

MINI-LATHE QUICK CHANGE TOOL POST

Cutting and assembly details

Machinists should familiarize themselves with the contents of this section before jumping in to the drawings. Many details are described here due to lack of space on drawings.

Main Block

***NOTE:** All aluminum components of this project are 6061-T6 grade aluminum. The instructions assume all edges are properly finished and ends are faced off.

Mount Post Construction and use of this QCTP will require replacement of the threaded mount post on the compound slide of your lathe. The original post is too short. The new post should be 3-inches long, threaded to 10 X 1.5 mm. 3/8 rod works nicely for this. I prefer using W-1 drill rod. **Do Not** use commercial threaded rod. It is not strong enough to take the strain and will stretch. The original post has a hex hole in the top for removal. To install the new post, tighten two nuts together near the top of the post and use a wrench to turn into the compound slide base.

A note on drill rod: Drill rod can be given a nice satin finish after cutting by going over the cut area with a 240 grit emery cloth strip while running the piece at fairly high speed (1800-2000 rpm) and then holding a piece of green scrubber pad tightly against it while sliding back and forth. If it gets a bit hot to handle, you are done.

Main Block The mount hole and the plunger holes are centered left to right looking at the dovetailed end as the front. The mount hole is drilled through with a size "W" drill. The lock plunger hole is formed by drilling through the block, from the face, with a 1/2-inch drill then using a 3/4-inch end mill counterbore the hole 1.6 inches deep. If a mill that long is not available, use a boring head. The bottom of the hole should be flat. On top of the block, counterbore the size "W" hole using a 3/4-inch end mill .100 deep. On the rear of the block, measure .5" up and .5" toward center from the bottom left corner. Drill 5/16 deep using a #38 drill. Tap the hole to 5-40.

To mill the dovetail face, Set the block up in the milling vice and using a 1/2" or larger end mill, mill toward center .375 and down about .322. The final depth is set later. Mill both sides leaving a land in the center 1.250 wide. Mount a 60° dovetail cutter. From the point of first touch, mill under the land .175 toward center of block. When properly finished, the outer edges of the land will nearly be knife edged. Lower the cutter a little to finish the depth of cut to .325.

After all parts are cut and the new mount post is installed, The thrust washer is shimmed and seated. The ring is a .125 slice of 3/4" drill rod center drilled with a "W" drill. Place the block on the post and set the ring into the counterbore. Thread down the lock handle and see where it locks tightly. Ideally, the handle should point to the tailstock. If it does not, remove the ring and put washers under it cut from brass shim stock until the handle locks in the correct position. Knurl the edge of the pressure ring lightly and press into the counterbore, over the shims. This can be easily done with the lock handle.

Threaded Insert Before making the threaded insert carefully measure the 1/2-inch hole at the rear of the block. Drill bits wobble and the hole may not be exact. Make the insert so the slim end is .001 to .0015 larger in diameter than the hole so it will press into the hole tightly. Drop the insert into the plunger hole from the front with the slim end down.

Firmly press it down into the hole until it bottoms. It should protrude slightly through the back wall. This is best done with a hydraulic press.

Plunger The plunger is made from a 1.5" long piece of $\frac{3}{4}$ " dia. Drill rod. Face off the ends and round the edges slightly. Clamp the plunger on its side in a vise in a milling machine. Centered on one side, 1.1" from the front, drill through using a "Z" drill. Using a $\frac{7}{16}$ " end mill, elongate the hole until the dimensions shown on the print are reached.

Plunger Lock For safety and nice appearance, the hub end of the plunger lock can be rounded in the lathe with a smooth file and finished as indicated in the note on drill rod. The plunger lock has a tommy bar inserted into the hub for leverage. It is not drilled or assembled until final assembly of the block.

The tommy bar is a piece of $\frac{3}{16}$ drill rod 1- $\frac{7}{8}$ " long. Knurl $\frac{1}{4}$ " of one end lightly and round the other end. With the block on the lathe and the plunger inserted, mount a tool holder and tighten the hub of the lock firmly by hand. Using a marker, place a dot in the middle of the smooth hub straight up, on top. Remove the lock and drill a $\frac{3}{16}$ " hole, $\frac{3}{8}$ " deep at the location of the dot. The knurled end of the bar should press nicely into the hole. If all tool holders are carefully milled, the bar should tighten on all holders slightly past top dead center. Jam-up tight is never necessary. Remove the block from the lathe to screw in the lock after bar insertion. Correct position can be determined by leaving on the tool holder and running in the lock until the bar is pointing up and the holder is locked. Thread in the stop pin and lightly snug up with a small screwdriver. The bar will now rest on the stop pin when loosened keeping it out of the way of other lathe components.

