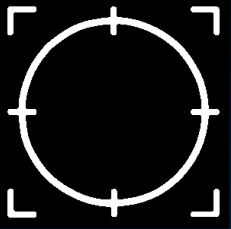


CD Overview - Part One



Ben Fawcett
Developer Support Engineer
S.C.E.E.





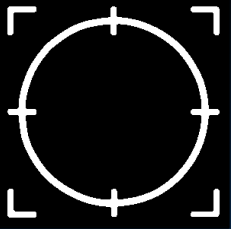
Covered topics

Functionality

Speed Considerations

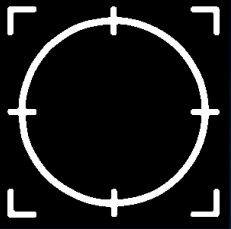
CD Errors

Multi-CD Games



Functionality

- ▶ Play Music
 - ▶ XA-ADPCM
 - ▶ CD-DA
- ▶ Streaming
 - ▶ Movies - CD Overview : Part Two
 - ▶ Data / World



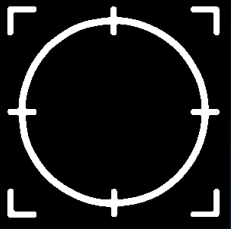
Play Music

➤ ADPCM

- Compressed 8X to 32X
- Easy to do: See `\PSX\SAMPLE\CD\TUTO\TUTO5.C`
- Continued in Sound Seminar

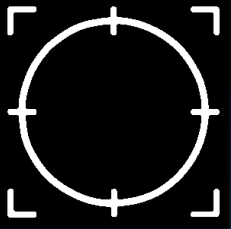
➤ DA / Red Book

- Lossless
- Easy to do: See `\PSX\SAMPLE\CD\TUTO\TUTO4.C`
- Continued in Sound Seminar



