

Floppy disk drives

Models

Many 5/25" floppy drives are compatible with the TI-99/4A disk controller. Here are a few examples:

Texas Instruments PHP1250
Magnetic Peripherals BR8B1A
Mitsubishi M4851-362U
MPI 51 & 52
Pertec FD200
Qumetrak 142
Remex RFD480
Shugart 400L, 450
Siemens 82, FDD100-5
Tandon TM65-2, Tm100-2A
Wango 82

Connection cable

The connection cable follows a standard convention:

#	I/O	Name	Function
2		?	(used on PCs, for 1.44 MB drives)
4		-	not used
6	>	SEL4	Select DSK4 (not on original TI FDC)
8	<	INDEX	Index pulse (hole in floppy detected)
10	>	SEL1	Select DSK1
12	>	SEL2	Select DSK2
14	>	SEL3	Select DSK3
16	>	STROBE	Motor on
18	>	DIR	Direction to step at (0=out, 1=in)
20	>	STEP	Step by one track
22	>	WDATA	Data output
24	>	WGATE	Enable data output
26	<	TRACK0	Track 0 reached
28	<	WPROTECT	Write protection detected
30	<	RDATA	Data input
32	>	SIDE	Side selection
34		-	not used

All odd numbered pins are connected to ground

So that you don't have to set your drive number yourself, Texas Instruments provided small connectors that redirect the SEL1, SEL2 and SEL3 lines, in the following way:

Controller	Drive 1	Connector	Drive 2	Connector	Drive 3
SEL1	>----- SEL1	----- ,-----	SEL1	----- ,-----	SEL1
SEL2	>----- SEL2	----- ' ,-----	SEL2	----- ' ,-----	SEL2
SEL3	>----- SEL3	----- ' -----	SEL3	----- ' -----	SEL3

See how it works? All drives are set to react to SEL1, but for the second drive SEL1 is actually connected to the SEL2 line. Similarly, for the last drive, SEL1 is actually connected to the SEL3 line. This technique is known as "wire twisting".

Terminal resistor pack

Some of the connection lines require a pull-up resistors: SEL1, SEL2, SEL3, STROBE, DIR, SETP, WDATA and WGATE. For reasons that are not very clear to me, the pull-up resistors must be located at the far end of the cable, i.e. in the last drive in the chain. This means that this drive MUST ALWAYS BE TURNED ON, even if you are not actually using it. Otherwise signals will not carry properly.

Normally, all drives come out of factory with a resistor pack installed. However, we cannot

leave the pack in place in each drive as this would pull up the lines too strongly and may damage the controller card. Therefore, you MUST remove the resistor pack from each drive but the last one in the chain. Let me mellow that: in fact, this depends on the value of the resistor. Most drives use 150 ohm resistor, and having more than 1 pack installed may damage the card, but some manufacturers (e.g. TEAC) use 500 ohm resistors and these can be left in place without any risk of damaging the controller (three 500 ohms resistors in parallel add up to 167 ohms).

Most of the time, the resistors come in the form of a DIP pack (dual-in-line) that looks like a small integrated circuit. It is generally installed on a socket, so you can remove it easily. Make sure you save it, in case you want to reinstall it later...

Shunt pack / DIP switch

As floppy disk drives were built to work on many different systems, they can be configured according to the user's needs. Sometimes, this is done by cutting connections on a so-called shunt pack. Occasionally, the shunt pack is replaced with a DIP-switch pack which only requires flipping tiny switches. Finally, you may encounter jumpers, i.e. two small pins connected by a little cap: just remove the cap to open the connection.

The problem is that, even though there is a convention on which options should be made available, each manufacturer does things in a slightly different way, labels the connections with different names, arranges them in a different order, or even splits the pack in several jumpers. Normally, you should see a single 14 or 16-pin pack (or switch) with the following labels:

HL or HS or H: Head loaded by drive selection line.
DS0 or DS1: Drive selected by SEL1.
DS1 or DS2: Drive selected by SEL2.
DS2 or DS3: Drive selected by SEL3.
DS3 or DS4: Drive selected by SEL4.
MX or X: mutiplex. Caution: DS4 and MX are often inverted.
HM or MH or M: Head loaded by the Strobe signal.

In case of doubt, follow the SEL1 connection (pin 10 on the cable) and see where it ends in the shunt pack.

Settings

As mentioned above, all drives should respond to SEL1, because we are using twisted connectors to redirect SEL2 and SEL3 to the SEL1 line. Thus, open all DS connections, except for DS0 (sometimes labelled DS1). If you decide for a straight cable solution (for instance, if you have twin, slim drives) connect the line you want and leave the other three open. Each drive should have one and only one DSx line connected.

HL and HM are mutually exclusive. They determine which signal should cause the magnetic head to be loaded on the disk: the SELx signal or the STROBE signal. Normally, you would want it to be the selection signal, so that only the drive you are accessing loads its head. To this end, connect HL and open HM. However, if you have only one drive, using HM may result in a slightly better performance (in this case, you should also connect MX).

MX determines whether the drive output lines should be enabled by the selection signal (MX open) or be permanently enabled (MX connected). Obviously, when using multiple drives MX should be left open. In a single-drive system, connecting MX may slightly improve the drive performance.

Power connector

The power connector in the drive looks like this (looking inside the drive plug):

```
,---+
|  O  | +12V
|  O  | Gnd (for 12V)
|  O  | Gnd (for 52V)
|  O  | +5V
`----+
```