PSEUDO DISK

and

AUXILIARY STORAGE BOARD

for

M/NET and S-100 Bus Based MP/M, CP/M Systems

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1. P512-Pseudo disk 512K board from Fic

These boards offer the following facilities:

high speed disk emulation.
cache for real-time, interactive data acquisition systems.
fast program development.
an efficient solution for data base application.

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1.1. Features

1. 512K Bytes of High Speed External Storage.
   - 150 ns, 64k*1 DRAMs used. All 512k is dynamically addressable.
   - Built in hardware counter automatically increments the on board memory address for high data transfer rates.

2. Disk Emulation
   - Full emulation of 512Kbyte to 3Mbyte disks with the PDISKXF software utility.
   - Files accessed at RAM speeds rather than the slower speed of mechanical devices.
   - For more or larger pseudo disks, simply add on more P512 cards, limited only by slots and power supply capacity.
   - Greatly enhanced throughput, especially in M/NET multiple user environments.

3. S100 Bus Compatible
   Meets all physical and electrical specifications of IEEE-696.

4. Self-Refresh

5. I/O Mapped Structure
   - Does not conflict with memory addressing.
   - No "common memory space" required, automatic address generation.

6. User Configured Addressing
   - User configured DIP switches allow assignment of 6 ports within 16 port boundaries.

7. External Battery Backup
   - Jumper selectable external backup power.

1.2. Specifications

Capacity:	
Per disk(Board)	512K Bytes
Per track(Bank)	64K Bytes
Tracks per disk	8
Sector per track	512
Bytes per sector	128
Transfer rate	1M Bytes/sec (4MHz bus clock)
Latency	0 sec (no latency)
Access time	
Track to track	0 sec (no head seek time)
Settling time	0 sec
Read/Write	442 nsec (150ns 64 64K*1 DRAM USED)
Power requirement	
Total current	700 mA (average)
Backup current	450 mA (average)
Board size	5.325"*10" (13.52cm*25.39cm)

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2. Installation

2.1. MP/M

With an M/Net system, the supplied Resident System Process (RSP) called PDISKXF is simply bound into MP/M at GENSYS time. This automatically handles all accesses to the RAM disks.

With CP/M systems, the PDISK boards must be "formatted" to look like a clean disk when the system is first powered up. The utility FMT is supplied to perform this function. It requires a command tail which specifies the discs to be formatted. Note a drive letter is required for each board installed. For example, if your system uses three boards originating at M for a 1.5Mbyte disk, the boards will be switched as M, N and O, and the FMT command is therefore

```
FMT M,N,O
```

Remember that FMT effectively erases everything on the PDISK, just like formatting a floppy disk. Be careful.

A test program called PTST is included and this exhaustively tests all RAM disks. Its use is interactive. Type the command PTST and it will prompt for the disks to test. As with FMT, each individual disk name must be given.

2.2. CP/M

With CP/M systems, you must execute the CPMPDISK.COM utility after power on or when the system is reset. Running this program produces the following output text:

```
A>CPMPDISK

---------- F. I. C. PSEUDO DISK ----------

** PSEUDO DISK handler ready

** You have the following PSEUDO DISK driver in your system:
   K,L,M,N,O,P

** Please run FMT.COM to format each pseudo disk immediately
   after powering up the system. The pseudo disk then appear
   as an empty disk. The contents of the pseudo disk will be
   random when the system is powered on, so unless your system
   has battery back up, always format the pseudo disk first.
   However, do once only.
```

NOTE: Pseudo disk has the following feature:

FORMAT: When the system is powered on the pseudo disk will have random contents, so it must be formatted to write a known pattern into the directory area. There will be NO files in the Pseudo disk after executing the utility program FMT.

RESET: A system reset will **not** affect the contents of the pseudo disk.

POWEROFF: All data in the pseudo disk is lost when the system is powered down. You must therefore save the contents of the pseudo disk BEFORE power off. This is, of course, not a requirement when the external battery back-up is used.