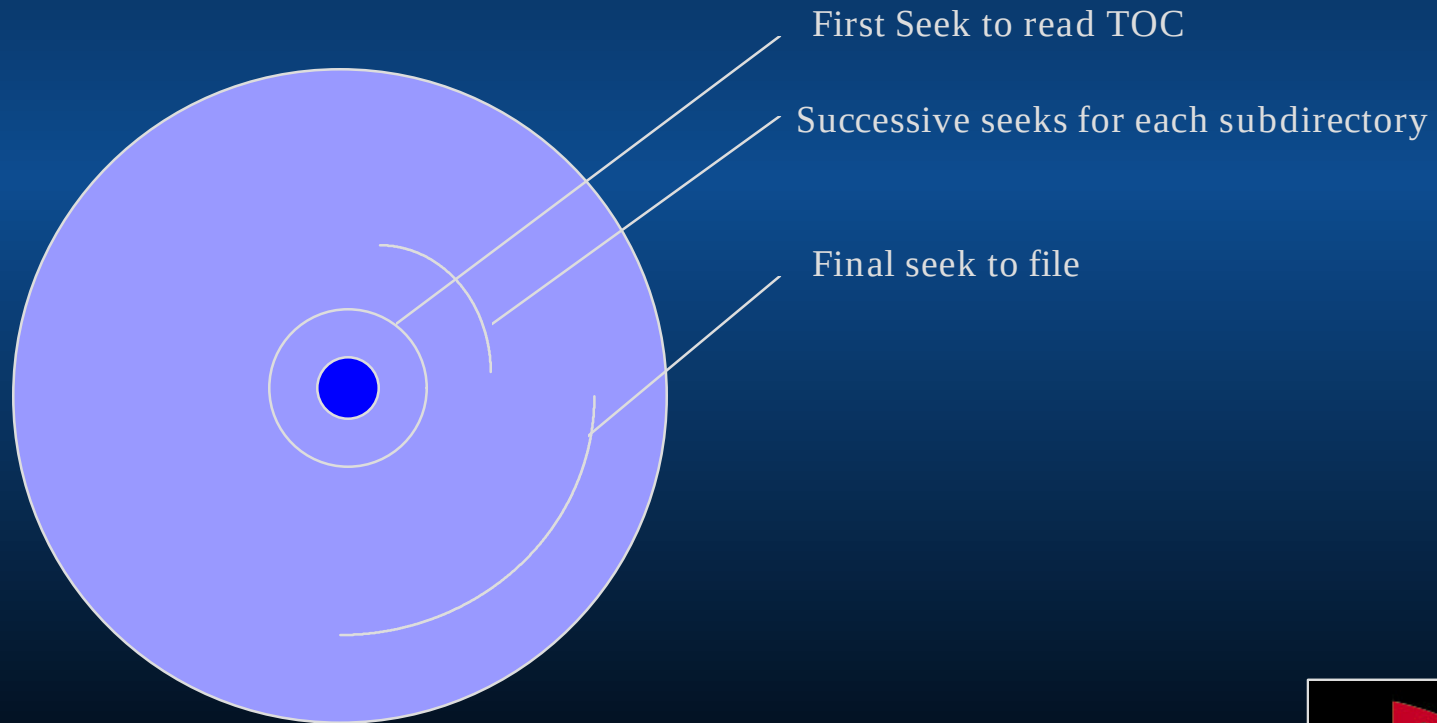
Speed Issues

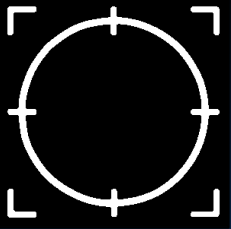
- Minimize seeks / Data organisation
- Read asynchronously
- Avoid speed changes



CdSearchFile vs. Direct Seek

CdSearchFile() has a single directory buffer, which causes it to seek multiple times to go to any file.

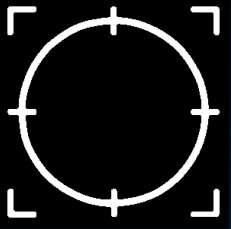




Hard-code file locations - .CCS

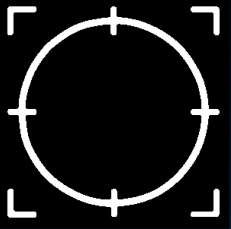
➤ Four easy steps :

- ❶ Use CDGEN to do a layout (works without CDW-900E)
 - Put MAIN.EXE last in track 1 (so size can vary)
 - Save as .CCS file
- ❷ Write/use a utility to create POS.H with position info from CCS file
 - Absolute file location appears on the line following each sourcefile path
- ❸ Compile with POS.H
- ❹ Burn CD / Build emulation image



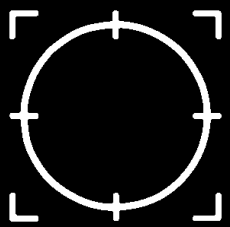
Hard-code File Locations - .MAP

- Can also use Buildcd to generate .MAP file
- Includes more information : size, physical location, logical location
- Paths can be difficult to find without prior knowledge



