

Computer One (C1) Disc Interface Project for the ICL One Per Desk (OPD)



Draft Technical Note – QUANTA – OPD C1 Disc Interface Project.
Computer One (C1) Disc Interface for the ICL One Per Desk (OPD)

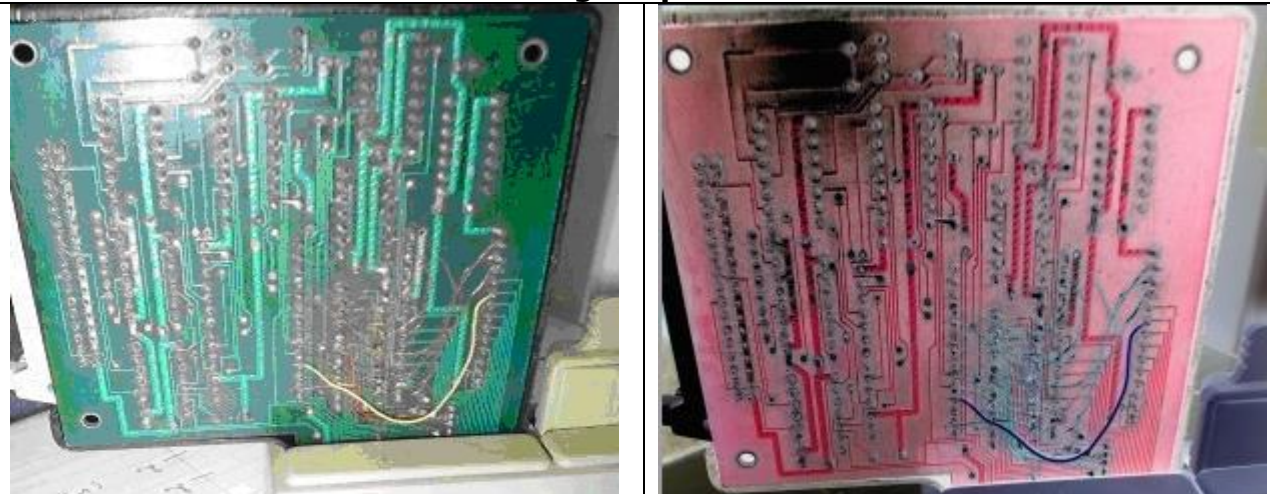
A number of OPD enthusiasts developed hardware add ons and home brew modifications for the OPD. Interest in the OPD peaked between 1992 – 1994, and lead to a number of articles in Micromart. In 2006, QUANTA agreed to expand their scope to include the ICL One Per Desk. In future articles, we will investigate how to put ICL Basic on ROM, how to expand the OPD memory store to 256K, and how to share printers, monitors and files between the OPD, Sinclair QL and PC.

Computer One developed a variety of software and hardware add ons for the Sinclair QL and ICL One Per Desk range of microcomputers in the mid 1980's. Computer One are most famous for their range of BASIC, Pascal and C compilers. This article concerns the Computer One disc interface which was launched in 1986.

Two disc interfaces were developed for the OPD – one marketed by Computer One, one by PCML. The **Computer One disc interface is simpler and suitable for a DIY project.**

The **PCML 'Teledrive' disc interface** boasts a second processor which is capable of running CP/M and a 256K RAM disc. This interface is considerably more complex than the C1 interface and is not suitable for a DIY enthusiast.

