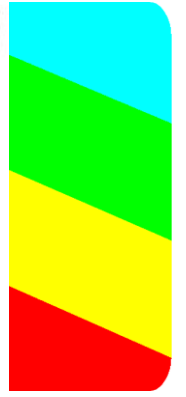


Opus Discovery

Maintenance manual



Doc version: V0.86 – 26 May 2021

Latest version of this document

Scan the QR code at the right, to check for the latest version of this document.



Introduction

This manual describes what is involved with refurbishing and maintaining your Opus Discovery.

This manual describes:

- Differences in Opus Discovery revisions
- How to reach the mainboard for maintenance
- What parts need to be refurbished
- Upgrading to more and modern drives
- Technical information and schematics

Maintenance kits

You can find offers for maintenance kits and upgrade kits for the Opus Discovery, at: <http://zxspectrum.shop/>.

Here is a direct link to the Opus Discovery section:

https://www.bytedelight.com/?product_cat=opus-discovery-upgrade-kits

Feedback

If you have anything to add to this manual, please contact me: opusdiscovery@bytedelight.com.

Or use the Contact form at ByteDelight.com.

Discussion

There is an active Facebook group about the Opus Discovery is discussed:

<https://www.facebook.com/groups/theopusdiscoveryclub>



Subscribe!

Revisions

Issue ?

This is most probably one of the earliest revisions.

This one has rectifier diodes, no bridge rectifiers.

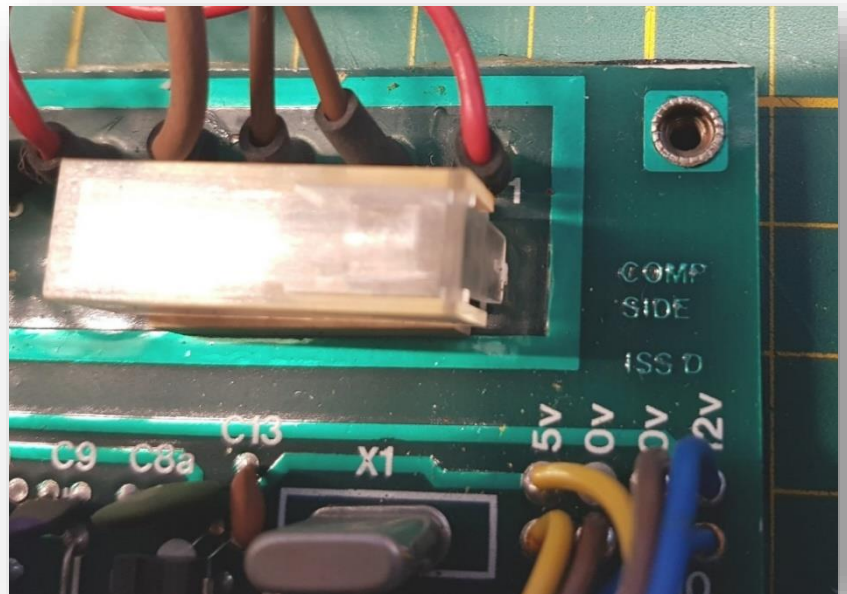
More info about other parts will be added later.



Issue D

This revision has:

- 2x bridge rectifiers (in some, maybe all issue D's, high quality Vishay 2KBB20 are used)
- 2x 4700uF capacitors
- 2x 1uF capacitors
- 2x 10uF capacitor



Reaching the mainboard for maintenance

For replacing parts on the main board, like the capacitors or the bridge rectifiers, you have to get the mainboard out.

