

# The HxC Emulator and Disk Systems of some HP Computers

## 1. SONY floppy disk drive MFD-52-W10

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This floppy disk drive is used for example in the HP 9153C combo disk system containing a hard disk and the floppy disk drive. The systems came with a HP-IB (IEEE-488) interface and were usually connected to HP computers of the Series 80, 100, or 9000. Besides the infamous „Nighthawk“ hard disks also many of the old floppy disk drives are failing due to age.

The SONY 3.5 inch floppy disk drives in these systems already have the common 34 pin connector. These drives have a rectangular eject button.

The HP part number of the drive is 9123-69101 - the manufacturer's designation is SONY MFD-52-W10. The disk drives have a 4 position switch for drive select 0...3, but this is not used by HP equipment (factory setting is 3).

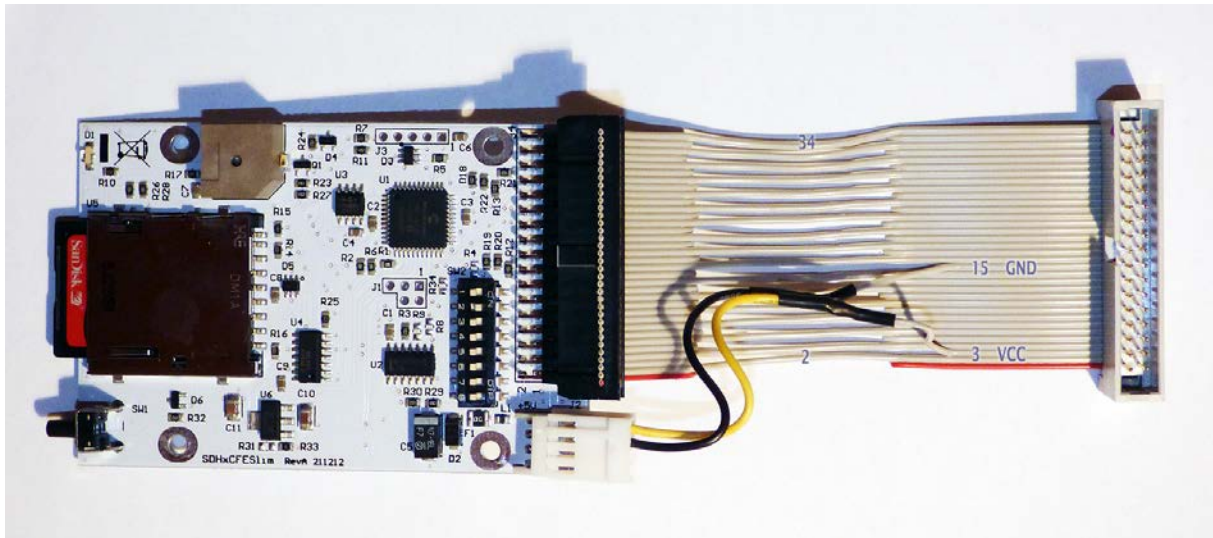
### 1.1. Connection

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HxC	SONY Connector				HxC
	Signal	pin	pin	Signal	
n.c.	Disk Change Reset (in)	1	2	Disk Change Indicator (out)	to 2
to VCC	5V	3	4	Drive LED (In Use)	n.c.
n.c.	5V	5	6	Drive Select 3 (in)	n.c.
n.c.	5V	7	8	Index Pulse (out)	to 8
n.c.	5V	9	10	Drive Select 0 (in)	to 10
n.c.	5V	11	12	Drive Select 1 (in)	to 12
n.c.	GND	13	14	Drive Select 2 (in)	to 14
to GND	GND	15	16	Motor On (in)	to 16
n.c.	GND	17	18	Direction Select (in)	to 18
n.c.	GND	19	20	Step (in)	to 20
n.c.	GND	21	22	Write Data (in)	to 22
n.c.	GND	23	24	Write Enable (in)	to 24
n.c.	GND	25	26	Track 0 Indicator (out)	to 26
n.c.	GND	27	28	Write Protect Indicator (out)	to 28
n.c.	12V	29	30	Read Data (out)	to 30
n.c.	12V	31	32	Head Select (in)	to 32
n.c.	12V	33	34	Drive Ready(out)	to 34

Notes:

- 1) pinout according to HP 9153B Service Manual.
- 2) All even lines are connected to their corresponding line on the HxC emulator, except for lines 4 and 6.
- 3) The two wires from pins 3 and 15 are routed to the separate power connector of the HxC Emulator.



