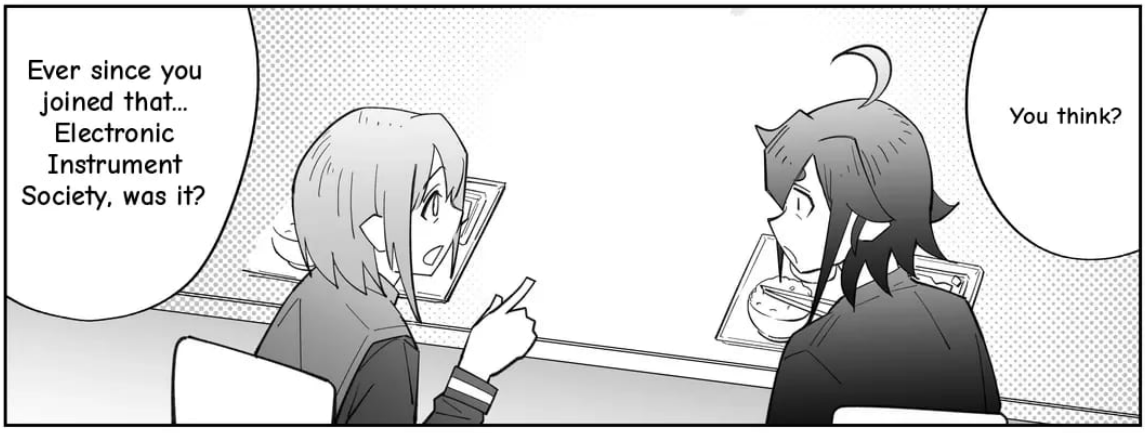
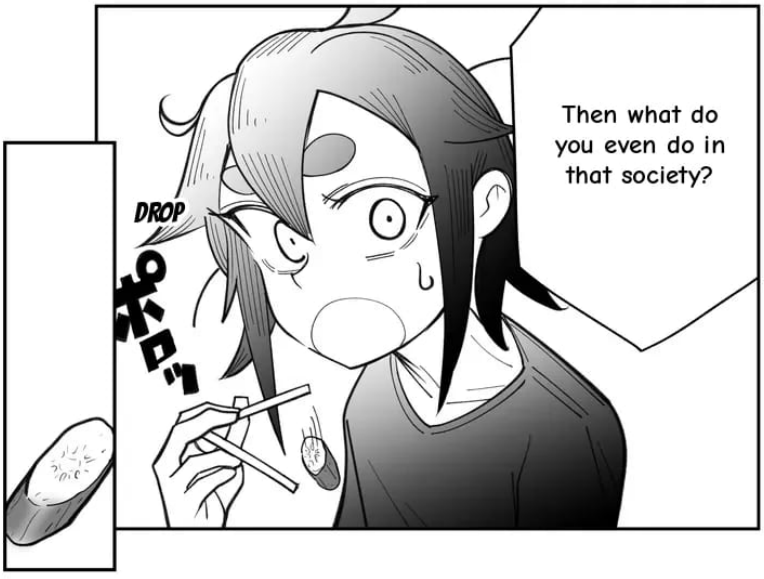
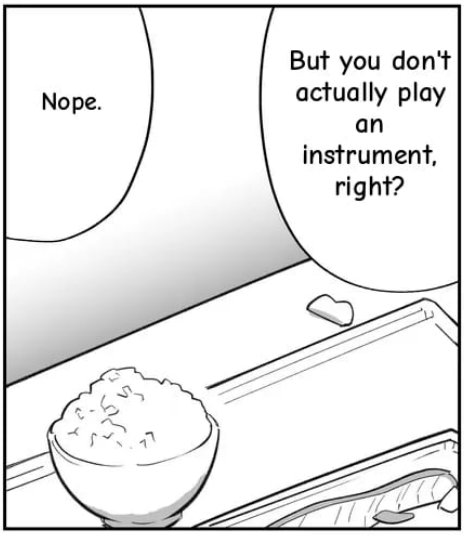
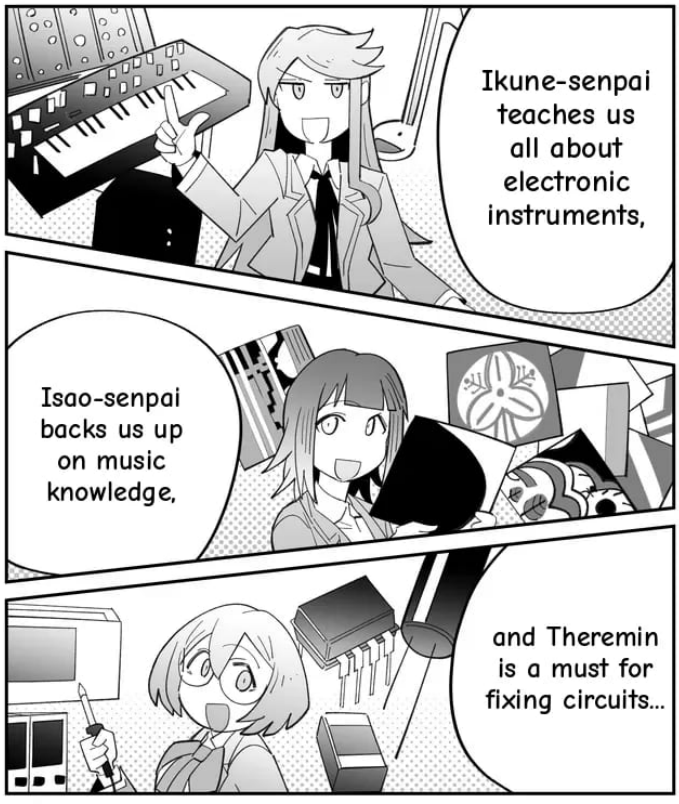

Sis, you seem kind of different lately.
SIGNAL 7: Kohaku Kogen


Ever since you joined that... Electronic Instrument Society, was it?
You think?


Then what do you even do in that society?
DROP
ポロッ


Nope.
But you don't actually play an instrument, right?


Ikune-senpai teaches us all about electronic instruments,
Isao-senpai backs us up on music knowledge,
and Theremin is a must for fixing circuits...

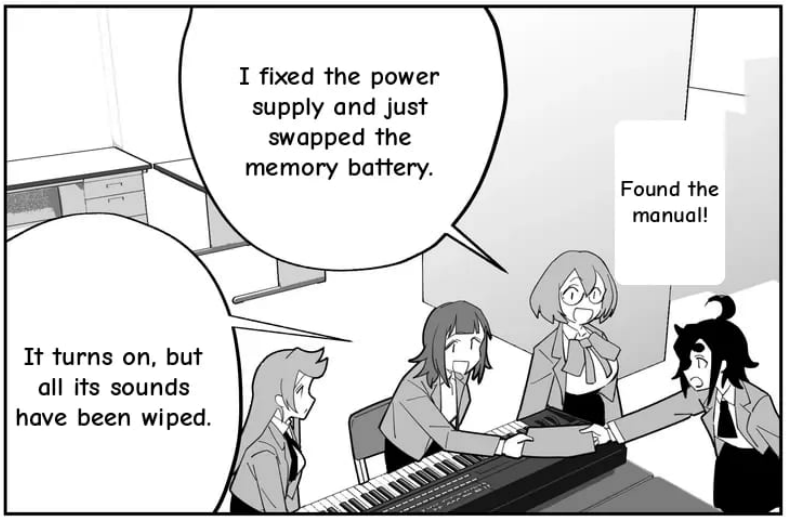

My role...?



