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Dear Sir,

We have great pleasure in enclosing our new MultiBoard Microsystem Catalogue.

Catalogue Number 5 has been designed to give a more complete picture of the growing range of 80-BUS products, paying particular attention to showing how the configuration of systems is possible. We have also included information on future products, and in so doing, hopefully emphasise the philosophy and direction which Gemini is pursuing.

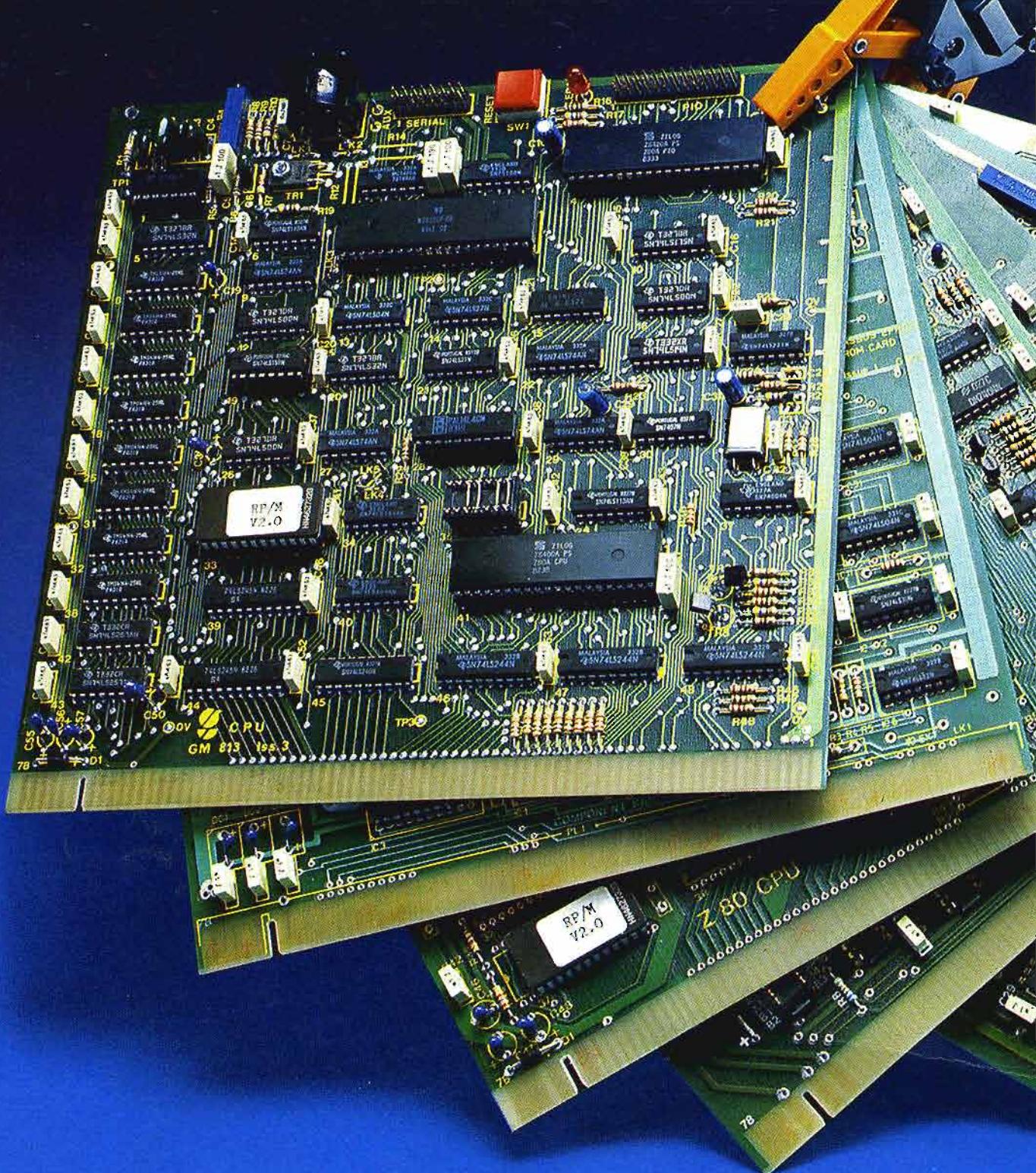
This catalogue is complimented by our Systems Catalogue Number 1, which provides more detailed information on our MultiBoard systems, namely the Gemini 2, Gemini 3, Gemini 4 MultiNet, Multi-Format-Bios and Quantum series of Microcomputers.

In conjunction with this catalogue, enclosed is our latest Price List with which we believe that it is possible for those customers who require it, to calculate the cost of a system configured to their own requirements. For all potential customers however, it does indicate the cost effectiveness of buying a flexible and expandable Gemini MultiBoard Computer System.

If you wish to learn more about the Gemini MultiBoard range of products, or wish to discuss your requirements further, please contact your local Gemini Dealer now.

Yours faithfully,

Ross Boxshall
SALES MANAGER



Gemini MultiBoard Microsystem CATALOGUE No.5

Introduction

This new MultiBoard microsystem catalogue has been changed in format from its predecessor in order to give a more complete picture of the very large range of products currently available for the 80-BUS. In particular, attention has been paid to showing potential customers how they can configure systems and also a lot more mechanical detail has been included.

In order to prolong the useful life of this catalogue, we have published some preliminary information of products which will not be available until later in 1985. However, details are included so that potential customers may understand the underlying philosophy and direction which Gemini is pursuing.

Gemini MultiBoard Microsystem – the expandable solution

The Gemini MultiBoard system was first introduced in 1980. Since then a large range of BUS compatible boards have been produced by both Gemini and a number of other companies.

The philosophy behind MultiBoard allows for a totally flexible approach to the configuration of computer systems, thereby meeting the exact requirements of the user. The majority of competitive systems offer limited features in expansion capability or flexibility. With the MultiBoard system your requirements may be met with a system comprising of only one board or by combinations of up to 10 or even more boards.

80-BUS Expansion

The first specification for 80-BUS was produced in 1978. The version which is now adopted by Gemini and other companies was established in 1980. Unlike alternative BUS structures the 80-BUS was specifically designed to support systems using the Z80. Although the Z80 continues to be one of the most widely used microprocessors, Gemini have now introduced an Intel 8088 processor based board which will act as a co-processor on the 80-BUS system.

CP/M and RP/M Operating System

The principal advantage of a Z80 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. Gemini's local area network (LAN), MultiNet, takes advantage of the vast range of CP/M software by making each workstation on the network appear to be a stand-alone CP/M system. 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 bytewide 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 appropriate.

If a video output is required the Gemini GM832 super video controller board can provide an 80 × 25 format, pixel graphics and a programmable character generator. The GM832 also provides 256 × 256 bit mapped graphics and also character attributes, including half-tone which can be particularly useful in wordprocessing applications. Colour graphics can be added to the system by using either the Gemini GM837 Microvector board, the IO828 PLUTO board, or the IO864 PLUTO II board, both from IO Research.

If mass storage is needed then one or even two floppy disk controller boards can be added to the system. Each board can handle up to four floppy disk drives including 8", 5.25" types. A further one or two 5.25" Winchester drives can be

incorporated into the system, and a wide range of additional memory add-on boards are available, including 64K and 256K dynamic RAM, 32K and 64K static RAM, 512K (RAMDISK) or a bytewise EPROM board.

Recognising the importance of providing an abundance of I/O facilities, Gemini has paid particular emphasis recently to expanding its range of I/O boards, which now include parallel I/O, serial (RS232) I/O, IEEE488 and A/D boards. Further expansion to the range continues and a modem board will be added in due course.

Finally, the Gemini MultiNet networking system allows the MultiBoard user to interconnect systems by adding GM836 network interface boards to the CPU boards. Unlike many systems this Network facility can be introduced retrospectively without any conflict.

Distribution Policy

MultiBoard products are available through Gemini's dealer network and also through approved distributors in Western Europe. The name and address of your nearest supplier can be obtained by contacting Gemini direct.

Any products listed within this catalogue, not manufactured by Gemini, are also made available from the Gemini dealer network, both in the UK and Overseas.

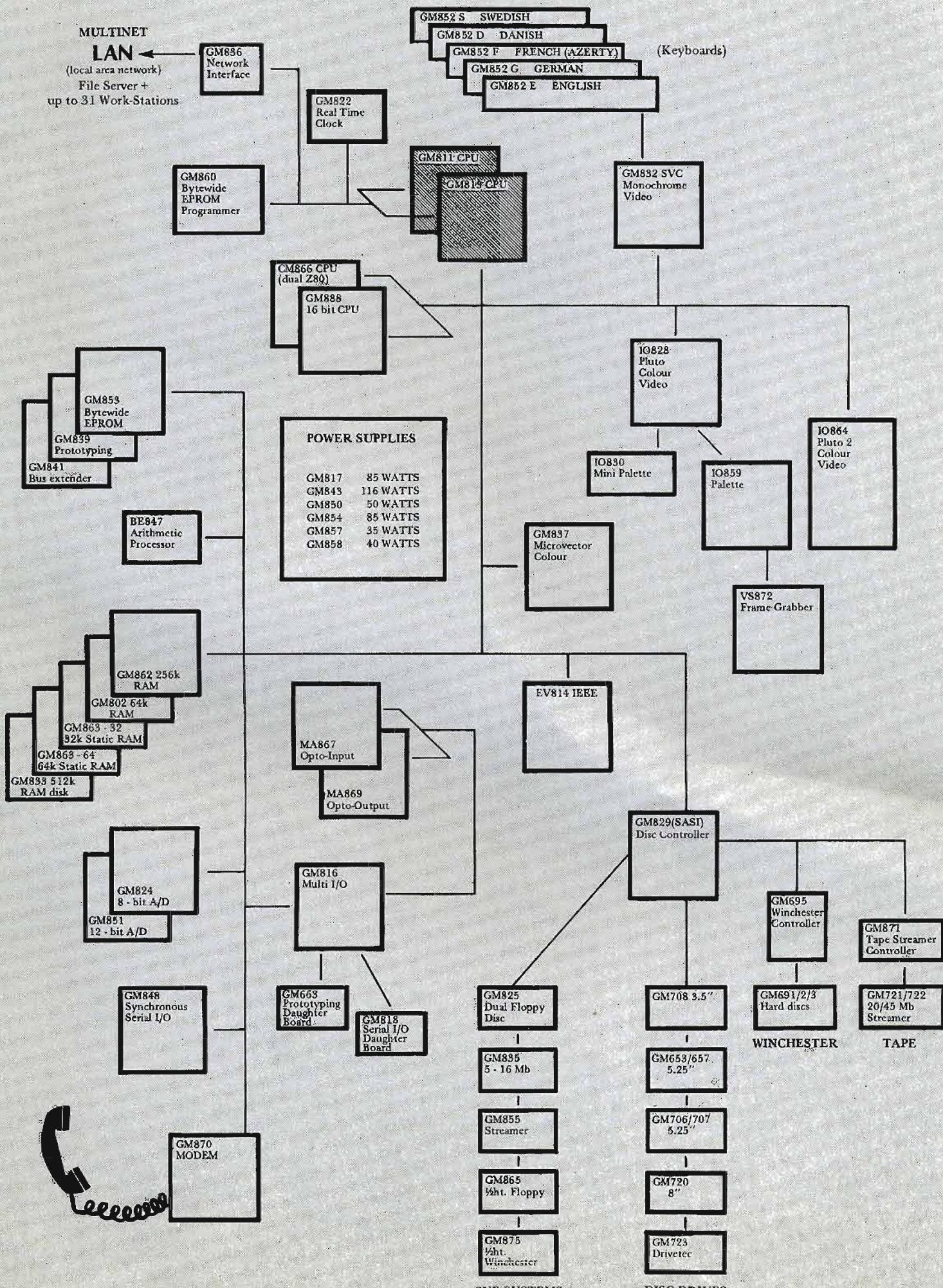
Addresses of all third party manufacturers have been supplied and all requests for further technical information should be directed towards these suppliers.

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The 80-BUS Microsystem





Examples of MultiBoard Systems

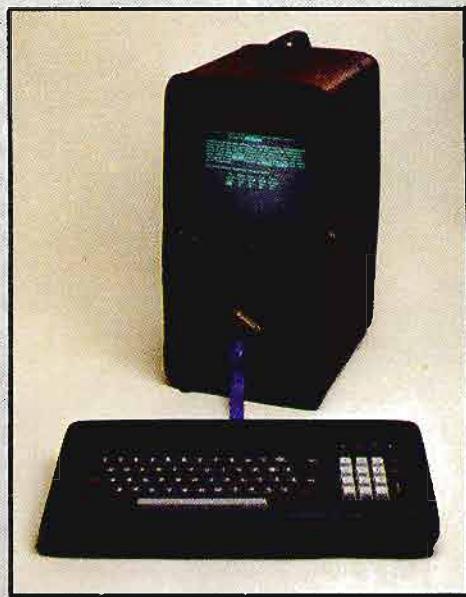
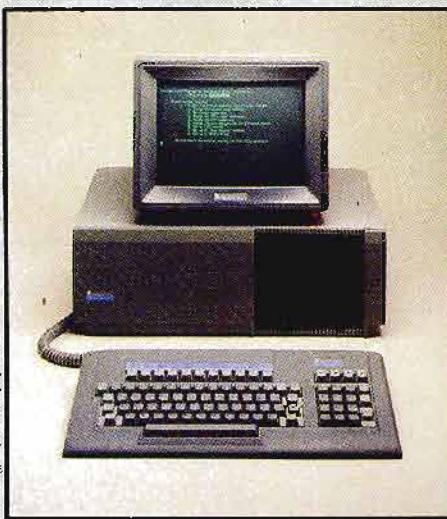
The flexibility of the Gemini 80-BUS allows the user to configure a wide range of computer systems. Although many customers prefer to manufacture their own dedicated system profiles, Gemini have produced 4 ranges of machines in system configurations which will find a wide appeal.

Gemini 2 ▶

The Gemini 2 system provides a high-performance system based around the GM813 CPU/64K RAM board, GM832 SVC board and GM829 FDC SASI board, together with two 800K floppy disk drives. The system incorporates a GM685 6-card rack which has 3 empty slots for future expansion. A 12" green monitor is supplied with this system, together with the Gemini GM852 keyboard.

GM905 – 2 x 800K floppy disk drives

GM906 – 1 x 800K floppy disk drives



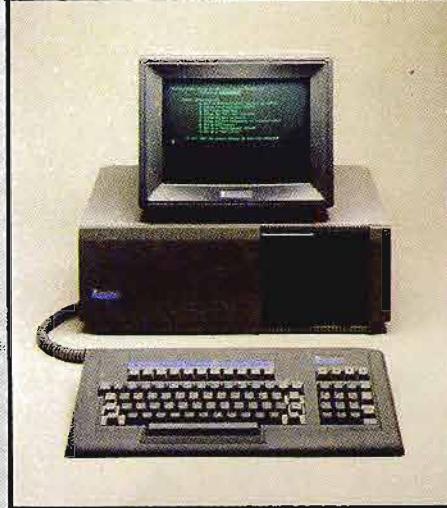
Gemini 3 ▶

The Gemini 3 is a Winchester hard disk based system. Once again, the standard GM813, GM832 and GM829 boards form the backbone of the system but an additional GM695 Winchester controller board is added in order to provide an interface to the hard disk. The Gemini 3 is both available in either 10.8 or 16.2 MegaByte versions and a 96 TPI 800K floppy disk drive is also provided. A 12" green monitor and GM852 keyboard are provided with this system.

GM908 – 1 x 10.8 MByte Winchester

GM914 – 1 x 16.2 MByte Winchester

GM924 – 1 x 20 MByte Winchester



Kenilworth ▲

The Kenilworth is an example of an OEM client using the Gemini MultiBoard range of 80-BUS boards, in this instance to produce a very professionally finished portable computer offering all the I/O facilities provided on the Gemini and Quantum ranges of systems.

Fitted with an 80 x 25 screen display on a 9" monitor, full screen editing under CP/M is provided via a standard QWERTY layout keyboard with a numeric pad and cursor control keys. The disk storage is provided on dual TEAC fast seek drives, offering a maximum of 1.5MB.

When not in use, the Kenilworth is as small as your filing tray; release the keyboard, and away you go!

This very compact system, ergonomically shaped to aid ease of carrying, has an overall size of 19" x 14.5" x 9.5" and weighs 28 pounds.

Gemini 4 MultiNet System

The Gemini MultiNet local area network (LAN) can support up to 31 work stations from a fileserver. Each workstation appears to the user as though it were a stand-alone CP/M disk system, and in most cases, this would be a diskless device. The workstation is built around the GM813 and GM832 boards, together with keyboard and a 12" green monitor.

Superstations (a workstation with local disk) can also be integrated into the network. This local disk facility can be either a floppy or hard disk and is particularly useful where one location might be subjected to a disproportionate amount of use.

The system is connected on an "open loop" configuration utilising a low cost, conventional twisted pair cable for the physical connection. The maximum end-to-end length of the cable is 600 metres (2000') and the locations of the fileserver and workstations are not critical. The data transmission rate is 250K baud.

GM909 Workstation (illustrated) ▶

GM912 10.8 MByte File Server

GM915 16.2 MByte File Server





Examples of MultiBoard Systems



Gemini 4 Colour Workstation (GM 923)

Gemini can now provide a colour workstation which utilises both the GM813, and GM832 boards, a 12" green monitor and GM852 keyboard, together with the IO Research PLUTO board. The workstation requires a high-resolution, long persistence colour monitor and provides exceptionally sophisticated graphics capability.



Gemini M-F-P

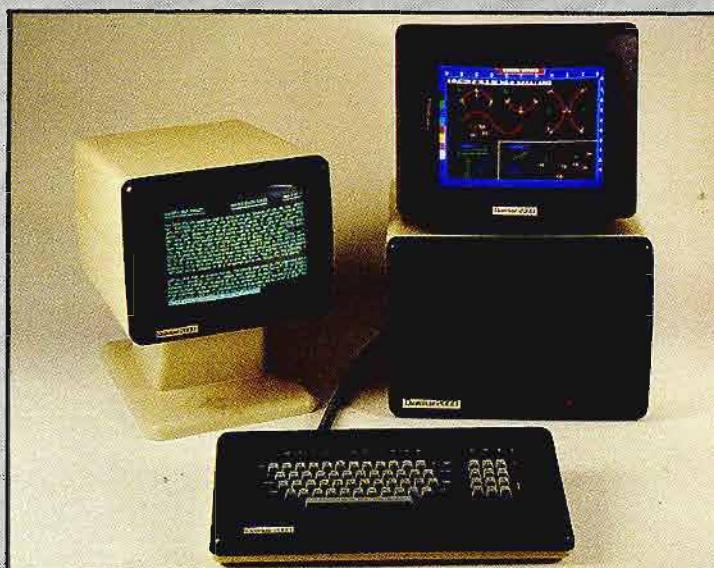
The flexibility of the MultiBoard is graphically illustrated with the Gemini M-F-B (Multi-Format-BIOS) system which facilitates the transfer of data from one media to another. The full M-F-B system comprises the main CPU unit which has a Winchester hard disk together with both 48 TPI and 96 TPI floppy disks, and an ancillary drive sub-system is available with either 8" or 3.5" drives.

Gemini fully support the system software of this product, and the system is now capable of handling over 400 different machine type and format combinations.

GM916 5.4 MByte system

GM921 16.8 MByte system

8" and 3.5" drives must be ordered separately (see page 24)



Quantum 2000

The Quantum range of systems has been developed to exploit the potential of certain vertical markets.

Current applications include:

CAD/CAM Workstation for use with a lathe.
Interactive Video System for training.
GENISYST twin Winchester system for General Practitioners.

Each variant of the Quantum is based around the GM813, GM832 and GM829 boards, and additional cards and drives are integrated as required. The system contains an 8-way motherboard assembly together with a robust power supply.

Special versions of the Quantum can accommodate the new PLUTO II board which has a 12" x 8" form factor rather than the conventional 8" x 8" normally found with 80-BUS boards.



Enclosure Components

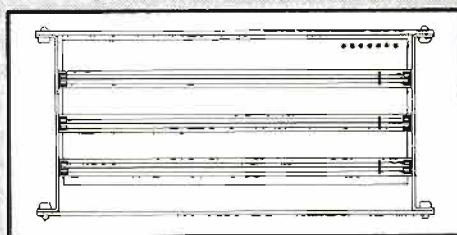
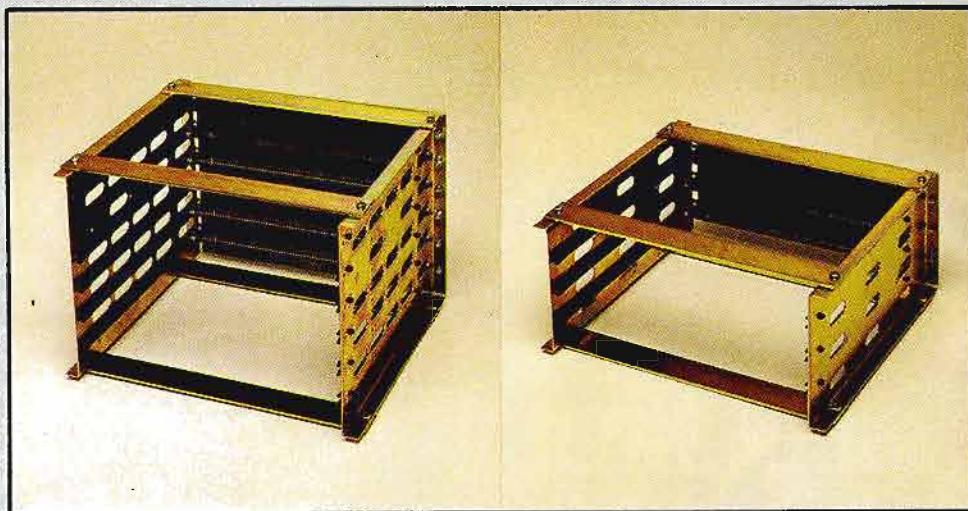
The component parts used to assemble the Gemini range of systems are available separately. The most commonly used building blocks are the 3- and 6-card frames, but in some applications, a 19" rack with an 8-way motherboard assembly is possibly more appropriate.

GM685 and GM686 Frames

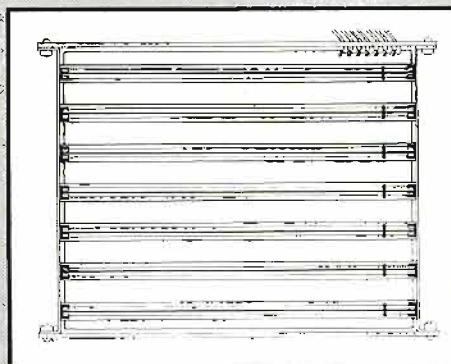
- 6 or 3 80-BUS slots

■ Wiring Loom Supplied

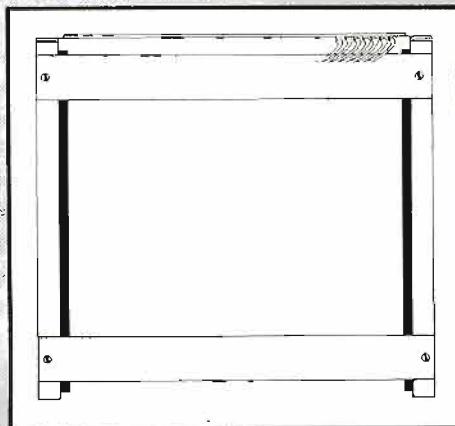
The Gemini GM685 and GM686 frames comprise metal chassis fitted with six or three card motherboards respectively. 80-BUS edge connectors and complete with a power supply wiring loom. The loom can be connected directly to one of the Gemini switch-mode power supplies, and in the case of the GM685, connectors are also included for connecting two floppy disc drives.



Front view GM686



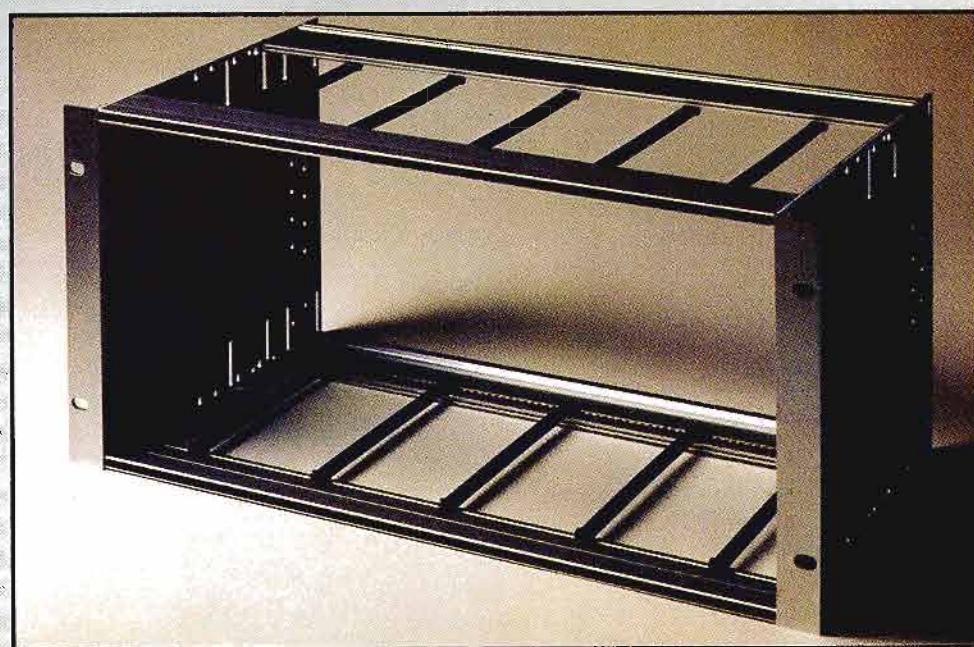
Front view GM685



Top view of GM685 and GM686

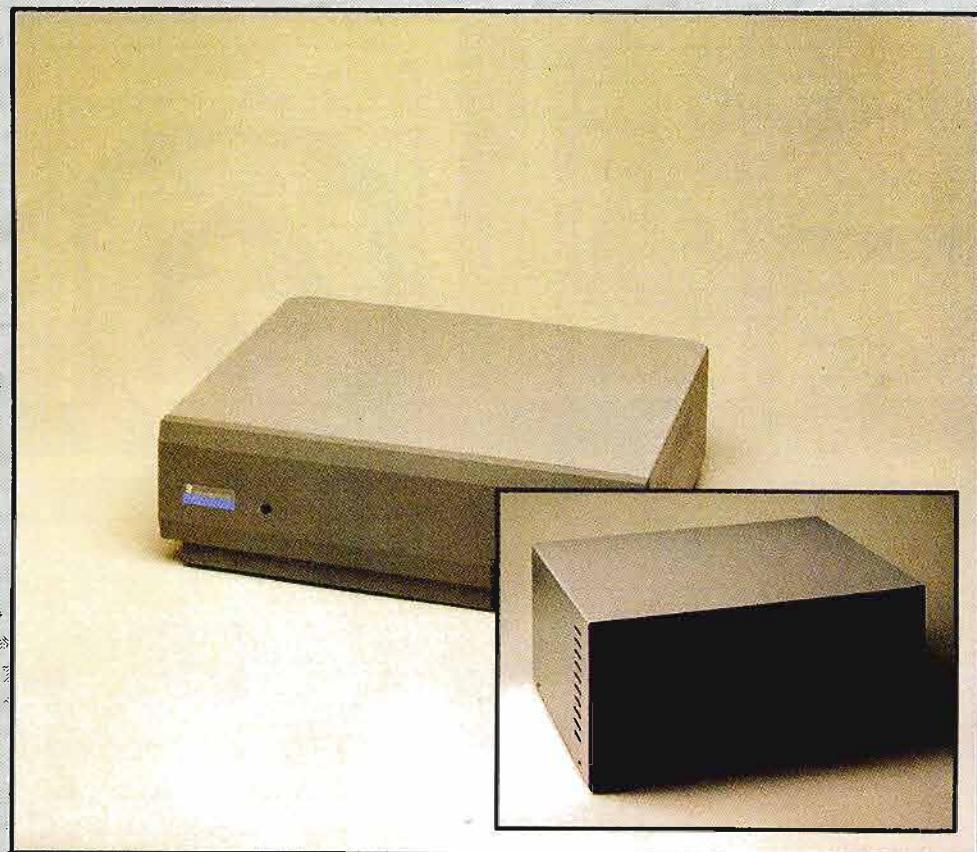
The GM610 19"

The GM610 19" rack provides the ideal framework for an extensive development system. The products "in design" which compliment this are the GM843 power supply (PSU) in metalwork, which can be attached to the left-hand side of the frame and a floppy disk drive mounting assembly, which is attached to the right and can accommodate up to two 5.25" devices.

