ABBA
THE SWITCH

WITH PAUL COLLINS

Have you ever found yourself in the following situation?. You are the proud owner of a CPC6128, Multiface II and a 3.5" B drive on which you would like to store your games but cannot because the MULTIFACE only recognises drive A. What you need is an ABBA switch that swaps drives A and B over.

INTRO
A previous issue of AA that is now out of print had a similar project and ABBA switch suppliers such as Avatar and Quantum proved expensive and unreliable. The alternative described below should cost no more than the price of a DPDT (Double Pole - Double Throw) switch (available from good electronics parts shops).

You will need a soldering iron, a few bits of wire, cutters, solder sucker and sharp knife.

TECHNICAL BIT
The CPC6128 has an industry standard 765 type Floppy Disc Controller (FDC, IC201) inside it which can actually handle up to 4 disc drives by decoding two of it's outputs. However, Amstrad decided to use just one of these outputs to control the internal drive (A) and external drive (B). This is achieved as shown in Figures 1a and, would you believe, 1b.

Two circuits are shown because two versions of the CPC6128 were produced. The type your machine uses can be determined by the date printed on the PCB near the Amstrad logo.

MODIFICATION DETAILS
The modification described here will add a DPDT switch that will swap DS0 and DS1 over, therefore switching drives A and B.

Ensuring that the machine is out of guarantee before opening it, remove the retaining screws and carefully

lift the cover away from the base. Two flat, flexible cables connect the keyboard in the cover to the base. These should be carefully prised out of their connectors, freeing the cover from the base.

Figures 2a and 2b shows an exploded view of the PCBs for the respective models, the direction of view and tracks we are interested in. Only sufficient components and tracks are shown to help identify their positions on the PCB. Tracks on the opposite

Figure 1a : CPC6128 1985 Model

Figure 1b : CPC6128 1988 Model
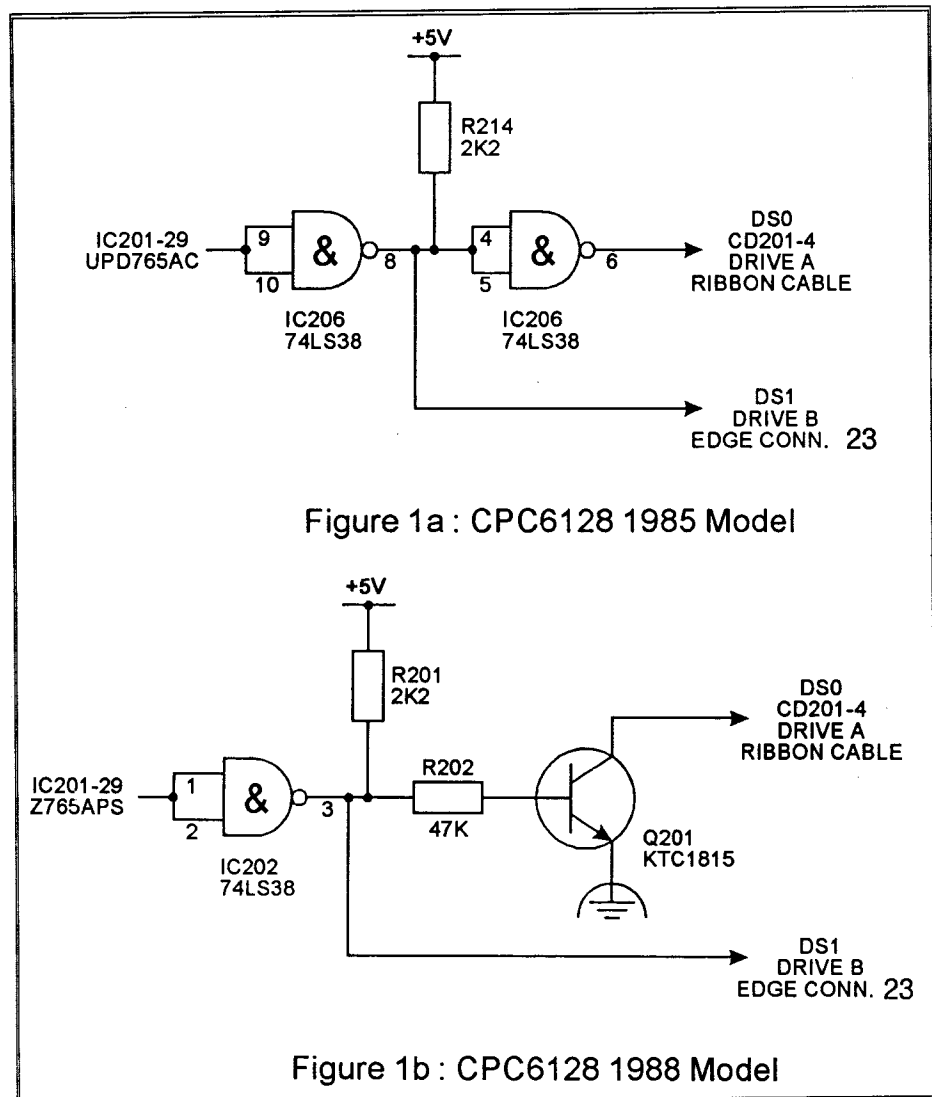
side of the PCB to that being viewed are shown dashed.

Referring to Figure 2a, cut the tracks with the two diagonal lines shown crossing them with the knife. Wires from the DPDT switch shown in Figure 3 should be soldered to the appropriate points as shown. Leave sufficient length of wire to enable the switch to be mounted on the cover, enabling the cover to be removed without breaking the wire. It is suggested that the switch is mounted above the Disc Drive 2 connector. When soldering to the holes as shown, first the green solder resist must be carefully scraped away from the hole to reveal the copper track and any solder in the hole must be removed using the solder sucker. DS0 and DS1 can be soldered directly to IC206 pins 6 and 9 repectively but do not hold the soldering iron on the pin for any longer than necessary. About 5 seconds should be sufficient to ensure a good joint. INT will need to be soldered on the solder side of the PCB at the ribbon cable connector. This wire can be passed through from the component side via a hole near the PCB edge connector currently filled with solder. Alternatively, drill a small hole in the PCB away from any tracks on either side.

