Disk Interfejsi

- ATA (IDE) ATAPI
- SCSI

ATA

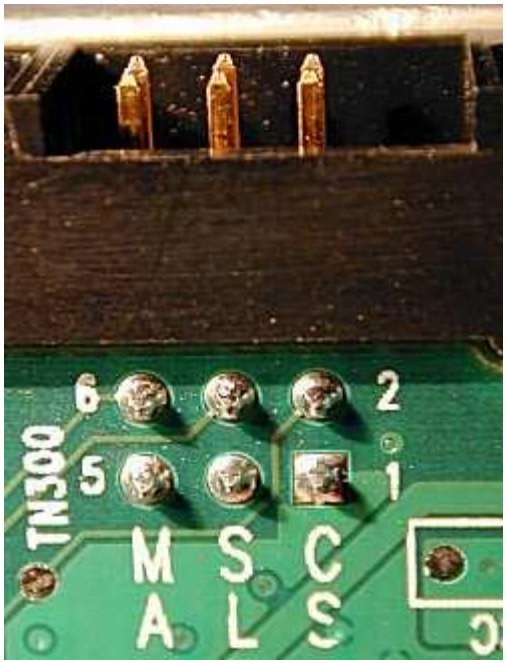
- Parallel ATA (PATA)
- Serial ATA (SATA)

Paralelni ATA

- Paralelni 16 bit disk interface
- Niska cena (Low cost)
- Visoke performanse (High Performances)
- Master/Slave konfiguracija

Figure 5. ATA Configuration With Two Peripheral Devices

- 3 data moda
  - PIO
  - DMA
  - UDMA



System-board architecture for EIDE drives

Recommended IDE Device Configurations

Hard Disks	ATAPI Devices	Notes
1	**0**	This is fairly uncommon today, since almost all systems have at least one optical drive. The best configuration is to use the primary master for the hard disk and disable the secondary controller (to save one IRQ).
1	**1**	The most common default configuration. Unless system resources are very tight, put the hard disk as a single drive on the master channel, and the ATAPI drive on the secondary channel.
2	**1**	The best configuration is to put each device on a separate channel through the use of a third IDE/ATA channel. If only two channels are available, it is generally best to put the fastest drive as a single device on the primary channel, the second hard disk as the master on the secondary channel, and the ATAPI as the slave on the secondary.
1	**2**	This is a common configuration when a second ATAPI device is added to a new system; the best configuration depends on what that device is. In general, put the hard disk by itself and share the secondary channel between the two ATAPI drives. However, if your two drives are a CD-ROM and a CD-RW drive, and you are doing a lot of copying from the CD-ROM drive to the CD-RW, you may have better luck separating those devices onto separate channels.
2	**2**	For optimal performance, buy an add-in controller card and use all four channels for the four devices. If you have three channels, then put the boot drive by itself on the primary channel, and then split the remaining three devices on the secondary and tertiary channels as described in the row just above. If you have only two channels, there are several options. I would put the fastest drive as the boot device on the primary master, and whatever drive is the least used as the slave on that channel. Then put the other two devices on the secondary channel. Avoid putting drives that can't be run in Ultra DMA with the boot device.
3	**1**	Fairly similar configuration to the two rows above. Use four channels if possible. If there are three put the two slowest devices together. If there are only two channels, configure as for the 2+2 option above.
1	**3**	Same as for 3+1 just above.
3	**2**	If you have more than four devices, you will need to add a controller to get a third IDE/ATA channel--or get rid of one of your devices. ;^) The best option is to add a PCI-based IDE/ATA controller card, which will give you four channels. If this is the case, put the three fastest or more used devices on their own channels, and the two slowest devices together. If you have three channels, put the boot drive by itself and split the other four drives up over the remaining two channels as described in the discussion for the 2+2 case.
2	**3**	Same as for 3+2 just above.