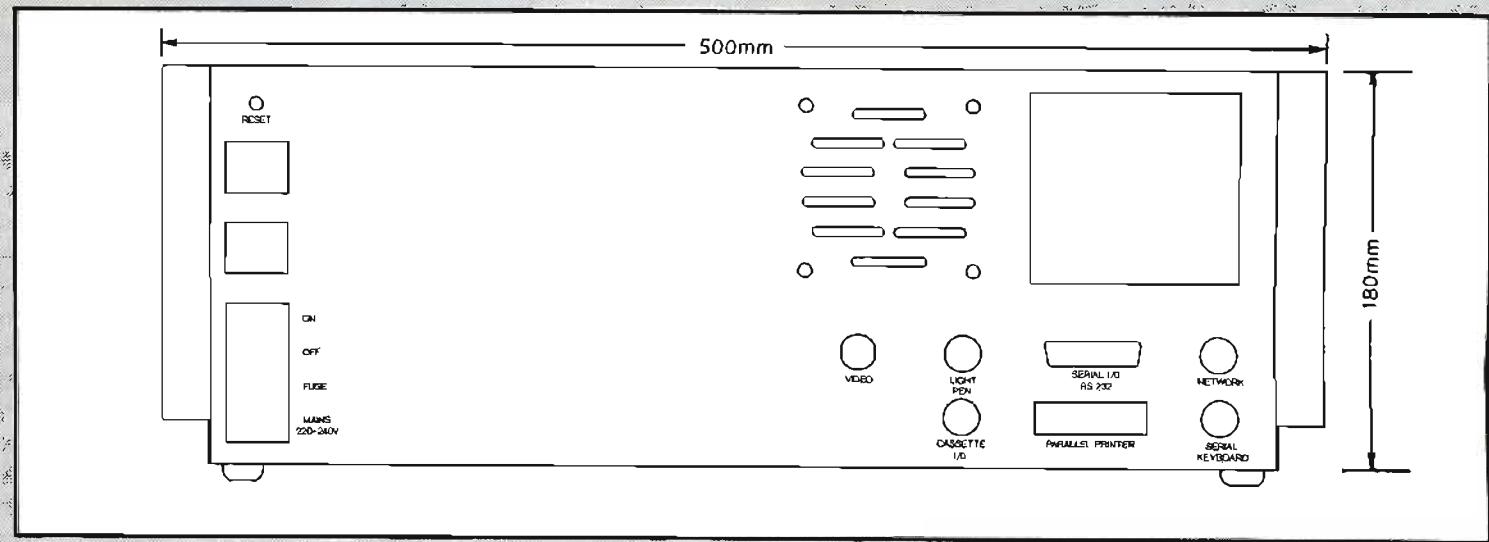




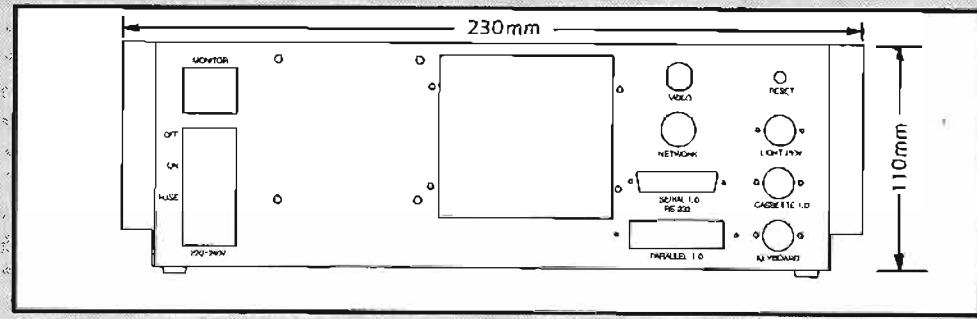
Enclosure Components



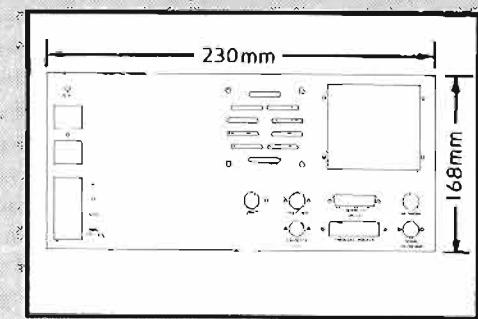
Enclosures are available to house the GM685 and GM686 frames. The GM685 6-card frame can be housed in either the GM661 enclosure which also accommodates 2 full height disk drives on the diskless GM688. The GM686 3-card frame can be housed within the GM687 enclosure.



GM661



GM687



GM688



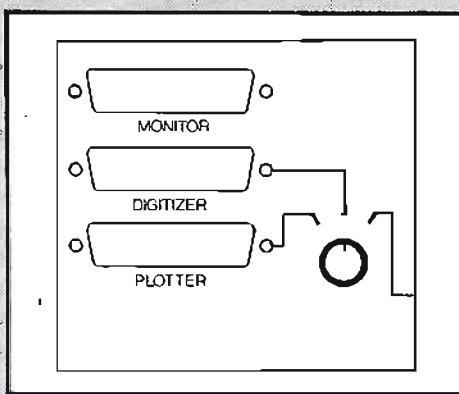
Enclosure Accessories

Since many customers would prefer to procure systems by specifically defining each component part, this catalogue has been laid out to allow this approach to be exploited to the full.

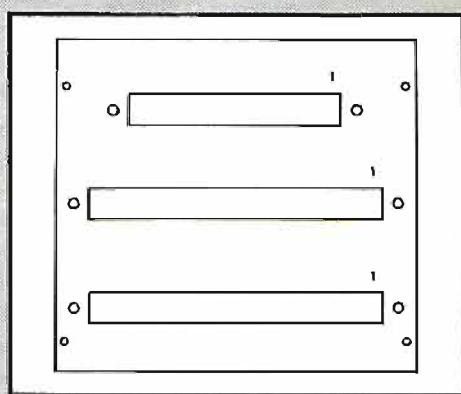
All of the component parts of the Gemini range of systems can be procured individually. In addition to the parts used regularly by Gemini, a range of ancillary interconnecting devices are also available.

On this page drawings are shown of the various back plates available for our enclosure range. The 5 larger plates have become standard on our new range of enclosures. The 4 smaller designs are suitable for use with the original Galaxy range.

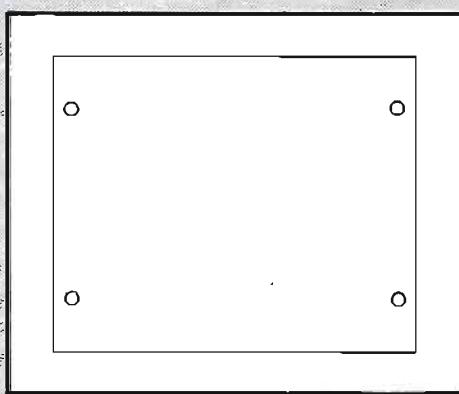
Gemini also supplies a full range of plugs, sockets, cables and other auxiliary components.



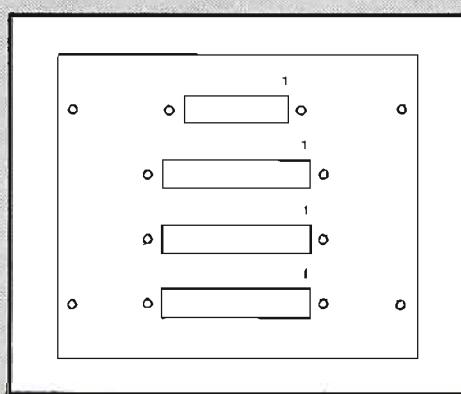
GM710



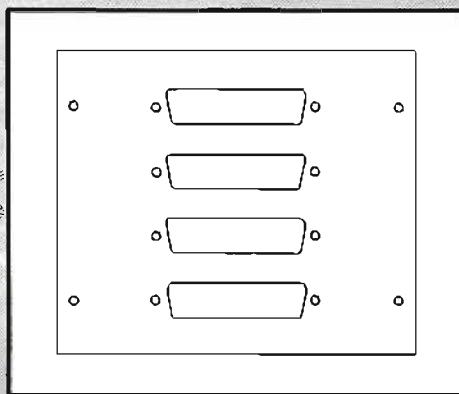
GM712 - 1 x 34 way IDS and 2 x 50 way IDS



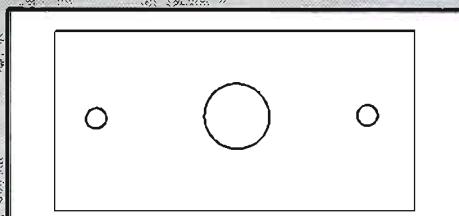
GM726 Plain



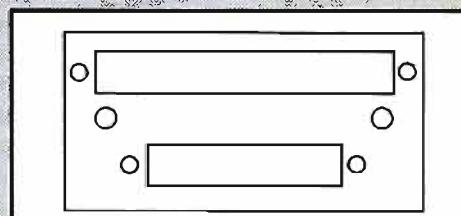
GM713 3 x 26 way and 1 x 16 way IDS



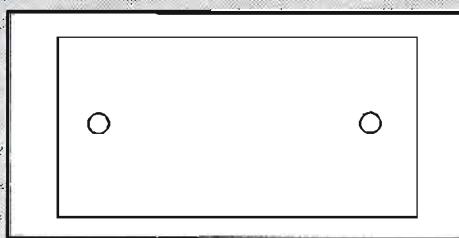
GM711 4 x DB25 sockets



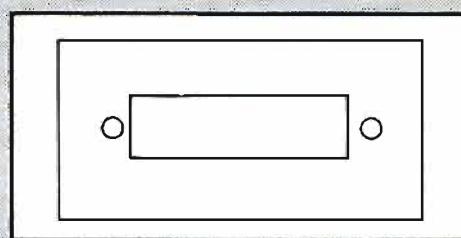
GM703 for MultiNet



GM718 1 x 50 way and 1 x 34 way IDS



GM702 Plain

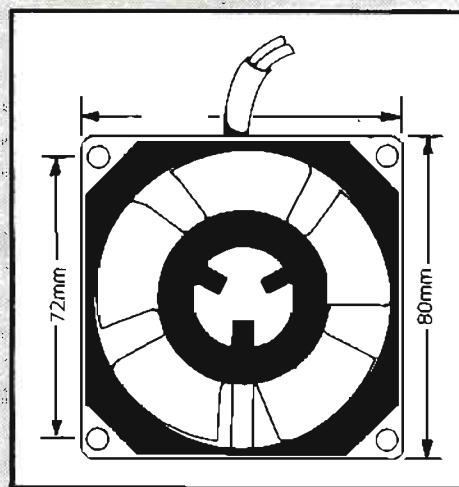


GM704 IEEE 488

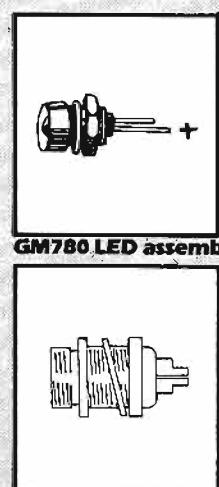
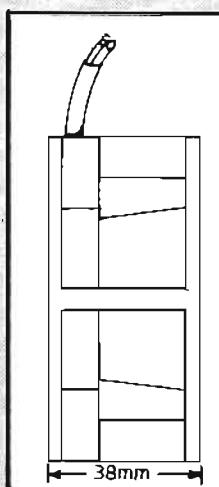


Enclosure Accessories

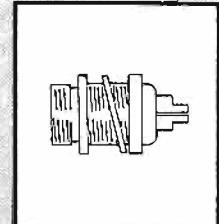
Some of the large range of components used in our systems are depicted here. A complete list is shown in our price list.



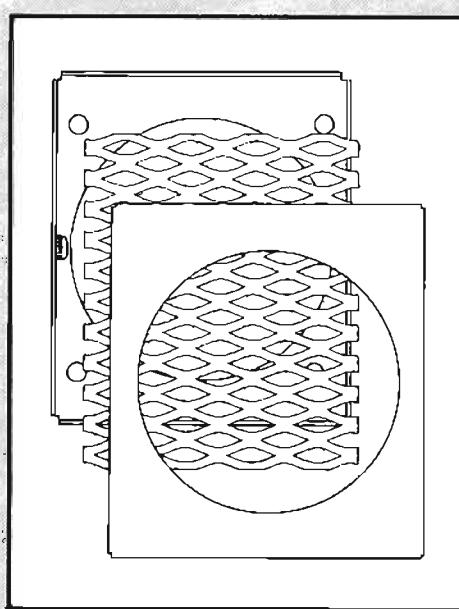
GM690 Mains Fan



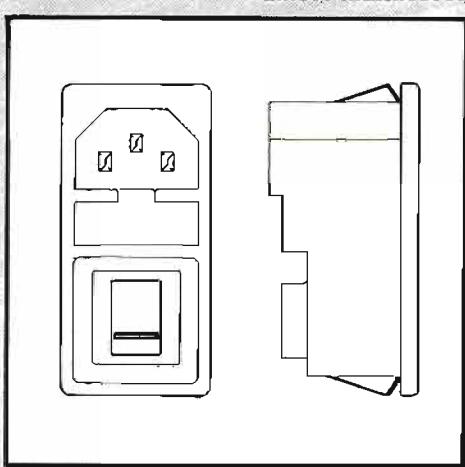
GM780 LED assembly



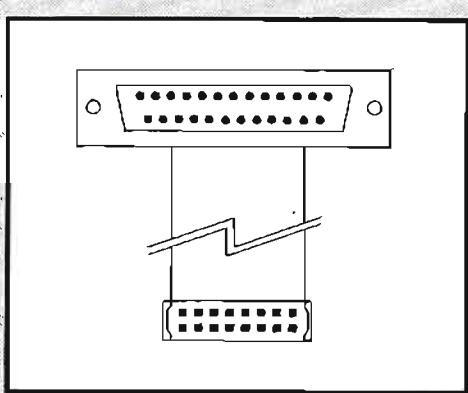
GM697 MultiNet socket



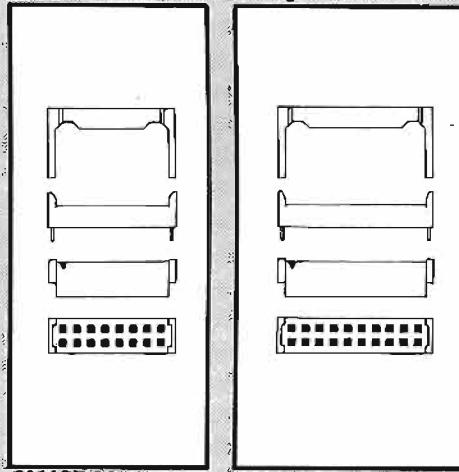
GM689 Fan Filter assembly



GM729 IEC Mains Input/Output, switch and fuse assembly

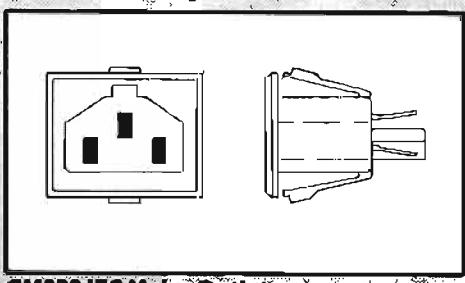


GM683 Internal serial cable assembly

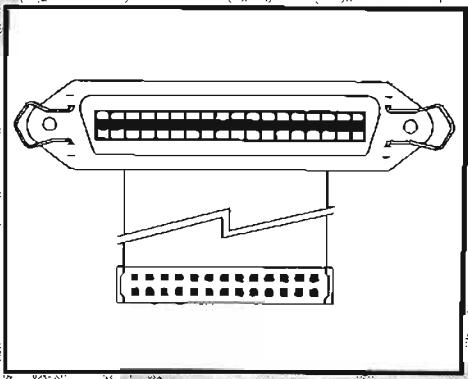


GM625 16 way ID socket

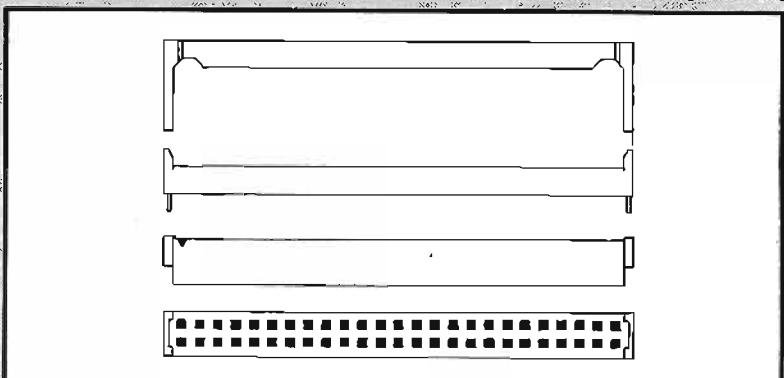
GM731 20 way ID socket



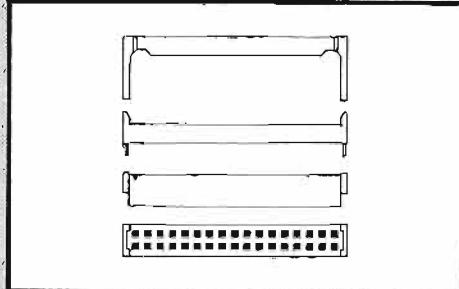
GM728 IEC Mains Outlet



GM669 Internal parallel (centronics) cable assembly

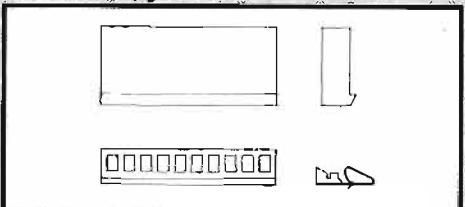


GM628 50 way ID socket

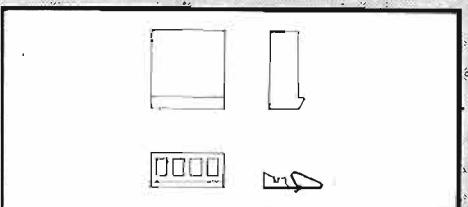


GM627 34 way ID socket

GM626 26 way ID socket (not illustrated)



PSU connector



PSU connector



CPU Boards

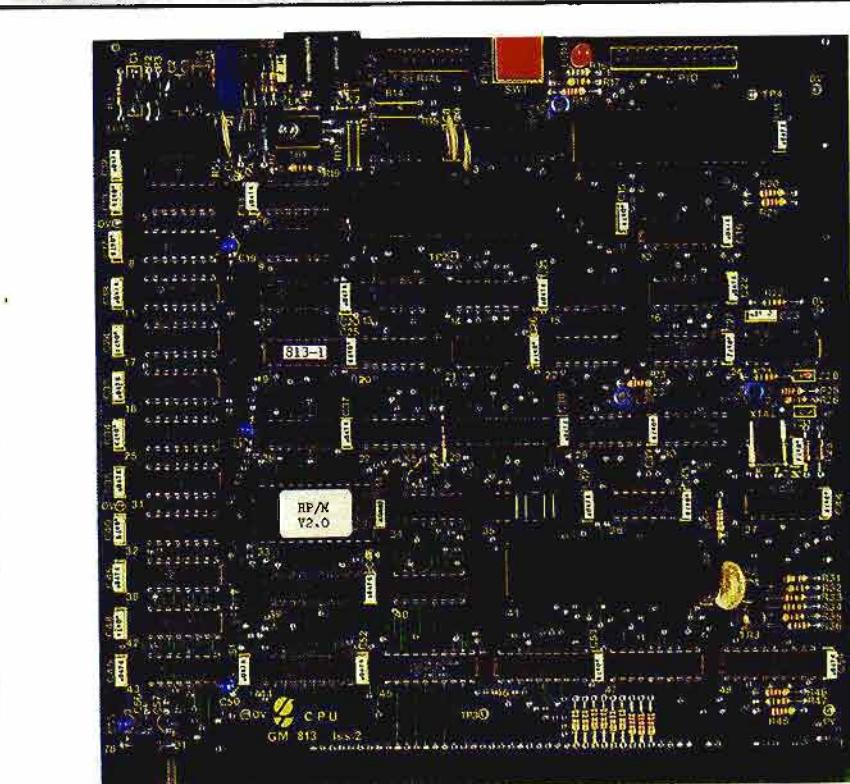
GM813 - CPU/64K RAM Board

- 4 MHz Z80A CPU
- 64K Dynamic RAM
- RS232 Serial Interface
- Two 8-Bit I/O Ports via Z80 PIO
- 1200 Baud Cassette Interface
- Extended and Page Addressing Modes

Controlled by a 4 MHz 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. 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. It 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. All Gemini expansion memory boards support this facility. The second method, Extended Addressing, involves the use of a 'Memory-Mapper', extending the number of address lines on the bus to 19, giving an addressing capability of 512K bytes. Under software control the user may select any 16 x 4K blocks from this memory to be at any place in the Z80A's 64K map, and this facility is fully supported by the Gemini GM853, GM862 and GM863 memory expansion boards. 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 1.200 baud Kansas City/CLUTS 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 drives and you have a 64K CP/M system.

GM888 - 16-Bit Processor Board

- 8 MHz 8088 16-Bit CPU
- Allows Dual Processor 80-BUS System
- Real Time Clock with Battery Back-Up
- Optional 8087 Arithmetic Co-Processor

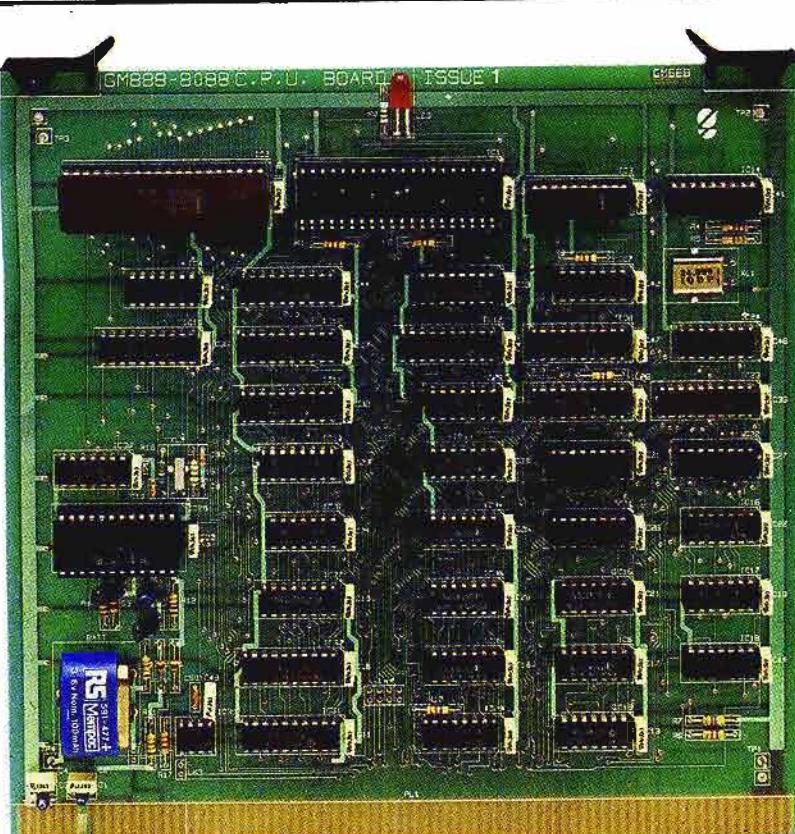
The Gemini GM888 board contains an Intel 8088 16-bit processor together with a Real Time Clock with battery back-up and a socket for the fitting of an optional 8087 high-speed arithmetic co-processor. An 80-BUS I/O port is allocated to allow the operating system or user program to switch between using the 8088 CPU on the GM888 and the Z80A on the host CPU board (i.e. GM811 or GM813).

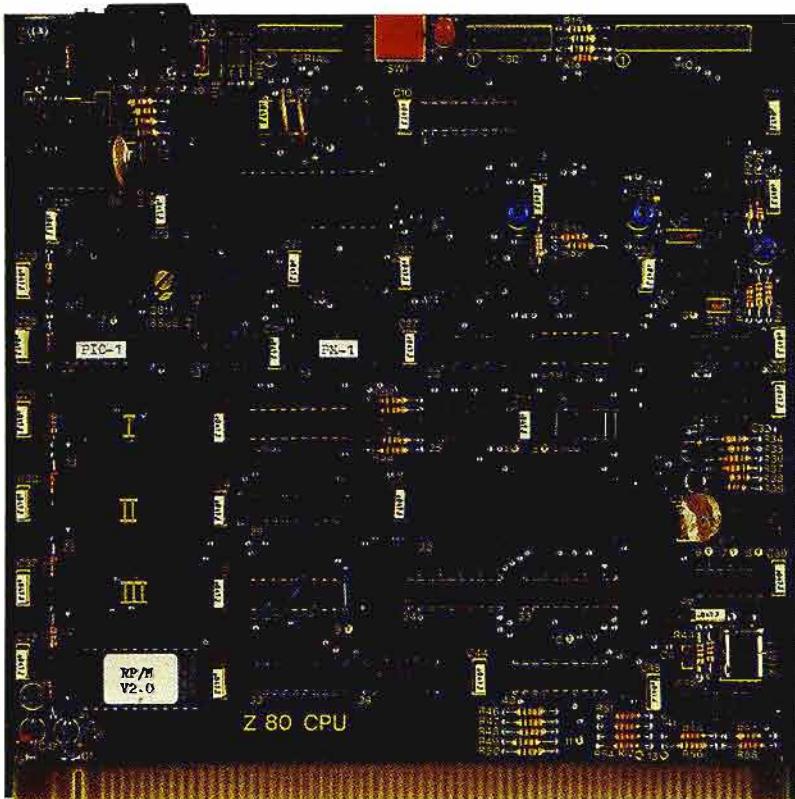
On-board firmware is restricted to a minimal 'bootstrap' program. This approach means that the operating system is not committed to one particular choice, but may be CP/M-86, Concurrent CP/M, MS-DOS (a variant of IBM PC-DOS), or any future 8088 compatible operating system. Gemini have already implemented CP/M-86.

