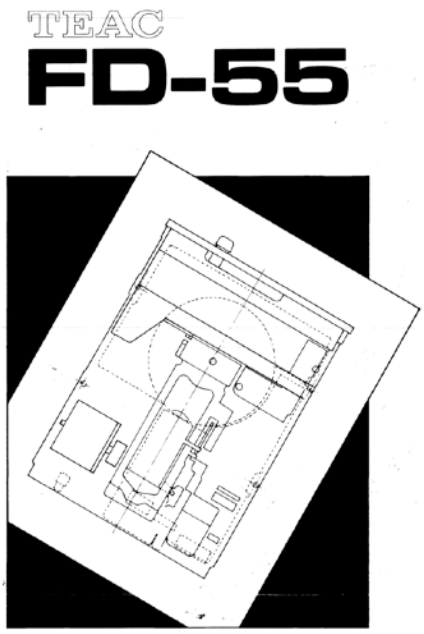
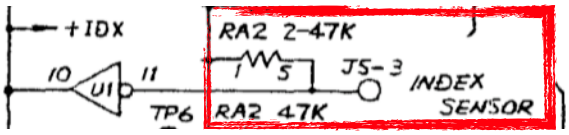
Modification of a Floppy Disk Drive (FDD) for a second index/sync-pulse sensor.

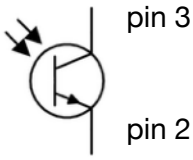
Background:



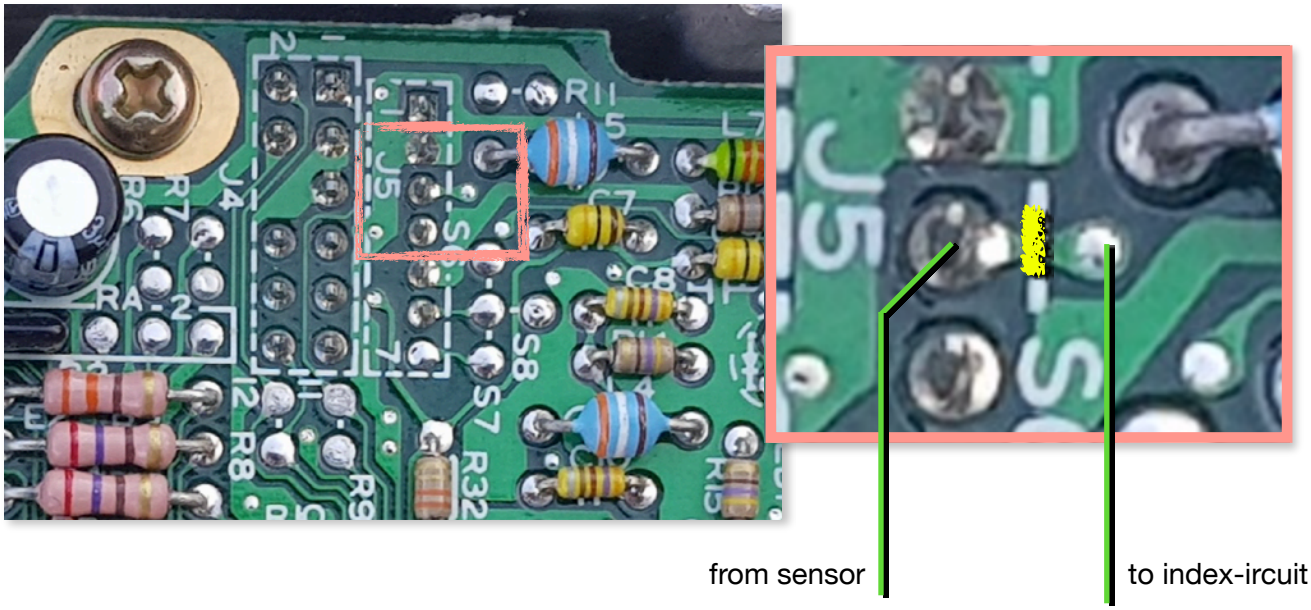
The FD55GFR will be used as example for the modification on the drive. The described method was used by the original Catweasel software to read C64 ‚Flip disks‘.[1]

The index-sensor is a photo diode that pulls the signal-line to ground when light is shone onto the sensor. The signal line is pulled up by a 47k resistor.[2]





To intercept the signal and feed a new signal into the FD-55GFR circuit the original signal must be cut at pin 3 of the J5 connector (J5-3). Pin 2 of J5 goes to ground (J5-2).