**Figure 1:** Adapter cable with power supply lines. All odd lines except 3 and 15 are cut. All lines with even numbers are connected to the upper row on the HxC connector. The plug on the original cable in the HP 9153 system is plugged into the connector at the right hand side.

## 1.2. Emulator Switches

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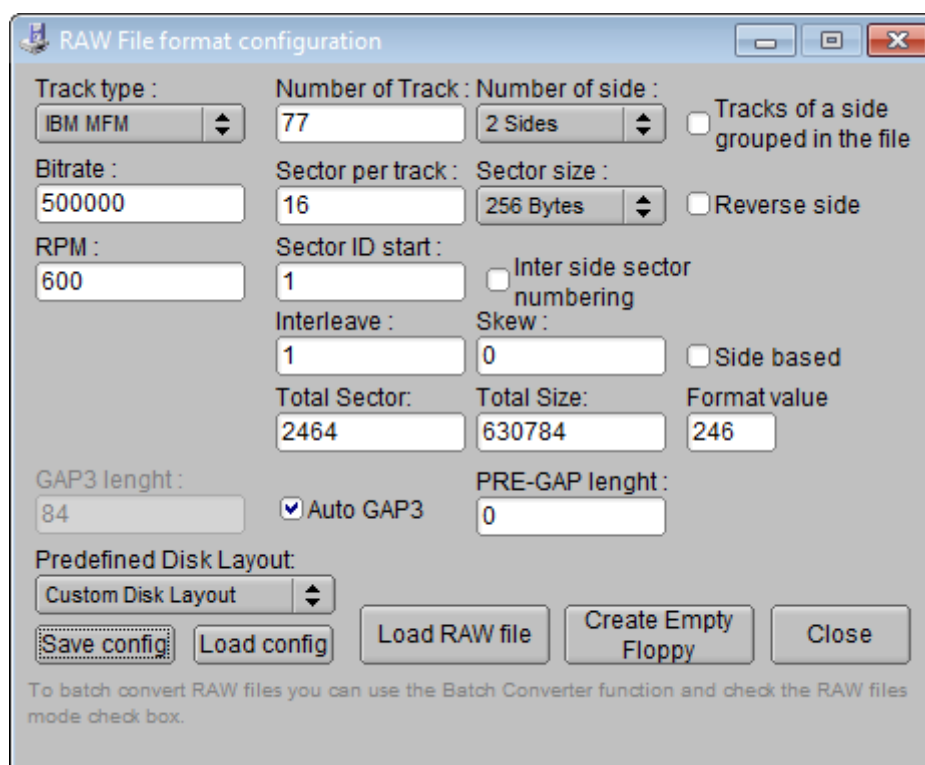
On the HxC emulator only the dip switch #2 must be set to the “ON” position. All other switches are left in their “OFF” position.

## 1.3. Disk Format for Series-80 Computers

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The HP Series 80 computers (HP-85, 86, 87, 9915) use a disk format which is characterized by 2 sides with 77 tracks on each side. Each track has sectors with a length of 256 bytes. Therefore the settings as shown in Figure 2 can be used to create a new raw disk.

Another special feature of the disk drives as used by HP is that they rotate at 600 rpm. This yields a higher data rate than e.g. on the IBM PC. Therefore the data rate must be set to 500'000 bits per second. The recording format is MFM.



**Figure 2: Settings for HP-85/86/87 disk images. This information is recorded in each HFE image file.**

After adjusting the values as shown in Figure 2 you can use the “Create Empty Floppy” button to create a new disk image. This image must then be written to the SD card using the “Export” command. Use a file name of the form “DSKA0000.HFE”.

