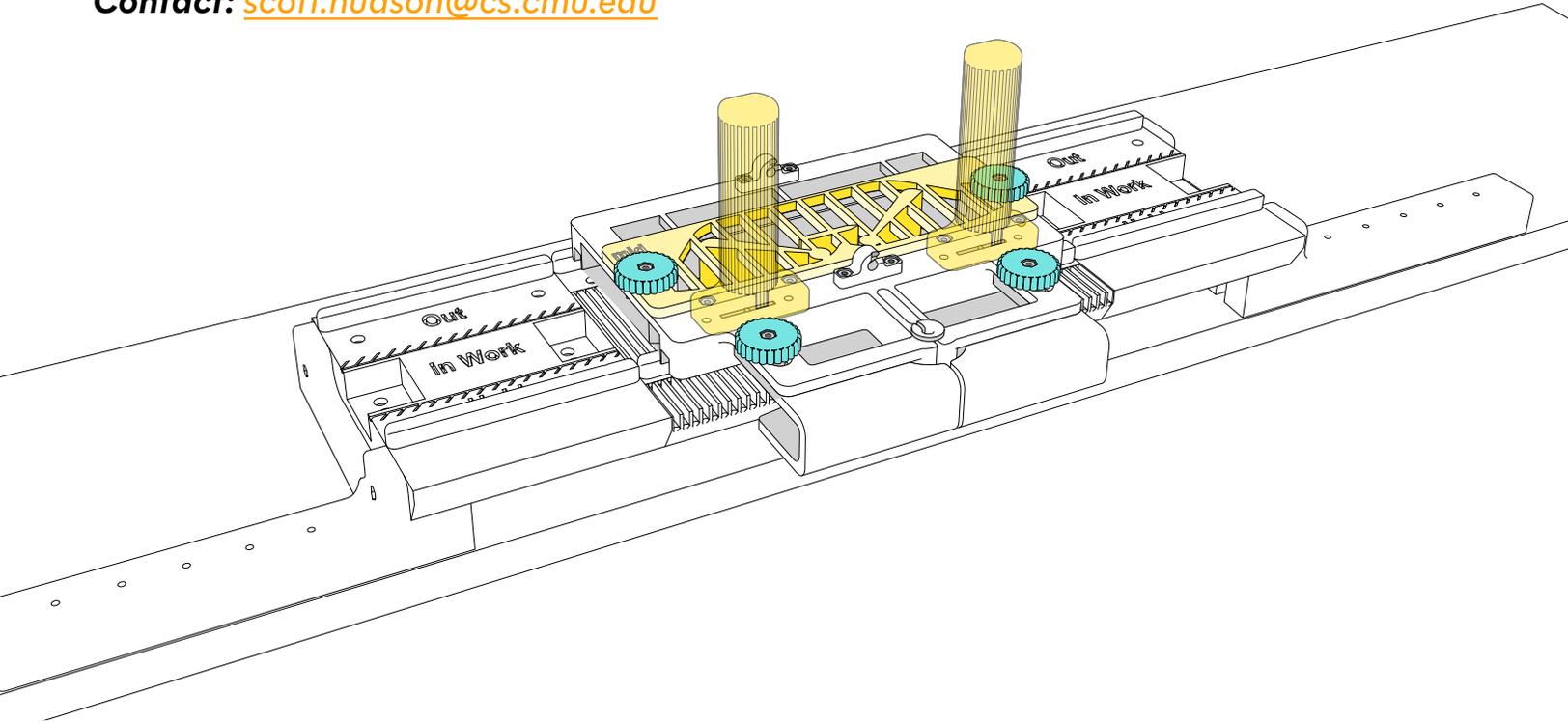# An inexpensive modular knitting machine

(version alpha 1.0, March 2026)
A project of Carnegie Mellon University DevLab
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1. Gather materials

Required materials for N bed modules:

▶ 14+6**N** M3x16 socket head bolts
▶ 14+6**N** M3 nuts
▶ 25**N** KR830, KR838, or KR850 needles such as *these*
▶ 205**N** mm of ~10mm wide weather stripping (with adhesive on one side) such as *this*
▶ Optional: a small amount of hot glue

Required tools:

▶ 2.5mm hex wrench (to fit M3 socket head); ball end recommended
▶ Scissors to cut the foam weatherstripping
▶ Emory board to adjust the fit of the grooves in the needle bed

Optional tools to clean prints (exact tools used depend on your printer/accuracy):

▶ Small sharp diagonal cutters such as *these*
▶ Craft knife such as *this*
▶ Tweezers or needle–nose pliers

| part_name	qty	printing note	part prep summary
needle_bed	N	–	Insert six nuts, at marked locations.
front_rail	N	Print with brim.	Remove brim. Clean out support material.
back_rail	N		
end_plate	2		Insert two nuts, at marked locations.
clamp_arm_left (optional)	1	40% infill.	Insert two nuts.
clamp_arm_right (optional)	1	40% infill.	
carriage_frame	1		
presser_left	1	Print with brim.	Remove brim and support material.
presser_right	1	Print with brim.	Remove brim and support material.
feed_ring	2		Remove support material. Sand inner edge of ring to prevent yarn snags. Insert two nuts per print.
feed_plug	1		Sand curved inner surface of the feed holes.
handle	2	80% infill	Insert two nuts per handle.
knob	4		Insert one nut per knob.
cam_mid or cam_short	1		

2. Prep printed parts

Remove brims and support materials. (Pliers/tweezers can help with this.) De–pending on your print settings, the edges of the bottom surfaces of your prints may be slightly bulged ("elephant's foot"); you may wish to trim these slightly with a craft knife, especially at the edges of bolt or nut holes.

