nascom

NASCOM FLOPPY DISC CONTROLLER

HARDWARE MANUAL

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Contents

1 Links

1.1 Solder links

There are four links on the board labelled LK1-4. These should be configured as below:

```
LK1     open (no link).
LK2     made from A to C when 1793 chip used (standard).
LK3     open (Spare i/p 1).
LK4     open (Spare i/p 2).
```

1.2. Header

LBK1 is used to set up the base address of the board. Only one short (either by switch pack or links) should be made on each board, indicating a board base address as follows:

```
1-16     No connection
2-15     Base = 20H
3-14       "  = 40H
4-13       "  = 60H
5-12       "  = 80H
6-11       "  = A0H
7-10       "  = C0H
8-9        "  = E0H - Standard address
```

Standard software (NASDOS & CP/M) is written using a base address of E0H.

1.3 Switch pack

The switch pack (LKB2) settings have the following meanings:

SW1-3 & SW 0

Only one of SW1-3 should be set at any one time. They control the write precomp operation, along with SW0 which, when on, disables write precomp altogether (regardless of setting of SW1-3). The function of each switch depends on the system operating frequency (i.e. 2 or 4 MHz). For 2MHz only 500ns or zero write precomp is possible - this is with SW1 only on. With 4 MHz operation SW3 enables 500ns and SW2 250ns write precomp. It should be noted that if all of SW1 to 3 are off, then SW0 should be on.

SW 4-5

These two switches control the clock to the FDC chip (1793). This clock is required to be 1 MHz for mini-floppies, or 2 MHz for 8 inch drives.

```
4-17 (SW 4) Divide by 2 from system clock (use for 2 MHz system)
5-16 (SW 5) Divide by 4 from system clock (use for 4 MHz system)
```

SW 6-7

Used for setting the voltage controlled oscillator (VCO) frequency This needs to be 500KHz for 5 1/4 drives or 1 MHz for 8 inch.

6-15 (SW 6)   Divide by 4 from system clock (2MHz system)

7-14 (SW 7)   Divide by 8 from system clock (4 MHz system)

This means that for a 2MHz 5 1/4 inch system or a 4 MHz 8 inch system, switches 4 and 6 are on. For a 4 MHz 5 1/4 inch system, switches 5 & 7 should be on. A special case exists when using a 2 MHz 8 inch system, when a link must be made between pins 4 and 19 on the underside of the board, and only SW6 in the on position.

SW 8

8-13 (SW 8)   On sets FDC to auto single/double density. (dependent on relevant i/p bit)

SW 9

9-12 (SW 9)   'on' enables write precomp with tracks greater than 43 when double density. It is usual to use this on 8 inch disks, but is also recommended with the NASCOM supplied TEAC drives.

Recommended settings of LBK2 for use with double desity TEAC drives (single or double sided).

SWITCH No.	Settings	
	2MHz	4MHz
1 (1-20)	off	off
2 (2-19)	off	on
3 (3-18)	off	off
4 (4-17)	on	off
5 (5-16)	off	on
6 (6-15)	on	off
7 (7-14)	off	on
8 (8-13)	on	on
9 (9-12)	on	on
0 (10-11)	on	off

These provide the following features:

4 MHZ : 1) 250ns write precomp on tracks >43
          2) Auto double/single density

2 MHz : Auto single/double density

1.4 Component values

NOTE: Although the floppy disk card has been designed for use with 5 1/4 or 8 inch drives NASCOM will only support there use with the NASCOM floppy disk drive unit (5 1/4 inch TEAC FD50E or F).

There are two components which need to be altered from the standard board as supplied when using 8 inch drives; these are:

1.4.1 C3 should be a 2% 68pF 63V Sub min ceramic instead of 150pF.

1.4.2 A 50 way connector needs to be inserted in plug position 2.

Note also that C1 should be omitted when using drives without a head solenoid.

2. FDC Ports assignments

The board uses 5 read/write IO ports addresses. The base address is set up by LBK.1 as descibed in section 1.2. In the following X is used as the base address, in use this will be 20H,40H etc. In particular for CP/M 2.2 and NAS-DOS this will be E0H, i.e. X3 means port E3H in these cases.