The small trace between the pin3 of J5 and the via has to be cut. Afterwards leads have to be soldered to the via and pin3. the leads have to be long enough to be connected to a switch on the front of the drive later on.

Next the new sync sensor must be selected. There are several choices:

1. **a reed switch**
2. **a hall sensor**
3. **a photocell**

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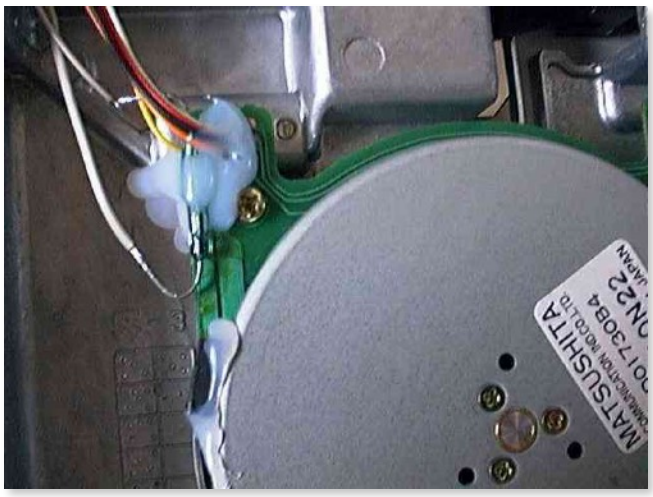
[1] https://web.archive.org/web/20060613190218/http://www.siliconsonic.de/t/flipside.html

[2] http://www.ndr-nkc.de/download/hard/FD55_maint.pdf (Page 213)

The reed switch method:[3]

This method is described by Jens Schönfeld to be used for the Catweasel FDD controller to be able to read C64 flip-disks. it basically uses the reed switch in the same way the photo-diode was used but with a magnet instead of light. The installation needs a bit of tinkering since the magnetic field must be aligned correctly for the switch to close. The magnetic field has be be strong enough as well and a small neodymium magnet may be needed for a reliable work condition



