## Need some help with 8 inch floppy drive...

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### Chuck(G) — February 23rd, 2017, 10:09 PM

Nope--bitrate depends on the encoding (modulation). FM reserves a clock bit for every data bit. MFM is more complex, but is self-clocking.and doesn't use separate clock bits. The raw maximum signal frequency is the same for both.

http://www.datarecoverytools.co.uk/w...e-10001111.jpg

### MikeS — February 23rd, 2017, 10:15 PM

Quote:

> *Originally Posted by* ***Chuck(G)***
>
> *Nope--bitrate depends on the encoding (modulation). FM reserves a clock bit for every data bit. MFM is more complex, but is self-clocking. The raw maximum frequency is the same for both.*

Sorry, what's the "nope" refer to? I thought I understood FM/MFM and bit rate vs. clock rate, but now my head's starting to hurt.

But to get back OT, the question was should the OP indeed always enter 500K for the Data rate in his various experiments?

### Chuck(G) — February 23rd, 2017, 10:19 PM

My opinion is "yes". Always 500KHz for 8".

### MikeS — February 23rd, 2017, 10:31 PM

Quote:

> *Originally Posted by* ***Chuck(G)***

> *Nope--bitrate depends on the encoding (modulation). FM reserves a clock bit for every data bit.*

---

Not to drag this on longer than necessary, but doesn't FM require **two** clock bits per data bit (which is why the bit rate is 250K vs. clock rate of 500), whereas with MFM they're more or less the same? Or am I now having a problem with clock "bit" vs. clock "rate"?

As I said, my head's starting to hurt...

## Chuck(G)

February 23rd, 2017, 11:18 PM

I find that most folks find the diagram posted above confusing because it traces the **magnetization** direction and not what's seem on reading. If you look at the write stage of most floppy drives, you'll see that it starts with a "T" type flip-flop.

Remember that magnetic recording, with very few exceptions, is a "pulse" technology on the read side. So, in the above diagram, every time the magnetization "flips", the read circuitry will see a pulse. Let's reproduce the diagram again:

http://www.datarecoverytools.co.uk/w...e-10001111.jpg

Armed the information that we see a pulse occurs every time the magnetization changes direction, so let's write a "1" for every clock interval with a pulse and a "0" if there is none.

So for the FM trace we have : 11 10 10 10 11 11 11 11 - note that every data bit is prefixed by a "1" clock bit.

MFM encoding is a bit more involved, as it depends on history of what was recorded--you can't have more than 2 successive cells with no transition/pulses. Further pulses can occur on half-clockimes, but no pulse can ever be closer from the previous one than a whole clock period. A "1" bit is signified by a transition on a half-clock; a transition on a full-clockl boundary and signifies a data clock bit.

You can see that FM has a spectrum with two peaks: t and 2t (for 1 and 0 cells) and MFM has a spectrum of 1, 1.5 and 2t components. The bandpass frequencies are still the same and you can see where MFM might be a bit more susceptible to timing "jitter", which is why most MFM data separators are PLL (or the digital equivalent) stabilized.

I've tried to be as brief as possible and hope I haven't over-simplified things to the point of error.

## MikeS

February 23rd, 2017, 11:48 PM

I get all that; As I said I'm just confused by your "FM reserves a clock bit for every

data bit" when it seems to me that every FM data bit requires **two** clock bits, and the ambiguity that while "data transfer" rate generally refers to bit rate apparently "data" rate usually refers to clock rate.

But confusion is more and more my normal state these days... ;-)

Anyway, interesting as it is, other than whether the OP should enter 500 or 250 at the data rate prompt this is getting a little off topic...

m

---

## Chuck(G)

February 24th, 2017, 12:37 AM

He should use 500Khz as the clock rate.

Don't confuse FM with the NRZ used in, say, async comms. Very different animals. FM always has (with certain "flagging" exceptions) a 1 clock bit followed by a 1 or 0 data bit. Got it? 2 bits, one of which is always 1; the other may be 1 or 0 depending on the data being sent. Clock bits have no intrinsic information content. MFM introduces clock bits only as needed to maintain synchronization.

