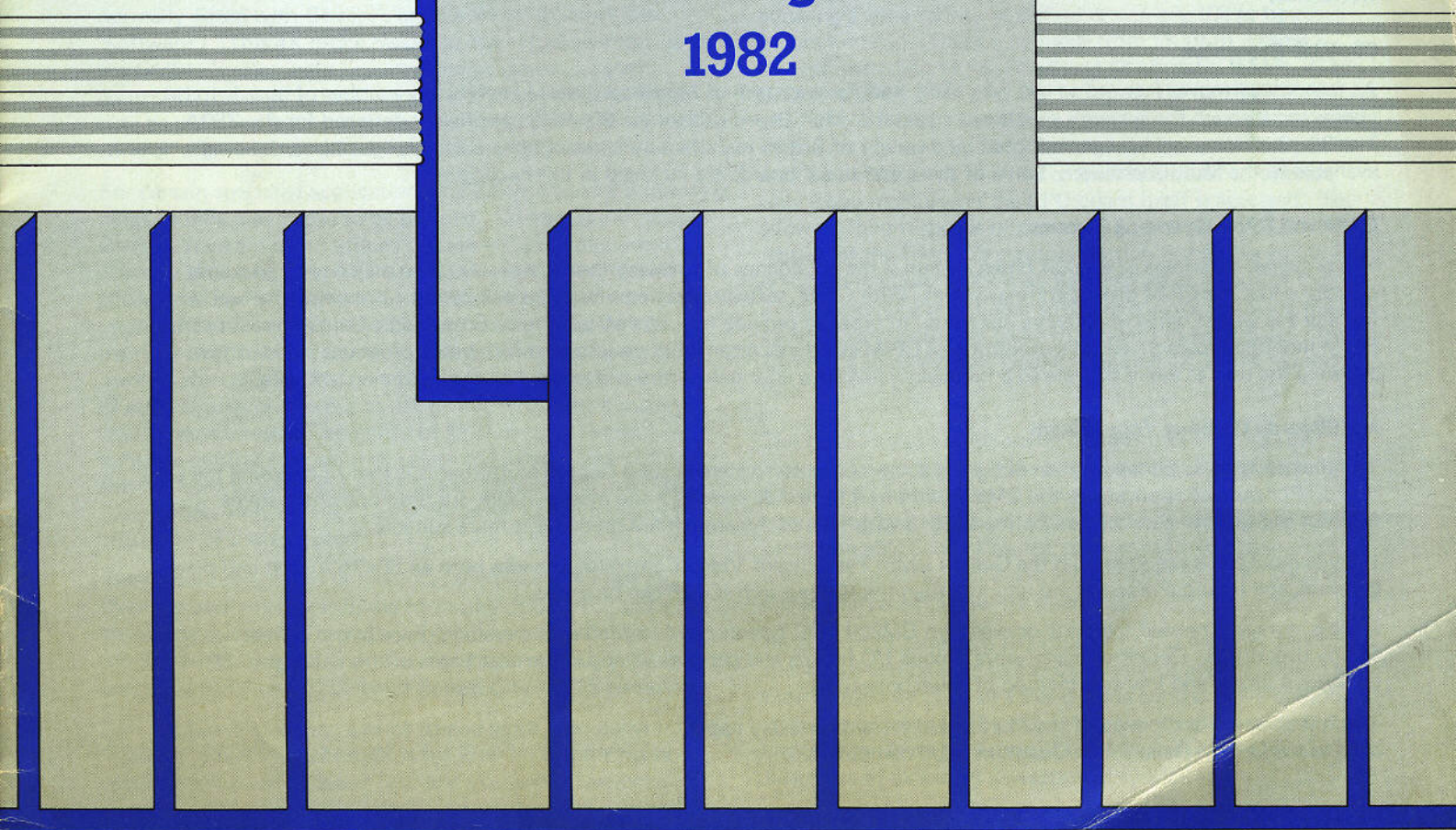


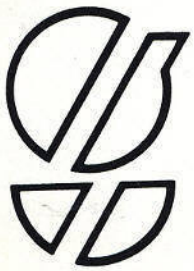
# The Gemini MultiBoard Microsystem



**Autumn  
Catalogue  
1982**







# The Gemini MultiBoard Microsystem

## THE GEMINI MULTIBOARD MICROSYSTEM

### MultiBoard - The Expandable Solution

The Gemini MultiBoard system provides you with access to a large and growing range of compatible microcomputer boards. Around these boards you can configure a solution to satisfy your own particular microprocessor needs. The ideal system for your requirements may be as many as 10 boards or as few as 1. With MultiBoard an almost unlimited number of system permutations are possible. This flexibility is made possible by Gemini's adoption of a number of accepted industrial standards.

### Z80A Microprocessor

The Z80A (the high speed version of the Z80) microprocessor forms the heart of the MultiBoard system. This processor's powerful instruction set has led to its popularity and widespread use. The Z80A is now the largest selling microprocessor worldwide.

### 80-BUS Expansion

As technology moves forward so can you. The modular approach of MultiBoard easily enables any number of boards to be connected through the system's simple bus structure. MultiBoard utilises the 80-BUS specifically designed for the Z80A. The 80-BUS standard has been adopted by a variety of British manufacturers, resulting in a wide range of boards being available to the MultiBoard user. Some of these additional boards are included in this catalogue.

### CP/M and RP/M Operating Systems

The principal advantage of a Z80A based system is the abundance of software that is available. The majority of packages operate under the CP/M disk operating system. With CP/M, software becomes machine independent providing the user with literally the widest range of software available. In order to provide for users of cassette based systems, Gemini developed the RP/M monitor program. RP/M's utilisation of CP/M standards means that cassette and disk based programs are identical, allowing the user to easily migrate to a full disk system at a later date without altering any of his existing software.

### MultiBoard - Defining Your System

The first decision to be taken when designing a new computer system around Gemini MultiBoards is that of choosing the CPU board. For control applications the GM811 with its 4 byte-wide sockets is the most suitable; for development systems, small business and general purpose designs the GM813 with 64K of dynamic RAM on-board is more suitable.

If a video output is required then the Gemini GM812 Intelligent Video Controller provides both an 80x25 format and pixel graphics, and if colour graphics are required then the IO Research IO828 can be added.

If mass storage is needed then one or even two GM809 FDC boards can be added to the system. Each board handles up to 4 floppy disk drives. Details of many other unique I/O boards and peripherals appear on later pages of this catalogue. 80-BUS provides a simple and low cost method of interconnection.

The full potential and power of the MultiBoard system is readily apparent when only three boards form a complete system, such as the Gemini Galaxy 1 or Quantum 2000 computers.

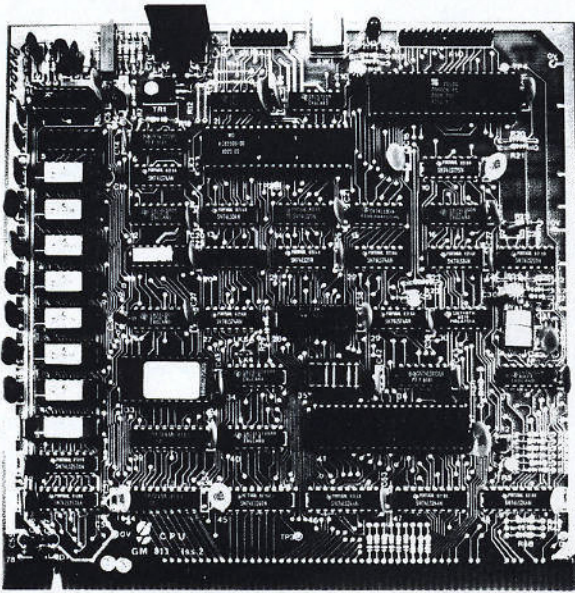
All prices in this brochure are subject to VAT.

Gemini Microcomputers Ltd. reserves the right to amend any price or specification without notice.



# CPU Boards

Gemini have produced two alternative CPU boards for the MultiBoard system to allow users to choose the one best suited to their own individual system requirements.



## GM813 – CPU/64K RAM BOARD

- \* 4MHz Z80A CPU
- \* 64K Dynamic RAM
- \* RS232 Serial Interface
- \* Two 8–Bit I/O Ports
- \* 1200 Baud Cassette Interface
- \* Extended and Page Addressing Modes

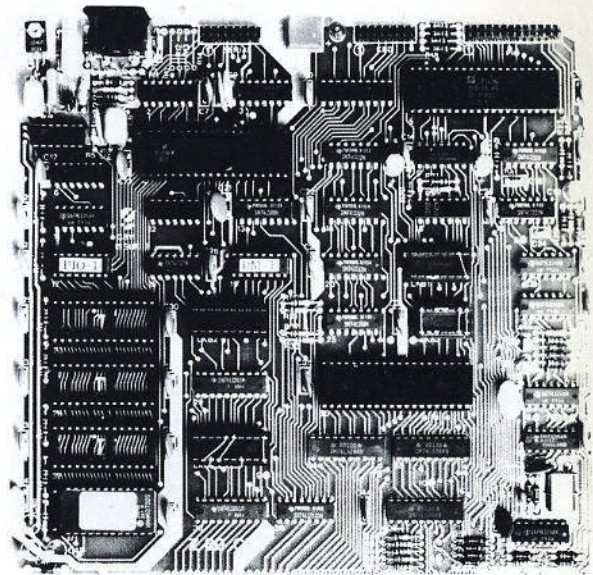
Controlled by a 4MHz Z80A processor and having 64K of on-board dynamic RAM, the Gemini GM813 is particularly suited for use in software development, educational or business applications. There is also an EPROM socket, normally fitted with Gemini's unique RP/M monitor (see 'Software'). This 4K block resides at the top of memory, and the GM813's reset jump circuitry always passes program control to this device on power-on or a reset. This 4K block may be switched in or out of the memory map under software control, allowing the full 64K of RAM to be utilised.