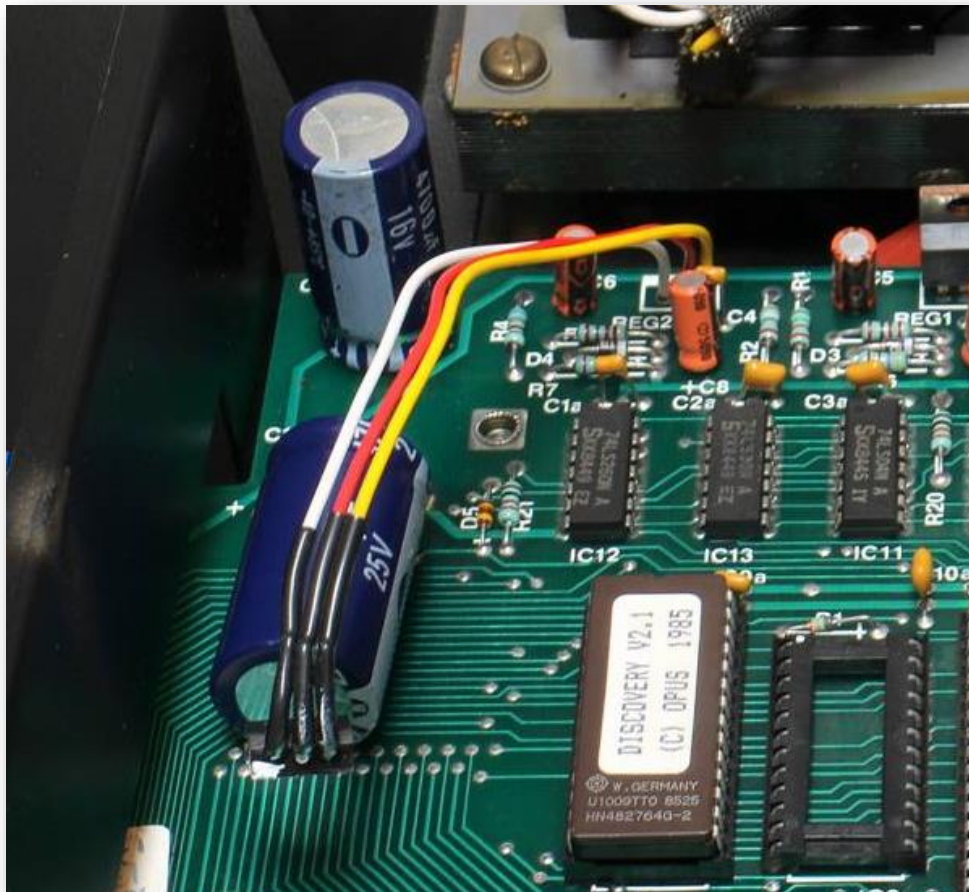
Watch out for voltage regulators attached to the plate where drives sit on

Before detaching anything, please make sure to check this paragraph!

On some revisions of the Opus Discovery, there is a voltage regulator mounted with a screw to the plate where the drives sit on. The plate then acts as a heatsink.

When detaching the mainboard to work on, be very careful not to bend and brake any of the legs of such a voltage regulator!

So start with removing it's screw so it becomes detached.



Voltage regulator detached from plate where drives sit on (photo taken from Nightfallcrew on Facebook)

Removable or non-removable plate where drives sit on

There are revisions of the Opus Discovery with a detachable plate where the drives sit on, and there are revisions where this plate cannot be removed.

When the plate can be removed, it is relatively easy to get the mainboard out, since you can remove the drives with the plate they sit on, and then only need to remove the mainboard screws, to work on the mainboard.

On the revisions of the Opus Discovery where the plate where the drives sit on cannot be removed, unfortunately all parts need to be disconnected, including:

- ON/OFF switch
- Strain relief on mains power cable – this is very hard without the correct tool, but can be done
- Transformer – its screws sometimes can be really hard to loosen



An Opus Discovery with non-removable plate for drives, with everything detached

Detach mains power strain relief / cable holder

Make sure power plug is not connected to mains power!

It is quite hard to remove the strain relief when needed (when the plate where the drives sit on, can't be detached). Use pliers and/or anything you can think of and have, to get it out. You need to push the two plastic parts to be able to pull it out, it's not easy.



Detach ON/OFF switch

Make sure power plug is not connected to mains power!

It's relatively easy to get the ON/OFF switch out. Use a long and wide flat screwdriver to push the plastic springs on the sides in, and push the switch out.



Screw sizes

Make sure not to lose any of the screws.

But in case you do, or need a replacement because a screw is damaged, here are the sizes:

- Bottom transformer: 2x M4x5

[More info will be added later]



Damaged screw, after trying to remove it when it was really tight, and then using a Dremel to cut it to be able to get a large screwdriver in for some more force.

