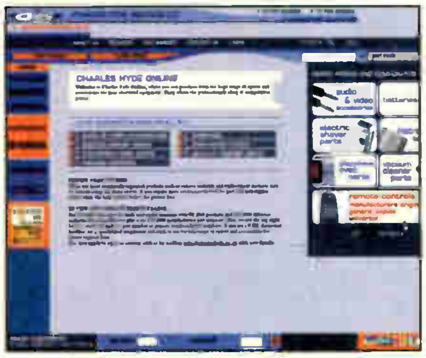

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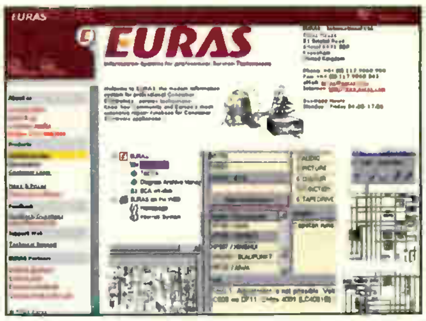

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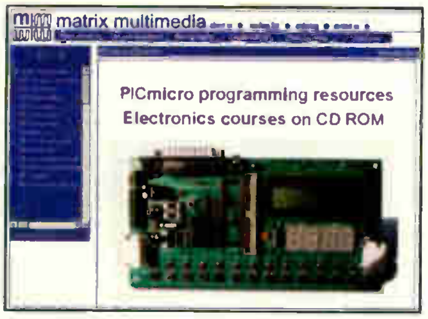

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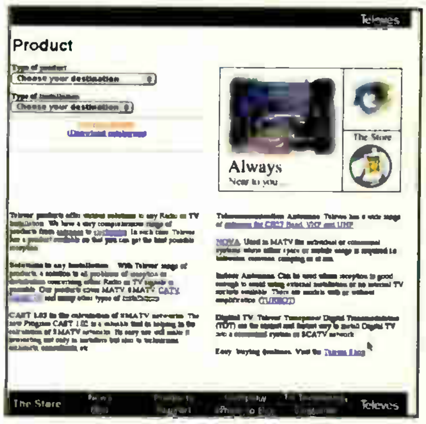

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Answer to Test Case 475

– page 530 –

Poor RT! He's a very good technician, but the combination of a 'bad day' and lack of knowledge of the TV chassis concerned led to a protracted diagnosis. He got there in the end however, and the set was returned the following morning. It hasn't bounced. But the DVD player and the audio amplifier are still haunting him. The MD player had to be returned to manufacturer's service department for attention.

The fundamental error RT made with the Tatung TV set was to assume that the pumping action was the result of an overload somewhere triggering the protection circuitry. He spent a lot of time barking up that particular tree. Pumping or 'ticking' effects are very often caused by excess current or overvoltage conditions. But, when they are, the pulsing is usually heavier and more powerful than was the case with this set.

In fact the voltages and currents generated by the chopper transformer T801 were at much lower than normal levels. The culprits turned out to be the two smaller electrolytics on the primary side of the supply: C816 (100μF, 25V), which is the reservoir capacitor for the supply to the TDA4605 chopper-control chip IC801; and C817 (1μF, 50V), which is in the feedback network. When checked with an ESR meter they were found to be very tired. Once they had been replaced the set sprang to life and produced surprisingly good results considering its age.

NEXT MONTH IN TELEVISION

A guide to the Panasonic Z7 chassis

Panasonic's Z7 chassis was used in a number of 14in. portables and basic 21in. models after replacing the Z5 chassis is 1997. Large numbers of them were sold. Brian Storm provides a serviceman's guide to the circuitry used in the chassis. A list of some common faults is included.

The Pace digital TV adapter

The Pace digital TV adapter provides reception of the free-to-view terrestrial digital TV channels with any TV set and should give a boost to DTT. Peter Marlow has been trying one out and provides a test report on its use and performance.

Power-line communications

For the past fifteen years the telecommunications and electricity supply industries have been collaborating on ways of transmitting broadband signals via the mains distribution network. J. LeJeune takes a look at the current state of the art.

