WORKING on the BONDWELL B12

Francis Massen (francis.massen@education.lu)

File: Working_on_the_Bondwell_B12.doc (or .docx and .pdf)

version: 1.0 date: 11 Feb 2026

INDEX:

1. Short description of the Bondwell B12 luggable computer.

The Computarium acquired many years ago a relatively rare Bondwell B12 laptop. This 1984 luggable model is much less heavier than the partially similar Philips 2000C, also works only on a mains power outlet and is based on the Z80A uP and the Z80ASIO chip. Main memory is 64kB, with enough naked positions on the motherboard for IC sockets holding a 64kB memory expansion.

The original version had two TEAC FB-501 single side, double density 5.25" drives with 48 tracks and a diskette capacity of 160kB in CP/M 2.2. There are two serial ports driven by the Z80SIO and a Centronics port driven by a 6521 ACIA.

No possibilities for expansion (except the 8 supplementary socket-places for memory) exist, and the motherboard has no bus slots for additional cards.

A remarkable capacity for these early times was the presence of a speech synthesizer chip, and a SPEECH.COM application to translate text into spoken words.

Bondwell Industrial Co. Inc. was a US (Fremont, CA) and Hongkong based company selling computers from 1981 to 1993; the B12 probably was developed in the USA and manfactured in Hongkong.

For more information see [**ref.1**].

The Computarium B12 worked well for several years, but tests in January 2026 showed that the 2 floppy drives were defective. I had no reliably working single-side drives left; these have one single head and opposite a cylindrical felt-pad that pushes the rotating magnetic disc to the read/write head. So the decision was taken to replace the 2 drives by dual-head ones (DSDD, 48 track), with the hope that these were simply working as single-side ones.

Images of the B12 can be found at Woutre's Classic Computers Collection (.IMD images) and at the retroarchive websites (see **[ref.2]**). The latter has images for different models (fig.1). It should be noted that the bondwl12.td0 file has only 87kB bytes and is as told the image of a SSDD disk (the standard of the original B12); the bondwl2.td0 is the image of a DSDD disk.

Name	Size	Format	Description
bondw14.td0	91446	TD0	No description available.
bondwel2.td0	314040	TD0	No description available.
bondw102.td0	213794	SSDD	3.5 CP/M 2.2 System Disk for Bondwell 2 Laptop
bondw112.td0	87594	SSDD	5.25 CP/M 2.2 System Disk for Bondwell 12
sample.sph	4608	SPH	No description available.
speech.com	28416	COM	No description available.

Fig. 1 The different TD0 images at retroarchive.org.

2. Dismounting and replacing the floppy drives.

Normally the replacement of a 5.25” floppy drive is easy work, but not here! The B12 case is of the clamshell type, where the 2 halves are mainained by small screws located deep at the bottom of cylindical wells. To make matters worse, the front panel has cut-outs that are too small to slide the drives out to the front, so this panel must also be removed The 2 Teac drives are held each by 4 screws in a metallic cage. Of these 8 screws, only 6 are easy to reach. Removing the last 2 is possible only by loosening the amber CRT screws and rotating it upwards.