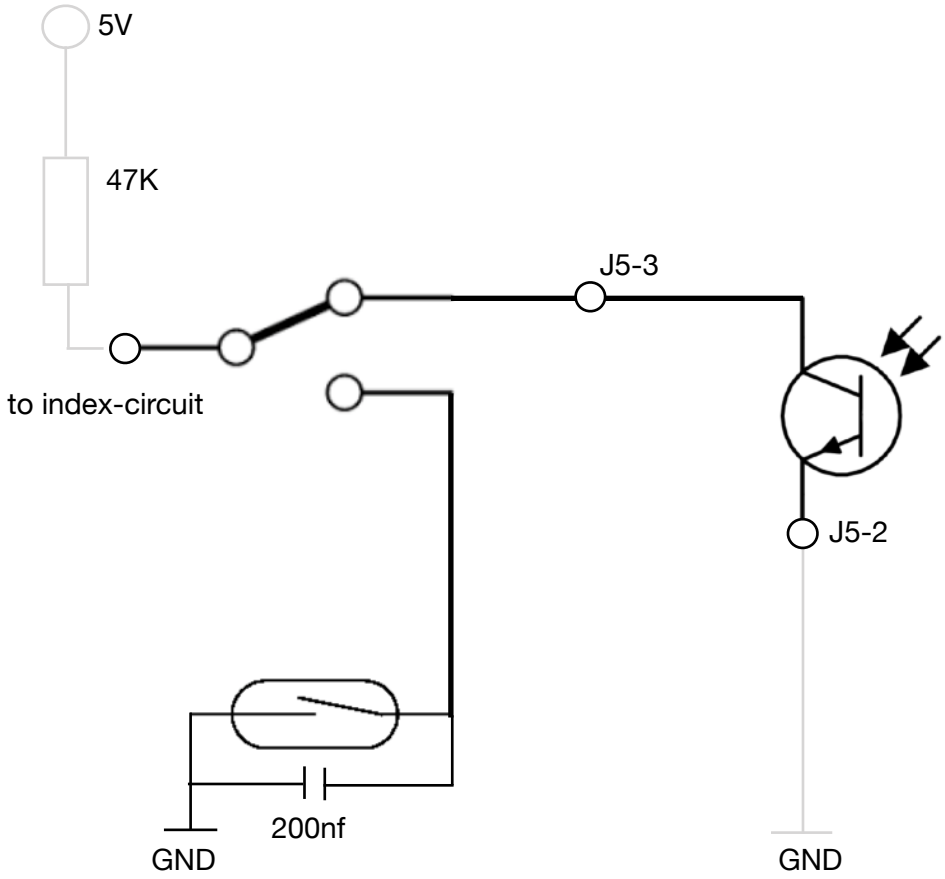
The reed-switch installed with hot glue in conjunction with a small permanent magnet (ferrite based in this picture).

It can take a bit of testing until the switch works as intended.

Since the reed switch may produce some bouncing it is advised to install a small ceramic capacitor (100nf - 200nf) in parallel to the reed switch.

One lead has to be connected to ground while the other lead has to be connected to the index-circuit (via a manual switch).

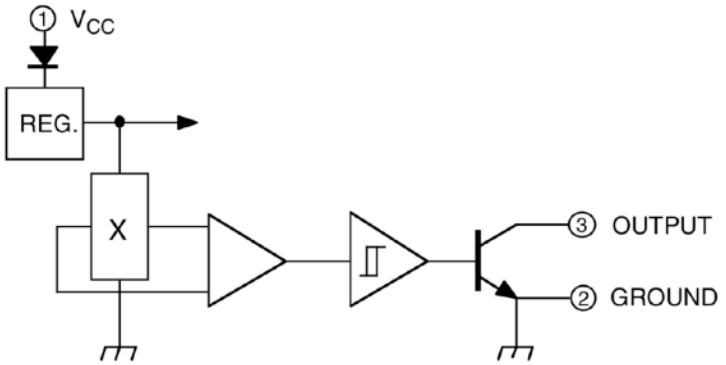
Simplified circuit:



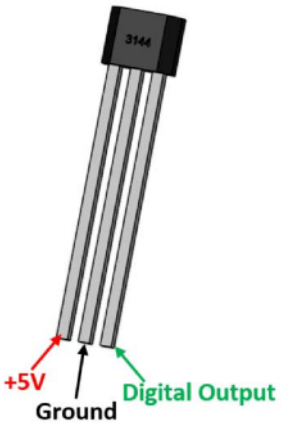
[3] https://web.archive.org/web/20060613190218/http://www.siliconsonic.de/t/flipside.html

The hall effect sensor method:

The hall-effect sensor (A3144 in this example) works like a transistor that switches to ground when a magnetic field is in the proximity.