Figure 2b can be treated as for Figure 2a above. All connections in this case except EXT will need to be soldered on the solder side of the PCB. Again, the wires should be passed through the PCB from the component side via a small hole.
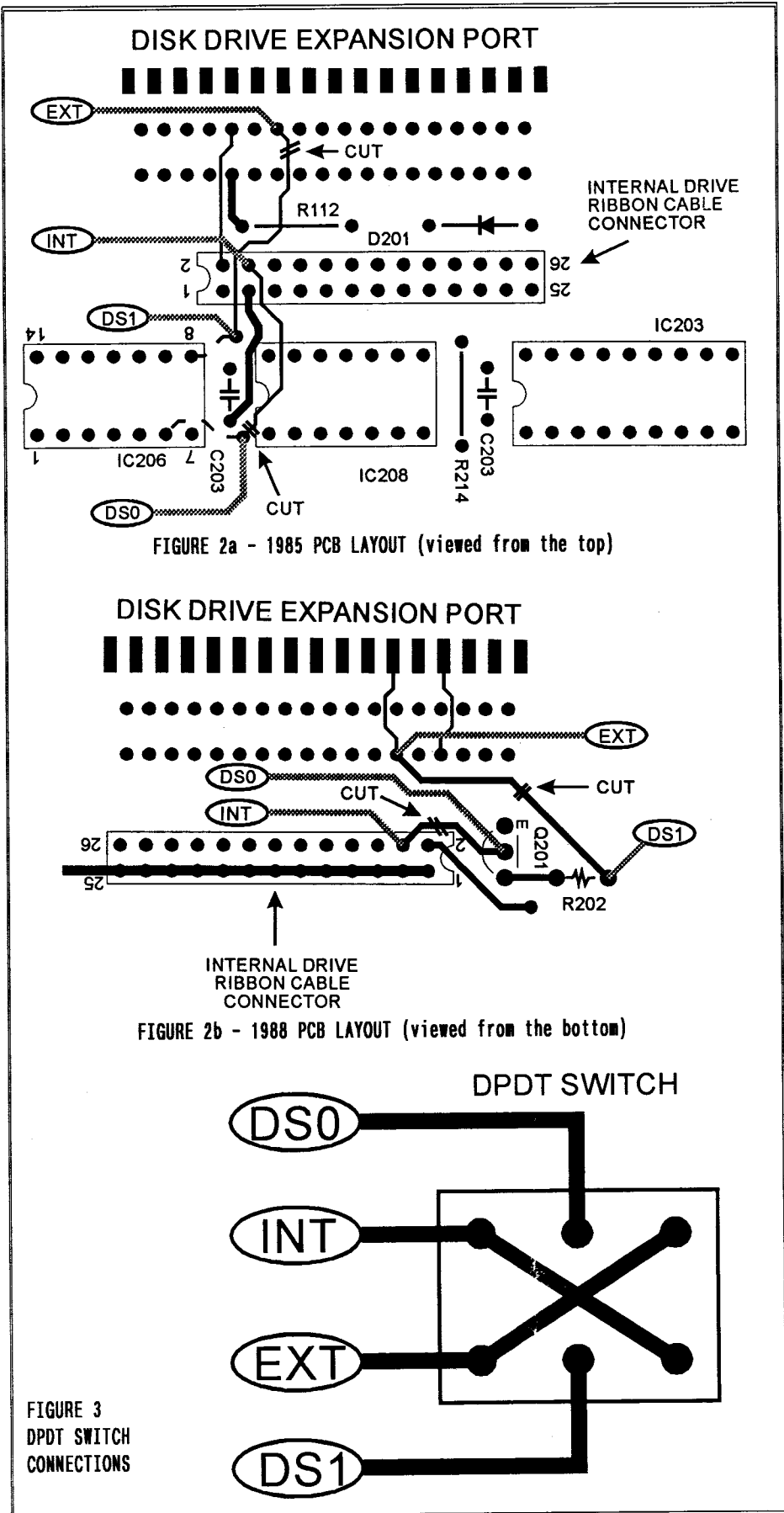
Close up the machine, carefully refitting the keyboard cables and if all is successful you should now be able to CAT the 3.5" drive as A. It is advised to switch the computer off before operating the switch at all times. You should now be able to take advantage of large capacity DOSs (such as PARADOS or ROMDOS) and the inexpensive price of 3.5" discs.

A MULTITUDE OF PROBLEMS
Note that when using the MULTIFACE and 3.5" discs in drive A, you may not be able to get all programs working with a disk greater than two thirds full. I don't know the reasons for this but found it to be the case. The Anti-MULTIFACE PD program (compatible with most games stored with a MULTIFACE)

can be used in this case. You can still use the MULTIFACE with this program once the game is in progress. Modification of the CPC6128 Plus machines should also be possible but the circuit and PCB layout were not available to the author. An article from another reader perhaps?. *Paul.*

FIGURE 2a - 1985 PCB LAYOUT (viewed from the top)

FIGURE 2b - 1988 PCB LAYOUT (viewed from the bottom)

FIGURE 3
DPDT SWITCH
CONNECTIONS

ABBASWITCH

By BRIAN KEY

RON LOOKS AT SOME CUTS AND CONNECTIONS FOR THE CPC

If you're terrified by the sight of a pair of pliers, and the smell of a hot soldering iron gives you galloping palpitations, then I fear this article is not for you.
(To be honest, I don't think it's for me either!)