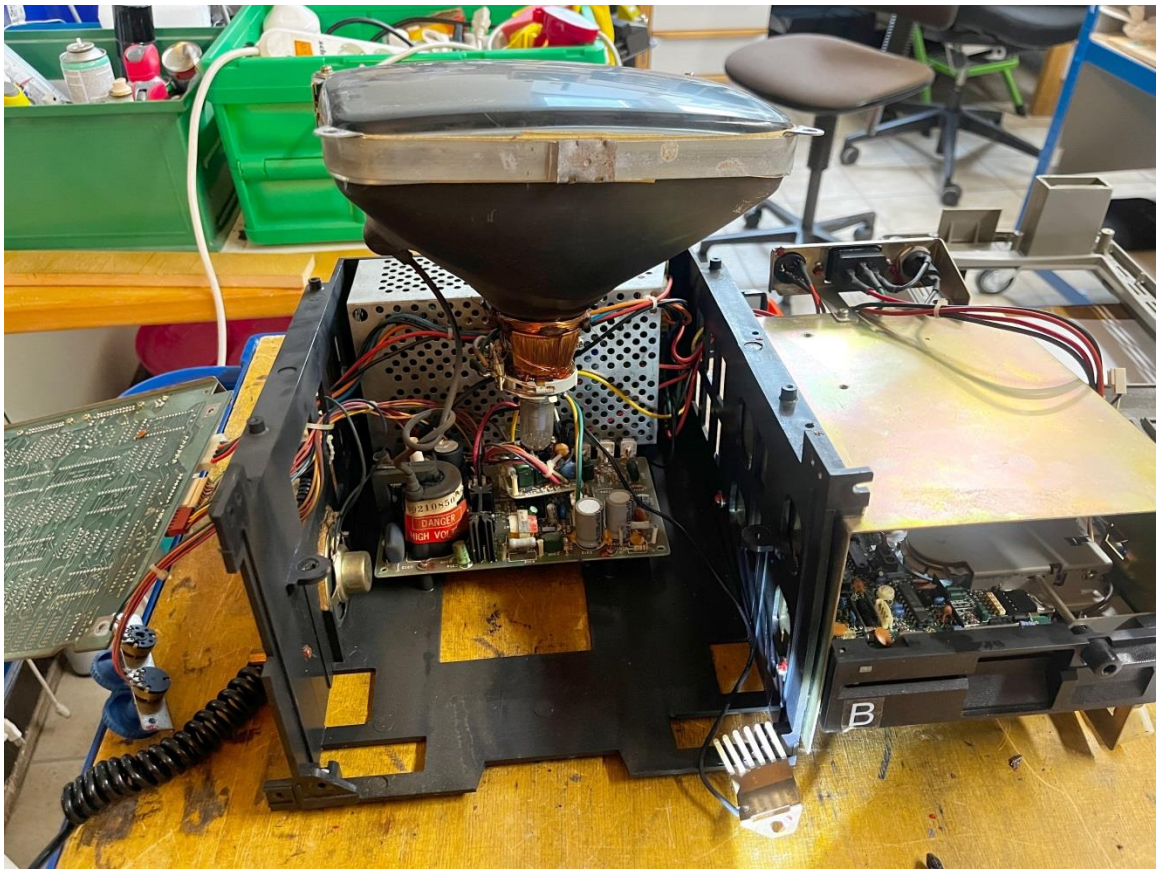


Fig. 2 and 3 : Opening the B12 and removing the drives.

Picture 3 shows how far one has to go to slide out the drives: The motherboard is screwed on top of the black plastic case, and is here seen rotated out to the left. Fig. 4 gives a close-up of the tidy motherboard. The 24pin IC on the upper left corner holds the BIOS. The middle large chip in the row of 3 is the Z80ASIO serial I/O chip, and the Z80A CPU is the single large IC in the 3rd row from below. The eight 64kbit dynamic memory chips are in the bottom row, with 8 unpopulated locations at the left.

The floppy drives are connected by a very short 34lines non-twisted cable to the connector seen on the right border. The logic is that of the original Shugart drives, with selection jumpers on the drives at DS0 and DS1. The replacement drives (a Copal and Mitsubishi model) work best on a IBM-style split-cable drive, so a mandatory longer cable of that style was used for first testing and final assembly (fig. 5).

I used the bondl12.td0 disk-image to create a working disk with the Greaseweazle, which accepts .td0 images without any prior conversion. This disk worked without any problem.