Replacing parts on the mainboard

Capacitors on early revisions

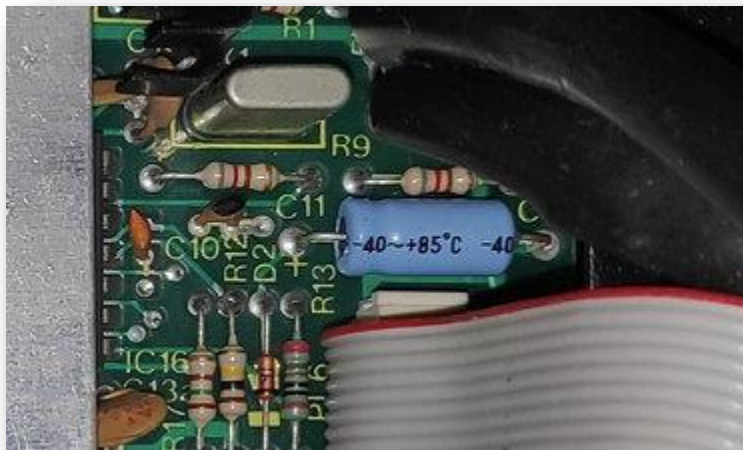
Three large capacitors

Two seem 3300uF, the left purple one 4700uF.



Small capacitors

There is at least an axial capacitor, probably 47uF (will be updated later):

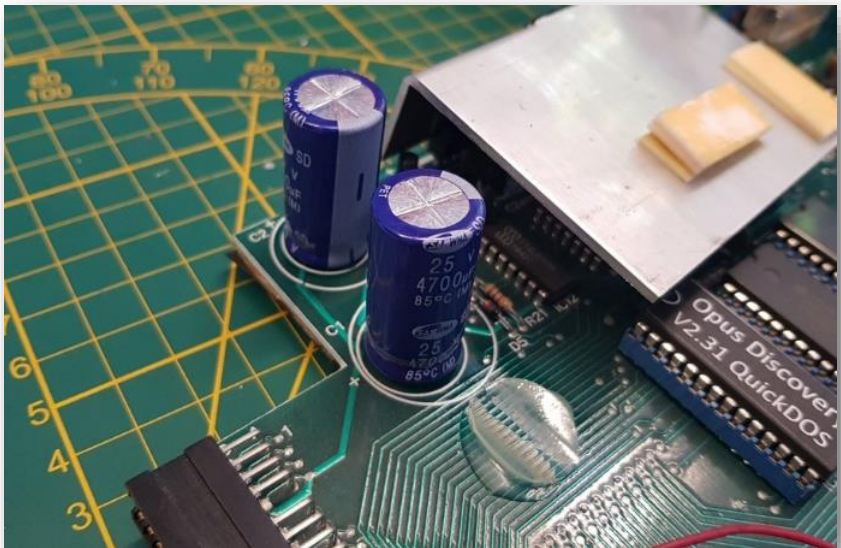


Capacitors on later revisions

Two 4700uF capacitors

Many later revisions of the Opus Discovery, seem to have these two large capacitors.

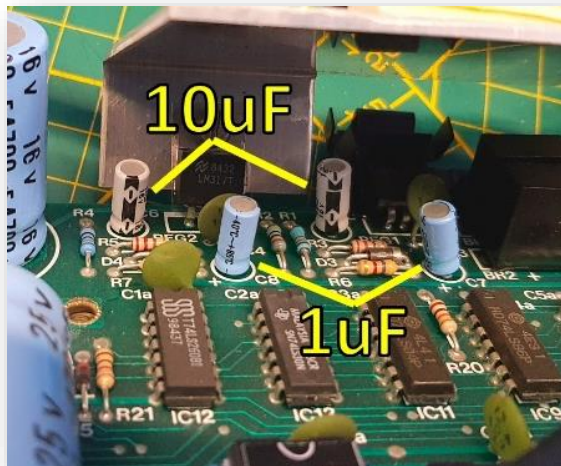
Both can be straight up, since the replacements are lower than the original 25V 4700uF capacitor.



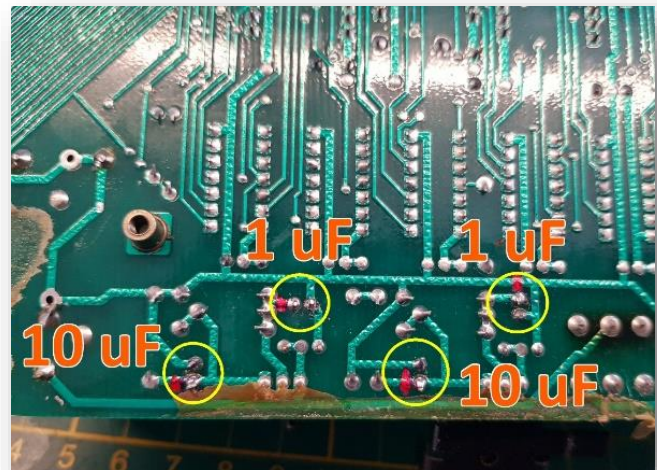
4 small capacitors

Many board revisions have these 4:

Top:



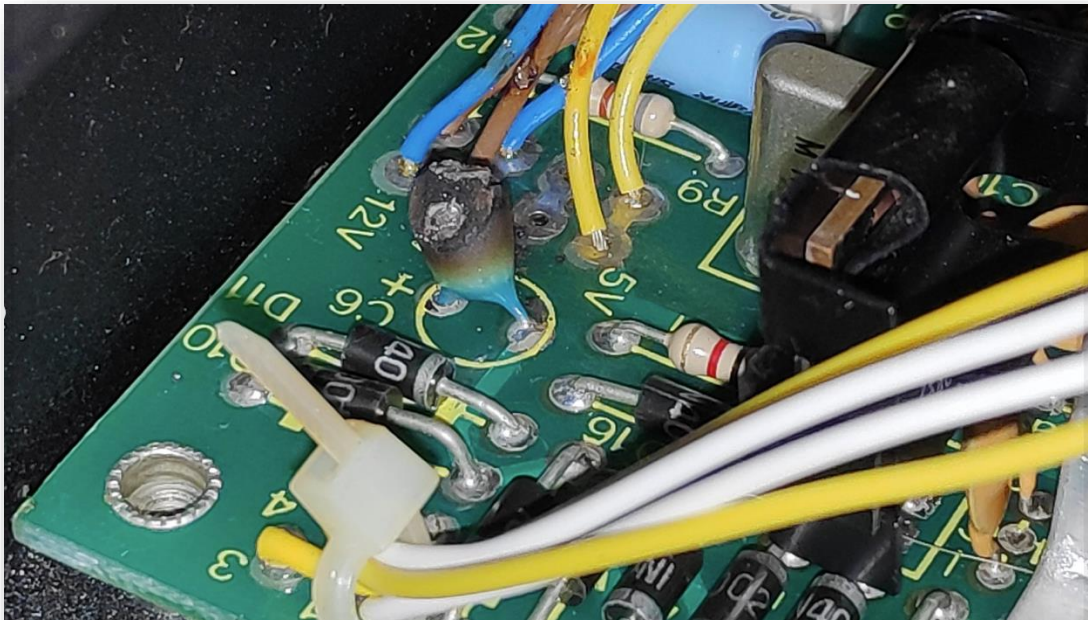
Bottom (red marks show '+' side):



More capacitors

As said earlier in this document, some board revisions have more / different electrolytic capacitors, that need to be replaced.

But it has also been reported that some non-electrolytic capacitors have gone bad, like shown here on this photo:



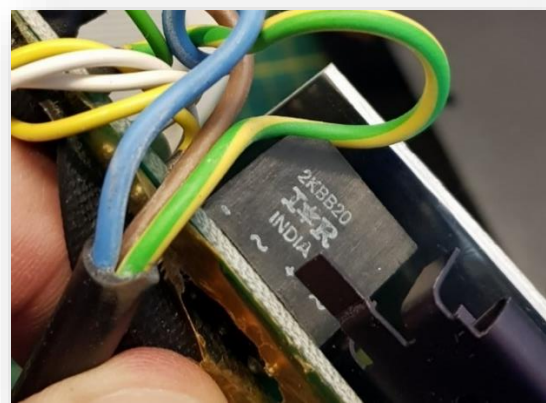
Rectifiers diodes or bridge rectifiers

There are two different solutions for rectifiers on Opus Discovery mainboard:

1. Rectifier diodes
2. Bridge rectifiers



Rectifier diodes - some are missing on this photo



Bridge rectifiers - high-quality model

[photo of low-quality bridge rectifiers will be added later]

Quality of the bridge rectifiers

When an Opus Discovery mainboard has bridge rectifiers, most often they were of poor quality. After some use, these often started melting, and needed to be replaced.

Some (probably later) Opus Discoveries, already have high-quality bridge rectifiers.

It turns out that the high-quality model used (at least in the one I serviced, shown on the photo 'Bridge rectifiers - high-quality'), are still the model of choice to replace the low-quality ones with, as explained in the next paragraph.

High-quality bridge rectifiers

Nowadays one of the few types that are drop-in replacements, are the Vishay 2KBB20.