INTRO
Hacking about in the internals of your computer is NOT a pastime for the faint-hearted. A slip of the tool is likely to cause terminal damage to the PCB, as is the overheating of components by not being very clever at soldering. Frankly, my advice would be, for what it's worth, if you've any doubts about your abilities in this area, get your friendly neighbourhood computer expert to do it for you.

However, having said that, this article is, after all, aimed at the DIY fanatics amongst you, and the above remarks are no more than my personal opinion. (So there!)

INSTRUCTIONS
The whole package is in fact in the form of a series of screens on disc with very little verbiage attached, other than the basic instructions on what to do annd where to do it, so I'll attempt to lay these out in article form pending any decision to add the program to the library.

I should add that the instructions appear to apply to the 6128 and possibly the 664, so whether they would apply to the 464's separate interface and dual drive cable is not very clear and I would suggest that 464 owners wait for clarification before poking about. So, on with the show.

THE ABBA SWITCH
You will need:

A DOUBLE POLE, DOUBLE THROW SWITCH. Suggested pattern is a sliding type if possible, to fit between the keyboard and the disc drive, and several lengths of different coloured wire, though not necessarily the colours specified.

1. Cut a short length of cable and bare both ends. To one end of this attach a 10" or longer length of RED cable by twisting the ends together and solder the joined ends to one of the corner terminals of the switch, then the other end of the short wire to the opposite corner terminal as shown. (Fig. 1.)
2. Repeat this using BLUE as the longer piece of cable and solder to the opposite corner terminals again as shown. (Fig. 1.)
3. Solder a length of ORANGE cable the same length as the RED cable to one of the centre terminals of the switch, and a similar length of BROWN to the other centre terminal terminal.
4. Cut the FOURTH conductor on the Disc Drive ribbon cable, and solder the BROWN cable to the DRIVE SIDE of the cut. Insulate the joint with insulating tape.
5. Solder the RED cable to the Pin Hole SEVENTH from the LEFT, and cut the track to this pin hole as shown. (Fig. 1)
6. Solder the ORANGE cable to the RIGHT HAND LEG furthest from you and the BLUE cable to the SECOND LEG from the RIGHT closest to you, on the LEFT HAND 74LS38 CHIP.
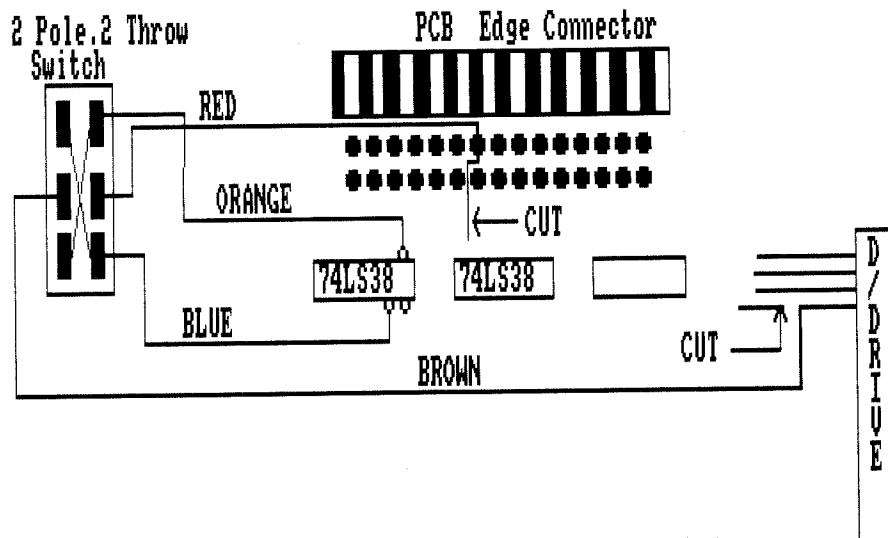

FIGURE 1.

SIDE SWITCHERY

Should the need arise for the fitting of a side switch to your disc drive, the following notes and drawing (Fig. 2.) should help you on your way, although as I said earlier, these instructions refer to the 6128 specifically as far as I can see, and 464 owners should again await clarification.

A number of 3.5" drives are fitted with side switches anyway, so check before you chop!

INSTRUCTIONS

The switch required in this case is a SINGLE POLE, DOUBLE THROW, and where you instal it is entirely up to you. Once more choose your own cable colours, as long as you don't get mixed up.

1. Solder wires to switch as shown in the diagram. (Fig. 2)
2. Solder WHITE wire to SECOND FROM RIGHT (Top Row) HOLE on FFD 2 Connector.
3. Solder RED wire to the LARGE HOLE full of solder on the RIGHT of the Edge Connector. (Or any other point connected to GROUND.)

PLEASE NOTE: While wiring up the switches ignore the numbers on the FDD 2 Edge Connector. They are wrong and only serve to confuse.
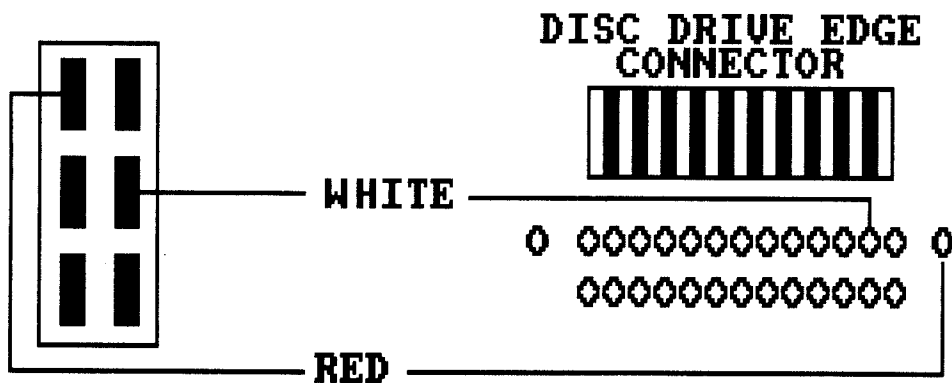

DISC DRIVE EDGE CONNECTOR

WHITE

RED

FIGURE 2.

