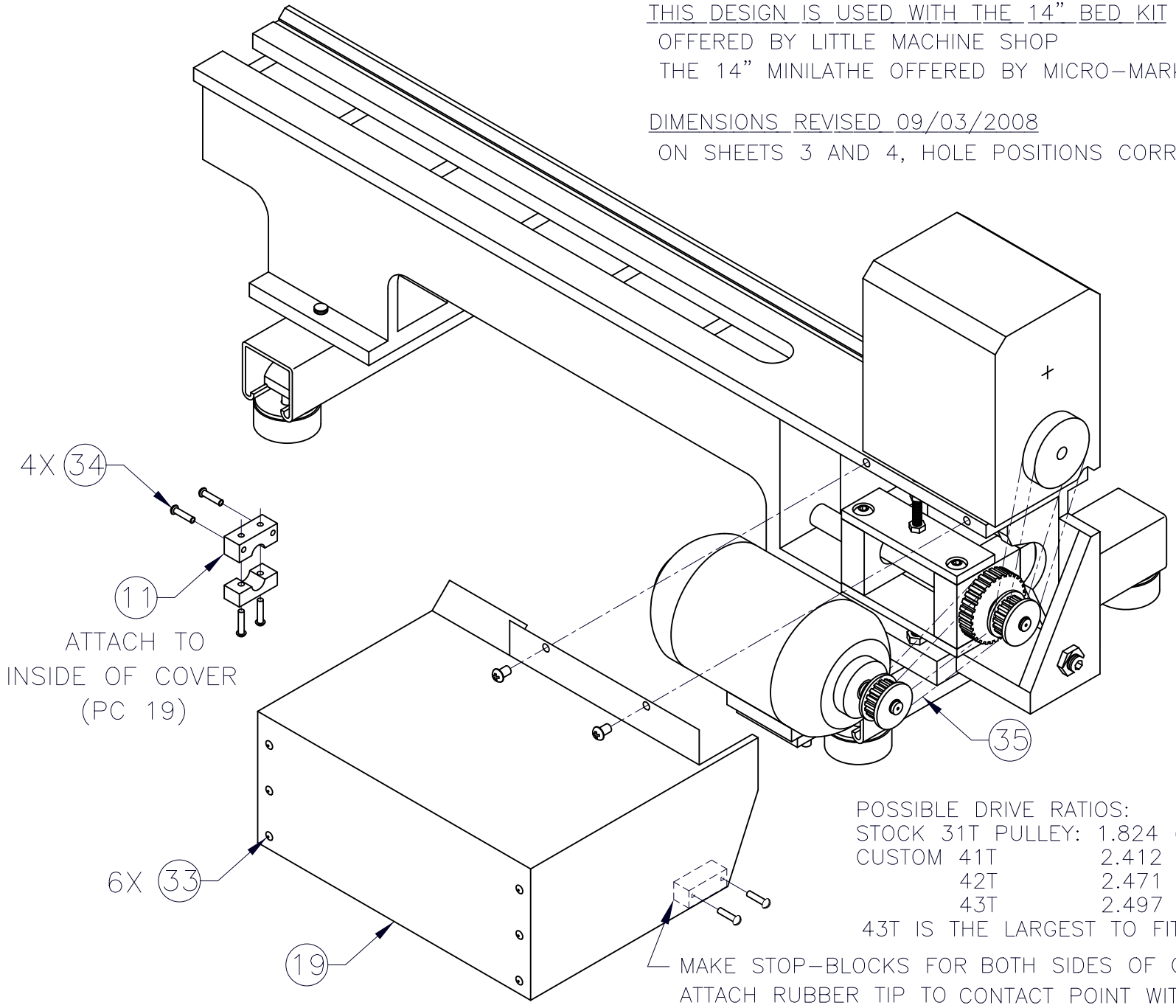
THIS DESIGN IS USED WITH THE 14" BED KIT
OFFERED BY LITTLE MACHINE SHOP
THE 14" MINILATHE OFFERED BY MICRO-MARK MAY DIFFER.