Evolucija ATA Interfejsa (Evolution of the ATA Interface)

- **ATA** standard, uveo IBM 1980 godine
- permantni razvoj
- **ATAPI**
  - **(Advanced Technology Attachment Packet Interface)**
  - **je proširenje, koje je omogućilo**
  - **da druge vrste periferala (CD-DVD)**
  - **dele ATA magistralu**

ATA modovi za prenos podataka (ATA Transfer Modes)

- PIO
- DMA
- UDMA

PIO mode

PIO Mode	Cycle Time (nanoseconds)	Maximum Transfer Rate (MB/s)	Defining Standard
Mode 0	600	3.3	ATA
Mode 1	383	5.2	ATA
Mode 2	240	8.3	ATA
Mode 3	180	11.1	ATA-2
Mode 4	120	16.7	ATA-2

DMA Mode

single-word

DMA Mode	Cycle Time (nanoseconds)	Maximum Transfer Rate (MB/s)	Defining Standard
Single Word Mode 0	960	2.1	ATA
Single Word Mode 1	480	4.2	ATA
Single Word Mode 2	240	8.3	ATA

multi-word

DMA Mode	Cycle Time (nanoseconds)	Maximum Transfer Rate (MB/s)	Defining Standard
Multiword Mode 0	480	4.2	ATA
Multiword Mode 1	150	13.3	ATA-2
Multiword Mode 2	120	16.7	ATA-2

UDMA

- maximum transfer rates:

Ultra DMA Mode	Cycle Time (nanoseconds)	Maximum Transfer Rate (MB/s)	Defining Standard
Mode 0	240	16.7	ATA/ATAPI-4
Mode 1	160	25.0	ATA/ATAPI-4
Mode 2	120	33.3	ATA/ATAPI-4
Mode 3	90	44.4	ATA/ATAPI-5
Mode 4	60	66.7	ATA/ATAPI-5
Mode 5	40	100.0	ATA/ATAPI-6?