THE PARADOS CONNECTION

This strikes me as the trickiest operation of the lot, and as a dedicated non-interferer with things computerish I would personally shy away from anything as drastic as chopping the legs off a ROM to remove it from the PCB.

Certainly, the reconnection of the PARADOS ROM is made easy, but should you muck up the ROM by clumsy soldering you would be hard put to replace the legless AMSDOS ROM, and might find yourself with a totally inoperative disc drive. Personally, I would get my tame expert to replace the ROM with a ROM socket so as to let me swap things round again if I didn't like the results.

However, I digress. Mine not to reason why, so why don't I just get on and tell you what you want to know?

Most of what you want to know is set out on the small series of drawings (Fig. 3) with the proviso that you should at all times use a VERY small soldering iron, and take great care not to overheat any of the components. It is definitely the case when soldering electronic components that the barest minimum of solder and heat should be used, and always use the highest quality low melting point cored solder. Cheap rubbish will cause you no end of grief.

OUTRO

So there you are. If you are into delving into the innards of your CPC you may find that all this is just what you have been looking for. Certainly the instructions are reasonably clear for all the operations, although we are not told how to get at this area of the computer. I suppose that anyone prepared to commit this sort of electronic mayhem knows the anatomy of the 6128 well enough not to be detered from exploring beneath the covers. All I can say is the Best of British Luck and Happy Soldering. *(Ron Izett)*
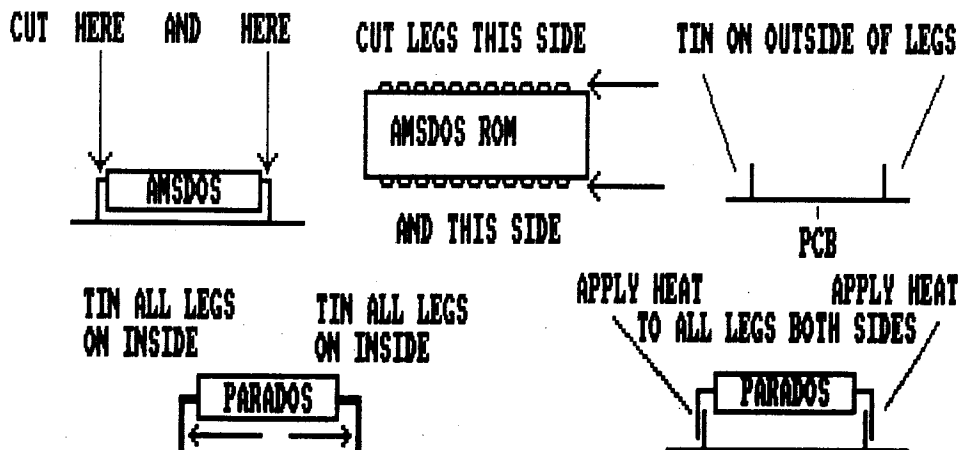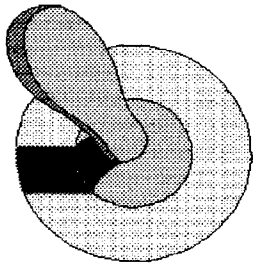

CUT HERE AND HERE

CUT LEGS THIS SIDE

TIN ON OUTSIDE OF LEGS

AMSDOS ROM

AND THIS SIDE

PCB

AMSDOS

TIN ALL LEGS ON INSIDE

TIN ALL LEGS ON INSIDE

APPLY HEAT

APPLY HEAT

TO ALL LEGS BOTH SIDES

PARADOS

PARADOS

FIGURE 3.

THE PLUS GETS AN ABBA SWITCH

With Bill Mohan

I've had an awful lot out of joining WACCI and after Paul Collin's invitation to follow up his article with one for pluses, I decided this was my opportunity to put some "in". Using my copy of the Plus Service Manual and after studying the actual computer for some time (hours) I tried it and it really does work! It is actually very easy, only four solder joints on the computer, two breaks in the original printed circuit tracks and a small bit of plastic surgery to fit it in.

SOME RULES TO PLAY BY

One   - Invest in an anti-static wrist band from Maplins....

Two   - Don't start if you're nervous.

Three - Don't be nervous, it's a very straight forward job to do.

Four - Study your PCB before you start, familiarity breeds familiarity!

Disconnect all of the wires, plugs and peripher...., doohdahs hanging off your Plus, turn him over and undo the screws holding him together. Don't forget the one deep inside the recess that you'll probably miss otherwise!

GETTING IN DEEPER

The cartridge has to come out at this point too... Spring the clips holding the case together and separate the two halves of the shell carefully. Be careful as the top half is held to the bottom with two pairs of wires, fortunately these are colour coded to match their sockets, black and blue. Ease out the plugs by releasing the spring clips and carefully put the top half where it isn't going to get trodden on (no don't laugh, it happens) and we'll assume that most people planning this job will have 6128 plusses so remove the plugs from your disc drive very carefully, then take out the disc drive unscrewing the fixing screws and lay it to one side.

NEARLY THERE

There are two very flimsy feeling but actually very robust, transparent ribbon cables plugging the keyboard to the PCB which have to be eased out of the sockets on the PCB and the keyboard also put away safely.

It is best to take out the screws holding the PCB to the base so that access to both sides is given.

NOW WE CAN START

On the PCB find the two drive sockets, then examine the area around them to find the small holes which run through the board carrying the tracks from top of the board to the underneath. On my diagram I've labelled them A and B.

