Compact Flash Controller

Instruction Manual & Functional Description

Contents

1 Introduction

This card has been designed to allow Compact Flash modules to be used in conjunction with an 80-BUS computer.

2 Components

Qty	Reference(s)	Value	Notes
1	D1, D2, D3, D4	LED	
8	DC1, DC2, DC3, DC4, DC5, DC6, DC7, DC8	100nF	
1	J2	CF Connector	Part: CFT-125-01-L-D-RA-01-SL
1	J3	Power	Aux power for adaptors (optional)
1	JP1	Link 1	NAS I/O
2	Q1, Q2	2N3906	
3	R1, R8, R12	1K2	
2	R2, R7	2K2	
6	R3, R6, R9, R13, R14, R15	4K7	
1	R4	470	
1	R5	1K	
2	R10, R11	10K	May be required. See the errata
1	SW1	SW_DIP_x08	Use a wire link
6	Tant1, Tant2, Tant3, Tant4, Tant5, Tant6	10uF	Tantalum
1	U1	7406	
1	U2	74LS74	
2	U3, U8	74LS32	
1	U4, U5, U6	74LS244	
1	U7	74LS138	

3 Notes on Components

All the components used have been selected at time of design to be readily available via commercial component suppliers.

3.1 CF Connector

This the only component that may prove difficult to source.

The CF connector is a through hole 2 x 25 pin connector manufacture by Samtec. The part number is: CFT-125-01-L-D-RA-01-SL

Datasheet

The connector has four plastic dimples on the bottom (for mounting on a PCB with alignment holes). It is recommended that these are snipped off before soldering to give a flat fit on the PCB.

The pins on the connector are spaced as 1.27mm so can be difficult to solder. It is recommended to use a fine tipped iron while using an inspection lens.

4 Construction

4.1 Before you start construction

Inspect the PCB for any visible signs of damage

Select your components:

- Turned pin sockets are recommended due to robustness and reliability
- Tantalum capacitors can be temperamental. Make sure they are inserted with the correct polarity, are of good quality and are overrated voltage wise.

4.2 Order of construction

The recommended order of construction is:

- Resistors
- Sockets
- Disc capacitors
- Tantalum capacitors
- Insert switches
- LED’s
- CF connector
- Insert IC’s

5 Configuration

5.1 NAS-I/O

If no other card in the system is supplying the NAS-I/O signal, put a link / switch at JP1

5.2 Port Base Address

The board can be configured to exists at addresses 0x80 through to 0xF0. It requires 8 ports, 0x?0 through 0x?7

The configuration at SW1 can be set either by using an 8-way DIP switch or by placing a link at the appropriate position.

6 Test Points

Four test points exists on the board which can be used to probe operation

6.1 TP1 – GND

This is the test point for the 0V rail

6.2 TP2 – RD Enable

This is the Read Enable signal for the CF module. It is active low

6.3 TP3 – WR Enable

This is the Write Enable signal for the CF module. It is active low

6.4 TP4 – Select

This is the output from the port addressing logic. When a port in the configured range is accessed this signal will go low.

7 Access the CF Module

Four test points exists on the board which can be used to probe operation

A useful guide to CF commands and operations cab be found here.

7.1 Port Addresses

Port	Read	Write
0x?0	Data	Data
0x?1	Error Code	Feature Select
0x?2	Sectors to Transfer	Sectors to Transfer
0x?3	LBA 0..7	LBA 0..7
0x?4	LBA 8..15	LBA 8..15
0x?5	LBA 16..23	LBA 16..23
0x?6	LBA 24..27	LBA 24..27
0x?7	Status	Write Command

7.2 Basic Operations

The following command sequences are sufficient to verify if a card if functional.

Addresses are offsets from the base address selected, so if you have selected 0xC0 as your base then 0x01 -> 0xC1, 0x02 -> -oxC2 etc

7.2.1 Select 8 Bit mode

The board is designed to operate in 8-bit mode so this needs to be configured.

Write 0x01 to 0x01 *8-bit mode*

Write 0xEF to 0x07 *Set features*

7.2.2 Set Sector Count

We only want to move one sector at a time (512 bytes) so this needs to be set.

Write 0x01 to 0x02 *Transfer one sector*

7.2.3 Select Sector to Read / Write

To select address 0x0000001, the LBA values are set as follows:

Write 0x01 to 0x03

Write 0x00 to 0x04

Write 0x00 to 0x05

Write 0xE0 to 0x06

7.2.4 Disable Cache

... otherwise your data won't stick!