Lock Handle Knob The knob is a $\frac{3}{4}$ " ball bearing. Anneal the bearing by heating to cherry red and allow it to slowly cool to room temperature. Do not heat it with an oxy-acetylene torch. It will heat the outer area too soon. The heat must reach the core. A Bernzomatic works fine although a bit slow. When cool, center punch a point, drill a $\frac{15}{64}$ " hole $\frac{1}{2}$ " deep then ream to .249.

Lock Handle Shaft Use a 3" piece of $\frac{5}{16}$ " drill rod. Turn down one end to .250 for a distance of .375. Turn down the other end to .232 for a distance of .250. Thread this end to 6 X 1mm. Where the threads meet the wall, cut down a relief to prevent binding at full insertion. Chuck the rod in a vertical standing rotary table or collet indexer and then, beginning $\frac{1}{4}$ " above the shoulder by the threads, mill a flat every 90° to create a square. Mill down .032 at each position to create a place for a $\frac{1}{4}$ " open end wrench. This will be used to tighten the shaft into the hub. When the shaft is completed, press the ball onto the unthreaded end.

Lock Handle Hub The hub is made from $\frac{3}{4}$ " drill rod. Most specs are on print. The hole on the angled face is perpendicular to that face angling it down toward the center. The spot face is to provide a flat face for the handle shaft to tighten against. After assembling the shaft, thread it into the hub and snug up with a $\frac{1}{4}$ " open end wrench.

Final Assembly At this point, the main block is done and can be assembled on the lathe. Slide in the plunger aligning its hole with the block hole. Put a tool holder on the dovetail. Screw in the plunger lock and snug it in place. Screw in the stop pin. Place the block down over the new mount post. Thread on the lock handle and tighten down with the main block in a desirable direction. All that is required now is to pull the handle toward you and change to a preferred tool holder pressing the handle back up to lock it.

The various stages of fabricating and assembly of this project can be seen on my web site. Go to **PROJECTS** and click on the photo of the QCTP. These photos of the actual item may help to clarify some of the drawings and descriptions.

Tool Holders

The drawings for the tool holders are largely self-explanatory. The tools are placed into the slot milled on the side and the screws tightened down. You may find a different length screw better for your specific uses. The height stop posts are 1-1/2" pieces of threaded rod tightened into the bottom of the block hole. These allow for a preset stop that puts the cutting tip of the tool in the exact center of the work piece. Once the disk is set, lock the nut against it and the next time you need it you just drop it on the block and go to work. As you build tool holders you need to keep in mind that the dovetails must be held to $\pm .001$ or the stop position of the plunger lock handle may go out of reasonable range.

The stop disks can be easily made by knurling an inch or so of 5/8" brass rod and drilling and tapping the center to 10-32. Using a cutoff blade, just take off 1/8" slices and clean them up. You can knock out several disks in short order like this.