DIMENSIONS REVISED 09/03/2008
ON SHEETS 3 AND 4, HOLE POSITIONS CORRECTED.



POSSIBLE DRIVE RATIOS:

STOCK 31T PULLEY:	1.824	(ø1.802)
CUSTOM 41T	2.412	(ø2.380)
42T	2.471	(ø2.439)
43T	2.497	(ø2.497)

43T IS THE LARGEST TO FIT

MAKE STOP-BLOCKS FOR BOTH SIDES OF COVER
ATTACH RUBBER TIP TO CONTACT POINT WITH BED

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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PAGE	REQ'D	SIZE	SPEC	MATERIAL	DESCRIPTION	ITEM
1	1	1.5 X 70	BLACK	RUBBER, FABRIC (LMS P/N 1105)	BELT, TIMING	35
1	4	#6-32 X .63	ZINC	STEEL, PLATED	SCREW, ROUND HEAD	34
1	6	.125 X .375	ZINC	STEEL, PLATED	POP RIVET	33
15	1	5100-25 OR EQUAL	TRUARC	STEEL, BLACK	RING, RETAINING	32
17	1	.25-20 UNC	ZINC	STEEL, GALVANIZED	NUT, UNISTRUT	31
17	1	1.50 ..13 X .25	ZINC	STEEL, GALVANIZED, EXTRA HEAVY	FENDER WASHER, LARGE	30
17	1	LMS P/N 1294	BLACK	W/ STEEL WASHER INSERT	FOOT, RUBBER, MINILATHE	29
17	4	.25-20 X 1.0	PLAIN	STEEL	SOCKET HEAD CAP SCREW	28
17	4	M8	ZINC	STEEL GALVANIZED	FLAT WASHER	27
17	4	M8.0X1.25-16.0	BLACK	STEEL, SOCKET HEAD, HEX DRIVE	SOCKET HEAD CAP SCREW	26
16	1	M6.0X1.0	ZINC	STEEL, PLATED	NUT, HEX	25
16	1	M6	ZINC	STEEL, PLATED	FLAT WASHER	24
16	2	M6.0X1.0-25MM	BLACK	STEEL, HEX SOCKET, HEADLESS	SET SCREW	23
15	2	M6.0X1.0-16MM	BLACK	STEEL, HEX SOCKET, FLAT HEAD	CAPSCREW	22
14	4	.25-20 X .75	BLACK	STEEL, SOCKET HEAD, HEX DRIVE	CAPSCREW	21
14	5	M6.0X1.0-16MM	BLACK	STEEL, HEX SOCKET. BUTTON HEAD	CAPSCREW	20
13	1	17" X 12" X .025"	PLAIN	STEEL SHEET, GALVANIZED	MOTOR COVER	19
12	1	1.50 X 1.63 X 10.0	PLAIN	STEEL (UNISTRUT RAIL) + GREEN PAINT	FOOT, LATHE TS END	18
12	1	1.50 X 1.63 X 10.0	PLAIN	STEEL (UNISTRUT RAIL) + GREEN PAINT	FOOT, LATHE HS END	17
11	1	5/16-24 UNF X .625	PLAIN	STEEL (MAKE FROM BOLT)	STUD	16
11	1	LMS P/N 1899 *	PLAIN	STEEL, BLACK FINISH	MOTOR MOUNT (MODIFIED)	15
10	1	LMS P/N 1205	PLAIN	PLASTIC, MOLDED, BLACK	COG PULLEY, MOTOR	14
10	1	10MM X 2.50" DIA.	PLAIN	ACETAL SHEET	COG PULLEY (CUSTOM)	13
10	1	3MM SQUARE X 1.00 LONG	PLAIN	STEEL KEYSTOCK	PLAIN KEY (ALTERNATE)	12
9	1	.50 SQUARE X 1.25	6061-T6	ALUMINUM FLAT BAR	CLAMP, POWER CORD	11
9	1	LMS P/N XXXX	PLAIN	PLASTIC, MOLDED, BLACK	COG PULLEY (STANDARD)	10
9	1	.25 SQ X 1.00 LONG	1018	COLD FINISH MILD STEEL	DUAL KEY	9
9	2	22 OD X 8 ID X 7MM WIDE	608Z	COLD FINISHED MILD STEEL (CRS)	BALL BEARING	8
8	1	.50 X 2.00 X 2.25	6061-T6	ALUMINUM FLAT BAR	MOTOR SADDLE	7
7	1	.25 X 2.00 X 4.50	1018	HOT ROLLED MILD STEEL FLAT BAR	MOTOR BRACKET	6
6	1	ø.625 ROUND BAR	1018	COLD FINISHED MILD STEEL (CRS)	SPACER (ALTERNATE)	5a
6	1	ø.625 ROUND BAR	1018	COLD FINISHED MILD STEEL (CRS)	SPACER	5
6	1	.500 ROUND BAR	1018	COLD FINISHED MILD STEEL (CRS)	SHAFT	4
5	1	.25 X 1.25 X 4.00	6061-T6	ALUMINUM FLAT BAR	STOP BAR	3
4	2	.75 X 2.00 X 2.25	6061-T6	ALUMINUM PLATE	BEARING BLOCK	2
3	1	ø.500 X 2.000" FLAT	6061-T6	ALUMINUM FLAT BAR	BACK PLATE	1