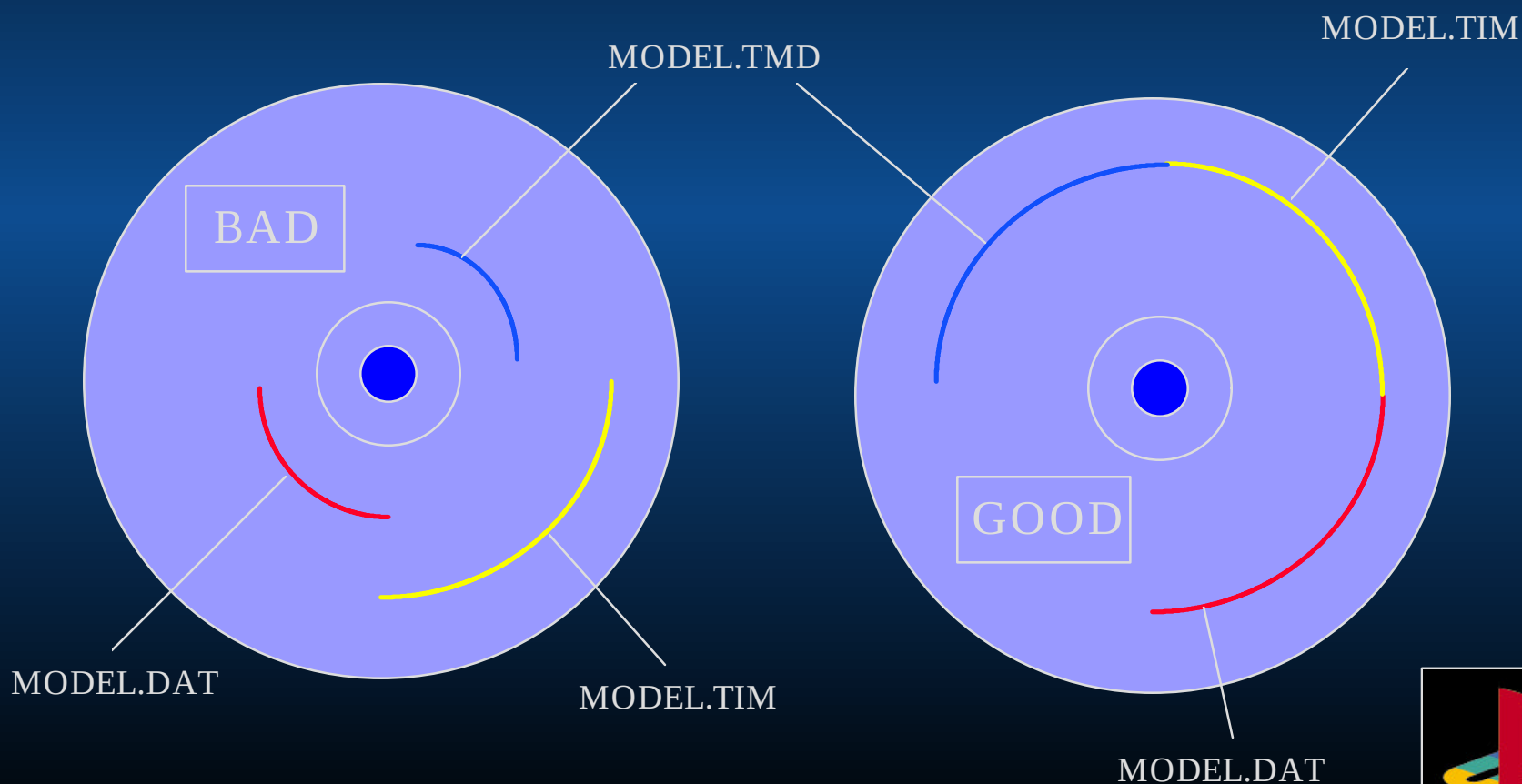
Data Organisation

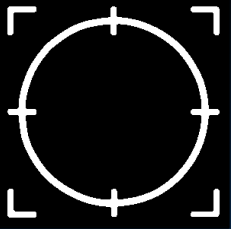
- +/- 100 sector seeks require rotation of CD read head, but not linear motion, so they are much faster than longer seeks
- Optimize data layout to take advantage of this
- Set up data in contiguous blocks



Set data up in contiguous blocks

MODEL.TMD, MODEL.TIM, MODEL.DAT
to be read at same time

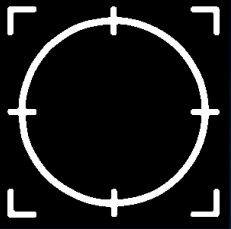




Read asynchronously

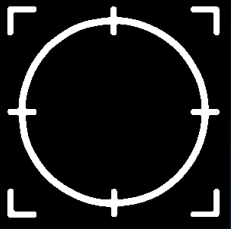
Main loop:

```
...  
ERROR:  
while( CdControl(CdISetloc, (u_char *)&fp.pos, 0) == 0 );  
if( CdRead(nsector, sectbuf[], CdIModeSpeed) == 0 )  
    goto ERROR:  
  
/* Since CdRead() runs in the background, the program can do  
 * another task in the foreground. The current reading status can  
 * be modified in CdReadSync().  
 */  
  
while ((cnt = CdReadSync(1, 0)) > 0)  
{  
    :  
    :  
    /* Foreground routines */  
    :  
    :  
}  
  
if (cnt == -1) goto ERROR:
```



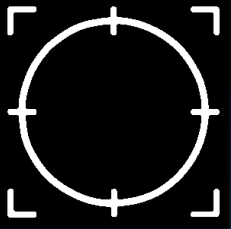
Avoid speed changes

- Spin up and spin down takes a lot of time
 - Avoid using CD-DA with a lot of intermittent CD access
 - Use XA audio at double speed instead
- Do not use CdlStop, use CdlPause instead