For certain specialist applications the Z80A's normal addressing range of 64K may prove to be limiting. Consequently on the GM813 there are two methods of extending the amount of memory available. The first is a Page Mode capability that allows the user to select one of four entire pages of memory under software control. The GM802, GM803 and MP826 memory boards all support this facility. The second method involves the use of a 'Memory Mapper', extending the number of address lines on the bus to 19, giving, with future memory boards, an addressing capability of 512K bytes. Under software control the user may select any 16x4K blocks from this memory to be at any place in the Z80A's 64K map. In conjunction with the Page Mode this gives a total memory capability of 2 Megabytes!

The GM813 also has extensive I/O facilities. There are dual 8–bit parallel interfaces in the form of a Z80A PIO, and a serial interface which includes programmable baud rates, full modem control signals, inputs and outputs at RS232 levels, and a highly reliable 1200 baud Kansas City/CUTS cassette interface.

The GM813 CPU/RAM board is the ideal choice for many applications. Add a video board and you have a powerful cassette based system, then add a disk controller board and you have a 64K CP/M system.

**GM813 – CPU/64K RAM with RP/M – £225**



## GM811 – CPU BOARD

- \* 4MHz Z80A CPU
- \* Four 'Byte-wide' Memory Sockets
- \* Two 8–Bit Input/Output Ports
- \* 8 Bit Input Port
- \* RS232 Serial Interface
- \* 1200 Baud CUTS Cassette Interface

The Gemini GM811 is ideal for OEM and other specialised applications because of its use of a 4MHz Z80A micro-processor and its incredible memory flexibility. Four 'byte-wide' sockets are provided for on-board memory, allowing a wide variety of different memory ICs to be accommodated. These may range from 1Kx8 to 32Kx8 devices, including 1Kx8, 2Kx8 and 4Kx8 static RAMs, 2716, 2732 and 2764 EPROMs, and 2Kx8, 4Kx8, 8Kx8, 16Kx8 and 32Kx8 ROMs. There is no restriction as to what mixture of devices is installed. Additionally wait states on the board may be permanently enabled or disabled, or set to operate only when memory on the CPU board itself is accessed. This allows different speeds of memory ICs to be used. A further feature of the GM811's memory section is that the entire on-board memory block may be switched in or out of the Z80A's memory map under software control, allowing the full capacity of an external 64K RAM board to be utilised. The GM811 is supplied with Gemini's unique 4K RP/M monitor (see 'Software').

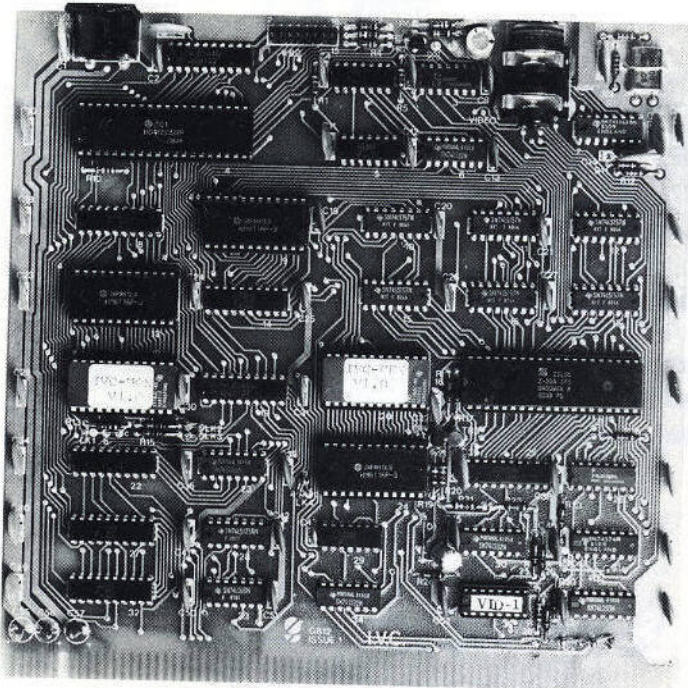
The GM811 also has extensive I/O facilities. Two 8–bit input/output ports are provided by a Z80A PIO in addition to a further 8–bit input port that may be used, for example, for connection to a keyboard. A serial interface includes programmable baud rates, full modem control signals, inputs and outputs at RS232 levels, and a highly reliable 1200 baud Kansas City/CUTS cassette interface.

Because of its extensive I/O capability and memory flexibility this board can be used in a wide variety of applications. It may be used by itself as a stand-alone controller, in conjunction with one or more I/O boards in a more advanced control capacity, or in combination with a whole range of 80–BUS boards as an extensive development system.

**GM811 – CPU with RP/M – £125**



# Video Boards



## GM812 – IVC BOARD

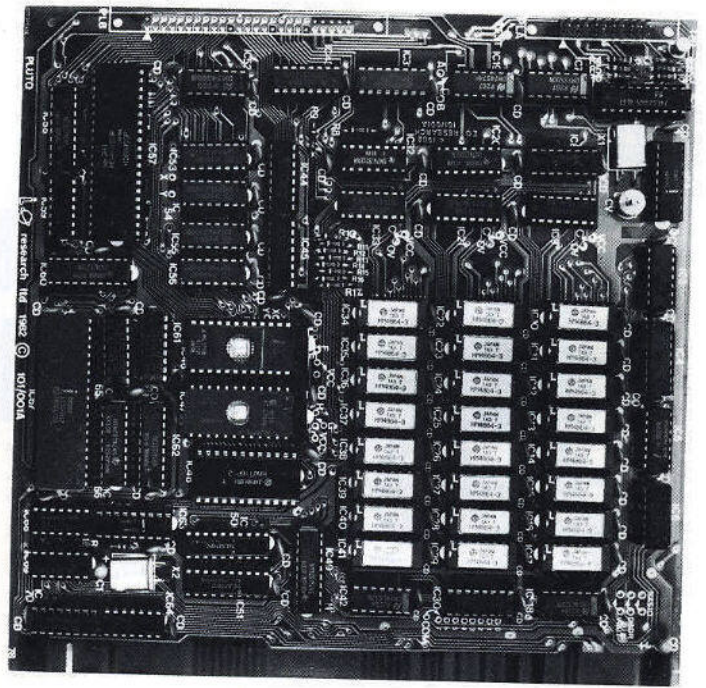
- \* 80 x 25 Display Format
- \* On-board Z80A Microprocessor
- \* Buffered Keyboard Input
- \* Programmable Character Generator
- \* 160 x 75 Pixel Graphics
- \* Light Pen Input

The GM812 Intelligent Video Controller (IVC) Board is an 80-BUS compatible video display board. It features its own on-board Z80A processor to allow the video section of the computer to provide a variety of complex video functions without imposing any memory or processing overhead on the main CPU. Communication between the GM812 and the host system is through the bus, via two Z80A I/O ports. All reading and writing to the screen is transparent, providing a flicker free display. The standard screen format of the GM812 is 80 x 25, the preferred format for most applications. The board also has an adjustable dot clock to provide alternative formats.

The standard character set of 128 characters provides all upper and lower case alpha-numerics plus some additional characters. Lower case characters have true descenders. An additional 128 character shapes may be defined under software control. These can be used to provide inverse characters, or pixel graphics characters with a resolution of 160 x 75. Alternatively the user may define his own characters under software control.

The GM812 includes both light pen and ASCII keyboard input sockets. The light pen input can resolve a single character on the screen. The keyboard input provides a buffer to allow 'type-ahead' without loss of characters.

**GM812 – IVC – £125**



## I0828 – COLOUR GRAPHICS PROCESSOR BOARD

- \* 640 x 576 Bit Mapped Display
- \* On-board 16-Bit Microprocessor
- \* Comprehensive On-board Software

The IO Research I0828A ('PLUTO') is an intelligent high-resolution colour graphics display board. It combines 192K bytes of dual-ported RAM with a fast 16-bit microprocessor which, in conjunction with a comprehensive on-board software package, provides a highly functional graphics system. Commands are issued to 'PLUTO' as a sequence of bytes over two Z80A I/O ports.

The I0828A provides a resolution of 640h x 576v, or two switchable screens of 640h x 288v, both in eight colours. The user may define his own characters and symbols.

A second version of the I0828 (I0828B – 'BABY PLUTO') is also available, providing the power and performance of 'PLUTO', but with 96K bytes of memory and half the resolution.

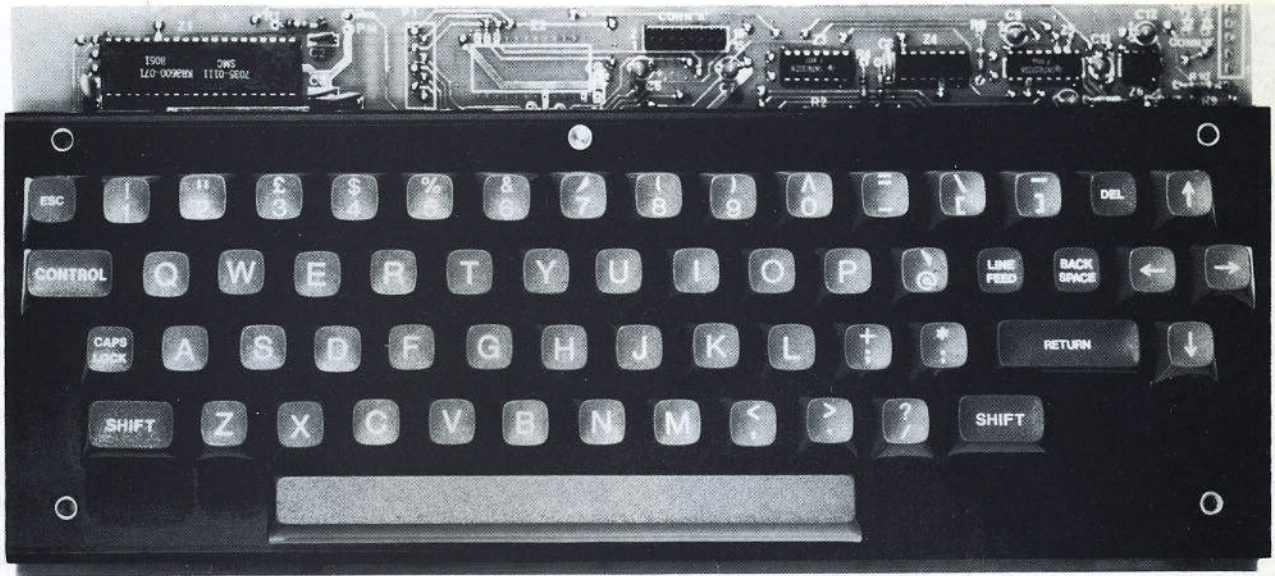
The I0828's on-board software provides a number of high-level functions, including fast vector draw and rectangle fill, both using REPLACE, XOR, AND and OR functions, and also copy and complex polygon colour fill commands.