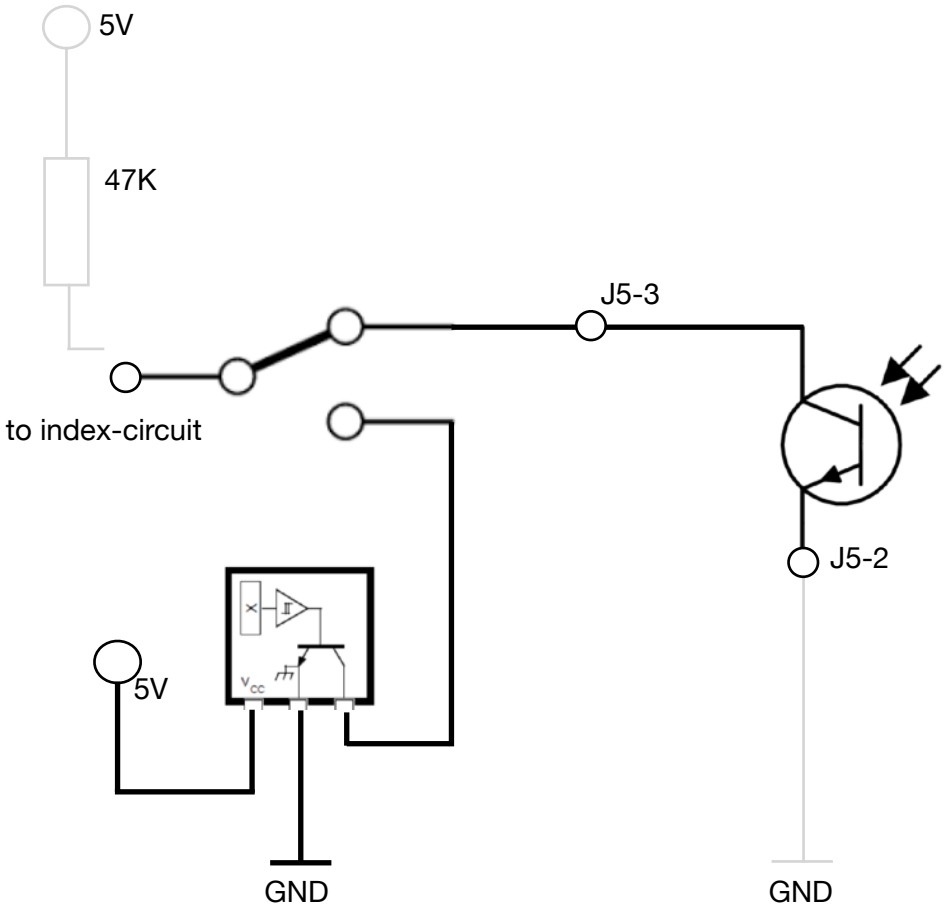
[5]



[4]

In this regard it behaves exactly the same as the photo-diode of the FD-55 index-circuit. But since it is an active component, it needs 5V power to work. The hall effect sensor needs a much smaller magnetic field than the reed switch.

Simplified circuit:

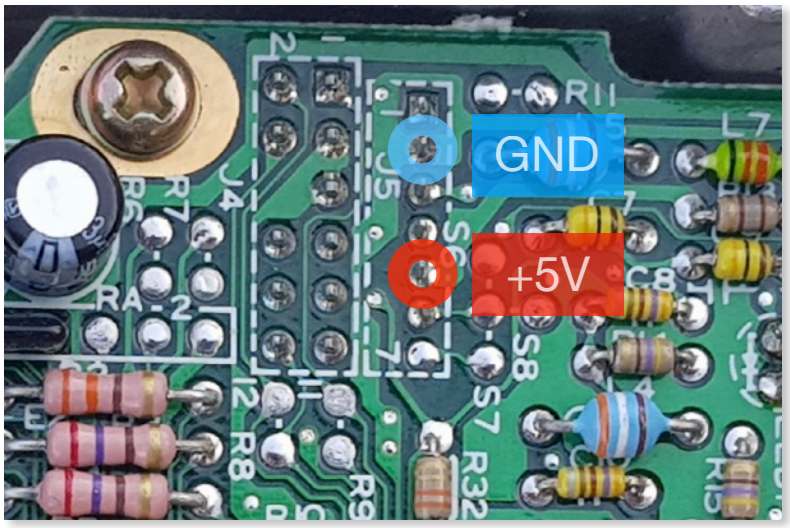


[4] https://components101.com/a3144-hall-effect-sensor

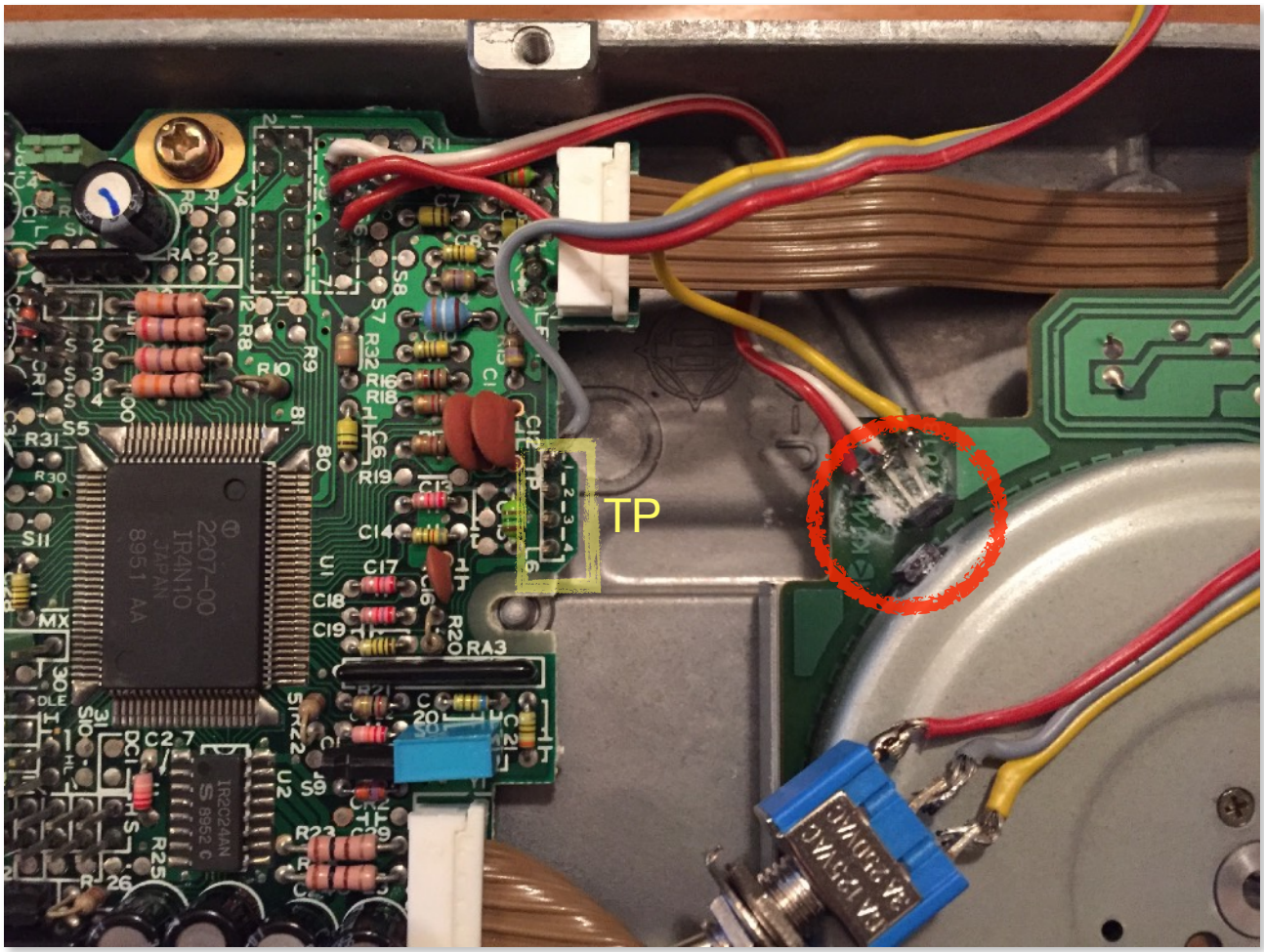
[5] https://www.mpja.com/download/a3144eul.pdf

The available pins on the FD55GFR PCB allow us to easily get +5V and GND.