The GM888 board is based on the 8MHz version of the 8088 CPU, and it is interfaced to the 4MHz 80-BUS via a 'state-machine'. This interface maps the 8088 control signals to Z80 equivalents so that the board may be used with the existing Gemini MultiBoard range. An apparent overall CPU clock-rate of approximately 6MHz is achieved, out-performing the 4.77MHz rate of the IBM PC quite considerably.

The on-board battery-backed Real Time Clock provides time and date information which may be used by certain operating systems. It also provides regular interrupts, which may be utilised by Concurrent CP/M for task switching, and a small area of battery-backed memory, which may be used to hold system configuration information.

The addition of this board to a Gemini MultiBoard system will allow the user to run both existing CP/M-80 applications programs as well as software written for the 16-bit operating systems mentioned above.





CPU & Video Boards

GM811 - CPU Board

- 4 MHz Z80A CPU
- Four 'Bytewide' Memory Sockets
- Two 8-Bit I/O Ports via Z80 PIO
- 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 4 MHz Z80A microprocessor and its incredible memory flexibility. Four 'bytewide' sockets are provided for on-board memory, allowing a wide variety of different memory ICs to be accommodated. These may range from $1K \times 8$ to $32K \times 8$ devices including $1K \times 8$, $2K \times 8$ and $4K \times 8$ static RAMs, 2716, 2732, 2764 and 27128 EPROMs, and $2K \times 8$, $4K \times 8$, $8K \times 8$, $16K \times 8$ and $32K \times 8$ ROMs. There is no restriction as to what mixture of devices is installed, decoding being done by an exchangeable PROM. 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 onboard memory block may be switched in or out of the Z80A's memory map under software control, allowing the full capacity of external RAM boards to be utilised. The GM811 is supplied with Gemini's unique 4K RP/M monitor.

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.

GM832 - SVC Board

- 80 × 25 Display Format
- 256 × 256 Hi-Res Graphics
- 6 MHz Z80B Microprocessor
- 256 Character Programmable Character Generator
- Buffered Keyboard Input
- User-definable Character Attributes
- On-board Buzzer

The GM832 Super Video Controller (SVC) Board is an 80-BUS compatible video display board. It features its own on-board 6MHz Z80B 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 GM832 and the host system is through the bus, via 80-BUS I/O ports. All reading and writing to the screen is transparent, providing a flicker-free display. Two standard text modes are provided, 40 × 25 and 80 × 25, the preferred format for most applications.

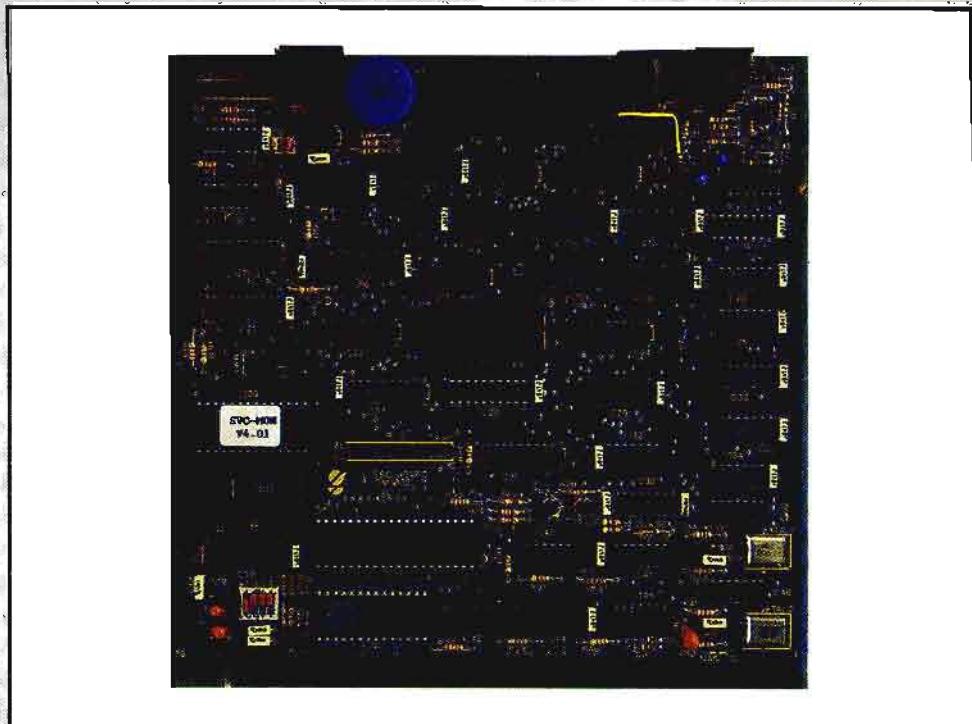
The character set of 256 characters is fully software definable, and the GM832 has switchable language options of English, French, German, Swedish, American and Danish alphabets. By default the first 128 characters provides all upper and lower case alpha-numerics plus some additional characters. Lower case characters have true descenders. The other 128 character shapes may be used to provide inverse characters, or pixel graphics characters with a resolution of 160 × 75. Alternatively the user may define his own characters under software control as well as select between the character attributes of blinking, half-tone and half-intensity.

The GM832 also provides a high-resolution graphics mode of 256 × 256. The onboard monitor program contains a number of high-level commands to make these graphics easy to use –

including line drawing, circle drawing and polygon fill routines. Text handling is supported in the graphics mode, providing 25 lines of 32 characters.

Finally the GM832 SVC includes an on-board buzzer and both light pen and ASCII keyboard input sockets.

The buzzer responds to the ASCII BELL code, the light pen input can resolve a single character on the screen, and the keyboard input, which supports either serial or parallel Gemini keyboards, provides a buffer to allow 'type-ahead' without loss of characters.





Keyboards

GM852 – 87 Key Keyboard

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

Exclusively designed for Gemini, the GM852 range of keyboards are 87 key ASCII encoded keyboards, 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 their normal, shifted and control modes, and software on the GM812 or GM832 video boards then translates each of these codes into strings that can be defined by the user, either directly from the keyboard, or under program control.

The main cluster of the GM852 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. Both serial and parallel output variants of the GM852 are available.

Each of the GM852 keyboard range is supplied in an attractively designed low profile enclosure designed to DIN standards, and comes complete with connecting cable and plug. The GM852 is available configured to meet the needs of several languages, and is in fact available in English, German, French, Swedish and Danish variants.



FØ	F1	F2	F3	F4	F5	F6	F7	F8	F9	edit				
esc	1	"	ƒ	\$	%	&	/	()	-	=	~	del	back space
tab	Q	W	E	R	T	Y	U	I	O	P	\	{		return
ctrl	A	S	D	F	G	H	J	K	L	*	:	}		caps lock
shift	Z	X	C	V	B	N	M	<	>	?	!	\		shift
space														

GM852PE – 87 key English keyboard with Parallel Interface

GM852SE – 87 key English keyboard with Serial Interface

FØ	F1	F2	F3	F4	F5	F6	F7	F8	F9	edit				
esc	1	"	*	\$	%	&	/	()	-	=	^	del	back space
tab	Q	W	E	R	T	Z	U	I	O	P	Ü	;		return
ctrl	A	S	D	F	G	H	J	K	L	Ö	Ä	*		caps lock
shift	Y	X	C	V	B	N	M	,	.	?	!	§		shift
space														

GM852PG – 87 key German keyboard with Parallel Interface

GM852SG – 87 key German keyboard with Serial Interface



Keyboards

	FØ	F1	F2	F3	F4	F5	F6	F7	F8	F9	edit		F10	F11	F12	F13
esc	1 &	2 é {	3 "	4 ,	5 {	6 §	7 } è	8 !	9 ç \ à @	0)	.	[-	del	✉	
→	A	Z	E	R	T	Y	U	I	O	P	“	”	\$	←		
ctrl	Q	S	D	F	G	H	J	K	L	M	%	ü	! >	↓		
↑	W	X	C	V	B	N	?	.	:	/	+	*	<	↑		
space																

GM852PF – 87 key French keyboard with Parallel Interface
 GM852SF – 87 key French keyboard with Serial Interface

	FØ	F1	F2	F3	F4	F5	F6	F7	F8	F9	edit		←	→	↑	↓
esc	!	"	#	¤	%	&	/	()	=	?	'	del	back space		
tab	Q	W	E	R	T	Y	U	I	O	P	Å	^	ü	return		
ctrl	A	S	D	F	G	H	J	K	L	Ö	Ä	*	:	caps lock		
shift	Z	X	C	V	B	N	M	:	:	-	>	<	shift			
space																

GM852PS – 87 key Swedish keyboard with Parallel Interface
 GM852SS – 87 key Swedish keyboard with Serial Interface

	FØ	F1	F2	F3	F4	F5	F6	F7	F8	F9	edit		←	→	↑	↓
esc	!	"	£	\$	%	&	/	()	=	~	^	del	back space		
tab	Q	W	E	R	T	Y	U	I	O	P	Å	+	:	return		
ctrl	A	S	D	F	G	H	J	K	L	Æ	Ø	*	:	caps lock		
shift	Z	X	C	V	B	N	M	<	>	?	^	@	/	shift		
space																

GM852PD – 87 key Danish keyboard with Parallel Interface
 GM852SD – 87 key Danish keyboard with Serial Interface



Memory Boards

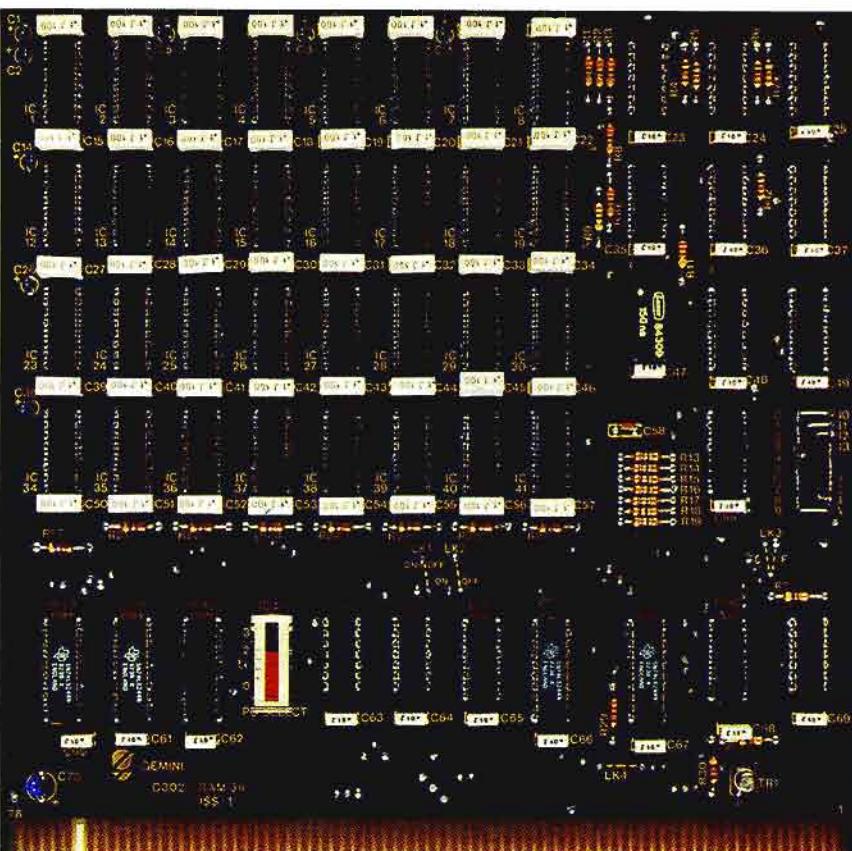
GM802 – 64K Dynamic RAM Board

- 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.

Although the GM802 does not support the Extended Addressing range of the GM813 and GM888 boards, it does include logic for Gemini 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.



GM862 – 256K Dynamic RAM Board

- 256K Dynamic RAM
- Page Mode Operation
- Extended Addressing Operation
- Special 'Common Area' Mode
- Can Use Multiple Boards – Up to 2 MBytes

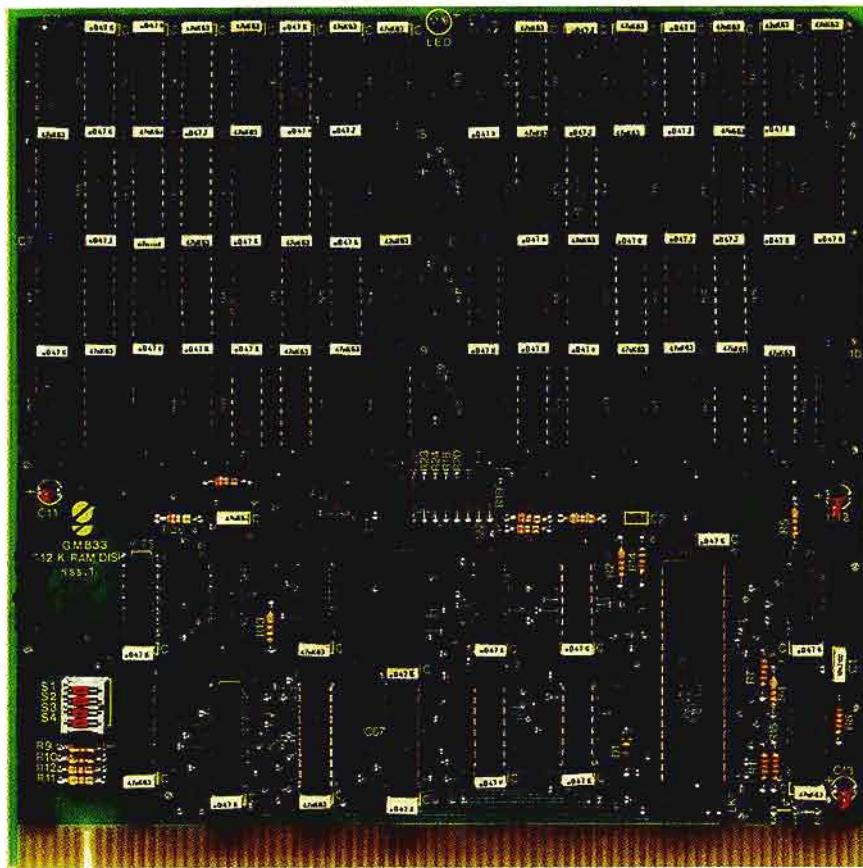
The Gemini GM862 is a dynamic random access memory board with a capacity of 256K bytes. It supports the two standard 80-BUS memory expansion techniques of memory-mapped Extended Addressing and Page-Mode. In addition, when used in Page Mode, the GM862 can be configured so that only the lower 56K or 60K of memory is paged, leaving the top 8K or 4K of memory common to all four pages.

The configuration of the board is totally flexible. Each of the four 64K banks of memory on the card can be assigned to a particular Page and a particular Extended Address. These are defined by the settings of the onboard switches.

With the Gemini GM811 CPU board, only one GM862 may be used, but with the Gemini GM813 CPU board, with its on-board 'Memory-mapper' or the 8088 processor based GM888 CPU board, with its additional address lines, a total of 2 Mbytes of memory can be accessed by installing multiple GM862 boards in the system.



Memory Boards



GM863 – Static RAM Board

- Available with 32K or 64K Static RAM
 - Battery Back-up
 - Page Mode Operation
 - Supports Extended Addressing

The Gemini GM863 Static RAM board is available fitted with either 32K or 64K bytes of static RAM. Together with automatically recharged battery back-up, this provides memory content retention during power-down periods.

The GM863 board supports the 80-BUS Extended Addressing mode, and may also be set to any one of the four pages of the Gemini Page Mode system.

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.

GM863-32 – 32K of battery-backed static RAM
GM863-64 – 64K of battery-backed static RAM

GM833 – 512K RAM-DISK

- **512K Bytes Dynamic RAM**
 - **High-speed 'silicon disk'**
 - **Simple Software Interface**
 - **Can Use Multiple Boards – Up to 8 MByte**

The GM833 'RAM-DISK' board is not a conventional RAM board, but has been designed to use three 80-BUS I/O ports, which may be regarded as 'track', 'sector' and 'data'. This allows the board to be very simply interfaced to CP/M to appear as an extremely high speed disk drive — over 30 times faster than a conventional floppy disk in certain applications. Alternatively the user may simply drive the board directly from an applications program for, for example, high-speed data capture.

The GM833 'RAM-DISK' is supplied with 512K bytes capacity, and an on-board DIL switch allows multiple boards to be fitted to a single system, up to 8 MBytes, the maximum logical drive size permitted by CP/M 2.2.

in Design



EPROM Board & Programmer

GM853 – EPROM Board

- Up to 512K of Firmware
- 2764, 27128, 27256 and 27512 EPROMs supported.
- Page Mode Operation
- Supports Extended Addressing

The Gemini GM853 EPROM board contains 8 'byterwide' sockets to accept many different types of memory device, ranging from 64Kbit (8K × 8) up to 512Kbit (64K × 8). This includes the standard 2764, 27128, 27256 and 27512 devices. It is therefore ideal for any system requiring a large amount of firmware. The 8 'byterwide' sockets are divided into two banks of four, and each bank may contain different size memory devices to the other.

The board supports the 80-BUS Extended Addressing mode, and may also be set to any one of the four pages of the Gemini Page Mode system.

in Design!



GM860 – Bytewide EPROM Programmer

- Programs from 2716 up to 27256 EPROMs
- Supports high-speed Intelligent Programming Algorithm
- Self-contained Unit
- Connects to Parallel Port

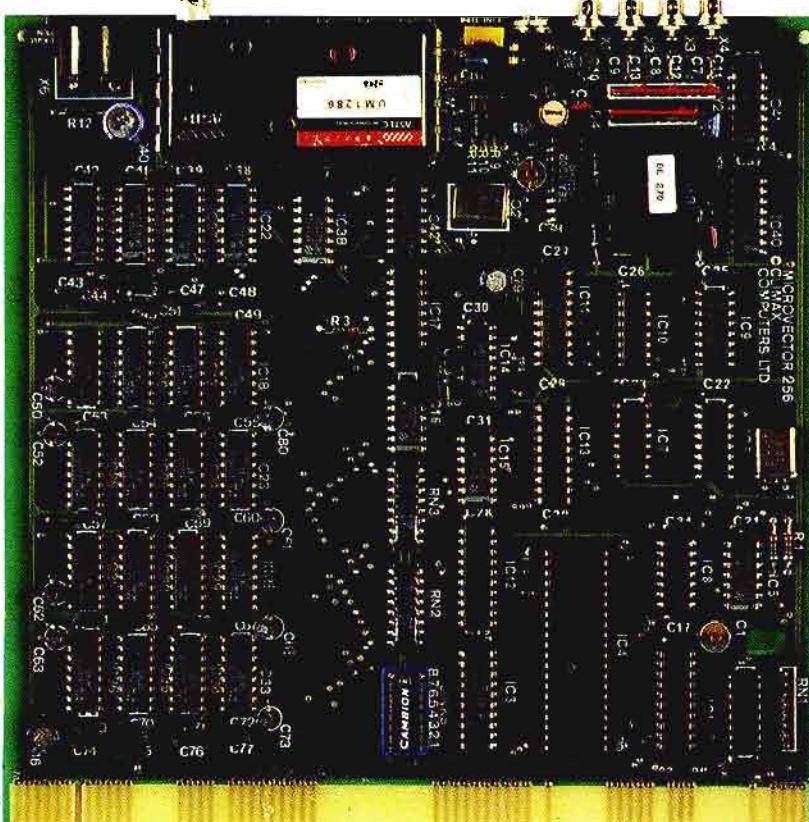
The Gemini GM860 Bytewide EPROM Programmer is capable of programming 2716, 2732, 2732A, 2764, 27128 and 27256 EPROMs. For EPROMs of 2764 and larger the GM860 utilises the approved high-speed Intelligent Programming Algorithm to drastically reduce the programming time of these devices.

The GM860 Programmer is supplied in a compact enclosure containing its own mains-powered PSU unit to generate the various programming voltage requirements. 'Power-On' and 'Socket-Busy' indicators inform the user of the programmer's status. Connection is to the host system's PIO, and a cable is supplied to utilise the parallel printer socket fitted to the Gemini and Quantum computer systems.

Comprehensive CP/M software is included to read, write and verify EPROMs to and from disk files.



Colour Boards



GM837 – Colour Graphics Display Interface

- **256 × 256 Pixel 16 Colour Display**
- **Ultra-fast Vector and Character Generation**
- **96 ASCII Character Set**
- **Audio and Light Pen Inputs**

The Gemini GM837 is a high performance graphics display interface board. Various graphics primitives such as vector and character generation are provided by a Thomson EF9365 Graphic Display Processor. The plotting rate is typically 1 million pixels per second, giving animation capability. Various vector and character types can be selected and characters may be scaled to give 256 different sizes.

The GM837 has a high quality PAL UHF output with an intercarrier sound facility as well as a composite 75 ohm B/W output and 75 ohm RGB outputs for connection to a video monitor.

The GM837 provides a resolution of 256 × 256 pixels in 16 colours using 32K bytes of on-board memory. The board occupies 17 Z80 I/O ports, commands being single byte control codes.

A comprehensive set of assembly language subroutines given in the operating manual enables the user to develop his own graphics programs quickly and efficiently.

IO828 – Colour Graphics Processor Board ▶

- **Up to 768 × 576 Bit Mapped Display**
- **On-board 16-Bit Microprocessor**
- **Comprehensive On-board Software**

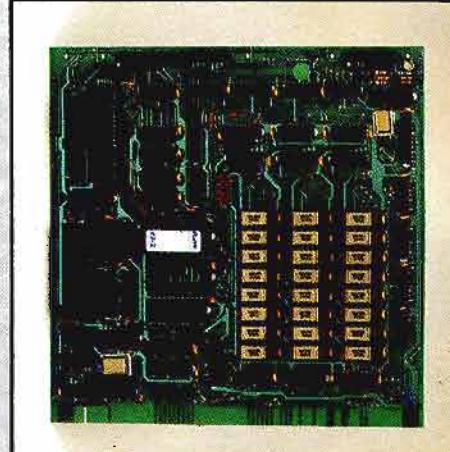
The IO Research IO828 ('PLUTO') is an intelligent high-resolution colour graphics display board. It combines 192K bytes of dual-ported RAM with a fast 16-bit microprocessor which, in conjunction with a comprehensive on-board software package, provides a highly functional graphics system. Commands are issued to 'PLUTO' as a sequence of bytes over two Z80A I/O ports.

The IO828 provides a resolution of 640 × 576, or two screens of 640 × 288, both in eight colours. A high resolution version of the IO828 is also available, providing an increased horizontal resolution of 768. In all cases the user may also define his own characters and symbols.

The IO828'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.

IO828H 768 × 576 Pixel IO828L 640 × 576 Pixel

For further details contact: IO Research Ltd, Exchange Building, High Street, Barnet, Herts. EN5 5SY.



VS872 – Video Frame Grabber

- **768H × 576V Resolution**
- **256 Colours**
- **RGB or Composite Video Input**

The VS872 Video Frame Grabber board from Video Data Systems is an 80-BUS compatible video digitizer storage card that allows images from video cameras, or any system with RGB or composite video outputs, to be captured.

The image is stored in a 442 Kbyte RAM buffer with a resolution of 768H × 576V in 256 colours. The image is sampled by Flash A/D converters at a rate of 14.7 MHz over two frames of video (1/25 sec).

Once an image has been captured it may be transferred to disk, printer or to an appropriate graphics card for display. The VS872 is controlled via two 80-BUS I/O ports, one being a status port, the other a data port.

(Not illustrated)

For further details contact: IO Research Ltd, Exchange Building, High Street, Barnet, Herts. EN5 5SY.



IO830 – MINI PALETTE BOARD ▲

The IO830 Mini Palette board from IO Research is a small piggy-back card for direct connection to the IO828 'Pluto' board. It adds extra colour capability to 'Pluto', allowing any 8 colours to be selected from a choice of 4096. It contains 2 independent colour look-up tables and a software selectable 'flash' command.

For further details contact: IO Research Ltd, Exchange Building, High Street, Barnet, Herts. EN5 5SY.

Colour Boards and Peripherals

IO859 - PLUTO PALETTE ▶

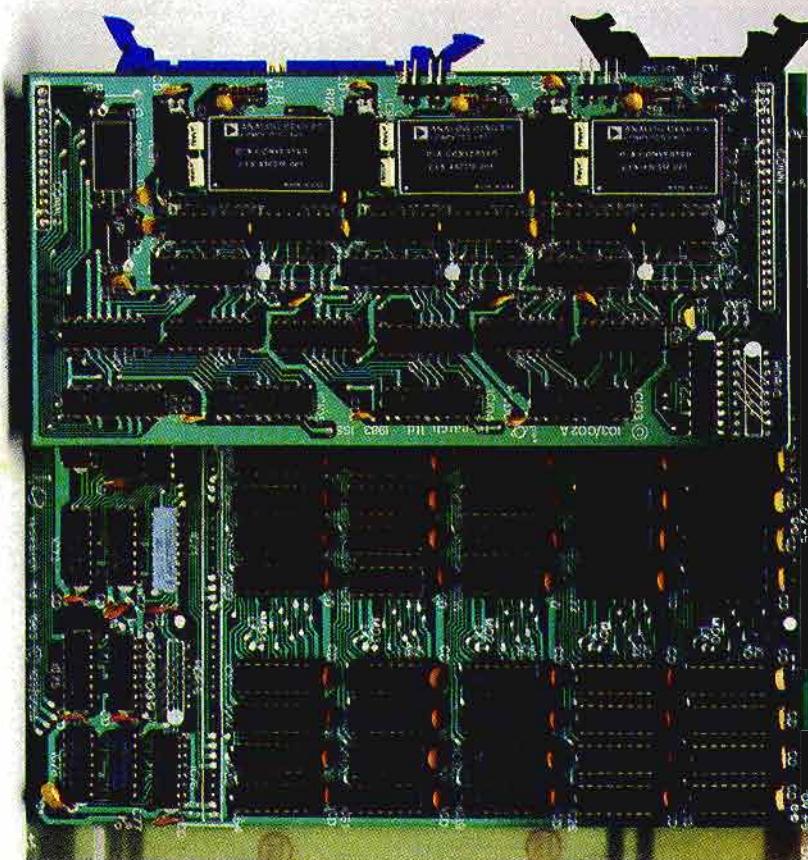
- Expands IO828 Colour Board
- Allows 256 Colours from a Palette of 16.7 Million

The IO Research IO859 Palette Board adds extra colours to the IO828 'Pluto' without cutting down any of the processor's performance in speed or resolution.