**I0828A – 'PLUTO' COLOUR BOARD – £399**

**I0828B – 'BABY PLUTO' COLOUR BOARD – £299**



# Keyboards



## GM821 – 59 KEY KEYBOARD ▲

- \* 128 ASCII Code Output
- \* Cursor Control Keys

The GM821 is a 59 key ASCII encoded keyboard that has been exclusively designed for Gemini. The output of 7 data bits plus strobe provides 128 ASCII codes. The user would normally connect this to the GM812 IVC, thus benefitting from the input buffer on this board. The keyboard features cursor control keys, a caps. lock function, and auto-repeat action on all keys.

**GM821 – 59 KEY KEYBOARD – £57.50**  
**GM647 – KEYBOARD ENCLOSURE – £19.50**

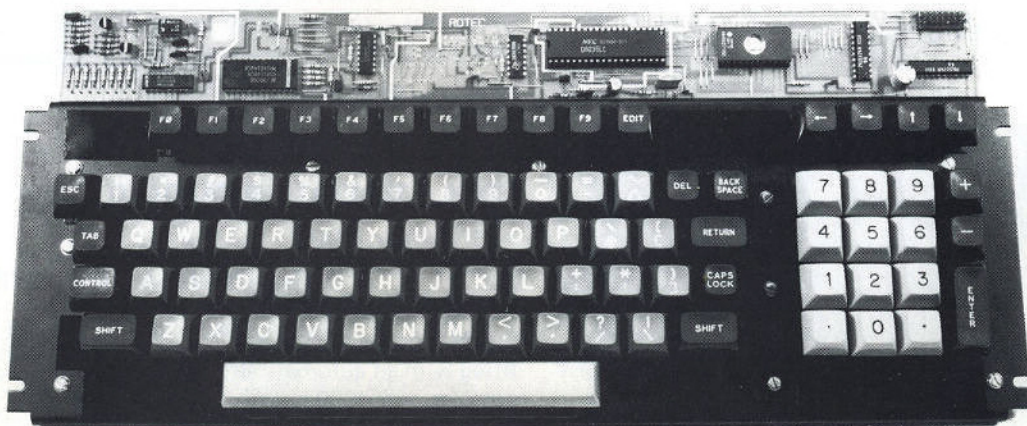
## GM827 – 87 KEY KEYBOARD

- \* User Definable Function Keys
- \* Numeric Keypad
- \* Cursor Control Keys

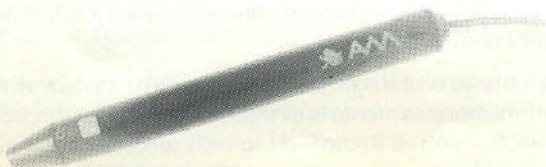
Exclusively designed for Gemini, the GM827 is an 87 key ASCII encoded keyboard, providing 11 function keys, cursor control keys and a numeric pad, in addition to the main 57 key cluster. These 30 additional keys return unique two-byte codes in both their normal and shifted modes, and software on the GM812 IVC then translates each of these 60 codes into strings that can be defined by the user, either directly from the keyboard or under program control.

The main key cluster of the GM827 provides 128 ASCII codes and includes TAB, ESCAPE, CONTROL and CAPS. LOCK keys. The output from the keyboard is 7 data bits plus strobe and is auto-repeating when any key is held down.

▼ **GM827 – 87 KEY KEYBOARD – £85**  
**GM664 – KEYBOARD ENCLOSURE – £25**



## AM820 – LIGHT PEN



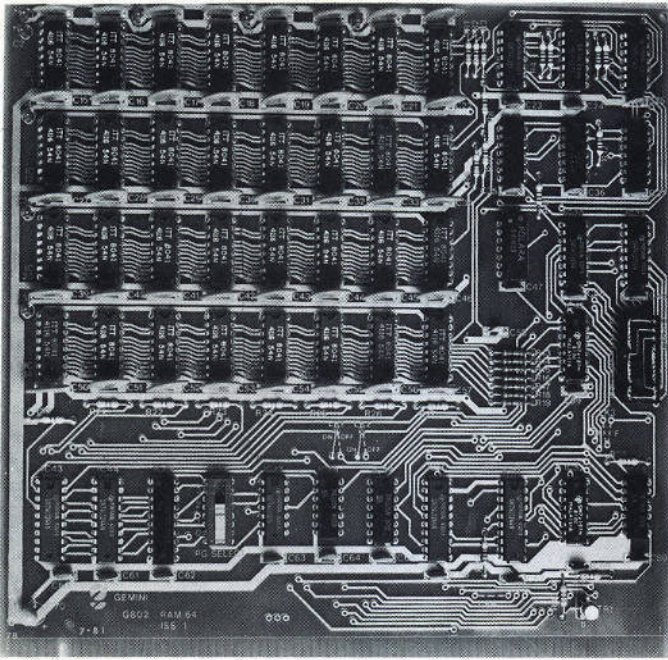
- \* Simple Connection
- \* Many Applications

This low cost light pen from Arfon Microelectronics plugs directly into the Gemini GM812 IVC board. It may be used in many applications including answer selection, editing, menu selection and movement of displayed data blocks.

**AM820 – LIGHT PEN – £35**



# Memory Boards



## GM802 – 64K DYNAMIC RAM BOARD

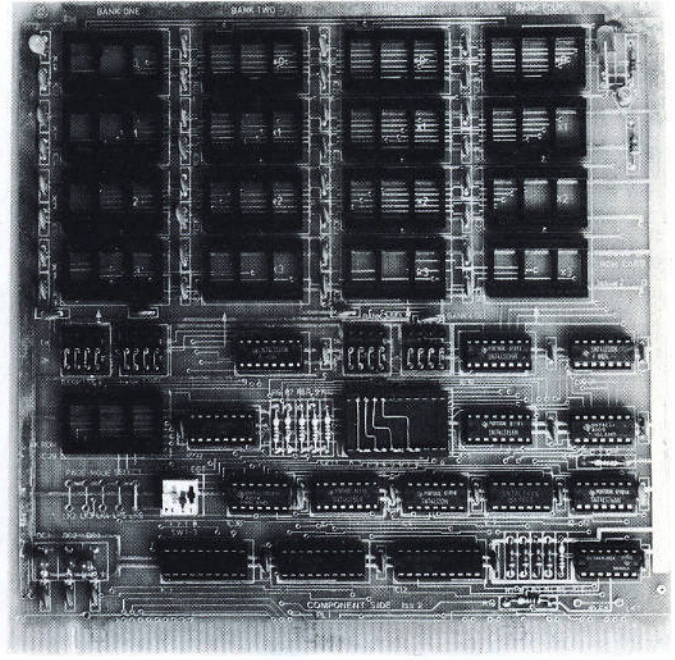
- \* 64K Dynamic RAM
- \* 4MHz Operation
- \* RAM Disable Function
- \* Page Mode Operation

The Gemini GM802 is a dynamic random access memory board with a capacity of 64K bytes, allowing the total memory capability of the Z80A to be implemented on a single board. The board utilises an active delay line to give full 4MHz operation, with no wait-states required.

The GM802 includes logic for a Page Mode operation which, when used with the appropriate software, allows up to four memory boards to be fitted in a single system.

Additionally this RAM board supports the 80-BUS RAMDIS signal. This allows the user to have ROM or EPROM in the system, the RAMDIS signal ensuring that there is no bus contention with the 64K RAM.

**GM802 – 64K RAM – £125**



## GM803 – EPROM/ROM BOARD

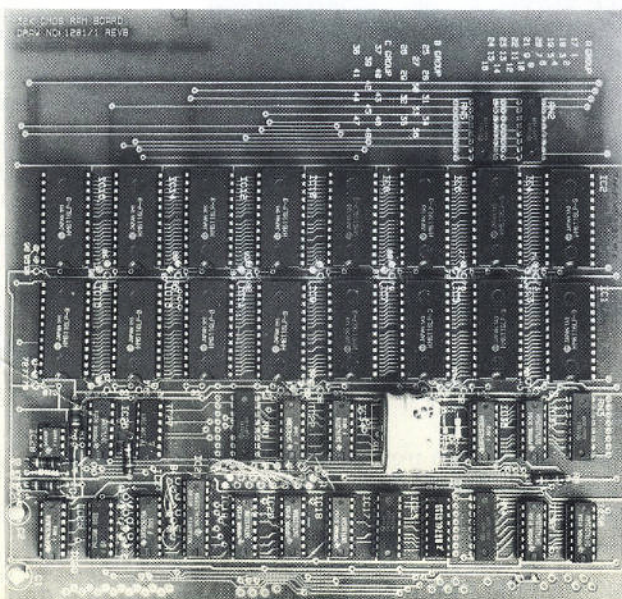
- \* Up to 40K of Firmware
- \* 2708 or 2716 Type EPROMs
- \* Page Mode Operation

The Gemini GM803 EPROM/ROM board is ideal for the user requiring a large amount of firmware in his system. This board caters for up to 40K of EPROM and ROM. There are 16 sockets organised in four banks of four and, as long as each bank contains the same type of EPROM, banks may be mixed between 2708 (1K x 8) and 2716 (2K x 8) devices. Each bank may be decoded to start at any 4K boundary.