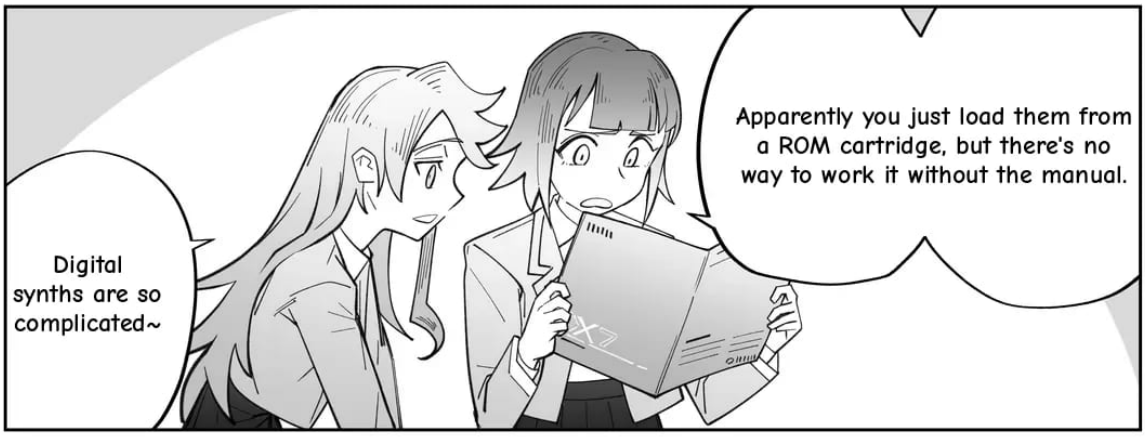

Am I only good for cleaning and filing?


Kohaku! Find the manual?
Oh— yes!


A DX7. It's an FM synth.
What's this?
YAMAHA DX7
DX7
JAPAN / 1983 / YAMAHA


I fixed the power supply and just swapped the memory battery.
Found the manual!
It turns on, but all its sounds have been wiped.


Doesn't it work?


Apparently you just load them from a ROM cartridge, but there's no way to work it without the manual.
Digital synths are so complicated~

Yep, yep.

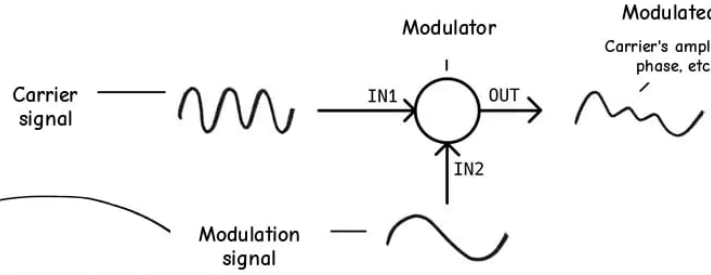
Frequency modulation, like FM radio?

What does the "FM" in "FM synth" mean?

Guess we should start with what modulation even is.

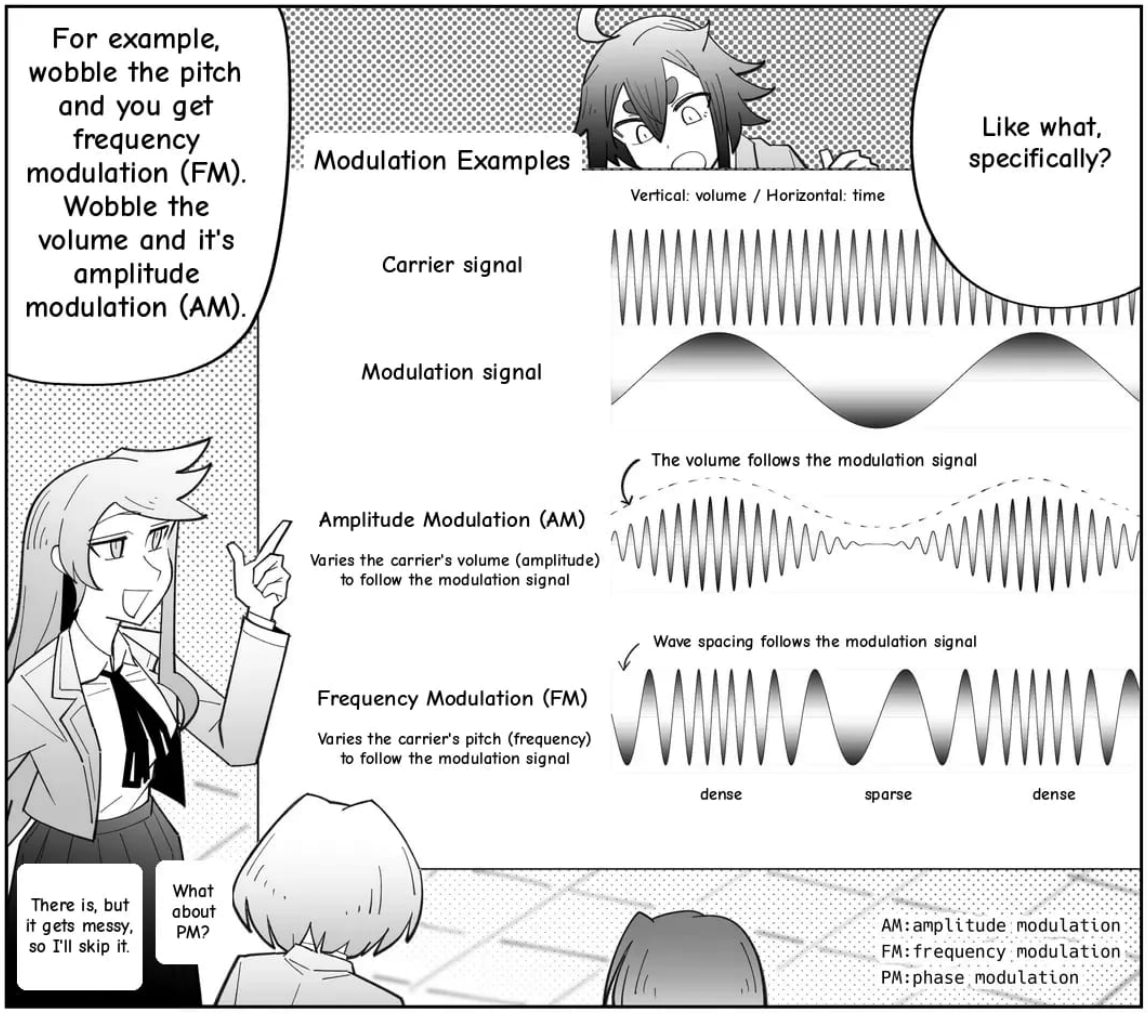
Modulation

Changing a parameter of the carrier signal (amplitude, frequency, phase, etc.) with the modulation signal

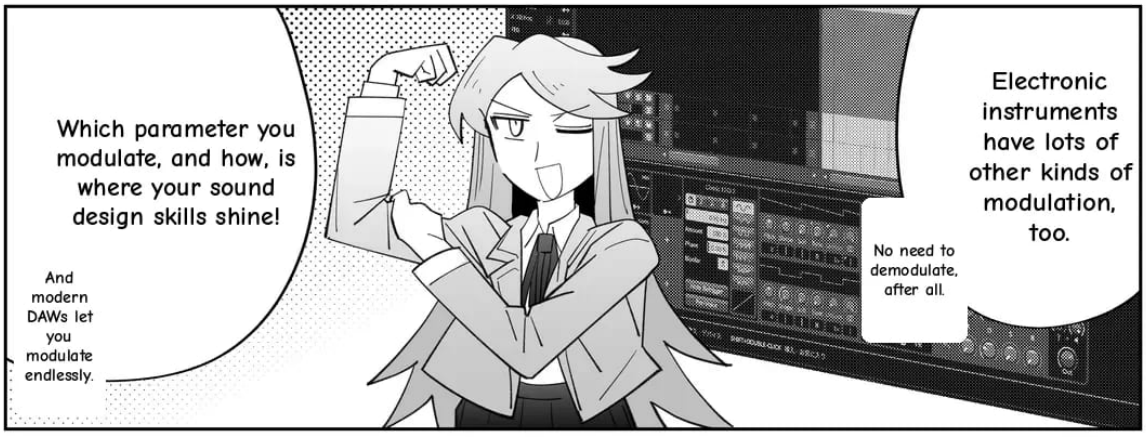


Modulation means changing one signal with another signal.