Tips from Alan Dent

Alan Dent reports on some unusual and difficult faults that could have you running round in circles. These tips could save you a lot of time and stress.

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Replacement line output transistors

In the May issue TV fault finding pages Graham Richards mentioned a line output transistor problem with the Sharp Model 66AS05H (4BS-C chassis). I had the same problem a few weeks ago. After resoldering a dry-joint on the scan-coil connector PCB and fitting a new 2SD1546 line output transistor the set was fine for a couple of days. Then the customer brought it back because it was tripping. The 2SD1546 transistor had failed again.

The set was brought back more than once, and the customer was not happy – each trip involved him in a twelve-mile journey.

The cause of the problem was the transistor itself, and the solution is simple. Use only a 2SD1546 supplied by Sharp or obtained from WVE, quoting the part number given in the service manual. If the logo on the replacement transistor you fit differs from that on the original transistor you took out, you are going to have a problem. I had tried an S2000AF, which lasted better than the first 2SD1546 – about three weeks instead of a couple of days. The clue is that the Sharp-supplied 2SD1546 transistor will leave the heatsink as cool as a cucumber. If the heatsink is hot to touch after an hour, you've fitted a Mickey Mouse transistor.

Michael Dranfield,
Buxton, Derbyshire.

That scam

I found the scam story (May letters) shocking all round. One of the oldest con tricks in the book is the caller who just happens to be passing your door and wonders if you would be interested in buying some extraordinary bargain that just happens to have become available because of a cancelled or surplus order. My dad warned me about such merchants when I was about nine years old, at which time the current racket was selling long lengths of brand-new linoleum nicely rolled up. Those who fell for this ended up with a bundle of useless offcuts for their money. Years later a scruffy individual called on me with the tale that he had just completed laying new carpets in the QE2 (it had just been launched) and had some superb leftover rolls for sale at a bargain price. Then there was the guy who had just finished tarmacking a large car park and was willing to use the leftover material to resurface my driveway at a very low price. He seemed quite aggrieved when I told him I wasn't born yesterday. Not that I mind these try-ons too much: they provide me with useful material for my short stories in *The Radiophile*.

A van called at our house a few weeks ago, while I was out. The driver asked my wife if she wanted to buy a brand-new TV set at a bargain price. Having been well warned about such dodgy operators, she told him to get lost. I can't help wondering whether it was the same chap who took John Priest's builder friend to the cleaners. John wonders how a successful trader could have been taken in so easily. Well, it's the essence of a con trick that the mark (victim to you) should think he is far too clever to get caught out. The next step is to get him involved in some sub-legal enterprise that appears to offer a huge reward for a minimal outlay. You can't tell me that anyone who has been in business for years could expect to obtain a brand-new 33in. TV plus a video recorder for peanuts, unless it was hot. In a case like this, as soon as you put your hand in your pocket you are as good as making yourself a receiver of stolen goods, so you complain to the police at your peril.

Mind you, what I find truly shocking is that John, who says he's been in the trade for over fifty years, should still be trotting off doing TV service calls in the evening! Crikey, I'm glad I got over that sort of thing some thirty years ago, when I forsook the TV workbench for journalism and vintage radio. Take my tip, John. Come back in out of the cold and rediscover the sunny climes of valve radio, where the owners of sets that require repair treat you properly as an expert worthy of great respect and will pay you a proper rate for doing a far more agreeable kind of job.

Chas E. Miller,
Editor, The Radiophile,
Woodseaves, Staffs.

I've read with interest the letters on the TV/VCR sales scam. It would seem that these people travel all over the country to con others. They struck here in Buxton a few months ago. Again there was a ten-year old Panasonic TV sprayed silver to make it look like a modern set. Another of my customers bought a 32in. widescreen Sharp TV set for £150. When he got it home he found that the on/off switch wasn't working. In fact the switch didn't click because there was no chassis inside

Virus control

The recent articles by Peter Marlow and Nick Beer on computer virus control will, I'm sure, prove helpful to many readers. My own experience indicates that most of the problems stem from downloading e-mails from unknown sources, so I now automatically delete any dubious ones first. But even so I have been caught out. With regard to e-mail attachments, I now always transfer these directly to a floppy disc which can be easily scanned using anti-viral software.