Pluto Palette adds extra memory to that already on the 'Pluto' board to give 8 bits per pixel. This allows a colour look-up table of 256 entries. Each of these entries is used to define 256 intensity levels independently on each of the Red, Green and Blue outputs. Therefore this gives 256 simultaneous colour shades from a choice of 16.7 million.

The IO859 can also be configured with only 16 levels on each of the Red, Green and Blue outputs, giving 256 simultaneous colour shades from a choice of 4096.

The colour look-up table is an extremely useful tool as it gives the user a totally flexible choice of colours and the ability to change them later. The appearance of the picture can therefore be changed, for example to improve the contrast or change subtle colour tones. The ability to re-map colours can be useful for very high speed animation where a monochrome picture sequence can be drawn in different colours, all of which can be mapped to black; these may then be 'revealed' one at a time by re-mapping each of the table entries in turn to a colour.



IO864 - PLUTO II ▶

- 768 × 576 Bit Mapped Display
- On-board 8 MHz 8088
- 256 Colours
- Pan and Zoom
- Optional On-board Frame Grabber

Pluto II from IO Research is a brand new and very powerful single board graphics display system, which has been designed to be completely hardware and software compatible with the original Pluto board.

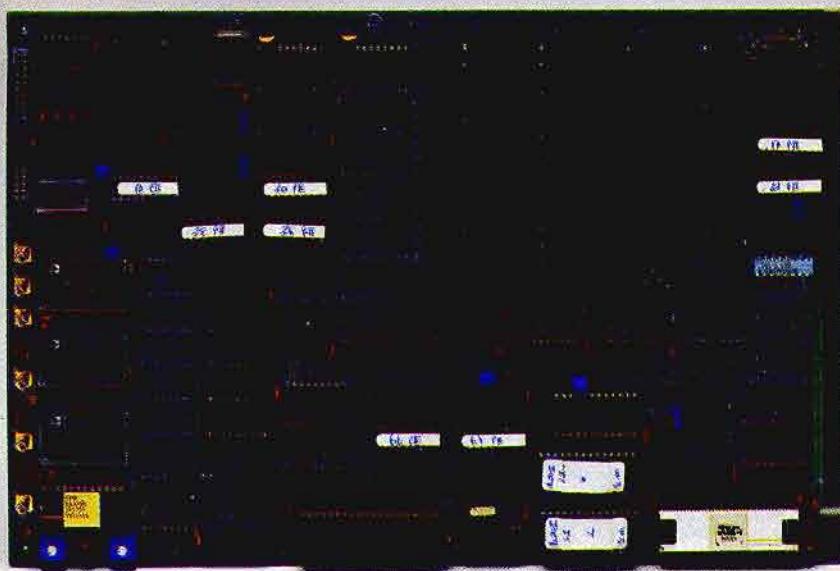
Re-designed to use up-to-date technology the board replaces 3 boards from the original Pluto range with one compact unit giving high reliability and ease of use. Being based upon the highly successful Pluto concept, Pluto II's more advanced video circuitry produces truly advanced colour graphics.

The board format is a compact 12" by 8", multi-layer, 80-BUS compatible. The processor is an 8 MHz 8088. Half a megabyte of memory as standard gives a display screen of 768H by 576V, or an optional 1 megabyte of memory gives two displayable screens of the same resolution. 256 colours can be displayed simultaneously from a palette of 16.7 million shades. Inbuilt graphics functions in ROM give over 100 high level commands including vector and raster operations, now with fast text scrolling and smooth shading.

New hardware facilities include Pan and 16 levels of Zoom. Panning allows the display of a large virtual area with the 1 megabyte of memory. A real-time Frame Grabber is an on-board option, grabbing 50 times per second onto the screen, and including a preview facility enabling the camera image to be lined up before a grab.

Multiple Plutos can be synchronised for use in special applications.

This board cannot be mounted in a standard Gemini system. However, the Quantum Computer systems series 2000 machines have been re-engineered to accommodate this enlarged form factor. An additional -5V power supply is required in a system accommodating this board.





Software Packages for Colour Boards



Quantum Computer Systems Ltd, which has specialised in the development of colour graphic based systems is now an associated company of Gemini.

The Quantum System is now finding its way into many different O.E.M. applications, including several based around the PLUTO colour graphic card. Other applications include a package for General Practitioners.

The system can accommodate both the main PLUTO board, together with a full Palette, or alternatively the new PLUTO II can also be integrated, (the Palette board requires an additional -5 volt power supply, and a new back plate is required when installing the PLUTO II into a system).

QUANTUM CAD/CAM

The following paragraphs describe a CAD/CAM package which Quantum Microcomputers Ltd has produced specifically for T S Harrison & Sons Ltd, a member of the 600 group of companies. This description is intended to give an indication of applications that Gemini/Quantum equipment has in CAD/CAM. It should be noted that the package could easily be rewritten for other applications.

The Harrison Auto Turn System is designed to be a general introduction to CAD/CAM in machine control and to the general capabilities of machines in the workshop. The package uses a high resolution colour graphics system for the display of drawings and tool path simulations and both may also be drawn by a plotter.

There are 6 main sections to the Harrison Auto Turn System:

1) Blank and Drawing

This allows the creation and alterations of drawing files. In use a blank is specified [by size] and drawings are constructed from basic element sections: Face, Straight, Tapered, Radius and Threaded turnings external and internal. Chamfer, inserts and X/Z tolerance definition.

2) Manual Code Input

The machine codes can be entered in machine format by this section. Features include automatic tabulation and back tracking.

3) Automatic Code Generation

Machine codes may be generated automatically from drawing files with this option. Basic types of turning are controlled by parameters entered interactively as the machine codes are generated. The tool path generated is simulated on screen.

4) Simulate from Code File

A machine code file may be graphically simulated by a tool path description. The tool is simulated as a POINT with different colours showing different tools.

5) Transmit Plot File to Plotter

The Dimensioning program, Simulator and the Automatic Machine Code Generator generate an Image File which may be plotted. This section allows for direct transmission to plotter.

6) Dimension and Plot

This takes the picture file and automatically generates a Plot File with dimensions of the picture file specified. An approximation of the drawing generated appears on the graphics screen.

"The IO828 PLUTO card was developed by IO Research Ltd as an 80-BUS product to meet the growing need for cost-effective colour graphics. Since the board was launched in 1983, it has met with widespread acclaim and sufficient time has now elapsed for a number of interesting software packages to have been developed. We have included a brief outline of some of these, so that the potential of the Gemini system, together with this product, can be understood."

CAD-8

CAD-8 is a low cost package from EIX Ltd, specifically designed for creating accurate two-dimensional multilayered artwork in the form of plots and photographic masks. Its main application is in printed circuit board design.

CAD-8 is fast and easy to operate. Artwork is prepared by manipulating the components that form the layout, such as pads and tracks, directly on the screen by means of the keyboard or the graphics digitizer. Sections of drawings can be recalled from floppy disk whenever needed and placed anywhere on the drawing.

Draughting facilities include pan and zoom, track and component "rubber banding", "pick and place", block movement of complete drawing sections, and automatic allocation of vias on layer change (for plated through holes).

The finished artwork can be fed to a pen plotter or alternatively a "tape" file can be produced for sending to a bureau via a modem.

The program maintains descriptions of component names and track signal names. CAD-8 can produce a cross reference printout of all components by name and point to point connections by signal name. This is an invaluable

aid in checking the artwork laid out against the original circuit description or circuit diagram.

CAD-8 is ideal for users with modest PCB design needs who cannot contemplate the cost of a fully fledged CAD design station. CAD-8's main benefit is the possibility of producing artwork or changes to existing artwork within a very short time scale and cheaply. CAD-8 is aimed at the small design office, as a stand alone station, and for direct access by the design engineers themselves.

DR Draw

Digital Research's DR Draw allows you to use your microcomputer to communicate your ideas with high-quality graphics. DR Draw's capabilities give form to your imagination, allowing you to create your own graphic designs. With DR Draw you can create, preview, change, and refine a drawing before you print or plot it.

GSX

Gemini have implemented GSX for use with the 'Pluto' colour board. GSX is Digital Research's graphic extension to CP/M and provides output through standard operating system calls. It is made up of two main components, the GDOS and the GIOS. The GDOS (Graphic Device Operating System) is analogous to the BDOS in CP/M systems and contains the device independent part of GSX. The GIOS (Graphics Input and Output System) is the device dependent module that provides the software interface between the GDOS and the specific hardware, in this case, the 'Pluto'. Thus the GDOS intercepts and services graphic calls by first loading the required driver and then passing it on to the GIOS.

QWIKDRAW

Gemini have produced the Qwikdraw Graphics Package for use with the 'Pluto' colour board. Input is by means of the GM413 Digitizer Pad. Drawing of graphical displays is easy, the package allowing the creation of lines, circles, smooth curves and dots, plus the ability of 'freehand' input. Different colours may be selected for all of these elements and colour fills are also catered for. Lettering may be incorporated in the display and may be in any one of four different orientations. Once created, pictures may be displayed for re-editing or may be output to the GM418 3-pen Plotter or to a dot matrix printer. Extensive 'Help' messages are incorporated into the program.

INTERVID

This Interactive Video package from Quantum provides a means of combining Video Recorder and Computer technologies. The 80-BUS computer contains a 'Pluto' colour board and also controls a video recorder. A colour monitor is attached to the system and will display either the video recording or the output of the 'Pluto', as determined by the system.

The system can therefore be programmed, for example, to display a portion of a video tape, then display a question on the 'Pluto', the user responds to the question, and depending on whether or not the response is correct, the video recorder either continues to the next sequence, or rewinds and replays the first portion again.



Disk Systems

GM829 - FDC/SASI Board

- Single/Double Density Operation
- Single/Double Sided Drive Support
- Up to 4 mixed 3.5", 5.25" and 8" Drives
- Industry Standard SASI Hard Disk Interface

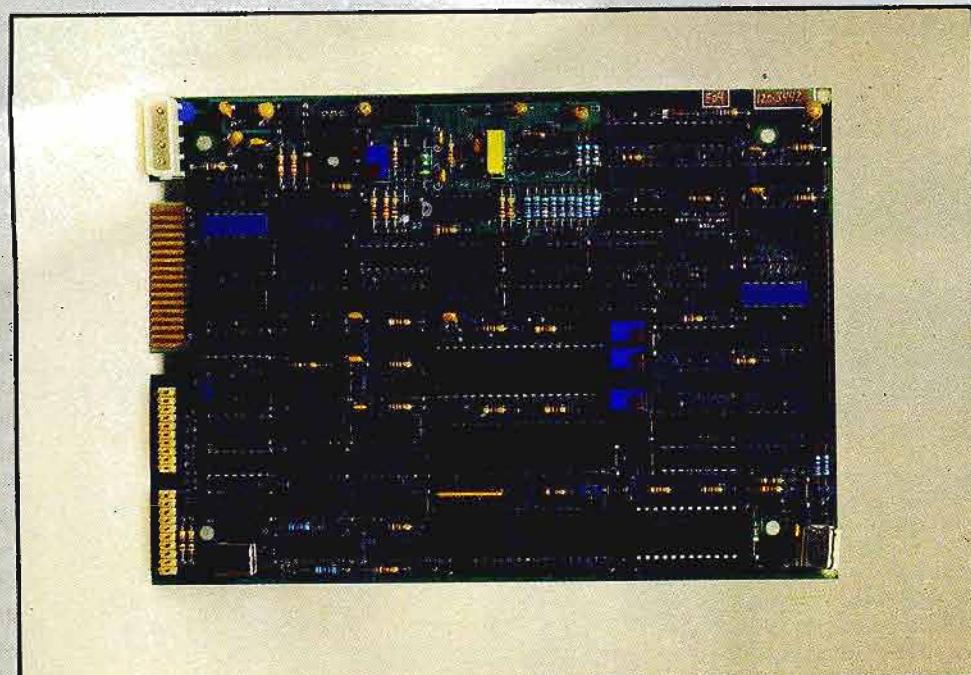
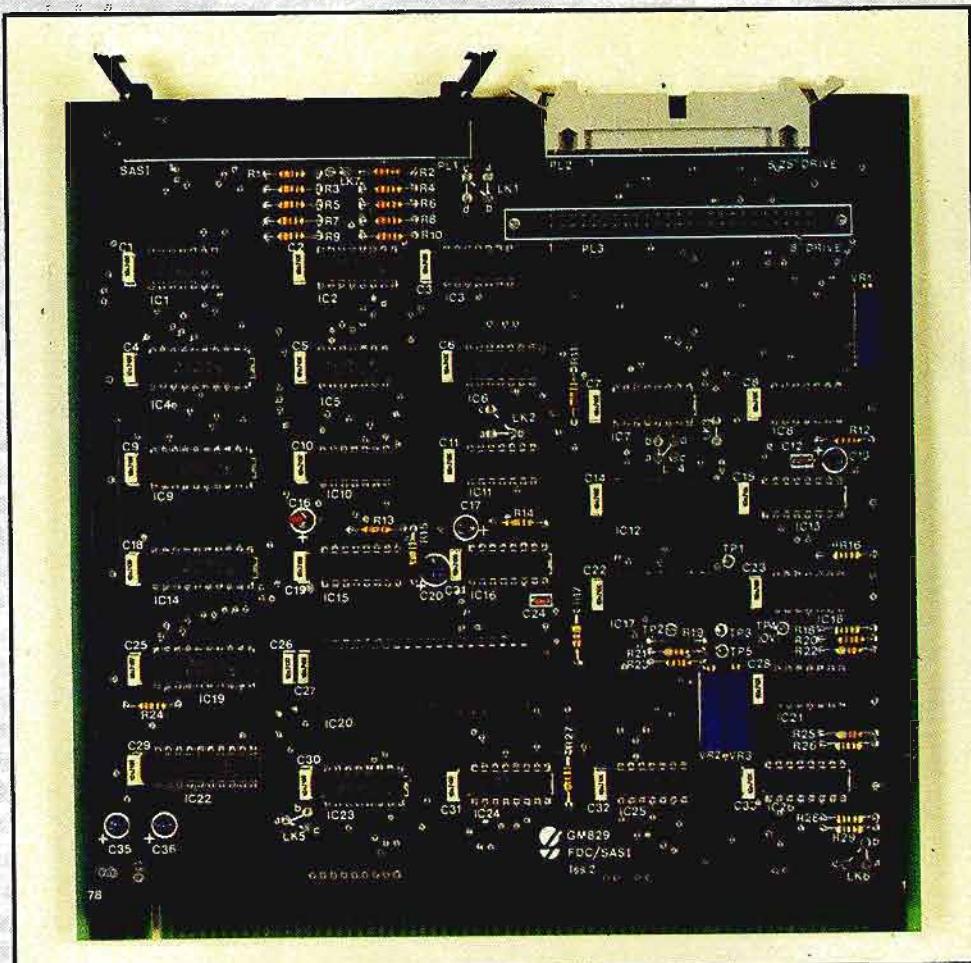
The Gemini GM829 combined FDC (floppy disk controller) and SASI (Shugart Associates Systems Interface) board has been designed to allow both floppy disk drives and Winchester hard disk drives to be easily added to a MultiBoard system.

Up to four floppy disk drives may be controlled. These may be single or double sided, 48 or 96 TPI drives, in single or double density formats. The drives may also be 3.5", 5.25" or 8" types, or a combination of these. Switching between single and double density, and 3.5", 5.25" or 8" drives, are under software control.

High performance and reliability are provided by variable write precompensation and phase locked loop data recovery circuitry. The board uses the Western Digital 1397 chip set and occupies 8 Z80 I/O ports. These ports may be set to one of two positions, allowing, with the appropriate software, two GM829 boards to be used in a single system.

The industry standard 50 way 'SASI' interface allows Winchester hard disk sub-systems, such as the Gemini GM835, to be simply plugged straight in.

This board is a development of the extremely popular GM809 FDC board and maintains the same elegant and reliable engineering design which has been proven on the GM809. Full 5.25" software compatibility is maintained, with the added advantage of also being able to control 3.5", 5.25", 8" and hard disk drives simultaneously from the one 80-BUS board.



GM695 - Winchester Disk Controller

- Industry Standard SASI Interface
- Automatic Error Detection and Correction
- Automatic Retries
- Extensive Diagnostics

The GM695 Winchester Fixed Disk Controller Board provides a compact, field-proven microprocessor-based controller to operate one or two 5.25" Winchester hard-disk drives. The GM695 is produced by Xebec, the industry's largest independent disk controller manufacturer.

Connecting directly to the GM829 FDC/SASI Board, the GM695 incorporates automatic error detection and correction, automatic seek and position verification, and automatic retry on drive errors.

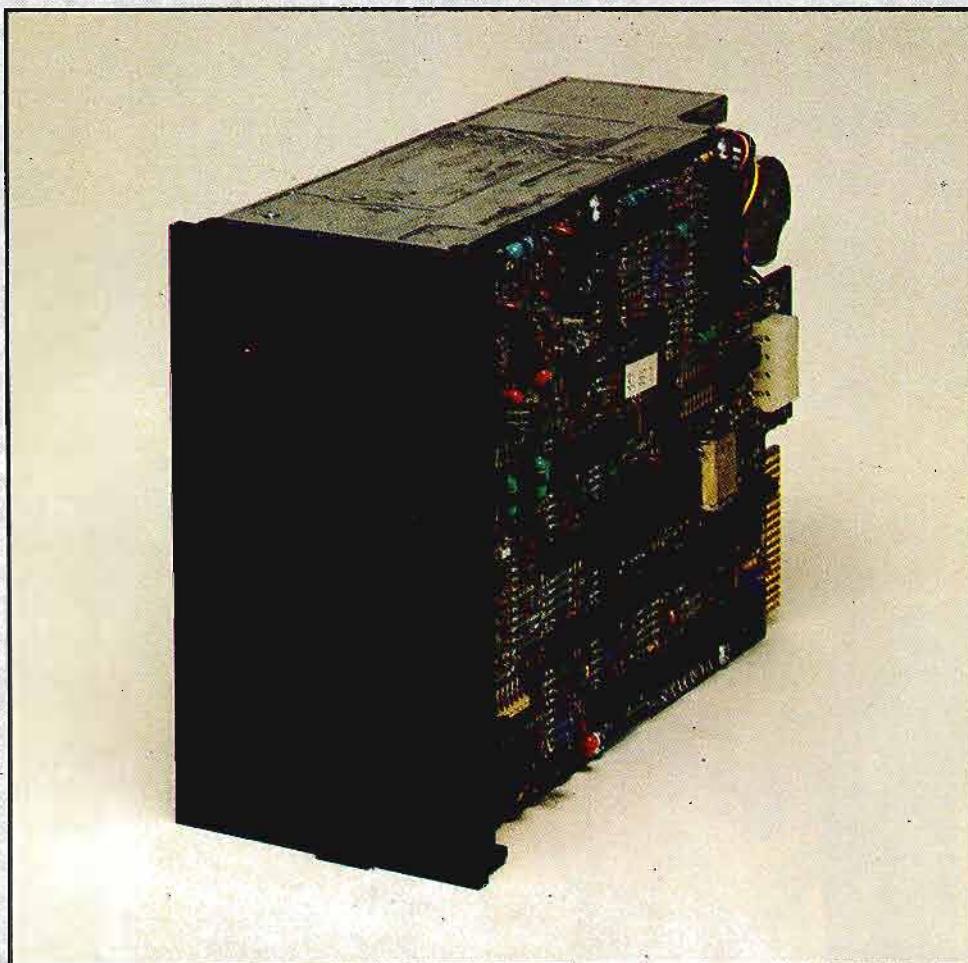


Disk Drives

GM653 and GM657 Floppy Disk Drives

- 400KB and 800KB formatted capacities
- Microprocessor Controlled
- Silent Operation
- Second Generation Reliability

The GM653/GM657 are second generation floppy disk drives manufactured by Micropolis and containing many advanced features. These include twin chassis construction, steel leadscrew with jewel follower for head positioning, accurate disk centering mechanism and microprocessor control. The GM653 and GM657 are both double density, 96 TPI drives with 6 mS track-to-track access times. The GM653 is single sided and the GM657 is double sided, providing formatted capacities of 400K and 800K byte capacities respectively.



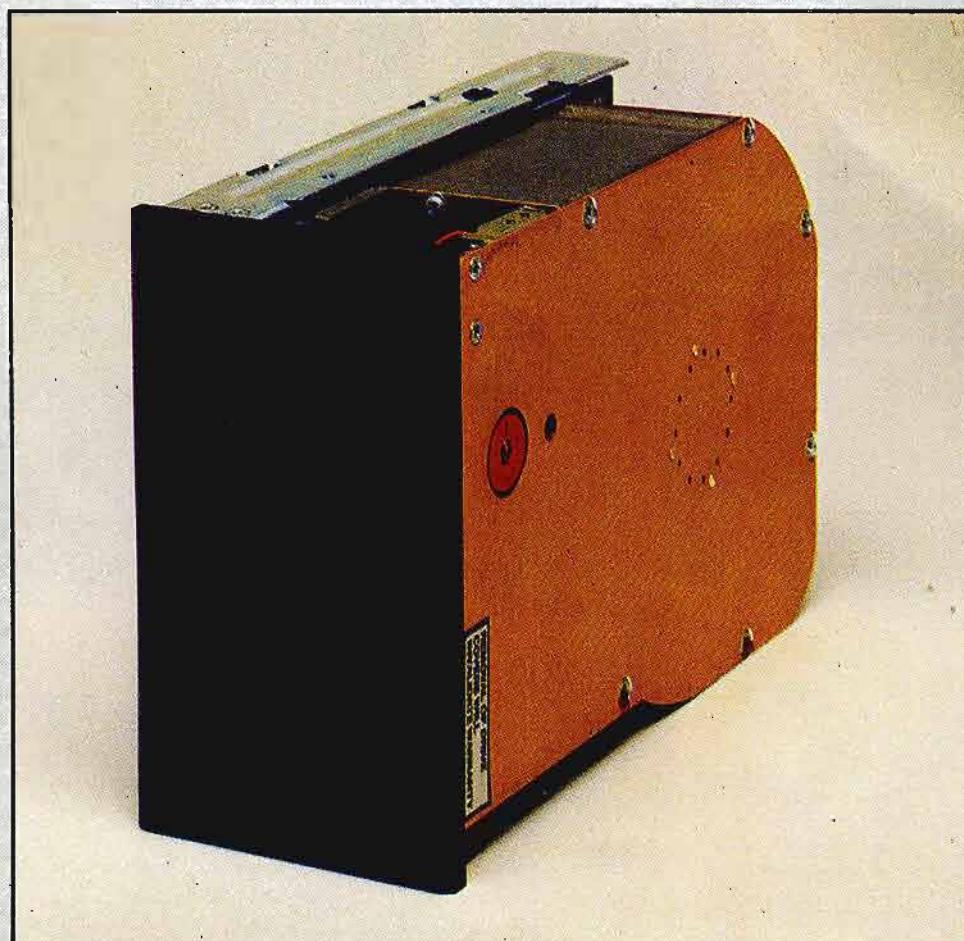
GM691, GM692 and GM693 Winchester Disk Drives

- 5.4, 10.8 and 16.2 Megabyte formatted capacities
- Industry Standard Interface
- Microprocessor Controlled
- British Made

The GM691, GM692 and GM693 are Winchester disk drives manufactured by Rodime. These high-performance drives incorporate many advanced features, including thermal compensation, two chamber construction, and special airflow giving these drives high reliability.

The GM691, GM692 and GM693 feature microprocessor control which includes ten self-diagnostic tests. An automatic transit lock allows simple transportation. The GM691 is a single platter drive, the GM692 twin platter, and the GM693 triple platter, providing 5.4, 10.8 and 16.2 MB capacities respectively.

The GM694 20 Megabyte drive is also available.





Disk Drives

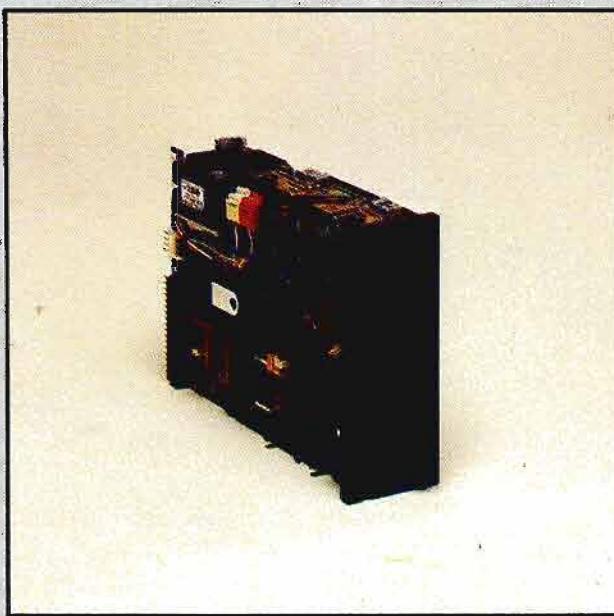
GM708 - 3.5" FLOPPY DISK DRIVE

- 800 KB formatted Capacity
- Compact Unit
- Fast Access Time

The GM708 is a 3.5" disk drive unit manufactured by Epson. It is an 80 track, double-sided, double-density drive with a track density of 135 TPI. This therefore provides a total formatted capacity of 800 KB. The GM708 uses a steel belt for head positioning and has a track to track access time of 3 mS.

The diskettes used with the GM708 are enclosed in hard cartridges, providing a high level of security against accidental damage.

The electrical interface and software requirements of the GM708 are identical to those of the GM707 5.25" drive, allowing simple substitution of drives where space is of prime importance.



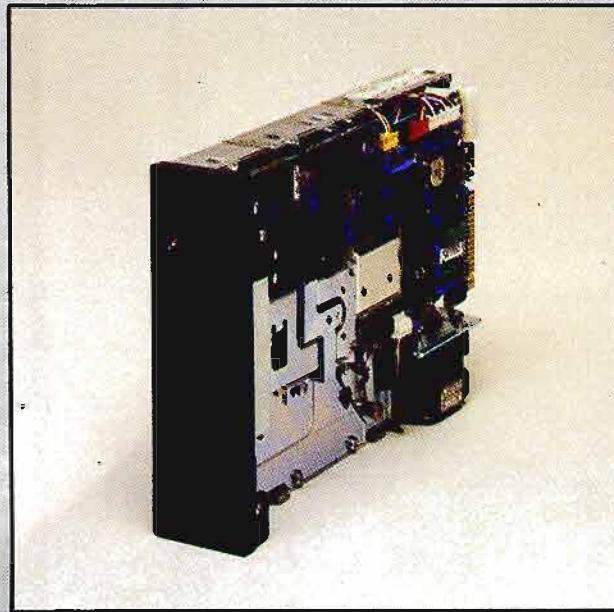
GM706 and GM707 5.25" FLOPPY DISK DRIVES

- 400 KB and 800 KB Formatted Capacities
- Half-height Units
- Fast Stepping Rates

The GM706 and GM707 are half-height 5.25" floppy disk drives manufactured by Toshiba. The high-speed head positioning mechanism uses a steel belt and reduces track to track access times to 5 mS and 3 mS respectively. Use of direct-drive axial type flat DC brushless motors assures increased accuracy and extended life.