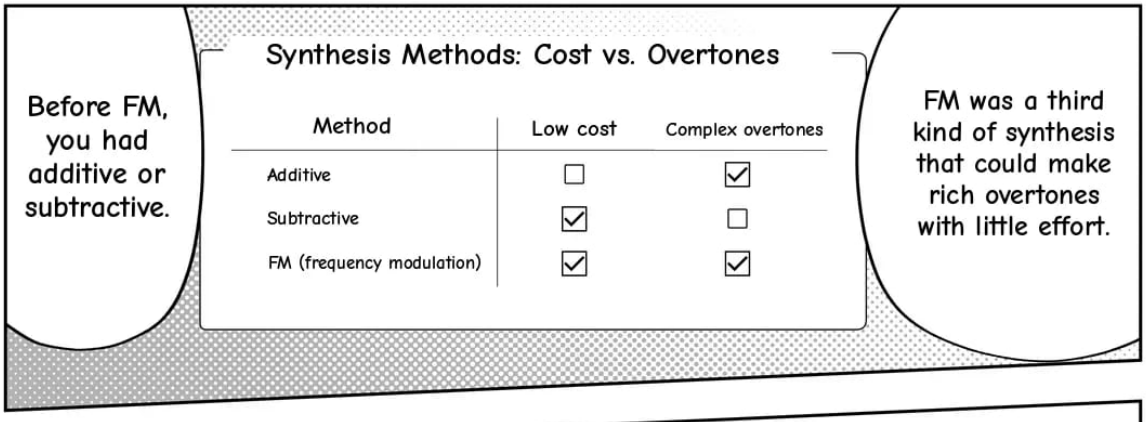
In the electronic instrument world, we call pretty much anything that automatically changes a parameter over time "modulation."

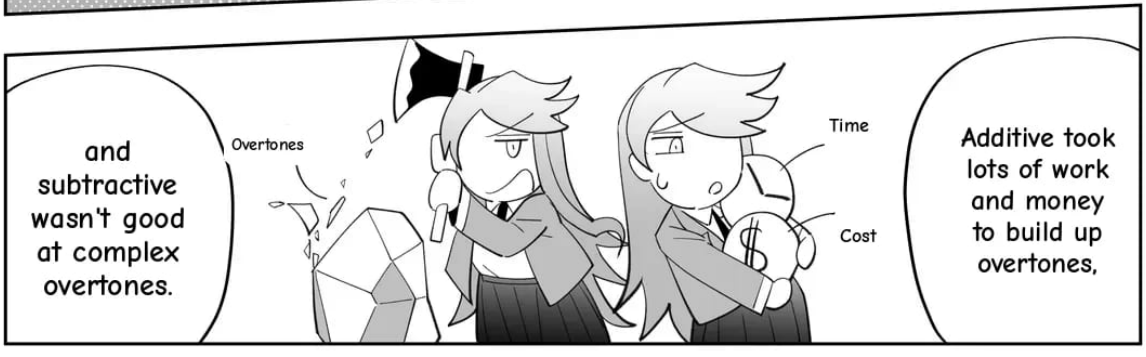

For example, wobble the pitch and you get frequency modulation (FM). Wobble the volume and it's amplitude modulation (AM).
Like what, specifically?
Modulation Examples
Vertical: volume / Horizontal: time
Carrier signal
Modulation signal
The volume follows the modulation signal
Amplitude Modulation (AM)
Varies the carrier's volume (amplitude) to follow the modulation signal
Wave spacing follows the modulation signal
Frequency Modulation (FM)
Varies the carrier's pitch (frequency) to follow the modulation signal
dense
sparse
dense
What about PM?
There is, but it gets messy, so I'll skip it.
AM:amplitude modulation
FM:frequency modulation
PM:phase modulation