The board also has a 24 pin MK36000 series 8K ROM socket, as well as a wait-state generator for use with slower EPROMs. When selected the wait-state facility is only active when the board is being addressed.

The GM803 supports the Page Mode scheme, which enables up to four memory boards to be fitted to a single system. The RP/M Page command allows memory contents to be transferred from one page to another with a single instruction.

**GM803 – EPROM/ROM – £65**



## MP826 – 32K STATIC RAM BOARD

- \* 32K Static RAM
- \* Battery back-up
- \* Page Mode Operation

The Microcode MP826 is a 32K CMOS static RAM board fitted with an automatically recharged battery back-up. This provides over 1000 hours of memory retention during power-down periods. The use of high speed RAMs allows full 4MHz operation, with no wait-states being required.

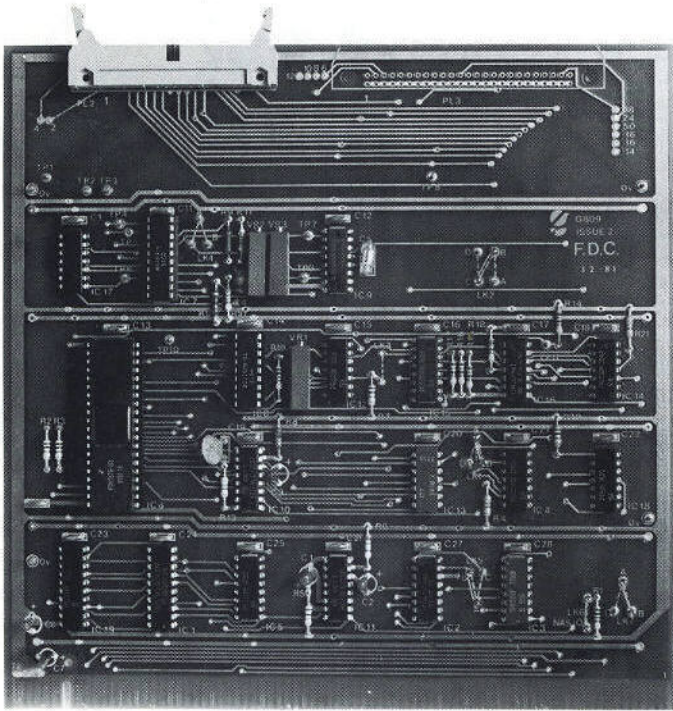
The flexible address decoding of the MP826, combined with logic for Page Mode operation, allows a wide range of possible memory configurations.

The ability to switch off the microcomputer system without loss of memory contents is extremely convenient, especially in systems involved in medium to high speed data-acquisition.

**MP826 – STATIC RAM – £185**



# Disk Systems



## GM809 – FDC BOARD

- \* Single/double density
- \* Single/double sided
- \* 8" or 5.25" Drives

The Gemini GM809 floppy disk controller board has been designed to be used with up to four 5.25" or 8" drives. These may be single or double sided, ordinary or double track density drives, in single or double density formats. Switching between single and double density is under software control.

To give high performance and reliability the board has variable write precompensation and phase locked loop data recovery circuitry. The board uses the latest Western Digital 1397 chip set and occupies 5 Z80A I/O ports. These ports may be set to one of two positions, allowing two GM809 FDC boards to be used in a single system.

The board is link selectable to allow either Pertec FD250 (48TPI) or Micropolis 1015 (96TPI) type 5.25" drives to be used. For use with 8" drives a small upgrade kit is available.

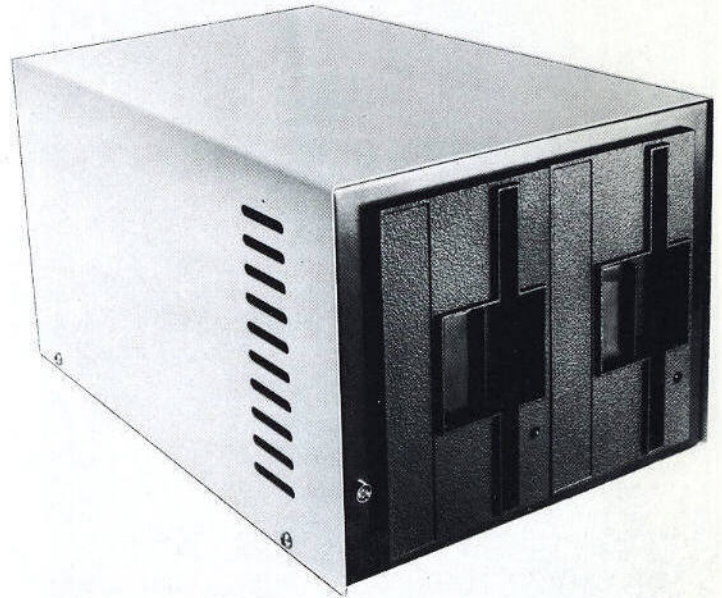
**GM809 – FDC – £125**

**GM605 – 8" UPGRADE KIT – £5**

## GEMINI DISK SYSTEMS – A BRIEF HISTORY

At Gemini we have always maintained a policy of constant development and improvement of our product range. Our first disk system, the GM805, was produced as an add-on to the Nascom computer range. The GM805 was a single density system using Pertec FD250 drives and providing 160K storage per drive, (Gemini SDDS format). This system proved extremely popular and from it we developed the again highly successful GM809/GM815 double density system, providing 350K per drive, (Gemini DDDS format).

However, the future of 48TPI (tracks per inch) drives such as the FD250 is limited as all manufacturers change over to the new high capacity 96TPI drives. These are the drives of the future, and these are the drives used in the Gemini GM825.



## GM825 – DISK DRIVE UNIT

- \* Integral Power Supply
- \* High Capacity Drives
- \* Stylish Enclosure

The Gemini GM825 floppy disk housing is supplied with either one or two 5.25" single sided, double density, 96TPI high capacity Micropolis 1015F5 disk drives. These provide 400K bytes of formatted storage per drive. (Gemini QDSS format).

The GM825 housing contains its own integral power supply for the drives and comes complete with the cable assembly for connecting to the GM809 disk controller board.

**GM825-1S – SINGLE DRIVE DISK UNIT – £350**  
**GM825-2S – DOUBLE DRIVE DISK UNIT – £575**  
**GM653 – ADDITIONAL DISK DRIVE – £240**

## New Product

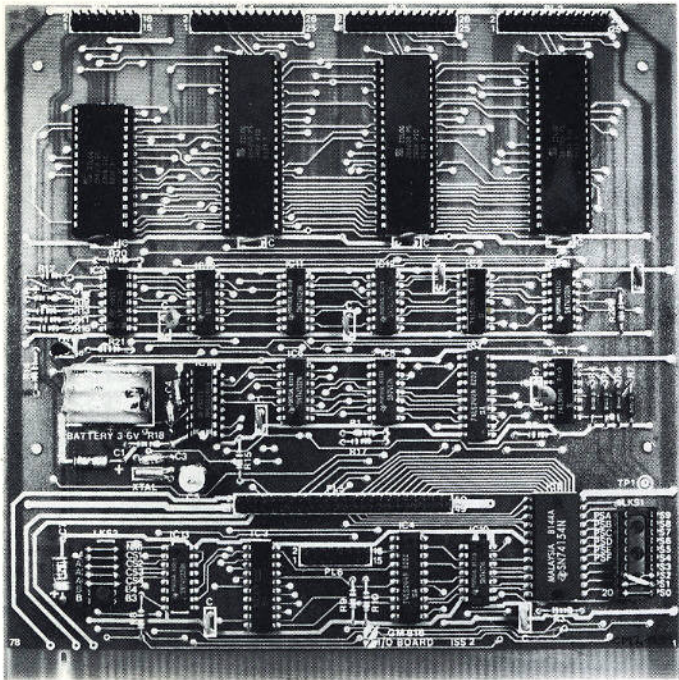
### GM835 – WINCHESTER DRIVE SUB-SYSTEM

- \* 5.4 Megabyte Formatted Capacity
- \* Industry Standard SASI Interface
- \* Integral Controller and Power Supply

**GM835-6 – WINCHESTER SUB-SYSTEM – TBA**



# I/O Boards



## GM816 MULTI-I/O BOARD

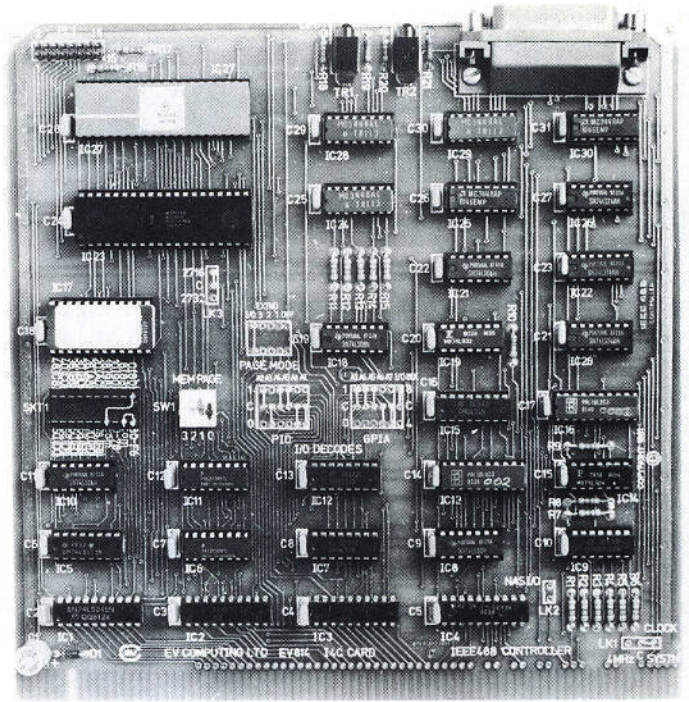
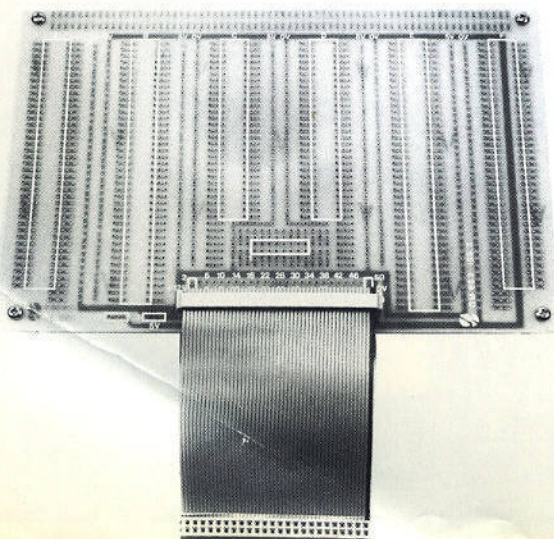
- \* 6 I/O Ports
- \* 4 Counter/Timer Channels
- \* Real Time Clock
- \* Further Expansion Capability

The Gemini GM816 Multi-I/O board provides a comprehensive means of interfacing with the outside world. Three Z80A PIOs provide 6 bi-directional 8-bit data ports with hand-shaking signals, a Z80A CTC provides 4 counter/timer channels, and an MM58174 provides a Real Time Clock. An on-board auto-recharging battery keeps the clock functioning during power-down periods, and the clock chip itself provides information from tenths of seconds to tens of months.