The GM706 is a 48 TPI double-sided, double-density drive, providing 400K formatted capacity. The GM707 is a 96 TPI double-sided, double-density drive, providing 800K formatted capacity.

Full height bezels are available for these drives.
(ref. GM727)

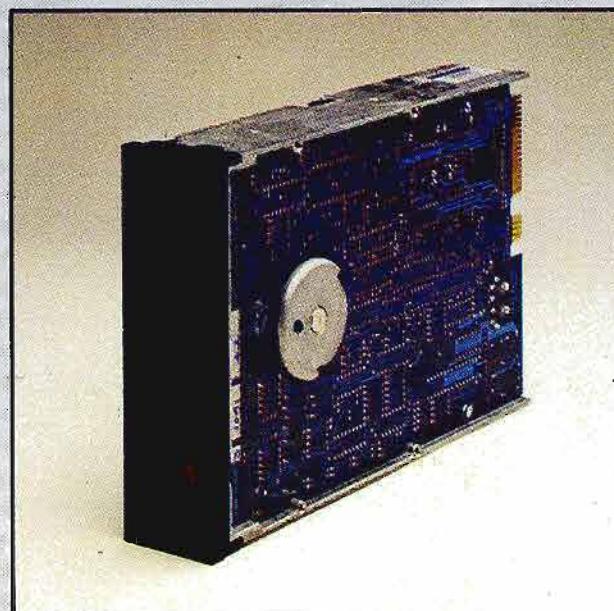


GM723 - 5.25" FLOPPY DISK DRIVE

- 2.78 MByte Formatted Capacity
- Half-Height Unit
- 3 mS Stepping Rate

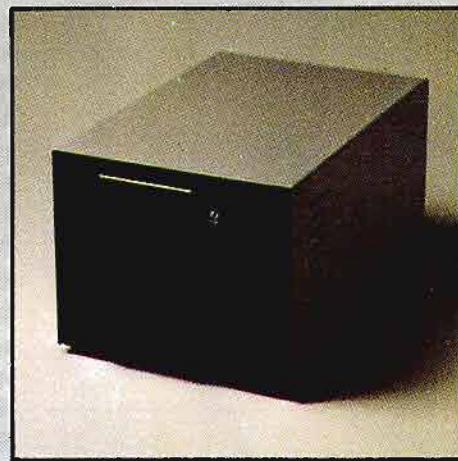
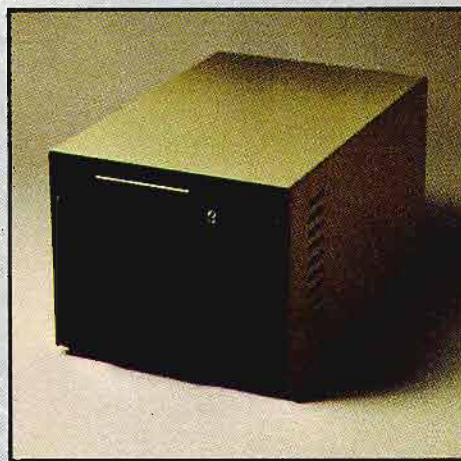
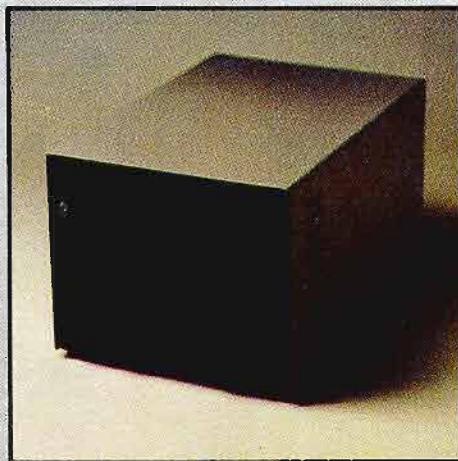
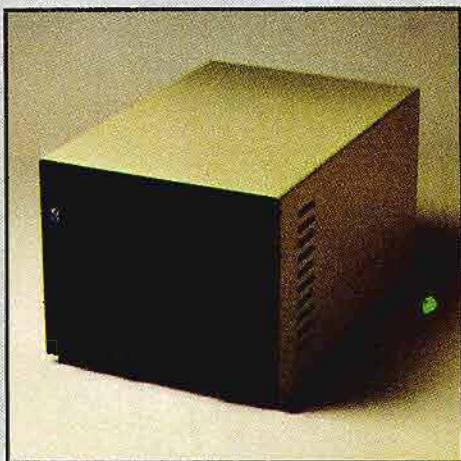
The GM723 is an ultra-high capacity 5.25" floppy disk drive manufactured by Drivetec. The drive is of double-sided, 500-Kbit/second transfer rate, 192 tpi design and provides a formatted capacity of 2.78 MBytes.

Ideal for applications requiring ultra-high capacity floppy disk storage, or for use as a Winchester back-up device, the GM723 offers 3 mS track-to-track access times and read/write heads positioned to an accuracy of 200 micro inches through a dual-stepper, closed loop servo system.





Disk Sub-Systems



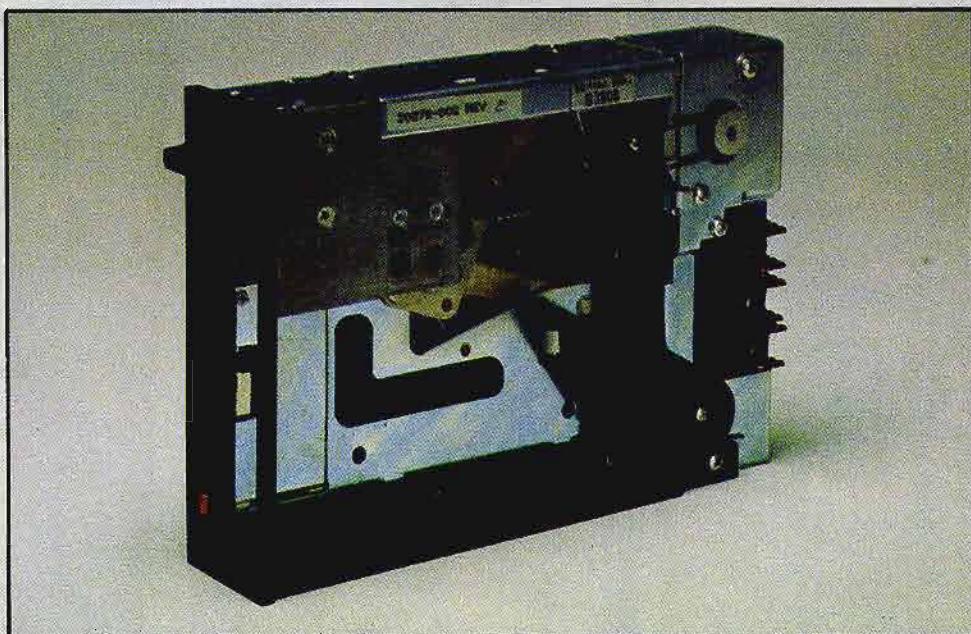
GM721 AND GM722 – TAPE STREAMERS ▼

- **20 MB or 45 MB Capacities**
- **Compact Unit**
- **Efficient Winchester Back-Up**

The GM721 and GM722 Streaming Cartridge Tape Drives are manufactured by Archive Corporation, the industry's leading 1/4" tape streamer manufacturer. Both versions are housed in standard 5.25" half-height enclosures.

containing the Read/Write head, capstan motor, stepper motor, cartridge load mechanism, and basic drive PCB. Output from the drives is to QIC-36 standard, and an interface board is required to connect either of these drives to the host system.

The GM721 and GM722 use industry standard 1/4" cartridges to provide formatted capacities of 20 MB and 45 MB respectively.



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 or double sided, double density, 96 TPI high capacity Micropolis 1115 disk drives. These provide 400K or 800K bytes of formatted storage per drive. (Gemini ODSS and ODDS formats.)

The GM825 housing contains its own integral power supply for the drives and comes complete with the cable assembly for connecting to the GM829 disk controller board.

GM825-1S – Single 400K disk drive unit

GM825-2S – Twin 400K disk drive unit

GM825-1D – Single 800K disk drive unit

GM825-2D – Twin 800K disk drive unit

GM653 – Additional 400K disk drive

GM657 – Additional 800K disk drive

GM835 – Winchester Drive Sub-System

- **5.4, 10.8 or 16.2 Megabyte Formatted Capacity**
- **Industry Standard SASI Interface**
- **Integral Controller and Power Supply**

The Gemini GM835 has been designed to plug directly into the GM829 FDC/SASI board to provide the MultiBoard user with the hard-disk advantages of high performance, high speed, high reliability and high storage.

The enclosure, styled to match the Gemini Galaxy and GM825 floppy disk housings, contains the Winchester drive, the GM695 Winchester controller board, and a switch mode power supply. The drives used are the British made Rodime RO202, RO203 and RO204 models, providing 10.8, 16.2 and 20MB capacities respectively. Average seek time is 90 ms and the data transfer rate is 5 MBytes per second. The intelligent controller provides a 512 byte sector buffer and automatic error detection and correction.

GM835-5 – 5.4 MByte Winchester S/Sys.

GM835-10 – 10.8 MByte Winchester S/Sys.

GM835-16 – 16.2 MByte Winchester S/Sys.

GM835-20 – 20 MByte Winchester S/Sys.

GM855 – TAPE STREAMER SUB-SYSTEM

- **20 MB or 45 MB Capacities**
- **SASI/SCSI Interface**
- **Integral Controller and Power Supply**

The GM855 Streaming Cartridge Tap Sub-System has been designed to plug directly into the GM829 FDC-SASI board to provide the MultiBoard user with a high-performance back-up system for Winchester disk drives.

The GM855 enclosure, styled to match other Gemini enclosures, contains either the GM721 or GM722 Tape Streamer, a SASI/SCSI controller board, and a power supply. The controller board performs automatic "Read After Write" verification on the data, which is recorded on the tape in QIC-24 format. If an error is detected the block is immediately re-written using the same block number. The controller also contains a large buffer in order to keep the tape streaming, and thus provide a fast back-up time.

GM855-20 – 20 Mbyte Tape Streamer S/Sys.

GM855-45 – 45 Mbyte Tape Streamer S/Sys.

[not illustrated]

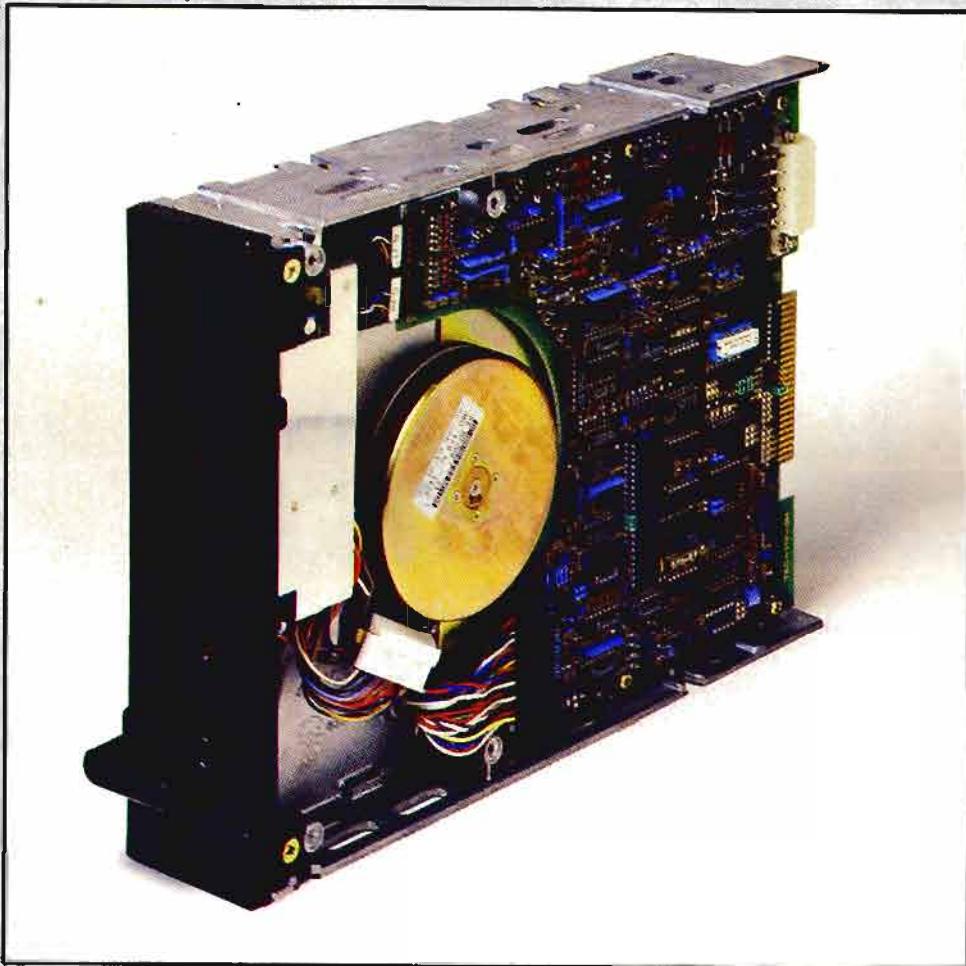


Disk Sub-Systems

GM720 - 8" DISK DRIVE

- Double-Sided, Double-Density
- Fast Access Time
- Half-Height Unit

The GM720 is an 8" floppy disk drive manufactured by Toshiba. This is a high-performance, highly reliable, half-height floppy disk drive for 8" disks, with a very fast track to track access time of 3 mS. The drive may be used in single- or double-density and is double-sided, providing a formatted capacity of up to 1.2 Mbytes.



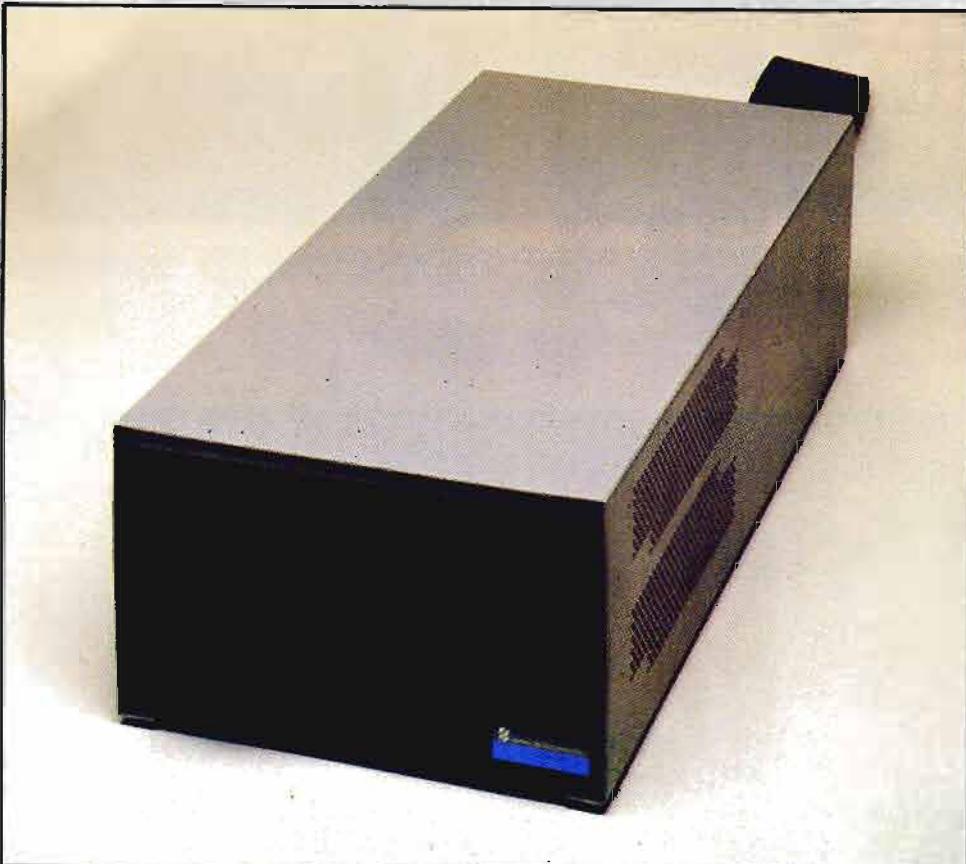
GM415, GM416 and GM417 - DISK DRIVE UNITS

- Integral Power Supply
- 1 or 2 8" Drives
- Optional 3.5" Drive

The GM415, GM416 and GM417 range of disk drive units offer the MultiBoard user exceptional flexibility in coping with various disk requirements.

The GM415 unit contains a GM720 double-sided, double-density 8" disk drive plus power supply in an enclosure that has been colour-matched with the rest of the Gemini range.

Other options are the GM416 unit, which contains a second GM720 8" drive, and the GM417, which contains a GM708 double-sided, double-density 3.5" disk drive.





Network and Modem Boards

GM836 – Network Interface Board

- 250 Kbaud Transmission

- Up to 32 Stations

- Simple Interface to Multiboard Systems

The Gemini GM836 is a small add-on board which plugs into the 26-way connector of the PIO of a GM811 or GM813 CPU board by means of a ribbon cable. The board contains all of the necessary interfacing circuitry to allow the connection of a machine to a network. Data is transmitted serially using a differential transmission method at 250 Kbaud along a twisted pair cable. Using this system up to 32 machines can be connected to the network and the length of cable can be up to 600m (2000 feet) end to end.

Data is transmitted through the network in variable sized packets, each packet having a CRC to detect errors during transmission, retries being automatically performed if a packet is delivered incorrectly.

There are two software options when ordering GM836 boards. GM836 UPG is supplied with software to allow a MultiBoard of Galaxy system with Winchester drive to be converted into a file-server, a floppy or Winchester based system to be converted into a SuperStation, or a disk-less MultiBoard system to be converted into a WorkStation.

GM870 – MODEM

- 300 Baud Full Duplex

- 1200/75 Baud Asymmetric Duplex

- Auto Dial and Auto Answer

The Gemini GM870 is an 80-BUS compatible MODEM board. It is designed around the AMD 7910 chip and provides for low speed data communication capability based on the CCITT standards V.21 (300/300 baud operation) and V.23 (1200/75 baud operation) in both originate and answer modes. The GM870 also has an auto-dial feature as well as an auto-answer capability. The auto-dialer performs loop disconnection operation, the most common dialling technique supported by virtually all UK connection systems.

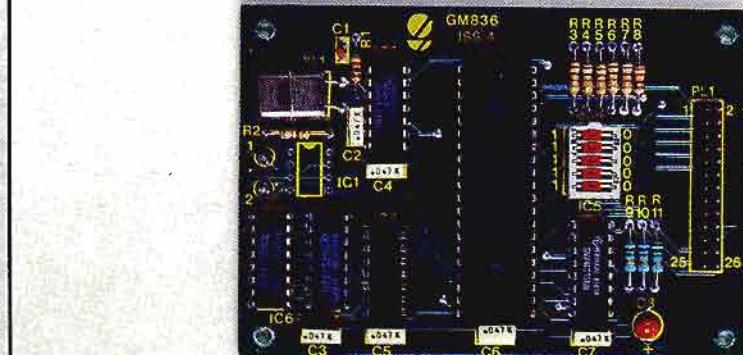
The GM870 also has an on-board software controlled amplifier for connection to a loudspeaker to monitor the progress of the call.

EASYLINK

Gemini have recently became distributors for EasyLink, a totally new electronic mail communication service.

EasyLink, a product of Cable and Wireless and America's Western Union, two of the world's largest companies involved in communications, allows companies of all sizes to pass text between desks and offices without the needs of expensive specialist equipment or telex lines. Using existing equipment and the standard telephone service, EasyLink provides fast and accurate communications.

You enter your message using your Gemini System. This links by telephone to the EasyLink Computer Centre which provides your EasyLink to any telex terminal or any subscriber nationally or internationally. Anytime, Day or night. Remember, there are more than 1,600,000 current users of telex world-wide, and you can communicate with them within 24 hours with EasyLink.



GM836 OEM is supplied with basic transport software for sending and receiving blocks of data to and from other 836 boards connected together in, for example, a control application.

GM836 may also be purchased by itself.

in Design

EasyLink supplies the subscriber with a mailbox, to which all messages are sent and stored. The software used in conjunction with a Modem allows you to dial the EasyLink computer, and once connected, you are able to transmit messages as required.

To receive messages, your system can be configured to interrogate your mailbox at regular intervals, and output selected messages to screen or printer. All incoming messages to your mailbox are FREE – even from the telex network.

THE SYSTEM ALLOWS

- Personal Passwords for security
- On line 'Help' messages
- Multi-addressing from single message entry
- Special priority message service
- Notification of delivered messages available

- Regular mailing lists can be maintained

- Daily summary reports available

- Incoming messages stored or routed in accordance with subscriber's instructions

- 'Copy to file' facility

- Delivery to your terminal or received messages

- Batch entry of messages

- Access to 1.6 million telex users

Your company can register with EasyLink and receive your first password and EasyLink address number. If you would like other users in your office to have their own personal passwords and address numbers, they will cost extra. With the monthly subscription you will find EasyLink an affordable solution to your communication needs.



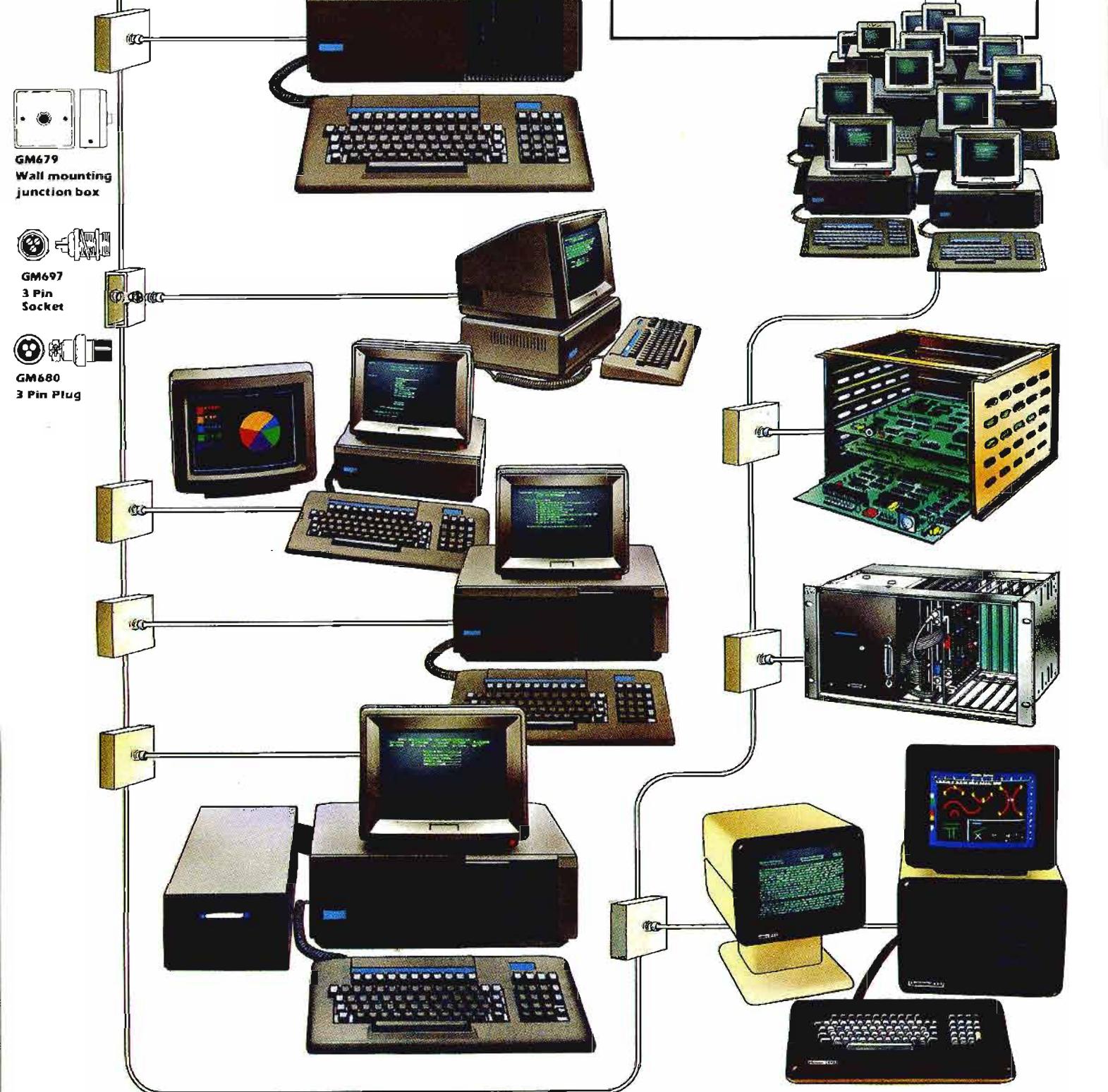
Local Area Networks (LAN's)

Gemini MultiNet (LAN) System

Local Area Networks

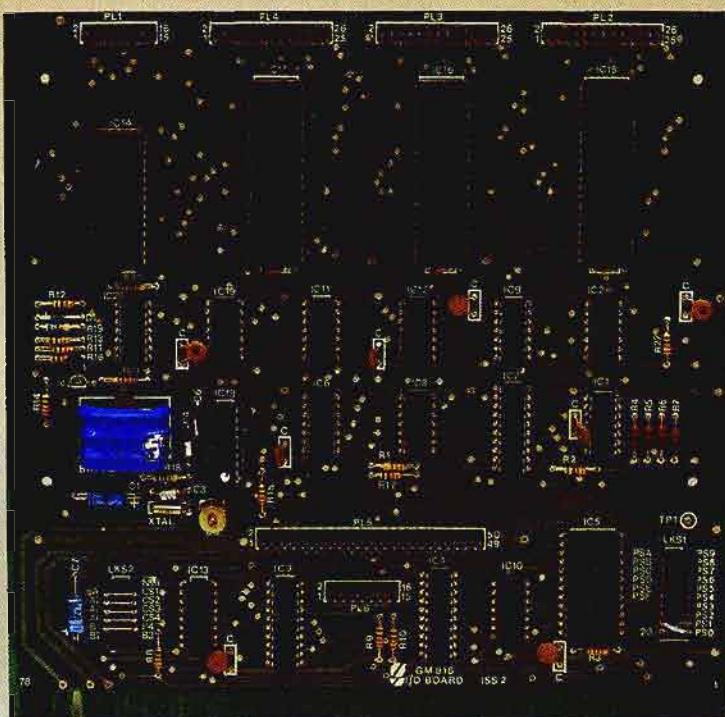
31

The Gemini MultiNet LAN can support up to 31 workstations, examples of which are illustrated here.