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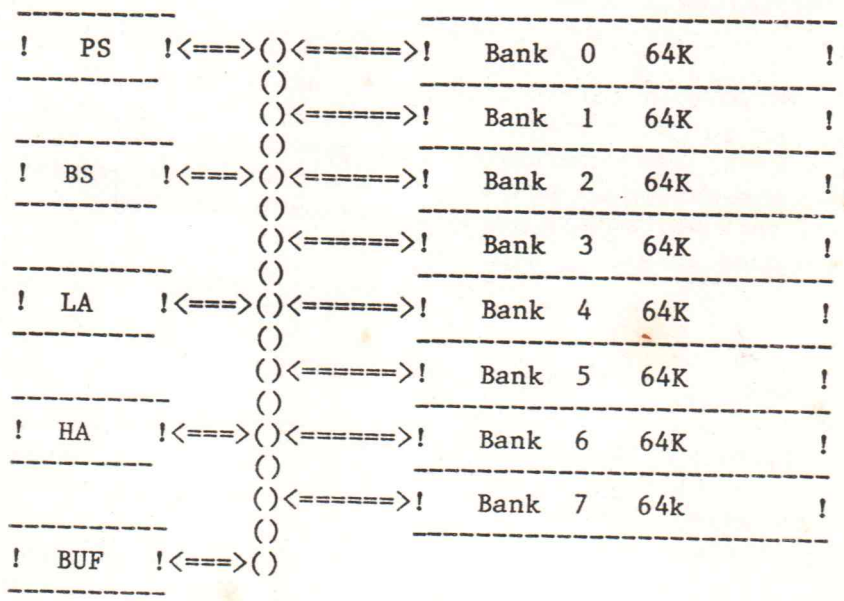
3. Programming Information

Here we will discuss the operation of the pseudo disk from the programmer's viewpoint. The logical block diagram of the Pseudo disk is showed in Fig 1. The following port addresses define the Pseudo disk I/O ports.

DISK		PORT ADDRESS
	K:	AOH
	L:	BOH
	M:	COH
	N:	DOH
	O:	EOH
	P:	FOH

The associated register's port addresses are:

PS = BASE
BS = BASE + 1
LA = BASE + 2
HA = BASE + 3
BUF = BASE + 6



PS : Port (Board) Select register
BS : Bank Select register
LA : Low Address register
HA : High Address register
BUF : Buffer register

FIGURE 1 - Pseudo Disk Block Diagram

As an example, the following program segment reads a block of data from the pseudo disk to memory, using as parameters:

Block size : 128 bytes

Source : pseudo disk
address 100H to 180H on bank 2

Destination: main memory
address 200H to 280H

Program segment:

```
     LD   C,0A0H          ; pseudo disk K:
     XOR  A               ; A=0
     OUT  (C),A           ; select pseudo disk K:
     NOP  ! NOP           ; time to stop refresh counter
     NOP  ! NOP
     LD   C,0A1H          ; address of BS
     LD   A,2             ; (BS)=2
     OUT  (C),A           ; select bank 2
     LD   C,0A2H          ; address of LA
     LD   A,00H
     OUT  (C),A           ; low byte of address=00H
     LD   C,0A3H
     LD   A,01H
     OUT  (C),A           ; high byte of address=01H
     LD   C,0A6H          ; address of BUF
     LD   B,128           ; block size 128
     LD   HL,200H         ; destination address
     INIR                 ; block read

; Here memory address on pseudo disk is automatically incremented.

     LD   C,0A0H
     LD   A,0FFH          ;
     OUT  (C),A           ;    off port (de-select pseudo disk K:)
     NOP  ! NOP
     NOP  ! NOP
```

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4. Performance Testing

4.1. File Copying

The following times are typical for copying the same file between different disk types.