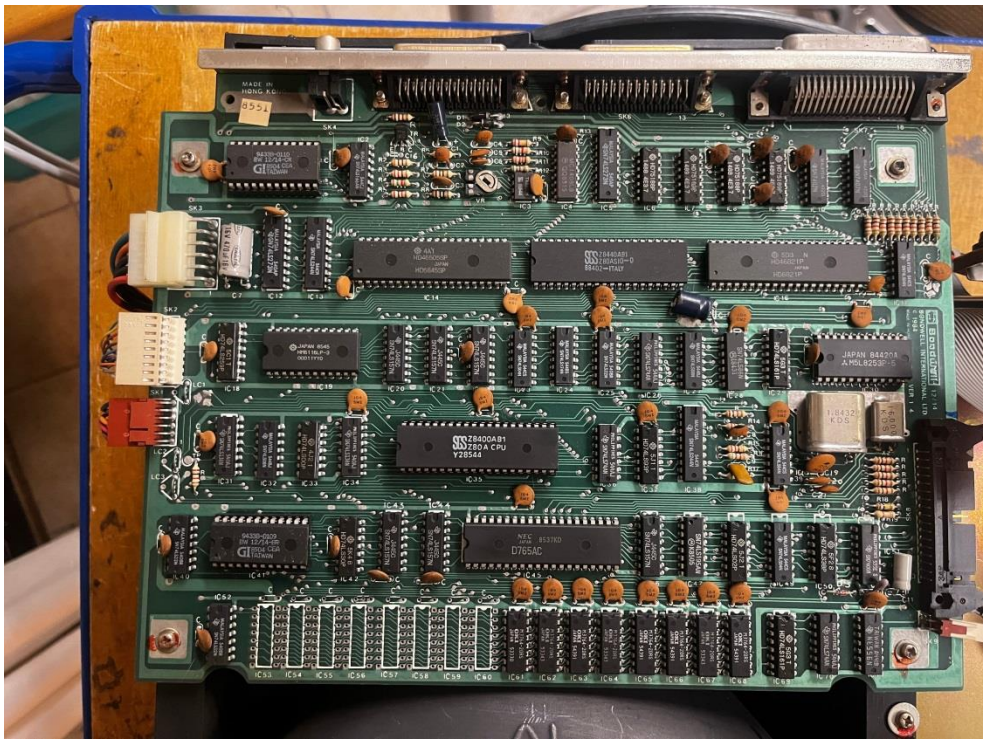


Fig. 4. The motherboard in its original location.

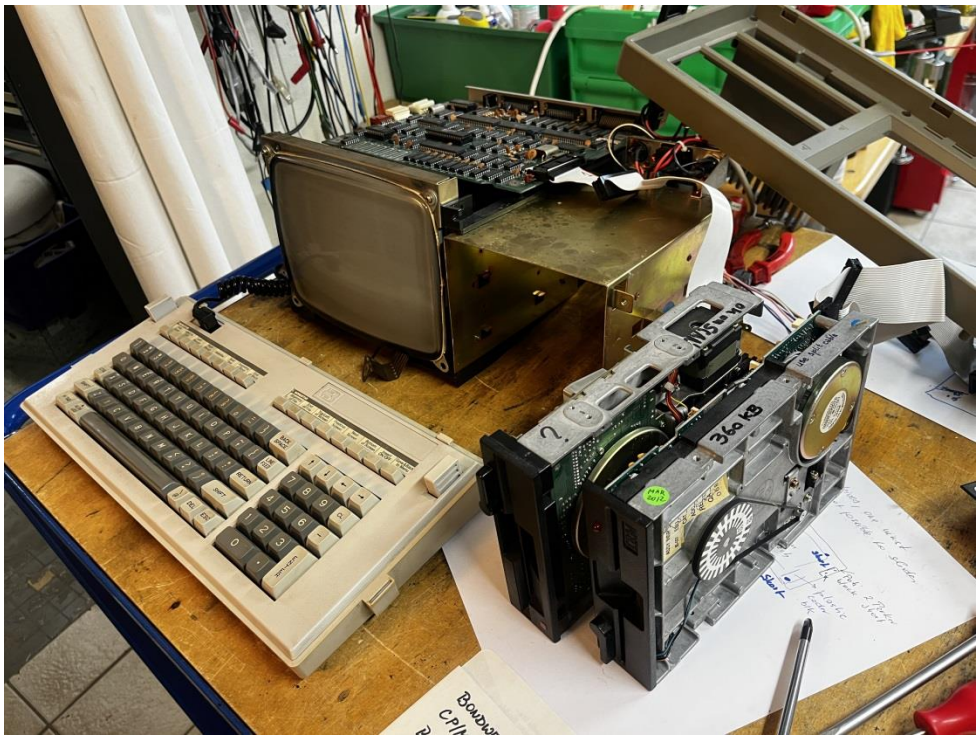
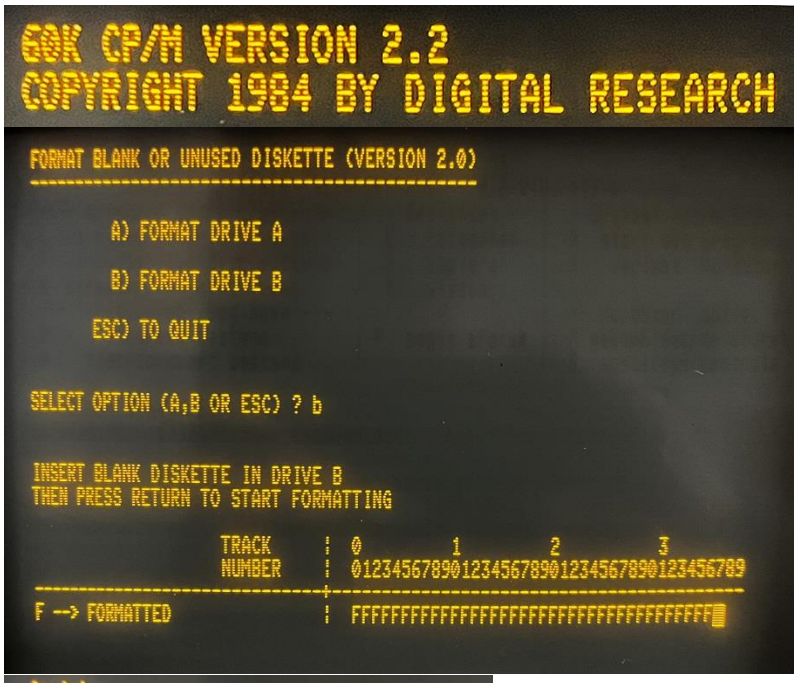
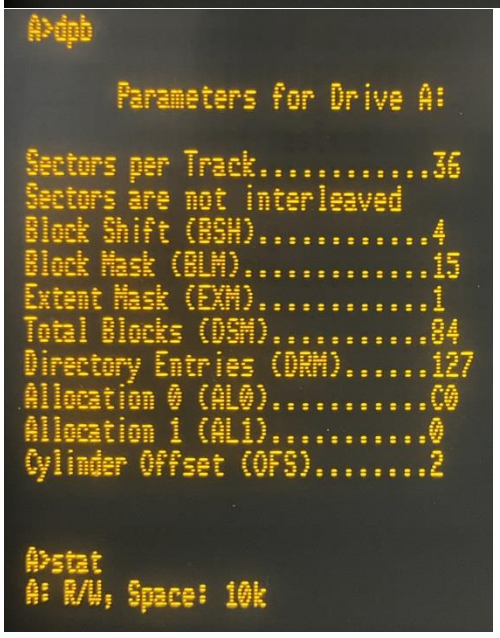