2.1 FDC chip (1793) registers

Ports X0 to X3 are the four read/write registers as used by the floppy disk controller chip:

Port	Read function	Write function
X0	Status register	Command register
X1	Track register	Track register
X2	Sector register	Sector register
X3	Data register	Data register

If more details of these registers is required, these should be obtained from the relevant Western digital FD1793 data sheet.

2.2 Other I/O ports

The above described registers control the operation of the 1793, however, several other functions (such as drive select) are needed in a disk drive system. These are provided by another two ports, X4 and X5.

2.2.1 Port X4

Bit	Read	Write
D0	Drive select 0 (DS0)	DS0
D1	DS1	DS1
D2	DS2	DS2
D3	DS3	DS3
D4	Side select (SSL)	SSL - only if LK.2 is A to C
D5	Spare 1 -high if no LK3	Low stops motor, high triggers for 10s.
D6	LOW gives single den.	Density- as read
D7	Spare 2 -high if no LK4	Connected to P4 on board.

2.2.2 Port X5

NOTE - Write port is not used

Bit	Function
D0	INTRQ from 1793 FDC chip
D1	NOT READY - For this to be low motor must be on, and in the case of 8" drives when LK.1 is present,READY i/p must be true.
D2	0
D3	0
D4	0
D5	0
D6	0
D7	DRQ from 1793

3. Input/output connections to FDC

3.1 PL1 - 5 1/4 drive connector

All odd pins on this connector are taken to ground. The even pins are connected as follows:

Pin	Function
2	spare (pad 2)
4	spare (pad 4)
6	Drive select 3
8	Index hole
10	Drive select 0
12	Drive select 1
14	Drive select 2
16	Motor on
18	Direction select (for head step)
20	Step
22	Write data
24	Write gate
26	Track 00
28	Write protect
30	Read data
32	Side select
34	spare (pad 34)

3.2 PL2 - 8 inch drive connector

Pin	Function
2	Track greater than 43
4	pad 4
6	pad 6
8	pad 8
10	pad 10
12	pad 12
14	pad 14
16	pad 16
18	pad 18
20	Index hole
22	Ready
24	pad 24
26	Drive select 1
28	Drive select 2
30	Drive select 3
32	Drive select 4
34	Direction
36	Step
38	Write data
40	Write gate
42	Track 00
44	Write protect
46	Read data
48	pad 48
50	pad 50

3.3 PL3 - NASBUS

Pin	Function
1-4	Gnd
5	System clock
6,7	No connection
8	P3 on board
9-11	No connection
12	$\overline{\text{NASIO}}$
13	$\overline{\text{DBDR}}$
14	$\overline{\text{RESET}}$
15	No connection
16	$\overline{\text{BAI}}$
17	$\overline{\text{BAO}}$
18	No connection
19	$\overline{\text{IEI}}$
20	$\overline{\text{IEO}}$
21-25	No connection
26	$\overline{\text{IORQ}}$
27	No connection
28	$\overline{\text{WR}}$
29	$\overline{\text{RD}}$
30	A0
31	A1
32	A2
33	A3
34	A4
35	A5
36	A6
37	A7
38-48	No connection
49	Gnd
50	D0
51	D1
52	D2
53	D3
54	D4
55	D5
56	D6
57	D7
58-71	No connection
72	Key
73-74	+12V
75-78	+5V

4. Setting up

Before the FDC board can be used in a system, this system must be set up so that it can use external ports. On a NASOM 2, this means that LSW2/8 needs to be set for External Ports (switch or link up, as viewed with switch at the top of board). Once this and the FDC board switches and links have been set as required, there is one other adjustment which may need to be made ; that is to the preset potentiometer. This is set up in manufacture for operation with a 4 MHz system, but may need adjusting for different systems. This potentiomer sets up the centre frequency of the VCO. When set up properly the LED will just be on the point of turning on/off (Turning the pot clockwise turns the LED off). Set up as follows:

4.1 Ensure that no disk access is being made (e.g. disconnect the drives!)

4.2 Turn pot anti-clockwise, until the LED comes on.

4.3 Now turn pot clockwise a quarter of a turn.

The VCO is now set up.

It should be noted that the actual status of the LED (i.e. on, off or flashing) during operation of the floppy disks is virtually meaningless at any time other than when setting up.

Component changes on Floppy Disk Board

Please note that the following component values on the Floppy disk controller card may be different to those shown on the circuit diagram:

R 28 is now 220k
R 29 is now 150k

C6 is now 100μF
C7 is now 22μF