File size: 323 records (41,344 bytes)

Drivers	transfer time
floppy disk	43 sec
hard disk	17 sec
Pseudo disk	7 sec

4.2. File Reading - BDOS

These represent typical Read time using standard BDOS sequential read calls. The sample file size was 323 records or 411,344 bytes.

All three users using the same driver:

	console 0	console 1	console 2
	(time unit : second)		
floppy disk	201	204	206
hard disk	19	20	21
Pseudo disk	7	8	8

All three users using different drivers:

hard disk	E: 33	F: 35	C: 36
Pseudo disk	K: 7	L: 8	M: 8

4.3. File Reading - XIOS

This example uses direct XIOS calls and represents the time to read a single 128 byte sector.

drive	time interval
floppy disk	116 ms
hard disk	0.92 ms
Pseudo disk	0.76 ms

5. Amalgamating Pseudo Disks for Large Disk Sizes

Each pseudo disk has a storage capacity of 512k bytes. The software utilities PDISKXF (for MP/M MNet systems) and CPDMELD (for CP/M systems) allow the installation of two through six contiguously addressed pseudo disks to create larger disk sizes.

5.1. MP/M Systems

In MP/M system, use the Resident System Process (RSP) called PDISKXF. The board selection switches must also be setup in a slightly different way. Please read the following notes and select the pseudo disk drivers' storage capacity by setting the DIP switch on each P512 board.

Once the switch settings associated with the pseudo disk driver name have been properly configured, the installation of PDISKXF simply requires creating a new MPM via GENSYS that includes this RSP.

5.2. CP/M Systems

In a CP/M system, you must execute the utility CPDMELD.COM after power on or reset of your system. Please note that either CPMPDISK.COM (not meld-type) or CPDMELD.COM (meld-type) can be executed after coldstarting your system.

Note on installation procedures for both MP/M and CP/M:

Due to hardware restrictions, when melding single boards to create two or more separate and larger pseudo disks, at least one disk name (port) should be used to separate the logical pseudo disks. If you require two 512Kbyte discs for example, they would be switched as M and O, not M and N, because the software could not otherwise tell the discs were meant to be separate.

Here are some examples of melding.

Figure 2 - Five P512 boards are melded into two drivers with a storage capacity of 1,536K bytes and 1,024K bytes respectively. The driver name and corresponding DIP switch settings are shown. Boards K, L and M are logically melded to form the pseudo disk K: with a total capacity of 1,536K bytes, while P512 boards O and P are melded to the pseudo disk O: with a capacity of 1,024K bytes total.

Note how driver name (port) N: is used as a **separator**, and must not be used in the system.

Figure 3 - This is another example using the "separator" concept. Five P512 boards are melded to two drivers with storage capacities of 1,536K bytes and 1,024K bytes respectively. Here P512 boards K and L are melded to form the pseudo disk K: with a capacity of 1024K bytes total; and P512 boards N, O and P are melded to form the pseudo disk N: with a capacity of 1536K bytes total. Once again, driver name (port) M: is used as a **separator** and must not be used in the system.