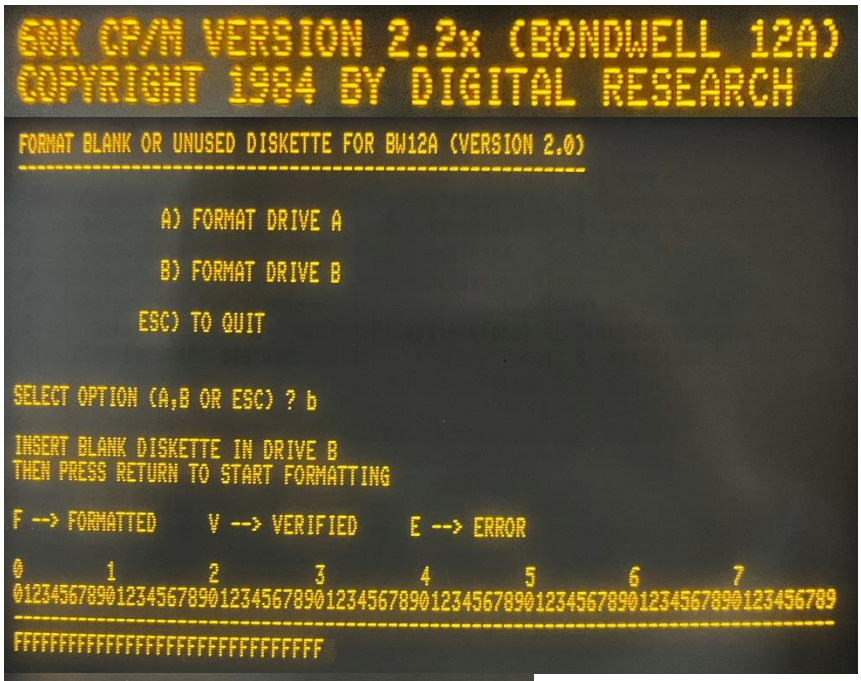
Fig.5. Tests with the replacement DSDD drives.