**C1 Interface board fits into one OPD capsule.
Circuit board is contained in a 'mega capsule'.**



**Computer One (C1) Disc Interface
C1 Disc Interface connected to a four capsule OPD ROM Pack.**



Overview of the C1 Disc Interface and Comparison Spectrum Disc Interfaces

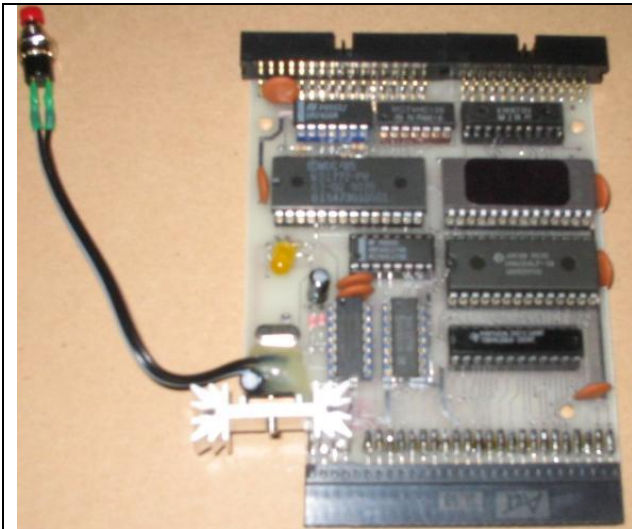
The C1 Disc Interface connects to the disc drive via a 34 way ribbon cable.

The C1 interface is **fairly simple**, and has many similarities to disc interfaces developed for the Sinclair QL and [+D](#) and [DISCiPLE](#) for the **ZX Spectrum** :

1. The circuit board has ten 74LS series 'glue' chips surrounding a Western Digital **WD1770/2 disc controller** chip.
2. **Firmware** is stored in a 128 Kbyte (16Kilobyte) EPROM chip which can be programmed from a PC or a Sinclair QL. The C1 Firmware is available in OPD Teledrive, QL QDOS and MSDOS PC formats.
3. The C1 interface is housed on a double sided circuit board which is powered from an expansion slot on the OPD. The C1 interface does not have any custom logic chips or surface mounted components. All chips are socketed.

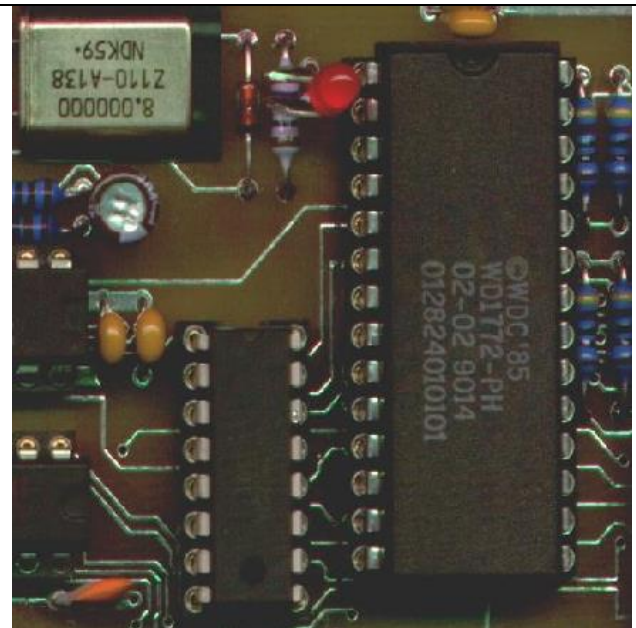
The design of the C1 interface is considerably simpler than **PCML's Teledrive**. PCML incorporated a 2nd Z80 processor, 256K RAM disc, more sophisticated DOS firmware and support for CP/M. This made their disc interface more complex.





Notice the similarities between C1, ZX Spectrum and QL disc interfaces :