---

## MikeS

February 24th, 2017, 01:01 AM

Quote:

> *Originally Posted by* ***Chuck(G)***
>
> *He should use 500Khz as the clock rate.*
>
> *Don't confuse FM with the NRZ used in, say, async comms. Very different animals. FM always has (with certain "flagging" exceptions) a 1 clock bit followed by a 1 or 0 data bit. Got it? 2 bits, one of which is always 1; the other may be 1 or 0 depending on the data being sent. Clock bits have no intrinsic information content. MFM introduces clock bits only as needed to maintain synchronization.*

Let's hope the OP read that among all the other rambling... ;-)

Still sounds like 2 clock bits per FM data bit to me, so I still don't get what you meant by "FM reserves a clock bit for every data bit;" but that's OK; I'm sure folks are getting bored by now...

And of course baud & bps are different animals from FM clock &. bit rates, I just meant that it's another example where the bit rate is not necessarily the same as the "clock" rate.

m

---

## Chuck(G)

February 24th, 2017, 02:01 AM

Let me try again by saying this: Clock period is not the same as bit cell. At a 500KHz clock a bit cell (4 usec) in FM is 2 clock periods; it however encodes only one explicit clock bit per bit cell. It results in a data rate of 1 bit per bit cell, or 250Kbits/second. In MFM, by dint of clocking either on the edge or the middle of a clock period, a bit cell is 2 usec and results in a data rate of 500K bits/second. In MFM, clock bits (i.e. nondata transitions) are supplied only as needed to maintain good synchronization. They always occur on the edge of a clock period.

I think what you're trying to say is that you see FM as requiring two clock periods/cycles. That's true--but you have to differentiate the notion of "data" (i.e. information bits) and "clocks" (non-information bits intended for synchronization).

Communications protocols such as asynchronous rely on the fact that the implied clock domain is the same on both the talker and listener side--and, aside from small errors, is essentially the same and need only be accurate over the period of a single character, so including explicit clocking information would be superfluous. Note that synchronous communication requires a separate clock signal.

## Adventurer

February 24th, 2017, 07:02 AM

Quote:

> *Originally Posted by **Chuck(G)***
>
> *What Al says is correct--don't confuse the clock rate with the bitrate. All 8" diskettes are written at 500KHz clock (high density), whether they're FM or MFM (or MMFM, but that's a different subject). The **bitrate** of FM is half that of MFM, but the clock is the same.*
>
> *What are you using for a floppy controller? Has it passed the FM test of [url=http://www.classiccmp.org/dunfield/img54306/testfdc.zip]TestFDC{/url]?*

I use an old ISA controller, which works with a 360K 5.25 inch floppy. There should be no problems with writing a single density media. By the way, testfdc is not usable with an 8 inch drive anyway, since it tries to format 80 cylinders instead of 77, and, of course, fails for both - single and double density formats...

## Chuck(G)

February 24th, 2017, 07:22 AM

AFAIK, there are no non-ISA legacy PC controllers, even if they're embedded into a non-ISA board chipset; the DMA and interrupt structure remains a child of the ISA bus scheme (IRQ 6, DMA 2, Port 3F2-3f7).

However, you'll need to use a controller that's capable of driving 1.44MB 3.5" floppies--an old one-data-rate 360K controller won't pass muster. You need to use a controller that's capable of 500KHz "high-density" operation. (500KHz applies to both high

density 1.2M (5.25') and 1.44M (3.5") drives). I'm not suggesting that you drive your 8" drive with testfdc--but rather hook up a 3.5" or 5.25" high-density drive and run the test. If it passes for both FM and MFM high-density data rates, then you're good.

## Adventurer

February 24th, 2017, 05:54 PM

Quote:

2 Attachment(s)

*Originally Posted by **Chuck(G)***

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Did a test - is it really that bad as it looks? Basically, it looks that my floppy controller is not capable of writing any of the formats I need:

Attachment 36499

I had another PC with a floppy controller - this time Celeron 2.8 - the results does not seem to look better anyway...

