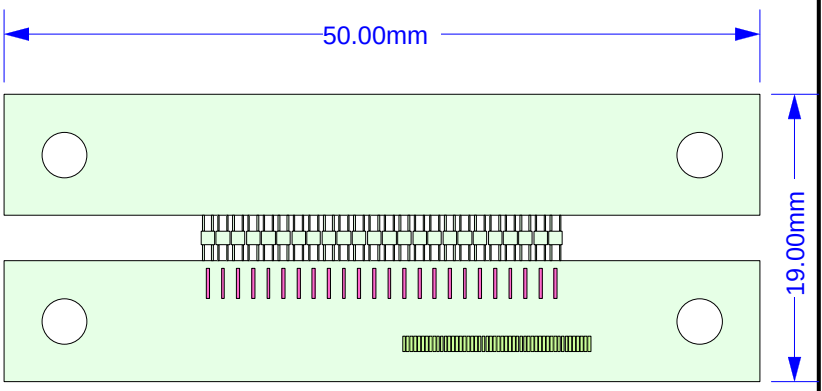
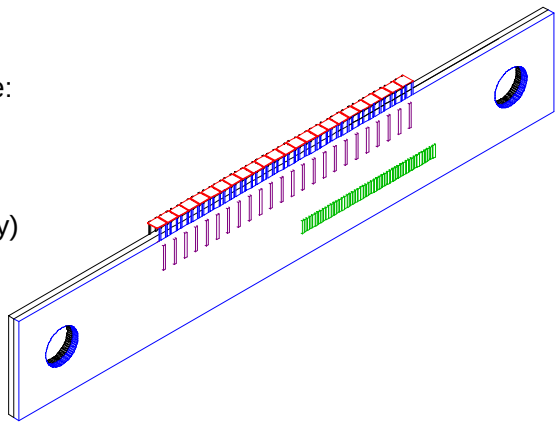
Start with a modified 1x24 Pop-Up Array (PUA)

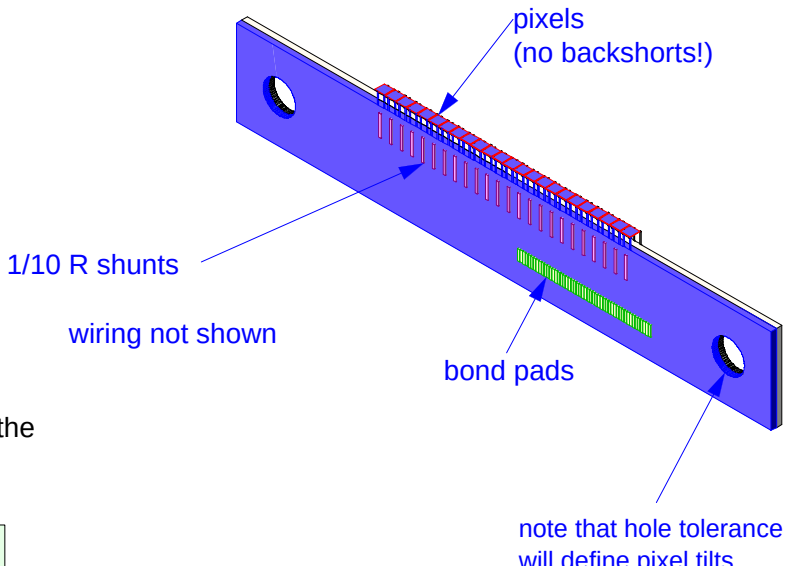


This array features:
- Wide frame
- Micromachined alignment holes
- Patterned 1/10 value Shunt Resistors
- 0.450mm thick wafer

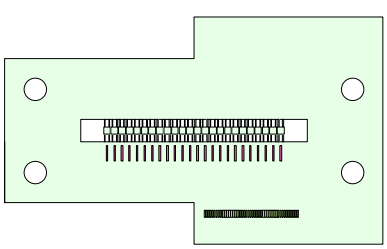
Fold this PUA onto itself & glue:



This is a 1x24 popped-up PUA with 1mm pitch (along the array) and 0.90mm width



Note added in review: in reality, I think we'd have to have the bond pads hanging down, as was done for SPIRE. This way, when we flip the PUAs onto each other, they won't obscure the bonds. The PUA will look something like this before cutting:

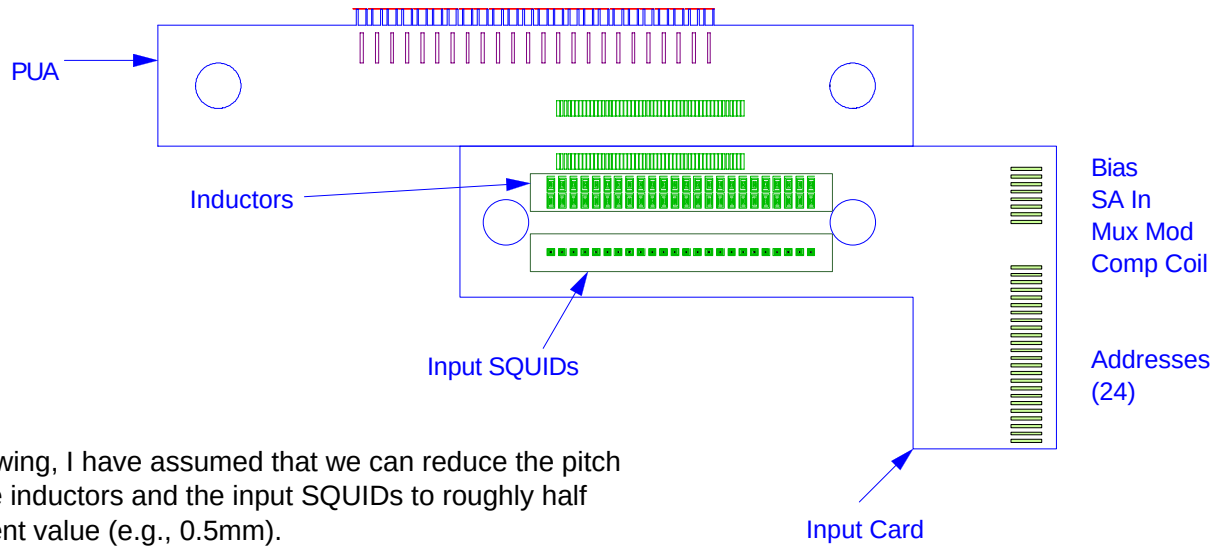


We also make a strange angled card:

This card holds the Inductor chip and the Input SQUID chip.
It would be either ceramic or fiberglass (although kapton flex on copper sounds interesting...).
It would have a row of bond pads to mate to the PUA.
It would have an array of pads (?) for the address lines, which I assume are daisy-chainable somehow.
It would have some outputs.

These units can be assembled and tested separately, so that only working "input cards" are used.

The card would be about 1mm thick, but the chips could be recessed to allow more wirebond headroom.



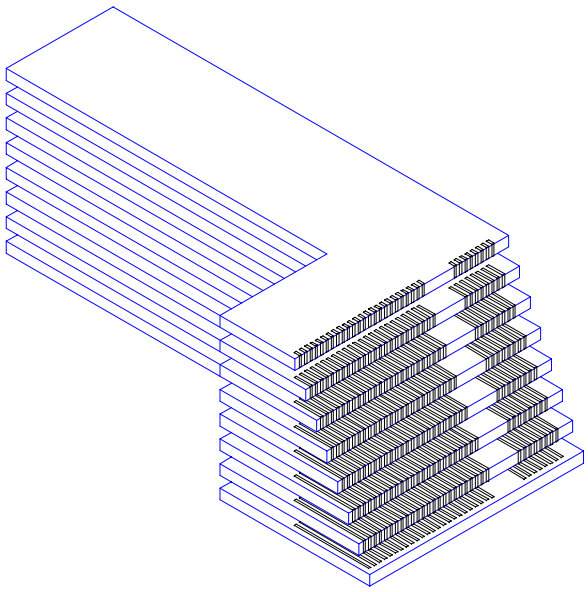
In this drawing, I have assumed that we can reduce the pitch of both the inductors and the input SQUIDs to roughly half their present value (e.g., 0.5mm).