The GM816 has an internally decoded I/O bus, and provision has been made for a daughter board to connect into and mount onto the PCB to expand its I/O capability. Daughter boards may, for example, provide A-D or D-A conversion, opto-coupling, or additional PIOs, UARTs etc.

A prototyping daughter board (GM663) is available for custom applications. It comes complete with interconnect to the I/O board and mounting pillars.

**GM816 – MULTI-I/O – £125**  
**GM663 – DAUGHTER BOARD – £18**



## EV814 – IEEE488 CONTROLLER

- \* Cost Effective Controller
- \* Comprehensive Software Supplied

This board from EV Computing has been designed to fully implement all IEEE488 interface functions. It is capable of controlling any equipment fitted with a standard IEEE488 or GPIB interface.

Under the supplied software the interface responds both to standard IEEE488 message mnemonics, and a set of comprehensive macro commands. These may be typed on the keyboard or passed from the users BASIC or machine code program via a simple user routine.

The circuit board incorporates a standard IEEE488 bus connector and, together with the board's other features, this should enable the user to get his bus controller system up and running immediately.

With the increasing popularity of the IEEE488 interface bus, this board gives the user a very versatile method of controlling equipment on the bus at minimal cost.

**EV814 – IEEE488 – £140**

# New Products

## GM818 – SERIAL I/O BOARD

- \* 4 Serial I/O Channels
- \* Programmable Baud Rates
- \* Synchronous/Asynchronous Operation

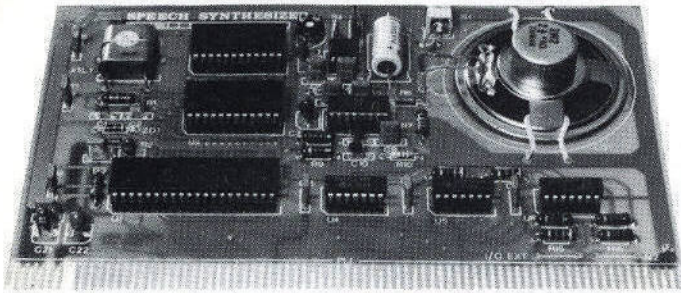
## GM818 – SERIAL I/O – TBA

## GM836 – NETWORK BOARD

- \* Allows Low Cost Networking System
- \* Up to 32 Stations
- \* Simple Interface to MultiBoard Systems

## GM836 – NETWORK BOARD – TBA



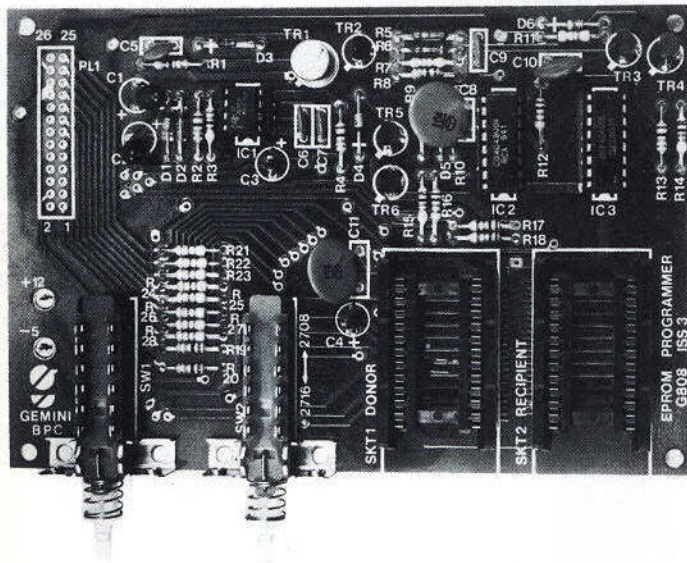


### AM819 – SPEECH BOARD

- \* Useful Vocabulary
- \* On-board Loudspeaker

The Arfon Microelectronics AM819 speech board utilises the National Semiconductor Digitalker chip set. This gives a vocabulary of over 140 words and sub-sounds. The sub-sounds may be used to further extend the vocabulary. An output socket is provided to allow an external amplifier and speaker to be used. Additionally an on-board speaker is provided.

### AM819 – SPEECH – £85

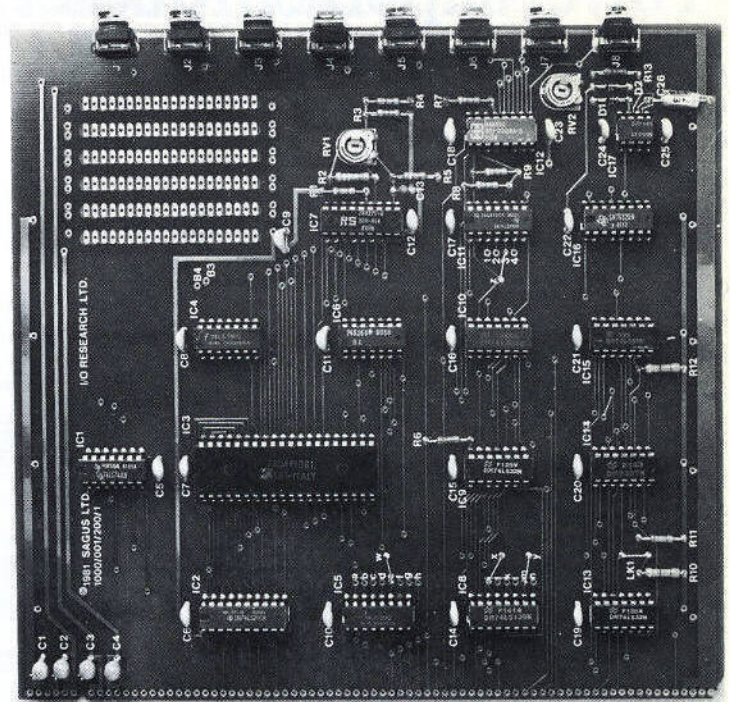


### GM808K – EPROM PROGRAMMER

- \* Programs 2708 or 2716 EPROMs
- \* Connects to Z80A PIO
- \* Software Supplied

The Gemini GM808K is a small board that connects to the Z80A PIO on the CPU or I/O boards. It allows the user to program 2708 (triple rail - 1Kx8) or 2716 (single rail - 2Kx8) EPROMs. The programmer is supplied with two low insertion force sockets to allow easy duplication of EPROMs. Software is provided to allow reading, programming, copying and verification of EPROMs.

### GM808K – EPROM PROG – £29.50 (kit)



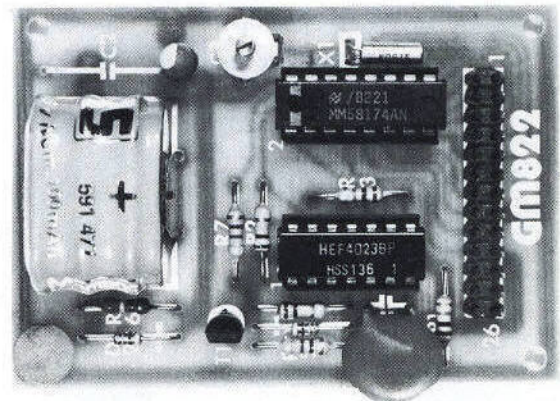
### I0824 – A/D BOARD

- \* 8 Input Channels
- \* 8 Bit Resolution
- \* Sample and Hold

The I0824 is an Analogue to Digital convertor board from IO Research. It provides 8 channels, each having a resolution of 8 bits. Inputs to the board are via jack sockets, the standard analogue input range being 0 - 5 volts. All input channels have over-voltage protection. Signal conversion time is approximately 30 micro-seconds, including a sample-and-hold phase.

The I0824 has full interrupt control, user configurable I/O addresses, an on-board prototyping area, and comes complete with a comprehensive manual.