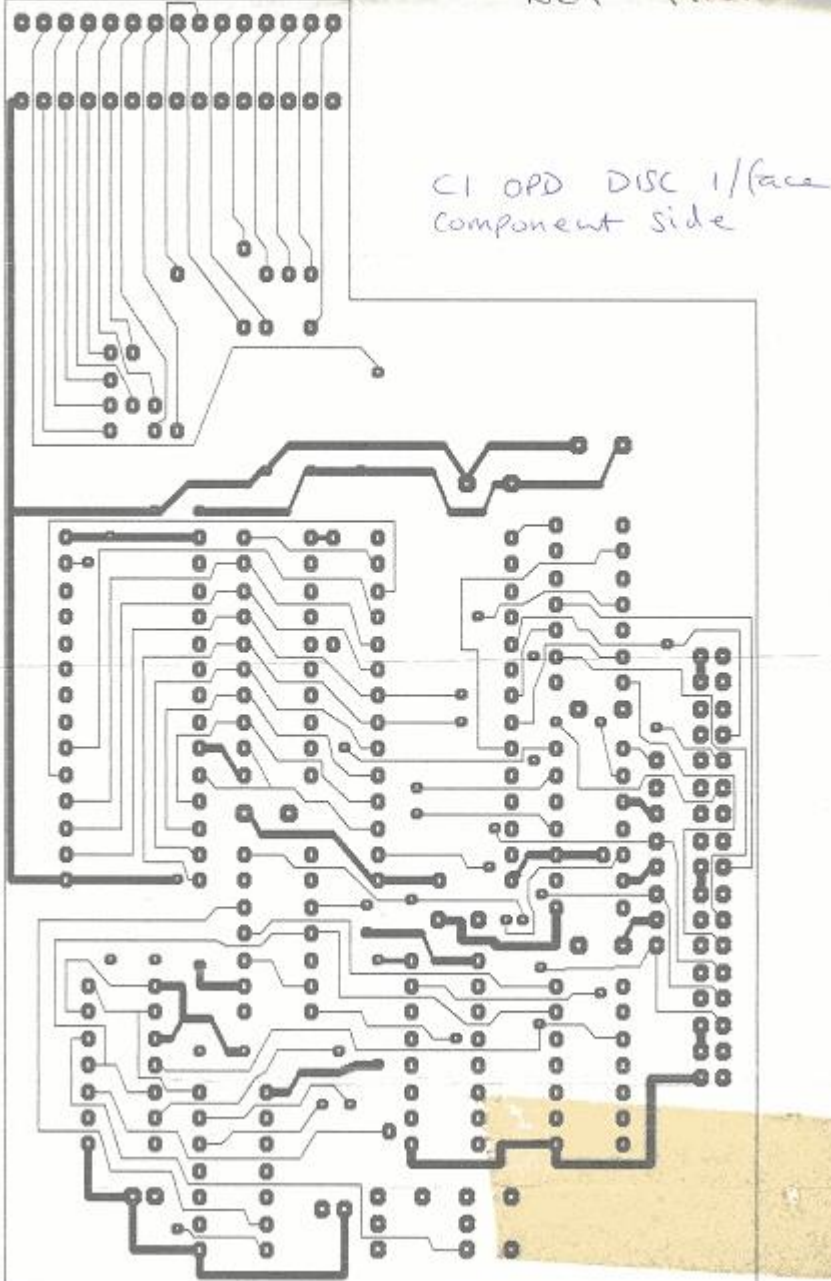
- 8 Mhz crystal
- Western Digital WD1772 disc controller
- Firmware on Eprom
- Use of 74 series logic chips and absence of custom PAL logic chips
- Simple double sided circuit board
- Sinclair 8 bit architecture