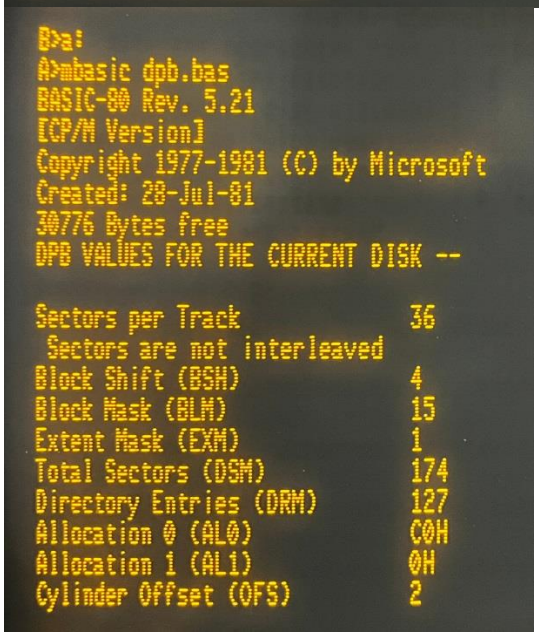
3. Two different versions of the B12

During the different tests, I was surprised that some-times I could format diskettes for 320kB and sometimes only for 160kB. Some detective work showed that there exist 2 different versions of the CP/M 2.2: the “original” CP/ M 2.2 for SSDD disks on the B12, and a CP/M 2.2x for DSDD disks on the B12A. Curiously, the BIOS in our model accepts both versions, and one does not need the B14 model to work with DS disks (as found in many texts). Here two tables show the differences between start screen, formatting and DPB (drive parameter block) fetch:









Tables 1 and 2: The different screens for CP/M 2.2 and 2.2x. Note the differences in DSM for the first and second version.The first DPB was calculated by DPB.COM, the last using the Basic DPB.BAS given in the Philips 2000C report (**[ref. 3]**).

4. Creating system and other software disks

4.1. The structure of the disks

Both systems have the same structure in their disks: 48 tracks (per side), 18 sectors/track, 256 bytes/sector, 2 first tracks reserved for the system, no interleave. MFM.
Here the disk definitions given by 22DISK (Sybex) and the corresponding I wrote for Greasewezle:

22disk disk definitions for Bondwell B12 and B14
BEGIN BON1 Bondwell 12 – SSDD 48 tpi 5.25” DENSITY MFM, LOW CYLINDERS 40 SIDES 1 SECTORS 18, 256 SKEW 2 SIDE1 0 0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17 BSH 4 BLM 15 EXM 1 DSM 84 DRM 127 AL0 0CH AL1 0 OFS 2 BEGIN BON2 Bondwell 14 – DSDD 48 tpi 5.25” DENSITY MFM, LOW CYLINDERS 40 SIDES 1 SECTORS 18, 256 SKEW 2 SIDE1 0 0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17 SIDE2 1 0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17 ORDER CYLINDERS BSH 4 BLM 15 EXM 1 DSM 174 DRM 127 AL0 0CH AL1 0 OFS 2

Table 3: Disk defintions from 22DISK (Sybex).

Greaseweazle disk definitions written for Bondwell **diskdefs_bondwell.cfg**
disk bw12.160_noGap3 cyls = 40 heads = 1 tracks = * ibm.mfm secs = 18 bps = 256 interleave = 1 id = 0

```
                rate = 250
        end
end

disk bw12.160
        cyls = 40
        heads = 1
        tracks = * ibm.mfm
                secs = 18
                bps = 256
                gap3 = 57
                interleave = 1
                id = 0
                rate = 250
        end
end

disk bw14.320
        cyls = 40
        heads = 2
        tracks = * ibm.mfm
                secs = 18
                bps = 256
                interleave = 1
                id = 0
                rate = 250
        end
end
```

Table 4: Disk definitions for Greaseweazle (disk bw14.320 = B12A)

For the B12 (or B12A) it is best to omit the gap3 instruction; such disks run ok, but much slower than those written without the gap3 seting.

The most important information here is that the interleave is I = 1:1 (i.e. no interleave), as shown by the DPB screenshots.

