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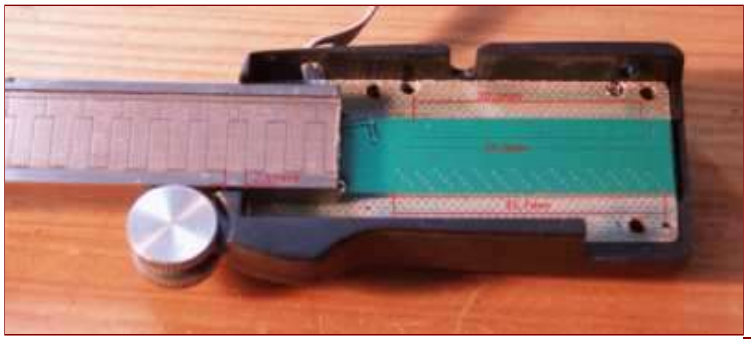
How do the Digital Scales work?

I can't offer a complete explanation, but some insights that go quite into depth. Sizes of the physical placement of capacitors that form an electronic vernier and how the signals look like can be found here. This information is really for the nerds and not of any use for those who want to just build their next steam model.

Under the Sticker:



click to enlarge

Note:
Chances are very high, that the numbers given in the above picture are a bit off. It is quite reasonable that all is etched in mils. So the 2.55mm would be 2.54mm. Also note, that we use the "," as decimal point.

That's how it looks if you peel off the sticker (with the ruler's numbers printed on). On the left is the calipers body (a part of it) with the sticker removed. To the right is the backside of the PCB. Sizes given if you look at the enlarged picture. The pad on the PCB that is 30.5mm wide receives the signals. Those signals are coming from the 56 pads below.

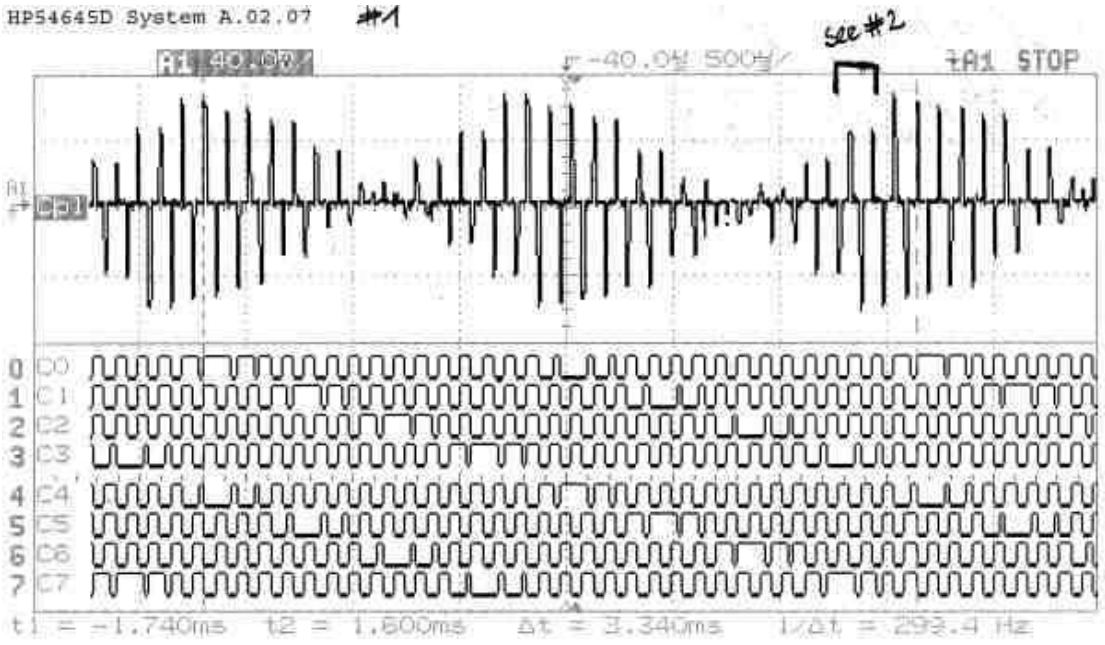
I have lent me a HP 54645D. A **wonderful** mixed signal scope. 100MHz 2 channel analog + 16 channel digital. Quite old (mfg-date unknown) with a centronics interface that takes 5 minutes to print a single page. Then I scanned the pages. I had so much joy using it! Thanks a lot to the guys at eubus!

click to enlarge

Just for your curiosity, this is a picture of the measuring setup. I fixed cables with adhesive tape to the table, connected signals through vero-wire and ribbon-cable to the scope. Quite delicate!

Here is a picture showing the signal (analog channel on top is the receiver pad).
C0…C7 are connected to the sender pads. How C0…C7 are connected to the 56 sender pads in a

moment.



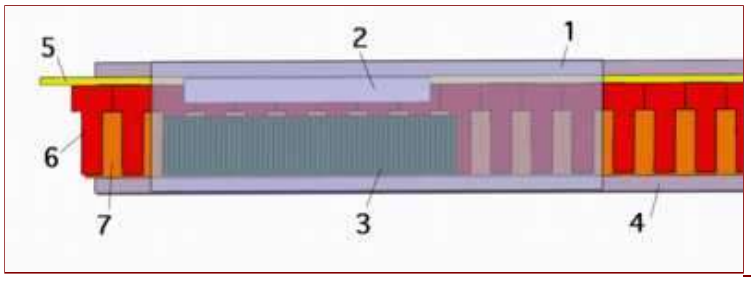
click to enlarge (1.2 MB!)

Here is a **detail of the above screen dump** (the part marked "see#2") (0.8 MB!)

Here are 3 parts of the digital signals stretched and timing handwritten into it: Digital **part#1**, **part#2**, **part#3**
You have to print that out and glue it together. :-)

C3 is connected to the leftmost sender pad, C2 to the second, C1 -> 3rd, C0 -> 4th, C7-> 5th, C6 -> 6th, C5 -> 7th, C4 -> 8th.
Then it starts all over again (C3, C2, C1, C0, C7, C6, C5, C4, ...). So every CX is connected to 7 sender pads.

Here is a drawing how the coupler-pcb and the slide-pcb work together:



click to enlarge

I name the parts:

1. Slide PCB (with IC, LCD, buttons etc. on it. Just the caps are shown)
2. Receiver pad (on slide PCB)
3. sender pads (56 pads) (on slide PCB)
4. caliper body
5. strip (on coupler PCB)
6. Tee (on coupler PCB)
7. Comb (on coupler PCB)

Part 5…7 are on the coupler-PCB that is glued into a recess of the body (4).

Part 5 doesn't seem to have some function.

Drawing is to scale where necessary (especially the relation of 3, 6, 7).

The coupler pcb is a two sided thin (0.6mm) PCB. The back side is plain Cu with no etching. The coupler-PCB can be homemade if you have access to a PCB prototype router. I didn't try that, but have heard of someone having success.