### I0824 – A/D – £120



### GM822K – REAL TIME CLOCK

- \* Real Time Clock
- \* Calendar
- \* Battery Back-up

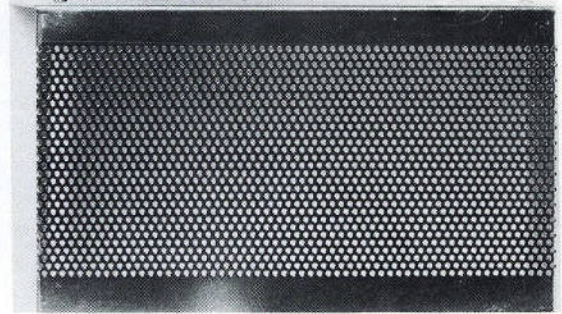
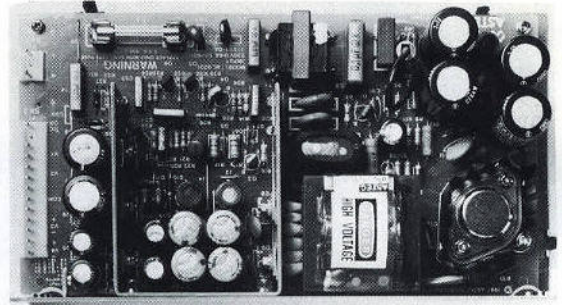
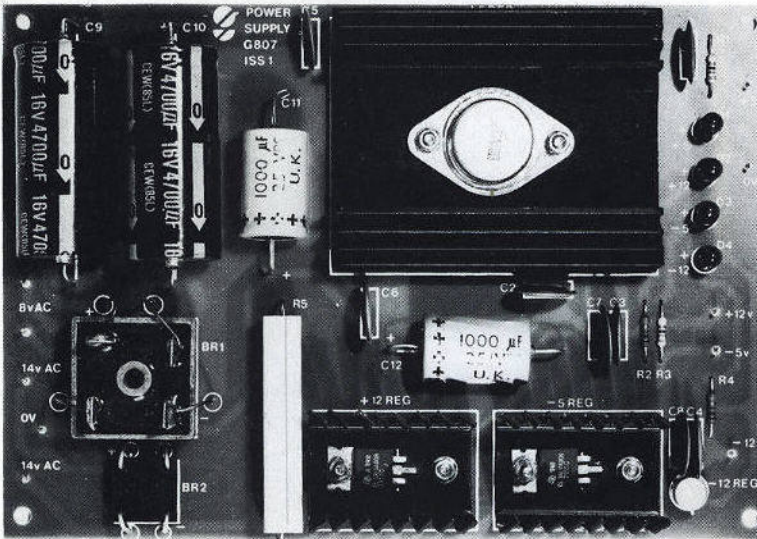
The Gemini GM822K is a small board that connects to a Z80A PIO. It uses the MM58174 real time clock chip that provides the time from tenths of seconds to tens of months. An auto-recharging on-board battery provides back-up when the computer system is switched off.

### GM822K – RTC – £29.50 (kit)



# Power Supplies, Motherboards and Frames

Gemini produces a wide range of power supplies, motherboards and frames to give the user the flexibility of expansion that he requires.



## GM807 – 3A POWER SUPPLY

- \* Compact Unit
- \* Ideal for Small Systems

For a system of 3 or 4 boards the Gemini GM807 3A power supply is ideal. Contained on a 7" x 5" board plus external transformer this unit has LED indication on all outputs and provides:-

+ 5V at 3A    - 5V at 1A  
+12V at 1A    -12V at 80mA

**GM807 – 3A PSU – £140**

## GM817 – 6A POWER SUPPLY

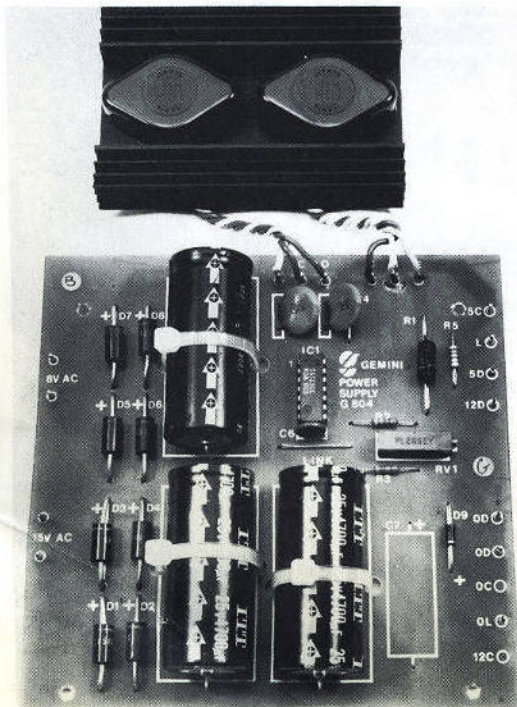
- \* Switch Mode Design
- \* Protected Outputs
- \* Compact Shielded Unit

The Gemini GM817 is a switch mode power supply of compact design and low magnetic radiation to conform to International Safety and RFI Regulations. Suitable for systems of 7 or 8 boards, or 4 or 5 boards plus two disk drives, the GM817 has dual line inputs and regulated outputs of:-

+ 5V at 6.0A    - 5V at 0.5A  
+12V at 2.5A    -12V at 0.5A

The GM817 measures 8" x 4.5" x 2.4"

**GM817 – 6A PSU – £75**



## GM804K – DISK PSU

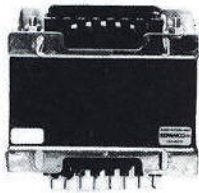
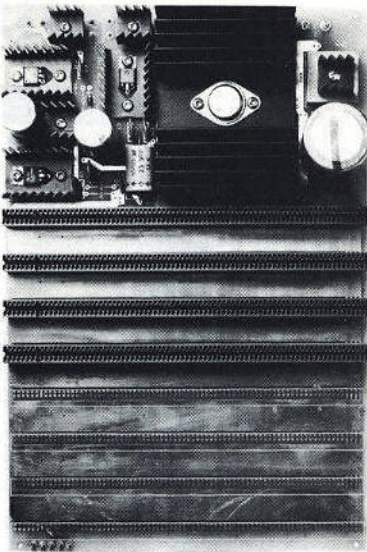
- \* Supplies 1 or 2 drives
- \* Compact Unit

The Gemini GM804K has been designed specifically for supplying the requirements of 1 or 2 5.25" disk drives. Contained on a single board plus external transformer the GM804K supplies:-

+ 5V at 1.2A    +12V at 2.8A

**GM804K – DISK PSU – £32.50 (kit)**





### GM810K – COMBINED PSU/MOTHERBOARD

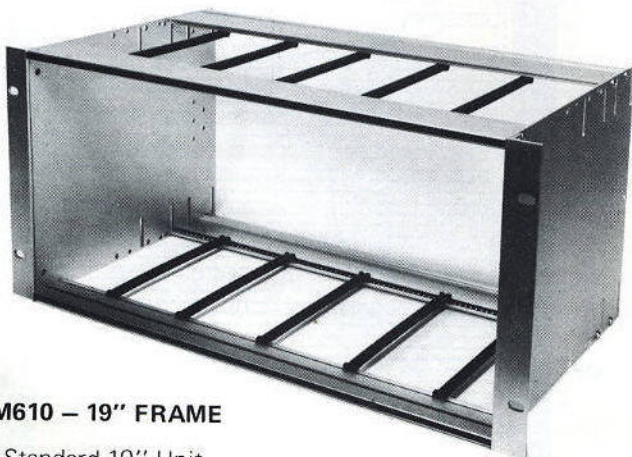
- \* 5A PSU
- \* 8 Slot Motherboard
- \* Extensive Ground Plane

The Gemini GM810K is a 12" x 8" board, providing a powerful 5A PSU in conjunction with an 8 slot motherboard. The motherboard incorporates full 80-BUS daisy-chaining and an extensive ground plane to reduce electrical noise to an absolute minimum. The power supply outputs are:-

+ 5V at 5A      - 5V at 0.5A  
 +12V at 1A     -12V at 0.5A

This product is ideal for mounting in a standard 19" frame.

**GM810K – COMBINED PSU/MOTHERBOARD – £69.50 (kit)**



### GM610 – 19" FRAME

- \* Standard 19" Unit
- \* Ideal for Development Systems

The Gemini GM610 frame is ideal for the user wanting a system consisting of a large number of boards and requiring easy access to them. The frame can support any of the Gemini motherboards (GM654, 655 or 656), or the Gemini GM810 combined 5A PSU and 8 slot motherboard.

**GM610 – 19" FRAME – £35**

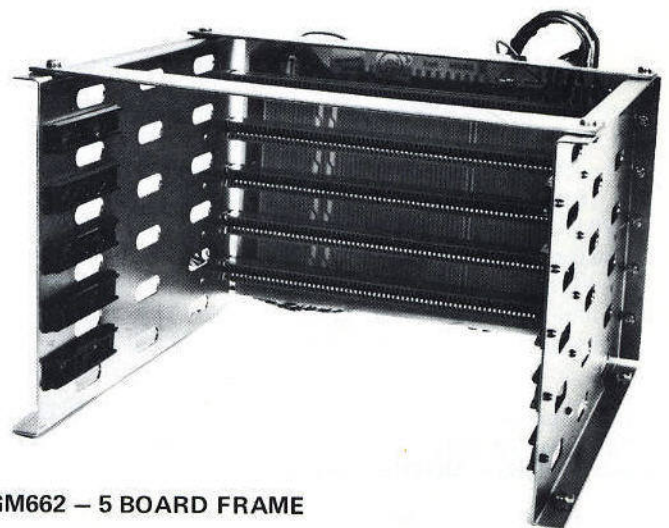
# Multiboard Accessories

## CABLES

GM615 – 26 way ID PIO Cable for GM811/GM813/GM816	£ 3.95
GM616 – 16 way ID Serial Cable for GM811/GM813	£ 2.50
GM617 – 16 way ID Keyboard Cable for GM811/GM812 to GM821/GM827	£ 3.95
GM646 – DB15(M) to DB15(F) Keyboard Cable (as on Galaxy 1)	£ 7.25
GM648 – 34 way ID Disk Drive Cable Assy (GM809 to 2 drives, 36")	£17.00
GM649 – 34 way ID Disk Drive Cable Assy (GM809 to 2 drives, 22")	£16.00
GM650 – 34 way ID Disk Drive Cable Assy (GM809 to 3 drives, 22")	£20.00
GM660 – Galaxy Video Cable (PL259 plug to Phono plug)	£ 1.26
GM665 – Centronics Type Parallel Printer Cable	£15.00