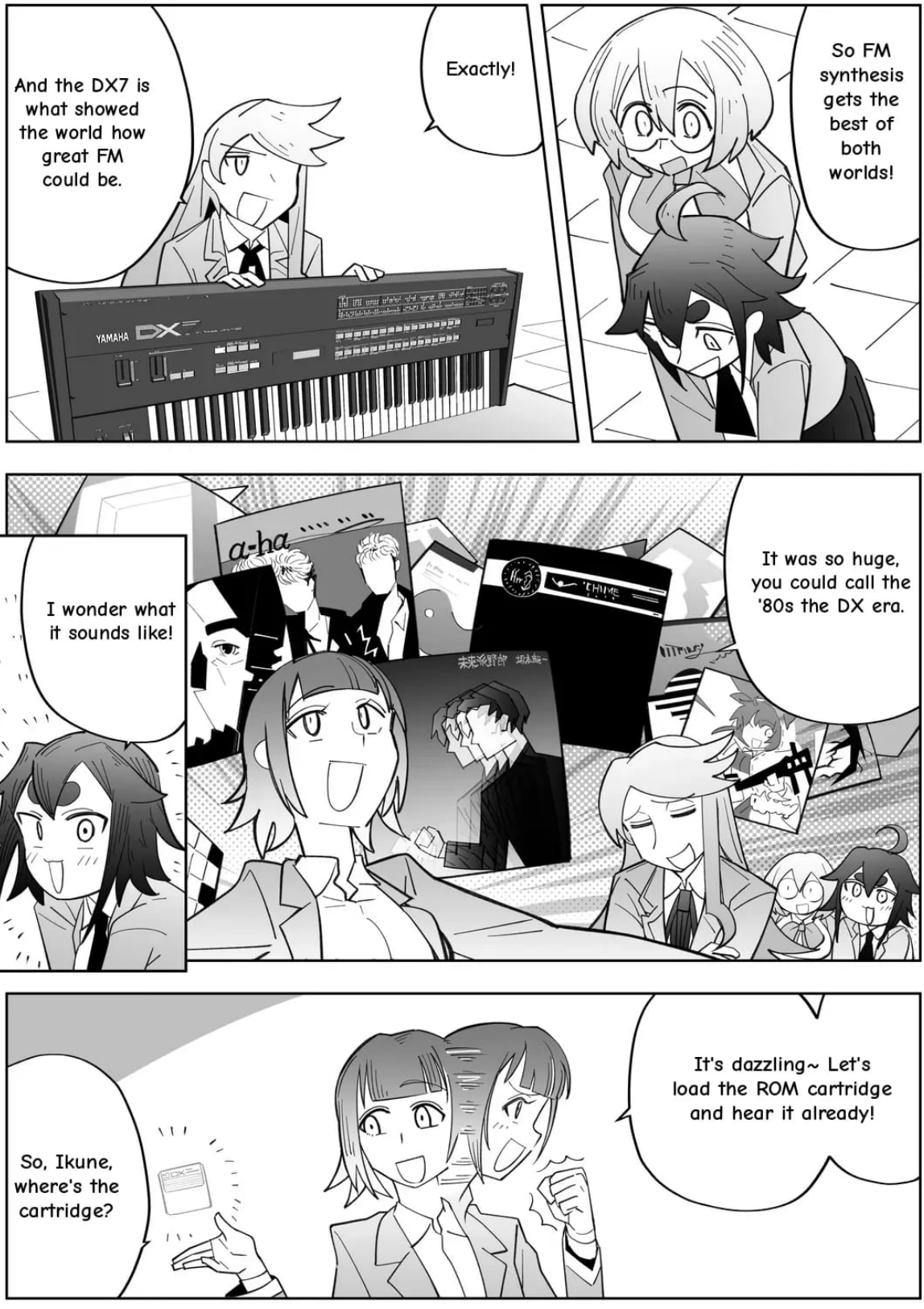

HIGH-SPEED VIBRATO!
WEEE~
ビャ～
高速ビブラート!
In everyday terms, FM is vibrato and AM is tremolo.
Though when people say "FM synth," what's inside is usually PM (phase modulation).*
*"FM" synths are really PM: actual "FM synths" use PM. So why call them "FM"? Yamaha's reasons are unknown, but since linear FM gives much the same results as PM under certain conditions, they probably went with the name that sounded better.

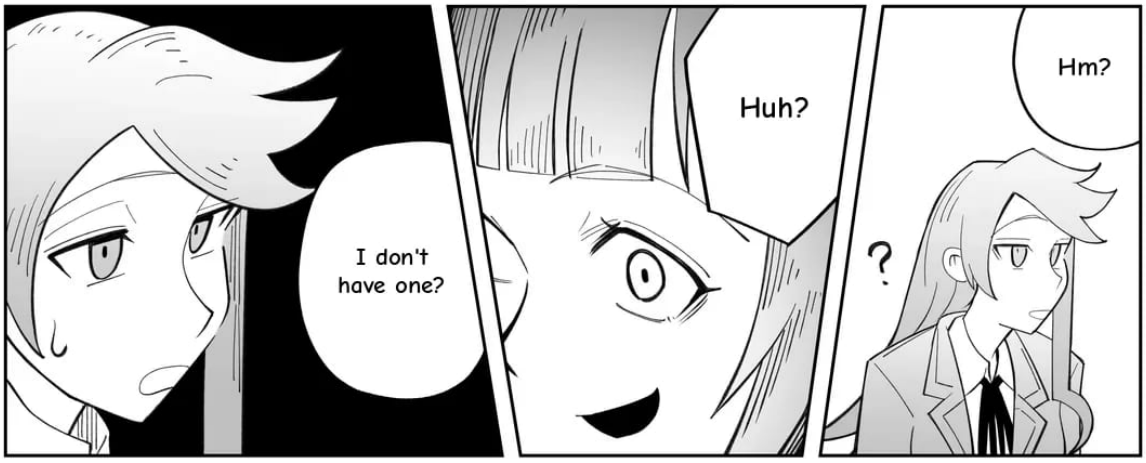

Which parameter you modulate, and how, is where your sound design skills shine!
And modern DAWs let you modulate endlessly.
No need to demodulate, after all.
Electronic instruments have lots of other kinds of modulation, too.

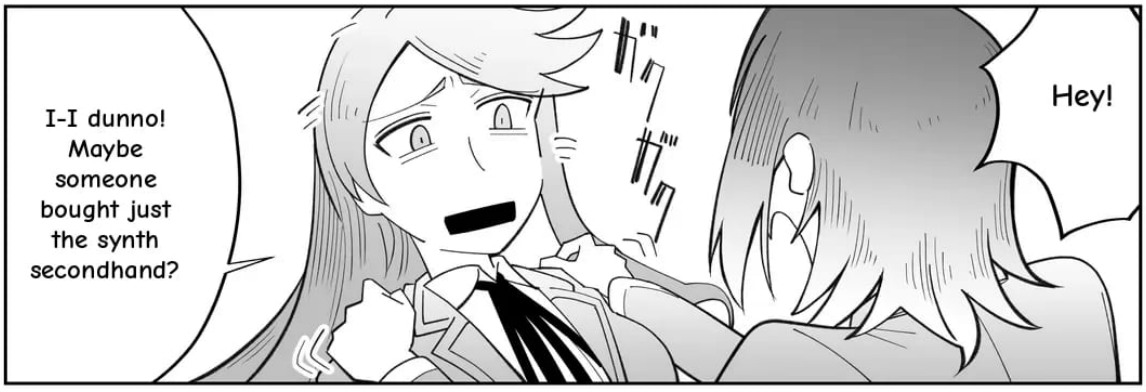

You never hear of an "AM synth," right?
with so many kinds, what made FM synthesis so special?
\Special!!/
FM
Ring
PWM
PCM
All kinds of
Modulation
Okay, I get modulation, but...


Before FM, you had additive or subtractive.
Synthesis Methods: Cost vs. Overtones
Method | Low cost | Complex overtones
Additive | ☐ | ☑
Subtractive | ☑ | ☐
FM (frequency modulation) | ☑ | ☑
FM was a third kind of synthesis that could make rich overtones with little effort.

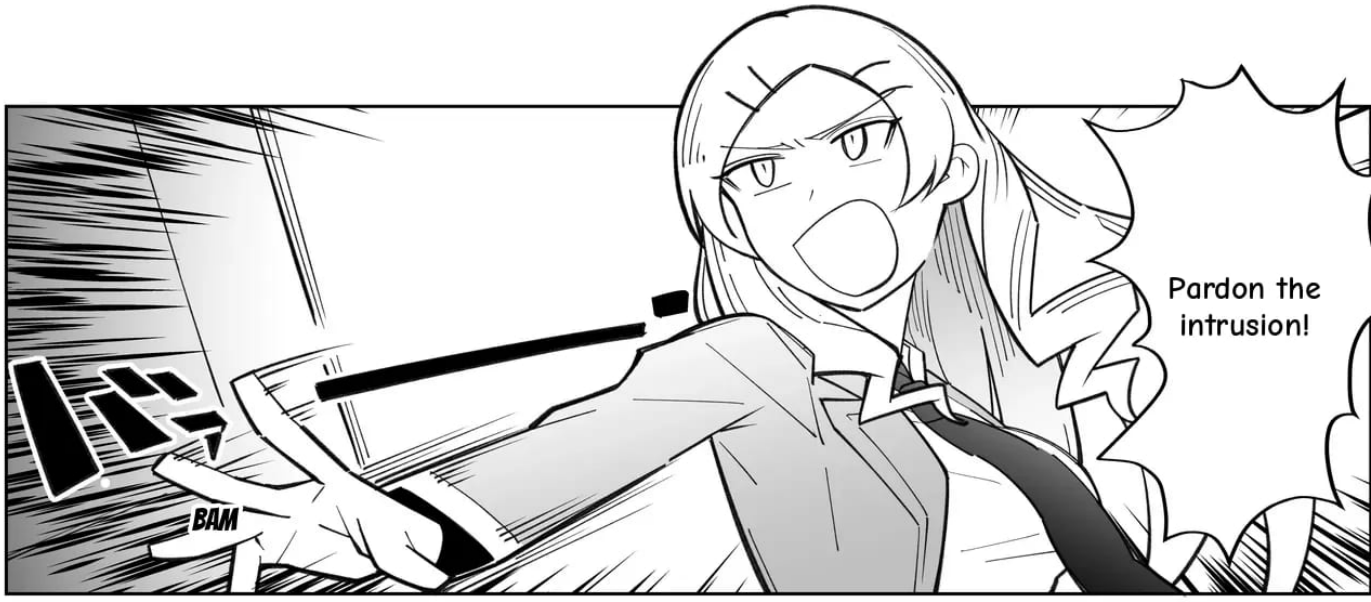

and subtractive wasn't good at complex overtones.
Overtones
Time
Cost
$
Additive took lots of work and money to build up overtones,


So FM synthesis gets the best of both worlds!
Exactly!
And the DX7 is what showed the world how great FM could be.
YAMAHA DX7
It was so huge, you could call the '80s the DX era.
I wonder what it sounds like!
a-ha
CHIMES
It's dazzling~ Let's load the ROM cartridge and hear it already!
So, Ikune, where's the cartridge?

