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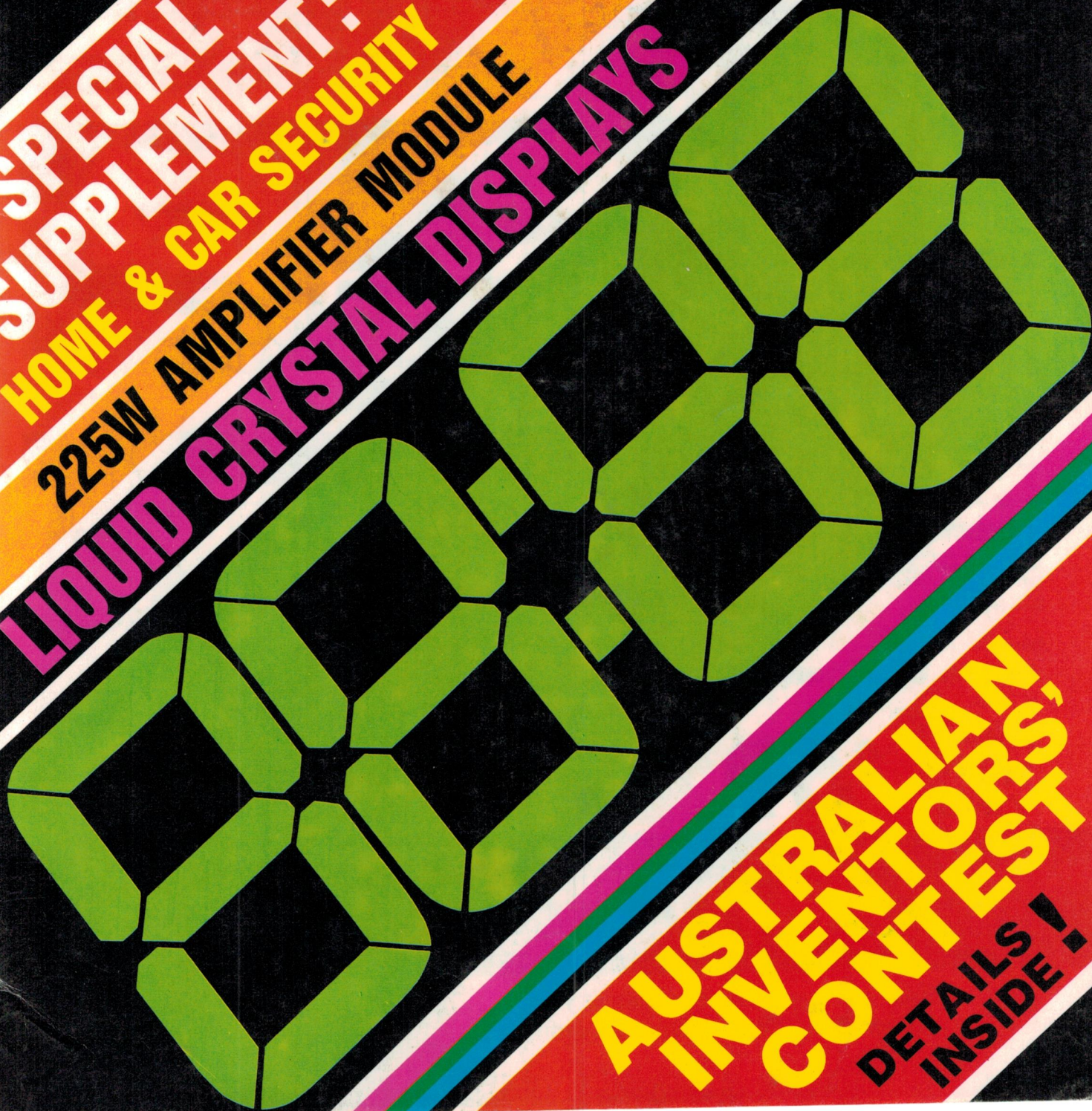
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SPECIAL SUPPLEMENT:
HOME & CAR SECURITY

225W AMPLIFIER MODULE

LIQUID CRYSTAL DISPLAYS

AUSTRALIAN INVENTORS' CONTEST

DETAILS INSIDE!

Features

Hifi, Video and Reviews

Projects and Circuits

Personal Computers

Columns

Departments

HF amateur transceiver

This exciting new HF amateur band transceiver can cover any single 500kHz band within 2-30MHz and features CW, LSB and USB transmission modes. It's easy to build, a snack to align and will cost you just $349. Pt.1 begins on page 74.