COMPONENTS AND MATERIALS REQUIRED FOR ONE ASSEMBLY

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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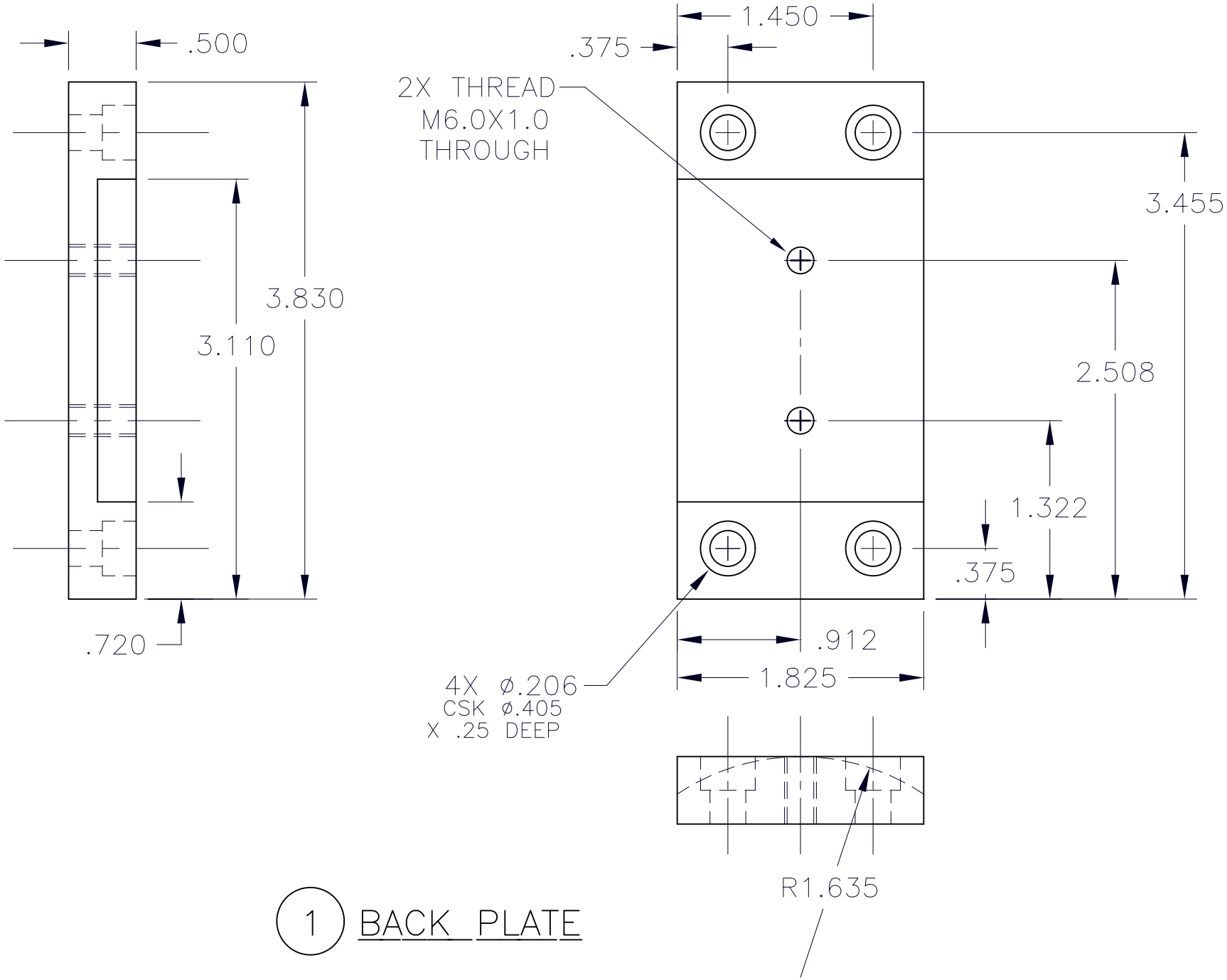