My experience with anti-viral software has not been without problems. For a long time I used Dr Solomons, which was very effective. When this was bought out by Network Associates however I was persuaded to take, instead of my due free up-date, a free transfer to McAfee. I found that this was slower than Dr Solomons and very much more memory hungry. When I attempted to transfer back to my original system I was subjected to a lot of stone-walling from the offices in both the Netherlands and the US. The only thing I found out was that the Dr Solomons suite had been upgraded and significantly increased in price. I am now a Norton convert.

Geoff Lewis,
Canterbury, Kent.

the set. To disguise the fact, someone had carefully glued a couple of old scart sockets and a tuner into the back of the cabinet. The purchaser had been told that the set had fallen off the back of a lorry, which was why it was being offered so cheap.

About a year ago a man came into the shop to ask whether we had any old video recorders we were going to throw away. I suppose this is how they go about getting their 'stock'.

Michael Dranfield,
Buxton, Derbyshire.

Silicone sealer

In the May issue Monitors pages there was reference to silicone rubber sealant being suitable for securing and insulating power supply connections. A short while ago I repaired a mains-powered inspection lamp used for working on my car. A few days later my son came running into the house saying he had received a shock from a brakepipe while working on his car.

To cut a longish story short, I discovered that the silicone sealer I had used was conductive. When the repair was checked with an Avometer the resistance read 30kΩ, which is low enough to give quite a jolt even with dry hands. It may well be that only some makes of silicone sealer do this, and the *Television* article did specify "silicone rubber sealant" while what I had used was the plumbers' type. But if you are not aware of this problem the results could be lethal.

Stephen Forsyth,
Garmouth, Scotland.

Weight of sets

Lifting heavy TV sets is a well-known cause of back injury. In view of this, why don't manufacturers put the weight on the set itself for everyone to be able to see, long after the box has been discarded? They put on the screen size and an electrical danger warning, but nothing about the weight, despite this being a proven health and safety hazard. Customers also need to be advised at shops.

RETRA and BREMA have put forward proposals to minimise the possibility of back and other injuries (hernia), all to do with set design. This is commendable, but what is needed is information on weight.

Harry Todd,
Snaresbrook, London E17.

How many STBs?

One problem with digital TV seems to be as follows. In a not untypical house there may be a TV set, VCR and digital box in the lounge, a portable TV in the kitchen, another one in the parent's bedroom and a TV/VCR combi unit in the children's bedroom.

At present these TV sets and VCRs can all receive the analogue channels. What happens when the analogue signals are switched off? Each TV set and VCR would require a digital box. In the example mentioned above, an additional four digital boxes would be required to maintain the current service. Who is going to pay for them all?

It seems that the digital TV revolution has never been thought out thoroughly, let alone explained to the public.

John Donaldson,
Cumbernauld, Scotland.

3D viewing

There is at present incompatibility between CRT sets with 100Hz field scanning and 3D viewing. Most 100Hz sets don't work with worldwide-distributed 3D TV viewing hardware, for example from http://ww.i-glasses.com/Store/3dhardware.php3, to play 3D DVDs such as IMAX from www.nwave.com. These work with LCD shutterglasses and 50/60Hz PAL field-sequential video, sending typically odd fields as left-eye images and even fields as right-eye images. With my old 50Hz TV set they create a perfect 3D picture when viewed with the infra-red controlled LCD shutterglasses, but with my 100Hz TV set you get a double image, because such sets add odd and even fields together electronically. This cancels or corrupts the 3D information available to the shutterglasses. In the process the left and right images are merged so that a correct, clear 3D image isn't shown.

What seems to be required is some circuit modifications that bypass the circuitry which adds the odd and even fields together, thus allowing 3D viewing with 100Hz sets. This would give the best 3D viewing in the world. It would be best for future 100Hz models to have a menu item to switch off the electronic odd and even field addition, thus providing compatibility.

