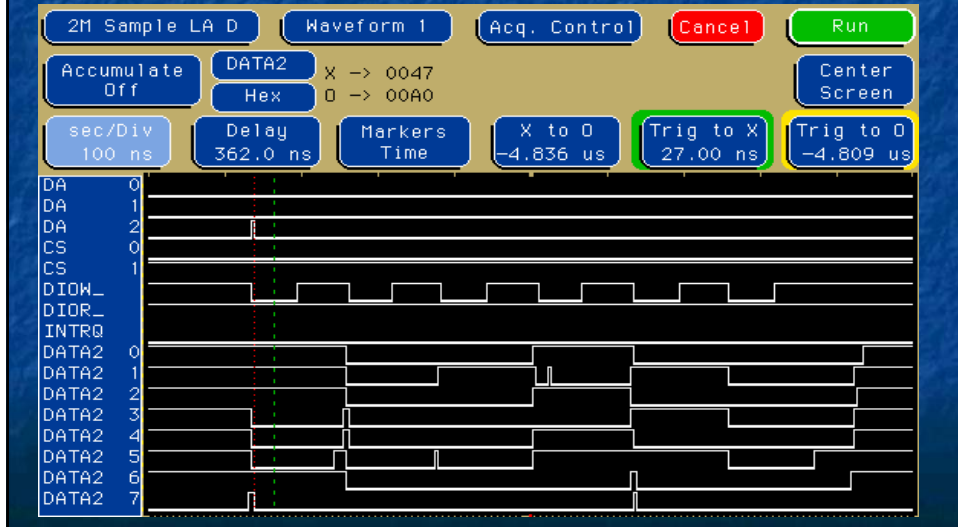


## Checkpoint #2 ATAPI Controller



## ATA Command Block

Register	7	6	5	4	3	2	1	0
Features								
Sector Count								
Sector Number								
Cylinder Low								
Cylinder High								
Device/Head								
Command	Command Code							

NOTE – na indicates the content of a bit or field is not applicable to the particular command. Obs indicates that the use of this bit is obsolete.

- Seven bytes long
- Normally write parameters in to the registers first
- Write the command code last
- Written 8 bits at a time in the lower half of DD[0:15]

# The PACKET command

Register	7	6	5	4	3	2	1	0
Features	na	na	na	na	na	na	OVL	DMA
Sector Count	Tag					na		
Sector Number	na							
Byte count low (Cylinder Low)	Byte count limit (7-0)							
Byte count high (Cylinder High)	Byte count limit (15-8)							
Device/Head	obs	na	obs	DEV	na	na	na	na
Command	A0h							

- Introduced to expand aging ATA drive control spec
- Prepares the device to accept an **ATAPI command packet**
- The **PACKET** command doesn't need registers set up before it is sent

# Addressing ATA registers

Table F.4 – Register functions and selection addresses except PACKET and SERVICE commands.

Addresses					Functions	
CS0-	CS1-	DA2	DA1	DA0	Read (DIOR-)	Write (DIOW-)
N	N	x	x	x	Released	Not used
<b>Control block registers</b>						
N	A	N	x	x	Released	Not used
N	A	A	N	x	Released	Not used
N	A	A	A	N	Alternate Status	Device Control
N	A	A	A	A	Obsolete(see note)	Not used
<b>Command block registers</b>						
A	N	N	N	N	Data	Data
A	N	N	N	A	Error	Features
A	N	N	A	N	Sector Count	Sector Count
A	N	N	A	A	Sector Number	Sector Number
A	N	A	N	N	Cylinder Low	Cylinder Low
A	N	A	N	A	Cylinder High	Cylinder High
A	N	A	A	N	Device/Head	Device/Head
A	N	A	A	A	Status	Command
A	A	x	x	x	Released	Not used

Key:  
A = signal asserted      N = signal negated      x = don't care  
NOTE – This register is obsolete. It is recommended that a device not respond to a read of this address.