Attachment 36500

Meanwhile my 5V adapter for feeding 8 inch drive gave up ghost - IC circuit exploded (I strongly suspect this was manufacturing fault), so I need a new one.

Now I need a compatible floppy controller for writing 8 inch floppies. I will make a research, but are there any known models, which work? That would be better rather than getting all possible floppy drive controllers/computers with controller.

## MikeS

February 24th, 2017, 06:43 PM

Quote:

*Originally Posted by **Adventurer***

*...*
*Now I need a compatible floppy controller for writing 8 inch floppies. I will make a research, but are there any known models, which work? That would be better rather than getting all possible floppy drive controllers/computers with controller.*

Check out the registry at Dave Dunfield's site referenced in post #2
http://classiccmp.org/dunfield/img/index.htm

Is your controller 8-bit or 16-bit ISA?

## MikeS

February 24th, 2017, 06:57 PM

Quote:

> *Originally Posted by* ***Chuck(G)***
>
> *...I think what you're trying to say is that you see FM as requiring two clock periods/cycles. That's true--but you have to differentiate the notion of "data" (i.e. information bits) and "clocks" (non-information bits intended for synchronization).*

Yup; that's what I was trying to say; no need to reiterate that bit and clock rates are not the same thing, that's obvious.

We've gone off on a discussion of diskette and comm protocols (mostly talking past each other somehow); I ***only*** wanted to clarify Al's ambiguous remark that "8" disks always write at 500K"; most references to "**data rate**" out there refer to bps (250**Kbps** for 8"FM) whereas Al is obviously talking about **clock rate** (500**KHz**).

The relevance to this thread was what the OP should enter in response to IMD's Data rate question; apparently it should actually be the clock rate.

e.g. (From Patterson's blog)
*Those 5" disks would spin at 300 RPM (5 revolutions per second), a little slower than the 360 RPM (6 revolutions per second) of 8" disks. And the 5" disks had exactly half the* ***data rate****, 125,000 bits per second, vs.* ***250 kbps*** *for 8".*

Also Wikipedia:
https://en.wikipedia.org/wiki/List_o...y_disk_formats

## Chuck(G)

February 24th, 2017, 07:23 PM

Mike, it's worse than that--when I talk about clock bits, I'm talking about an actual recovered clock from the data stream. This gets to be important when talking about address marks with "missing" clock bits.

Yes, there's data rate and clock rate. Perhaps the best way to talk about them is "bit cell time". It can get to be really confusing if you talk about the high-end spectrum. Both MFM and FM have the same high frequency limit in their spectrum; but the encoding efficiency differs. Given the "dumbness" of diskette drives, it's the bandpass that's probably of most interest to an engineer; whether FM, MFM, MMFM, GCR or RLL encodings are used doesn't really matter for him.
---
@Adventurer, your FDCTEST results show why you're not having luck.

If you're looking for 486-P3 integrated FDC motherboards, support of FM (single density) is hit or miss. For example, I have an FIC KC19 (Intel 820) P3 motherboard, that has great support for FM floppies, but it stands as an island in a sea of similar (including 440BX) motherboards with no support at all for FM. Unfortunately, support for ISA slot (it has 2) DMA is completely absent.

The ISA FDC controller done here by James Pierce and others does support FM.

## Adventurer

February 24th, 2017, 09:47 PM

Quote:

> *Originally Posted by* ***MikeS***
>
> *Check out the registry at Dave Dunfield's site referenced in post #2*
> *http://classiccmp.org/dunfield/img/index.htm*
>
> *Is your controller 8-bit or 16-bit ISA?*

Thanks, I did not pay attention at the beginning. It seems that FD controller is no less important than FDAP adapter or the 8 inch drive itself.

I do think it is 16 bit adapter, but I am not sure. One thing I know - I need another one :)

## Chuck(G)

February 24th, 2017, 09:51 PM

Find yourself a 16-bit ISA SCSI controller with FDC. Look at the FDC chip--if it's by NSC, you're in luck. Other possibilities exist, however.

Don Maslin and I started compiling a list years ago--I suspect that Dave's list is derived from that.