I/O Boards

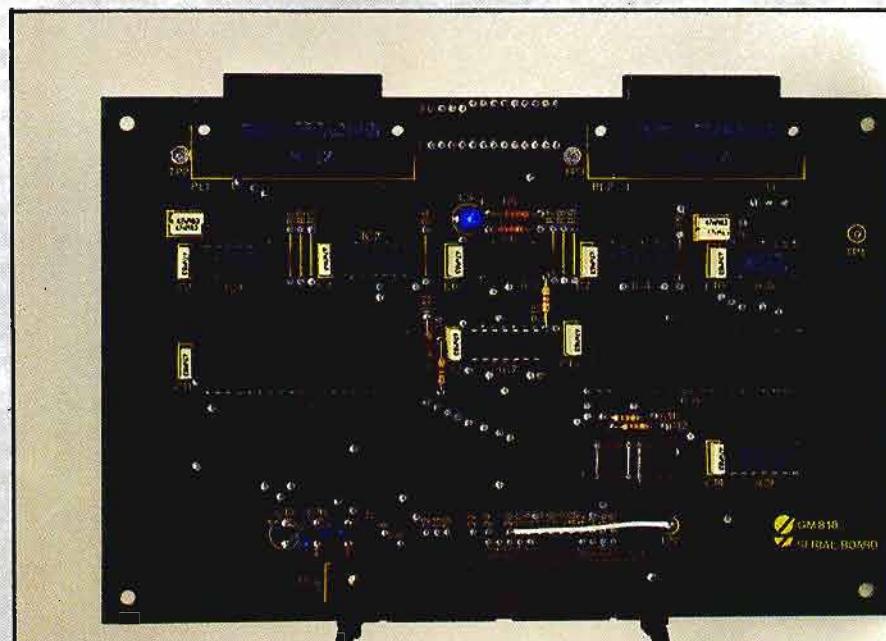


GM818 – Serial I/O Board ▶

- **2 Serial I/O Channels**
- **Fully Programmable**
- **RS232 I/O Levels**
- **Full Modem Controls**

The GM818 Serial I/O Board is one of the daughter boards available for the GM816 Multi-I/O Board. Fitted with two 8250 type UARTS it provides two serial I/O channels with individually programmable baud rates, stop bits, parity, etc. Full modem control signals are provided and all inputs and outputs are at RS232 levels. Four uncommitted output lines and two uncommitted input lines are also provided.

The GM818 board is supplied with interconnection cable and mounting pillars for fitting on the GM816 board and it utilises the buffering and decoding logic of this board. Because of this approach, the GM818 allows extensive asynchronous serial communication facilities to be added to a MultiBoard system for minimal cost.



◀ GM663 – Prototyping Daughter Board

- **Economical System Expansion**
- **Minimal Interface Logic Required**

The GM663 Prototyping daughter board mounts onto the GM816 Multi-I/O Board and interconnection is provided via the 50-way ribbon cable assembly supplied. The prototyping board takes advantage of the necessary buffered bus and decode signals provided by the GM816 thus allowing easy prototyping of additional I/O devices.

This photograph shows clearly how easy it is for additional boards to be made utilising the buffering and decode sections of the GM816 I/O board. This particular board is the prototype of the GM818 board, also featured on this page.

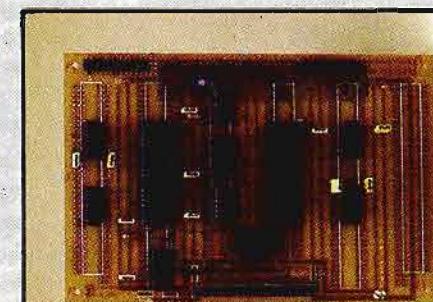
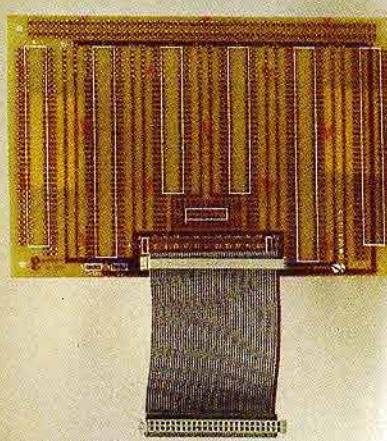
◀ GM816 – Multi-I/O Board

- **6 8-Bit I/O Ports (3x Z80 PIOs)**
- **4 Counter/Timer Channels**
- **Real Time Clock**
- **Further Expansion Capability**

The Gemini GM816 Multi-I/O board provides a comprehensive means of interfacing with external devices. Three Z80A PIOs provide 6 bi-directional 8-bit data ports with handshaking 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 provide, for example, A-D or D-A conversion, opto-coupling, or additional PIOs, UARTs, etc. Currently available are the GM818 Serial daughter board and the GM663 Prototyping daughter board.

During 1985 the GM818 D-A connector daughter board will be available.





I/O Boards

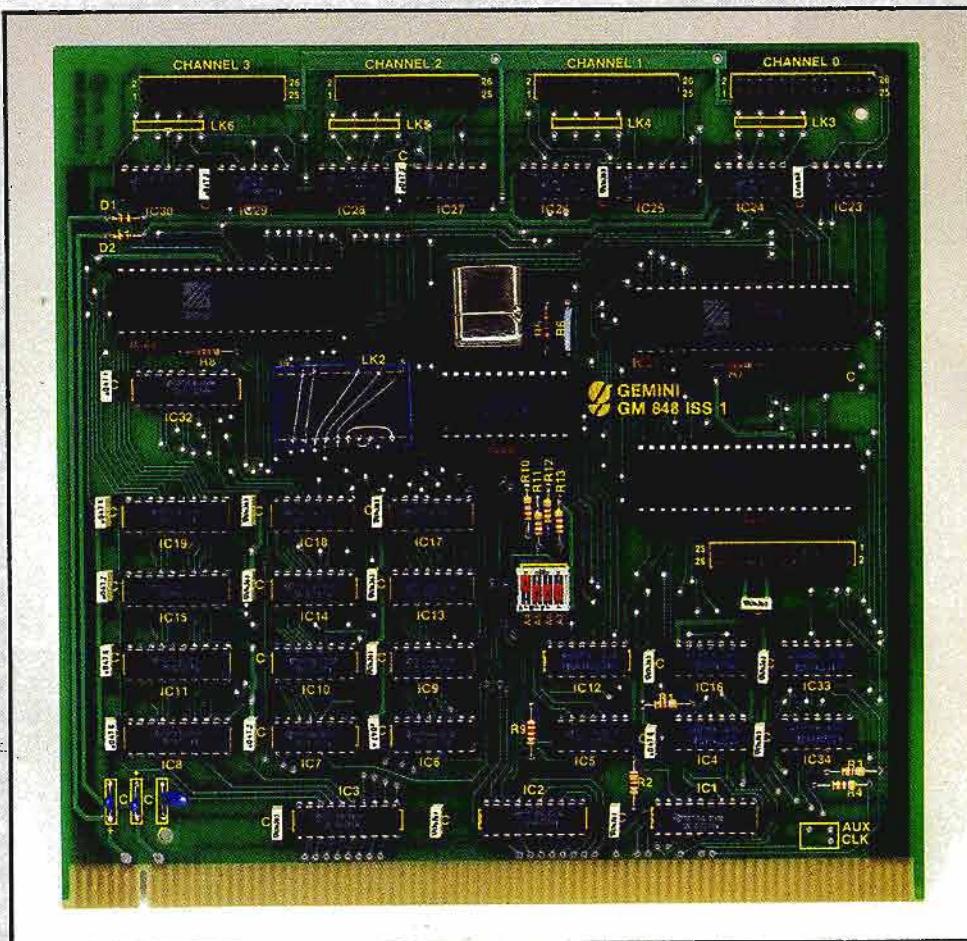
GM848 – Serial I/O Boards

- 4 Serial I/O Channels
- Programmable Baud Rates
- Synchronous/Asynchronous Operation
- Two 8-bit I/O Ports (Z80 PIO)

The GM848 Serial I/O Board utilises two Z80A SIO chips to provide four Synchronous/Asynchronous serial channels. Baud rates are independently software selectable for all four channels and for the transmit and receive side of each channel. Baud rates are switchable between 75 and 19200 baud or, for synchronous communication, from the external clocks. All inputs and outputs are provided at RS232 levels and full modem control signals are available.

The GM848 is also fitted with a Z80A PIO to provide two 8-bit bi-directional data ports with handshake signals.

Both of the SIOs and the PIO on the GM848 are part of the 80-BUS interrupt daisy-chain, allowing this board to operate under the Z80 vectored interrupt scheme. The GM848 occupies 16 consecutive 80-BUS I/O ports, the base address of which is switch-selectable.



EV814 – IEEE488 Controller

- IEEE488/GPIB Controller
- Comprehensive Software Supplied
- Cost Effective Controller

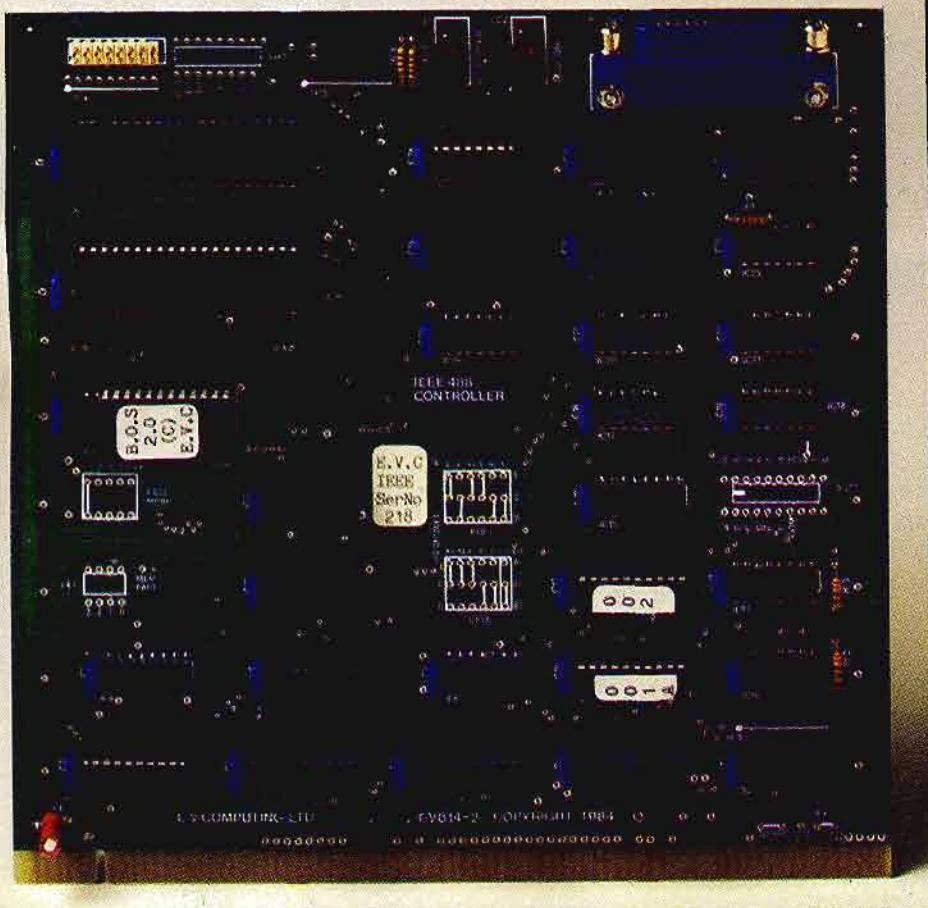
This board from EV Computing has been designed to fully implement all IEEE488 interface functions. It is capable of controlling any equipment fitted with a standard IEEE488 or GPIB interface.

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 user's 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.

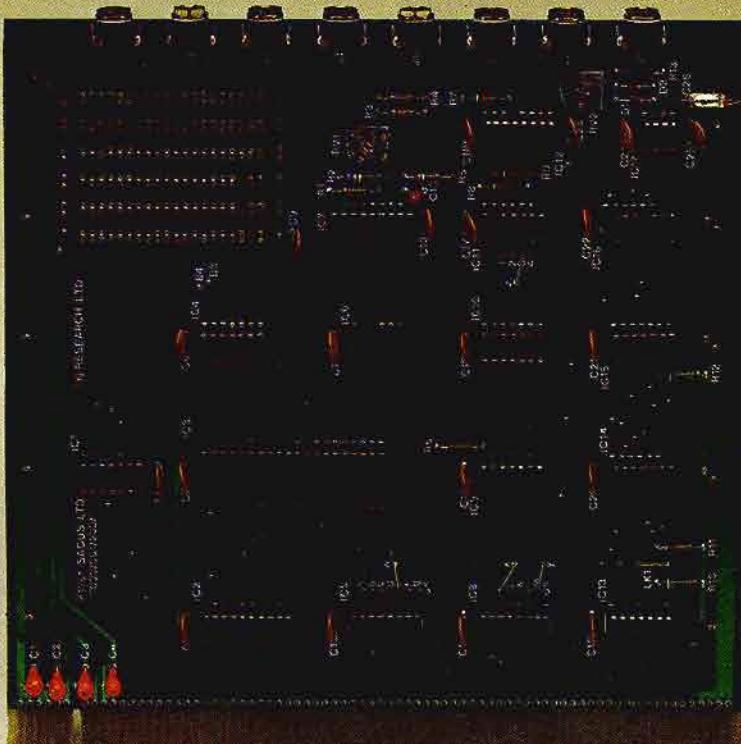
With the increasing popularity of the IEEE488 interface bus, this board gives the user a very versatile method of controlling equipment on the bus at minimal cost.

For further detail contact:
EV Computing
700 Burnage Lane
Manchester M19 1NA
Tel: 061-431 4866





I/O Boards



GM824 – A/D Board

■ 8 Input Channels

■ 8 Bit Resolution

■ Sample and Hold

The Gemini GM824 is an Analogue to Digital convertor board. 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 GM824 has full interrupt control, user configurable I/O addresses, an onboard prototyping area, and comes complete with a comprehensive manual.

GM851 – 12-BIT A/D BOARD

■ Selectable Input Ranges

■ 30 uS for 12-bit Conversion

■ High-accuracy Instrumentation Amplifier

■ Sample/Hold Amplifier

The Gemini GM851 is a full feature 12-bit A/D board incorporating a number of features to provide both for ease and versatility of operation and ensuring accuracy of the conversion. The major facilities are:

- link selectable choice of 16 single-ended or 8 differential inputs
- high accuracy instrumentation amplifier to provide selectable gains of 1, 10, 100 and 1000
- fast and accurate sample-hold amplifier to ensure conversion integrity
- link selectable choice of 8 different input ranges
- link selectable choice of 12-bit or 8-bit conversions, with conversion time of 30 uS for 12-bit conversions
- ability of interrupt generation on conversion completion

in Design!



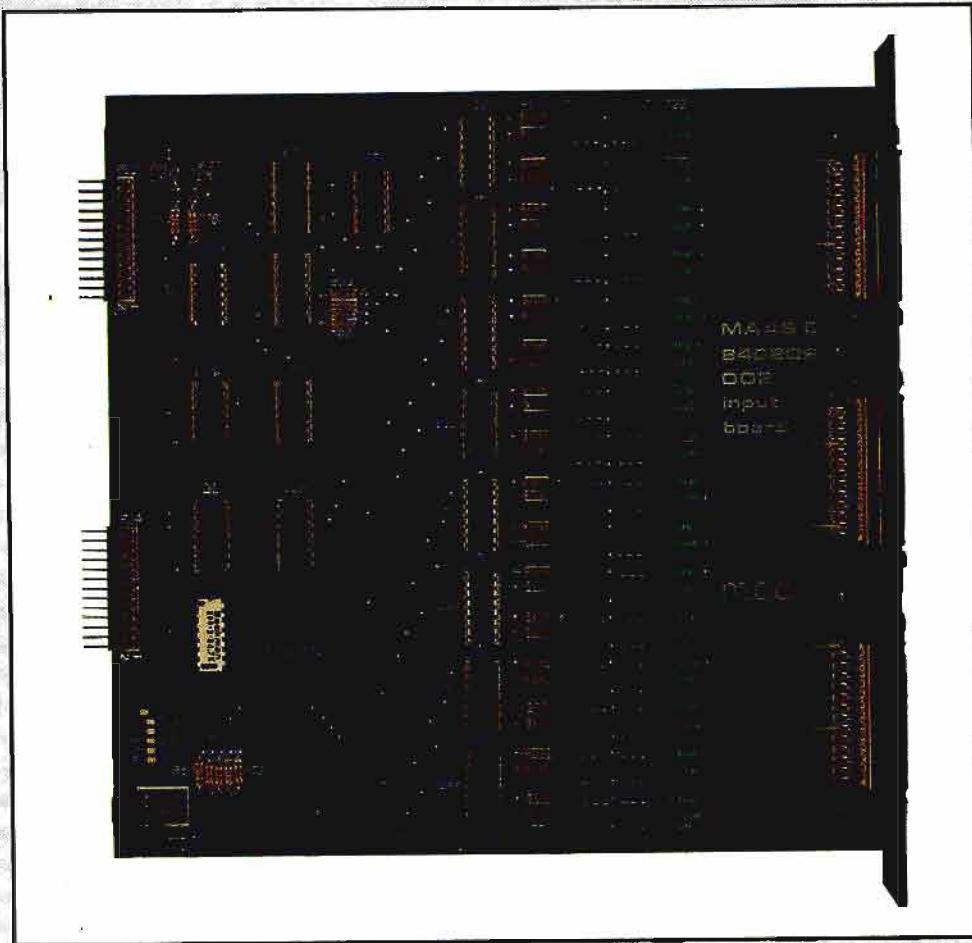
I/O Boards

MC867 - Opto-Input Board

- 32 Optically Isolated Inputs
- Adjustable for 12 or 24 V Input

The Maas Computer Consultants' MC867 board is an 8" x 8" board designed for use with the Gemini GM816 Multi-I/O board. This board is intended for use in applications where external equipment is to be controlled.

Up to 32 boards can be coupled to a single GM816 board, thereby providing up to 1024 inputs. Provided the total number of boards does not exceed 32, these boards may also be mixed with the MC869 Opto-Output board.



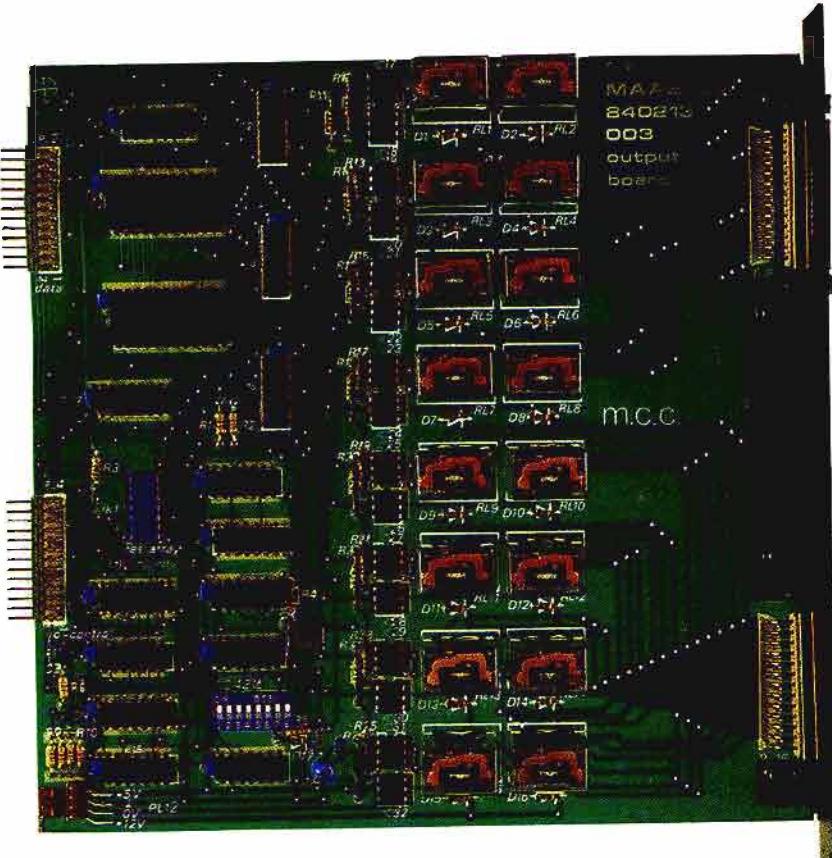
MC869 - Opto-Output Board

- 16 Optically Isolated Outputs
- Available with or without relays

The Maas Computer Consultants' MC869 board is an 8" x 8" board designed for use with the Gemini GM816 Multi-I/O board. This board utilises 16 relays, double protected by opto-couplers which assist the controlling relays. The board is also available without relays, and jumpered for direct output from the opto-couplers.

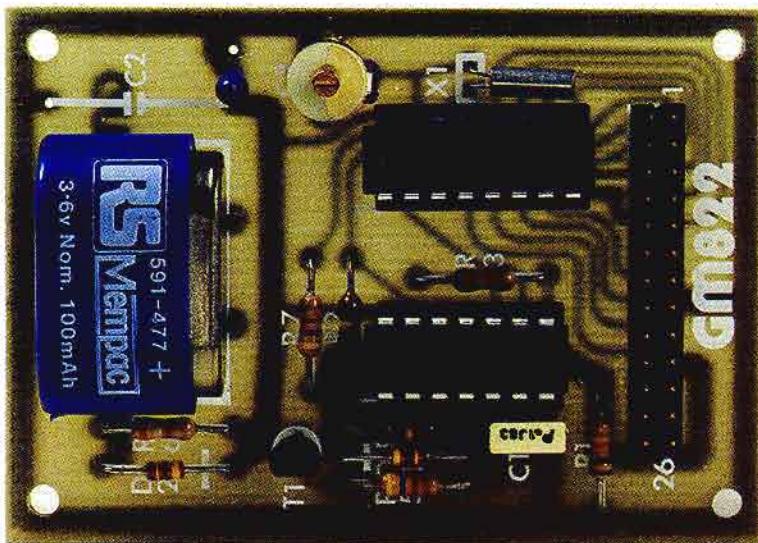
A separate 12V supply is recommended for the relays, and to facilitate this a separate connector is provided on the board. Each relay can switch 220V (+/- 2A A.C.) and can be connected in one of three ways - normally open, normally closed, or single-pole changeover.

Up to 32 boards can be coupled to a single GM816 board, thereby providing up to 512 outputs. Provided the total number of boards does not exceed 32, these boards may also be mixed with the MC867 Opto-Input board.





Miscellaneous Boards



GM822K – Real Time Clock Kit

- 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.

The GM822K is supplied as a kit.

BE847 – Arithmetic Board

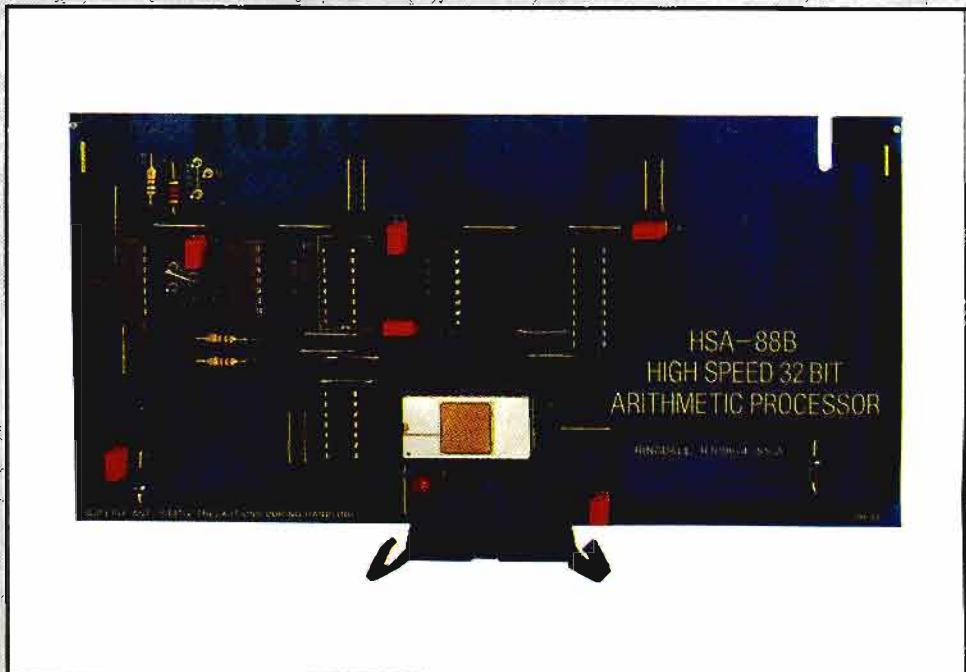
- High Speed Arithmetic Processor
- Simple Software Interface
- Pascal Compiler Included

The BE847 Arithmetic Board from Belectra utilises the AMD 9511 IC and performs high speed arithmetic and trigonometric calculations in hardware, 10 to 100 times faster than the equivalent Z80 software routines. It operates simultaneously with the system CPU, further increasing throughput.

The BE847 is supplied with the Hisoft HPS Pascal compiler. HPS has been specially modified to use the BE847 for all maths functions and features 32 bit integers.

The BE847 is also very easily used by assembly language programs.

