6809-BASED MICROCOMPUTER

Gary Mills concludes this series of articles with a discussion of the two main chips used and the software available to run on the machine.

Although the visual star of the show is the NEC7220A graphics controller, the 6809 is itself a very noteworthy chip. It was designed as a sophisticated answer to the 8080 and 8085 Intel chips, and incorporates a vastly improved set of addressing modes.

One of the most important features of the chip is the capacity to use program counter realtive addressing. This allows the programmer to generate Position Independent Code (PIC). PIC can be loaded and run anywhere in the available address space, and is easily ROMable. Both of these features are used to great advantage by operating systems which run on the 6809.

In terms of sheer speed the 6809 compares favourably with the Z80. A straight clock speed comparison is misleading because the Z80 takes an average of four clock cycles to perform instructions while the 6809 takes one. From benchmarks published in the 68XX Micro Journal, a two megahertz 6809 performs at almost exactly the same level as a 6 megahertz Z80. The 6809 in this design switches between 1 and 2 megahertz under software control.

The NEC7220A

The NEC7220A is a state-of-the-art graphics chip. While not a games chip, it has immense power for CAD applications and driving high resolution displays. It is currently used in the Epson QX10 and new QX16, and in the NEC personal computer series.

A full description of its capabilities would require several complete articles, but a brief list may help to convey the general idea:-

line and arc drawing
area fill
zoom and pan
up to four independently scrollable areas
software definable character set
resolution of 768h by 576v (in this computer)

It does all of this at the incredible drawing rate of 80 nanoseconds per pixel. To understand how fast this is, look at the four figures over the page. They can be drawn and erased on the screen in succession in under 7 seconds.

The publications listed below may be of interest to those who wish to explore in more detail the facilities offered by this chip.

uPD7220/GDC, uPD77220-1/ uPD7220-2 Graphics Display Controller

This is a fundamental document describing the chip's capacities and instruction set. However, it is terse and sparse on examples. It is published by NEC and can usually be requested when you purchase the chip, or ordered directly from them.

Product Description Graphics Display Controller uPD7220

Another NEC publication but better furnished with examples of the chip in use. It is available free-of-charge.

Application Note APN — 02 uPD 7220 Graphics Display Controller

Again from NEC, this document contains techniques and hints for programming the chip. It is available free-of-charge.

"Super Graphics Hardware from NEC"

An article by Steve Levin in BYTE magazine, April 1983. It gives a clear and concise summary of the chip's capabilities. A good introduction.

Monitor Routines Supporting Graphics

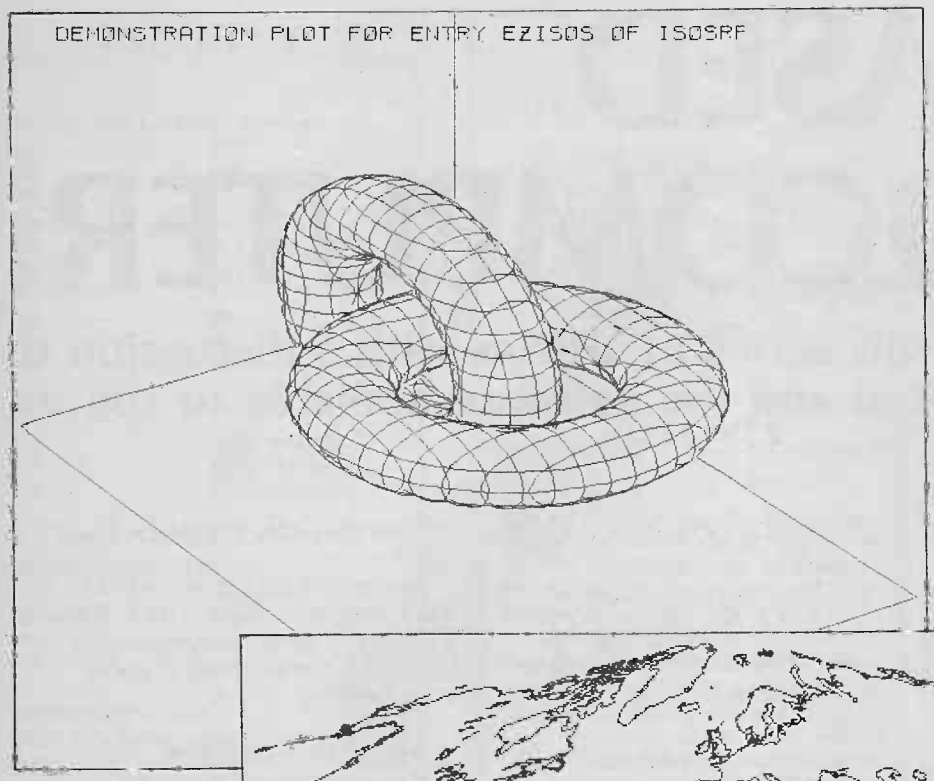
While contemplating the list of literature above, it may help to know that a great deal of work has been done for you. The kit for the project as supplied by Micro Concepts has a full set of assembly level graphics routines delivered in its firmware. They include:

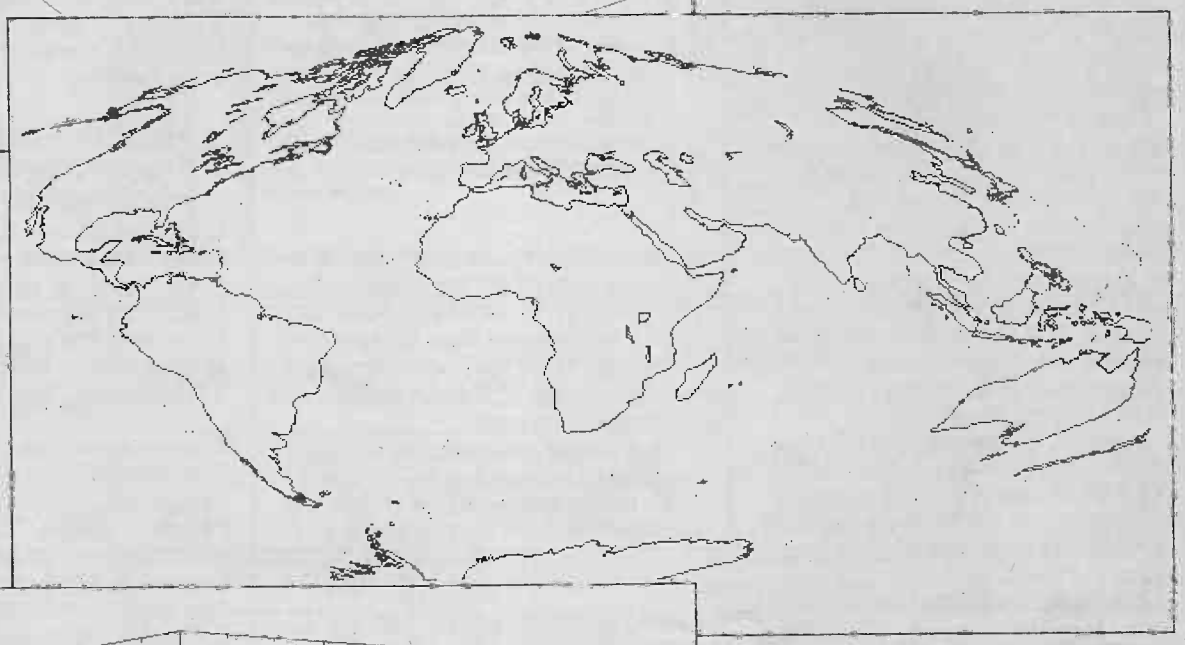
Set graphics cursor position
Plot a point
Plot a line
Plot a rectangle
Plot a circle
Set a text cursor location
Get a text cursor location
Put a character on the screen
Get or set a zoom factor
Set an area fill pattern
Fill an area