"A" is very near to the capacitor marked C24, but below and left of it and has a thin track from it to the sixth connector on the external disc drive socket. (This is in fact pin 11)

With a fine drill, (I use a modelmaking drill but with care the tip of a small modelling knife blade can be used) remove the layer of lacquer at the hole but don't take off the layer of copper track that you'll expose. When I do any work inside my computer I always use the fine wire used by Telecom engineers but you can buy similar stuff at Maplins. Just use single core wire which will fit through the circuit board holes and fit a piece about 12 inches long bared off at about an eighth of an inch. Push it through from beneath so that it protrudes just above the surface and just solder the tip to the bared ring of copper track you've exposed.

It is a good idea to have different coloured cables for each wire and I'll explain later the code I've used.

Figure 1
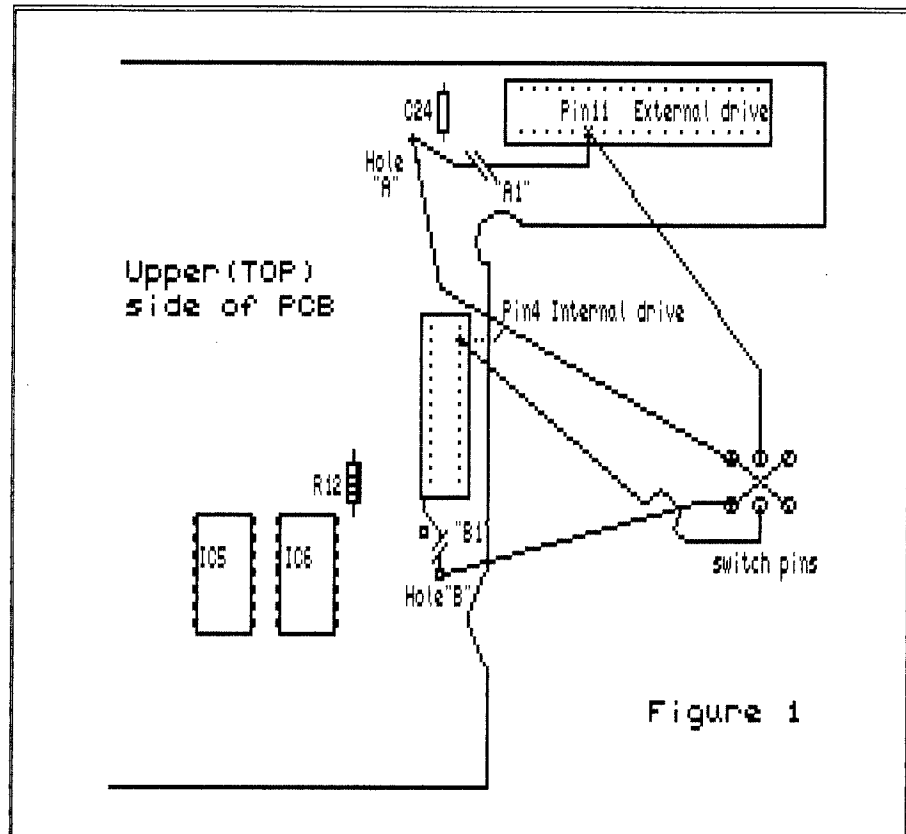
MOVING QUIETLY ON

Now then that didn't hurt at all did it? We'll call this cable "A" ('cos of where it starts) and move on to cable "B". This uses one of a pair of holes which lie close to each other just between you and the internal drive socket, on top of the board you can see two tracks heading up towards the back end of the PCB, on mine they both go out of sight under the plug for the drive. You want the one on the right of the pair, I call it "B". At this point a vague familiarity sets in, cleaning away the lacquer from the edge of the hole, going just a little inside if possible, if you've a fine drill, so that the same job can be done as with hole /cable "A" i.e. pushed as before from below and carefully soldered in place. When you do the soldering be careful to ensure that the solder actually "takes" to both the wire and the PCB avoiding the dreaded "dry-joint". If you only scrape away just enough of the lacquer you reduce the chances of soldering over any of the adjacent tracks, a point worth remembering. That then is cable "B".

ON THE OTHER SIDE

Now turn the PCB over and search at the connections of the two drive sockets to familiarise yourself with the layout, when you are sure of yourself you want the connection for pin 11 on the external drive and from above you'll see it is the sixth pin from the left. Solder another length of wire to this pin, being very careful not to let the solder run across to any other pin, (you could end up with, at best a very confused computer and at worst without a computer at all! so do be careful!) this will eventually join cable "A" to the external drive, through the abba switch.

Find pin 4 on your internal drive socket and solder another cable to it likewise. I've used Orange wire from point "A" to the switch and Orange/White from the switch to pin 11 and I've used Blue from point "B" and Blue/White to pin 4 just so that it is easier to follow what the wiring is doing for me.

A SWITCH IN TIME SAVES...

The switch I've used is a DPDT

Miniature flick switch from Maplins but it depends what you like, I don't trust Slider Switches, why do you think your stereos start to get noisy and unreliable? Yes, your old Slider Switch is usually to blame, ask any radio engineer.

On whatever switch you use, wire up the cross pieces as per the diagram and then on your PCB find the tracks marked "A1" and "B1"and cut away with very sharp knife the copper tracks so that there is NO continuity between the cut edges this is ever so important or the switch won't work and "Arnie" will get confused as previously discussed. I cut each track in two places and peel away the piece from the centre, much easier said than done, Amstrad use a very good PCB, at least they did with mine. It is time to use that well known phrase or saying again.... BE VERY CAREFUL, cutting through the copper is difficult and you must NOT let your efforts cause any cracks in your PCB or you won't be needing an ABBA switch, just another computer!

