MORROW

Morrow   Micro Decision   Board

Revision 2.0 Technical Information

Supplement

MICRO DECISION

Technical Support Services

D-USR

40 PIN I/O CONNECTOR

The 40 pin I/O connector connects the Micro Decision with the outside world.

The pin connections for the buss are:

/BRD	1
/BWR	3
/RESET	5
/4M	7
/IO00	9
/IO10	11
/IO20	13
/IO30	15
AB3	17
AB2	19
AB1	21
AB0	23
DB7	25
DB6	27
DB5	29
DB4	31
DB3	33
DB2	35
DB1	37
DB0	39
+5v	38
+5v	40
+12v	36
-12v	34

unlabeled pins are grounded

The 40 pin I/O connector is at location F-1 through K-1, or locations A-6,7 through D-6,7, depending on the board lay-out. Either board may be supplied with a 2X20 header block or solder holes only.

BAUD RATE GENERATOR

The baud rates for the Micro Decision are software selectable
through the SETUP program. The baud rate generator is an Intel
8253 counter timer chip which is accessed through ports 0F0-0F3h.
Channel 0 is used for Floppy Drive Timing and should not be
written to; Channel 1 is serial port 1 baud; Channel 2 is
serial port 2 baud.

The seven most popular baud rates (110, 300, 600, 1200, 2400,
4800 and 9600) can be chosen through the SETUP program for both
serial ports. The SETUP program also enables you to choose
between software handshaking, (XON-XOFF) or hardware handshaking
(DTR pin 20) on the second serial port.

PARALLEL PORT

The Micro Decision's parallel port is a Centronics compatible port employing a 34 pin edge connector for connection to a printer. The data is transferred through a 74LS374 tri-state buffer to the connector. The addresses for the ports are:

        F4   Data port
        F5   Status port
                    Read: bit 3 = 1=ACK
                            bit 4 = 1=Busy

                    Write: bit 7 = Strobe

The signals for the 34 pin edge connector are:

        Odd pins 1 - 23, 33 twisted pair ground
             2   STROBE   (neg.)
             4   DB0
             6   DB1
             8   DB2
            10   DB3
            12   DB4
            14   DB5
            16   DB6
            18   DB7
            20   Acknowledge   (neg.)
            22   Ready/Busy
        All other pins n/c.

The SETUP program on the CP/M diskette must be used to set the CP/M LST device to acknowledge the parallel port instead of the second serial port.

MICRO DECISION REVISION 1.0 PORT ADDRESSES

PORT	FUNCTION
0F5	MOTOR CHECK PORT
0F6	ROM ENABLE/DISABLE (out=enable/in=disable)
0F7	VFO COUNT SET PORT
0F8	MOTOR & SHIFT CONTROL
0FA	UPD-765 STATUS
0FB	UPD-765 DATA
0FC	1st. SERIAL PORT DATA
0FD	1st. SERIAL PORT STATUS
0FE	2nd. SERIAL PORT DATA
0FF	2nd. SERIAL PORT STATUS

MICRO DECISION REVISION 2.0 PORT ADDRESSES

0F0	
0F1	
0F2	8253 BAUD RATE GENERATOR
0F3	
0F4	CENTRONICS DATA PORT
0F5	CENTRONICS STATUS PORT read bit 3 ACK=1 write bit 7 stobe=0 read bit 4 busy=1

All other ports remain the same.

mdporttf

DISK DRIVE CONNECTOR

The disk drives are connected to the motherboard through two 34 pin edge connectors labeled JD0 for drive "A", and JD1 for drives "B" through "D". Drives "C" and "D" are daisy-chained from drive "B". The pin-outs for the connectors are listed below.

JD0		JD1	
8	/INDEX	8	/INDEX
10	/DS0	10	/DS0
16	/MOTOR	12	/DS1
18	/DIRECTION	14	/DS2
20	/STEP	16	/MOTOR
22	/WRITE DATA	18	/DIRECTION
24	/WRITE GATE	20	/STEP
26	/TRACK 0	22	/WRITE DATA
28	/WRITE PROTECT	24	/WRITE GATE
30	/READ DATA	26	/TRACK 0
32	/SIDE SELECT	28	/WRITE PROTECT
		30	/READ DATA
		32	/SIDE SELECT

All odd numbered pins on JD0 and JD1 are grounded.

Micro-Decision Diskette Format Specifications.

Introduction:
This document provides details of the Micro-Decision's native diskette format. Micro-Decision diskettes use a soft-sectored, double-density, IBM like format. Both single and double sided versions of this format are supported. This format is compatible with both Western Digital 179X and NEC 765 type controllers.