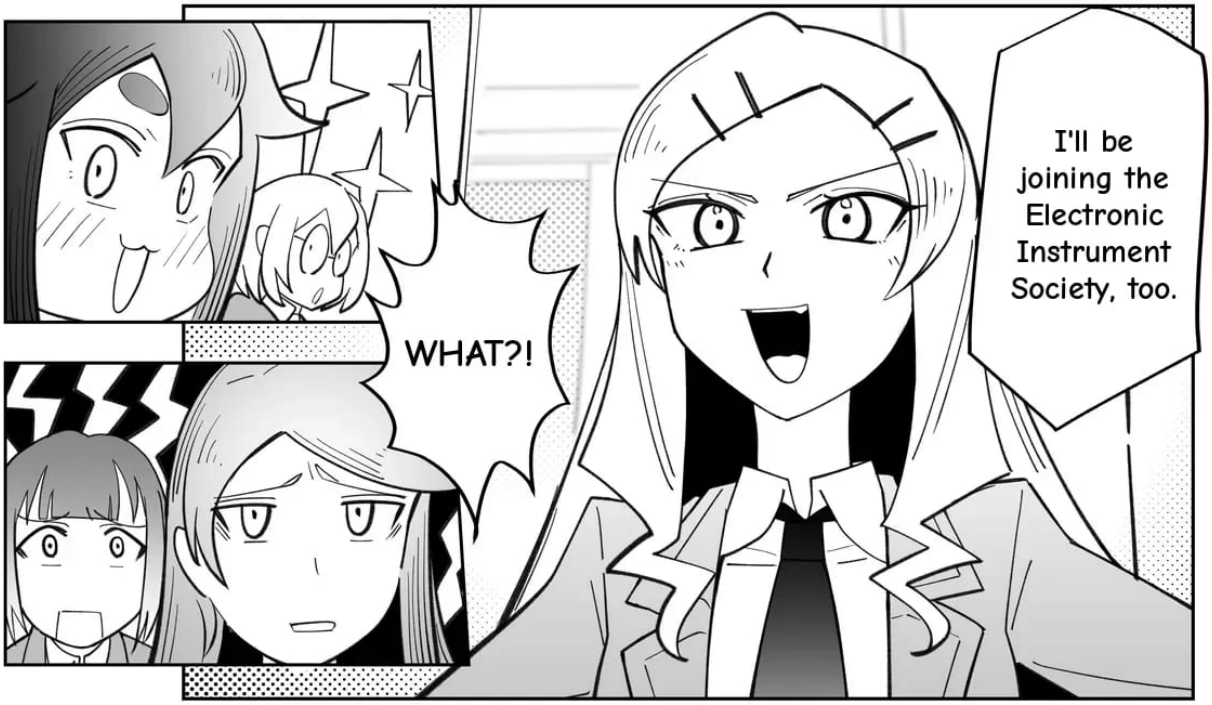

I don't have one?
Huh?
Hm?
?

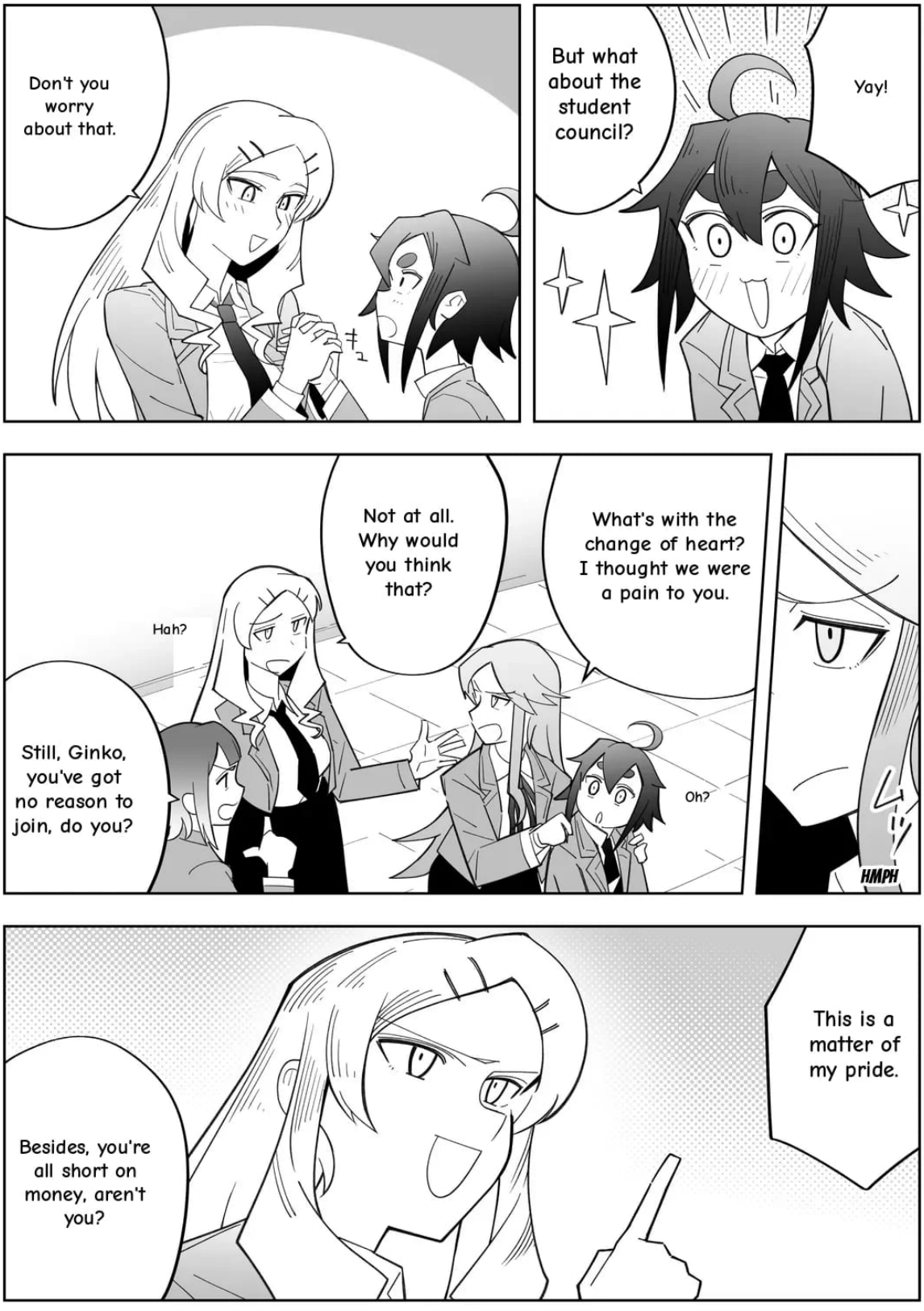

I-I dunno! Maybe someone bought just the synth secondhand?
Hey!