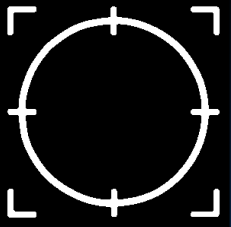
CD Error issues

- Read errors
- Seek errors
 - Retry
 - Overshoot



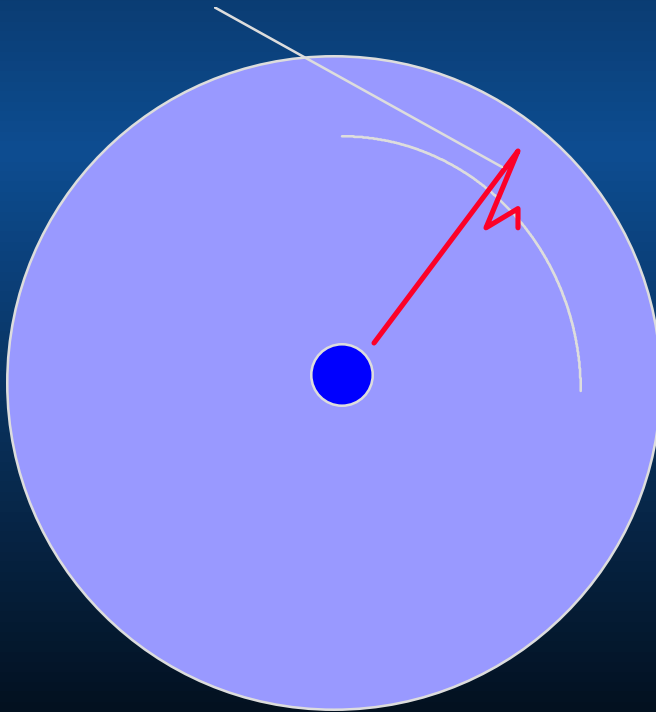
Read Errors

- CdControl() only returns successful acceptance of CD command, not successful completion of CD command
- Bad Strategy:
 - if (CdControl(CdIReadN, pos, result) != 1) goto error;
- Good strategy
 - Set up a watchdog timer in VSyncCallback for retry
 - Example: CdRead waits 8 seconds