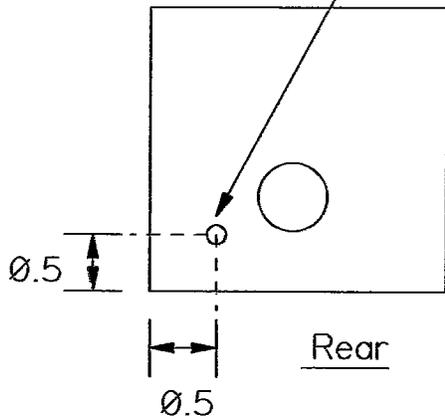
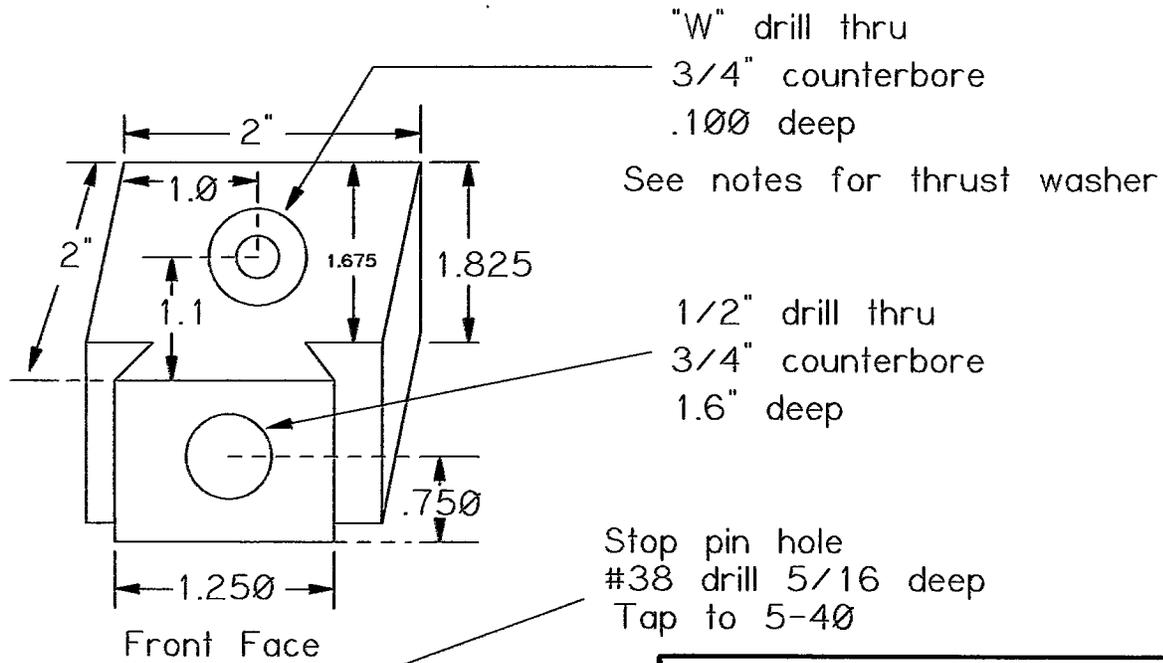
The boring holder shows a 1/2" hole for the cutter, but it can just as easily be 3/8" if that is the size you use. Mine is 1/2" with a sleeve inserted that allows me to use either 3/8 or 1/2" boring tools. The sleeve is made of 1/16" spring steel and came from a commercial holder that I did not like otherwise. I would not know how to tell you to construct such a sleeve.

Using the basic scenario, you can build custom tool holders for many types of tools you want to hold. Possibly a cutoff blade or a home ground cutter.

I hope you enjoy this project as much as I enjoy the use of the prototype. If you need clarification or help on this or find errors, feel free to contact me through the email function on the web site. <http://cburg.home.comcast.net> or <http://home.comcast.net/~cburg>.

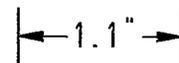
Main Block

Aluminum

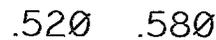
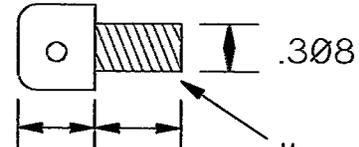


Plunger Lock

5/8" dia. drill rod

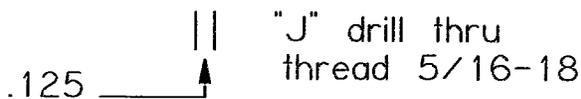
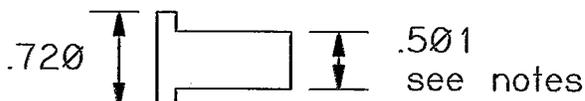
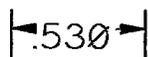