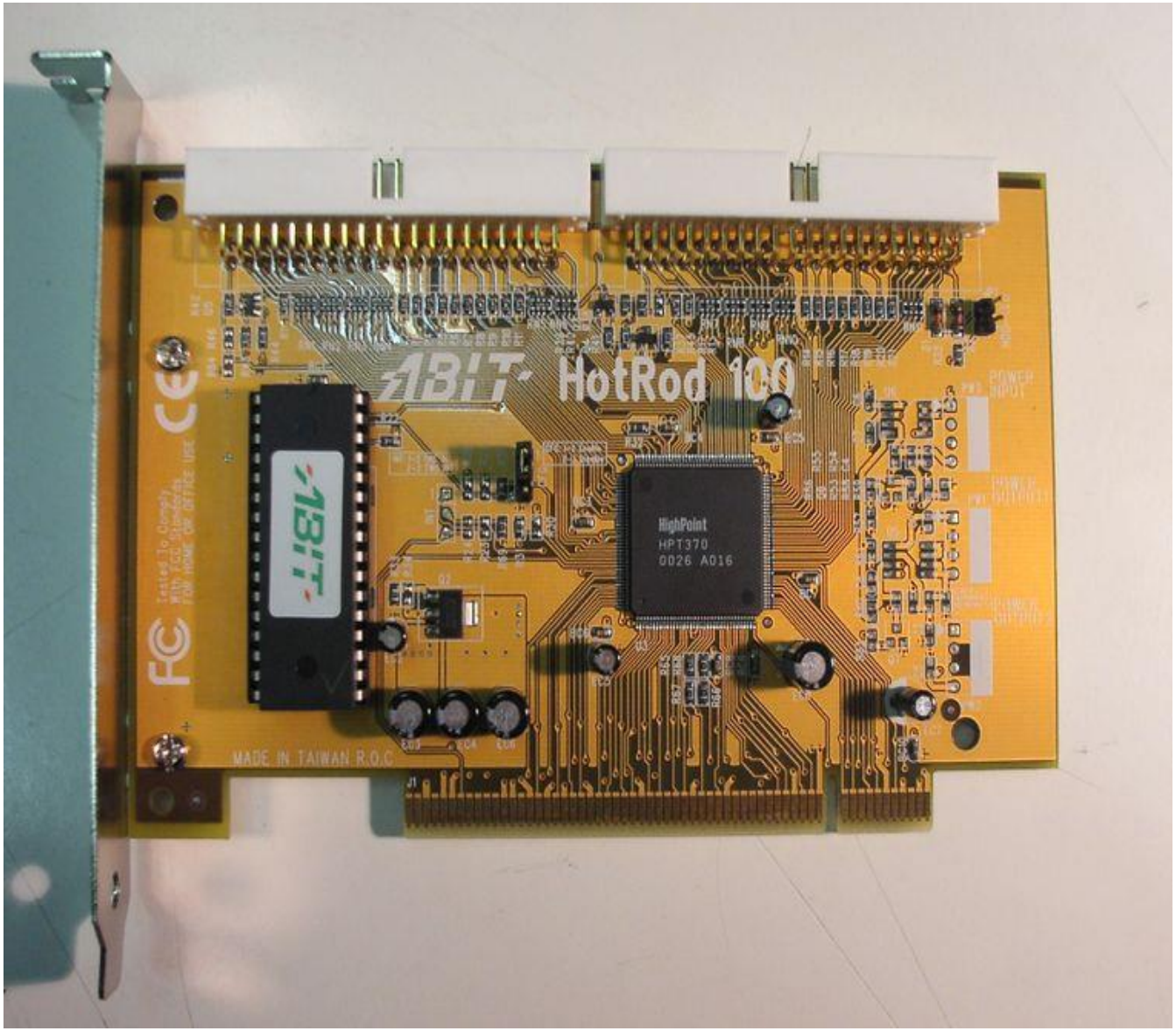
Istorija PATA

History of parallel ATA

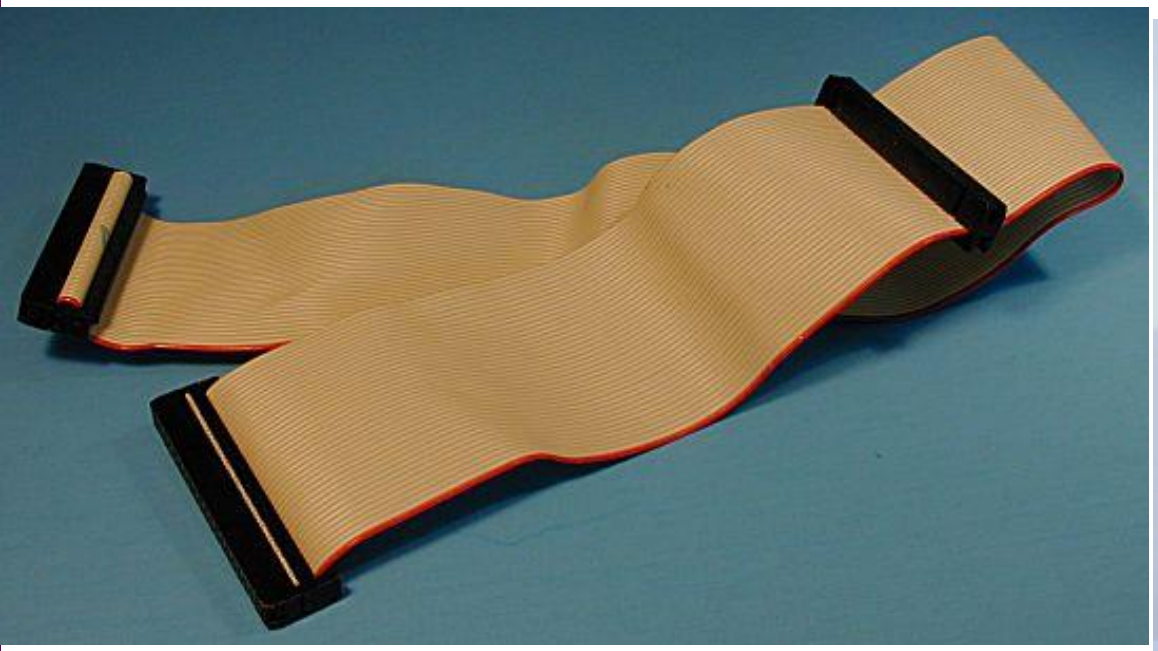
Generation	Standard	Year	Speed	Key features
IDE		1986		Pre-standard
	ATA	1994		PIO modes 0-2, multiword DMA 0
EIDE	ATA-2	1996	16 MB/sec	PIO modes 3-4, multiword DMA modes 1-2, LBAs
	ATA-3	1997	16 MB/sec	SMART
	ATA/ATAPI-4	1998	33 MB/sec	Ultra DMA modes 0-2, CRC, overlap, queuing, 80-wire
Ultra DMA 66	ATA/ATAPI-5	2000	66 MB/sec	Ultra DMA mode 3-4
Ultra DMA 100	ATA/ATAPI-6	2002	100 MB/sec	Ultra DMA mode 5, 48-bit LBA
Ultra DMA 133	ATA/ATAPI-7	2003	133 MB/sec	Ultra DMA mode 6