For further details contact:
Belectra Ltd
11 Decoy Road
Worthing, Sussex BN14 8ND
Tel: 0903 213131





Extender & Prototype Boards

GM839 – Prototyping Board

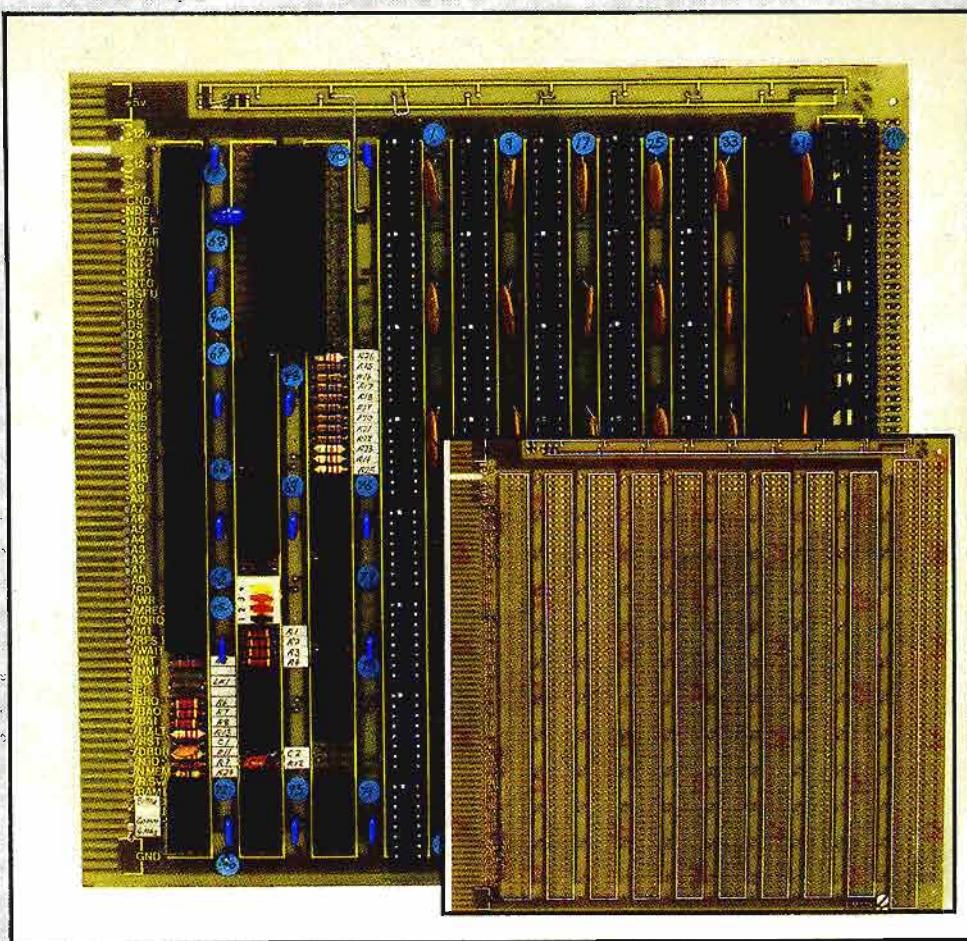
■ Fibreglass PCB

■ 80-BUS Signal Identification

■ High Density IC Capability

The Gemini GM839 high quality 80-BUS prototyping board provides the MultiBoard user with a convenient means of adding specialised 'one-off' boards to his system. This single sided fibreglass PCB provides extensive power supply tracking and the layout has been optimised to allow a high IC packing density. Additionally one edge of the PCB has been designed to accommodate multi-way insulation displacement type connectors.

The component side of the GM839 is silk-screened to show the positioning of the power rails and component pads, and all 80-BUS signals are identified. On the reverse side of the board the 80-BUS lines are identified by number. An 80-BUS specification booklet is included.

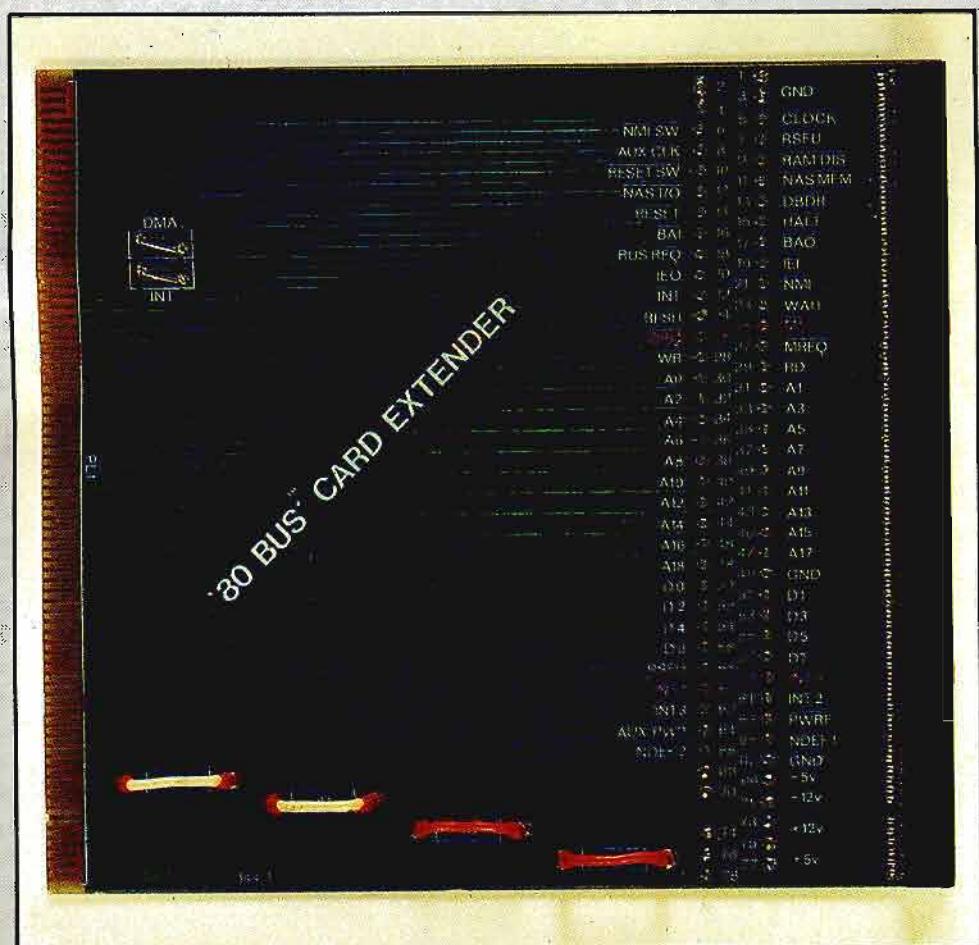


GM841 – Extender Board

■ Test Point on each Line

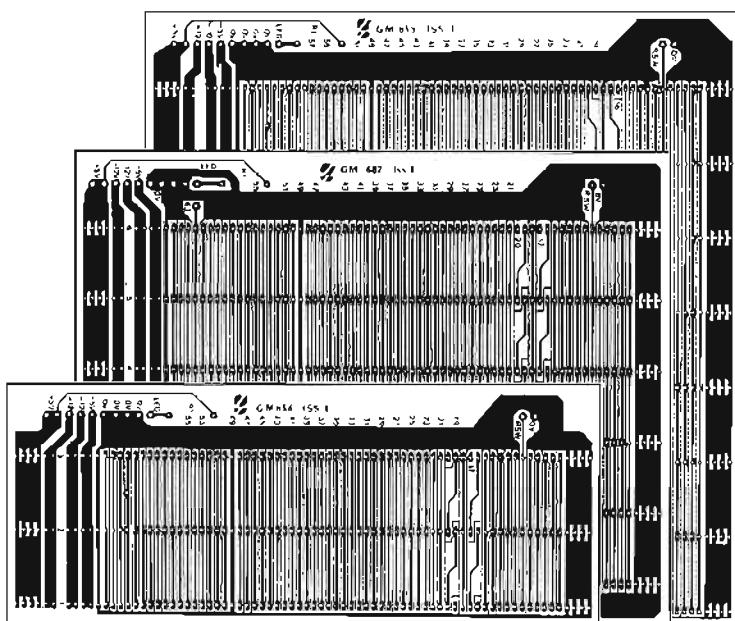
■ All 80-BUS Signals Identified

The GM841 Extender Board allows 80-BUS boards to be brought outside of a frame for testing and debugging purposes. Test points are provided on every bus line and each line is identified by both number and 80-BUS name.





Motherboard Assemblies



GM655, GM682 and GM656 Motherboards

■ 3, 6 and 8 slot Versions

■ 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.

GM656 – 3-slot motherboard

GM682 – 6-slot motherboard

GM655 – 8-slot motherboard

GM654 – 5-slot motherboard

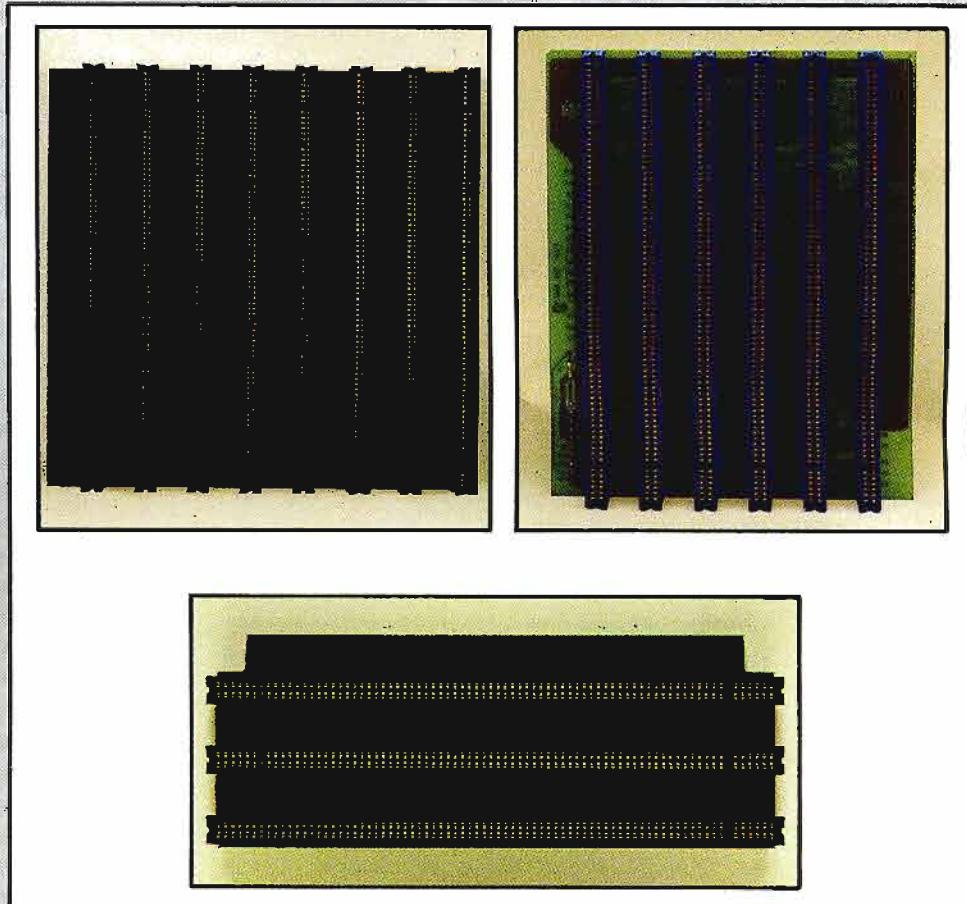
GM846, GM845 and GM844 Motherboard Assemblies

The range of motherboards shown above are available completely assembled with 80-BUS edge connectors.

GM846 – 3-slot motherboard assembly

GM845 – 6-slot motherboard assembly

GM844 – 8-slot motherboard assembly





Backplanes & Accessories

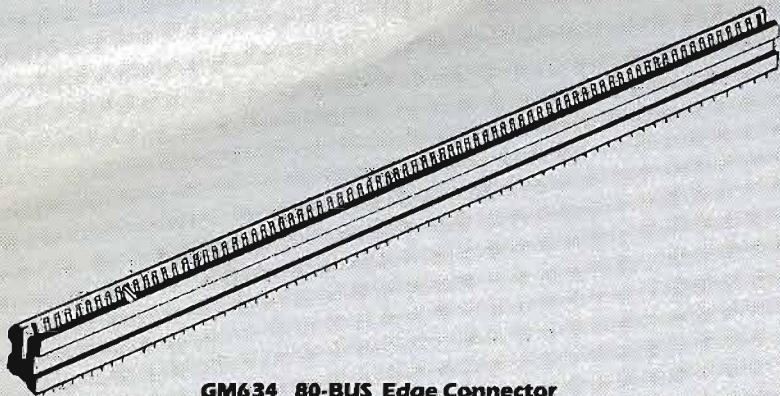
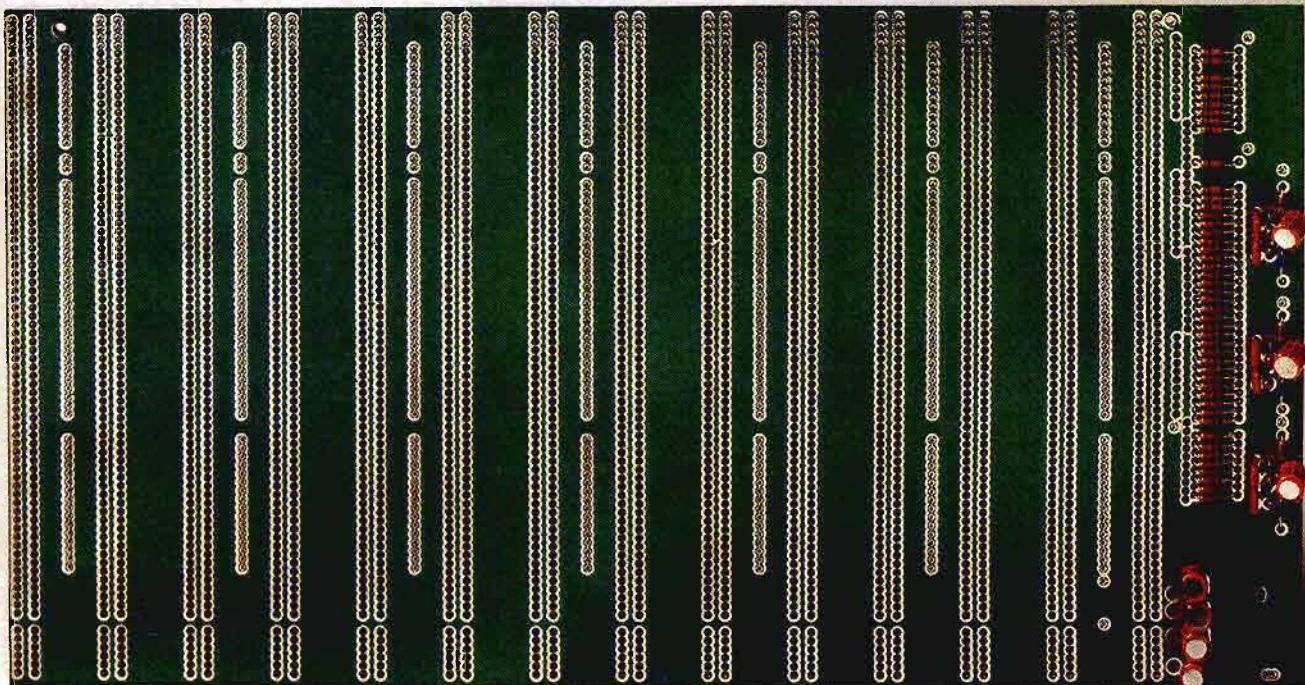
MP840 - Terminated Backplane

- 14-slot Backplane
- Signal Termination
- Extension Ground Shielding

The Microcode MP840 is a 14-slot 80-BUS backplane which has been specially designed to overcome problems often associated with running long microcomputer backplanes. All active bus signals are terminated into a potential balanced RC filter and are interlaced with ground shield tracks, plus one side of the backplane provides a complete ground plane.

The backplane features interrupt and bus request daisy chaining and can be used in different lengths by a simple 'score and break' operation.

For further details contact:
Microcode Process Control Systems
41a Moor Lane
Clitheroe, Lancs.
Tel: 0200 27890



GM634 80-BUS Edge Connector



GM635 Edge Connector clip



Operating Systems & Accessories

Z80 Operating Systems

For disk system users Gemini have implemented the CP/M 2.2 disk operating system (D05). CP/M is the accepted industry standard D05 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 or GM832 SVC, include on-screen editing, both of commands and within user programs, and the ability to 'dump' the contents of the screen to a printer.

CP/M

Gemini have produced various CP/M2.2 packages. Each of these contain a master CP/M2.2 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 between media, the tapes being in RP/M format.
WRITCAS	

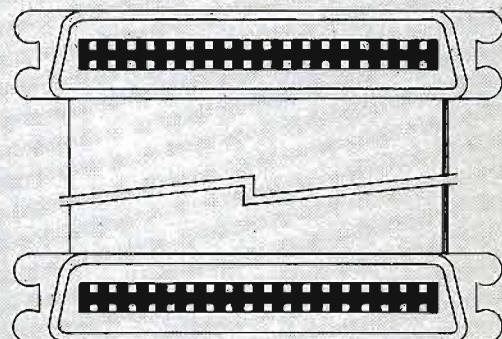
In a CP/M system the BIOS is the software interface between the CP/M operating system and the specific hardware in use. In these CP/M packages the BIOSs are extremely comprehensive. Extensive error checking, reporting and retry facilities are included. The printer routines incorporated allow for serial,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

8088 Operating Systems

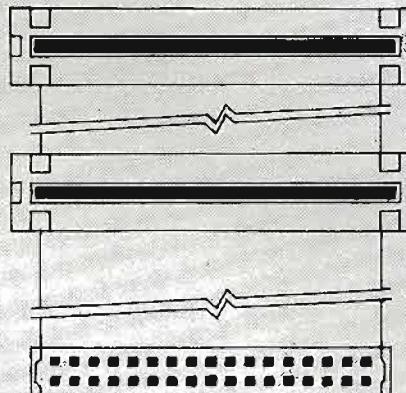
CP/M-86

For use with systems incorporating the GM888 8088 processor board Gemini have implemented Digital Research's CP/M-86 operating system. CP/M-86 is the 16 bit version of the popular CP/M operating system with a time tested modular design that can support application programs that are both large and complex. CP/M-86 can manage up to a megabyte of main memory and gives application programs full advantage of the 8088 address space. There is also complete file compatibility with CP/M-80, allowing both CP/M-80 and CP/M-86 programs to reside on the same disks and use the same data files.

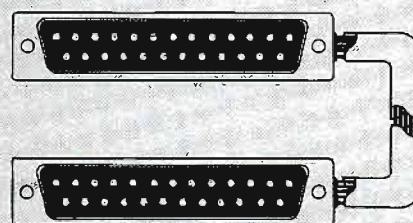
Some of the cable assemblies used both internally in enclosures and externally for interconnection to peripherals are depicted below. Please consult our price list for details of the complete range.



GM665 Parallel Printer Cable



GM649/GM650 Internal Floppy Disk Cable Assembly



GM699/GM709/GM717 Serial Cable



GM736 Internal Serial Keyboard Cable Assembly



GM660 Video Cable Assembly



GM732 Cassette & Light Pen/Cable Assembly Internal



GM733 Internal Video Cable Assembly



Power Supplies

GM817, GM843, GM850, GM854, GM857 and GM858 Power Supplies

■ Switch Mode Designs

■ Protected Outputs

■ Compact Shielded Units

The Gemini range of switch-mode power supply units are of compact design and low magnetic radiation, to conform to International Safety and RFI Regulations. This range of supplies is ideal for most system sizes. Each supply has dual input voltages and regulated outputs of:

	-12	-5	+5	+12	Max. Power Watts
	Volts				
GM817	0.5*	0.5*	6.0	2.5 {4.0}	85
GM843	0.5*	0.5*	12.0	4.0	116
GM850	1.0*	1.0*	6.0	1.0*	50
GM854		0.5	8.0	4.0 {6.0} 2.0 {5.0}	85
GM857	0.3		3.0	1.3	35
GM858	0.5*		3.0	2.0	40

Figures in brackets { } are PEAK currents available.
Outputs marked * are floating outputs, and can therefore be connected to be either -ve or +ve.



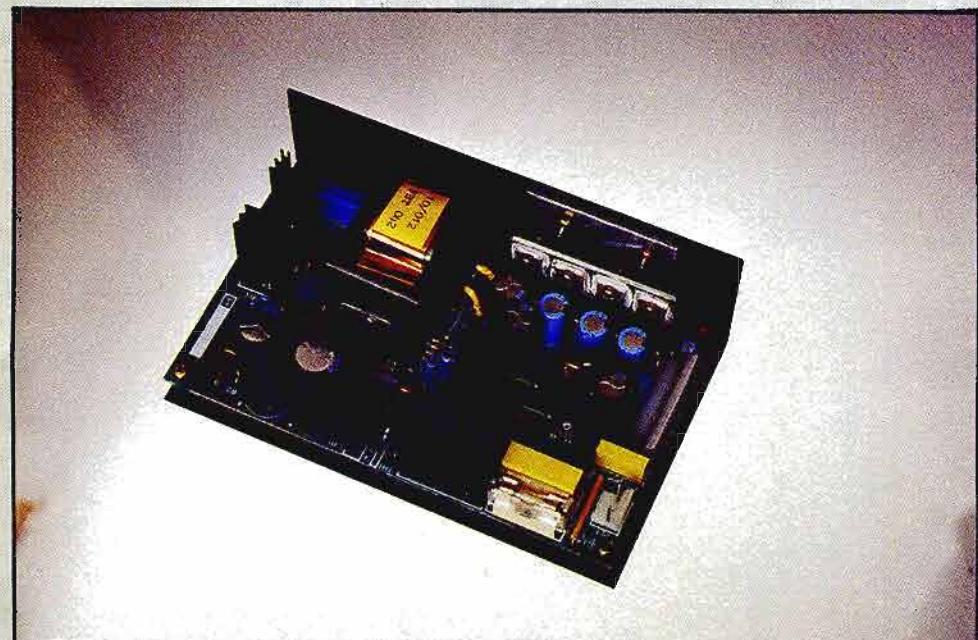
GM817 – supplied with metal shroud



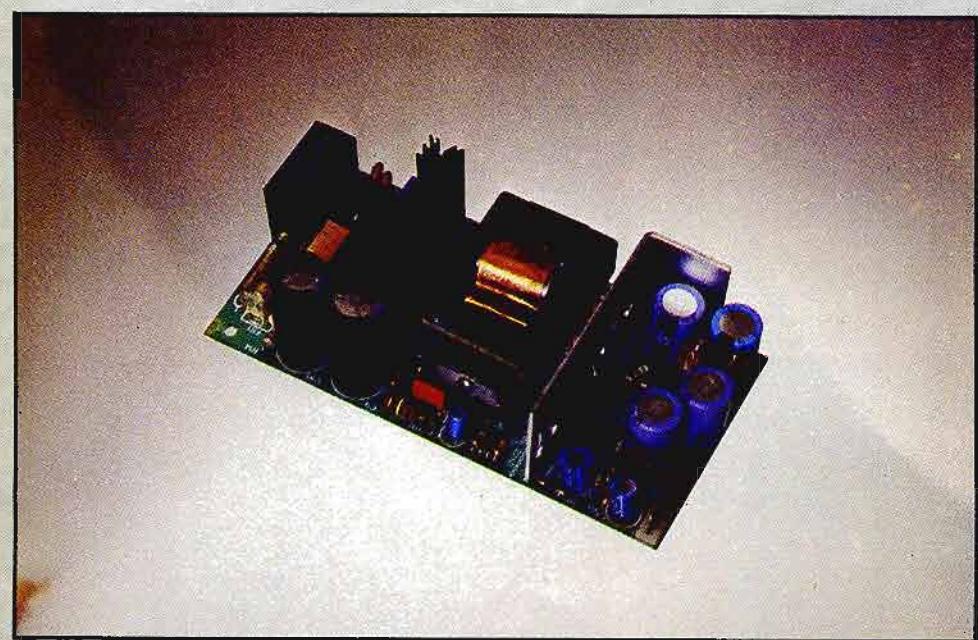
GM843 – supplied with metal shroud



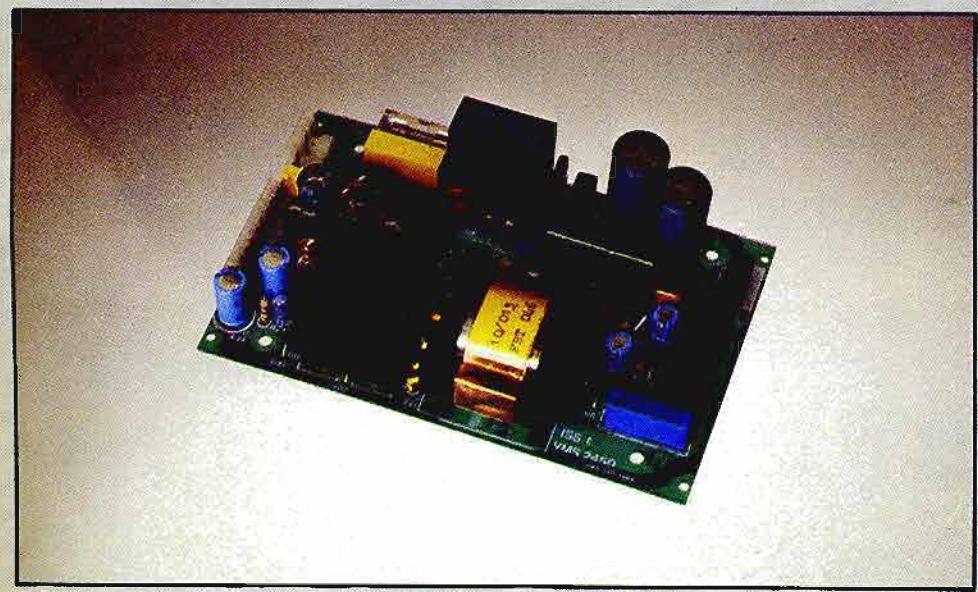
Power Supplies



GM850



GM857



GM858



Monitors

GM406 - MONOCHROME MONITOR

- 12" Green Screen
- 0.5-1.5 V p-p Input
- Attractive Enclosure

The GM406 monochrome monitor is designed for use with MultiBoard systems using the GM832 SVC board for video display. The monitor has a 12", P31 phosphor, chemical etched screen to give high quality output. Contrast and brightness controls are conveniently placed to allow users to adjust the display to their own requirements. The GM406 is colour matched to the rest of the Gemini system.



GM411 AND GM412 COLOUR MONITORS

- 14" Colour Monitors
- Medium/High Resolution Options
- RGB Inputs

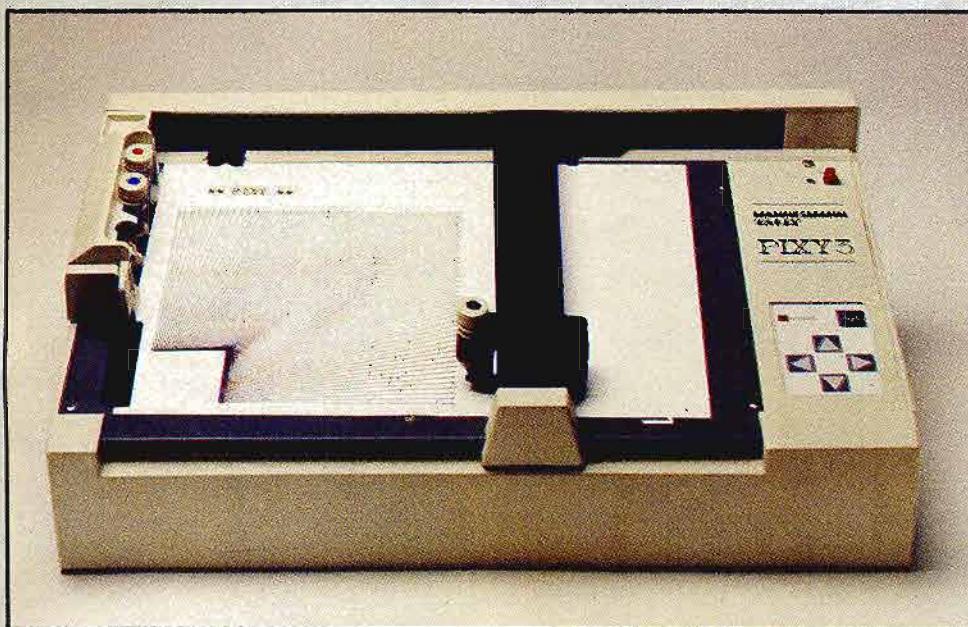
The GM411 and GM412 are high technology colour monitors manufactured by Cotron Electronics Ltd.