Parts List for the Computer One (C1) Disc Interface board	
<u>Integrated Circuits</u> IC1 : WD1770/2 Western Digital Floppy Disc Controller IC2 : 27D128 16K Byte Eprom (Eprom needs to be erased and programmed with the C1 firmware. The C1 firmware image is available in OPD Teledrive, QL QDOS and MSDOS PC format) <u>74 Series chips 'glue' logic chips :</u> IC3 : 74LS245N [20 pin DIL] IC4 : 74LS175N [16 pin DIL] IC5 : 74LS10N [14 pin DIL] IC6 : 74LS02N [14 pin DIL] IC7 : 74LS74AN [14 pin DIL] IC8 : 74LS04N [14 pin DIL] IC9 : 7406N [14 pin DIL] IC10 : 7438N [14 pin DIL] IC Sockets 14 pin DIL x 6 : IC5 – IC10 16 pin DIL x 1 : IC4 20 pin DIL x 1 : IC3 28 pin DIL x 2 : IC1, IC2 Capacitors C1 : 35 mF 35V Electrolytic radial C2 : TBA mF C3 : 100 mF 10V electrolytic radial C4 : TBA mF C5 - C11 : TBA mF Resistors R1 : TBA Ohm R2 : TBA Ohm R3, R4, R5 : TBA Ohm R6, R7, R8, R9 : TBA Ohm Oscillator Crystal XTAL1 : 8 Mhz, labelled ECM/11E Connectors EC1 : 32 way OPD connector (16 x 2) PL1 : 36 way IDE floppy disc connector	Floppy Disc Controller This chip can be obtained from surplus ZX Spectrum and QL disc interfaces. Component Price : < £8 EPROM for C1 Firmware 16K Eproms are easy to come by second hand. 32K Eprom chips can be substituted. IC2 contains the C1 Firmware. The firmware occupies a 16K slot in the OPD memory map. Component Price : £2.50 <u>Glue support logic</u> Octal bus transceiver 3-state. Quad D flip-flop with clear. Triple 3-input NAND gate Quad 2-input NOR gate Dual D-type flip-flop w/preset and clr Hex inverter Hex inverter buffer/driver Quad 2-input pos. NAND buffer(O.C.) Component Price : £0.15 - £0.40 each Component Price : £0.20 each C1 and C3 are radial electrolytic capacitors. C2, C4 – C11 are ceramic decoupling capacitors which surround each IC on the board. These are simple 1/8th of a watt resistors. Similar to Oscillator in the QL and OPD. Look in Maplin, RS and Farnell catalogues Standard IDE connector.
Double sided circuit board. Two piece plastic case. Inserts and grommets.	Sample circuit board : Issue Number 2, © Adder Technology 1986