GND is J5-2 and +5V is J5-5. The hall-sensor A3144 needs ground and 5V to operate since it is an active element. The output is TTL-conform in this configuration. Like the photo-diode of the index-circuit of the FD55GFR it pulls the output-line to ground if a strong enough magnetic field is detected.
Even the very weak magnet used in the following setup is strong enough to generate a clear signal when it passes by the sensor.



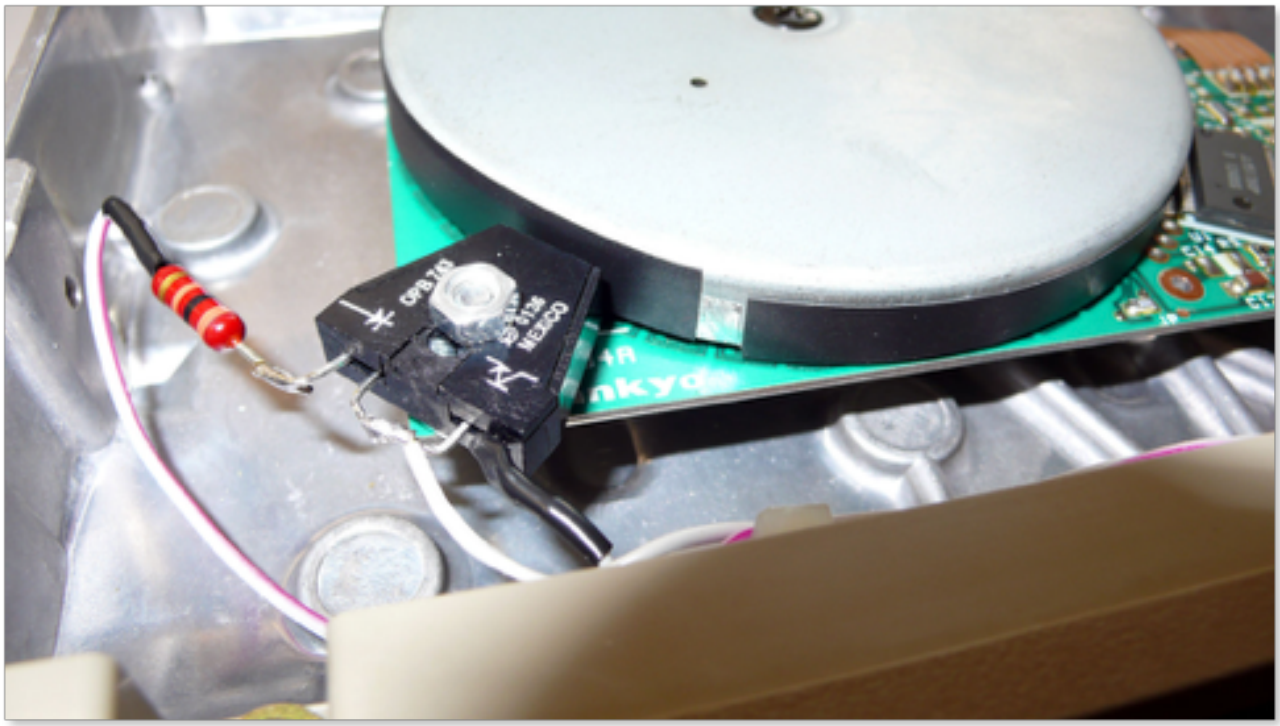
If the sensor is installed as described on the previous page, the resulting setup can look like this:



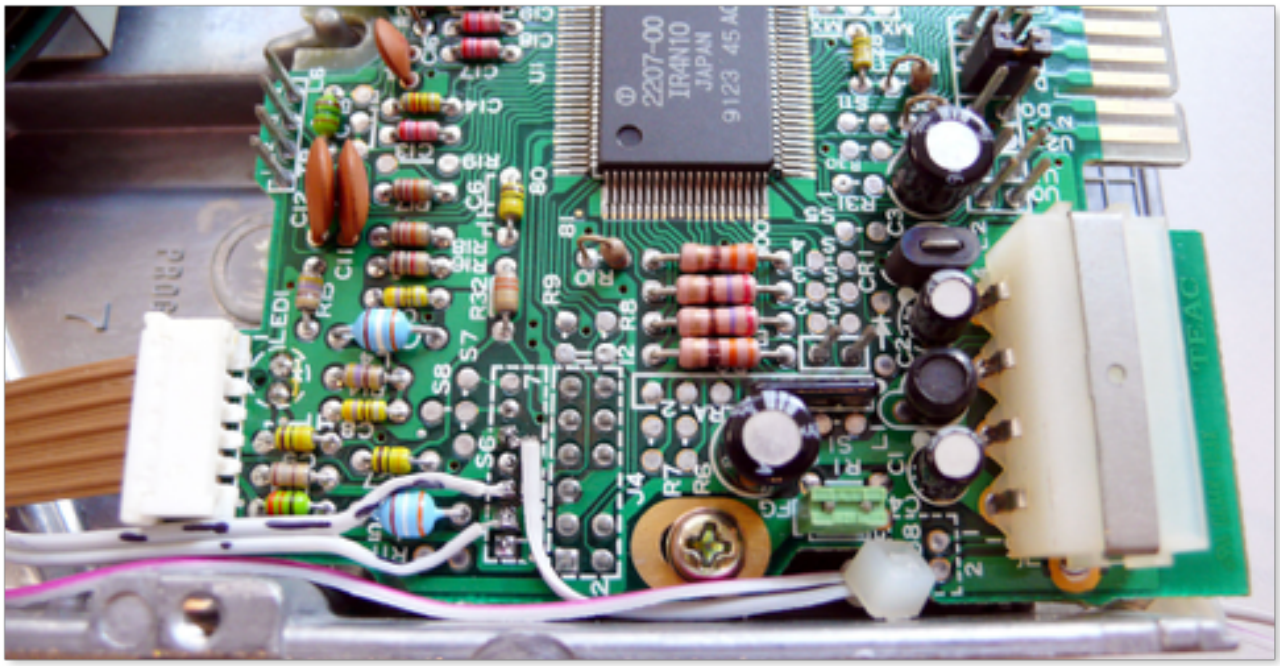
Since the via (as used in the reed-switch mod) is not easily accessible it is also possible to use pin 1 of the „TP“ pin array. The area with the red circle shows the hall sensor and the magnet installed on the drive motor. Super glue was used to fixate the parts. The wires on the hall sensor are:
red = 5V, white = GND, yellow = output. The switch is used to select either the new hall-sensor (red) or the FD55GFR index-sensor (yellow). The **gray** wire leads to the index-circuit of the the FD55GFR.

Photocell-method[6]

The method was described in the „classic-computing.de“ forum by the user „Antikythera“. It uses an OPTEK OPB743 optical sensor in combination with a reflective surface sticker on the drive motor. Notice the 100 Ohms resistor at the infrared LED-input to reduce the voltage below 5V.



