

Opus Discovery

Upgrade kit #2 / #3

**Thank you for purchasing this upgrade
to enhance your Opus Discovery
with one or two PC floppy disk drives!**

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Introduction

This upgrade will allow you to store over four times the amount of data (800KB) compared to the original Opus Discovery drive (170KB).

The disks formatted with the new drive will also enable you to exchange software on a PC disk drive (with an emulator or tools like SamDisk).

This manual describes

- a. How to install modern PC drives to use as 800KB DSDD drives
- b. How to install the V2.31 ROM and 6116 RAM chips

BYTEDELIGHT

Installing one or two PC drives

These can be used as Double Sided Double Density drives to format up to 800KB.

1. Disconnect and remove top cover

Disconnect the Opus Discovery from power and disconnect the ZX Spectrum from Opus Discovery. Remove the top cover by removing the 3 screws at the bottom, and 1 on the back.

Be careful with the joystick connector which usually sticks out: you might need to lift the top cover a bit to get it around the joystick connector.

2. Remove the metal piece that covers the hole of the second drive



3. Disconnect the power + data cables of the original disk drive

Remove the power cable and ribbon cable from the drive.

4. Detach the plate carrying the original disk drive (if possible)

Some Opus Discovery interfaces have a detachable middle plate, some don't. If yours doesn't have one, simply continue with the next step.

If your Opus Discovery has a detachable middle plate, please be aware of this:

Carefully check if the detachable middle plate has a voltage regulator attached to it at the bottom.

If so, be very careful with the its wires! If one comes loose, you will have to reattach it, which can be a nasty job (especially if the wires or pins of the regulator break).

It can be wise to detach the regulator, so its wires can't break accidentally; notice any isolator sheet between the regulator and the metal plate.

If it's too risky, leave the middle plate attached and continue with step 2; it's not mandatory to remove the middle plate, but it is handy as some new holes must be drilled.

5. Mark the front position of the original drive with a pencil

This is useful for mounting the new drive(s) with the correct front alignment.

6. Remove the original Opus Discovery drive

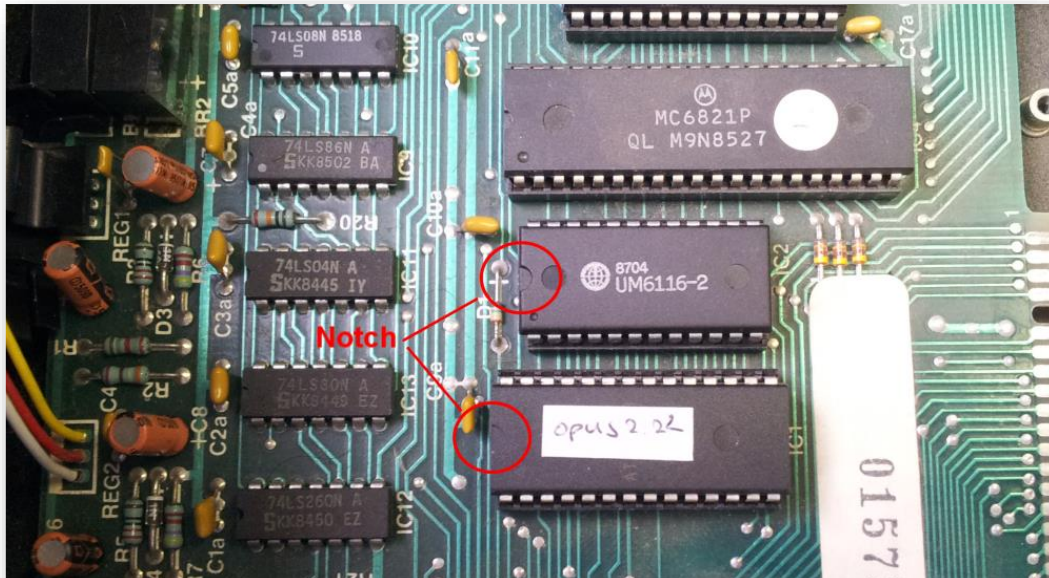
Keep the non-metal shield that comes off on the bottom (if your Opus Discovery has that); it's for protection of the power transformer and must be reattached with the new PC drive.