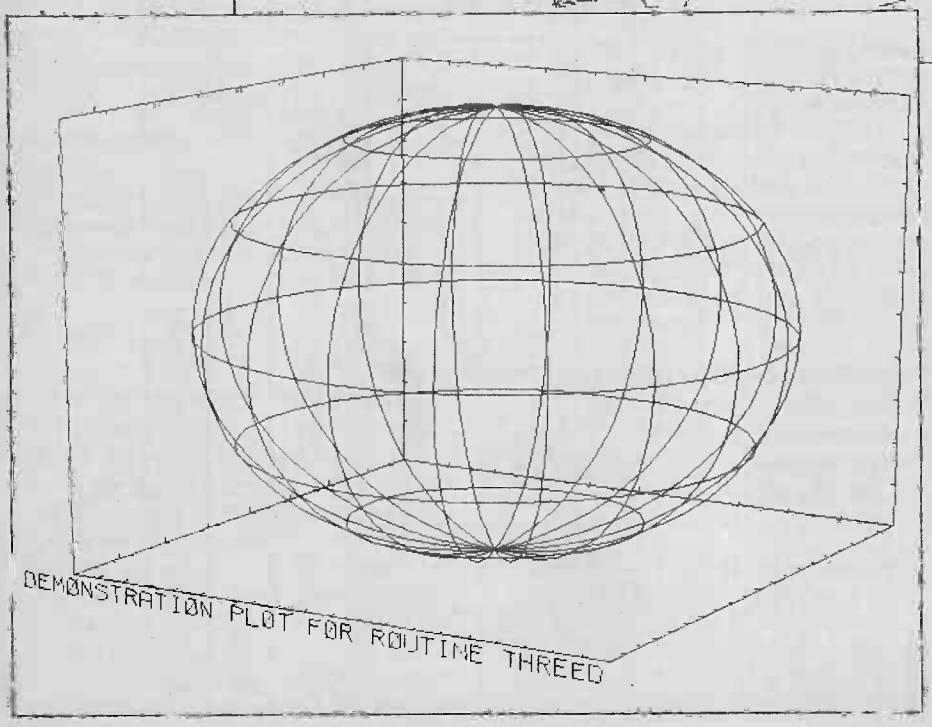
These routines can be called directly from your assembly language programs, and are fully described in the Microbox II literature.

The Flex Operating System

One of the strengths of this design is that it will run FLEX. Flex is a popular, standardised, and very useful operating system. It is perhaps not as well publicised as, for example CP/M because it has had different, less conspicuous areas of application rather than being used as a background for word processors and spreadsheets.







FLEX *can* run wordprocessors and spreadsheets (very good ones, too), but is primarily known as an engineer's operating system. It is consistently found on software development machines. Because of this there is a welter of languages, compilers, interpreters, assemblers and cross assemblers that run on FLEX, and because this machine can look like a standard FLEX machine to them, they all run on it.

The list of languages and applications that Micro Concepts sells is representative. The high-level languages include BASIC, both interpreted and compiled, COBOL, C, Small-C, PL9, Pascal, a Pascal cross-compiler for the 68000, Forth and BCPL. Assembly language packages include cross-assemblers for just about every commercially available chip, relocating assemblers, debuggers, simulators and translators. Applications include word processors, mail merge packages, database managers, and spreadsheets.

Not only does FLEX support disk, EPROM disk and EPROM programmer in this design, but a graphics macro library compatible with FLEX's native macro-assembler is provided with the kit. Further, two of the FLEX compilers, PL9 and Small-C, have graphics libraries expressly written for this machine. Already there is a character set editor, graphics screen dump, save, and restore routines, several games and an interactive graphics package for The four figures with this article

SATELLITE TV ROUND-UP

Slow But Sure?

Britain's Independent Broadcasting Authority, the IBA, has adopted the slogan 'Evolution Not Revolution' in its attempt to win the broadcast industry over to its C-MAC television transmission system.