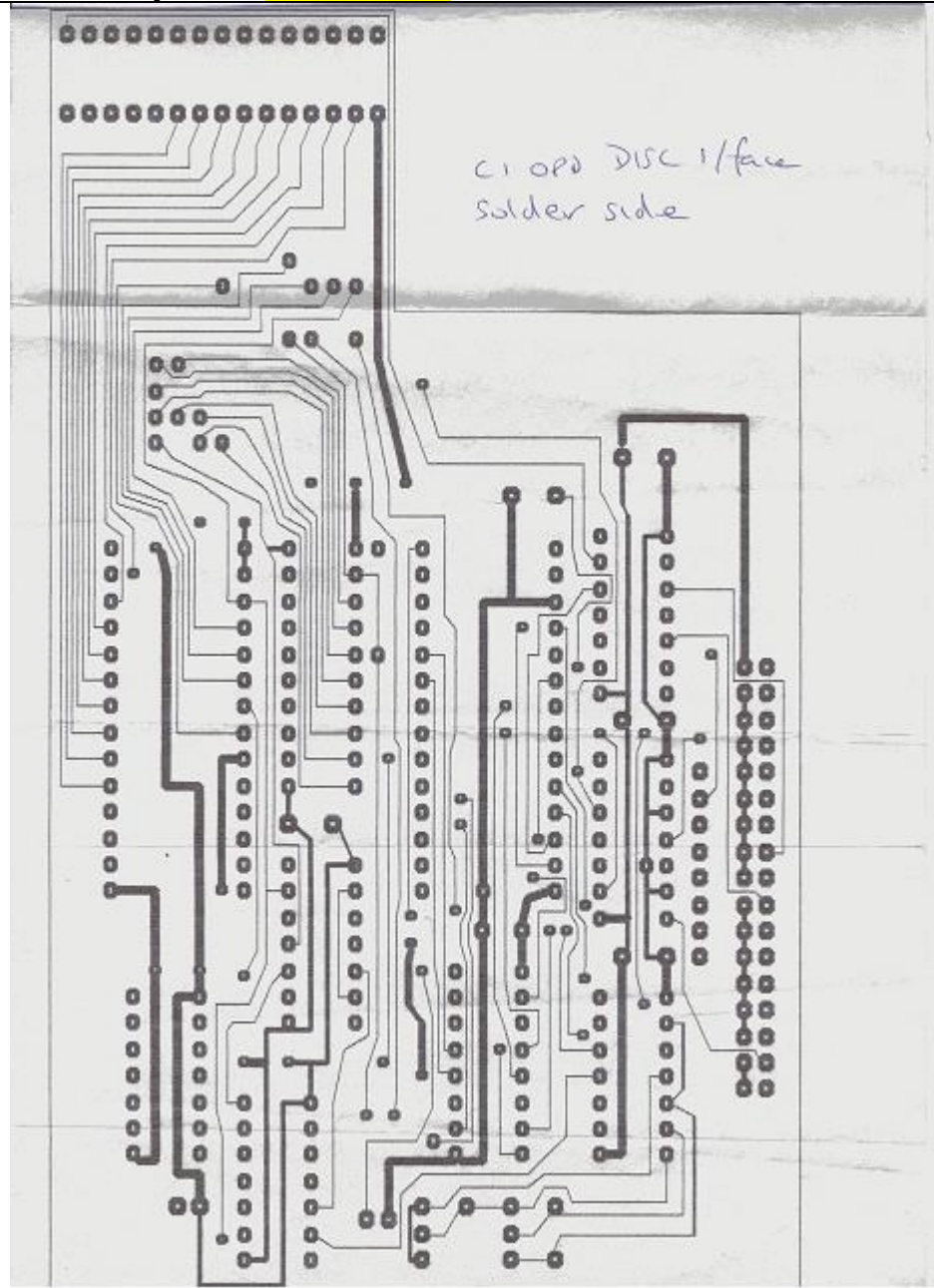
Computer One OPD Disc Interface

Track Layout : Component Side