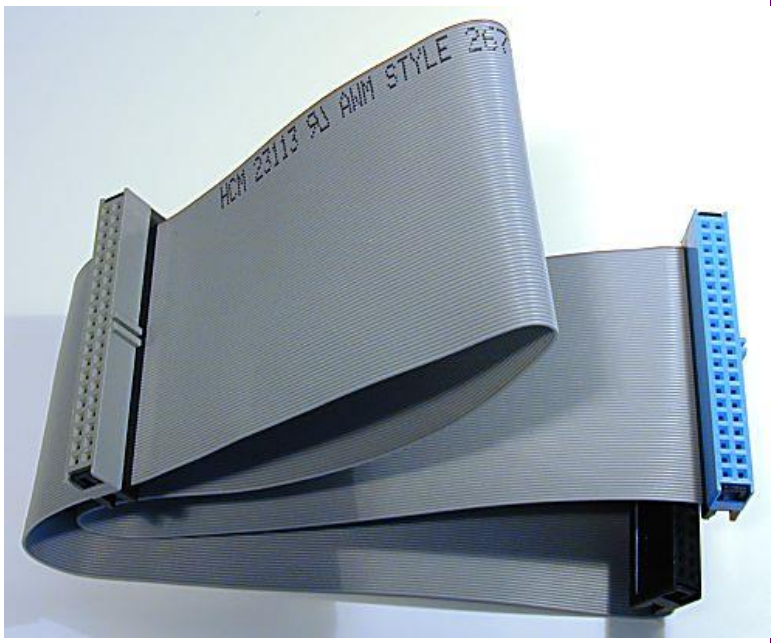
PATA kontoleri

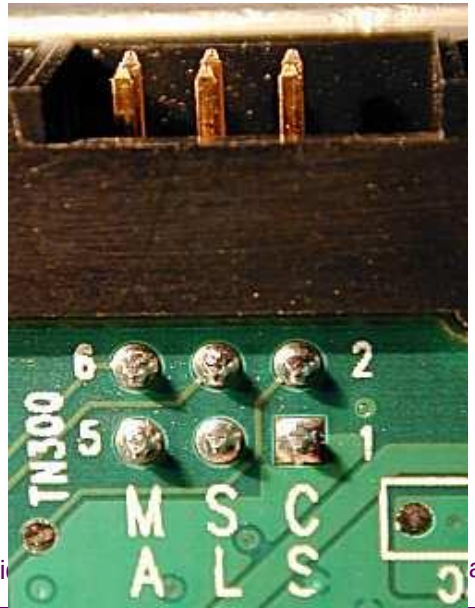
PATA kontroler kao PCI kartica



PATA kablovi







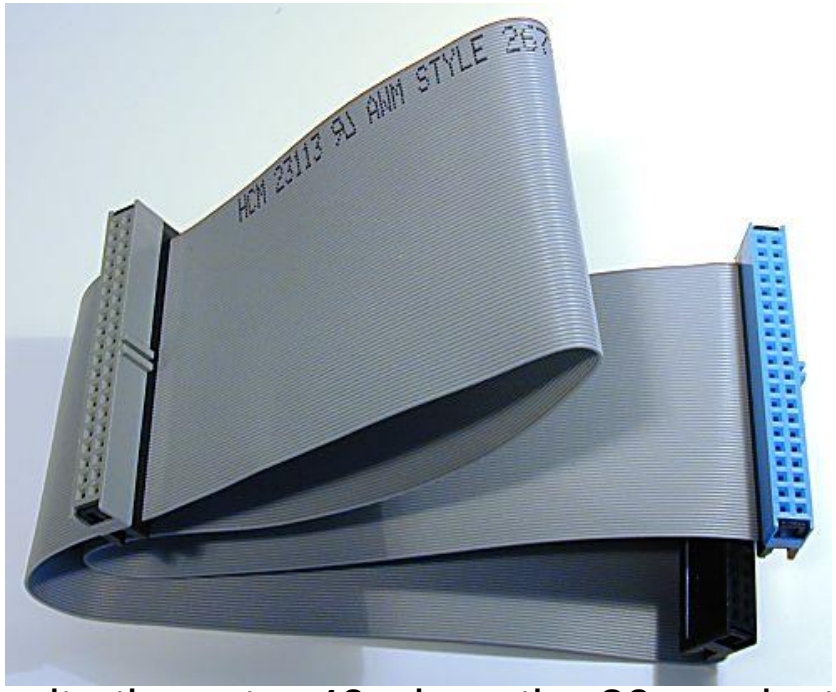
IDE/ATA Connectors and Signals

- The table below lists the names of the signals, along with the pin number of the standard connector that each uses:

Pin #	Signal	Pin #	Signal
1	-RESET	**2**	GROUND
3	DD7	**4**	DD8
5	DD6	**6**	DD9
7	DD5	**8**	DD10
9	DD4	**10**	DD11
11	DD3	**12**	DD12
13	DD2	**14**	DD13
15	DD1	**16**	DD14
17	DD0	**18**	DD15
19	GROUND	**20**	(key)
21	DMARQ	**22**	GROUND
23	-DIOW: STOP	**24**	GROUND
25	DIOR:-HDMARDY:HSTROBE	**26**	GROUND
27	IORDY:-DDMARDY:DSTROBE	**28**	CSEL
29	-DMACK	**30**	GROUND
31	INTRQ	**32**	(reserved)
33	DA1	**34**	-PDIAG:-CBLID
35	DA0	**36**	DA2
37	-CS0	**38**	-CS1
39	-DASP	**40**	GROUND

Ultra DMA (80-Conductor) IDE/ATA Cables

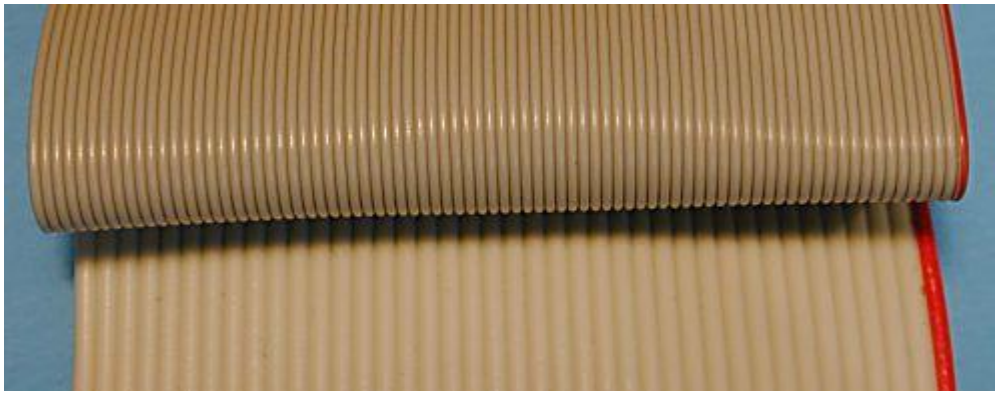
- A standard 80-conductor Ultra DMA IDE/ATA interface cable.
  Note the blue, gray and black connectors, and the 80 thin wires.
  The red marking on wire #1 is still present (but hard to see in this photo.)



- **Width:** Despite the extra 40 wires, the 80-conductor cable is about the same width as a 40-conductor cable--which is good, because the current width is difficult enough to work with. :^) This bit of "magic" is accomplished by using thinner, lower-gauge wires within the cable.