A CLEAN MOUNT

You have now made yourself an ABBA switch for hardly any money and all you have to do now is mount it on the case of your computer somewhere that it won't keep getting bashed about.

Some of you may recall that my computer started life as a 464plus and has been "upgraded" to 6128 standard so I've been able to fit the switch on the right of the case where most of you have a disc drive, but where my

drive cable exits the machine. Being presumptious, I would expect you to find somewhere near there or on the back to mount it, a good reason for using a miniature DPDT is its lack of bulk, it'll go almost anywhere. If you don't mind the smell of hot plastic a tip for cutting the very strong case is to use the tip of a soldering iron to gently cut away the mounting hole. If you do use your iron for this, please, please make sure you clean the tip thoroughly before you use it again and never treat someone else's iron that way...

When reassembling the computer make sure that you get the copper earth spring properly in place under the top edge of the keyboard, put all plugs back into their respective sockets and put all screws back into their rightful holes. Don't be tempted to try out the switch until every thing is back together and the screws tightly back in place, but as I said (wrote) earlier don't be nervous, it'll work.

AND FINALLY....

Just follow the diagram, all relevant info is there, really and although I advise soldering under the drive sockets the pin locations are ALWAYS given from above. Just remember the usual disclaimers, no-one, least of all me is forcing you to do this.

BUT REMEMBER, REMEMBER

Never change the designated drive over with the computer turned on...

Bill

The DDI-1 Disk Drive Interface
Gets a ABBA Switch
by David Godfree

A few days ago I decided to connect a 3.5" Drive to my Amstrad 464 Plus with DDI-1 Interface, I decided on a Sony PC Drive from my local PC shop, it cost a mere £18.00.....

thought indicated wire 1 actually indicated wire 34 so they are numbered 34-1 as shown in Fig.3, they might be different on your version.

Now I will tell you how to connect the DDI-1 to a 464 Plus which Philip ask for

THE STORY CONTINUES
When I got home, I started to panic on how to connect it without blowing away my beloved Amstrad.

I telephoned Nigel Callcutt but could not get hold of him and I apologize to his family for any inconvenience.

I then telephoned Philip DiRichleau to see if he could help me, and what a lovely chap he is.
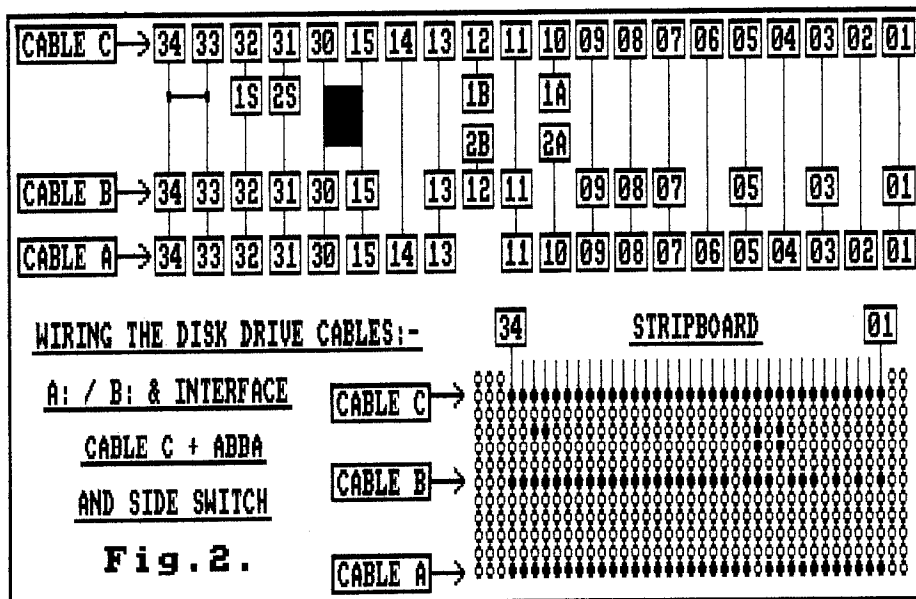
We had a long chat on how I should go about it and a couple of days later I phoned Philip to tell him how I connected an ABBA switch to the DDI-1 Interface.

Philip asked me if I would write a article on how I did it, so here it is, the article or tutorial, as requested and I hope it is an enjoyable read because this is my first go at writing anything for WACCI.

PLEASE NOTE:
THAT YOU DON'T HAVE TO DO THIS!
Before we start note that in **Fig.2** wires 15 to 30 are not connected together they are all individual and the diagram has been drawn this way so hopefully not to take up too much room, also whether this article is the same for all drives I'm not sure, because I don't want to blow up WACCI reader's computers.

WIRING THE DISK DRIVE CABLES:-
A: / B: & INTERFACE
CABLE C + ABBA
AND SIDE SWITCH
Fig.2.

STRIPBOARD

WIRING THE ABBA SWITCH

```
1 = Interface, 2 = Disk Drive:-
--------------------------------
2A, Drive 0 Select(2):
1A, Drive 0 Select(1):

2B, Drive 1 Select(2):
1B, Drive 1 Select(1):
```
**Fig.1.**

GET IT CONNECTED
We start off first by connecting the Disk Drive to the DDI-1 Interface the interface cable **B** would not fit the drive so this is why I had to use stripboard to connect both the 3" A: Drive & the 3.5" B: Drive, so I started by cutting off the old interface connectors, I then stripped the wires, twisted the strands together and soldered all the wires to the stripboard *(CABLE C)* as shown.

In **Fig.2**, I then had to work out which wires connected to Drive B:, I then connected the appropriate connector and cable to stripboard position *(CABLE B)*, the holes which are not filled in are the ones that should not be connected, this also applies to *(CABLE A)* if you follow **Fig.2** then you should not have any problems.