7. Installing the V2.31 ROM and 6116 RAM chips

When you weren't able to detach the middle plate, or when your Opus Discovery doesn't have a detachable middle plate, you can reach both chips / sockets from the right side when the top cover is removed.

Use a flat screwdriver or pliers to lift and remove the original rom.

Be very careful when inserting the new chips; the legs of both chips will easily get bent or break!



8. Old capacitors

It's a good thing to replace the two large capacitors.

However this requires to detach the printed circuit board too. This requires some skills. The capacitors are not included in this upgrade kit.

When you are going to use the original drive, follow steps 9 and 10, otherwise skip to step 11.

9. Configure the original drive as the second drive

Change the drive select jumper on the Opus drive to DS1:



10. Attach the original drive on the right side of the plate

You can use the pre drilled holes for the original drive.

11. Create 2 new holes for the new PC floppy disk drive(s)

Some Opus Discoveries seem already to have the correct hole distances for the PC drive.

Check if yours does too: make sure that the front of the new drive(s) align with the front position of the old drive (if used).

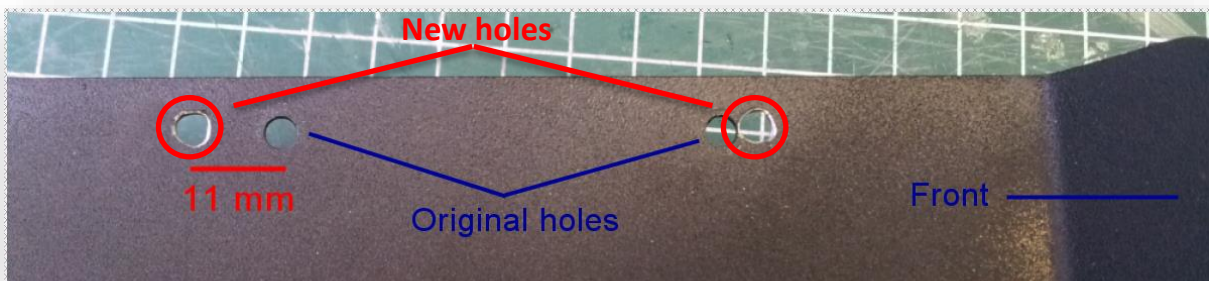
If the holes are not yet at the correct position, follow the instructions in this step.

When you are upgrading to two PC drives, do the same at both sides.

The new holes roughly need to be positioned shown in underneath photo.

But do check the exact hole positions yourself!

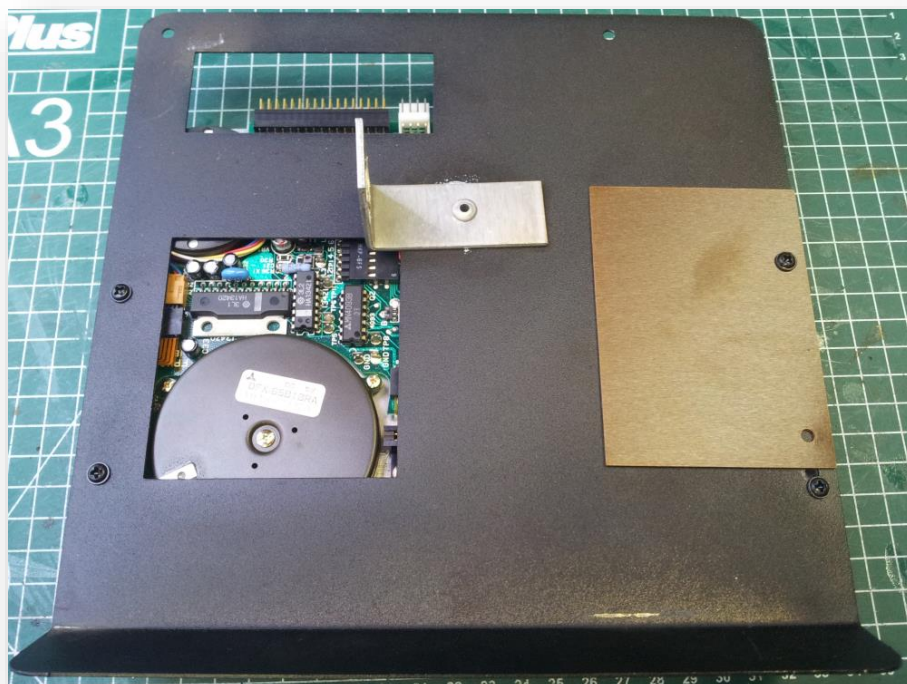
Make sure to remove any drilling residue by using a vacuum cleaner or by vibrating the metal dust out!