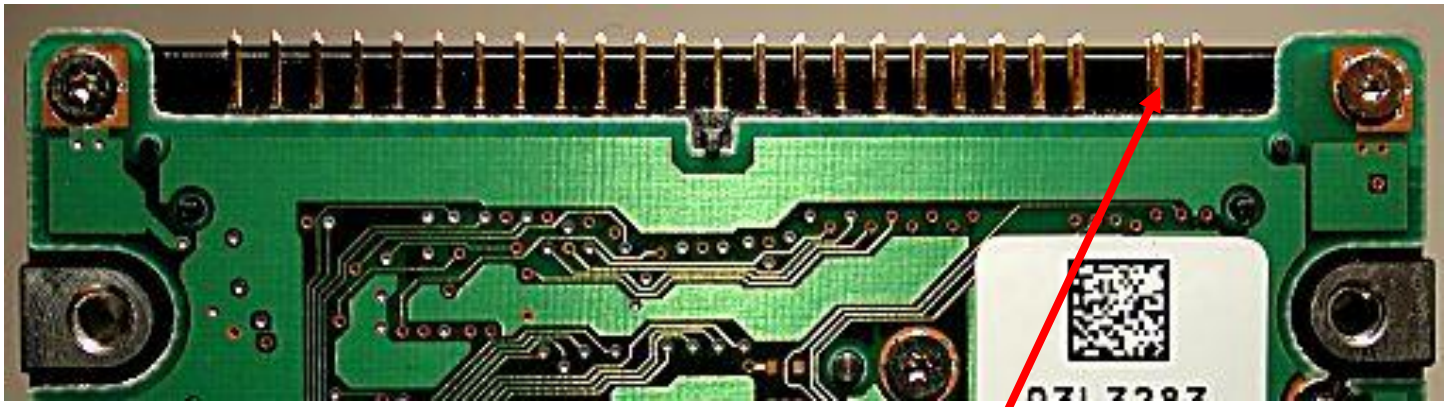
Ultra DMA (80-Conductor) IDE/ATA Cables

- A comparison of the wires used in 80-conductor and 40-conductor cables. The 80-conductor cable is about the **same width** as the older style because thinner gauge wires are used to make up the ribbon.



- Aside from the above, the cable can be treated the same way as a 40-conductor cable. Since it is of higher quality, it can be used in place of a 40-conductor cable in older systems without any issues. However, it does *not* directly replace a 40-conductor cable select cable. Note also that the 18" length restriction associated with the original 40-conductor cable applies to this variation as well.

Notebook IDE/ATA Configuration



- Underside of a 2.5" form factor notebook hard drive. You can see the main connector, with its **two rows of 22 pins** (the second row is hard to see). On the right are two more pins which are used for **jumpers**.

- Notebooks are of course very limited in space, so "expansion" is usually not an option, at least not using the built-in IDE/ATA interface. The hard disk usually is assigned as the single device on the primary IDE/ATA channel, and the drive's optical drive (if any) assigned to the secondary. There's no way to decide to add a second device to these channels on a typical notebook. Expanding a notebook to add a second hard disk is usually done using one of the specialty interfaces such as USB or PCMCIA

Tipičan predstavnik PATA diskova

Specifications

Capacity	100GB, 160GB, 300GB, 500GB
Interface	ATA/EIDE
Average Seek Time*	<9.3ms
Rotational Speed	7200 RPM
Data Transfer Rate*	up to 100MB/sec
Cache Buffer	16 MB
Compatibility	Mac & PC
Standard Warranty	3 years

Primeri za razumevanje

- **PRIMER ZA VEŽBU BR. 1**
  - PATA diskovi
- **PRIMER ZA VEŽBU BR. 2**
  - PATA taktovi i brzine prenosa

PRIMER BR. 1
< PATA diskovi >

- **Date su karakteristike jednog realnog PATA diska**.

DiamondMax® Plus 8	
maximum Capacity of 40.0 GB	40.0 GB
average seek time	10ms
rotational speed	7,200 rpm
media speed	42MB/s
disk interface	Parallel ATA-133
maximum disk buffer throughput	133 MB/sec
disk buffer	2 MB

- Imate 2 takva diska vezana u konfiguraciji Primary master, primary Slave.
- Pristigla su 2 zahteva, za svaki disk po jedan
- **disk #1:** sa adrese (cilindar 15, head 0, sektor 13), pročitati 10 sektora
- **disk #2:** sa adrese (cilindar 940, head 2, sektor 1), pročitati 40 sektora

PRIMER BR. 1
< PATA diskovi >

- a) odrediti ukupno vreme trajanja oba disk pristupa bez preklapanja media i interface faze

- b) odrediti ukupno vreme trajanja oba disk pristupa, ako se diskovi povežu u konfiguraciji primary master, secondary master

PRIMER BR. 1
< PATA diskovi >

- a) Podjimo od paralelnog ATA kanala, konfiguracija master slave:

Figure 5. ATA Configuration With Two Peripheral Devices

- ATA kanal ili ATA magistrala je single-task orijentisana, dozvoljava samu jednu disk operaciju u jednom trenutku.
- Ako su oba diska na istom kanalu, moguća je samo disk operacija u jednom trenutku.
- Prvo se izvrši jedna komanda, pa tek onda druga.