What's coming

Next month we intend to describe a high-quality bookshelf loudspeaker system and a hand-free telephone adapter. See page 117 for further details.

145W mosfet amplifier module
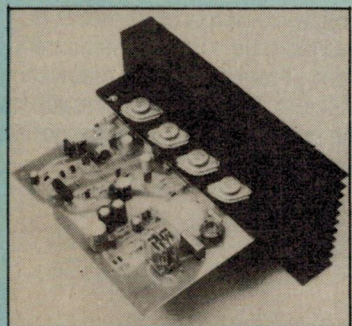
Looking for a rugged amplifier module with bags of power? This design delivers 145W RMS into 8Ω or 225W into 4Ω and features on-board loudspeaker protection. Construction begins on page 34.

Amstrad CPC664 personal computer

The Amstrad CPC664 Integrated Computer/Disk System is a powerful personal computer which follows on from the successful CPC464 model. It includes a compact floppy disk drive, 64K of RAM, colour, music generation and other powerful enhancements.

By JOHN CLARKE

Our review sample comprised the CPC664 keyboard with disk drive and GT65 Hi-Res green monitor. Both CP/M and Dr LOGO software is provided as standard on disk with the computer.

A large range of software specifically for the CPC664 is also available. These include language and programming, music and graphics, educational, business and games. CP/M based software can also run on the Amstrad with minor modifications.

The computer keyboard is a conventional QWERTY layout together with cursor keys and separate numeric and function keys. The overall length of the keyboard unit is substantial at 570mm, but this also includes the floppy disk drive located to the right. The standard typewriter keys and the numeric keys are grey while the cursor and other oft-used keys are a light blue shade, contrasting with the dark grey of the case.

A 30cm Amstrad monitor completes the computer system. This monitor has a high resolution green phosphor CRT giving the standard 80 column by 25 line display format. The monitor connects directly to the video output from the computer via a coiled cable. The computer power supply is also contained within the monitor and both 12V and 5V regulated supplies connect from it to the computer via coiled cables.

Apart from the video and power connections at the rear of the keyboard console, there are sockets for a joystick, stereo sound socket, tape socket and three printed circuit board outlets. These latter ports are for a second disk drive, Centronics printer interface and finally, an expansion socket comprising the Z80 data, address and signal bus.

For colour use, the Amstrad CTM644 colour monitor or alternatively a colour television can be used. For the latter case, the computer will require 12V and 5V power supplies and an RF modulator if the TV set does not have a direct video connection. Amstrad can provide an MP-1 MK2 modulator/power supply, specifically for this purpose.

The floppy disk drive is the now popular Sony 3-inch standard. The disk is divided into 40 tracks and 9 sectors. Each track within a sector can store 512 bytes to give an overall storage of 180K bytes for each side of the disk.

The microprocessor is the good old-

The Amstrad CPC664 includes a compact floppy disk drive and 64K of RAM.

faithful 8-bit Z-80 teamed up with the 6845 picture tube controller. The latter is an intelligent device which performs video timing and refresh memory addressing functions. It provides a screen resolution of 256 × 256 pixels with each pixel separately addressable.

The 64K of random access memory consists of eight 4164 ICs. These are 64K bit dynamic RAMs. A 32K ROM contains the BASIC interpreter and also the firmware. The latter performs the keyboard scanning via an 8255 PIO and takes care of other operating tasks.

An Uncommitted Logic Array (ULA) is used to allow the ROM to share part of the same address space as the RAM. The ULA decides whether RAM addressing or ROM addressing is required and directs the chip enable signals from the CPU to the correct memory.

For music generation, a General Instruments AY-3-8912 sound generator is included. Programming of the tone period, duration, volume, volume envelope, tone envelope and noise period is available. In addition, the music can be directed out of the left channel, right channel or both channels for a stereo effect.

Testing the Amstrad

As supplied, the computer comes without a mains plug and it is therefore necessary to install this yourself. For safety reasons, we would prefer to see these computers sold with mains plugs fitted and we assume that this will normally be the case.

When first powered up, the computer responds with 1984 Amstrad BASIC 1.1. This is a very comprehensive version of BASIC which apart from including the common commands such as PRINT, RUN, ABS, GOSUB, POKE, etc, includes interrupt, graphics and sound commands.

Interrupts

The interrupt commands are AFTER, EVERY, DI and EI. The AFTER command calls a subroutine (interrupt) after a given period of time has elapsed. Four separate timers are available for AFTER interrupts. Timer 3 has the highest priority and an interrupt will occur as soon as timer 3 calls the interrupt. For the lower priority timers; 2, 1 and 0, an interrupt can only occur when the higher number timer or timers are not serving an interrupt.