12. Attach the new drive(s) and the protective shield

The protective shield must be mounted at its original side, that will be above the transformer of the Opus Discovery.

You can probably only use one screw in the protective shield, but that's ok:

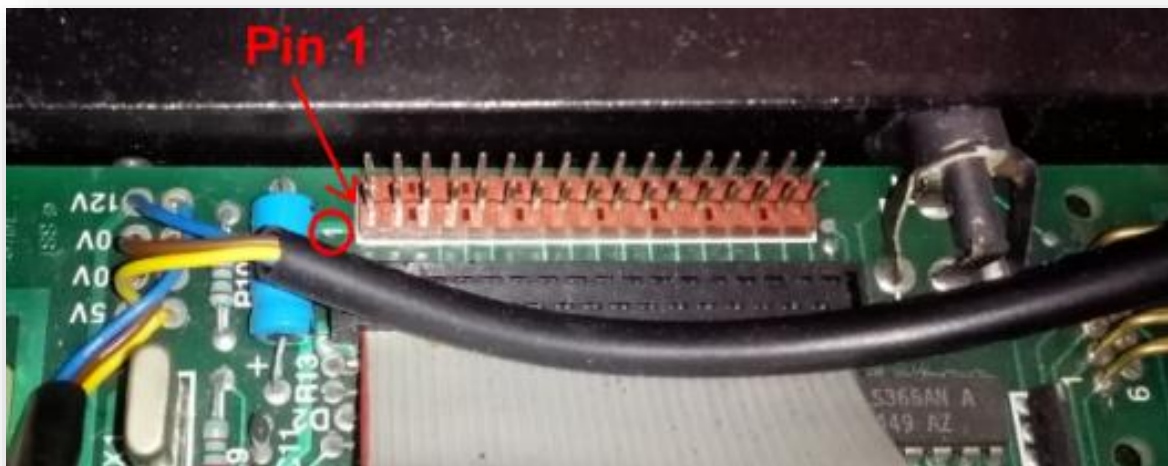


Example with one new PC floppy disk drive at the left, and the original at the right:



13. Connect the new ribbon cable to the Opus Discovery circuit board

Connect the new ribbon cable behind the original fixed one, with the colored wire of the ribbon cable connected to pin 1 of the connector:



14. Reattach the middle plate with the two disk drives



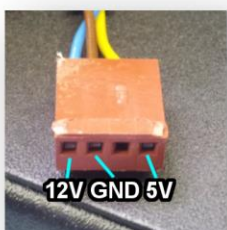
15. Connect the power cables

Make sure you connect the power plug correctly!

Connecting 12V to a 5V power input, will probably destroy the drives electronics!

The yellow wire usually is the 5V line, but please measure before connecting it to a drive!

Connector pinout:



On original Opus floppy drive:



On PC floppy disk drive:



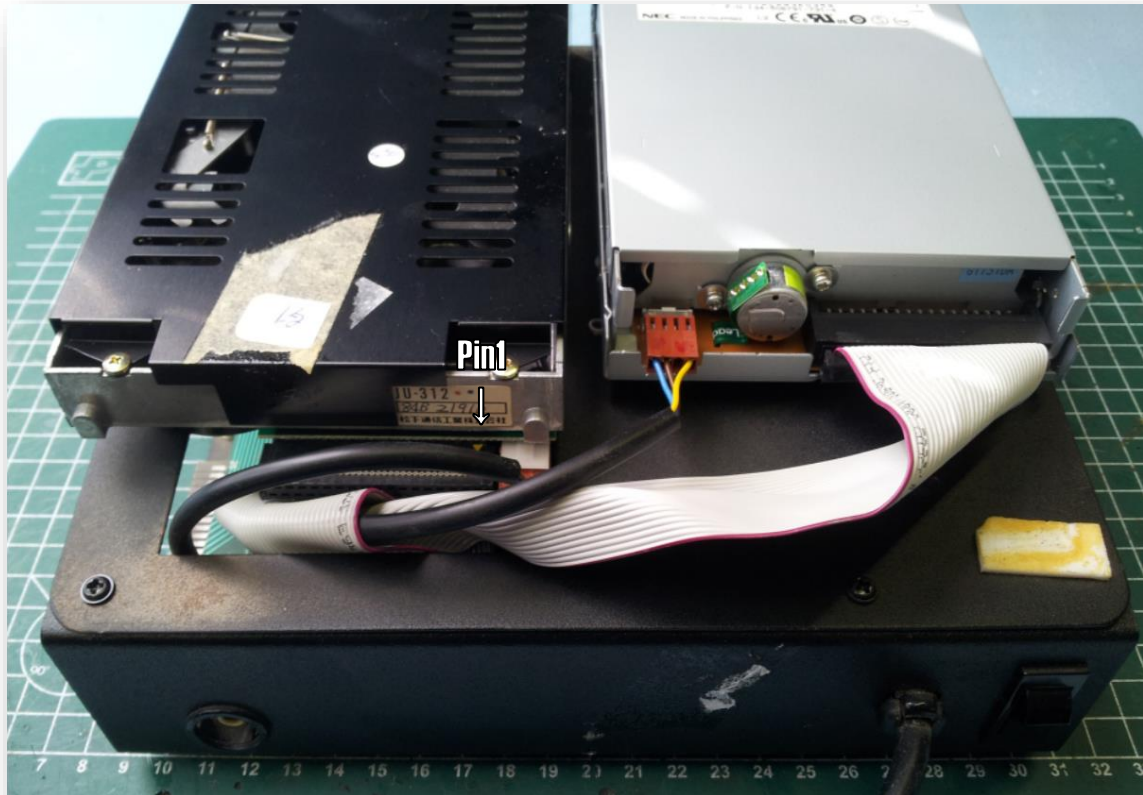
16. Connect the flat cables

Connect the original flat cable (that is fixed to the Opus board) to the left (first) drive (DS0). This cable carries the 'Motor On A' signal.

The red wire indicating pin 1 isn't always on the correct side on the original cable!

However pin 1 is noted on the Opus motherboard correctly (see photo at step 13).

The new flat cable must be connected to the right (second) floppy disk drive (DS1): with many Opus Discovery mainboards, the extra connector is configured to be used with drive DS1 only, which carries the 'Motor On B' signal.



17. Test the set

Before continuing, test the set carefully before closing it with the top cover.

18. Close the top cover

And then, that was it!

Ok, except for some mandatory floppy disk tips and hints.

Using HD floppy disks

You can't use high density (HD) disks as double density (DD), as these are made of different materials.

Use real DD floppies instead.

Is it possible to use SD formatted floppies (from the original Opus Discovery drive) in a PC floppy disk drive?

It's impossible to read or write floppies that are formatted on the original 170KB drive in a PC drive.

The main reason is that the step size is twice as large, and also the track width is different.

Formatting and copying

The disk labeled 'copy' and 'format' contains two utilities needed to use DD disks.

Enter 'RUN' after booting your ZX Spectrum with Opus Discovery and the auto load program will ask you which of these programs you want to use, or follow the loading instructions underneath.

Format

Formatting using the standard command will always format to 40 tracks, single sides, etc.

To use the full capacity of the new drive, you will need another formatting utility.

Load the format tool by:

```
LOAD *1;"format"
```

or

```
LOAD *"m";1;"format"
```

This utility configures the disk format values in the table stored in the 6116 ram chip, and formats disks with this format.

The utility asks a number of questions.

For formatting double density disks in the new PC drive, use these settings:

- 80 tracks
- 10 sectors per track
- 512 bytes per sector
- 7 CAT blocks / sectors
- 2 sides

Copy

Copying using the original command won't work:

```
MOVE "d";1 TO "d";2
```

As this command only works with two identical drives / floppies.

Load the copy tool by:

```
LOAD *1;"copy"
```

or

```
LOAD *"m";1;"copy"
```

When you try this, you will get read or write errors (maybe not at the first track, but you will when putting more data on the disk).

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