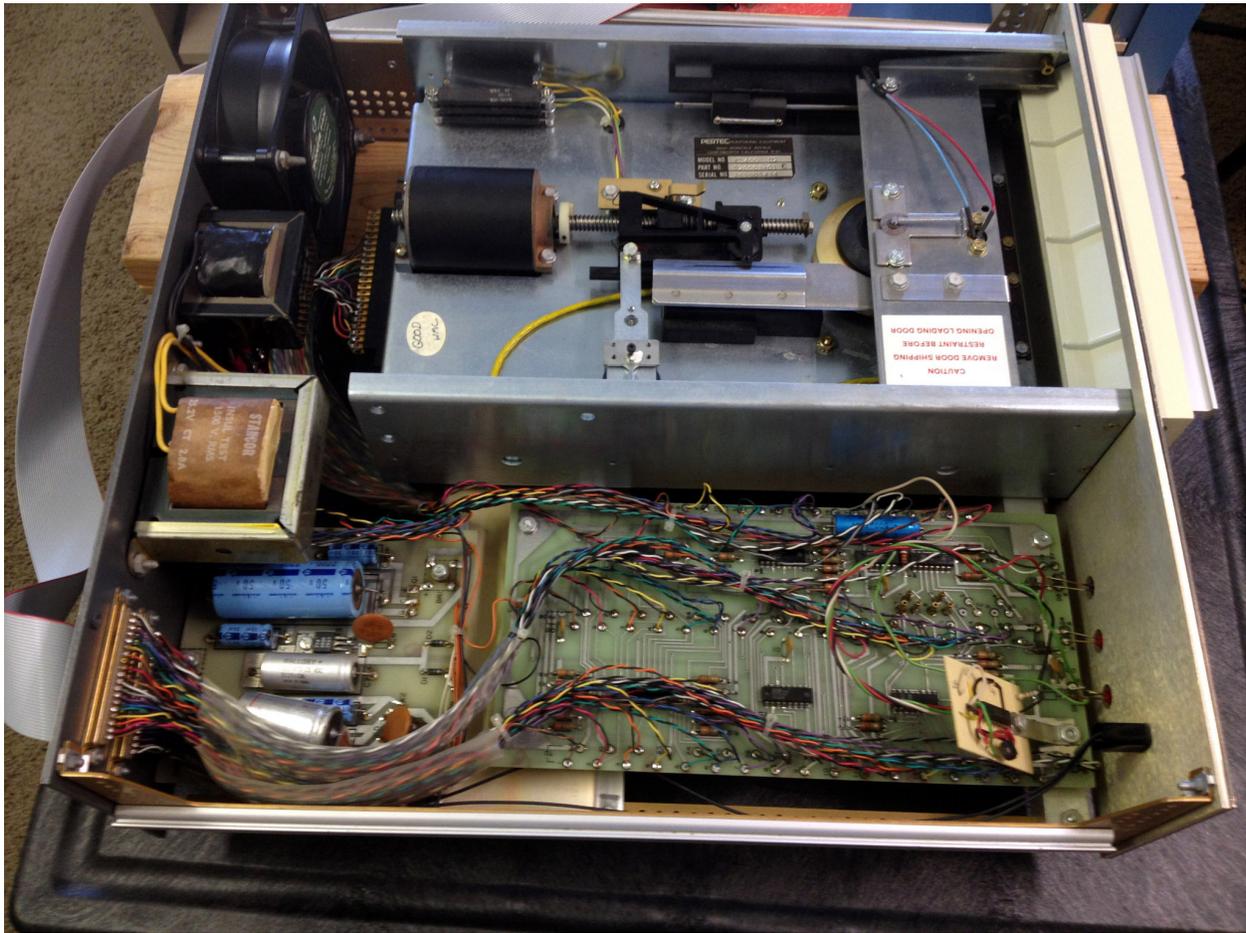


Altair 8 inch Floppy Drive Restoration Notes

This is an early version of the Altair 8" drive. It uses the first version of the Pertec FD-400 drive with an aluminum door and the 600191 PCB. The buffer board includes a user-installed modification that makes the power light flicker while the motor is spinning with a disk inserted. This was probably so the user could verify the hub motor was still spinning. The motor on these drives could seize and stop spinning, and if left that way too long, damage drive electronics.