The EVERY command calls a subroutine repeatedly at the specific period. There are four timers also available with this command and they also have priority in a similar manner to the AFTER timers.

Two separate commands, the DI and EI commands disable and enable the interrupts respectively.

Graphics

There are many graphics commands for the CPC664 most of which could be put to best use with a colour monitor. One of the major commands is DRAW. This draws a line from the cursor position to specified x,y coordinates. The colour of the line can also be allocated as one of 16 colours. How the line interacts with the graphics already on the screen can also be specified. A similar instruction, DRAWR, specifies a relative x,y offset.

The GRAPHICS PEN command sets the colour of the line and options the background mode as either opaque or transparent. GRAPHICS PAPER sets the colour of the area behind the graphics drawn. When animating these graphics, the colours will merge behind, or cover up the background depending upon whether the AND or OR option is used and the particular code number of the colour specified. The terminology for this effect is colour plane sprites.

As well, there are other graphics control commands which FILL in areas bounded by a line, MOVE the graphics cursor and change the BORDER colour. The SPEED command can alternate two colours at a specified rate.

A particularly interesting command is FRAME. It allows synchronising of the writing of graphics onto the screen with the frame flyback of the monitor. This is an important command since without it any animation on the screen would flicker or tear.

Sound

Several BASIC commands allow a tone to be generated over eight octaves. SOUND provides for seven parameters to be controlled. These are the channel status, tone period, duration, volume, volume envelope, tone envelope, and noise. Most of these parameters are self explanatory with the exception of the first and the last.

Channel status provides direction of the sound from one or more separate A, B or C channels. In addition one channel can be specified to rendezvous (merge together) with another channel. If the sound channels are connected to a stereo amplifier then the A channel will be the left channel; the B channel, right and the C channel both left and right.

The noise parameter refers to a white noise source which can be switched off or mixed with the sound.

Separate envelope controls are also available. The ENT command provides control of the tone envelope, while the ENV command controls the volume envelope.

Arcade-style games will benefit from this complex sound programming facility. The stereo provision allows the sound to follow action on the screen adding realism to the visual effects.

Disk Operating System

Included with the 664 is a selection of software on a 3-inch floppy disk. This comprises a Disk Operating System called AMSDOS, version 2.2 of CP/M and Dr LOGO. The DOS system is accessed from BASIC merely by pressing the upper case and "/" keys. Once the DOS is accessed, the command following "/" has control over data within the compact floppy disc.

The DOS provides facilities for creating file names, saving files, copying and screem dumping. It also has commands for saving onto tape.

A wide range of software is available, including business and games packages.
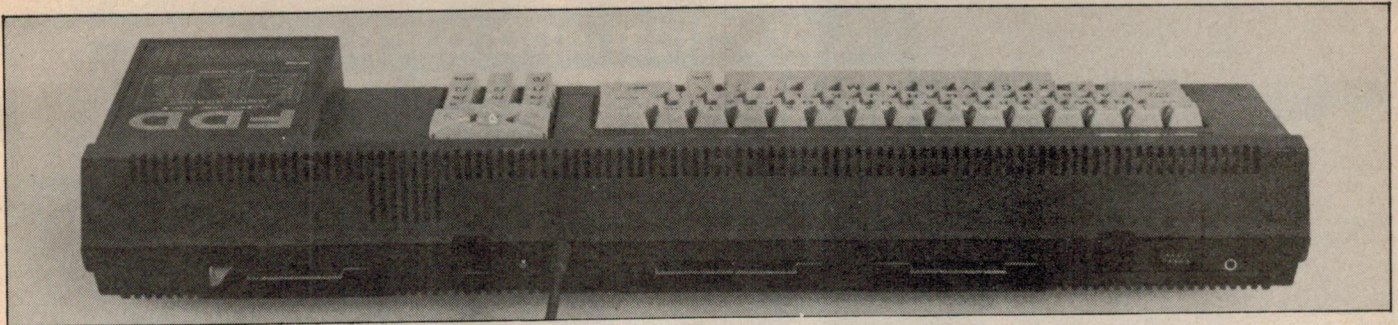
The rear panel carries the three output ports, together with sockets for video output, tape, sound and a joystick control.

Amstrad CPC664

In addition to the normal range of commands offered by CP/M, the same disk incorporates an 8080 assembler, an 8080 assembly code debugging aid, a hexadecimal file dump utility, a simple context editor, a Console Command Mode batch processing package and a transient program batch processing package.

Dr LOGO

Dr LOGO is a customised version of LOGO, a programming language which is a collection of procedures called primitives. These primitives are used to build up a program.