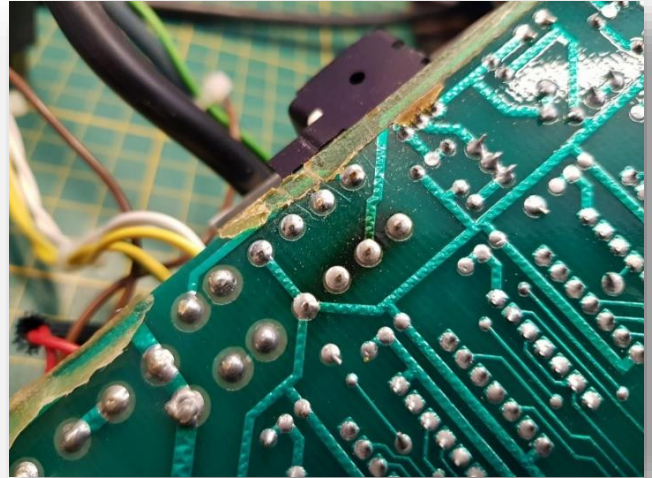
At the moment of writing, these are available at RS Online, Mouser and Farnell.

Heat spots

Whatever rectifying solution is used, low-quality or high-quality bridge rectifiers, or rectifying diodes: on all boards I've seen there are dark spots that are built up throughout the years.

This indicates that a lot of current has been flowing through these rectifying parts and the pads and tracks, causing heat to have built up.

It does not have to be a problem, but check for brittle solder joints, and replace the solder if needed.



Upgrading to more or modern drives

Find the latest version of the Opus Discovery Upgrade Kit manual here:

https://www.bytedelight.com/?page_id=9099

I know, it's cheap referring to another document, but that makes it possible to edit that information at one place only.

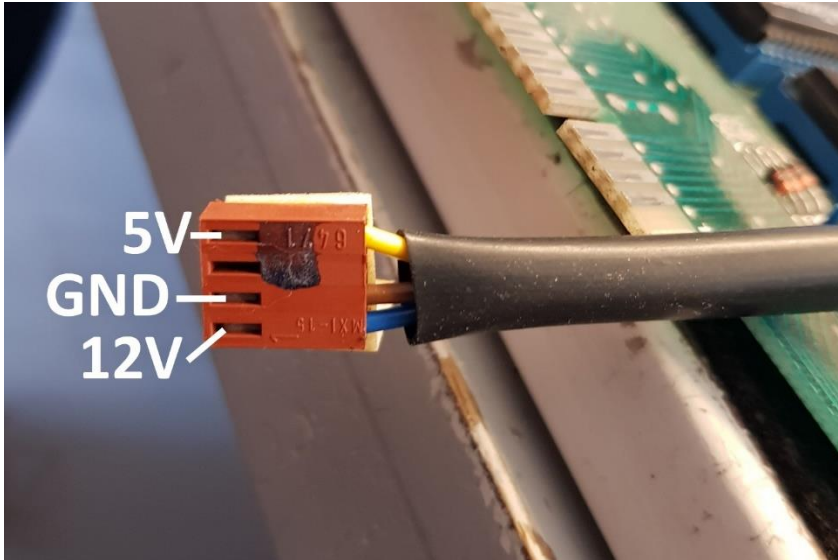
Tech info

Drive plug pinout

I'm not sure if this is the same on all revisions of the Opus Discovery.

Also, I can imagine the plugs or cables have been replaced or modified by users.

So always make sure to measure the voltages on the pins!



Most DD or HD drives* run on 5V only, but the original SSSD (single sided single density) drives require both 5V and 12V.

*When using HD drives, do only use DD floppy diskettes, not HD diskettes.

Some people (like myself in the past) think that HD floppy disks with the HD hole covered, can be used as DD disks, but HD disks are made of a different material, and will very likely loose data if (ab)used as DD disk.

ROMs

- V2.1: support for 720KB drives, which also requires a 6116 RAM chip (see paragraph below)
- V2.2: support for ZX Spectrum 128K models
- V2.31: QuickDOS

Optional RAM

6116 chip is required for support of other drives than the standard Single Sided Single Density (170KB) drive.