4.2. Making the disks

With Greaseweazle (and a DSDD 5.25” drive) this is straightforward; using our CopyStation with IMD also works with a minimum of settings, leaving the gap settings “as read” and setting interleave to 1.

The CP/M 2.2 package contains normally a BACKUP.COM utility, which is meant for doing backups from drive A: to B: (or the inverse). The very important utility SETUP.COM (often called upon by Autorun) must be used to set the RS232 parameters for both ports. Do not forget to choose the (U)date option before leaving, as this command finishes the settings by copying the “editor” area to the “archive”.. The settings can be saved to a file (for instance SYSSETUP.COM) that can be selected at the startup of Setup. I found that the “archive” still must be (U)pdated.

5. Serial Communication and data transfer with a PC

The following figure 6 shows the pin-out of the two serial ports: on the two female DB25 connectors only pins 1,2,3,4,5,6,20 and 24 are used as signals. A 3-wire Null-Modem cable (or a more complete wired null-modem cable) can be used. As the Philips 2000c has pins 14,18,25 (which here carry voltages) not in usage, the cable from the P2000C may be also be used. I had best results using on the PC-side a vintage MAXDATA laptop running Teraterm. With a more recent laptop with a USB-Serial converter, there sometimes are strange communication hickups.
To send and receive text files, the simple *PIP fileGET=RDR:* or *PIP PUN:=filePUT* work very well (even for longer files) at 9600 b/s, with a 10ms delay for each character and 100ms for a new line defined in Teraterm.

The problem (similar to the P2000C) case, was **binary transfer** using the XMODEM protocol. I had real problems to find the addresses of the Data and Status registers of the SIO, and after much searching found the answer in a short article on connecting a serial IMP printer to the B12/B14. The addresses are 40H and 41H (for Data/Status port A) or 42H/43H for port B. Just much later I found the same adresses in a posting in the forum of classic-computing.de.

Asking the Google IA only gave general answers (like 80H/81H or 4H/6H etc…) that might exist for other systems, but certainly not for the B12. So much for relying on an IA !

Mike Douglas (deramp.com) has many PCGET/PCPUT examples for different systems, but not for Bondwell. I thought the Altair (which is also a Z80 system and uses an 8080-SIO) could be an example, but Mike told me that the Altair has an ACIA for serial comms… no luck there!

Mathias from classic-computing.de has written a P2000GET.ASM and P2000PUT.ASM for the Philips 2000C (remember: also a Z80A+Z80ASIO computer), but I was unable to get a correct .COM file using the CP/M 2.2 assembler (ASM.COM) of the B12 system. The problem was this: the ASM.COM accepts the Z80 mnemonics of the P2000GET/PUT assembly files, allows a LOAD (or MLOAD) without any angry messages, but the resulting code is