100Hz flickerless 3D TV sets are sold in America, and a 100Hz TV chip that works with 3D viewing has been developed in Europe. The 3D TV incompatibility problem should be overcome in future 100Hz TV designs.

Philip Heggie
pheg@alphalink.com.au ■

HELP WANTED

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department – address on page 515

Wanted: Good second-hand RF modulator for the Goodmans VCR1000HQ. Also a circuit diagram for this model. E. Christie, 251 The Avenue, Seaham, Co. Durham SR7 8BE. Phone 0191 581 2265.

Wanted: Two AC/DC switches for the Solartron CD1400 oscilloscope (Y amp module CX1441). Phone Mark on 01268 414 654 (Basildon, Essex).

Wanted/for disposal: Require the D board, containing the DC-DC converter (part no. 1-607-791-11), for the Sony VCR Model SLC9; also the remote-control and sensor boards T12236 and T1190A for the Ferguson TV Model 59J7. Have for disposal, both as new, the LCD remote-control unit for the JVC VCR Model HRD560 and the jog-shuttle remote-control unit type RMT-V131A for the Sony VCR Model SLV715. Ron Bruce, 11 New Zealand Way, Rainham, Essex RM13 8JP. Phone 01708 558 792.

Wanted: Circuit diagrams or service manuals for the following: Smile computer monitor Model CA6515DL and the Tri-star computer serial no. 3314251. Has anyone for sale a Tandy talking meter – the 80MΩ version? Phone Tony Dearing on 01482 215 655 (Hull, East Yorkshire).

Wanted: Triple-standard interface for the Microvitec Cub monitor. Also an Emiscope 3/3 CRT for a pre-war TV set and service information for the RGD B2351T and Defiant TR947 405-line TV sets. Phone Robin Howells on 07977 770 397 after 6pm (Stourport-on-Severn, Worcestershire).

Wanted: Thomson W76EJS011X107 widescreen CRT for the Toshiba Model 32Z13B, the two front-door flaps and a remote-control unit. Also a complete working chassis board for the Sharp TV Model 76DW18H. Phone 01582 571 121 (Luton, Beds) and ask for Tony.

Wanted: Back issues of *Television*. D. Lee, 16 Devonshire Place, Claughton, Birkenhead, Wirral, Cheshire CH43 1TU.16.

Wanted/for disposal: Require service manual and video head assembly for a Philips Model VR2324 VCR (Video 2000 system). Have for disposal a Sanyo Betamax VCR Model VTC5300 (spares source). Alan Stubbings, 7 Church Road, Saxilby, Lincoln LN1 2HH. Phone 01522 586 790 weekdays, 01522 702 601 evenings/weekends.

Wanted: Working video heads for the Ferguson FV82LV VCR and a chopper transformer for the Ferguson TX100 chassis. Brian Battams, 23 Dudley Drive, South Ruislip, Middx HA4 6QN. Phone 020 8845 5123 or e-mail brianbattams@aol.com

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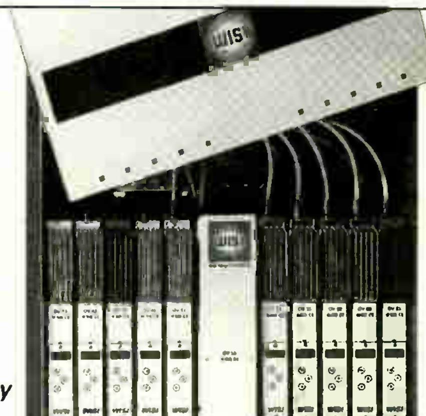

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WHAT A LIFE

A radio problem, then a load of faulty TVs. There's plenty of work for those of us who managed to survived the storm. Donald Bullock's servicing commentary

When the postman called the other morning he brought a friendly letter from an absent friend, a bulky Jiffybag that contained a hard-to-get spare part for my wordprocessor, and a couple of cheques for stuff I'd written twenty years ago and recently sent off on spec. So I was a happy soul when I arrived at the workshop. Not for long.