If the card is made of fiberglass, we can attach to it using through-holes and soldered wires.
If it is made of ceramic, we will probably have to solder and glue wires, as we did for SPIRE.

Attaching the address lines to each other might be easiest if we stagger the board edges slightly, as shown. This would enable us to daisychain the cards by wirebonds or by soldered bus wire.

The address line count is assumed to be 48 (24 wires, daisychained on both sides).

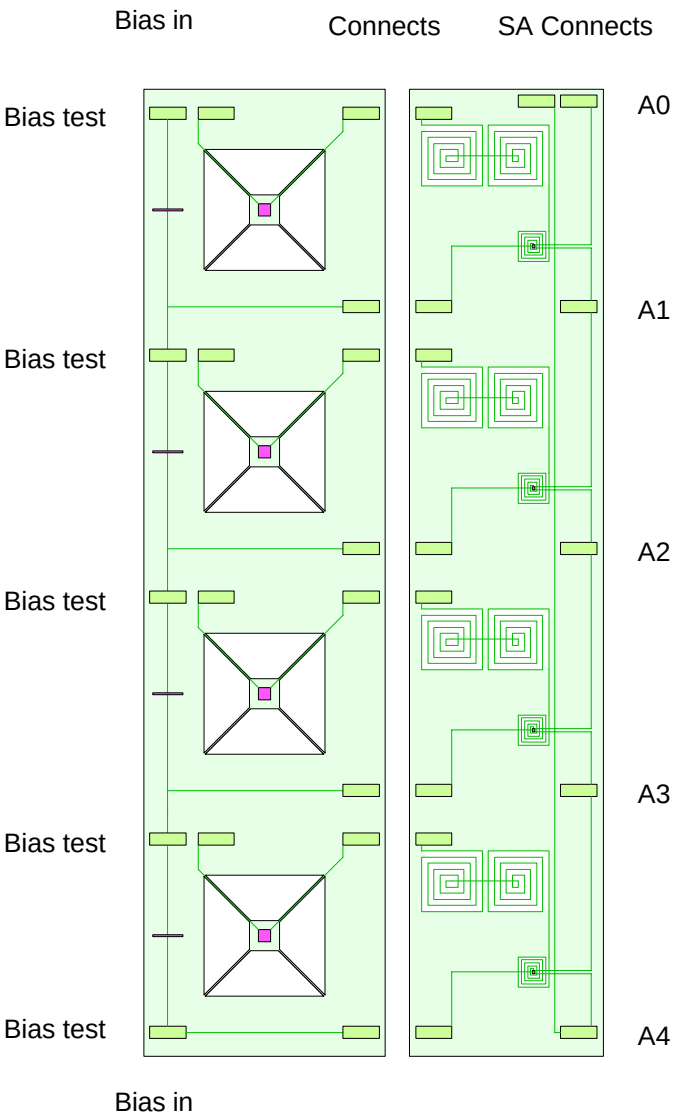
Each column would also require a Mux Mod, Comp Coil, Bolometer Bias, and SA In lines.