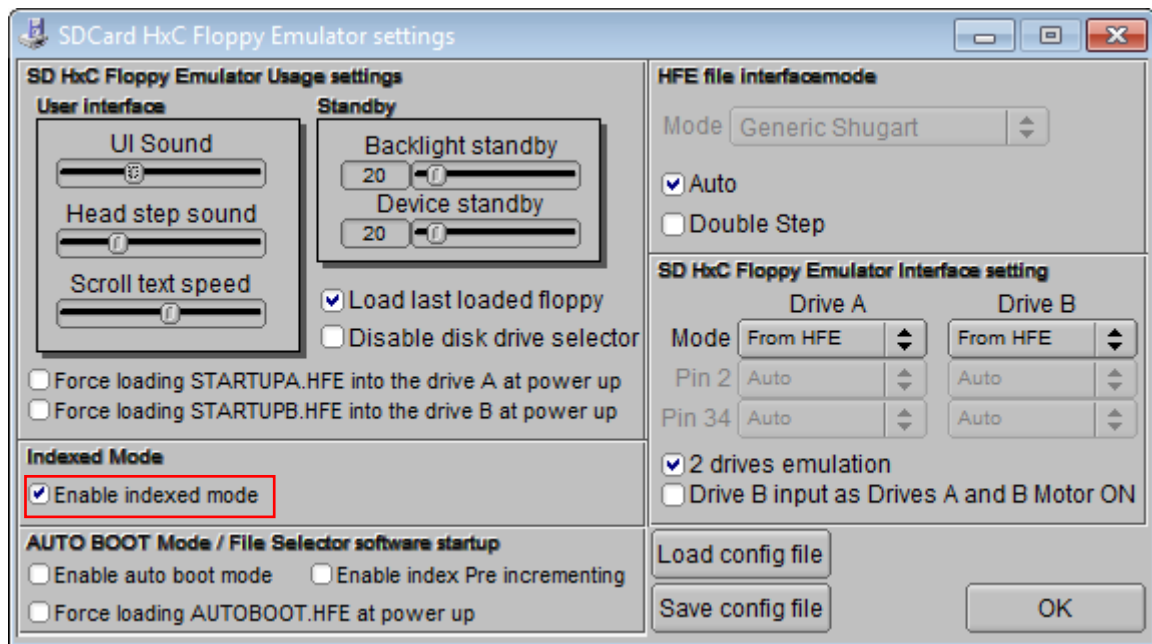
It is sufficient to export a single disk image to the SD card first.

If you examine the header of a HFE file it should look like shown in Figure 3.

```
00000000 48 58 43 50 49 43 46 45 00 4D 02 00 F4 01 00 00 HXCPICFE.M.....
00000010 07 01 01 00 FF FF FF FF FF FF FF FF FF FF FF FF .....
```

**Figure 3: Hex dump of the first part of a HFE file for the SONY drive used in the 9153C disk drive with HP Series-80 computers.**

Besides the disk images, the emulator also needs a configuration file which controls its operating mode. You can create this file using the settings shown in Figure 4 below.



**Figure 4: Emulator configuration for HP Series-80 disks. This information is stored in the CFG file.**

Make sure that the option “indexed mode” is enabled to use the numbered disk files names. Also check that the interface is set to the default value of Shugart compatible. You must save the configuration file to the SD card using the “Save config file” command button.

Your SD card must finally have this .CFG file plus one or more numbered disk image files in HFE format.

## 1.4. Preparing the Disk Image for Usage

You must INITIALIZE each new disk image with the Series-80 computer. This can be affected by the command

```
INITIALIZE "0000",":D831"
```

assuming that your disk system is connected to an HP-IB interface with select code 8 and that the system has the address 3 and that the disk is unit number 1 (0 should be the hard disk).

If you have initialized a disk image, you can use a PC to create as many copies of this initialized disk image for future application as you need. Remember that you must name each file according to the “indexed” operating mode with a name like “DSKA0000.HFE”, incrementing the number for each additional file. The file numbers must form a contiguous sequence, i.e. no gaps are allowed.

When you later select the next image using the pushbutton of the emulator, it will beep once for the first file, twice for the second file etc. Holding the button longer will reset the index to the first file “DSKA0000.HFE”.