Format Characteristics:
All Micro-Decision diskettes have 4Ø cylinders. Single sided diskettes have one track per cylinder (i.e. 4Ø tracks), while double sided diskettes have two tracks per cylinder (i.e. 8Ø tracks). Each track has five 1k byte sectors. This gives a total formatted capacity of either 2ØØk bytes (single sided) or 4ØØk bytes (double sided).

Two tracks (1Øk bytes) are allocated for the bootable image of the CP/M operating system. And either 4k bytes (single sided) or 6k bytes (double sided) are allocated for the diskette directory. This gives a total usable capacity of 186k bytes (single sided) or 384k bytes (double sided), with up to 136 files (single density) or 192 files (double density).

Track Format:
All tracks are formated the same way, only the cylinder number (and head number for double sided diskettes) are different from one track to another.

Number of Bytes (Decimal)	Value	(Hex)		
8Ø	4E			
12	Ø			
3	C2*			
1	FC		Index Address Mark	
5Ø	4E			
12	Ø			
3	A1**			
1	FE		I.D. Address Mark	
1	Ø – 27		Cylinder	
1	Ø – 1		Side	
1	1 – 5		Sector	Repeat
1	3		Sector Size Code	5 Times
2	C.R.C.			
22	4E			
12	Ø			
3	A1**			
1	FB		Data Address Mark	
1Ø24	E5		Default Data	
2	C.R.C.			
85	4E			
⁻25Ø	4E		Continue to end of track	

*   Missing clock between bits 4 & 5.
** Missing clock between bits 3 & 4.

1

No physical skew is used, that is the sectors are written in order on each track.

On the Micro-Decision, double sided diskettes are handled as 80 track diskettes, with the even numbered tracks on side 0, and the odd numbered tracks on side 1. The relationship between track, cylinder, and side is :

    Track = (2 x Cylinder) + side

    or conversly

    Cylinder = Integer (Track / 2)
    Side   = Least-Significant-Bit (Track)

CP/M Parameters:
The parameters for the DISKDEF macro are:

	Single Sided	Double Sided
FSC	1	1
LSC	40	40
SKF	*	*
BLS	2048	2048
DKS	95	195
DIR	128	192
CKS	128	192
OFS	2	2

These parameters produce a DPB with the folowing values:

	Single Sided		Double Sided	
SPT	DW	40	DW	40
BSH	DB	4	DB	4
BLM	DB	15	DB	15
EXM	DB	1	DB	1
DSM	DW	94	DW	194
DRM	DW	127	DW	191
AL0	DB	192	DB	224
AL1	DB	0	DB	0
CKS	DW	32	DW	48
OFF	DW	2	DW	2

* A hand coded translation table must be provided ad shown below:

```
XLT:      DB 1,2,3,4,5,6,7,8
          DB 25,26,27,28,29,30,31,32
          DB 9,10,11,12,13,14,15,16
          DB 33,34,35,36,37,38,39,40
          DB 17,18,19,20,21,22,23,24
```

Track Ø Data:
In order for the Micro-Decision to correctly access the diskette,
the following data MUST be on sectors 1 and 2 of track Ø:

Data for track Ø sector 1 of single sided diskettes:

```
ØØØD                      CR       EQU ØDH
ØØØA                      LF       EQU ØAH
ØØ18                      BTERR    EQU 18H
ØØØ3                      MESG     EQU 3
                          ;
                                   ORG ØFEØØH

FEØØ     ØØ                         NOP
FEØ1     ØØ                         NOP
FEØ2     ØØ                         NOP
FEØ3     3E C9                      LD A,ØC9H
FEØ5     32 FDFF                    LD (ØFDFFH),A
FEØ8     CD FDFF                    CALL ØFDFFH
FEØB     21 FFFE          RADD:     LD HL,-2
FEØE     39                         ADD HL,SP
FEØF     5E                         LD E, (HL)
FE1Ø     23                         INC HL
FE11     56                         LD D, (HL)
FE12     21 ØØ17                    LD HL,EMSG-RADD
FE15     19                         ADD HL,DE
FE16     EB                         EX DE,HL
FE17     31 FFØØ                    LD SP,ØFFØØH
FE1A     D3 F6                      OUT (ØF6H),A
FE1C     CD ØØØ3                    CALL MESG
FE1F     C3 ØØ18                    JP BTERR          ;JMP TO ROM


FE22     ØD ØA 4E 6F      EMSG:     DB CR,LF,'Not a SYSTEM Diskette.'
FE26     74 2Ø 61 2Ø
FE2A     53 59 53 54
FE2E     45 4D 2Ø 44
FE32     69 73 6B 65
FE36     74 74 65 2E
FE3A     ØD ØA ØØ                   DB CR,LF,Ø

FE3D                                DS (ØFE8ØH-$),Ø

FE8Ø     ØØØØ                       DW Ø
FE82     ØØØØ                       DW Ø
FE84     ØØØØ                       DW Ø
FE86     ØØØØ                       DW Ø
FE88     ØØ                         DB Ø
FE89     ØØ28                       DW 4Ø
FE8B     Ø4                         DB 4
FE8C     ØF                         DB 15
FE8D     Ø1                         DB 1
FE8E     ØØ5E                       DW 94
FE9Ø     ØØ7F                       DW 127
FE92     CØ                         DB ØCØH
FE93     ØØ                         DB Ø
```

```
FE94    0020                            DW 32
FE96    0002                            DW 2
FE98    E1                              DB 0E1H
FE99                                    DS 103,0

Data for track 0 sector 1 of double sided diskettes:
000D                                    EQU 0DH
000A                                    EQU 0AH
0018                                    EQU 18H
0003                                    EQU 3

                                        ORG 0FE00H
                        ;
FE00    00                              NOP
FE01    00                              NOP
FE02    00                              NOP
FE03    3E C9                           LD A,0C9H
FE05    32 FDFF                         LD (0FEFFH),A
FE08    CD FDFF                         CALL 0FDFFH
FE0B    21 FFFE                         LD HL,-2
FE0E    39                              ADD HL,SP
FE0F    5E                              LD E,(HL)
FE10    23                              INC HL
FE11    56                              LD D,(HL)
FE12    21 0017                         LD HL,EMSG-RADD
FE15    19                              ADD HL,DE
FE16    EB                              EX DE,HL
FE17    31 FF00                         LD SP,0FF00H
FE1A    D3 F6                           OUT (0F6H),A
FE1C    CD 0003                         CALL MESG
FE1F    C3 0018                         JP BTERR        ;JMP TO ROM


FE22    0D 0A 4E 6F     EMSG:           DB CR,LF,'Not a SYSTEM Diskette.'
FE26    74 20 61 20
FE2A    53 59 53 54
FE2E    45 4D 20 44
FE32    69 73 6B 65
FE36    74 74 65 2E
FE3A    0D 0A 00                        DB CR,LF,0

FE3D                                    DS (OFE80H-$),0

FE80    00                              DB 0
FE81    04                              DB 4
FE82    0000                            DW 0
FE84    0000                            DW 0
FE86    0000                            DW 0
FE88    00                              DB 0
FE89    0028                            DW 40
FE8B    04                              DB 4
FE8C    0F                              DB 15
FE8D    01                              DB 01
FE8E    00C2                            DW 194
FE90    00BF                            DW 191
```

4

```
FE92    EØ                          DB ØEØH
FE93    ØØ                          DB Ø
FE94    ØØ3Ø                        DW 48
FE96    ØØØ2                        DW 2
FE98    89                          DB 89H
FE99                                DS 1Ø3,Ø
```

Data for track Ø sector 2 of single and double sided diskettes:
```
ØØØD                    CR          EQU ØDH
ØØØA                    LF          EQU ØAH
ØØ18                    BTERR       EQU 18H
ØØØ3                    MESG        EQU 3
                        ;
                                    ORG ØFEØØH
                        ;
FEØØ    ØØ                          NOP
FEØ1    ØØ                          NOP
FEØ2    ØØ                          NOP
FEØ3    3E C9                       LD A,ØC9H
FEØ5    32 FDFF                     LD (ØFDFFH),A
FEØ8    CD FDFF                     CALL ØFDFFH
FEØB    21 FFFE         RADD:       LD HL,-2
FEØE    39                          ADD HL,SP
FEØF    5E                          LD E,(HL)
FE1Ø    23                          INC HL
FE11    56                          LD D,(HL)
FE12    21 ØØ17                     LD HL,EMSG-RADD
FE15    19                          ADD HL,DE
FE16    EB                          EX DE,HL
FE17    31 FFØØ                     LD SP,ØFFØØH
FE1A    D3 F6                       OUT (OF6H),A
FE1C    CD ØØØ3                     CALL MESG
FE1F    C3 ØØ18                     JP BTERR        ;JMP TO ROM

FE22    ØD ØA 4E 6F     EMSG:       DB CR,LF,'Not a SYSTEM Diskette.'
FE26    74 2Ø 61 2Ø
FE2A    53 59 53 54
FE2E    45 4D 2Ø 44
FE32    69 73 6B 65
FE36    74 74 65 2E
FE3A    ØD ØA ØØ                    DB CR,LF,Ø

FE3D                                DS (OFE8ØH-$),Ø
```

5