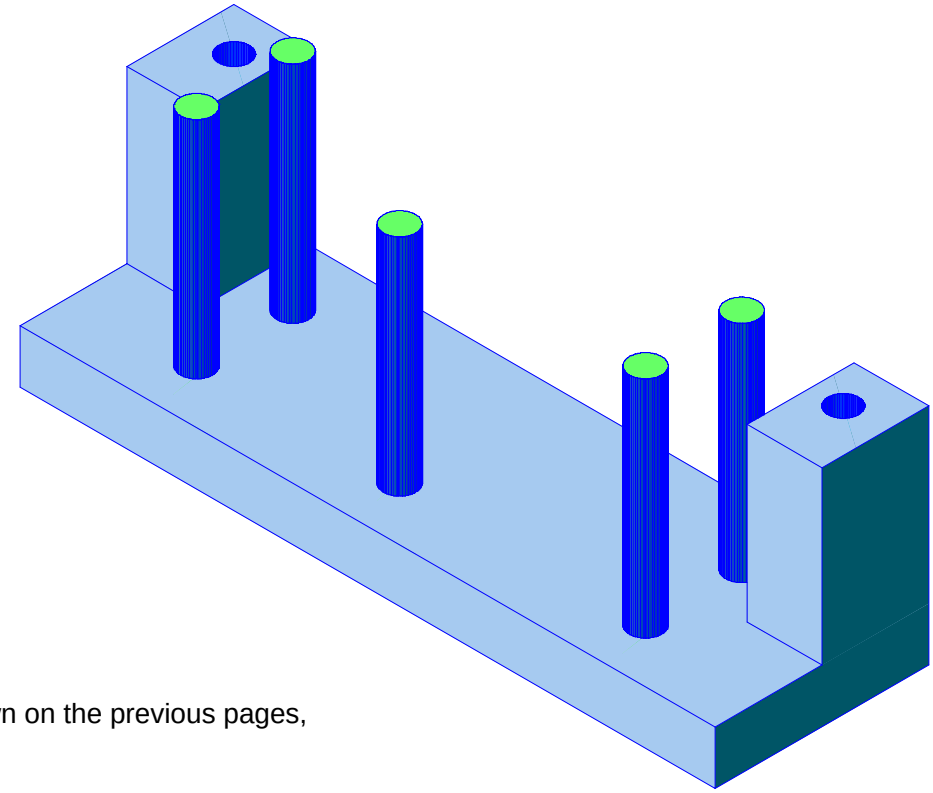
So far, the asembly we've made so far works a bit like the SIRCE detector design in an electrical sense.

Each bolometer / Nyquist inductor / input coil has its own place on a chip of like parts.

All the internal wirebonds (as shown below) are either made or built in.