Walham trouble

A large, scruffy fellow with a bulky radio was waiting. "McGoggle" he said. "I'm having trouble with this radio. Walham trouble. Not enough to start with, then none at all".

"Er, Walham trouble" I said. "Not sure about that. Could you explain?"

He gave me a withering look. "Walham trouble is walham trouble" he replied.

"Oh, ah, yes, of course" I said, fingering my chin. Must be getting past it I thought. Perhaps the boys will know. I got the job pad out. "What name did you say?"

"Walham trouble" he said, then departed.

The radio set was a BVC M1188. It had a big label saying "Made in the EC", which I suppose means almost anywhere. When I plugged the set in it worked all right. I listened to Radio 4 until John Peel came on, then switched to Radio 2. This gave me Terry Wogan, so I hurriedly switched back to Peel.

The set worked all day and the next day too. When McGoggle came back I pointed this out. He looked at the set, ran his eye along its mains lead to the wall socket, and shook his head.

"There's no electric where I come from" he said, "so I don't plug the wireless into it. All I do is to turn this knob marked Walham."

I looked. The word wasn't walham, it was volume. When I disconnected the mains plug Peel's voice croaked into Wogan's for about fifteen seconds then mercifully died away. I then noticed that the set had a well-hidden battery compartment. I opened it and found four U2 batteries covered in green slime. So I asked McGoggle to call back later.

It took me an hour to dismantle the set and clean everything up. What staggered me was that the radio had worked as well as it did with battery operation. I was feeling rather nasty when old Mr and Mrs Hopplestone bumbled in.

We're pensioners, see

"Well, what do you want?" I asked.

"A few more pounds on our pensions" he said.

"We'm old age pensioners, see" she said.

"And now our telly's gone dead" he continued, "it's a crying shame."

I attempted a grin and said "oh, I dunno. Where is it anyway?"

He pointed to a gleaming new Jaguar a hundred yards up the street.

I went to get it and found a widescreen Ferguson set, Model W7023U (ICC17 chassis). By the time I had tottered back to the shop I was knackered.

"Wh, what's up with it?" I struggled to say.

"On the counter with it" she ordered. Then, facing me, "it's dead Mr Billhook. If you asks me, 'e done it. Polishes it too hard when he does the 'ouse."

"Just stands there flashing" Hopplestone said.

"Gracious me" I managed, "you'd best leave it with us."

Shortly afterwards Steven came in.

"Nice morning" he breezed.

"No it's not!" I exclaimed, "and anyway you might care to take a look at this Ferguson set. It's stuck in standby and flashing. Five flashes, a pause then two flashes."

"Line or field trouble or both" he pronounced.

I looked at him. Too smart I thought, as he took the back off. He soon discovered that the line output transformer had shorted turns.

"Getting to be a common fault" he commented, "we've got a spare one here. It comes with a modification kit. You have to change two coils, some capacitors and surface-mounted resistors. Their values depend on chassis version – to suit the tube."

When he'd finished the repair he switched the set on. "Now to see whether the tube has suffered" he said, "they sometimes do with these sets."

It was OK. In fact the picture was excellent. It wasn't long before the Hopplestones were back.

"Did you have to make a charge, Mr Bullock?" he said to Steven.

Steven gave them the bill and they studied it.

"Could you knock a few quid off, Mr Bullock?" she asked.

Steven amended the bill a bit then carried the set to their car.

When he returned he was gibbering. "Did you see their brand new Jag?" he asked, "do you know they're nearly thirty thousand?"

An Alba portable

A bright know-it-all came in with an Alba 14in. portable. "I want this mended only if it's going to be cheap" he said. "I see new ones everywhere I go, and they are getting cheaper by the day. I want you to find out what's wrong, then I'll tell you yes or no."

"No can do" said Steven. "Pay us £8 and we'll mend it if the cost is no more than £25. If it's going to be more and you say no we keep the £8."