## Command Address

CS0- = 0

CS1- = 1

DA0 = 1

DA1 = 1

DA2 = 1

- CS0- and CS1- are active low
- They are asserted (A) when they are zero

# 40 SIGNALS ?!?!

Table A.3 – 40-pin I/O connector interface signals

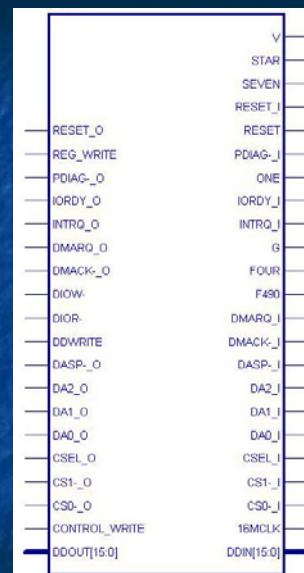
Signal name	Connector contact	Conductor		Connector contact	Signal name
RESET-	1	1	2	2	Ground
DD7	3	3	4	4	DD6
DD6	5	5	6	6	DD9
DD5	7	7	8	8	DD10
DD4	9	9	10	10	DD11
DD3	11	11	12	12	DD12
DD2	13	13	14	14	DD13
DD1	15	15	16	16	DD14
DD0	17	17	18	18	DD15
Ground	19	19	20	20	(unused)
DMARQ	21	21	22	22	Ground
DIOW-STOP	23	23	24	24	Ground
DIOR-HCMARDY- -HSTRCBE	25	25	26	26	Ground
IORDY-GOMARDY- -DSTRCBE	27	27	28	28	CSEL
DMACK-	29	29	30	30	Ground
INTRQ	31	31	32	32	Clockrate (user select)
DA1	33	33	34	34	PDIAG-C-Block
DA0	35	35	36	36	DA2
CS0-	37	37	38	38	CS1-
DASP-	39	39	40	40	Ground

NOTE - Pin 32 was defined as KCS16 in ATA-2, ANSI X3.276-1996.

Figure A.3 – 40-pin IO header mounting

Be really careful with the wire wrapping

BIG I/O  
Block  
and  
Test Bit File  
(our gifts to you)



# The ATAPI Command Packet

Table 76 - PLAY AUDIO MSF Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (47h)							
1	Reserved							
2	Reserved							
3	Starting M Field							
4	Starting S Field							
5	Starting F Field							
6	Ending M Field							
7	Ending S Field							
8	Ending F Field							
9	Reserved							
10	Reserved							
11	Reserved							

- 12 bytes
- Written 16 bits at a time on DD[0:15]
- M = minutes
- S = seconds
- F = frame (1/75<sup>th</sup> second)

## The 4 tasks:

- Wire wrap board
- Implement ATAPI commands
- Create TOC
- Make real time



# Implement CD controls



## Required Commands:

- Play
- Next Track
- Previous Track
- Stop
- Pause / Resume
- Eject

## Three ATAPI commands

- PLAY AUDIO MSF  
47h
- START / STOP UNIT  
1Bh
- PAUSE / RESUME  
4Bh

## Table of Contents

- Pick a CD to hard code the track beginning times in MSF format
- Pick a CD that you won't mind hearing the first song 10,000 times
- Keep a record of present track
- We can use the TOC to jump to the next and previous tracks

## Real Time

- Replace the existing "random time"
- Create a counter that counts @ 1 Hz
- $0.953674 \text{ Hz} = 16\text{MHz} / 2^{24}$
- Elapsed time since beginning of track
- Resets to zero with STOP
- Pauses with PAUSE

## TONS OF REDUNDANT DATA

- Think about how to encode your commands to minimize space

## TIPS

- Buy an IDE cable and leave it on your board
- Buy a ZIP disk at IEEE and back up your project to it every day
- Learn to put signals out to pins and look at them on the logic analyzer

# The End

- Demo cable pins
- GOOD LUCK !!!!!!!