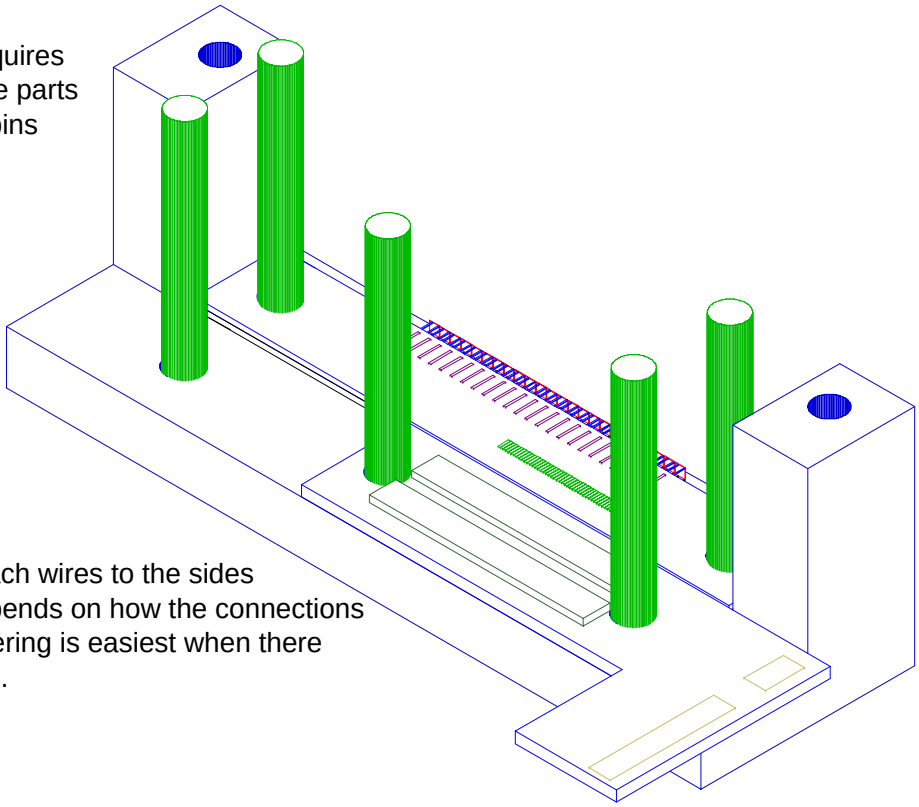


We take the assembly and place it into a cradle which has 5 dowel pins appropriately placed to hold things well. The cradle is an alumina piece; the 5 rods probably brass, and threaded into the cradle. Two screw holes are placed in the top of the cradle.



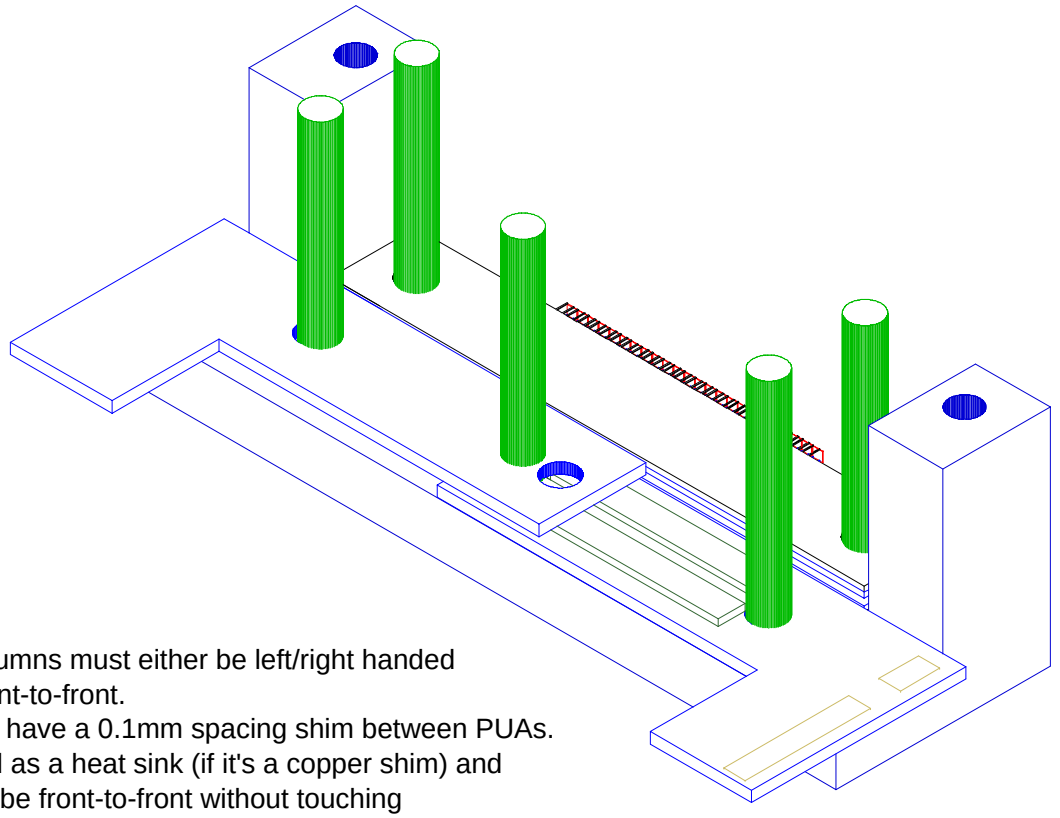
As we build up the assemblies shown on the previous pages, we begin the stacking:

The stacking requires that we place the parts over the dowel pins and connect the wirebonds.



