

# MORROW



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**Morrow Micro Decision Board**

**Revision 2.0 Technical Information**

**Supplement**

## **MICRO DECISION**

**Technical Support Services**

## 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

<u>PORT</u>	<u>FUNCTION</u>
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.

## 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 40 cylinders. Single sided diskettes have one track per cylinder (i.e. 40 tracks), while double sided diskettes have two tracks per cylinder (i.e. 80 tracks). Each track has five 1k byte sectors. This gives a total formatted capacity of either 200k bytes (single sided) or 400k bytes (double sided).

Two tracks (10k 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 128 files (single density) or 192 files (double density).

### Track Format:

All tracks are formatted 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)		
80	4E		
12	0		
3	C2*		
1	FC	Index Address Mark	
50	4E		
12	0		
3	A1**		
1	FE	I.D. Address Mark	
1	0 - 27	Cylinder	
1	0 - 1	Side	
1	1 - 5	Sector	Repeat
1	3	Sector Size Code	5 times
2	C.R.C.		
22	4E		
12	0		
3	A1**		
1	FB	Data Address Mark	
1024	E5	Default Data	
2	C.R.C.		
85	4E		
~250	4E	Continue to end of track	

\* Missing clock between bits 4 & 5.

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

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:

$$\text{Track} = (2 \times \text{Cylinder}) + \text{Side}$$

or conversly

$$\text{Cylinder} = \text{Integer}(\text{Track} / 2)$$

$$\text{Side} = \text{Least-Significant-Bit}(\text{Track})$$

#### CP/M Parameters:

The parameters for the DISKDEF macro are:

	<u>Single Sided</u>	<u>Double Sided</u>
FSC	1	1
LSC	40	40
SKP	*	*
BLS	2048	2048
DKS	95	195
DIR	128	192
CKS	128	192
OFS	2	2

These parameters produce a DPB with the following values:

	<u>Single Sided</u>	<u>Double Sided</u>
SPT	DW 40	DW 40
BSH	DB 4	DB 4
ELM	DE 15	DB 15
EXM	DB 1	DB 1
DSM	DW 94	DW 194
DRM	DW 127	DW 191
ALO	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 as 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





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		CR	EQU 0DH
000A		LF	EQU 0AH
0018		BTERR	EQU 18H
0003		MESG	EQU 3
			;
			ORG 0FE00H
			;
FE00	00		NOP
FE01	00		NOP
FE02	00		NOP
FE03	3E C9		LD A,0C9H
FE05	32 FDFE		LD (0FDFE),A
FE08	CD FDFE		CALL 0FDFE
FE0B	21 FFFE	RADD:	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 (0FE80H-\$),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 1
FE8E	00C2		DW 194
FE90	00BF		DW 191

FE92	E0	DB	0E0H
FE93	00	DB	0
FE94	0030	DW	48
FE96	0002	DW	2
FE98	89	DB	89H
FE99		DS	103,0

Data for track 0 sector 2 of single and double sided diskettes:

000D		CR	EQU	0DH
000A		LF	EQU	0AH
0018		BTERR	EQU	18H
0003		MSG	EQU	3
				ORG 0FE00H
FE00	00			NOP
FE01	00			NOP
FE02	00			NOP
FE03	3E C9			LD A,0C9H
FE05	32 FDFP			LD (0FDFFH),A
FE08	CD FDFP			CALL 0FDFFH
FE0B	21 FFFE			RADD: 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,MSG-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 MSG
FE1F	C3 0018			JP BTERR ;JMP TO ROM
FE22	0D 0A 4E 6F	MSG:	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 (0FE80H-\$),0