See notes



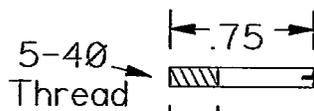
Threaded Insert

3/4" dia. CRS



Stop Pin

1/8" drill rod

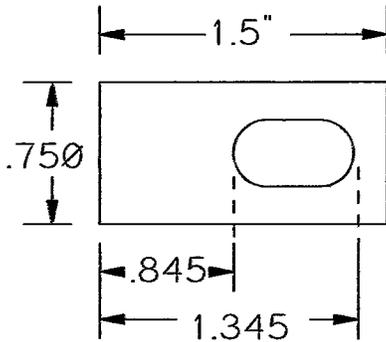


Mill 1/16" slot
.050 deep
for screwdriver



Plunger

3/4" dia. drill rod

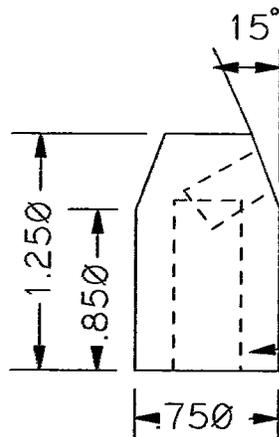


See notes for slot construction

Lock Handle

Hub & shaft are drill rod
Knob is a 3/4" ball bearing

Hub



In center of angled face, drill ".060" to center hole.

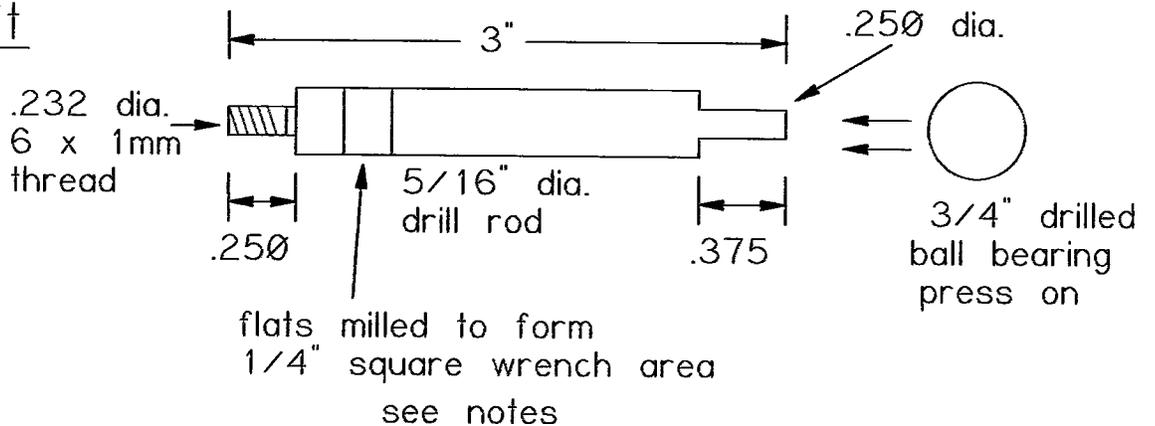
Tap to 6 X 1mm

Spot face hole with 5/16 mill

From bottom, drill "S"