## CONNECTORS

GM619 – 34 way PCB Connector (Standard Disk Drive Type)	£ 4.75
GM625 – 16 way ID Socket (F)	£ 1.30
GM626 – 26 " " " "	£ 1.80
GM627 – 34 " " " "	£ 2.40
GM628 – 50 " " " "	£ 3.75
GM632 – 77 way (80-BUS) Edge Connectors	£ 4.30
GM634 – Edge Connector Clips (for GM632)	£ 0.10
GM640 – DB25 ID Socket	£ 5.00
GM641 – DB25 ID Plug	£ 5.00
GM642 – DB15 ID Socket	£ 3.50
GM643 – DB15 ID Plug	£ 3.00
GM644 – Centronics Type 34 way ID Socket	£ 3.75
GM645 – Centronics Type 34 way ID Plug	£ 4.95



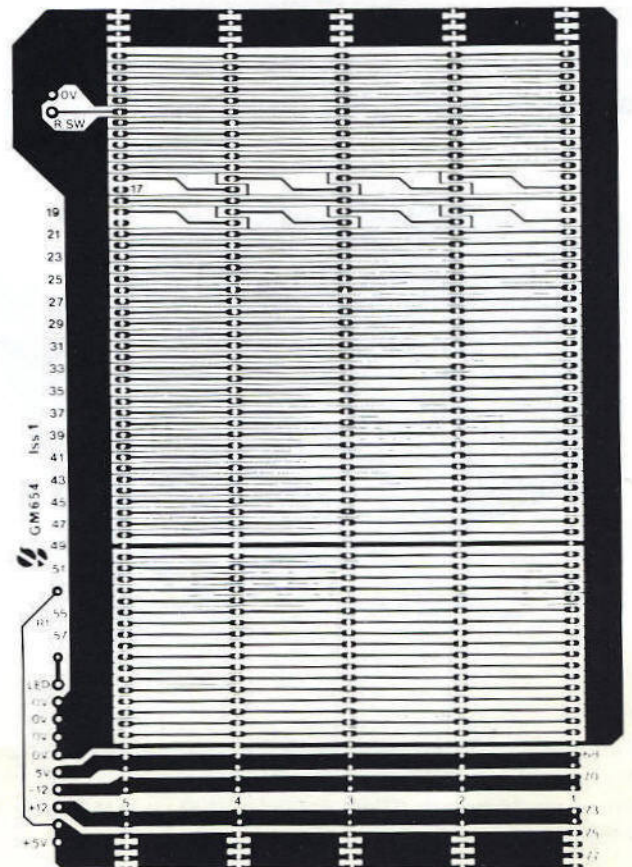
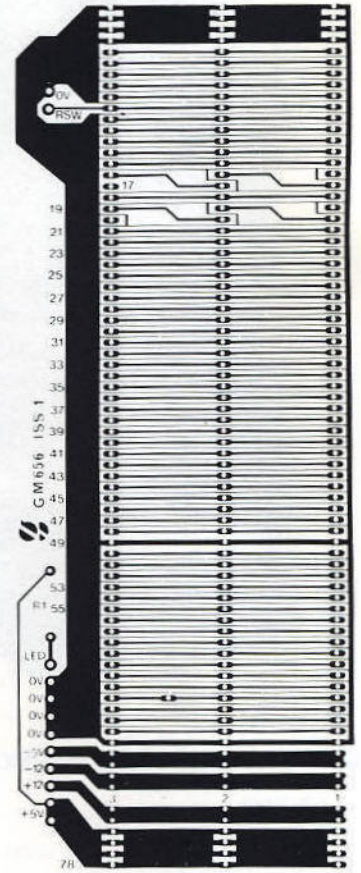
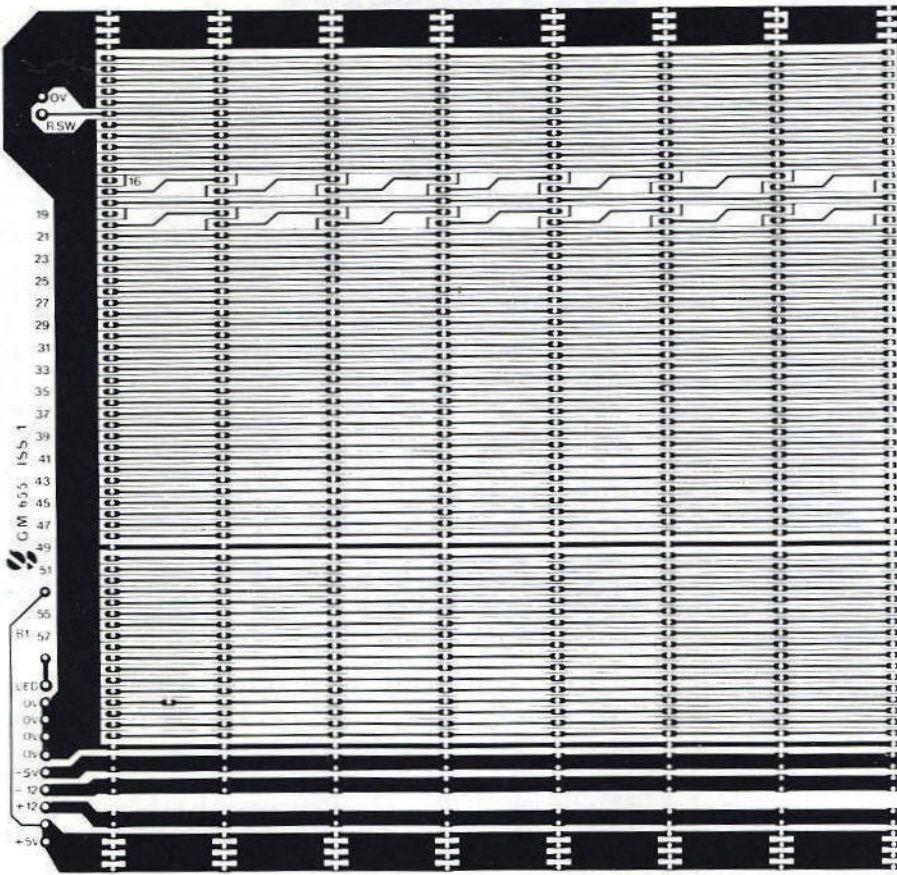
### GM662 – 5 BOARD FRAME

- \* 5 80-BUS Slots
- \* Wiring Loom Supplied

The Gemini GM662 frame comprises of a metal chassis fitted with a five card motherboard, five 80-BUS edge connectors and complete with a wiring loom. The loom can be connected directly to the GM817 6A switch mode PSU, and connectors are also included for attaching two Micropolis 1015 disk drives.

**GM662 – 5 BOARD FRAME – £50**





**GM654/655/656 – MOTHERBOARDS**

- \* 3,5 and 8 slot Motherboards
- \* Full Daisy-chaining
- \* Extensive Ground Plane

The Gemini motherboards cater for a wide range of system requirements. Available in 3 different sizes they all incorporate full 80-BUS daisy-chaining and an extensive ground plane to keep electrical noise to an absolute minimum.

- GM654 – 5 SLOT MOTHERBOARD – £6**
- GM655 – 8 SLOT MOTHERBOARD – £10**
- GM656 – 3 SLOT MOTHERBOARD – £5**



# Software

For disk system users Gemini have implemented the CP/M 2.2 disk operating system (DOS). CP/M is the accepted industry standard DOS and consequently there is already a vast software base upon which Gemini users can draw. For cassette based systems Gemini have adopted the RP/M monitor which has been written in such a way as to be upward compatible to CP/M. This compatibility means that Gemini are able to offer a number of packages written specifically for MultiBoard that may be run on either disk or cassette based systems without modification to the code.

## RP/M

RP/M is the resident operating system on the GM811 CPU and GM813 CPU/RAM boards. The concept behind RP/M is that software should be compatible between Gemini computers regardless of whether or not disks are used. Therefore, from the point of view of the programs being executed, RP/M has been written to appear as much like CP/M as possible. However the code used is quite different and the commands are simple and do not resemble those provided by CP/M.

RP/M provides a useful series of commands for processing tape files, examining and manipulating ports and memory and executing programs. RP/M can also 'boot' a disk, so that it is still needed if a disk system is added. Commands are fully checked for errors and a wide range of error messages produced. Special features of RP/M, when used in conjunction with the GM812 IVC, include on-screen editing, both of commands and within user programs, and the ability to 'dump' the contents of the screen to a printer.

**GM537 – RP/M V2 (2732 EPROM) – £20**  
(supplied with GM811 and GM813).

## CP/M

For disk system users with the GM809 FDC board and GM815 or GM825 Disk Drives Gemini have produced the GM512 and GM532 CP/M 2.2 packages. Each of these contain a master CP/M 2.2 disk and extensive documentation. As well as the standard CP/M programs (PIP, STAT, SUBMIT, SYSGEN etc.) the disk contains five Gemini supplied utility programs:-

FORMAT – formats and verifies blank disks  
BACKUP – provides a fast means of copying disks for back-up purposes  
CONFIG – allows easy setting of BIOS options (see below)  
READCAS ) allow tape and disk files to be transferred  
WRITCAS ) between media, the tapes being in RP/M format.

In a CP/M system the BIOS is the software interface between the CP/M operating system and the specific hardware in use. In these CP/M packages the BIOSs are extremely comprehensive. Extensive error checking, reporting and retry facilities are included. The printer routines incorporated allow for serial, serial with handshake or parallel printers to be connected, and a very powerful on-screen editing facility is provided.

**GM512 – CP/M 2.2 PACKAGE (Gemini DDDS format) – £90**  
**GM532 – CP/M 2.2 PACKAGE (Gemini QDSS format) – £90**

## COM-PAS

COM-PAS is a complete programming package based on the high level programming language Pascal, and consists of a powerful screen editor, and a one pass compiler. The use of these has been integrated so that on finding an error during compilation, the compiler automatically invokes the editor and moves the cursor to the point of error, ready for immediate editing and recompilation, so decreasing program development time substantially.