## Adventurer

February 24th, 2017, 09:55 PM

1 Attachment(s)

Thanks to Modem7, today I finally received Textpack 4 floppy for IBM Displaywriter. It works! However, it is really frustrating to wait 6 minutes for it to boot, with long gaps of complete silence, with floppy drive being idle.
Attachment 36506

Unfortunately, I can not make a backup copy of it, because Displaywriter notices a read error and aborts the operation. Is there a setting somewhere to ignore read errors? I did not find one...

With the Displaywriter floppy being in DS/DD format, it makes it compatible even with my current floppy controller, however, because of read errors on track 5 and 6, all I'm getting is unusable image, because ImageDisks no longer "understands" the format of the floppy, and writes nothing after track 6

Tried Teledisk with similar results - the only difference is that Teledisk stops writing after track 7. Is there a remedy to this problem, or the floppy has to be with 0 read errors?

Slowly starting to think about ordering Kryoflux USB controller...

## Chuck(G)

February 24th, 2017, 10:23 PM

It sounds as if Track 6 is completely blank, though I'd check that with an FM-capable FDC.

## Adventurer

February 25th, 2017, 08:43 AM

Quote:

1 Attachment(s)

*Originally Posted by **Chuck(G)***

*It sounds as if Track 6 is completely blank, though I'd check that with an FM-capable FDC.*

Found another PC - here are the results - will this be enough?

Attachment 36516

## archeocomp

February 25th, 2017, 11:35 AM

Quote:

*Originally Posted by **Adventurer***

*Found another PC - here are the results - will this be enough?*

*Attachment 36516*

Looks promising, only third line from bottom makes me unsure :-) Give it a try

## Adventurer

February 25th, 2017, 05:35 PM

2 Attachment(s)

Quote:

> *Originally Posted by* ***archeocomp***
>
> *Looks promising, only third line from bottom makes me unsure :-) Give it a try*

Did it. Tried. Mess on my desk becomes bigger and bigger.
Attachment 36537

The results:

I can write images to floppy and back, both in SD and DAD formats, and now with 500K rate even for SD images, no errors. However, Displaywriter fails to recognise any of them.

Now I can copy Textpack floppy to 18-th sector, then it appears there is no data. However, Displaywriter is not unable to read my image, and I believe the floppy is not fully copied...

Attachment 36538

I did an experiment - formatted a floppy on a Displaywriter, then wrote the DS/DD image of Textpack. It did not work, but Displaywriter was still able to read old label "DOC", so it is clear the data are missing.

Maybe interleave, Format, Read/Write gaps should be set manually. Would be good to hear something from someone, who had been able to restore Displaywriter images back to floppy disk...

## Al Kossow

February 25th, 2017, 06:25 PM

try setting imagedisk to do an analysis on every track

a double-sided double-density Imagewriter disk should look like this

Cyl:0 Hd:0 500K FM 26 sectors size 128
Cyl 00 Hd 0 128 .CCC.C..ddddddddddddddddd 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Cyl:0 Hd:1 500K MFM 26 sectors size 256
Cyl 00 Hd 1 256 ddddddddddddddddddddddddddd 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Cyl:1 Hd:0 500K MFM 26 sectors size 256
Cyl 01 Hd 0 256 ..........C..... 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Cyl:1 Hd:1 500K MFM 26 sectors size 256
Cyl 01 Hd 1 256 ..... 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Cyl:2 Hd:0 500K MFM 26 sectors size 256
Cyl 02 Hd 0 256 ..... 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

21 22 23 24 25 26
Cyl:2 Hd:1 500K MFM 26 sectors size 256
Cyl 02 Hd 1 256 ..... 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

## Chuck(G)

February 25th, 2017, 06:43 PM

I believe that Al might have something--the DW, IIRC, does use Deleted Data Marks on the early cylinders. IMD should be able to copy them.

## Adventurer

February 25th, 2017, 07:46 PM

Already did that - without full analysis ImageDisk is unable to make an image to hard drive.

1 Attachment(s)

Now there are some good news after all - all day trying, but finally I managed to make a copy of the damaged Textpack 4 floppy on a Displaywriter itself. Now it boots in about 20 seconds instead of 6-7 minutes before. I now have 3 master floppies + the original damaged one, which can be read only in a Displaywriter.