.900 deep & tap 10 X 1.5mm

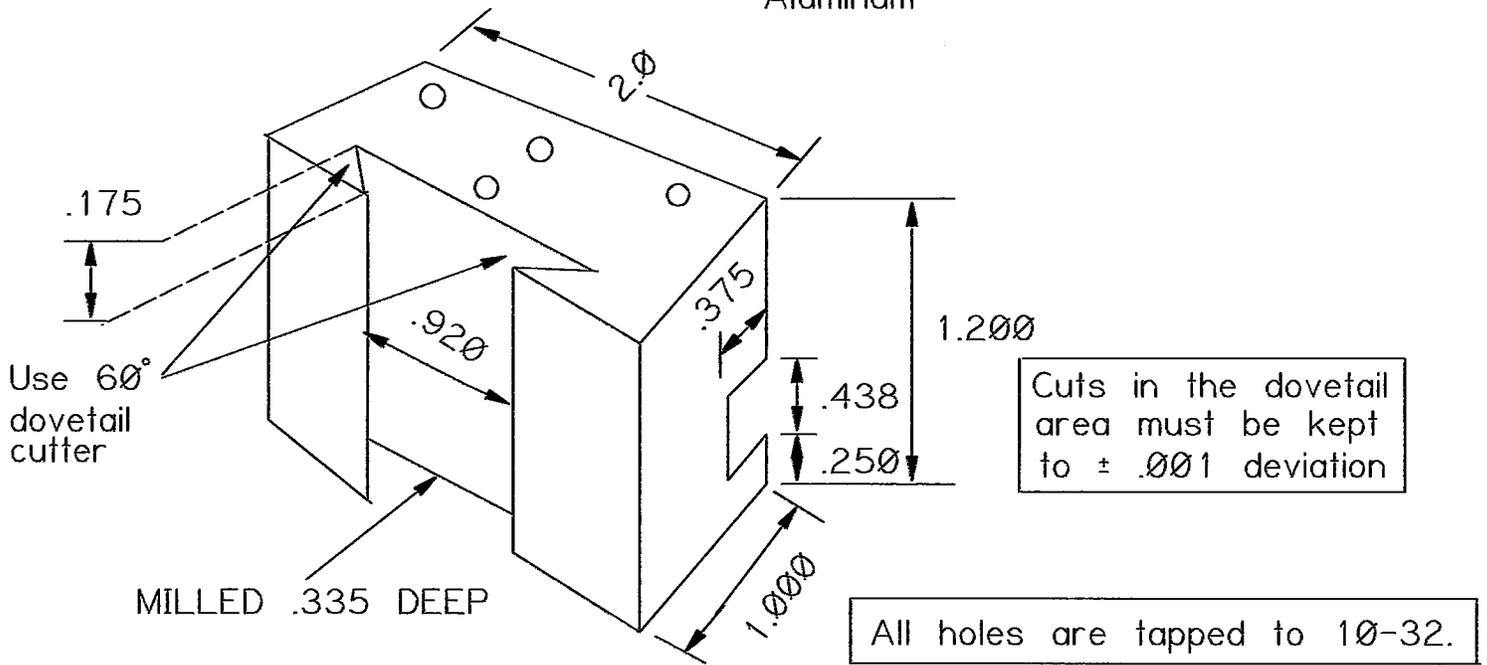
Shaft



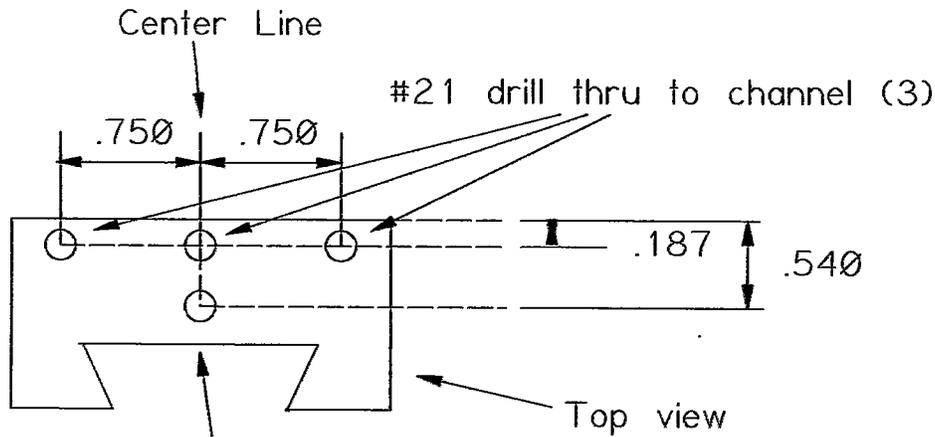
3/4" drilled ball bearing
press on

Straight Tool Holder

Aluminum



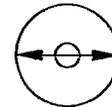
Socket head cap screws, 10-32 X 3/4 (3) for tool locks.
 1 1/2", 10-32 threaded rod for height adj.



#21 drill 1/2" deep

Install stop post rod here.

Stop disk



5/8" dia. brass

.125 thick, medium edge knurl.