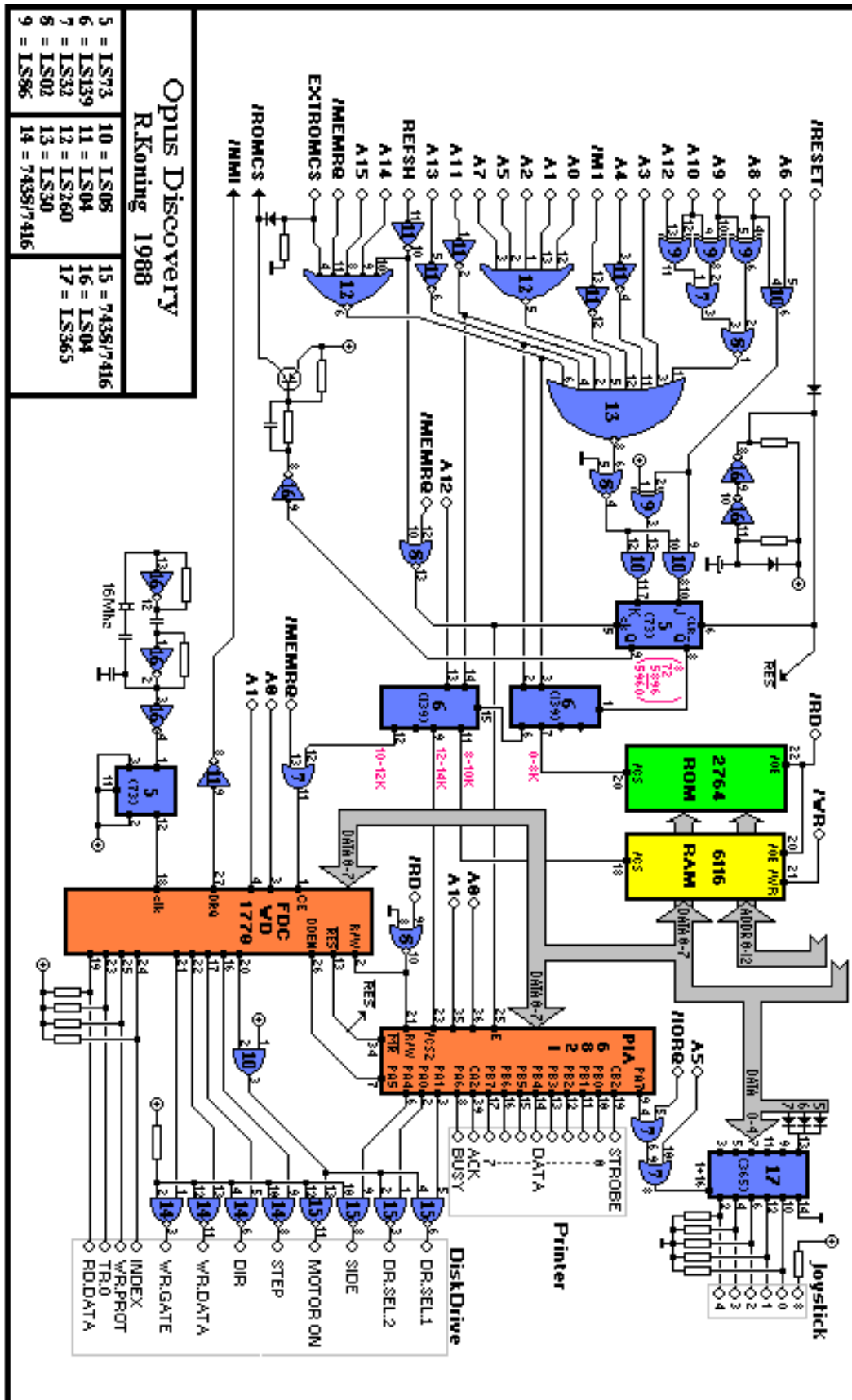
You also need a special formatting utility to format a non-standard drive.

A floppy disk with this utility is included with ByteDelight's Upgrade Kits for Opus Discovery.

Schematics

These schematics show only the logic part of the Opus Discovery mainboard, not the power part.

Schematic 1



Schematic 2

I found that there are some differences in (probably later) revisions, when it comes to the MOTOR ON signal. The reason that Opus Ltd. made this change, is most probably because with the earlier circuit, both drives (if there are 2) started spinning at the same time when one drive is accessed. This caused the rectifier diodes or (poor quality) bridge rectifiers to overheat and get faulty.

In the later circuit, both drives have their own MOTOR ON signal. However, this means that the lower floppy connector can only be used for drive 1 (DS0), and the second, upper, connector can only be used for drive 2 (DS1).