1 BACK PLATE

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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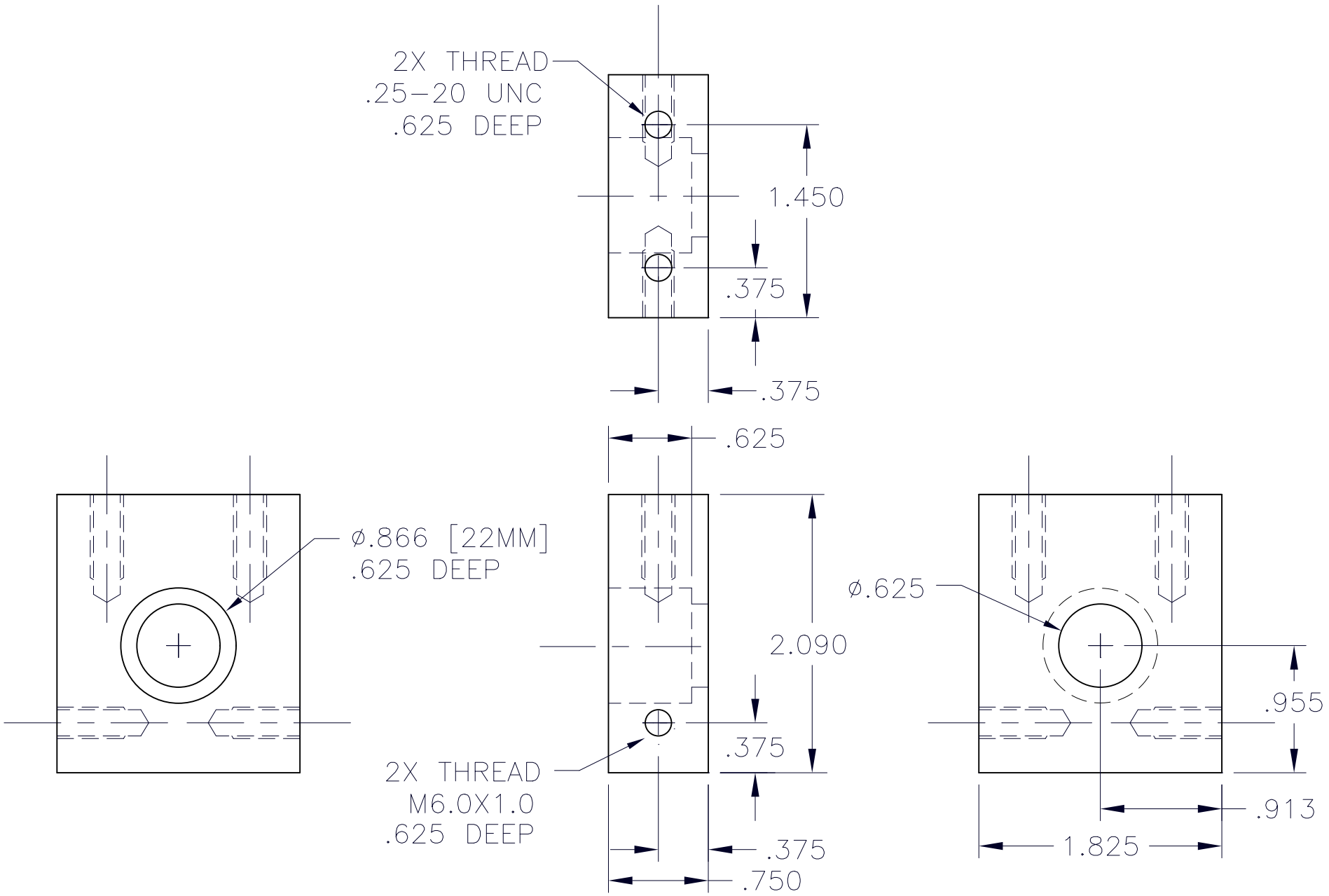