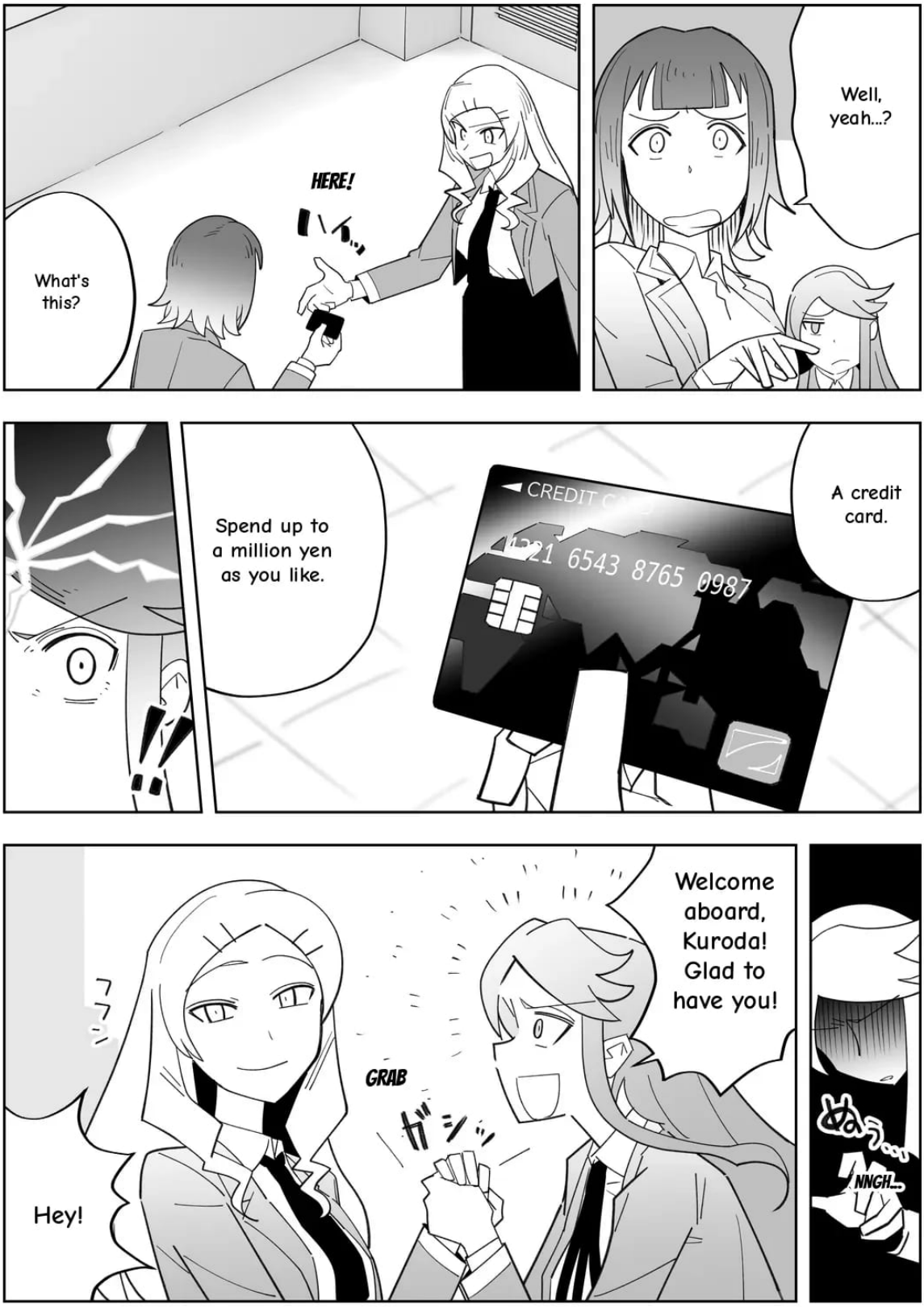

So we have to spend money again...?
It's not my fault~!
Those cartridges aren't cheap, you know!
SLIIDE

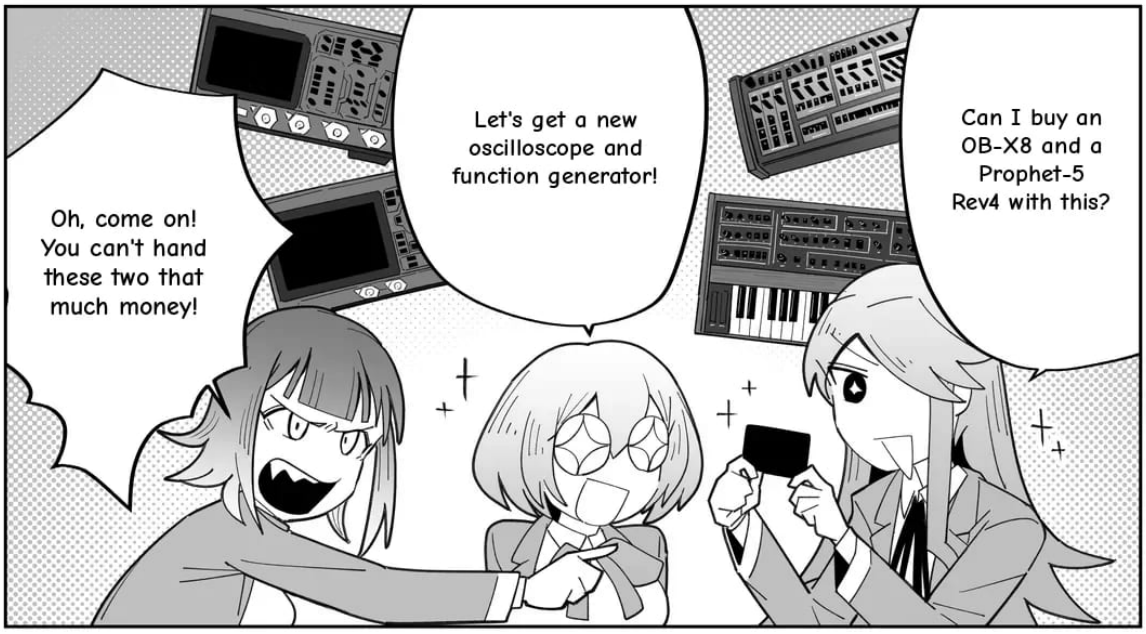

BAM
Pardon the intrusion!

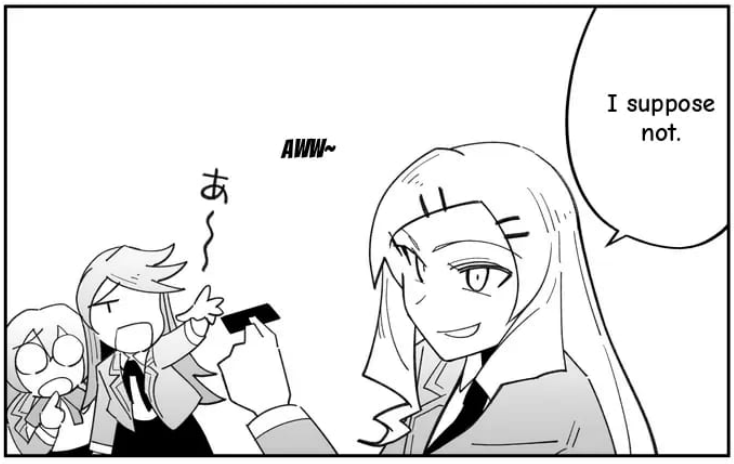

Not again.
Huh? Kuroda-senpai?
Got nothing better to do?