Now take a look at **Fig.3** on my DDI-1 Interface the wires are numbered 1-34 which, makes connecting anything a bit confusing because the blue strip that I

or did I get confused *(Sorry if I got it wrong)*, Unsolder the diode *(D101)* as shown by a 2 in **Fig.3,** the 1 represents the ROM Chip 40015, prise out the chip with a flat headed screwdriver.

Once I have my old CPC464 up and running I will try and make up a P.C.B so that I can switch between the use off it on the 464 Plus or CPC464. The way it is done is by disconnecting the power supply to the chip which the 1 in Fig.3 also represents and using a switch to connect and

DDI-1 CABLE
Fig.3.
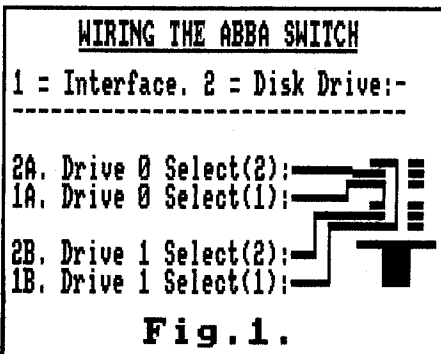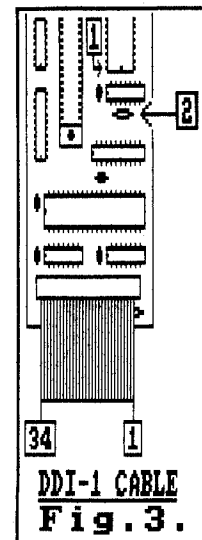
disconnect the Diode and power. (*Note: this might also work for other ROMs by finding the power line to the chip.*)

When I wired up the drive it did not detect whether there was a disc in the drive so by soldering pins 34 & 33 together the problem was solved.

When cables A, B & C are connected to the stripboard and they are correct, connect up the drives, make sure the cables are connected as if the connectors were on the DDI-1 Interface flat and not twisted, if the 3.5" Drive motor turns on as soon as you turn on the DDI-1 Drive, then the cable is up the wrong way on the 3.5", if unsure give me a call, then decide if you want an ABBA and Side Switch.

LET'S BE ABBAing YOU
Connecting an ABBA switch to the DDI-1 Interface is simple, if you look at **Fig.2** the wires which need to be switched are 12 and 10. You can wire the ABBA switch *(Fig.1)* between Cable C & B or Cable B & A on the stripboard, connect some wire to points 1B - 2B & 1A - 2A and cut the tracks, solder the wires to the correct switch pins **Fig.1**; if you're not sure what I am going on about look between Cable C & B in **Fig.2** and then look at the blown up view in **Fig.2**.

HOW IT ALL WORKS
I will now tell you how it works: leaving the switch out selects Drive A as A and Drive B as B, switching it in selects Drive A as B and Drive B as A. Now, as a point of interest I used the ABBA switch while the computer was still on: this did not harm the computer, but I did have to **CAT** before doing so otherwise the drive goes into crunch city. *(I'll advise you that, if you try this, it is at your own RISK!)*

GIVE ME A SIDE SWITCH
Look at **Fig.2**. Connect wire to points 1S & 2S then connect to a switch of your choice and this is also placed between Cable C & B see **Fig.2**; if unsure, switching in selects Side 1 or Side B and leaving out selects Side 0 or Side A.
Note: *This works fine with my setup of 3" A Drive and 3.5" B Drive and switched using the ABBA. Why do I say this? Well I'm unsure how you connect it with two 3.5" drives!*
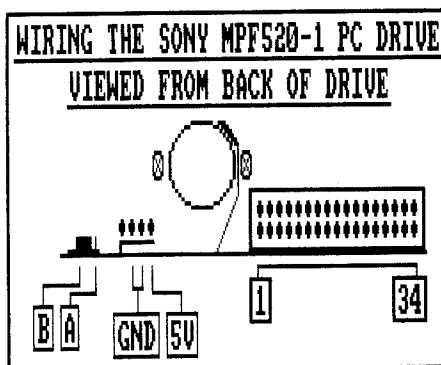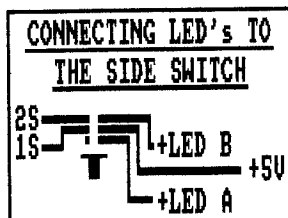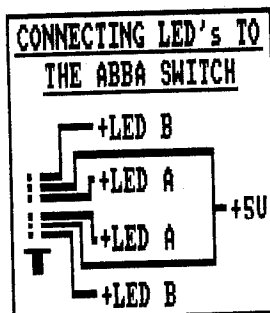
THAT'S ALL FOLKS
You now have a DDI-1 Interface with a ABBA switch connected and if you still haven't got a 3.5" then get hold of a Sony PC Drive Model: MPF520-1.

I hope that you have been able to follow this article and look forward to hearing any comments in future WACCIs.

If you would like help with this article then telephone me on: *(01705) 786110* and I will try to answer your questions and any new information on connecting disk drives.

Now all I need is a IDE 1GB Hard Drive and a IDE CD-ROM: any takers?

Before I go, I've included a diagram of the Sony connectors, and how to connect LEDs, if Philip can fit them in. *<<I can and I have, they are below - John>>*


```
CONNECTING LED's TO
THE ABBA SWITCH

      +LED B
      +LED A
                 +5U
      +LED A
      +LED B
```



```
CONNECTING LED's TO
THE SIDE SWITCH

2S
1S            +LED B
                    +5U
              +LED A
```



```
WIRING THE SONY MPF520-1 PC DRIVE
VIEWED FROM BACK OF DRIVE

B A   GND 5U    1        34
```

NEED SOME PARTS
1 Drive **A** cable *(Use piece left over from DDI-1 Interface Cable).*

1 Drive **B** cable *(34 way ribbon cable + 34 way IDC connector "Maplins")*

1 ABBA switch *(Latchswitch 4-pole +*

Cable for points 1A ,2A & 1B, 2B I used 7/0.2 wire, 1A,2A=GREEN, B, 2B = YELLOW "Maplin").