2 BEARING BLOCK–RIGHT HAND AND LEFT HAND

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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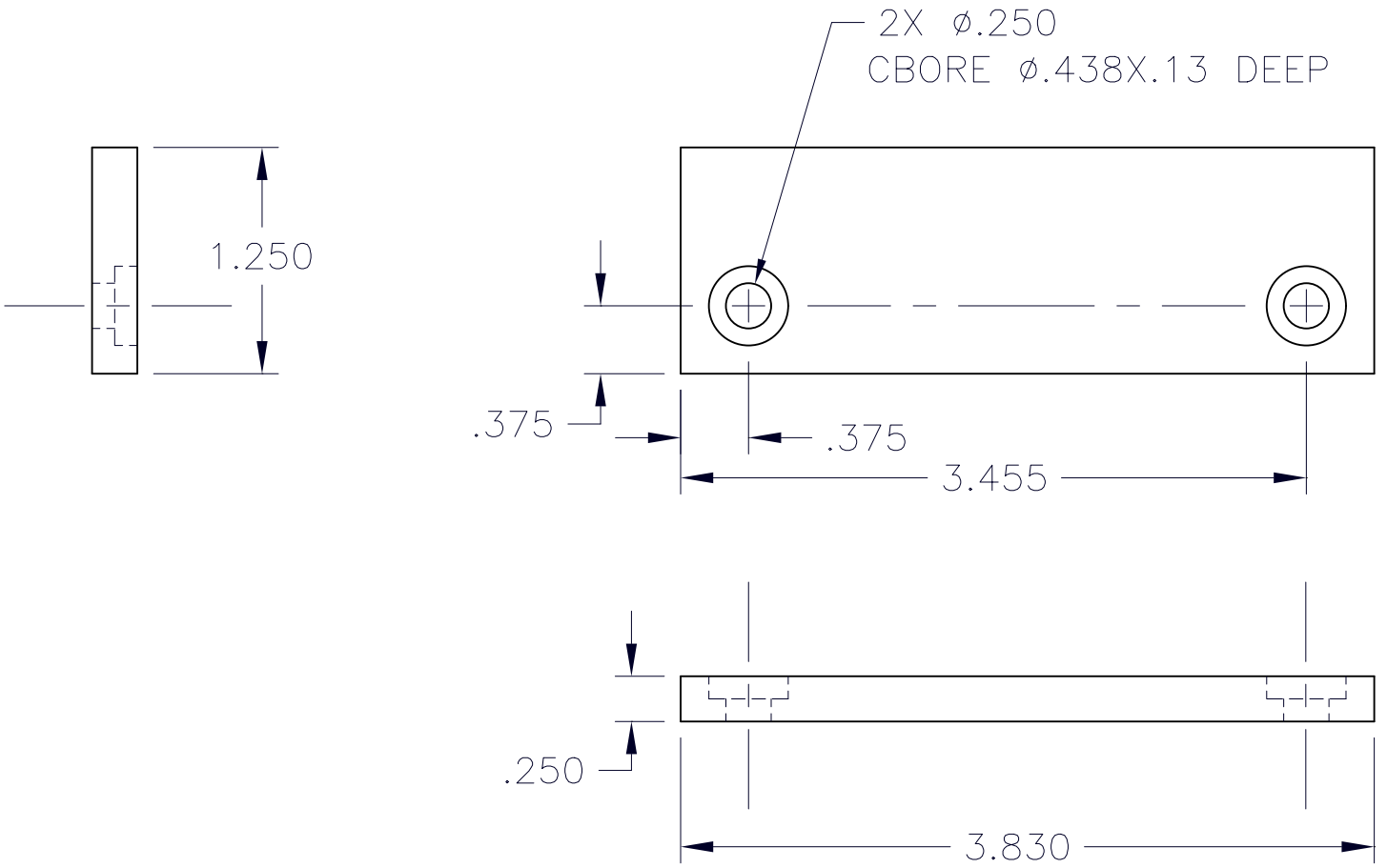