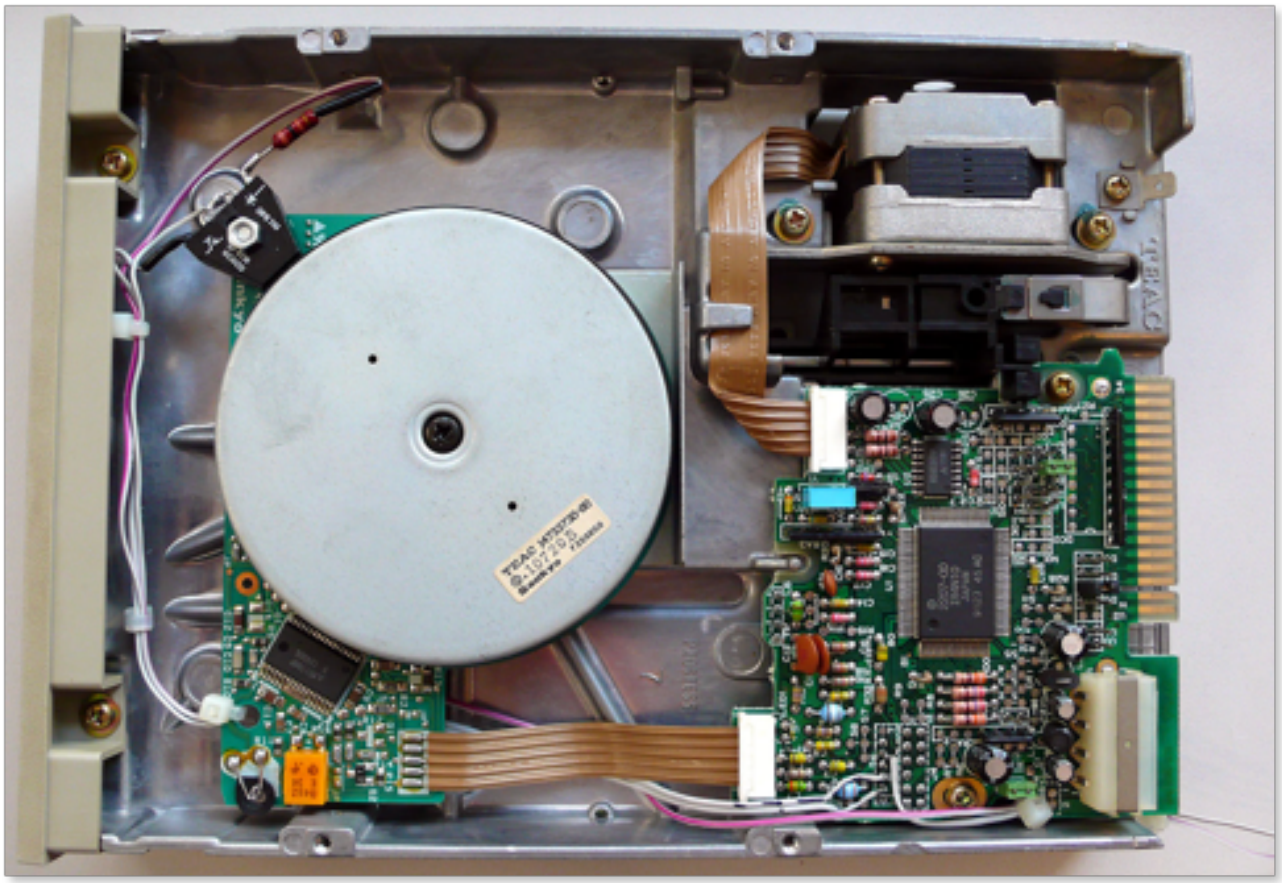
The way to connect this sensor is more or less the same as with the hall sensor:



[6] https://forum.classic-computing.de/forum/index.php?thread/16875-kryoflux-modifikation-eines-teac-fd-55gfr-5-25-hd-diskettenlaufwerks-für-flippy/

The main difference with this mod is that the FD55GFR index photo-diode is not cut from the index circuit but the new sensor is simply installed in parallel to the old one. By manually deactivating the new sensor when the disk is inserted in the correct way, the normal index-sensor will provide the index-signal and the disk can be read normally. If the disk is inserted upside-down, the old sensor will not generate any pulses since the index-hole is blocked. The new sensor has to be activated to be able to read a dsik. If both sensors are active, 2 pulses will be generated per rotation and may create some problems.

Complete view of the mod:



Conclusion:

There may be more methods to generate the missing index-pulse if the floppy-disk is inserted upside-down. Each of the 3 described methods have been tested and are working under normal conditions. Installation of these mods may need some testing and arranging of the components until a satisfactory result is archived.

Your milage may vary….