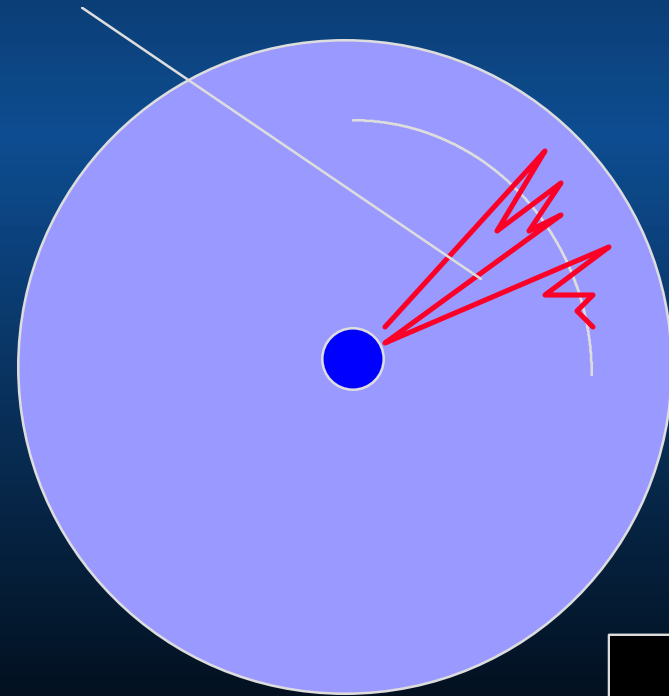


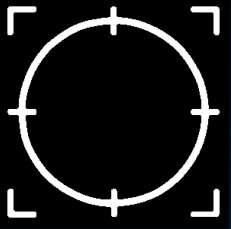
Seek Errors

CD read head can overshoot a few times before success

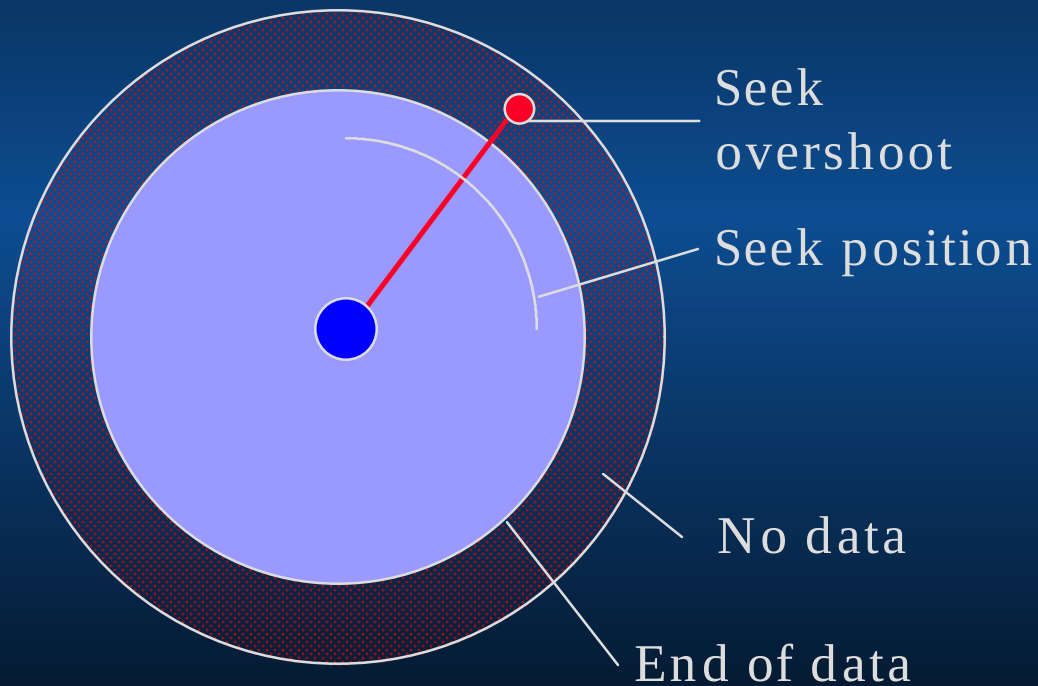


If the seek does not settle within a limited time, the head returns to the center and retries

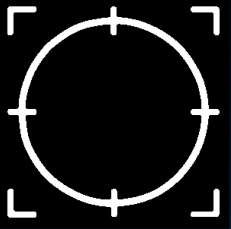




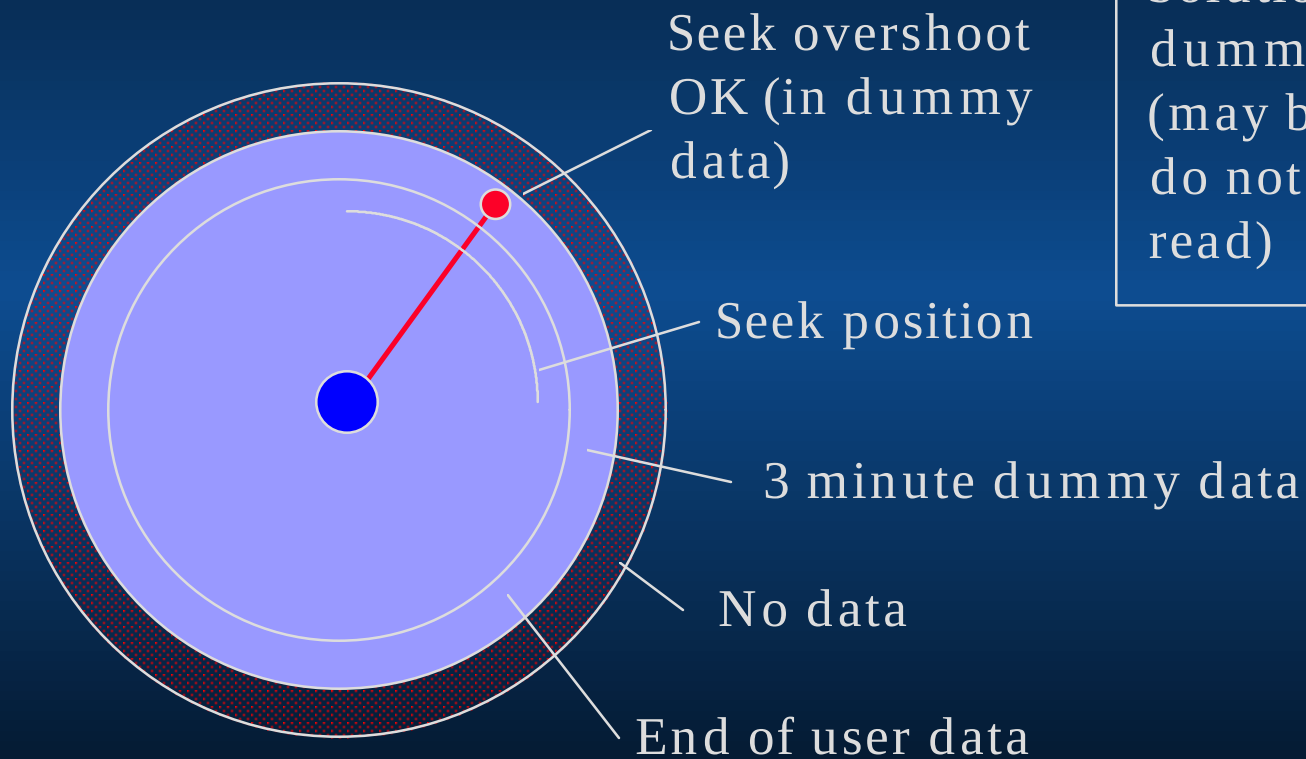
Seek Errors (cont.)