1 Side switch *(Switch of your choice + Cable for points 1S, 2S I used 7/0.2 wire, 1S, 2S=WHITE and a Latchswitch 2-pole "Maplin").*

One last thing if the ABBA switch was invented in the stoneage would Fred Flintstone have gone *ABBA YABBA DOOO?*   *David Godfree*

CPC664 - ABBA

Back in 1985 for a few months Amstrad marketed the CPC 664 before deciding, in its infinite wisdom, to replace it with the 6128. As a tribute to the reliability of that machine there are still quite a few around, and I've just fitted one with an ABBA switch.

First of all, the equipment that you'll need: **(a)** A screwdriver, **(b)** A soldering iron with solder, **(c)** A double pole, double throw switch, **(d)** Some wire - preferably 4-stranded telephone wire about 10 inches long, **(e)** A Very Sharp Knife.

Now for the method.

Firstly, prepare the switch. If you're using telephone wire then this part's easy. Cut back the outer insulation by about 3 cm and select two of the strands to be **INT** and **EXT**. Remove the inner insulation from these and solder the **INT** wire so that it cuts diagonally across the switch as per diagram. Push the bare wire to the base of the
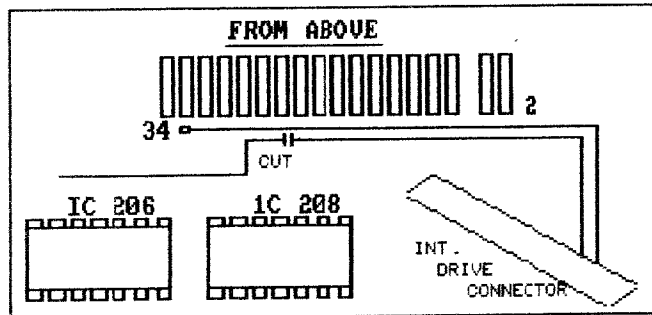
switch and ensure it doesn't foul the middle **(DS0 and DS1)** contacts. Then solder the **EXT** wire in a similar way, but lifting the bare wire away from the base. The two diagonal wires must not touch each other.

The remaining two strands should be shortened and soldered to the centre contacts of the switch. Again, make sure that no two wires accidentally touch. Now let's turn our attention to the computer. Turn the CPC 664 upside down and remove all the screws holding the machine together.

Open carefully and with infinite care unplug the keyboard membrane from the circuit board. The plastic grip lifts up in order to make the job a tad easier than it otherwise might
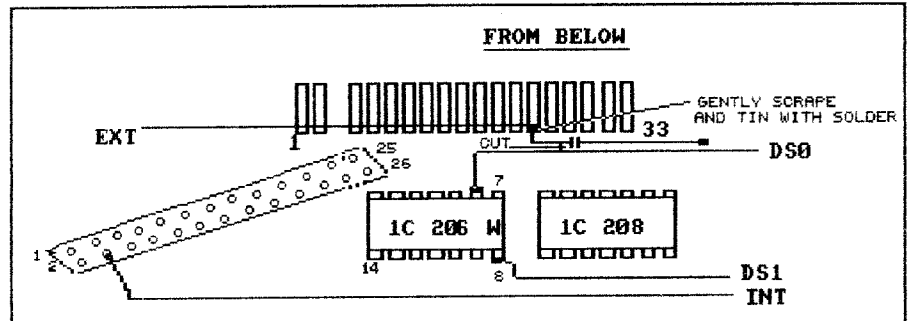
be. A word of warning, though: you are now handling the most fragile part of your 664, and although it's a simple enough task if you take care, it is possible to do irreparable damage to the membrane. Then unplug the leads to the speaker and power light, also on the circuit board close to the keyboard membrane socket.

Now you can perform the first operation. **CUT** the track on the circuit board with the **Very Sharp Knife**, as shown on the diagram showing the guts of your CPC shown from above. Be careful not to jerk the knife across the adjacent track.

Now remove the screws that hold the circuit board down and also the screws that retain the disc drive. carefully lift the circuit out out. You should be able to manipulate it so that you can clearly see the corner of the underside of the circuit board. Now you can proceed to perform the following operations:

Locate the external drive edge-connector and find the track leading to the sixth finger from the right. Cut the track leading to it and very, very carefully scrape any insulation and gunge from the end two or three

millimetres of that finger and tin it with solder. Then solder the wire designated as **EXT** to it. Locate IC 206 and solder **DS0** directly to **pin 6.** Try not to keep the hot iron in contact with that pin for more than a couple of seconds or so.

Then solder the wire designated as DS1 to pin 8, taking the same care and being equally swift. Finally, solder the wire designated as **INT** to **pin 4** of the internal drive connector. It's the pin next to pin 2, the second one along.

And there we have it. If you've done everything right then the switch should perform perfectly as an ABBA switch. If it doesn't, check that the two cut tracks have been properly cut *(use the knife and hack away a bit more)*. Check that no wires on the switch are shorting together. Check that the four solder connections on the circuit board aren't dry joints.
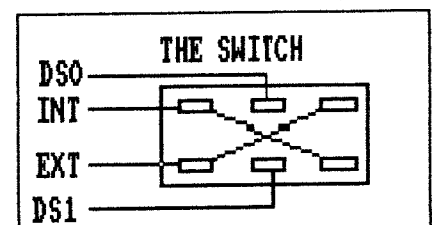
Then it'll work. *Promise.* Re-assemble your computer and if you've wrecked it don't blame me or *WACCI!*

Peter Rogerson