Write 0x82 to 0x01 *Disable cache command*

Write 0xEF to 0x07 *Set feature*

7.2.5 Read / Write

To read use the command 0x20, to write use the command 0x30 written to 0x07 and then read/write the sector to/from the data port 0x00

Between each byte you should check the status port to check if the next byte should be transferred.

However, I have found the Z80 at 4MHz to be slow enough not to need this. YMMV

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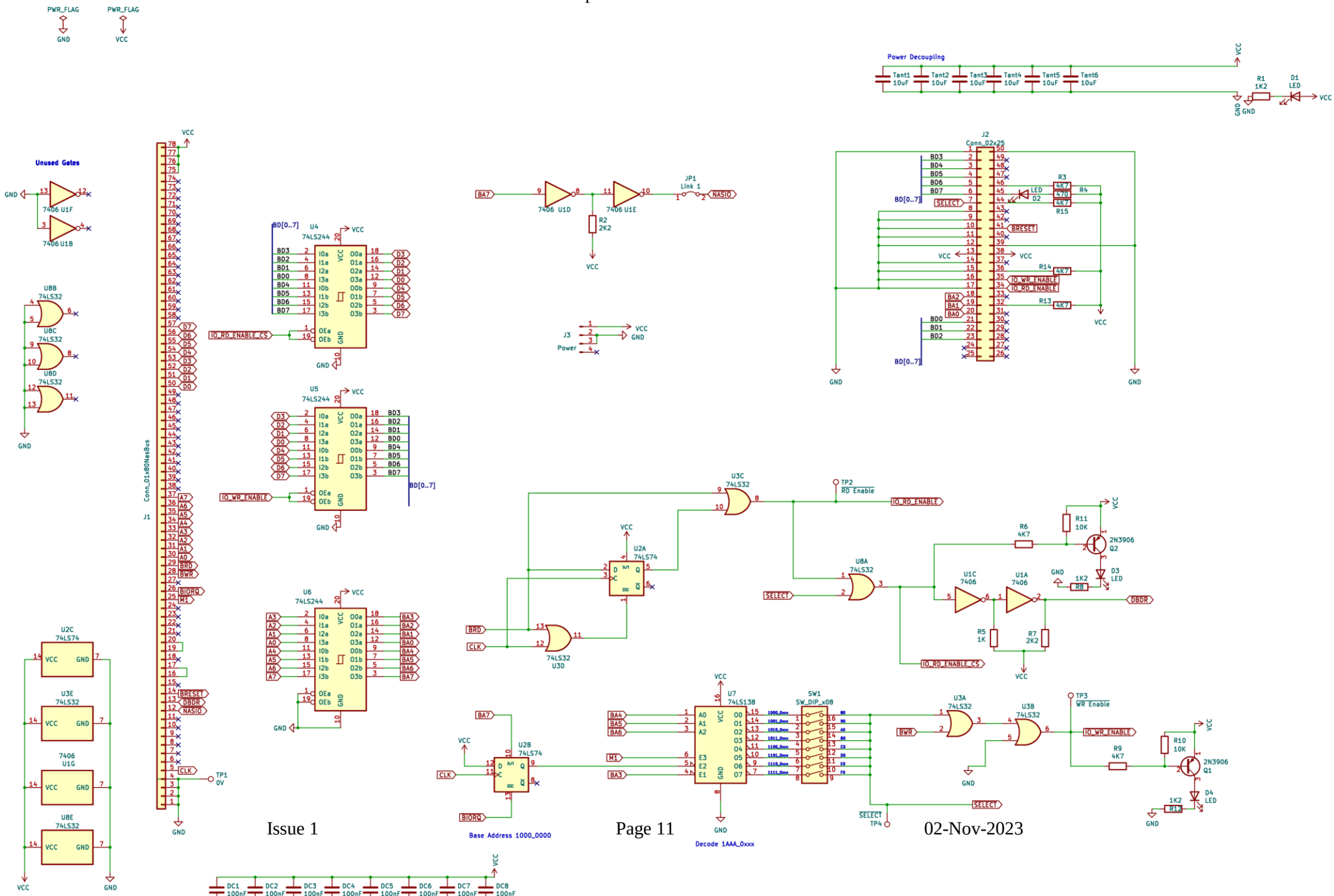

8 Errata

8.1 Version 1.0

Due to the tolerances of the 2N3906 transistors, it may be necessary to add 10K bias resistors at positions R10 and R11 on the circuit diagram.

These are only required if the READ / WRITE LED's (Q1 & Q2) remain lit when no activity is taking place.

It should be noted that these are indicators and do not impact actual operation.

9 Reference Images