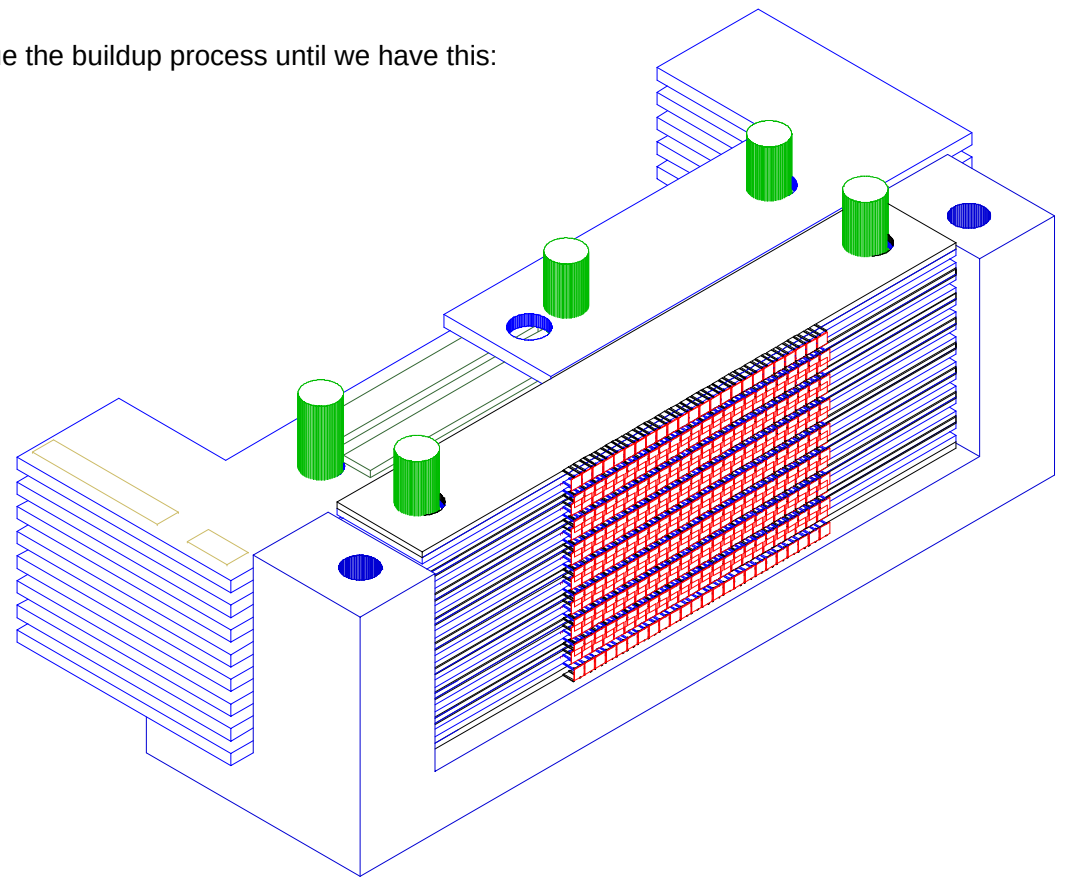
Whether we attach wires to the sides at this stage depends on how the connections are made: soldering is easiest when there is enough space.