Attachment 36548

Now I was able to make an image of the copied floppy with no read errors, however, some problems still remain.

First - it seems that floppy for the Textpack should be completely blank - if not, Displaywriter shows previous floppy label, and treats it as damaged document disk.

Second - even with blank floppy it is not a complete success - for the first time Displaywriter starts to read it, but few seconds later shows *02*.

I have a feeling that now I am very close to success, but something seems to be missing - could there be data on a floppy, which are not read by ImageDisk? Besides, judging from the file size (170K), it appears to be an image of SS/SD floppy, duplicated to DS/DD, rather than native DS/DD image.

Next task - will try the same with Teledisk...

## Chuck(G)

February 25th, 2017, 07:58 PM

IMD compresses its images, so size can be misleading. Use the "IMDU /B" utilitiy to extract an uncompressed image.

## Adventurer

February 26th, 2017, 12:31 AM

No luck so far...

ImageDisk settings:

Interleave 1:1 (tried best guess)
Double stepping: off
Sides: As read (tried double as well)
Tracks: 77
Full analysis: on
Increased step rate from 8 to 15 - the same, just writes slower

Run align/diagnostics - high pitched noise on all tracks, data read/write fine.

One more thing puzzles me - I took Displaywriter system floppy (it's named NEGKKE), opened in ImageDisk, and choosed "Erase".

Expected: When put in a Displaywriter, it would display it as a blank floppy: "*******"

Real result: Displaywriter still was able to read the disk name "NEGKKE". The question is - from where?

## Chuck(G)

February 26th, 2017, 02:58 AM

If you create an image file, how many sectors does it say it copied? It should say 2002.

If you scan an "erased" floppy with IMD, do you get any reports of data?

## Adventurer

February 26th, 2017, 08:03 PM

Quote:

1 Attachment(s)

*Originally Posted by **Chuck(G)***

*If you create an image file, how many sectors does it say it copied? It should say 2002.*

*If you scan an "erased" floppy with IMD, do you get any reports of data?*

According to ImageDisk, it has 2548 sectors:

Attachment 36607

Meanwhile I think I have found the problem - instead of real writing/formatting/erasing, it was only pretending to write. Textpack 4 floppy, erased and formatted, was still readable on IBM Displaywriter, although it had some trouble reading data from it.

I think it has to do something with unterminated input lines, strange, but with previous PC the drive was also the last one, but was able to read/write, although not in the formats I needed.

I tried to terminate them with 150 Ohm resistors, but floppy controller showed failure on boot - will try tomorrow with 1K resistors again. The drive write head is OK, since it was writing on another machine.

Still, the written images look OK in HEX editor - there is data, and the format is very similar to the ones uploaded in Bitsavers, so at least there is hope, that at least read function is working correctly.

## Al Kossow

February 26th, 2017, 08:12 PM

have you been able to read any of the copies you've made on the imagewriter that can boot?

it is very strange that track 0 side 0 is double-density. In the images I've made t0 s0 is always single density.

## Adventurer

February 26th, 2017, 08:27 PM

Quote:

> *Originally Posted by **Al Kossow***
>
> *have you been able to read any of the copies you've made on the imagewriter that can boot?*
>
> *it is very strange that track 0 side 0 is double-density. In the images I've made t0 s0 is always single density.*

I do not know if the images will work - I need to fix the drive first, as it is currently in a "read only" mode. I will report the results of testing as soon as the drive problems have been sorted out. If you are interested, I can mail you a copy of this particular Textpack 4 floppy (tested).

## Adventurer

February 27th, 2017, 06:44 PM

4 Attachment(s)

This looks like a dead end for experimenting - even with input lines terminated (both - 150 Ohms and 1000 Ohms), both computers still manage to recognise two drives instead of one. I strongly suspect the write signal goes to the wrong lines because of it.

