



#### How to diagnose and repair IBM Floppy Disk Drive 5"1/4 - 360kb

written by Sergio Gervasini for ESOCOP - The European Society for Computer Preservation http://www.esocop.org

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A copy of the license is available on Esocop's site and can be obtained here:

http://www.esocop.org/gnu/gnu-1.3-license.txt

### References

Tandon TM100-2 - Known Problems/Issues: <u>http://www.minuszerodegrees.net/5150\_5160/tandon\_tm100/tandon\_tm100-</u> 2\_problems.htm

Adjusting the radial alignment a Tandon TM100 -2A drive without an alignment disk (by Terry Stewart): http://www.classic-computers.org.nz/blog/2010-06-28-alignment-tandonm100.htm

Daves Old Computers - Disk/Software Image Archive (by Dave Dunfield): <u>http://www.classiccmp.org/dunfield/img/index.htm</u>

OEM OPERATING AND SERVICE MANUAL TM100-1 AND -2 DISK DRIVES: <u>http://www.bitsavers.org/pdf/tandon/TM100-1\_-</u> 2\_OEM\_Operating\_and\_Service\_Manual\_48TPI\_1981.pdf

## Introduction



In this document we analyze some of the common possible fault of the IBM Floppy Drive 5"1/4, mainly used by IBM in his PC models 5150 and 5160.

The unit is made by Tandon, the model is TM-100-2A, this is a dual side drive capable of 40 tracks and a total capacity of 360kb.

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We do not want to go into every possible failures, there are service manuals publicly available with all the information, but only in those that happen more frequently on units that are more than 30 years old and can be fixed easily with a little manual ability and without the use of special tools.

# **Visual Check**

First of all it's a good practice to inspect the unit to detect any electronic or mechanical problem, verifying the components condition, connectors, screw, cables, etc.



Usually the board has no problems, except the possibility of short circuits with the frame, so check carefully the board position.

Another problem that occurs on widely used units is the breaking of the upper head, in detail break of the delicate copper supports of the head.

A broken head it's almost impossible to repair, so carefully check it before inserting a disc, it could ruin it (see photo of a broken head).

Remember that if you have more than one floppy connected with the cable, the last floppy of the chain should have the resistor termination (not present in the board in photo).



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## Lubrication

One of the main problems we can have on these old components is the lack of greasing, in particular on the spindle and on the head guides.

In these cases there will be excessive noise, both in the rotation of the floppy and in the movement of the head, up to slowing down the rotation or even blocking the movement of the head.

The best solution would be to disassemble all moving parts to clean and lubricate them individually, but it is a complex job, so we suggest to remove only the belt, to avoid greasing it, and to spray only a little lubricant in the right positions (see the red arrows in the photos).

We use the WD-40 Specialist grease to have the best results.

Be careful to use only the bare minimum of grease and carefully clean all parts that are not involved in the movements.



After removing the belt, spray a little amount of grease in the position indicated by the red arrow, keeping the drive vertical as in the picture and manually rotating the spindle in order to distribute the lubricant on the central pin.

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Remember to reassemble the belt at the end of the work and make sure it is clean.

To lubricate the head guides we need to remove the electronic board, so unplug carefully all the connectors and remove the relative screws.

If possible clean up the guides with isopropyl alcohol before greasing.

Spray a little grease in the positions indicated by the red arrows and move gently the head back and forth until it runs well along all the guide.



## **Fix Screw**

The stepper motor moves the head backward and forward with a mechanism with 2 screws, which tend to loosen over time, it is therefore advisable to tighten the screws.

The first one is easily accessible after having removed the electronic card, to access the second one we need to remove the cover, by pulling the plastic black pins.





# **Cleaning heads**

With the electronic board removed is a good practice to clean the heads.

This can be achieved by using a cotton bud dipped in isopropyl alcohol, and then gently drying with absorbent paper.

# **Testing machine**



To check the floppy for the rotational speed and the head alignment we need a PC, a 286 or 386 machine are the best solution to do the job, in my case I have used an old 286 mother board with a VGA and a floppy/ide controller directly on the desk.

I use also a IDE/CF adapter to have an "hard disk" solid state where to put MsDos and the software useful for the work; a PC power supply and a keyboard completes the test machine. But ... we need an alignment disk, not so easy to find and expensive.

The alternative method (though not as accurate) is to use a floppy formatted in a drive of another machine, hopefully that has a good alignment, ie a drive that can read/write to floppies generated by other drives; I called this as "reference machine".

Use only industry-standard good quality DS/DD disks, NOT HD, and format a couple of them in the reference machine to obtain more than one disk good enough for alignment.

## Alignment

Before loosening the screws, to align the heads it is better to do some tests without touching anything, in some cases there is no need to do alignment. Or, you can discover other kinds of problems, ie an head not responding at all.

The software used for the test is ImageDisk written by Dave Dunfield that have an alignment function very useful for this scope, see references at the beginning of this document.

We can move the heads to any head/track and read continuosly the data, if the data is readed consistently on all tracks the heads are correctly aligned.

At the same time we can check the rotational speed looking the stroboscopic patterns on the spindle under a neon or fluorscent lamp to ensure that the drive run at the correct speed; if the rotating pattern stand still the speed is ok.

In this screen is shown the data read on the track 20 and denotes a correct alignment of the head (the 18 that indicate the number of sectors read correctly).

In case of bad alignment you will see a number > 0 in the last column or, worst, a different track number.

123456789	
0 • • • • • • • • 1 • • • • • •	
	70 4 18 3
	20 9 18 0
Insert formatted	20 4 18 0
diskette	20 8 18 0
	20 3 18 0
A = Analyze	20 7 18 0
B = Beep on∕off	20 2 18 0
D = read Data	20 7 18 0
F = Format	20 2 18 0
H = Head 0/1	20 6 18 0
1 = track Image	20 1 18 0
P = fmt Parms	20 6 18 0
R = Recal/seek	20 1 18 0
S = Step S/D	20 5 18 0
W = Write data	20 9 18 0
Z = Zero track	20 4 18 0
$0-9 = seek \ 0-90$	20 9 18 0
+/- = Seek +/-1	0 4 18 0
x = exit	20 8 18 0
	20 7

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In this case, proceed as follows: loosen the 3 screws indicated by the red arrow (2 at the bottom and the other on the back of the drive), and rotate the screw specified by the blue arrow to adjust the alignment while the drive is running.

When the alignment is perfect, tighten the 3 screws in order to avoid moving the head support.