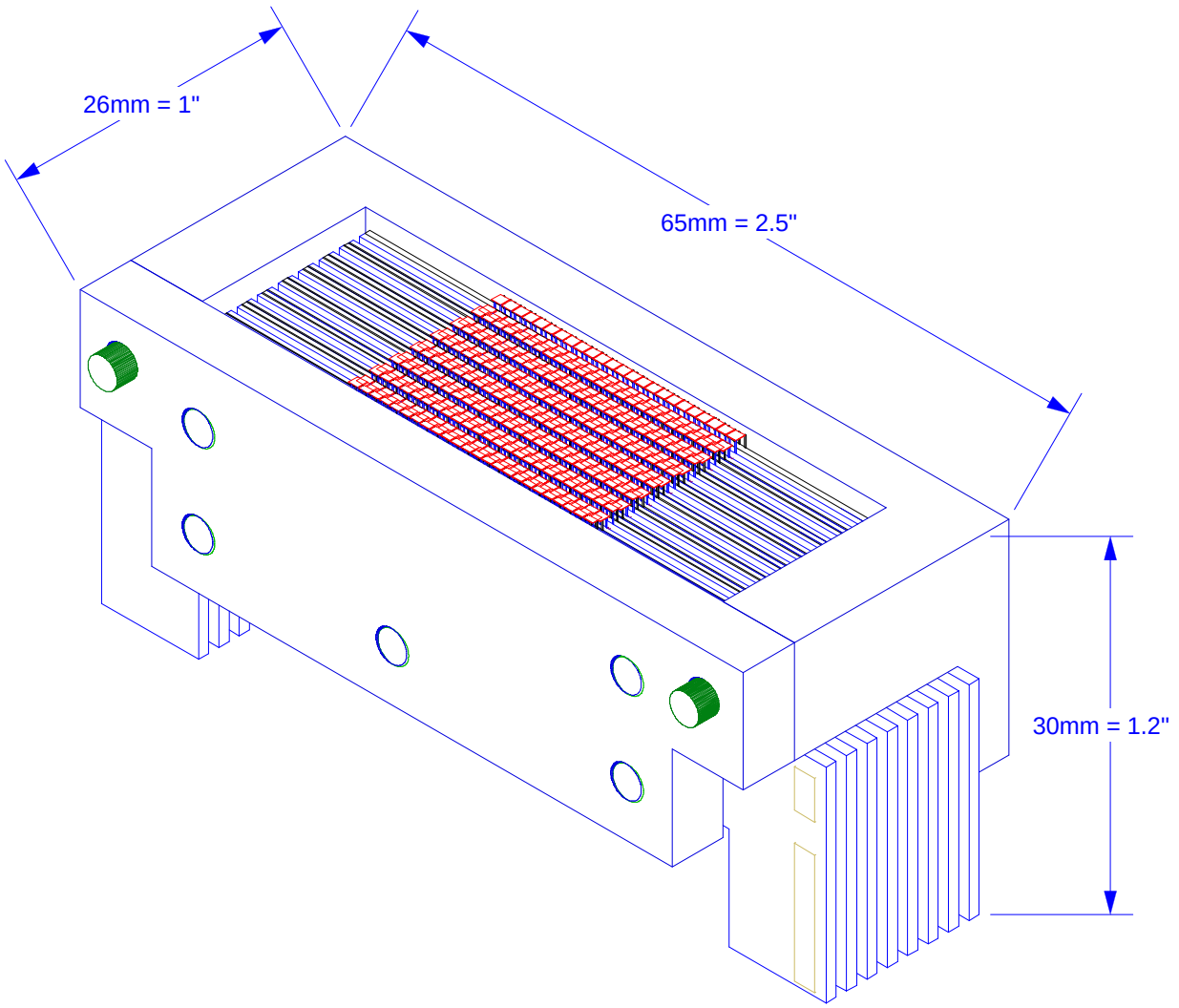
After two columns are stacked, this is what we have:



Note that the columns must either be left/right handed
or just flipped front-to-front.
Each column will have a 0.1mm spacing shim between PUAs.
This can be used as a heat sink (if it's a copper shim) and
permits PUAs to be front-to-front without touching

We continue the buildup process until we have this:





The final stack consists of a 16x24 (384 pixel) bolometer array. It may now be suspended by towers on a three-point system.

On each side, a 12-pair twisted cable for addresses would be attached. Additionally, a set of 24 pairs would fan out from the cards on each side, carrying Mux Mod, Comp Coil, and Bolometer Biases. Finally, a set of 8 pairs perhaps superconducting coaxes?) would run to the Series Array Cells, located elsewhere but probably mounted (and heat sunk) to the frame which holds the array.

This array requires only one gluing step per bolometer array: when folding. No tiny ceramic parts are used. Heat conduction relies mostly on pressed contact, and therefore the entire array may be disassembled. There are no bridge chips and all external wiring is repairable. The total dissipation should be 0.2μW.

There are still details to work out: how to heat sink sufficiently; how to attach to the cards; and how to shield magnetically.