## 2. Other SONY Floppy Disk Drives

Used in older HP gear, e.g. 9153A, 9114A, 9114B. These have 26 pin connectors and a separate power connector with +5V, +12V and GND. Square eject button.

SONY OA-D32W, OA-D32V, MFM, 600 rpm, max transfer rate 17 KBytes/second, tracks 0-69, sector IDs 1-16. Sector size 256 bytes. 270 KBytes (SS,DD).

I have not yet tried to connect a HxC Emulator to these systems.

### Specifications

	OA-D32W		OA-D32V		PIN NO	Description	Mnemonic
	SINGLE DENSITY	DOUBLE DENSITY	SINGLE DENSITY	DOUBLE DENSITY			
<b>Capacity</b>					1	Motor On	MTON
Unformatted Per Disk	500 Kbytes	1.0 Mbytes	250 Kbytes	500 Kbytes	2	Drive Select 0	SELECT 0
Unformatted Per Track	3.125 Kbytes	6.25 Kbytes	3.125 Kbytes	6.25 Kbytes	3	Disk Change	DSKCHG
Burst TRANSFER RATE	250 Kbits/sec	500 Kbits/sec	250 Kbits/sec	500 Kbits/sec	4	Drive Select 1	SELECT 1
<b>Access Time</b>					5	Disk Change Reset	CHCRST
Track to Track	12 msec.		12 msec.		6	Direction Select	DIRTN
Average*	350 msec.		350 msec.		7	Return	RETURN
Settling Time	30 msec.		30 msec.		8	Step	STEP
Head Load Time	60 msec.		60 msec.		9	Return	RETURN
Average Latency	50 msec.		50 msec.		10	Write Data	WRTDATA
<b>Functional</b>					11	Return	RETURN
Rotational Speed	600 RPM		600 RPM		12	Write Gate	WRTGATE
Recording Density (inside track)	4359 bpi   8717 bpi		4094 bpi   8187 bpi		13	Return	RETURN
Track density	approx. 135 TPI		approx. 135 TPI		14	Head Load	HDLOAD
Cylinders	80		80		15	Return	RETURN
Tracks	160		80		16	Head Select	HDSL
R/W Heads	2		1		17	Return	RETURN
Encoding Method	FM, MFM		FM, MFM		18	Index	INDEX
<b>Heat Dissipation</b>					19	Return	RETURN
Operating Mode (Head Load)	6.0 W		6.0 W		20	Track00	TRK00
Standby mode (Head Unload)	3.9 W		3.9 W		21	Return	RETURN
<b>Media Requirements</b>					22	Write Protect	WRTPRT
3.5" x 3.7" (90 mm x 94 mm)	SONY OM-D4440		SONY OM-D3440		23	Return	RETURN
					24	Read Data	RDDATA
					25	Return	RETURN
					26	Ready	READY

\* Average access time = 1/3 x (Track Nos.) x (Track to track time) + (Settling Time)

HxC	SONY Connector				HxC
	Signal	pin	pin	Signal	
to 16	Motor On (in)	1	2	Drive Select 0 (in)	to 10?
to 2	Disk Change Indicator (out)	3	4	Drive Select 1 (in)	n.c.?
n.c.	Disk Change Reset (in)	5	6	Direction Select (in)	to 18
	GND	7	8	Step (in)	to 20
	GND	9	10	Write Data (in)	to 22
	GND	11	12	Write Enable (in)	to 24
	GND	13	14	Head Load (in)	to ?
	GND	15	16	Head Select (in)	to 32
	GND	17	18	Index Pulse (out)	to 8
	GND	19	20	Track 0 Indicator (out)	to 26
	GND	21	22	Write Protect Indicator (out)	to 28
	GND	23	24	Read Data (out)	to 30
	GND	25	26	Drive Ready (out)	to 34

Has switch with 4 positions for drive select. Select lines 0 and 1 work in binary (11=1, 01=2, 10=3, 00=4). The head load signal lowers the head to the surface.

Power connector

- 1 +5V
- 2 GND (5V)
- 3 GND (12V)
- 4 12V