#21 drill thru center

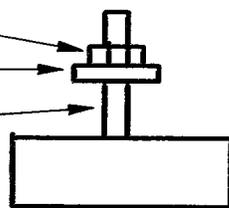
Tap 10-32

Hex lock nut

Stop disk

Adjusting rod

Block

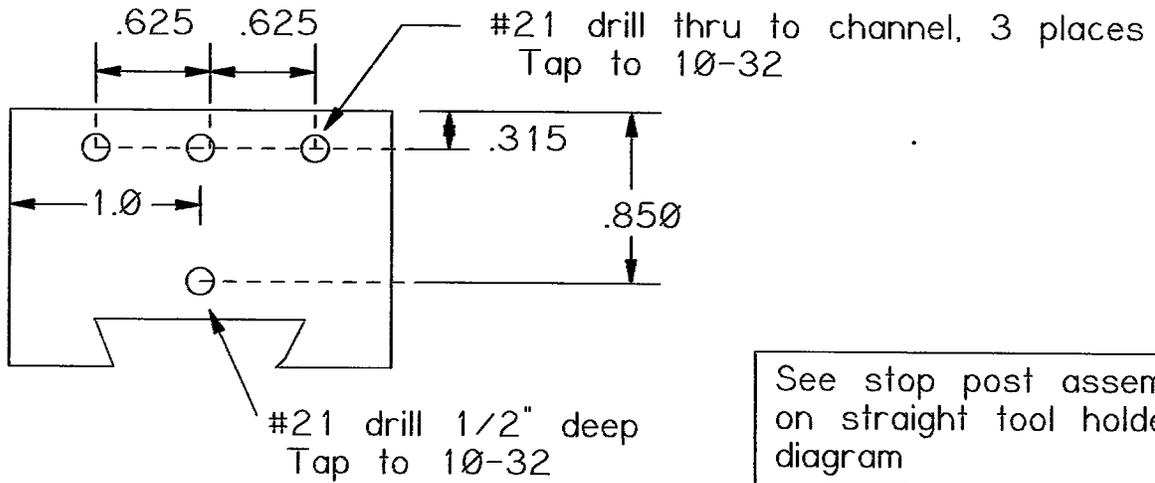
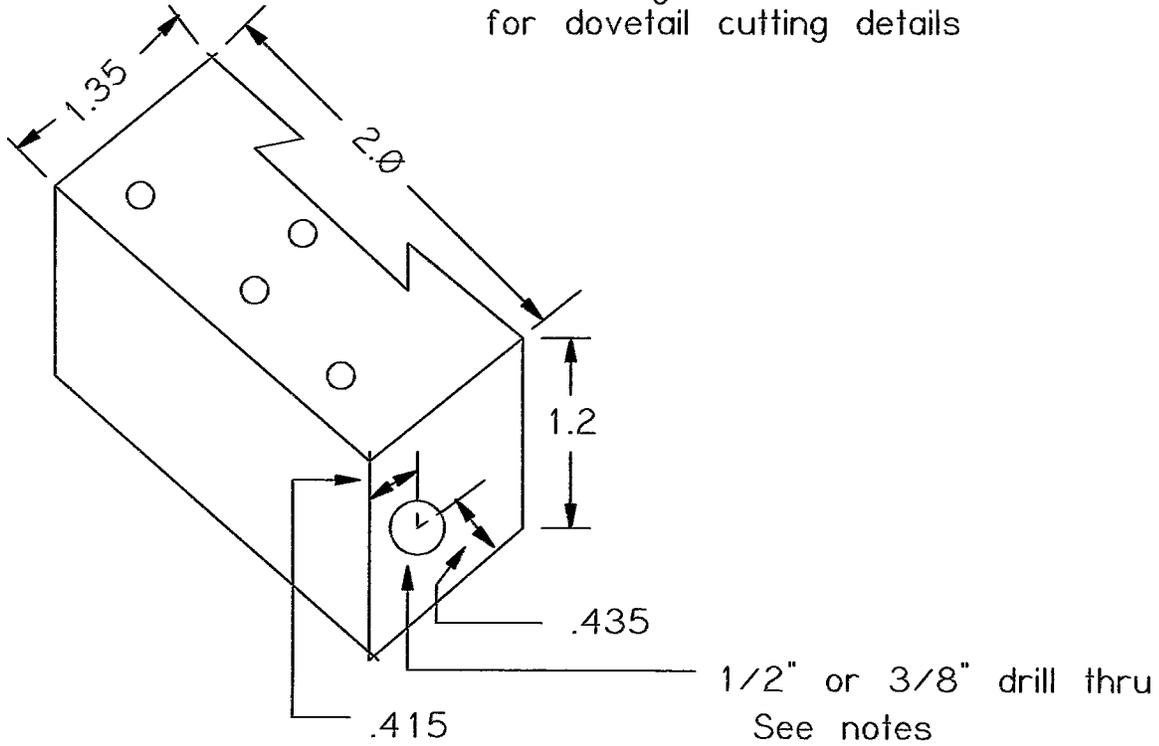


Stop post assembly

Boring Bar Holder

Aluminum

See straight tool holder
for dovetail cutting details



See stop post assembly
on straight tool holder
diagram