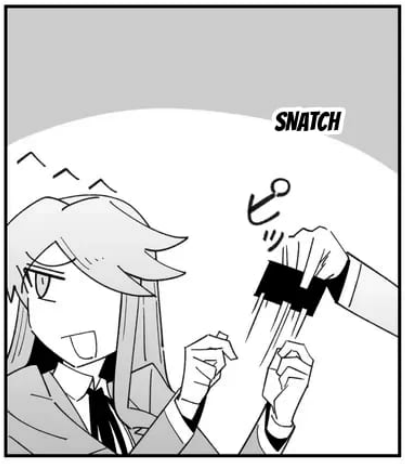

WHAT?!
I'll be joining the Electronic Instrument Society, too.

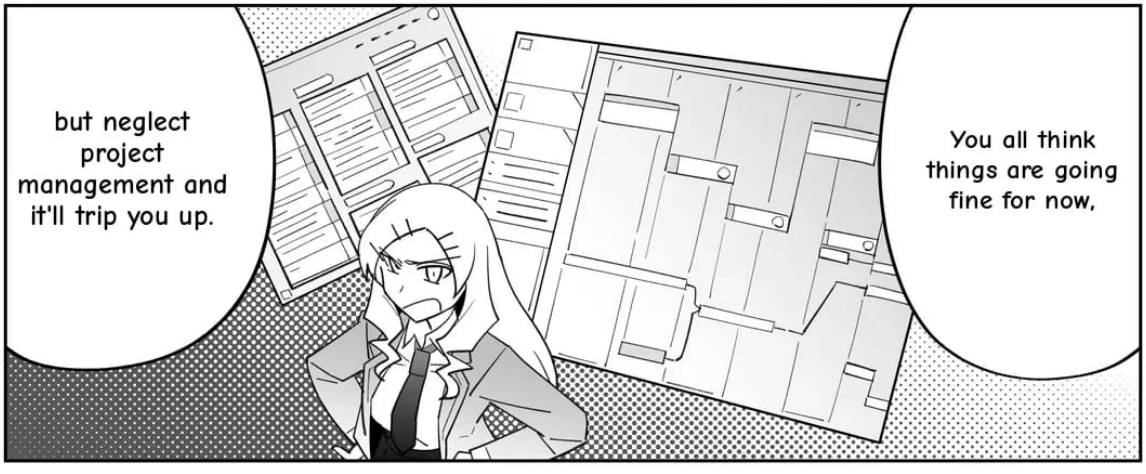

Don't you worry about that.
But what about the student council?
Yay!
What's with the change of heart? I thought we were a pain to you.
Not at all. Why would you think that?
Hah?
Still, Ginko, you've got no reason to join, do you?
Oh?
HMPH
This is a matter of my pride.
Besides, you're all short on money, aren't you?

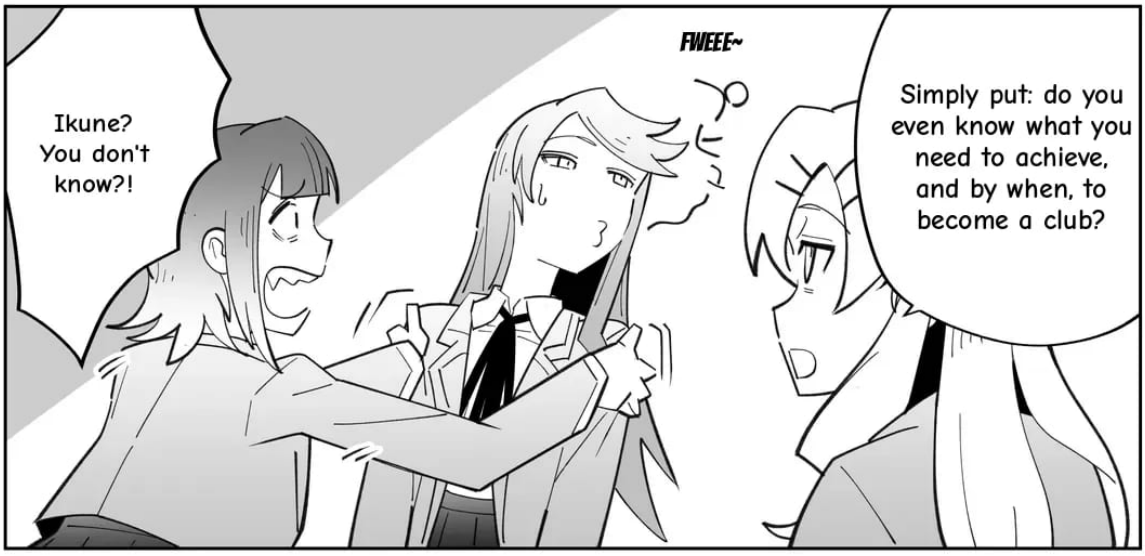

What's this?
HERE!
Well, yeah...?
Spend up to a million yen as you like.
A credit card.
CREDIT
6543 8765 0987
Hey!
GRAB
Welcome aboard, Kuroda! Glad to have you!
NNGH...


Oh, come on! You can't hand these two that much money!
Let's get a new oscilloscope and function generator!
Can I buy an OB-X8 and a Prophet-5 Rev4 with this?

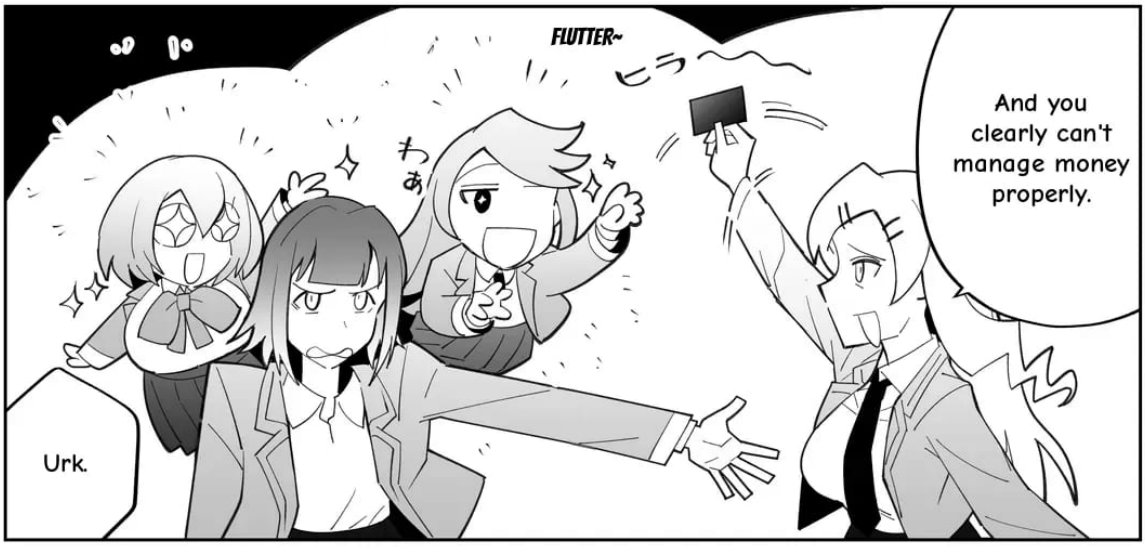

AWW~
あ～
I suppose not.