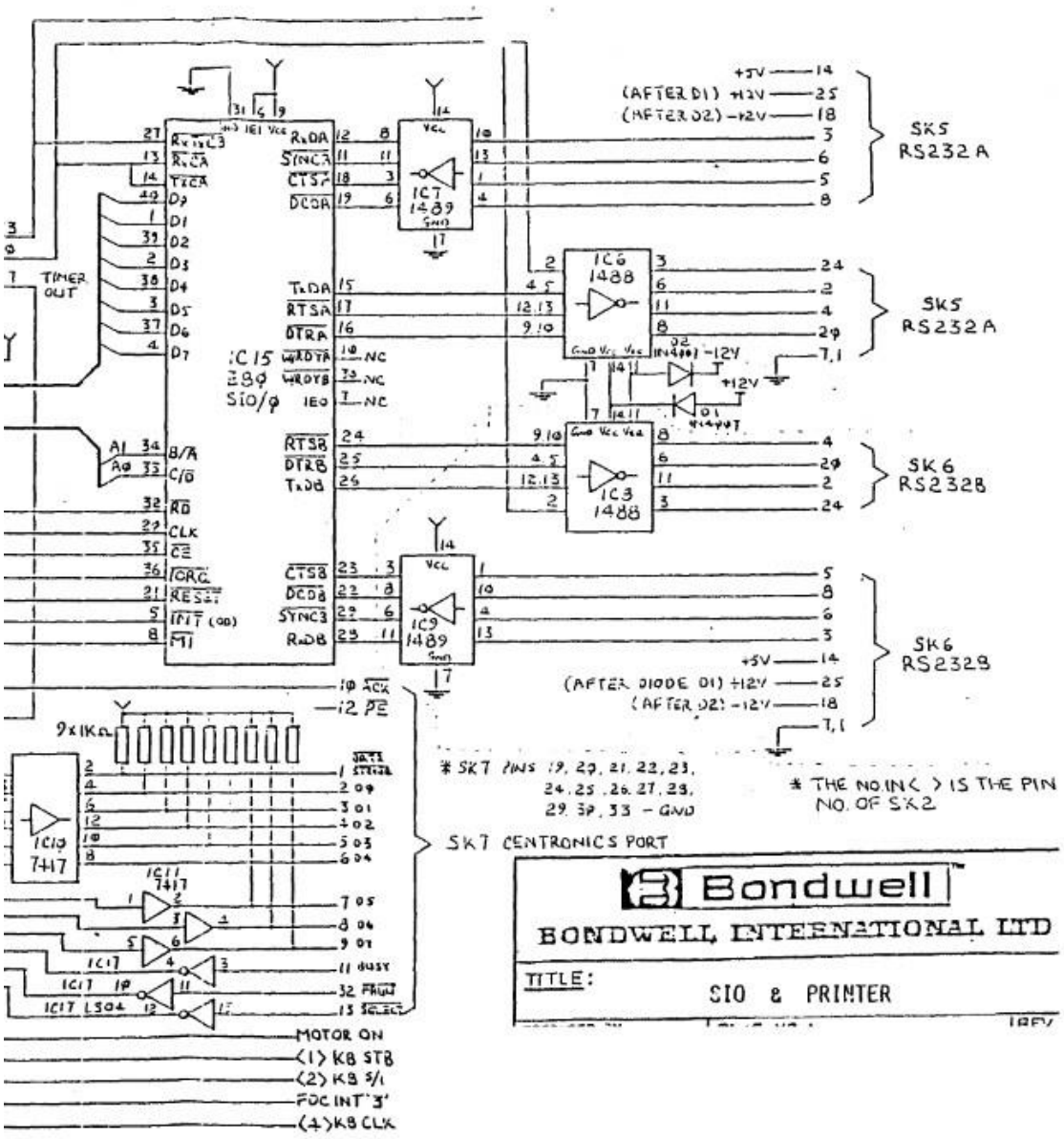


Fig 6. Pin-out of the two RS232 connectors of the B12

unusable. I finally solved this using the Z80 assembler of **the 2500 AD project** of F.J.Kraan (**[ref 5]).**
A simple change of the SIO adresses and omitting the ASEG instruction fixed the problem. Meanwhile Mathias sent me his solution using the Microsoft M80/L80 combo. So the main problem here (and the same encountered during the work on the Philips P2000C) finally came down to a strange assembly behaviour. One should expect that the CP/M 2.2 ASM.COM (ver.2.0) would

complain when confronted with unpalatable Z80 mnemonics, but that was not the case….

There remains a problem with Kermit-80. I assembled a generic CP/M version, but besides a few characters sent correctly to the PC in the CONNECT mode, the normal R(eceive) and S(end) do not work…

So this remains an open wound, as it is on the Philips 2000C.

6. Overal conclusion

Finally the nice B12 is again in full juvenile juice.. I really wonder why the manufacturer had not made working inside the machine more easy. But probably it was not meant to be opened!

I do not know how rare a working B12 is; according to a mail I found in a forum, there are not many working specimens left. So the Computarium will treat it with the due respect for the old!

If a reader finds errors (or addendums) in/for this paper, I am grateful for all remarks sent to mailto:francis.massen@education.lu.

References:

1. https://classictech.wordpress.com/computer-companies/bondwell-industrial-co-inc-fremont-calif/

2. Disk images for the Bondwell B12:
IMD: retro.co.za/ccc/bondwell/
TD0: www.retroarchive.org/maslin/disks/bondwell/index.html

3. MASSEN F. Working on the Philips 2000c (2026)
https://computarium.lcd.lu/literature/COMPUTARIUM_CREW/MASSEN/Working_on_the_Philips_P2000C.pdf

4. AD 2500 macro assembler for Z80
http://www.vintagecomputer.net/fjkraan/comp/mirror/z80cpu.eu/archive/rlee/L/LOOSECPM/300/U3/