COM-PAS compiles a large subset of standard Pascal, and includes many extensions to give increased versatility, including a string type, random access file handling, bit and byte manipulation, and direct access to memory locations and I/O ports. Compilation is performed directly into native Z80 machine code, at a speed of up to 5000 lines per minute on a 4MHz system, and the compiler supports two modes of operation. In the disk file mode the object code is linked to the 5K run time package and stored as a machine code file, whereas in the interactive mode the object code is stored directly into memory so it can be executed immediately, thus decreasing development time still further.

**GM522 – COMPAS DISK (Gemini DDDS format) – £120**  
**GM523 – COMPAS DISK (Gemini QDSS format) – £120**

## COMAL-80

COMAL-80 combines the simplicity of BASIC with many powerful Pascal constructs. It is strongly oriented towards use in an interactive mode by providing helpful typing and debugging aids such as free format input, line-by-line syntax checking and run-time error messages which identify the offending line. Most importantly, the use of line numbers and a built in operating environment of simple commands avoids the need for a separate text editor.

COMAL-80 includes most of the usual BASIC statements, and at the same time extends many of BASICs facilities, for example, allowing long variable names. Many COMAL-80 constructs are modelled after Pascal and are thus block structured. These include IF-THEN-ELSE, REPEAT-UNTIL, WHILE and CASE statements. Procedures may be written which have local variables and parameters which are called by value or by reference. These features encourage structured programming and make COMAL-80 an ideal language for both the beginner and trained programmer alike.

**GM527 – COMAL-80 DISK (Gemini DDDS format) – £100**  
**GM538 – COMAL-80 DISK (Gemini QDSS format) – £100**



## GEMZAP

GemZap is an assembler/editor package written specifically for the Gemini MultiBoard system operating under CP/M or RP/M. The basic concept of GemZap is that it includes all facilities required to enter and assemble source programs without the need of intermediate transfers of source text to and from disk or tape.

The assembler translates standard Z80 mnemonics into executable Z80 machine code. A wide range of pseudo operation codes are supported by GemZap including all standard Z80 and 8080 codes and conditional assembly. Through an assembly option you can select for an object file to be created. Other assembly options allow for the object code to be loaded into memory during assembly, and for creation of assembly listings. Full control of the list device is provided, to allow for paginated output with headings.

The editor is an on-screen editor. Features include find and replace commands, tabulator commands, and block commands for copying/deleting blocks of the source text. All commands are control characters or escape sequences. When a character is entered it is inserted directly into the text at the current cursor position. The source text is stored in memory using space compression, which will compress any number of contiguous blanks into one byte. Hence the source text can be tabulated into columns with no waste of memory.

- GM517 – GEMZAP TAPE (RP/M format) – £45**
- GM518 – GEMZAP DISK (Gemini DDDS format) – £45**
- GM539 – GEMZAP DISK (Gemini QDSS format) – £45**

## GEMDEBUG

GemDeBug is a software tool that can be used for debugging user written assembly language programs. It provides the means to load a program and monitor its execution. Programs can be single-stepped through suspect areas and the register usage can be monitored. Trace, untrace and line-by-line disassembly features are included.

Instructions provided include:-

- Display, Fill, Move and Modify memory
- Find a specified byte sequence
- List memory in mnemonic form
- Execute program (setting breakpoints)
- Trace or Untrace program execution
- Read file from tape or disk
- Read or Write to a Z80 I/O port
- Examine (and change) Z80 registers

- GM525 – GEMDEBUG TAPE (RP/M format) – £30**
- GM526 – GEMDEBUG DISK (Gemini DDDS format) – £30**
- GM540 – GEMDEBUG DISK (Gemini QDSS format) – £30**

## COPYSB

For computers with the GM809/GM815 disk system, COPYSB will copy entire disks between Gemini double density (DDDS) format and Superbrain QD or DD formats. Transfer may take place in either direction, and the program will also format disks in Superbrain formats.

- GM531 – COPYSB DISK (Gemini DDDS format) – £35**

## GEMPEN

GemPen is a text editor/formatter package developed specifically for the MultiBoard system running under RP/M or CP/M.

GemPen is aimed at the small business user and home computer user who requires a high standard of presentation on fairly short pieces of text, drafts and repetitive letters. GemPen is also designed to be used as a context editor for general use under RP/M or CP/M, where the extensive screen editing commands may be used in the preparation of source listings etc. The files sent to tape or disk are entirely compatible with ASCII files produced using standard CP/M release context editors. It is designed to be used by operators unused to computers and to this end its operation is kept as similar as possible to that of a typewriter, in as much as all commands are single keystrokes with immediate action and with a display of exactly what is in the text buffer at any time. No parameters have to be given with any command except those concerned with 'Find' functions and the reading of files from disk. All text formatting details such as line length and page lengths are changed by single keystrokes. GemPen has been designed to be simple to use by any typist or secretary untrained in the use of computers.

All text formatting is carried out in the text buffer and is displayed as it would be printed. There is no need for complex print time format parameters to be included or understood, which gives considerable advantages to the part time user. The maximum amount of text that can be worked on at any time is only limited by the maximum memory available to the computer system.

- GM519 – GEMPEN TAPE (RP/M format) – £45**
- GM521 – GEMPEN DISK (Gemini DDDS format) – £45**
- GM541 – GEMPEN DISK (Gemini QDSS format) – £45**

## LIST

LIST is a program to replace the CP/M 'TYPE' command. The user may specify an ambiguous file name, and list the files to the screen and/or the printer. All output is paginated, with headings that may either be specified by the user, or will default to the filename. Lines may optionally be numbered.

Listing may be interrupted and then skipped forwards or backwards by any number of pages. Alternatively, listing of any file may be aborted, in which case listing of the next file specified will commence.

- GM542 – LIST DISK (Gemini QDSS format) – £15**
- GM530 – LIST with REPAIR DISK (Gemini DDDS format) – £25**

## REPAIR

REPAIR is specifically for GM809/GM815 disk systems. This program allows the user to read and write to sectors of a disk directly. It can be used to recover files that have been accidentally erased, provided that they are still uncorrupted on the disk. It can also be used to recover source files from a disk on which the directory has been destroyed or corrupted.

- GM530 – LIST with REPAIR (Gemini DDDS format) – £25**



# Multiboard Based Systems

## VIZ: :APL

VIZ: :APL is the fullest implementation yet of APL for a microcomputer. APL is an interactive language, its compact notation making it ideal for the limited space available on a micro. Simple syntax makes it easy to learn and use, the power of its operators reduces enormously the need for iteration, and no data declarations are required as APL allocates space as it needs it.

One of the most powerful features of VIZ: :APL is that it is a virtual system. VIZ: :APL automatically overlays system components, primitives, user functions and variables as required. This gives an enormous effective increase in memory available to the user, potentially limited only by the amount of disk storage provided.

VIZ: :APL is a complete high level language system. It can be used to develop small programs faster, and large programs where there would not normally have been sufficient memory. The language can be enhanced almost indefinitely, and a library of the users own operators and functions can be built up.

**GM528 – VIZ: :APL DISK (Gemini DDDS format) – £255**

**GM544 – VIZ: :APL DISK (Gemini QDSS format) – £255**

## THE LAST ONE

'The Last One' is a programmer's design aid and code generator. It uses techniques evolved from work in the field of artificial intelligence combined with a highly interactive mode to determine the exact requirements of the user. 'The Last One' then takes over the tedious chore of turning this detailed 'flowchart' into lines of accurate coded BASIC, providing bug-free code.

The time taken to do any job is so short that any alterations to specifications or changes in file structures that need a complete program rewrite can be performed on the spot. The time saved in coding gives the user the opportunity to try out ideas that would otherwise be too time consuming to put into practice.

'The Last One' is used in conjunction with Microsoft's MBASIC (to be purchased separately by the user). Yet no knowledge of BASIC programming is required since all input is performed using question and answer routines written in plain English. Included in the price of 'The Last One' is a comprehensive manual to enable the programs to be generated as easily by the novice as by the expert.

**GM545 – 'THE LAST ONE' DISK (Gemini DDDS format) – £330**

**GM546 – 'THE LAST ONE' DISK (Gemini QDSS format) – £330**

## GEM-GRAPHPAC

This relocatable package from CCSOFT links with Microsoft's MBASIC and provides over twenty additional commands for controlling the block graphics capability of the GM812 IVC.

**GM547 – GEM-GRAPHPAC DISK (Gemini DDDS format) – £35**

**GM548 – GEM-GRAPHPAC DISK (Gemini QDSS format) – £35**

## ECONOMY BASIC

This package, also from CCSOFT, runs under CP/M or RP/M on a system fitted with the GM812 IVC. Written with the cassette user in mind, it is less than 8K long. This BASIC supports floating point numbers and incorporates GEM-GRAPHPAC.

**GM549 – ECONOMY BASIC TAPE (RP/M format) – £25**

**GM550 – ECONOMY BASIC DISK (Gemini DDDS format) – £35**

**GM551 – ECONOMY BASIC DISK (Gemini QDSS format) – £35**

## GEMINI GALAXY



- \* Twin Z80A Processors
- \* CP/M 2.2 Operating System
- \* 64K Dynamic RAM
- \* 800K disk capacity
- \* 80 x 25 video display
- \* Serial and parallel printer interfaces
- \* Cassette and light pen interfaces

The Galaxy computer is built around the Gemini MultiBoard products described in this catalogue.

The GM662 5 board frame is used to house the GM813 CPU/RAM or GM811 CPU and GM802 RAM, GM812 IVC and GM809 FDC boards. Twin Micropolis 1015F5 drives provide the disk storage, and power is supplied by a GM817 switch mode supply. A GM821 or GM827 keyboard is fitted in a GM647 or GM664 case and various cable assemblies connect all of the boards' interfaces to the rear panel of the Galaxy case and to the keyboard. The system is completed by a GM532 CP/M 2.2 package.

Further details of the Galaxy are available on request.



Microcomputers & word systems



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