PRIMER BR. 1
< PATA diskovi >

- a) Primary master, primary slave konfiguracija
- nema preklapanja,
- prvo se uradi jedna disk operacija
- a nema prekplapanja faza,
- svaka faza u disk transferu se radi pojedinačno

- **Ttotal=Taccess1 + Taccess2**

- disk #1: sa adrese (cilindar 15, head 0, sektor 13), pročitati 10 sektora
- Taccess1 = Tseek1 + Trotate1 + Tmedia1 + Tinterface1
- Tseek1 = 1 x average seek time = 10 msec
- Trotate1 = Trotate_avg(7200rmp) = 4.1 msec
- Tmedia1 = Q/Vmedia=10x0.5KB/42MB/s= 0.119 msec
- Tinteface1=Q/Vinterface=10x0.5KB/133MB/s= 0.038msec
- Taccess1= 14.257msec

PRIMER BR. 1
< PATA diskovi >

- a)
- disk #2: sa adrese (cilindar 940, head 2, sektor 1), pročitati 40 sektora

- Taccess2 = Tseek2 + Trotate2 + Tmedia2 + Tinterface2
- Tseek2 = 1 x average seek time = 10 msec
- Trotate2 = Trotate_avg(7200rmp) = 4.1 msec
- Tmedia2 = Q/Vmedia=40x0.5KB/24MB/s= 0.476msec
- Tinteface2=Q/Vinterface=40x0.5KB/133MB/s= 0.150msec
- Taccess2= 14.726msec

- **Ttotal=Taccess1 + Taccess2= 14.257 + 14.726 = 28.983msec**

PRIMER BR. 1
< PATA diskovi >

- b) 2 PATA diska se mogu mnogo bolje povezati, kao masteri na oba ATA kanala
- primary master

- secondary master

- U tom slučaju, 2 ATA kanala su multi-tasksing orijentisana, svaki radi nezavisno, tako sa se 2 disk pristupa mogu istovremeno odvijati

PRIMER BR. 1
< PATA diskovi >

- b) Primary master, secondary master konfiguracija
- disk operacije se preklapaju, obe se rade istovremeno
- **Ttotal=Max(Taccess1, Taccess2)**
- disk #1: sa adrese (cilindar 15, head 0, sektor 13), pročitati 10 sektora

- Taccess1 = Tseek1 + Trotate1 + Tmedia1 + Tinterface1
- Tseek1 = 1 x average seek time = 10 msec
- Trotate1 = Trotate_avg(7200rmp) = 4.1 msec
- Tmedia1 = Q/Vmedia=10x0.5KB/42MB/s= 0.119 msec
- Tinteface1=Q/Vinterface=10x0.5KB/133MB/s= 0.038msec
- Taccess1= 14.257msec

PRIMER BR. 2
<PATA taktovi i brzine prenosa >

- **PATA ima osnovni takt od 25MHz. Odrediti koji je to PATA.**

- Rešenje:
- Prvo ćemo da odredimo maksimalnu brzinu za UDMA, poštujući osnovne činjenice
  - UDMA prenosi podatke na obe ivice takta, što znači, 2 reči u jednom taktu
  - ATA je 16 bitni interfejs, u taktu se prenosi 2x16 bita

- Na osnovu toga dolazimo do formule
- **Ultra ATA transfer rate=**
- **25MHz strobe**
- **x 2 for double data rate clocking**
- **x 16 for bits per edge**
- **/ 8 bits per byte**
- **=** **100 Mbytes/sec**

- **Brzina transfera ovog PATA interfejsa je 100MB/s**
- **To PATA 100**

PRIMER BR. 2
<PATA taktovi i brzine prenosa >

- **Odrediti osnovni UDMA takt za PATA 133**
- Rešenje:
- **Prvo ćemo poći od formule**

- **V=(Frequency x 2 x 16)/8**

- **Ultra ATA transfer rate=**
- **X MHz strobe**
- **x 2 for double data rate clocking**
- **x 16 for bits per edge**
- **/ 8 bits per byte**
- **= 133 Mbytes/sec**

- **Frequency= 8xV / (2x16) = 8x133/32=33MHz**