It includes turtle graphics commands that allow an arrow head (turtle) to be moved about the screen and so draw. There are forward, back, rotate right and rotate left as well as turtle up and down statements.

Apart from graphics, logic and arithmetic commands, keyboard and joystick controls and sound commands are included. The language is easy to learn and has proved popular with young children and newcomers to computers.

Instruction manual

The CPC664 user instruction manual provides virtually all the information required to skilfully use the computer. For beginners it includes a foundation course in the first two chapters of the book. It is very well written and includes examples of using the computer to load a disk, run a BASIC program and to develop skills with the sound, colour graphics generation.

A complete list of Amstrad CPC664 BASIC keywords is given in chapter 3. Chapter 4 discusses using disks and cassettes. A complete chapter is given to CP/M and AMSDOS and to LOGO. The final two chapters include some vital information about the computer to include external connection diagrams and some data on the hexadecimal number system. The appendices also include some game programs, written in BASIC.

Although the manual is well written, we found the information to be VERY scattered throughout the book. Looking for information on sound generation, for instance, means looking up chapter 1, chapter 3, chapter 7 and chapter 8. If this aspect could be improved, it would be so much easier to use this manual.

Software

A wide range of software is available for the Amstrad CPC664. We were provided with some Electronic Home software including Bill Payer and Bank Manager. For the business software, we sampled the Amsword Advanced (word processing package) and Masterfile 464, an information filing and retrieval system.

The business software included loose leaf documentation of the package but all the packages were easy to use and well documented within the software itself. Programs without documentation had prompts and, where needed, notes to explain the software.

Conclusion

The Amstrad CPC664 is a modern 8-bit personal computer which appears to be well designed and easy to use. It includes an excellent version of BASIC and the bonus CP/M operating system allows a vast amount of CP/M based software to run. The combination of good graphics, sound, 64K of memory and compact floppy disk drive, helps make the unit an attractive contender in this hotly contended segment of the computer marketplace.

Recommended retail price of the CPC664 together with the GT65 high-resolution green screen monitor is $949.
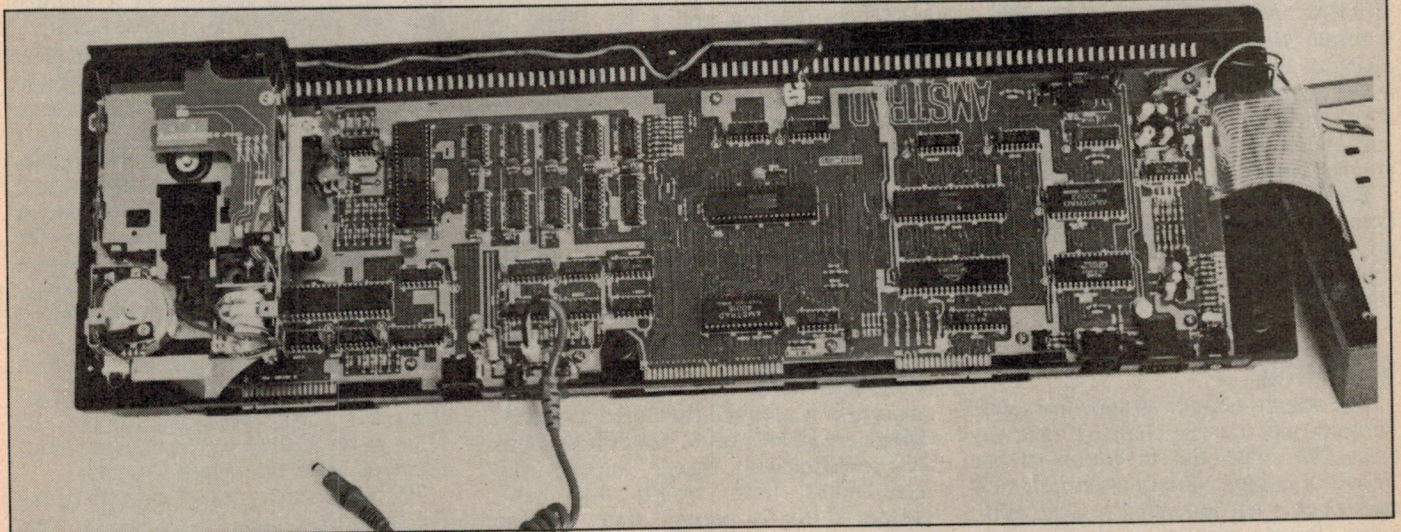
View inside the Amstrad CPC664. The unit is well-designed and well-constructed.