Designed for satellite-based systems in advance of the arrival of genuine DBS (direct broadcast by satellite), C-MAC is a step-up from the 625-line, 50Hz PAL system which dominates world TV broadcasting.

As a first step towards higher definition TV, C-MAC offers a 5:3 aspect ratio (like CinemaScope) and double the normal frame scanning rate. The result is a notably superior picture without too great a departure from current practice but capable of further improvement within a compatible system.

C-MAC has been accepted as the DBS standard by the European Broadcasting Union, is supported by Philips and other European manufacturers and is actually in use in Norway, but it faces strong competition from the 1125-line high definition TV system (HDTV) developed by Sony and NHK, the Japanese broadcasting authority.

Sony have recently demonstrated their system to plaudits from even their greatest opponents. The trouble is not that HDTV is technologically inferior. Far from it. The problem is that the system is not compatible with any existing broadcasting standard. Apart from that, it is expensive, requires tremendous bandwith and utilises a 60Hz field rate (alleged to prevent flicker). Even if the world adopts a 1125-line standard, 75% of all broadcast systems will still use a 50Hz field rate. Converters are inordinately expensive and cannot cope with the interference produced when 60Hz video equipment is used with 50Hz lights.

The Sony-NHK system may yet prove victorious — especially since the USA is one of the minority of countries operating on a 60Hz standard. Typically, we may expect Sony (with the aid of American friends) to try to batter us into submission, using a combination of seductive PR and crafty price manipulation. There is a real possiblity that the Japanese HDTV system may become a de facto international standard against the trend of the majority of TV users simply because those who might support the IBA and the EBU in Britain and elsewhere are too busy looking westwards for scraps from Ronald Regan's table to care what happens to European industry and innovation.

X and Y

NEC Busines Systems (Europe) are claiming a first for their NESAT Satellite TV Receiver System. The system features a 1.8m antenna and a small-size Low Noise Converter mounted at the focus. apart from being particularly unobstuctive, the LNCs can be stacked at right angles and their IF outputs combined. In this way, the system is readily utilised for the reception of X,Y and mixed polarisation signals. NEC say that a complete system including antenna, one LNC and tuner with PAL UHF output will cost around £1,500.

Contact: NEC Business Systems (Europe) Ltd, 35 Oval Road, London NW1 7EA (tel: 01-267 7000).

Good Connexions

A North London company claim to be the first to supply a full-band low-cost satellite TV receiving system aimed at the UK consumer. Connexions Satellite Systems, part of the SMC Supplies group, have three systems available comprising a 1.2 or 1.6 metre dish antenna, Low Noise Block converter and satellite receiver. The 1.2m system, designed to pick up 'Music Box' from the Eutelsat F1 satellite, costs £995 including VAT, but exclusive of delivery and installation. £1,045 will buy you a similar system with a fixed 1.6m antenna and for £1,295 you can get a system including a motor-driven 1.6m dish which can be readily adjusted to point at either of the two satellites currently broadcasting to Europe and the UK on the 12GHz band, Eutelsat F1 and Intelsat V. The component parts of the system can be bought separately and Connexions say they have 14 distributors throughout the UK. The company are mounting an advertising campaign in March, and they can be contacted at 125 East Barnet Road, New Barnet, Herts. EN4 8RF (tel: 01-441 1282).

TV Times

●A total of 18 channels are now available for satellite TV viewers in Europe, with two more channels from the Telecom 1 satellite planned for early this year. The channels are: Premiere (movies), Mirrorvision (entertainment), ScreenSport, The Children's Channel and Cable News Network from Intelsat; and Music Box, Sky Channel (entertainment, requires a decoder), TV5 (French language, general), RA1 (Italian language, general), Teleclub (German language movies), Filmnet (Dutch movie channel), Europa TV (general European programming), World Public News and Worldnet (US government news), SAT1 (publishers' channel), New World (religious broadcasts), 3SAT (German language, general) and RTL-Plus (entertainment) from Eutelsat. Only 14 of these, at most, are available at the same time, since Intelsat has only four and Eutelsat ten spare transponders.