Insert nuts into each of these locations:
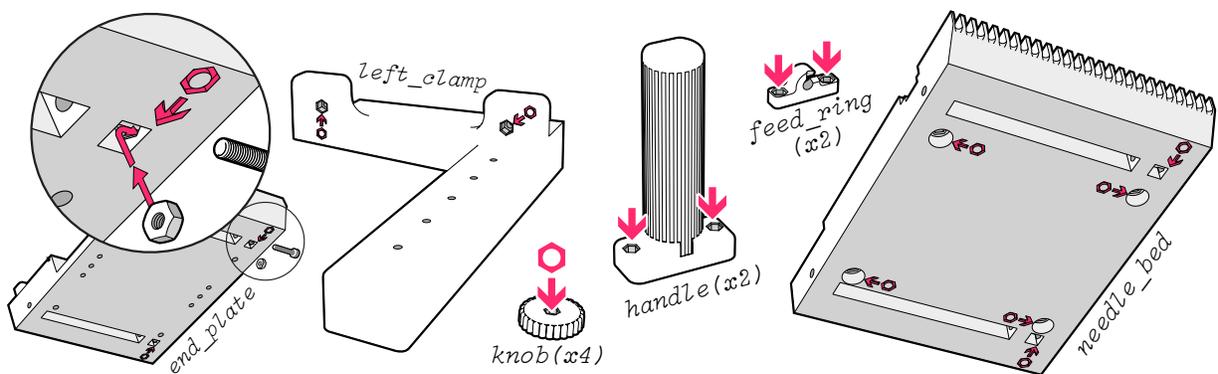
Note that you should have two copies of **end_plate**. *If you are using the clamp arms, insert the nut into both copies of this print. If you are not, you only need to do it for one. (See "Neelde bed Assembly" for how these will be attached.)*
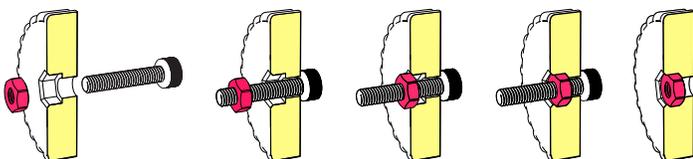

Each nut should be seated firmly into the plastic. Use a bolt to accomplish this: insert the bolt into the hole; thread the nut onto the bolt; tighten the bolt until it pulls the nut into the plastic; remove the bolt.

3. Needle bed assembly

Test the fit of needles in needle_bed: trace each of the grooves in the needle bed with the straight end of one of the needles. The needle end should be able to pass smoothly and easily along the entire groove. If any grooves are too tight or rough, use an emory board or sandpaper to widen or smooth the bad spots.
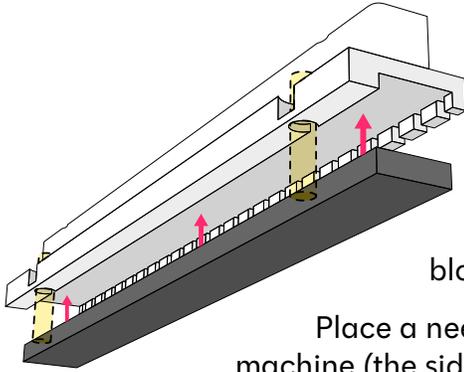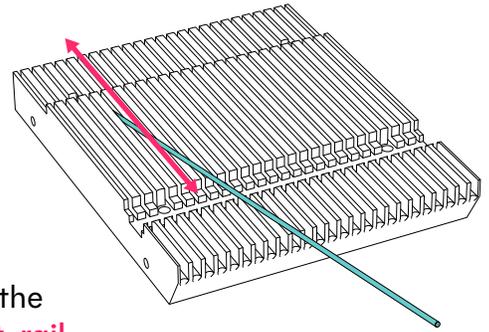
Fit the foam weatherstripping to the channel on the underside of front_rail. The ends should be trimmed as precisely as possible to fit the channel without leaving a gap at the sides.

Remove the sticker backing and place the foam with its long edge flush with the front (crenellated) edge of the channel— do not block the bolt holes.

Place a needle in each groove with the hooked end toward the front of the machine (the side with the foam) and the hooks facing up. Attach front_rail and back_rail with bolts through the vertical holes; leave the front bolts somewhat loose at first.

Test and adjust the tightness of the rail attachment and the resulting friction on the needles. You are aiming for just enough friction from the foam strip that the needles will stay in place if the bed is tilted or shaken, but will move easily when you slide them intentionally.