The set was left with us. It was fitted with an Onwa chassis and was stuck in standby. Some quick checks showed that there was HT at the collector of the 2SD1554 line output transistor but no line drive. The supply to the line driver stage was missing because R417 (2kΩ, 5W) was open-circuit. A replacement put that right, and we ended up with a happy customer.

A dead Bush, Part 1

Mrs Graveny is not the gentlest of creatures, particularly with her husband Tom. She barged in with Tom following behind her. He was carrying a giant Bush 28in. set.

"On the counter with it" she ordered. Then, facing me, "it's dead Mr Billhook. If you asks me, 'e done it. Polishes it too hard when he does the 'ouse."

She patted her pocket and found she'd no cigarettes. "Over the road, Tom, at the double, and get me some fags" she commanded.

Once they'd gone Paul took a look at the set, which was a Model 2863NTXA. He found a stack of trouble in the power supply. The chopper FET was short-circuit, all four mains bridge rectifier diodes had failed, also the chopper control chip IC802. The latter was a TDA4605-3. Some sets fitted with this chassis use different chips in the 4605 series, and there may be an A or an N after the number. The replacement chip has to be of identical type to the original, or the set won't start up. Paul decided to get stuck in replacing these items.

Another Bush

It seemed to be our day for Bush sets. The next customer brought in a 25in. 2571NTX. This one produced a bright green picture with flyback lines.

Steven began to remove the back. "Could you pass me a TDA6108JF chip?" he asked.

"But you haven't got the back off yet" I protested.

He turned out to be right of course. After he'd fitted the replacement chip the set worked perfectly. "It's become a common fault with these sets" he commented, "IC901 on the tube's base panel. I ordered half a dozen the other day."

The dead Bush Part 2

Meanwhile Paul had found more trouble in the 28in. Bush set's power supply. The optocoupler was short-circuit, and two resistors were open-circuit, R825 (2·2MΩ) and R817 (2·2Ω, 5W ceramic).

Once these had been replaced there was HT, but the set was still dead.

A Crown portable

The door opened and a gorgeous young lady entered. The air became full of blossoms, an unseen orchestra played, and the light took on a golden glow.

"What, er, can I do for you?" I croaked in a newly husky voice.

"It's my Crown portable" she sang, "seems to work only when it wants to. I do hope you can repair it for me."

"No trouble at all" I replied, "I'll give you a ring when it's ready."

As she left Greeneyes clopped in. "What awful cheap scent" she commented. "Horrible little madam, wasn't she?"

"Certainly was, dear" I replied.

The Crown portable was a Model CRP14. When we tried it we found that it worked all right from cold but cut out when warm. A little work with the freezer proved that the cause of the trouble was the 2SC1573A line output transistor. It worked and measured correctly when cold, but developed a severe base-to-collector leak when it was gently heated.

I replaced it ever so carefully, then dialled the number Miss Dream had left. "Donnie here" I breathed when the phone was lifted.

"Whatnie?" a deep masculine voice blared.

"Ah, er, this is the TV repair shop" I continued.

"Oh, our set. Good. I'll come down and collect it."

He arrived in an Aston Martin.

Another dead set

It was certainly proving to be a busy day. Yet another dead set was brought in, this time a Goodmans W288NS. This is a 28in. widescreen model and was yet another case of a leaky line output transistor, this time type S2055N. It had failed because of a dry-joint at one side of the line output stage tuning capacitor C134 (11nF, 1·6kV). Once we'd resoldered the joint and fitted a replacement transistor the set produced a very high-quality picture.

The dead Bush Part 3

Paul was still struggling with Mrs Graveny's 28in. Bush set. It remained dead though the power supply was now working. The BU2508AF line output transistor Q605 turned out to be leaky. Once it had been replaced the set showed some signs of life but was pulsing. After more searching Paul found the cause.

The set uses a scan-coil plug and socket, with the socket's pins on the main chassis. They were corroded where arcing had occurred because of a loose fit. Cleaning and retensioning the contacts cured the trouble. It had taken a lot of time, but the set finally produced a good picture. ■