The Basic DISK II Pages

Speedadjustment, Trackalignment, Cleaning and Service project

The DISK][Drive - a classic storage system

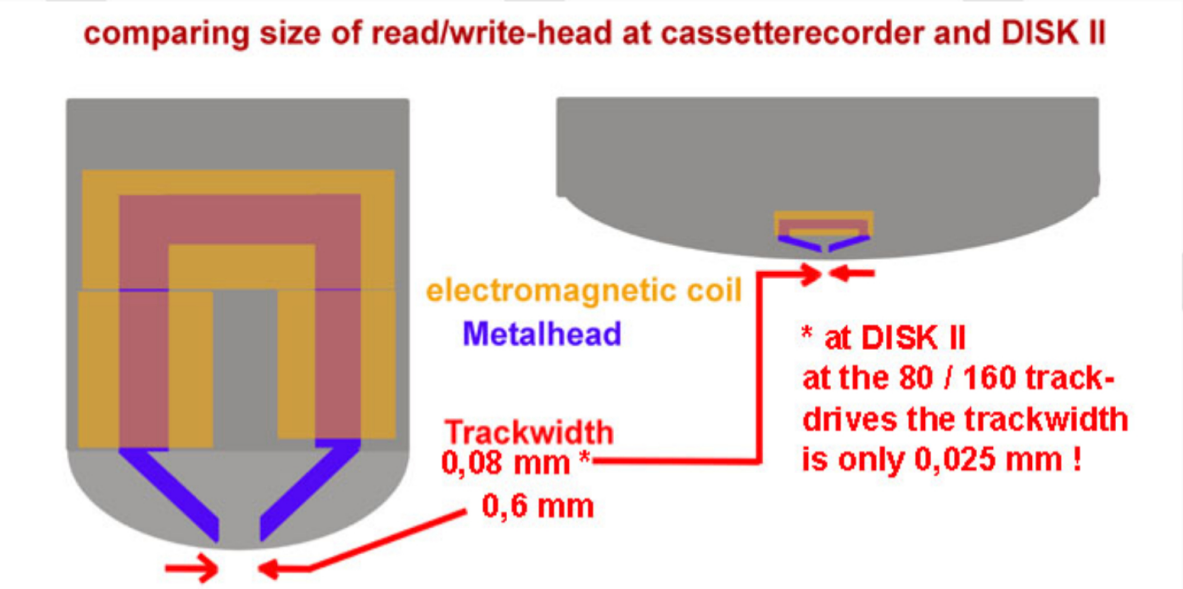
Important Warning ! Never dismount or open drives unless they have been disconnected
from the computer (i.e. unplugging the drive from the diskcontroller) and are without power !
Disobeying may leed to a damaged computer or damaged drive !
Only in very few tasks power will be needed and
this will be mentioned within the text at the correct place pointing to the needed precautions!

page about advanced adjustment of the offset
of the electronical Read/Write-Head compensation cycle