You can adjust the needle friction by carefully tightening the bolts attaching the front rail. Take care not to overtighten these as that area is small and thin. If necessary, the rails can be just a little high, if that's needed to keep the needles moving correctly.

Attach each end_plate and (optionally) the clamp_arm_left and clamp_arm_right.

left_clamp   end_plate   needle_bed[s]   end_plate   right_clamp
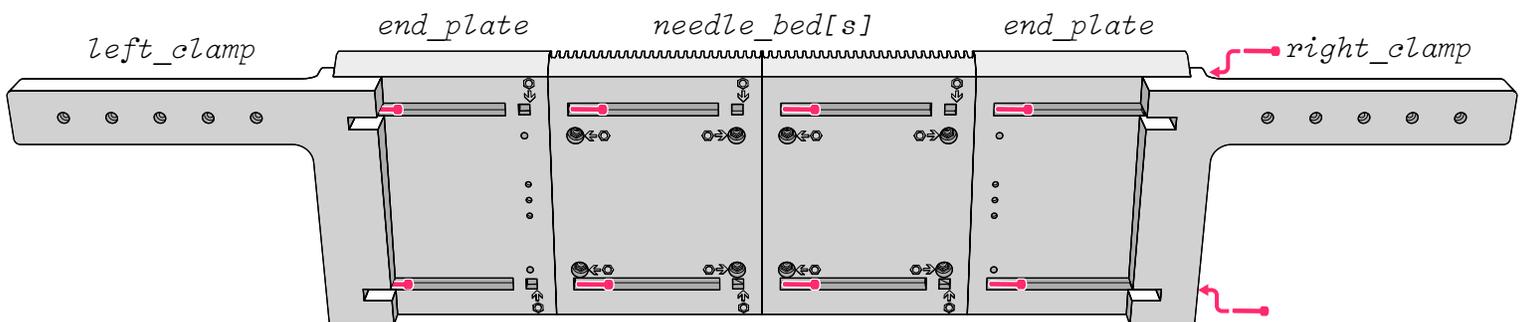
4. Carriage assembly

Press fit **feed_plug** into its hole at the front of **carriage_frame**. Attach each **feed_ring**. With two of the **knob**s, attach **presser_left** and **presser_right**. Attach each **handle**. The flat side of the handle should face the back of the carriage. Using the other two **knob**s, attach your choice of **cam** plate to the car–riage. You can use the knobs to just finger–tighten this attachment. You can optionally put a small amount of hot melt glue around the bolt head on the bottom of the carriage to keep it from turning if it is loose.

feed_ring(x2)
feed_plug

knob(x2)

handle(x2)

knob(x2)
cam mid or cam short
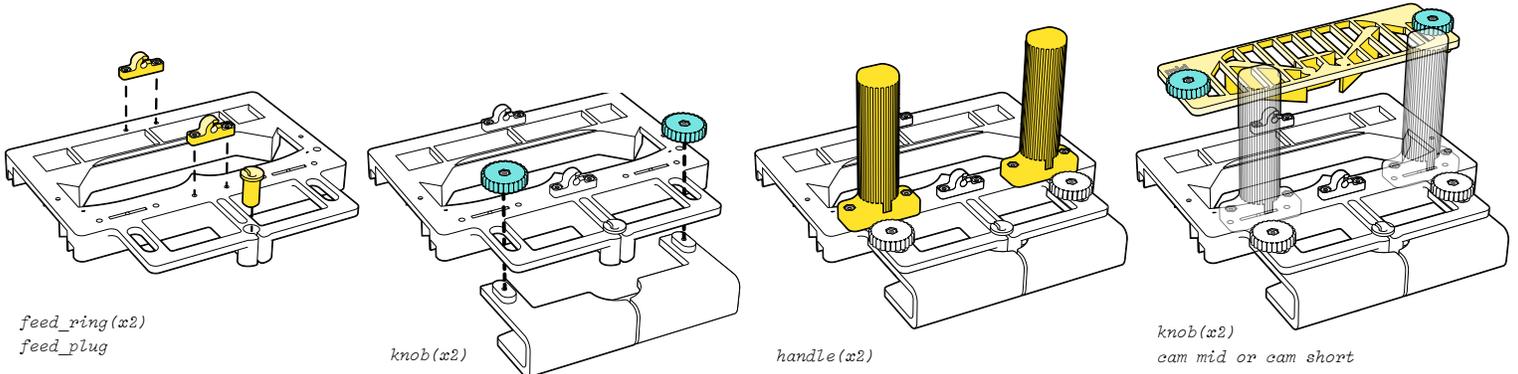
Place **presser_right** and **presser_left** in the slots and attach the associated knobs, but keep them loose. Place the carriage on the rails, push the pressers forward to contact the front of the bed, then pull them back away from the bed about 2mm. (Note that this distance may need to be adjusted based on the yarn used In general, they should be as close to the bed as possible without interfering with the motion of the carriage across the already knitted material.) Align the two pressers and tighten the knobs to hold in place.