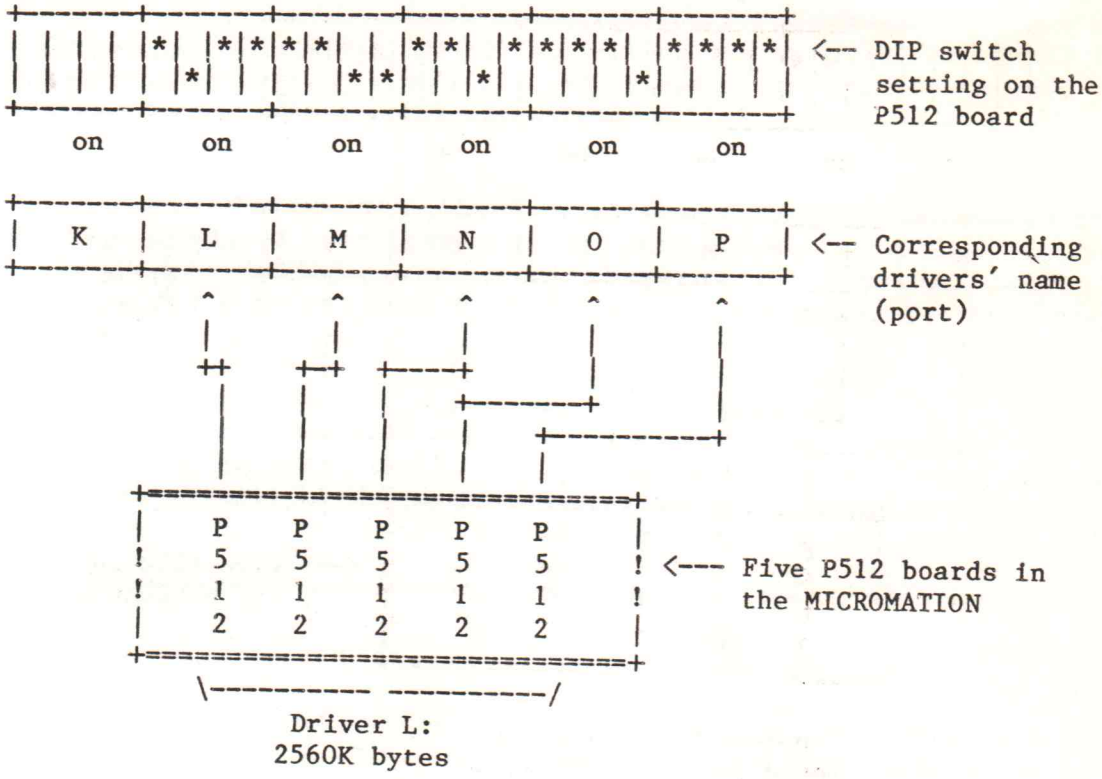

FIGURE 5

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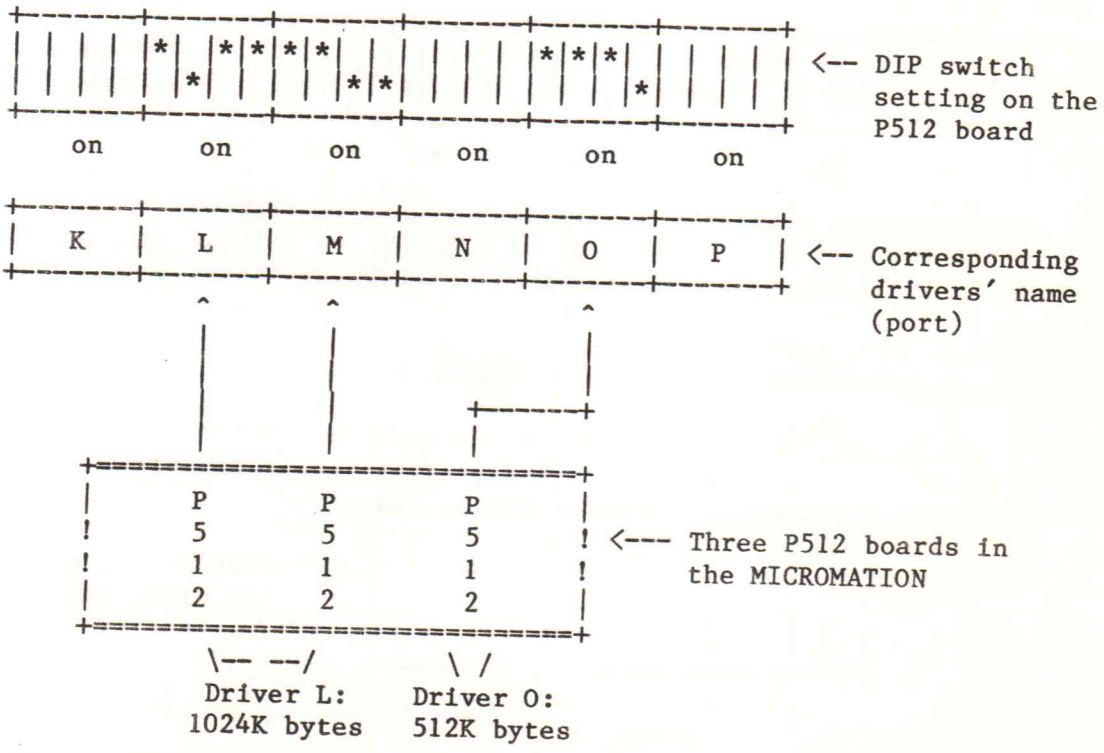