286 PC with ISA floppy controller:

Attachment 36616

Intel Celeron 2,6 Ghz with onboard floppy controller:

Attachment 36617

Input lines have been terminated:

Attachment 36618

Still, the PC with Celeron and best testfdc results (only unable to write SD in 128K - but completely fails when 8 inch drive is connected) seems suitable for my tasks, but ImageDisk fails to write/erase anything, but it looks like it is writing normally - heads move, FDADAP adapter shows correct track numbers etc. The only program which can format the disk is FDFORMAT, I can read/write in DOS after that, but it does not helps with Displaywriter data in any way. Whats even worse - it appears the reading is worse after terminating input lines, since it shows completely wrong data:

Attachment 36619

286 PC is in fact able to erase the disk with ImageDisk, but it fails in reading/writing, and BIOS recognises two 360K floppy drives.

Can anyone suggest what might be wrong? Tried different floppy cables, etc - still the same - two drives instead of one in the BIOS. I'm not sure if getting Adaptec SCSI card will solve the problem with data signals. I have no more ideas left...

## Chuck(G)

February 27th, 2017, 07:09 PM

I'm going to be lazy, but (a) what 8" drive are you using and (b) how is it jumpered (**all** jumpers, not just the ones that you think are important). I'm willing to go through the OEM specs and figure out how things should be.

8" drives on a PC are no big deal, really.

## Adventurer

February 27th, 2017, 07:17 PM

Quote: 1 Attachment(s)

*Originally Posted by **Chuck(G)***

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*8" drives on a PC are no big deal, really.*

The drive is Shugart SA-851. Seek was not working until I added jumpers to DS and C. Drive select set to 1, but tried all other positions. By mistake I removed write protect feature - cut WP and soldered NP joints. What else - some pins are bent/broken due to shipping, but there were no jumpers in the package. I can solder the joints if needed. I used Shugart SA 850 OEM manual for troubleshooting, but it appears I'm out of ideas for now.

I hope the photo is clear enough to see? I can upload a larger version somewhere, if needed.

Attachment 36620

## Chuck(G)

February 27th, 2017, 07:57 PM

Good enough--I'll get back later today on what I see.

## Adventurer

February 27th, 2017, 08:04 PM

Quote:

2 Attachment(s)

*Originally Posted by **Chuck(G)***

*Good enough--I'll get back later today on what I see.*

Just in case I added labels to the jumpers connected for an easier reading:

Attachment 36622

## Adventurer

February 27th, 2017, 09:22 PM

Made adjustments according to this picture:

1 Attachment(s)

Attachment 36626

PC-286
Now there is finally a single floppy drive in BIOS, stepper engages without DS and C connected. However, when i try to access the disk, stepper moves, but then a message appears "No interrupt from FDC controller". A jumper missing somewhere?
Strange, but drive is displayed as B: on Drive select1, and A: on drive select 2

PC-Celeron - shows error 601 on switching on - floppy controller failure, with the same configuration. Drive select change has no effect.

## Chuck(G)

February 28th, 2017, 12:58 AM

A PC doesn't use the "polled" feature of the FDC--and most controllers have it disabled. In general, a PC assumes the DS is active when a drive is being stepped.

No "no interrupt" is because the FDC doesn't see an index pulse, so something's still wrong.

Note that Shugart numbers their drive select from 1, not 0 (as do other makers), so you want DS2 in this case.

You don't want the drive select to function as a side select, so 1B..4B should be open.

In fact, but for DS2, the factory (in black) defaults should be the ones to use, if I'm reading them right.

## Adventurer

February 28th, 2017, 10:35 AM

Well, the driveToday I connected the drive back to 286 PC - and suddenly it appears no longer working there - the BIOS recognised a single drive, but no seek and no access light anymore.

Even worse, after a while I have no access light /solenoid working without controller connected. I suspect 5V electronics have failed. Time to get a new(old drive)? I can remove all jumpers again and start debugging, but it appears something has gone completely wrong, since drive access light should light and solenoid should make a click when applying power without controller connected.

## Chuck(G)

February 28th, 2017, 04:28 PM

If you apply power and ground the appropriate drive select, you should get the LED. Otherwise, nothing should happen, assuming that you have the correct pullups installed.

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