DB Prepared

A French subsidiary of Philips, Portenseigne SA, has announced production of a complete range of receiving equipment satellite TV aimed at every potential user from the large-scale cable and SMATV operator down to individual households. Portenseigne stress that they will be marketing an indoor adaptor for the reception of C-MAC broadcasts when higher-powered DB satellites come into use early in 1987.

PS

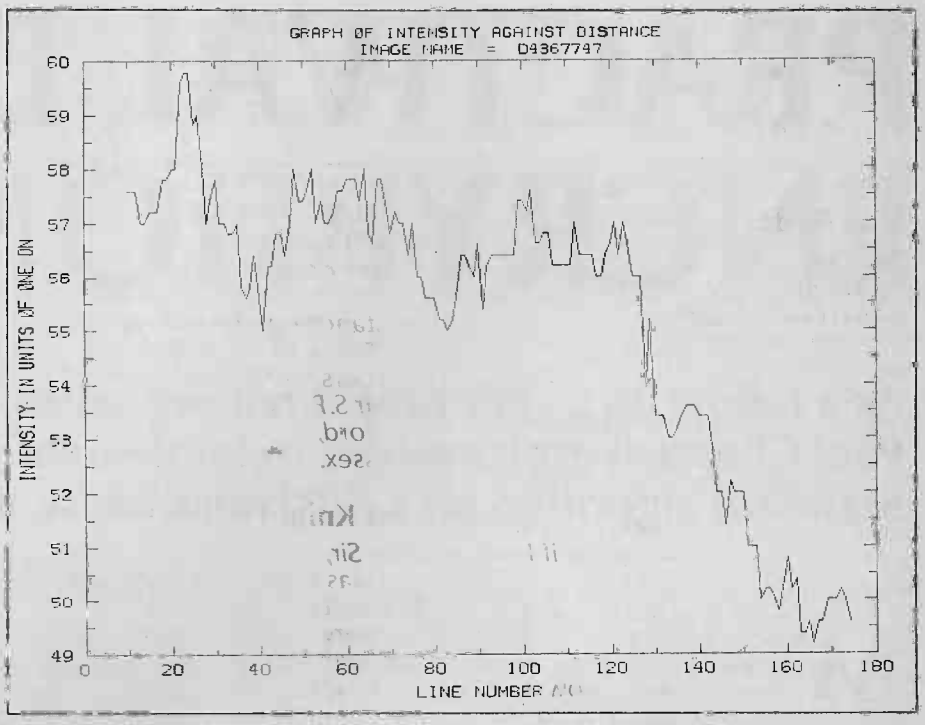
A Mr. Gale informs us that he has bound volumes of ETI for disposal. The volumes in question cover the years 1972 to 1977. Mr. Gale can be contacted on 91-205 0221.

were dumped to printer using the routines above.

Another aspect of a machine or system's useability is the number of people using it, and their availability. For FLEX there are several sources of information and news. One is the "68XX Micro Journal", an American publication that can be purchased in London at Stirling Microsystems on Baker Street or subscribed to directly. There are also various Dragon and Tandy Colour Computer organs.

6809 User's Group

The 68 Micro Group is a very active user's group which includes a large number of user's who have already built this kit. They hold meetings every four weeks in London, and maintain a disk library of around 30 volumes for FLEX and the 6809. You can have access to this library as a member either at their meetings or through the mail. At the moment they have 3 full disks devoted especially to this machine including the character set editor, screen save and dump routines, and the PL9 graphics interface mentioned above. You can contact the membership secretary about joining. Jim Turner, 63 Millais Road, London E11, tel 01-558 3681.



A basic kit for this design (the Microbox II) is available from Micro Concepts, 2 St. Stephens Road, Cheltenham, Gloucestershire GL51 5AA, tel, 0242-510525.

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