FIGURE 6

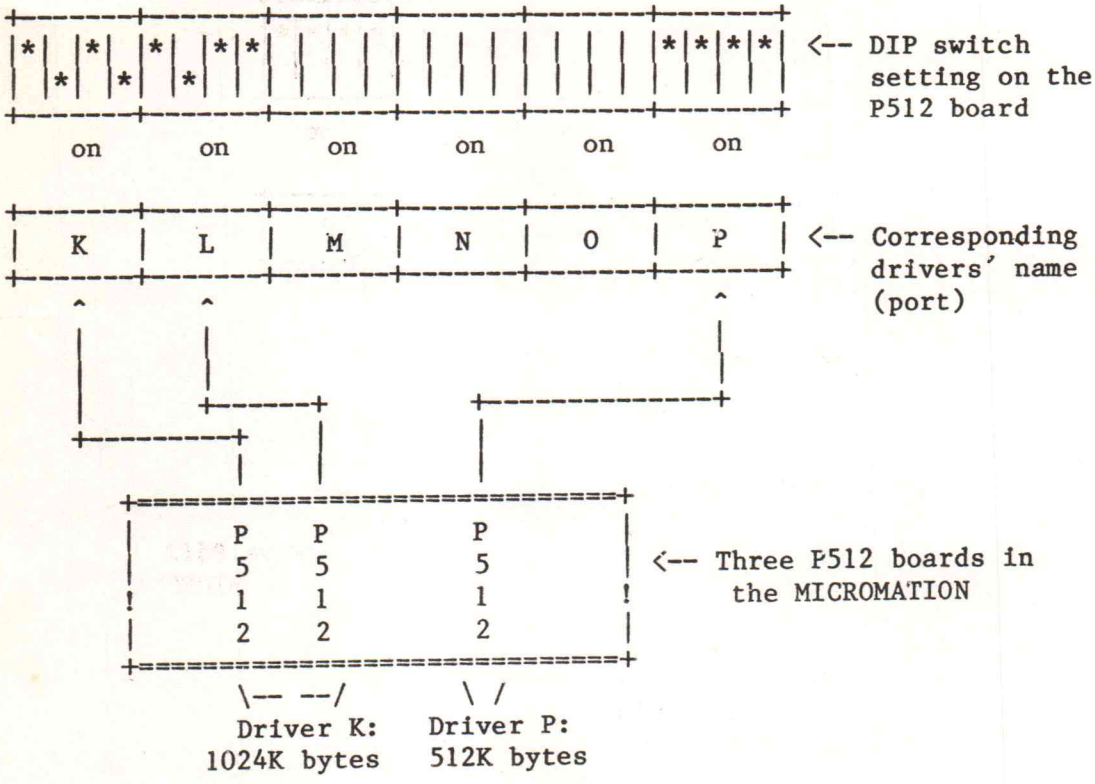
on on on on on on
<-- DIP switch setting on the P512 board
K L M N O P
<-- Corresponding drivers' name (port)
P512 P512 P512
<-- Three P512 boards in the MICROMATION
Driver K: 1024K bytes
Driver P: 512K bytes

FIGURE 7