In the photo above, the mod for flickering the power LED is on the small angled board at the bottom right corner.

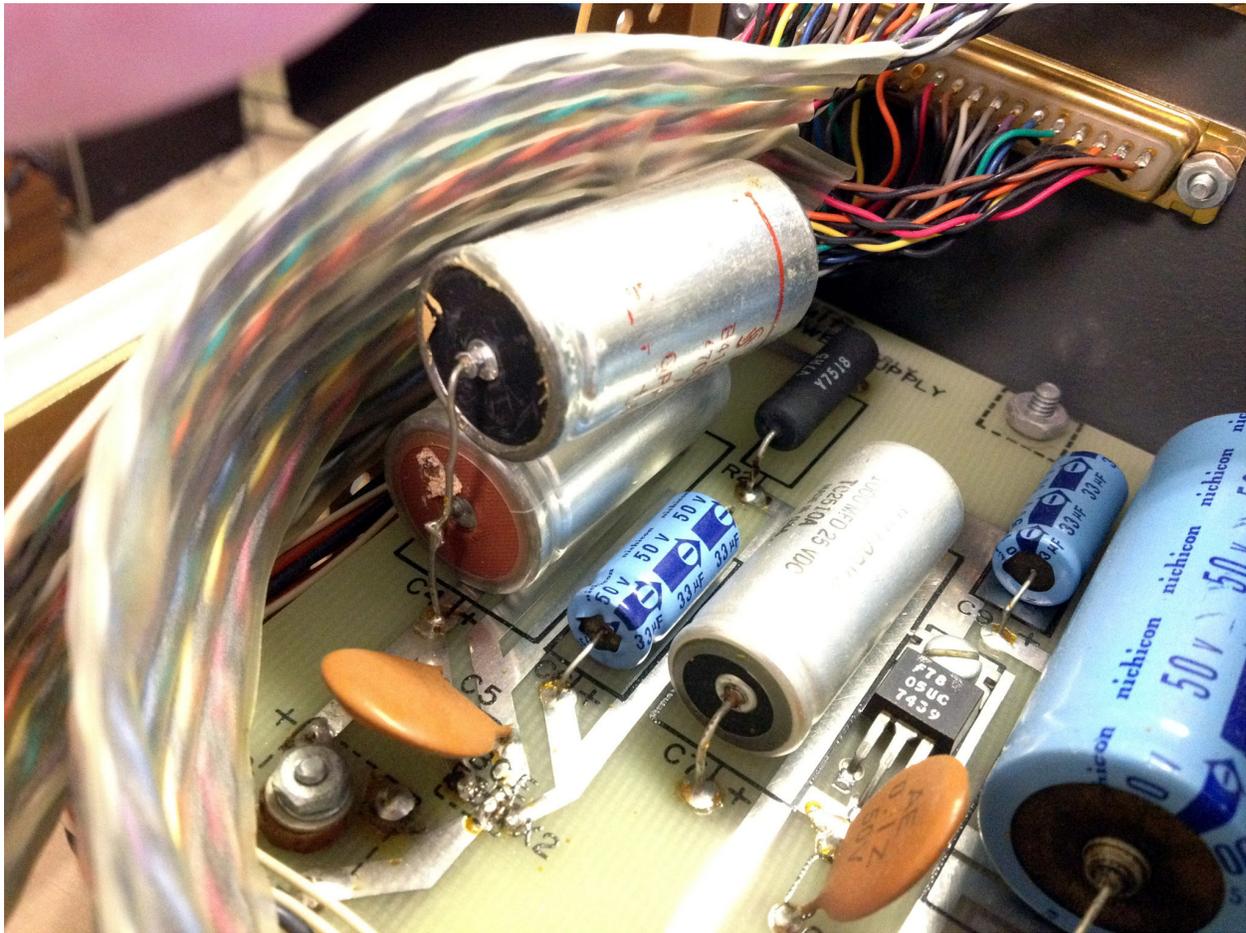
The drive is attached with four screws, but one of the two rear screws is longer and left about 1/8" from being tight. This implements the three-point attachment recommended by MITS so that the drive is not subject to torque from the cabinet when it is picked up or moved.