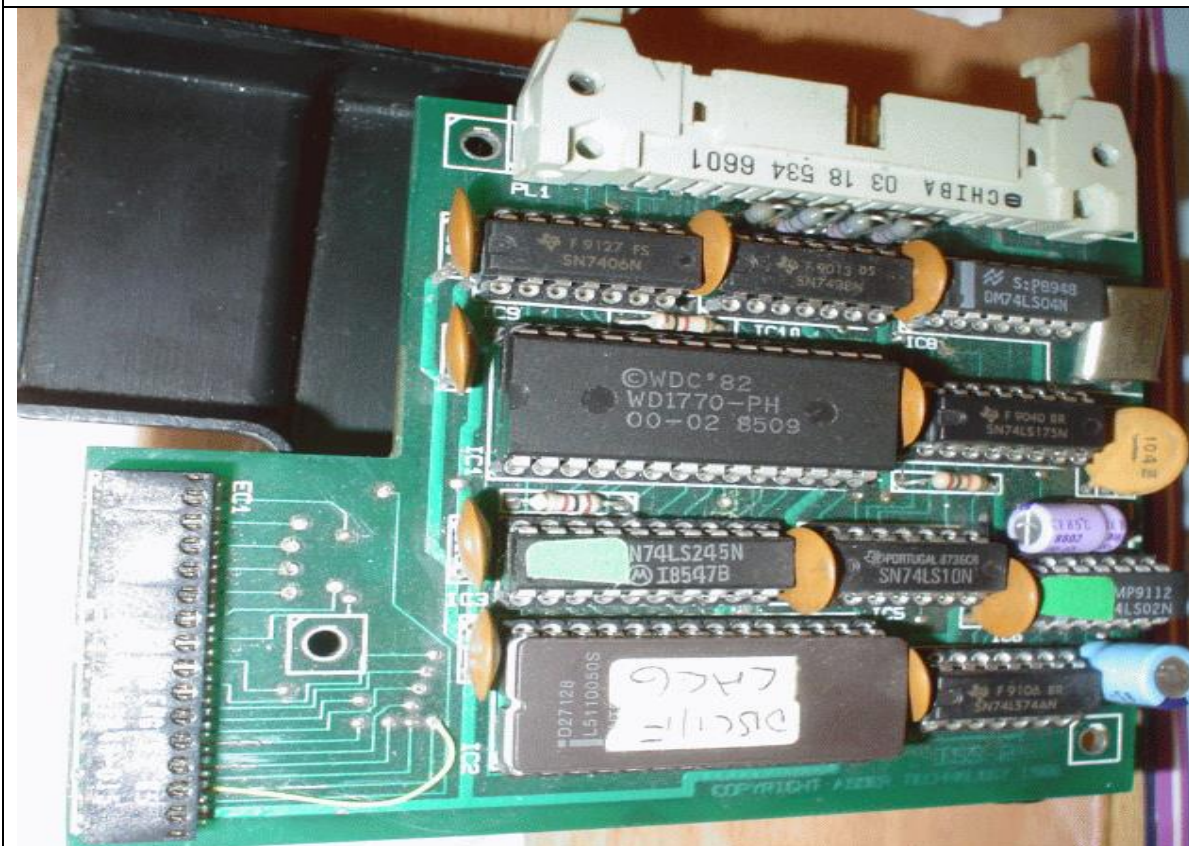
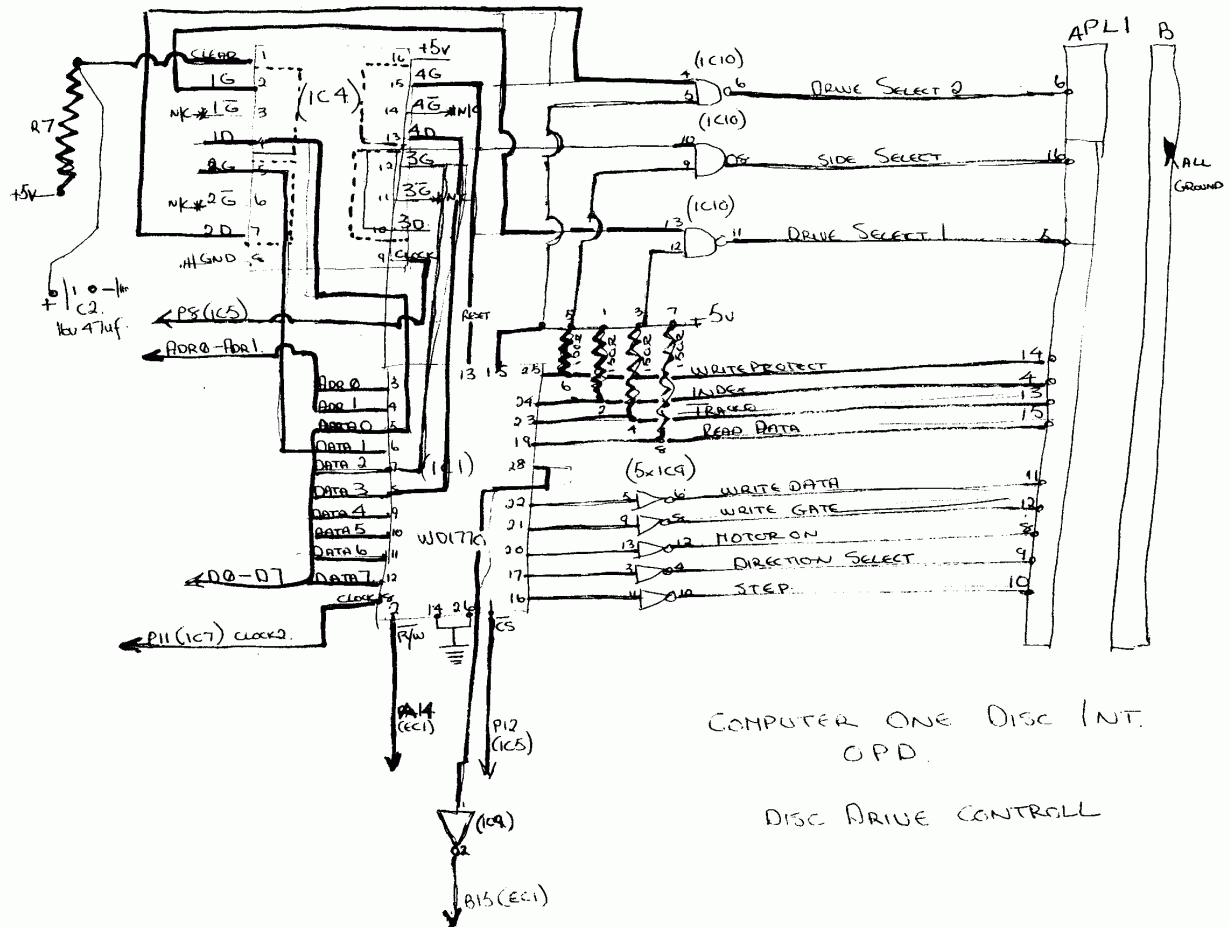
Computer One OPD Disc Interface