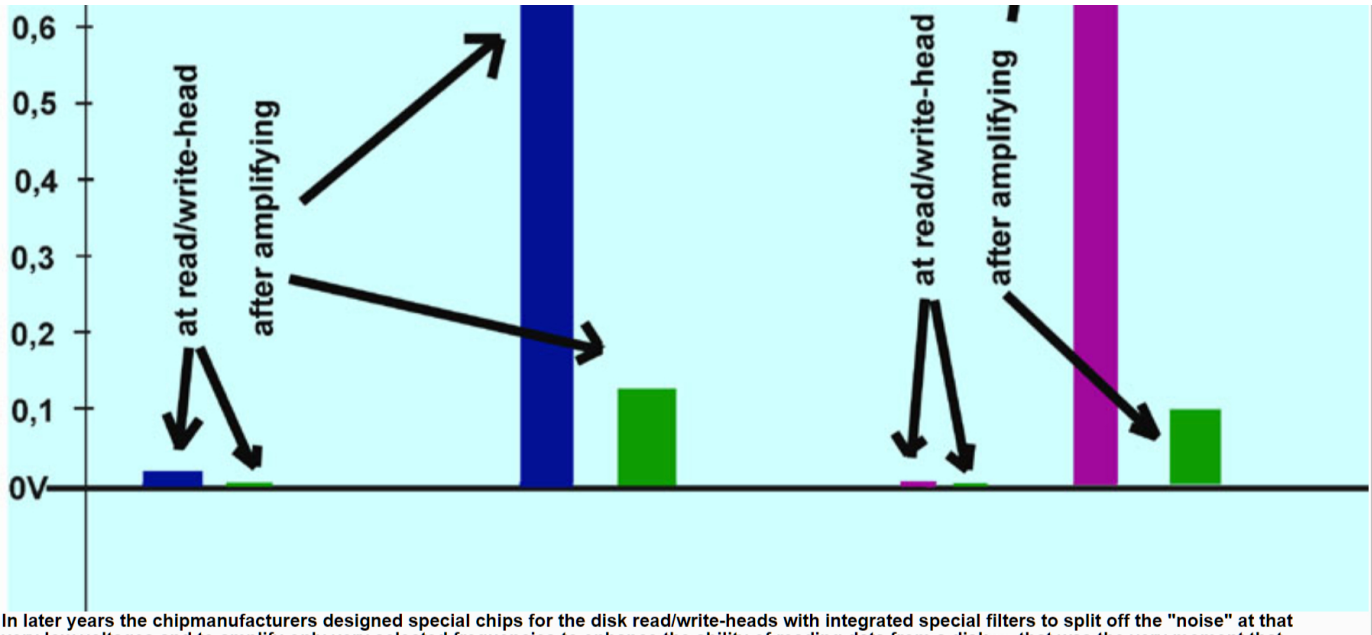
As explained in the previous pages there are several tasks that can be executed to keep the DISK II drive in a good working shape. Some of the tasks are rather simple like cleaning the drive from dirt and applying some grease to the sliding parts to ensure smooth working or adjusting speed of the diskturning within the correct limitation, some tasks require advanced knowledge and tools like adjusting the track zero - and the same is valid to adjusting the read/writecycle..... this task can only be solved with advanced electronic equipment: you will have to use a oscilloscope to be able to judge the signal at the analogPCB and you should have experience in using the scope ..... its also recommended to download the Circuitplans of the DISK II from SAMs from the site of asimov.

Again i will first give an intro with some basic explenations for better understanding of the technical details:

We all probably remember that experiment out of the old schooldays when a copperwire was wound several dozends of time around a steelnail and applying some DC-Voltage to the wire .... and the steelnail became magnetic while the current was applied - and after disconnecting the current the steelnail was not magnetic again.... - well that was a demontration in large to the effect of electromagnetic field. The same happens in the read/write head of a taperecorder and of course also the operation within the read/write head of a diskdrive is similar too..... the big difference is the scale of that..... just for fun a graphic to show that difference:

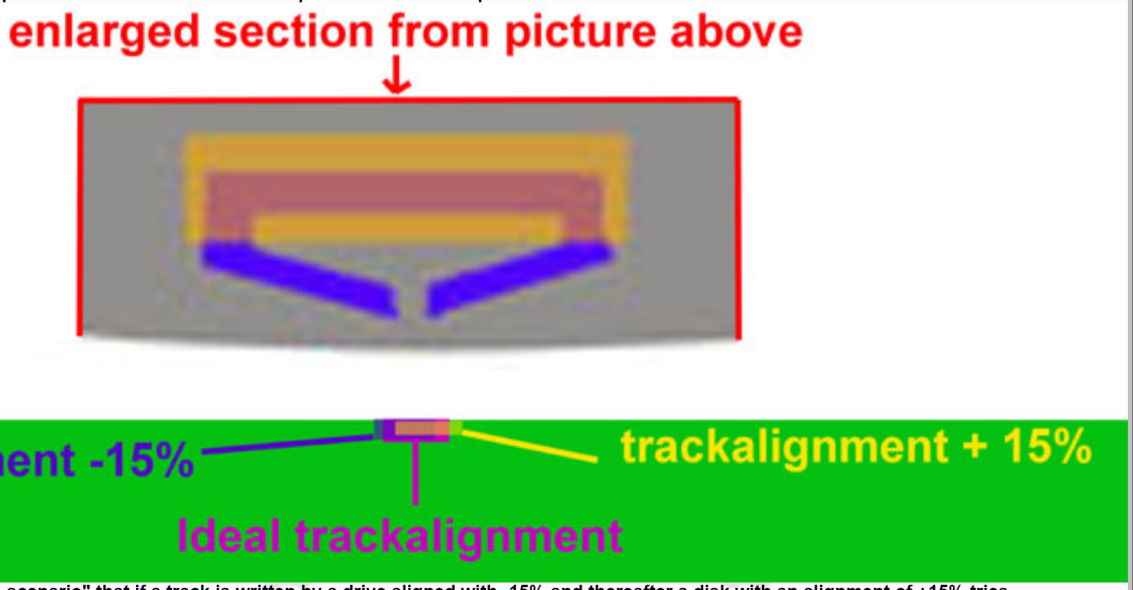


and as a result of the different sizes of those electromagnetic coils the electrical values of voltage differ same scale:
the read/write-head of a cassetterecorder delivers to the electronic of the PCB some voltage about to maximum of 10 millivolt (thats 10 thousendth parts of 1 volt or in numbers 0,01 Volt !) and the coil of the DISK II passes only 0,5 millivolt to 0,7 millivolt while reading the contents from the disk. In both cases the information must be amplified up to a value that can be passed to the level the electronic can use...
Within the cassetterecorder the audioamplifier needs an input of about 0,7 Volt to amplify the output to the speaker with some 6 Volts.
At the DISK II the required voltage must be amplified up to at least 4,5 Volt to clean the signal and pass it with 5 Volt to the controller of the computer !
And one of the important things to know is the fact that the "basic noise" from tape or disk will deliver some 0,002 to 0,003 Volt while reading - compared to the voltage of 0,01 at the taperecorder and to the 0,0006 Volt at the DISK II - and if you amplify the signal of course the noise is amplified too !
The following picture will visualize this explenation:



In later years the chipmanufacturers designed special chips for the disk read/write-heads with integrated special filters to split off the "noise" at that very low voltages and to amplify only very selected frequencies to enhance the ability of reading data from a disk .... that was the very moment that drives could be developed with more than 40 tracks (maximum of 360 kB per disk to 2 sides with 80 tracks and maximum of 640 kB per disk) and the ability to create diskformats with larger compression of data (the step upwards from double density to high density with the advantage of storing 1,44 MB to a disk instead of the former limitation to 640 kB).

And just beside of this you also should bear in mind that with the given trackwidth also at the trackalignment a tolerance of 10% to 15% is permitted by standard definition. To explain that relation of that to this topic lets see the next picture:



This means in "worst-case-scenario" that if a track is written by a drive aligned with -15% and thereafter a disk with an alignment of +15% tries to read the information the head will only read 70% of the track and 30% of the empty (but noisy) disk besides..... and this of course will also have affect to the electrical signal by giving the read information only 70% of trustable information and 30% of trash !

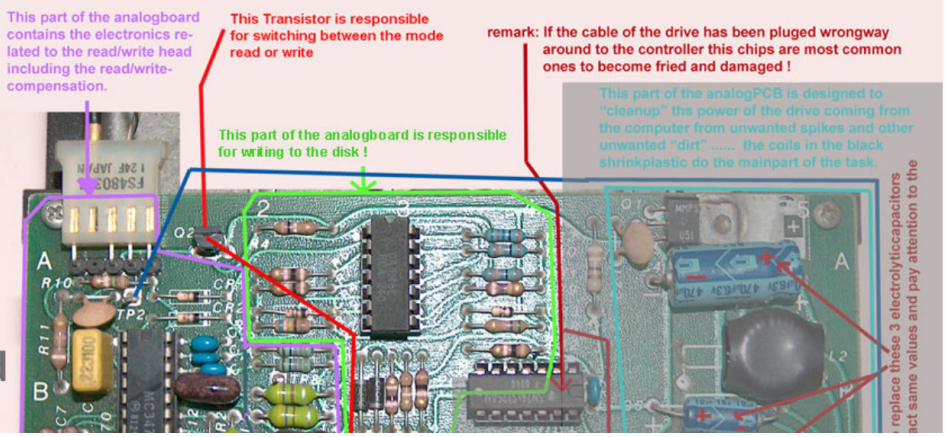
But now just an additional fact:
The adjustment of the electronic at the analogboard is also drifting by another +/- 15% too (!) given by the tolerance of the used components !!!