Connection is via a 25 pin D socket and is set for RGB and Composite sync at 1 volt level into 75 ohms. The GM411 provides Medium Resolution output of 650 horizontal pixels, whereas the GM412 provides High Resolution output of 850 horizontal pixels.





Peripherals

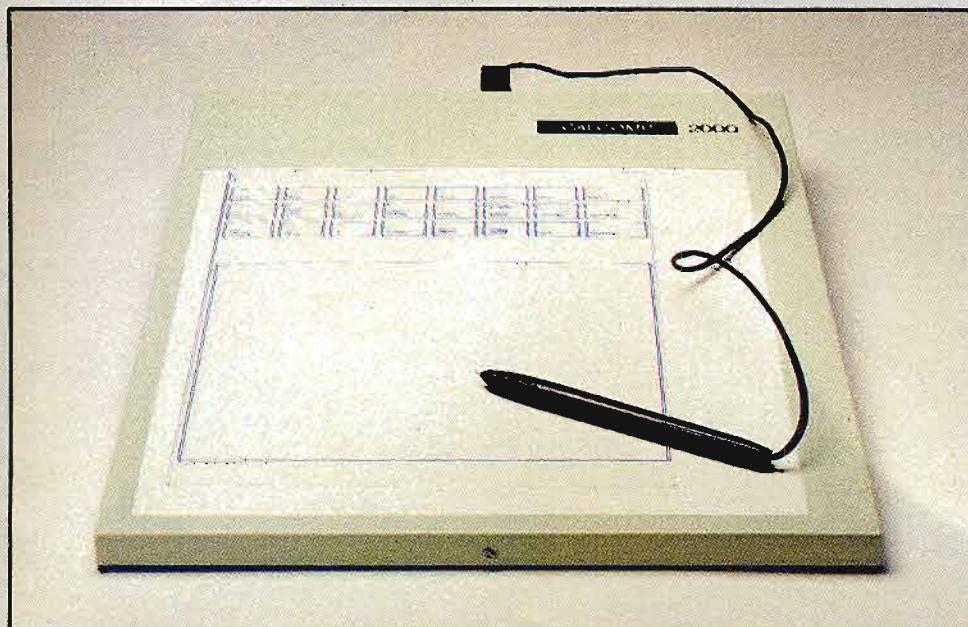


GM418 - 3-PEN PLOTTER

- 3-Pen Plotter
- Automatic Pen Change
- A4 Format

The GM418 3-Pen Plotter from Mannesmann Tally brings high quality plotting at a realistic price. It uses standard A4 size paper with easy flat-bed loading. The three pens of the GM418 provide multi-colour graphics without manual change of pens. An internal processor enables such facilities as circle, arc and spiral generation, as well as curve fitting. Oil-based ink pens are also available for use on mylar film to produce transparencies.

The GM418 Plotter is fitted with an RS232 computer interface.

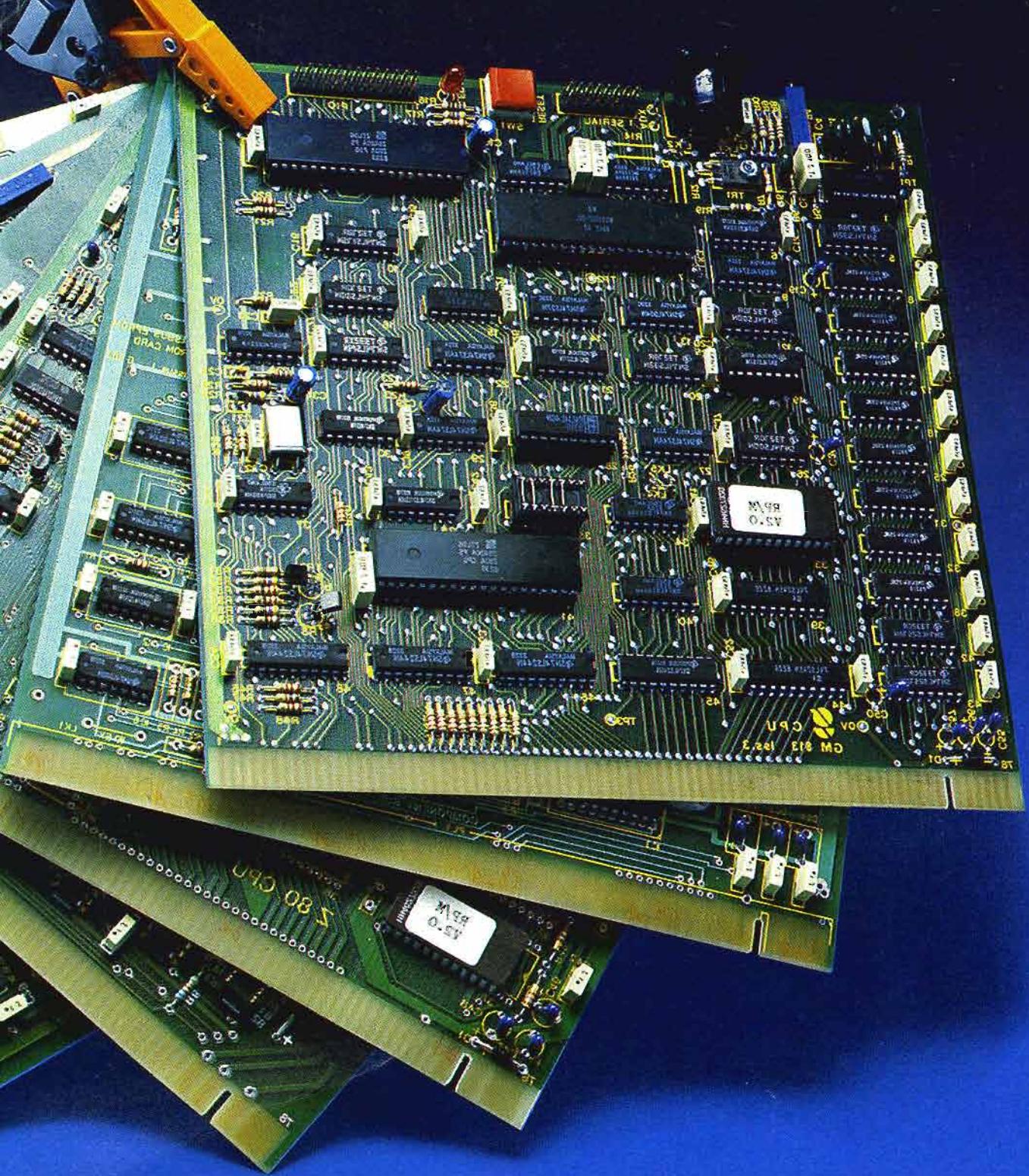


GM413 AND GM414 DIGITIZER PADS

- 200 Line/inch Resolution
- Large Digitizer Area
- Pen and Cursor Options

The GM413 and GM414 Digitizer Pads are manufactured by CalComp. These are simple devices for converting graphic information into digital form for entry into the computer. The valid digitizer area is 11.7" (298 mm) square, thus covering full A4 sheet sizes. The GM413 is supplied with a Pen as the input device, whereas the GM414 has a 4-button cursor. Resolution of both devices is 200 lines/inch (10 lines/mm).

The GM413 and GM414 are fitted with RS232 computer interfaces.



Gemini Microcomputers Ltd, 18 Woodside Road, Amersham, Bucks, England. HP7 0BH. Tel: (02403) 28321. Telex: 837788



GEMINI END USER PRICELIST

ISSUE 4

EFFECTIVE 01/01/85

GM900 SERIES SYSTEMS

PART NO.	DESCRIPTION	PRICE
<u>All GM900 series include video monitors and keyboards</u>		
GM903	GEMINI 2 Computer with 2x400K Drives	1495
GM904	" " " " 1x400K "	1275
GM905	" " " " 2x800K "	1695
GM906	" " " " 1x800K "	1395
GM907	GEMINI 3 " 1x5.4M + 1x800K "	2500
GM908	" " " 1x10.8M + 1x800K "	2750
GM914	" " " 1x16.2M + 1x800K "	3100
GM909	GEMINI 4 MultiNet Workstation	750
GM923	GEMINI 4 MultiNet Colour W'station (exc. colour monitor)	1325
GM923M	as above but also inc. Mini Pallette	1650
GM910	GEMINI 4 MultiNet Fileserver (5.4M + 800K)	2600
GM912	" " " (10.8M + 800K)	2850
GM915	" " " (16.2M + 800K)	3200
GM916	GEMINI MFB 5.4 MB + 96TPI DS + 48TPI DS	3750
GM921	" MFB 16.2 MB + 96TPI DS + 48TPI DS	4300
GM922	" MFB 96TPI SS + 96TPI DS + 48TPI DS	3000

Notes:

- 1) 8"/8"+3.5" unit (GM4XX) must be ordered at same time as M-F-B.
 - 2) MFB + GM4XX must NOT exceed FOUR floppies in total.
 - 3) GEMINI 4s require GM816 for Centronics printer I/O. add 125
 - 4) GEMINI 2, 3 or MFB as 'Superstation' (part GM9XXS) add 100

GM400 SERIES MONITORS AND PERIPHERALS

GM406	Eurovideo 12" Monitor (Green)	160
GM411	Cotron Rapier Hi-res Colour Monitor	575
GM700	Cable Mini-Palette to Rapier Monitor	32
GM725	Cable for Pluto to Rapier Monitor	32
GM717	Cable for Colour WorkStation to Rapier Monitor	32
GM415	8" Double 8" Double Sided Drive Unit + PSU in Case	875
GM416	2 x 8" " " " " " " " " " "	1275
GM417	8" Double " + 3.5" DS " " " " " " " "	1100
GM413	Digitiser Pad with Pen	575
GM414	" " " Cursor	650
GM699	Serial Cable for Digitiser Pad	15
GM418	Pixy 3 pen A4 plotter	399
GM709	Cable for Pixy Plotter	15

ALL PRICES SUBJECT TO VAT AT THE PREVAILING RATE.

E&OE

GM800 SERIES MULTIBOARD PRODUCTS

PART NO.	DESCRIPTION	PRICE
GM811	80-BUS Z80A CPU Board	125
GM813	80-BUS Z80A CPU/64K RAM Board	225
GM888	80-BUS 8088 Co-processor Board	190
GM832	80-BUS SVC (Super Video Controller) Board	195
GM837	80-BUS 256x256 Colour Graphics Board	165
I0828-H	80-BUS 'PLUTO' 768x576 Colour Graphics Board	600
I0828-L	" " 640x576 " " "	550
I0830	Mini-palette Expansion Board for PLUTO	325
GM802	80-BUS 64K Dynamic RAM Board	125
GM862	80-BUS 256K Dynamic RAM Board	325
GM863-32	80-BUS 32K Static RAM Board with battery back-up	TBA
GM863-64	80-BUS 64K Static RAM Board with battery back-up	TBA
GM853	80-BUS 'Bytewide' EPROM Board	TBA
GM860	'Bytewide' EPROM Programmer	150
GM829	80-BUS 5.25"/8" FDC + SASI Interface	145
GM833	80-BUS 0.5MByte 'RAM-DISK'	450
EV814	80-BUS IEEE-488 Interface Board	195
GM816	80-BUS I/O Board (RTC, CTC, 3xPIO+Expansion boards below)	125
GM824	80-BUS 8-bit A/D Board	125
GM848	80-BUS Serial + Parallel I/O Board	125
GM836	MultiNet Network Interface (Board Only)	50
GM836UPG	For GEMINI upgrade to Superstation	80
GM8360EM	GM836 with Transport Software + Manual	70
GM818	SERIAL I/O daughter board for GM816	65
GM663	PROTOTYPING " " " "	21
GM839	80-BUS PROTOTyping Board	12.50
GM841	80-BUS EXTENDER Board	30
GM807	3A Linear PSU	40
GM817	6A Switch-Mode PSU	75
GM843	10A " " "	125
GM850	5A " " "	50
GM852SE	Low prof 87 Key kbd in case w.cable SERIAL,English	135
GM852PE	" " " " " " PARALLEL, " "	145
GM852SD	As Above - Serial,Danish	145
GM852PD	" " Parallel, "	155
GM852SF	" " Serial,French	155
GM852PF	" " Parallel, "	160
GM852SG	" " Serial,German	145
GM852PG	" " Parallel, "	155
GM852SS	" " Serial,Swedish	145
GM852PS	" " Parallel, "	155
GM825-1D	Floppy Disk Drive Sub-system 1 x 800K	"
GM825-2D	" " " " 2 x 800K	"
GM835-5	Winchester Drive Sub-system 5.4 MByte	"
GM835-10	" " 10.8 MByte	"
GM835-16	" " 16.2 MByte	"
GM844	8-Way Motherboard with Connectors	50
GM845	6-Way " " "	38
GM846	3-Way " " "	22

GM500 SERIES SOFTWARENOTES

Gemini products in {} are additionally required to run these packages
 'RP/M' = GEMINI 1200 BAUD CUTS TAPE FORMAT
 'SDSS' = HENELEC/GM805 FORMAT (Pertec, 48TPI, Single Density, Double Sided)
 'DDDS' = GM809/GM815 FORMAT (" , 48 " , Double " , Double ")
 'QDSS' = GEMINI FORMAT (Micropolis, 96 " , Double " , Single ")
 'QDDS' = QUANTUM 2000 FORMAT (" , 96 " , Double " , Double ")

PART NO.	DESCRIPTION	FORMAT	PRICE
<u>Operating Systems for GEMINI Boards</u>			
GM537	RP/M V2 (for GM811/813)	2732	20
GM543	IVC-MON V2 (for GM812)	2732	20
GM569	SIMON (for GM811/GM813)	2716	12

Tape Software for RP/M Systems

GM517	GEM-ZAP {GM821/827+812}	RP/M	45
GM519	GEM-PEN {GM812}	RP/M	45
GM524	GEM-DEBUG	RP/M	30
GM549	ECONOMY BASIC {GM812}	RP/M	25

Operating Systems for GEMINI with disks

GM512	CP/M 2.2 {809/829+815}	DDDS	105
GM532	CP/M 2.2 {809/829+825}	QDSS	105
GM555	CP/M 2.2 {809/829+825}	QDDSS	105
GM578	CP/M-86 {809/829+888+825 or Galaxy+888}	QDSS	175

CP/M Software for GEMINI systems running Gemini QDSS Format

GM523	Compas V1	QDSS	150
GM539	Gem-Zap	QDSS	45
GM540	Gem-Debug	QDSS	30
GM541	Gem-Pen	QDSS	45
GM542	List	QDSS	15
GM544	VIZ::APL	QDSS	255
GM548	IVC Graphpac (links MBASIC)	QDSS	35
GM551	Economy BASIC for IVC	QDSS	28
GM557	MBASIC Interpreter	QDSS	225
GM558	dBASE II	QDSS	365
GM559	WordStar	QDSS	295
GM560	MailMerge	QDSS	145
GM561	SpellStar	QDSS	145
GM562	MARS	QDSS	295
GM570	Compas Version 3	QDSS	225
GM571	Sapphire Calcmaster	QDSS	50
GM579	Digital Research GSX {Pluto}	QDSS	50
GM580	" " " DR-Draw {Requires GSX}	QDSS	295
GM581	" " " DR-Graph {" " " " }	QDSS	195
GM582	" " " C-Basic	QDSS	150
GM573	Pluto Qwikdraw	QDSS	250
GM574	Economy BASIC for SVC	QDSS	28
GM575	SVC Graphpac (links MBASIC)	QDSS	35
GM576	WordStar Professional "Includes Wordstar, Mailmerge, Spellstar & Star Index"	QDSS	395

GM500 SERIES SOFTWARE - CONTINUEDCP/M Software for GEMINI systems running Gemini DDS Format

PART NO.	DESCRIPTION	FORMAT	PRICE
GM518	Gem-Zap	DDS	45
GM521	Gem-Pen	DDS	45
GM522	Compas V1	DDS	150
GM525	Gem-Debug	DDS	30
GM528	VIZ::APL	DDS	255
GM530	List/Repair	DDS	25
GM531	CopySB	DDS	35
GM547	IVC Graphpac	DDS	35
GM550	Economy BASIC	DDS	28
GM552	Config	DDS	25

Source Listings for Gemini Software and Firmware

All source listings are supplied for the purchasers own use only - Gemini retains copyright on all code based on the use of these listings. All purchasers of source listings must first sign a non-disclosure agreement.

GM563	CP/M 2.2 BIOS	Source	QDSS	500
GM564	IVC-MON V2	"	QDSS	100
GM565	Format/Backup/Util	"	QDSS	100
GM566	Config	"	QDSS	50
GM567	SysWin/FormWin	"	QDSS	100
GM568	SIMON Boot ROM	"	QDSS	100
GM577	SVC-MON V4	"	QDSS	100

GM300 SERIES MANUALS/LITERATURE

PART NO.	DESCRIPTION	PRICE
GM301	Z80 CPU (MK3880) Manual	4.00
GM302	Z80 PIO (MK3881) Manual	3.50
GM303	NAS-SYS 3 Manual	5.00
GM306	GM811 CPU Hardware Manual	2.00
GM307	GM811 RP/M Software Manual	1.00
GM310	GM803 EPROM Hardware Manual	1.00
GM311	GM802 RAM Hardware Manual	1.00
GM314	GM517/8 GEM-ZAP Manual	2.00
GM315	GM519-521 GEMPEN Manual	2.50
GM316	GEMINI GALAXY Manual	7.00
GM317	GM524/5 GEM-DEBUG Manual	2.00
GM318	GM813 Hardware Manual	2.50
GM319	CP/M 2.2 Manuals (Digital Research)	29.50
GM320	Z80 CTC (MK3882) Manual	3.50
GM321	GM816 I/O BOARD Hardware Manual	1.50
GM322	GM829 FDC/SASI Hardware Manual	1.50
GM323	MultiNet Workstation User Manual	2.50
GM324	" System Manual	2.50
GM325	" Installation Manual	2.50
GM326	" Superstation User Manual	2.50
GM327	" GM836 OEM Manual	2.50
GM328	M-F-B Software Manual	9.50
GM329	GM818 Serial Daughter Instr. Manual	2.50
GM330	GM832 SVC Software Manual	2.50
GM331	GM832 SVC Hardware Manual	1.80

GM300 SERIES MANUALS/LITERATURE - CONTINUED

PART NO.	DESCRIPTION	PRICE
GM332	GM837 Colour Board Users Manual	5.00
GM333	GM860 EPROM Programmer User Manual	1.80
GM334	GM833 User Manual	TBA
GM335	GM848 Users Manual	TBA
GM336	Z80 SIO (MK3884) Manual	TBA
GM337	GM824 Hardware Manual	TBA
GM338	CP/M 86 Manual	50.00
GM339	GSX Manual	20.00
GM340	DR-Draw Manual	30.00
GM341	DR-Graph Manual	30.00
GM342	C-BASIC Manual	30.00

GM600/700 SERIES MISCELLANEOUSFrames, Enclosures and Fans

GM609	3A PSU Enclosure for GM610 Frame	14.50
GM610	19" VERO Frame	37.50
GM647	KBD Enclosure for GM821	20.00
GM664	KBD Enclosure for GM827	25.00
GM661	GEMINI Enclosure (excluding card frame assembly)	90.00
GM687	3 Card Enclosure (as GM909 but bare case only)	70.00
GM688	6 " " (similar to above but 6 card)	80.00
GM685	6 Card Internal Frame Assembly	55.00
GM686	3 " " "	45.00
GM689	Fan Filter Assembly	9.00
GM690	Mains Fan (as GEMINI)	13.00
GM696	Fan Filter	0.15
GM702	Small Back plate for GEMINI - plain	6.00
GM703	" " " " - MultiNet	6.00
GM704	" " " " - IEEE	6.00
GM718	" " " " - 34W + 50W IDS	7.50
GM710	Large Back plate for GEMINI/Workstation - Multi RS232	8.50
GM711	" " " " " - 4 x DB25	8.50
GM712	" " " " " - 34W + 2x50W IDS	8.50
GM713	" " " " " - 16W + 3x26W IDS	8.50
GM726	" " " " " - Plain	7.50

Motherboards and Connectors

GM632	77 Way Edge Connector	4.30
GM633	43 " " "	2.25
GM634	Edge Connector Clips	0.13
GM654	Motherboard for 5 boards	TBA
GM655	" " 8 "	10.00
GM656	" " 3 "	5.00
GM682	" " 6 "	7.50
GM663	DAUGHTER BOARD Assy for 816 I/O brd.	21.00

GM600/700 SERIES MISCELLANEOUS - CONTINUED

Cable Notes:

- <1> Coiled Cable, DB15 plug at one end to a DB15 socket.
 - <2> 22" LONG, 34 Way IDS at End 1 to 2x34 Way PCB CONS 3.75" apart at End 2.
 - <3> 22" " " " " " " " " 3x34 " " " " " " " "
 - <4> 3' LONG, AMPHENOL IDP to AMPHENOL IDP (STANDARD CENTRONICS/EPSON ETC Cable)
 - <5> 6" LONG, 16 Way IDS to DB15P. (for USE INSIDE KEYBOARD CASES.)
 - <6> 10" LONG, 26 Way IDS (PIO COMPATIBLE) to AMPHENOL SOCKET (PARALLEL PRINTER). As used inside GEMINI.
 - <7> 3' LONG, 16 Way IDS (GM811/812 KBD SKT) to DB15S (821E/827E).
 - <8> 14" LONG, 16 Way IDS (GM811/813 RS232 SKT) to DB25S.

Assembled Cables

<None>

GM615	PIO Cable - 26 way cable, IDS connector on 1 end	5.00
GM616	Serial Cable (Nascom) - as GM615 but 16 way	3.20
GM646	Parallel GEMINI KBD Cable (Coiled Type)	<1> 19.50
GM660	GEMINI Video Cable (PL259-Phono)	1.26
GM665	Parallel Printer Cable	<4> 15.00
GM668	KBD Cable Assy (Intrnl-KBD Enc)	<5> 6.00
GM669	IDS Parallel Printer Cable	<6> 15.00
GM671	KBD Case-IVC Card 16 Way Cable	<7> 6.00
GM683	Internal Serial printer cable	<8> 8.00
GM699	Serial Cable for Digitiser Pad	15.00
GM700	Cable Mini-Pallette to Rapier Monitor	32.00
GM705	26 way cable for GM836 to GM811/813	5.00
GM709	Cable for Pixy Plotter	15.00
GM714	Set cables for GEMINI IVC -> SVC conversion	8.00
GM717	Cable for Colour WorkStation to Rapier Monitor	32.00
GM725	Cable for PLUTO to Rapier Monitor	32.00

Cable

GM672	100'	16	Way	ID	Cable		40.00
GM673	"	20	"	"	"		60.00
GM674	"	26	"	"	"		65.00
GM675	"	34	"	"	"		80.00
GM676	"	37	"	"	"		90.00
GM677	"	50	"	"	"		130.00

Disk Drives and Accessories

GM657	Micropolis 1115F6 Drive	(800K)	240.00
GM706	Toshiba ND-04D 48TPI DDDS 1/2 Height	(400K)	195.00
GM707	Toshiba ND-06D 96TPI QDDDS 1/2 Height	(800K)	195.00
GM727	Full Height Bezel for Toshiba Drives		6.80
GM708	Epson SM140 3.5" DS	(800K)	275.00
GM720	Toshiba ND-40D 8" 1/2 Height		TBA
GM619	34 Way ID/PCB edge connector		4.75
GM715	50 " " " "		7.50
GM649	34 Way Cable Assy (GEMINI)	<2>	16.00
GM650	" " " " (QM2000)	<3>	20.00
GM651	PERTEC/MICOPOLIS Power Skt/Pins		0.60
CM691	Rodime RO201 5.4M Winchester Drive		425.00
CM692	" RO202 10.8M " "		525.00
CM693	" RO203 16.2M " "		625.00
CM694	" RO204 21.6M " "		725.00
CM695	Xebec Winchester Controller Board		395.00

GM600/700 SERIES MISCELLANEOUS - CONTINUED

PART NO.	DESCRIPTION	PRICE
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Plugs and Sockets

GM620	4 Pin ID Plug (M)	0.20
GM621	16 Way ID Plug (M)	0.80
GM622	26 " " " "	1.20
GM623	34 " " " "	1.50
GM624	50 " " " "	2.00
GM625	16 Way ID Socket (F)	1.30
GM626	26 " " " "	1.80
GM627	34 " " " "	2.40
GM628	50 " " " "	3.75
GM630	34 Way RT Angle ID Plug inc. Ejectors	2.25
GM631	50 " " " " "	3.00
GM635	14 Pin Header Plug	0.60
GM636	16 " " " "	0.70
GM637	20 " " " "	0.85
GM639	DB25P	3.75
GM642	DB15S " "	3.50
GM643	DB15P " "	3.00
GM644	CENTRONICS (AMPHENOL) Socket	3.75
GM645	" " Plug	4.95

Power Supply Connector Plugs

GM670	SET CONNECTORS for GM817 S/M PSU	1.50
GM719	" " " " GM843 " "	1.60
GM724	" " " " GM850 " "	1.40

MultiNet Accessories

GM678	MultiNet Cable (100 Metres)	55.00
GM679	" Wall Mounting Junc.Box/Skt	3.50
GM680	" 3 Pin Plug	1.20
GM681	" BNC Plug	0.55
GM697	" 3 Pin Socket	1.20
GM716	" 1 metre spur (e.g. W'Station to Wall box)	4.00

SEMICONDUCTORS

Z80 CPU	4MHz Z80 CPU	3.50
Z80 PIO	4MHz Z80 PIO	3.50
Z80 CTC	4MHz Z80 CTC	3.50
Z80 SIO	4MHz Z80 SIO	4.75
HM6116P3	2Kx8 STATIC RAM	8.50
4116-25	16Kx1 DRAM 250nS	2.25
TMS4164-2564Kx1	DRAM 250 nS	6.50
2516/2716	2Kx8 EPROM	4.75
2732	4Kx8 EPROM	4.75
WD8250	UART	17.00
WD1397	FDC 3 CHIP SET	35.00
81LS97		1.75
N2MDCPM	(E/IM5600CPE)	5.00
6402	UART	5.00
75174	RS422 device for GM836 board	4.50
75175	" " " " "	4.50
75176	" " " " "	7.00
811/MEM	Custom GM811 Memory Decode PROM	10.00
812/IO	Custom GM812/832 IO " "	10.00