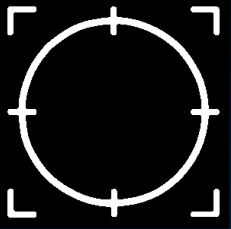
A seek past the end of data is fatal



Seek errors (cont.)

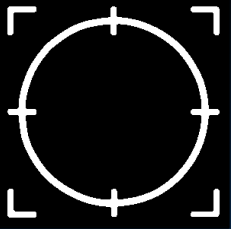


Solution: Put 3 minutes of dummy data at end of CD (may be real data that you do not seek into, but only read)



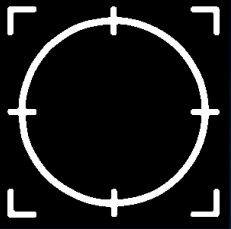
Multi CD games

- When the CD cover is opened, the CD subsystem is put into an indeterminate state
- Two ways to tell when CD subsystem state is restored :
 - ❶ Polling shell open flag then timing
 - ❷ Seeking until a non-error is returned



CD Status Flags

```
/* Status Contents */  
#define CdlStatPlay          0x80    /* playing CD-DA */  
#define CdlStatSeek         0x40    /* seeking */  
#define CdlStatRead         0x20    /* reading data sectors */  
#define CdlStatShellOpen    0x10    /* once shell open */  
#define CdlStatSeekError    0x04    /* seek error detected */  
#define CdlStatStandby      0x02    /* spindle motor rotating */  
#define CdlStatError        0x01    /* command error detected */
```



Polling Shell Open Flag

Psuedocode:

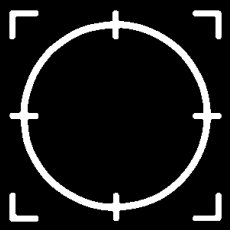
```
// Show "Put in Disk #2..." screen
```

```
while (!(status & CdlStatShellOpen)); // wait for lid to open
```

```
while (status & CdlStatShellOpen); // wait for lid to close
```

```
// Wait for a few seconds
```

```
// Continue ...
```

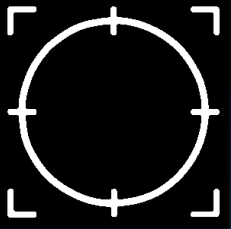


Seeking until non-error returned

Use logical seek, because a physical seek will
be successful for non-PlayStation CDs
If DA CD is anticipated, use physical seek

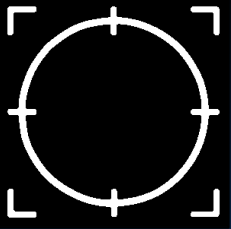
Pseudocode:

```
// Show "Put in Disk #2..." screen  
while (!(status & CdIStatShellOpen)); // wait for lid to open  
while (CdControlB(CdISeekL, pos, 0) == error); // wait for success  
// Continue ...
```



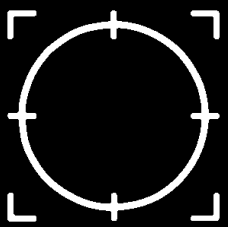
New functionality

- New libraries will include functions which aid in the detection of a second CD
- These include :
 - CdDiskReady()
 - CdGetDiskType()



Summary

- Reduce seeks / loading times
 - Optimise your data layout
 - Use hard-coded file locations
- CD errors will occur
 - Handle them appropriately
- Tomorrow - CD Overview Part Two



The End