Track Layout : Solder Side



Computer One OPD Disc Interface

Disc Controller Logic



Appendix B

DivIDE Hard disc and compact flash Interface :

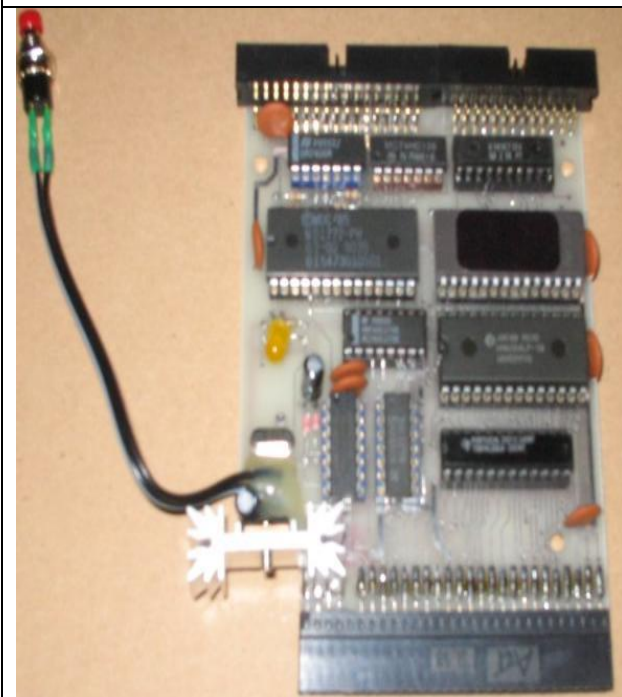
- <http://www.biehold.nl/rudy/+divide/index.htm>

Plus D floppy disc interface :

- <http://www.worldofspectrum.org/NotThePlusD/>
- <http://www.pcbpool.com/ppuk/info.html>
- <http://newton.sunderland.ac.uk/~specfreak/FD1/>
- <http://baze.au.com/divide/>
- http://baze.au.com/divide/howto/index_en.html

RWAP Services :

http://www.rwapsoftware.co.uk/spectrum/spectrum_storage.html



WD1770 Disc Controller : *From Wikipedia*

- The **WD1770** is the first in a line of [floppy disk controllers](#) produced by [Western Digital](#). It uses the [IBM 360](#) disc format and supports [single density](#) (FM) or [double density](#) (MFM) operation.
- A number of compatible chips were available, such as those from the VL177x family (produced by [VLSI Technology](#)).
- These families were used with the [Acorn Electron](#), [BBC Master](#), [Atari ST](#), [Acorn Archimedes](#) and [Commodore 1581](#) and the [SAM Coupé](#), as well as the [+D](#) and [DISCIPLE](#) disk interfaces for the [ZX Spectrum](#).

Acknowledgements :

- Thanks to David Warne for providing the C1 disc interface board, ROM dumps of the C1 firmware, scanning in the C1 user manual and offering support and advise.
- Thanks to David Walker for information on his MultiDiscover and OPD Transfer utility software.
- Thanks to John Gilpin of QUANTA and Rich Mellor of RWAP services.
- External disc drives shown in the photo were supplied through QUANTA and Rich Mellor of RWAP Services, who is a leading QL trader.
- RWAP provided the DSDD dual (720K) disc drives which are housed in a metal case with an external power supply, and connect to the C1 via a 34 way ribbon cable.