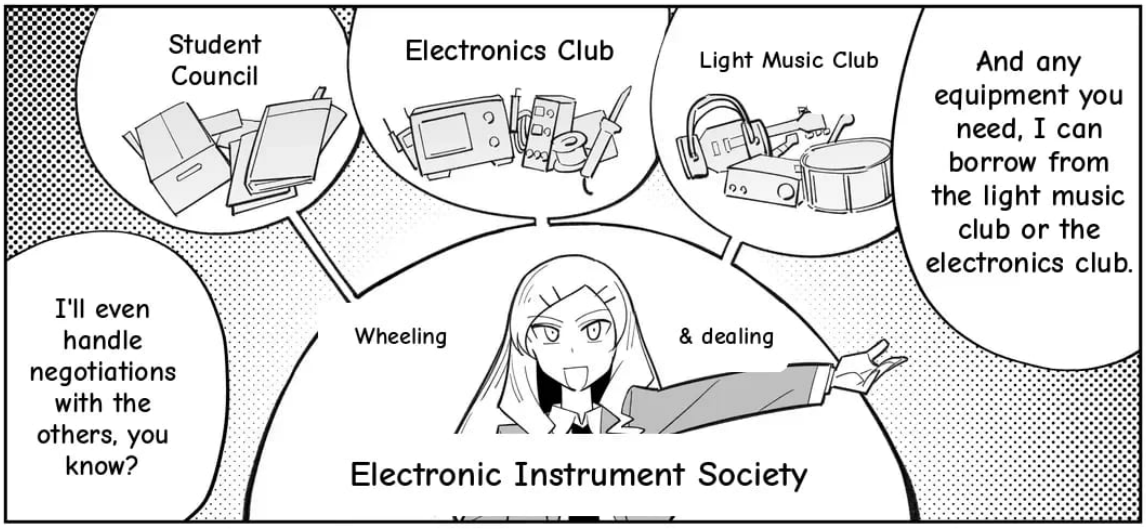

SNATCH
ピッ

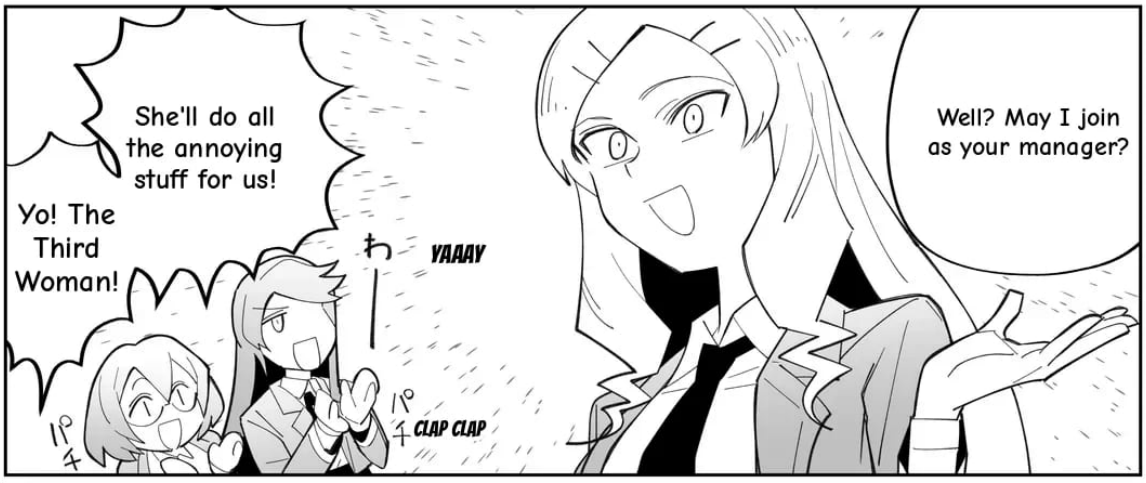

but neglect project management and it'll trip you up.
You all think things are going fine for now,

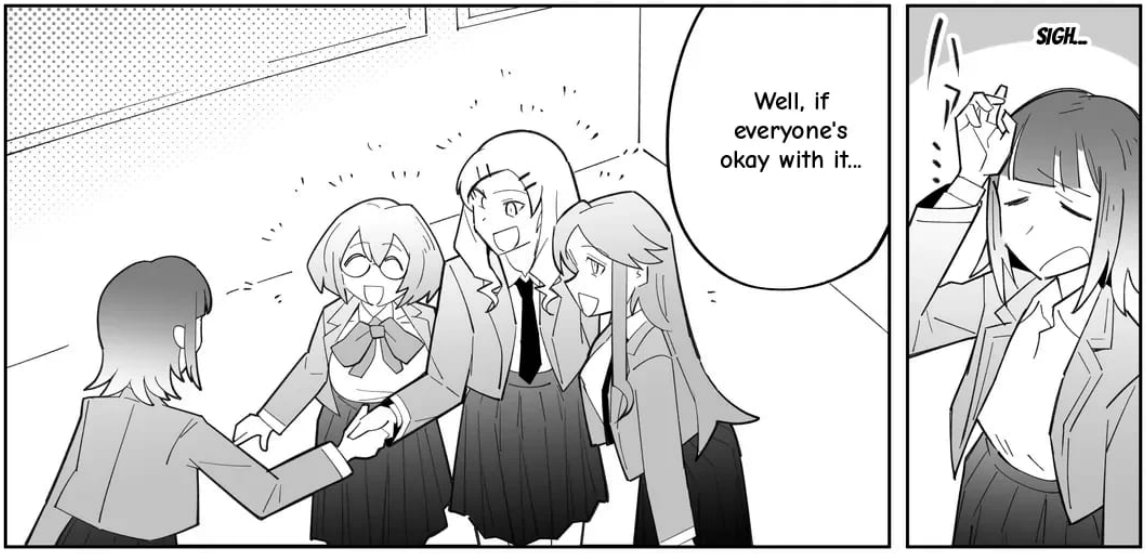

FWEEE~
Ikune? You don't know?!
Simply put: do you even know what you need to achieve, and by when, to become a club?


That's the target for the end of the school year, but the council plans next year ahead of time, so the real deadline is the end of the first half.
Schedule
Mar: Next year's budget
Apr: School year begins
Jul: YOU ARE HERE <
Sep: School festival
Oct: First-half progress check
DEADLINE
It was decided at the start of the year that this club room would be vacated.


FLUTTER~
And you clearly can't manage money properly.
Urk.


Student Council
Electronics Club
Light Music Club
And any equipment you need, I can borrow from the light music club or the electronics club.
I'll even handle negotiations with the others, you know?
Wheeling
& dealing
Electronic Instrument Society


Well? May I join as your manager?
She'll do all the annoying stuff for us!
Yo! The Third Woman!
YAAAY
CLAP CLAP


Well, if everyone's okay with it...
SIGH...


Huh? Come to think of it, where's Kohaku?
Don't tell me she...!
We've got enough members now! Off to the student council to turn in our club application~!
This is all I can do, anyway!


Yes!!
An application to found an Electronic Instrument Club?
HMMMM...
Student Council President
生徒会長
Rejected.
SMIRK
ニヤ
HUH?
TO NEXT SIGNAL↲