Power Supply Repair

An additional 4700uf capacitor has been soldered in parallel onto the original 3300uf filter cap for the 5 volt supply (see pictures on next page). Both capacitors show signs of leakage, though the 5 volt supply still looks good. I replaced the two capacitors with a single 8200uf capacitor (not shown).

Drive Repair

After blowing out dust and a bit of cleaning, the drive appeared to be in very good shape. Repeated seeking from track 0 to 76 and back was smooth and quiet, so I did not apply lube to the worm gear. The head needed cleaning and the head pad was worn to almost nothing. I cleaned the head with alcohol and replaced the head pad with a hand punched felt pad.



Original 5v Filter Caps

Drive Alignment

The drive PCB and test points required for drive alignment are on the bottom of the drive. To access the PCB, I placed the entire chassis on its edge, resting on two 2x4's so that the side extrusion dropped into the gap between the two boards. To access the test points required for drive alignment, the drive has to be moved forward several inches in order to clear a cross support across the bottom of the chassis. I slipped a 4 inch section of a 2x4 under the back corner of the drive to keep the drive roughly level.

This drive uses an older version of the PCB and schematic than the ones shown in the drive manual that is available on the Internet. The drive uses the 600191/190 PCB and schematic. Note: Numerous versions of the FD-400 and FD-510 schematics are available via the "Downloads" link at <http://Deramp.com>. Browse to /floppy_drives/pertec/Pertec 8in Schematics.

The test points for drive alignment differ than those specified in the on-line drive manual. For the 600191 assembly, TP14 is index, TP3 and TP5 are differential read data, and TP35 is ground.

Unlike later versions of the 8" Pertec drives, this version does not have pry points for adjusting index alignment. Instead, I had to loosen the index bracket enough to manually slide the bracket towards the center of the cabinet (moves timing too far negative), then tighten the bracket a bit,

then with the blade of a screwdriver on a edge of the index bracket, gently tap the screwdriver handle with a hammer to move timing back to the required +40us timing. Be very careful since the screwdriver can slip off and damage the alignment disk!

The index timing for this drive could not be perfectly adjusted. If the index skew between track 1 and 76 is zeroed, then index alignment cannot be adjusted more positive than about -80us. At this point, the bracket allows no further adjustment in the required direction. Index timing is spec'd at 40us +/-40us, so as adjusted, this drive is off by -120us. As expected, this causes occasional interchangeability issues with other drives.

I attempted to move the hub motor in the direction required to make the index timing more positive, but the motor was already positioned to that side of its mounting holes.

Index timing can also be changed by prying the stepper motor left or right. Unfortunately, this changes index skew which leaves index timing on track 1 different than on track 76. However, by using this technique, I was able to achieve index timing of 0us at track 1 and 80us at track 76. This puts the entire disk very close to the 40us +/-40us specification. As expected, this technique requires iterative adjustment of radial alignment each time the motor is pried left or right.

Motor Spinning Mod

The proto-board added for the motor-spinning mod is shown to the right. This board taps into +5 (red), ground (black), sector pulses (white), and the power LED anode (green).

When a disk is inserted and spinning, 32 sector pulses, plus one index pulse, go by each revolution. There are six revolutions per second for a total of 198 pulses per second. The 7490 on the board divides this by ten and modulates the power LED via its anode at 19.8hz. If the disk stops spinning (or no disk is inserted but the door is closed), the power light is steady on.

This is not a MITS supplied mod, and it did not appear any issues of "Computer Notes," however this is the second drive I've seen with the same modification in place.