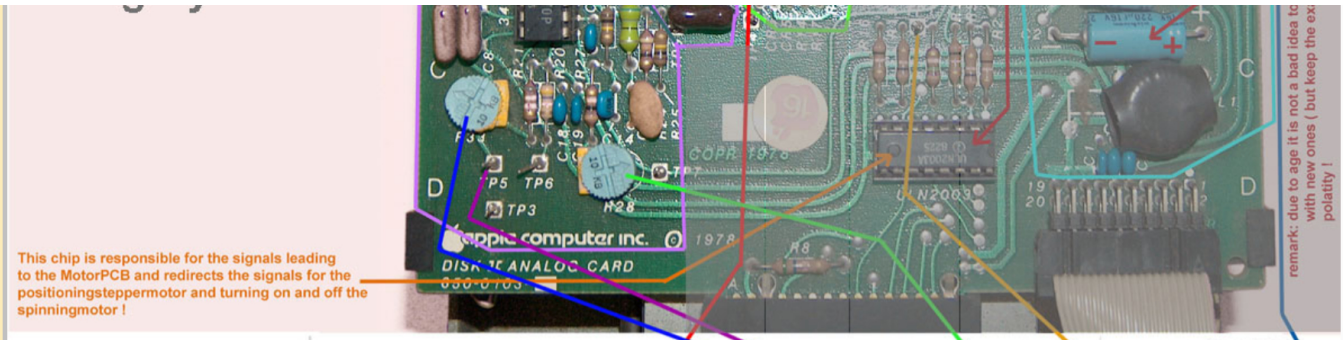
All facts together make the difference between a diskdrive that "reads nearly everything without mistakes" and a drive that has at least some 2 % or 3 % of read errors and therefor is forced to recalibrate more often while reading to finaly get the demanded information from the disk.

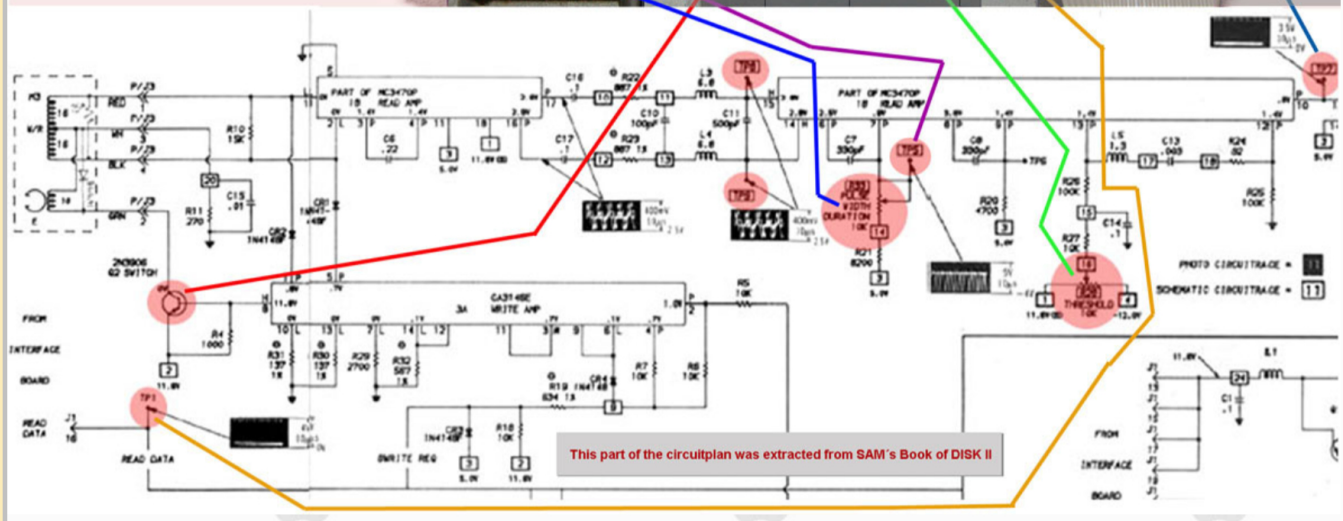
So now after the basics lets get into the hardware and the electronical task at the analogboard starting first again with a picture shown in the page before:

First we´ll take a look to the analogPCB to recognize at which points wé´ll have to make the measurements.....

In this picture those part that are not relevant, have been covered with gray shade !







Our attention will be fixed to the 2 variable yellow resistors with the light blue spintops at the bottom of the picture marked as R33 and R 28 (in the drawing also the one indicated with the blue line and the other marked by the light green line). Within the circuitplan they are marked by the enlarged red spots.

For the measurements the testpoints TP2, TP5, TP6 and TP7 will become important. That will be the related points to view during the adjustment of the signals with the 2 resistors the signals at the scope. In the following part of this page the measurements will be commented with good examples and bad ones.

Not complete yet !

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page about speedadjustment of the drive

Page about the writeprotection

page about calibrating the track zero

turnback to the page about basic mantainance

common mistakes at the Disk][drive and the controller

making a homebrew replacement of the DuoDisk Cable

Back to Indexpage

page back

Page forward

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