3 STOP BAR

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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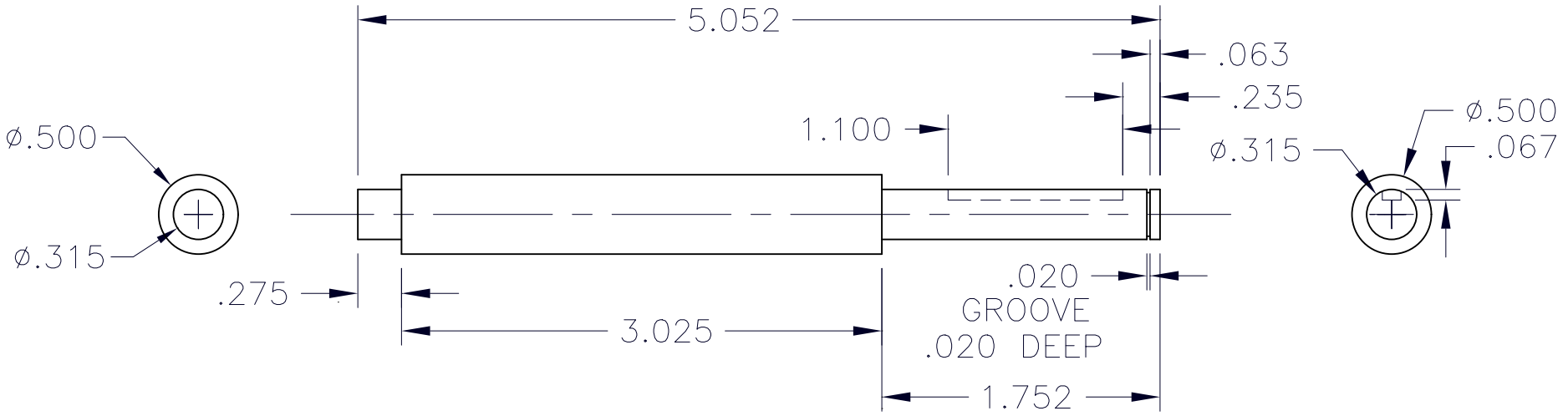
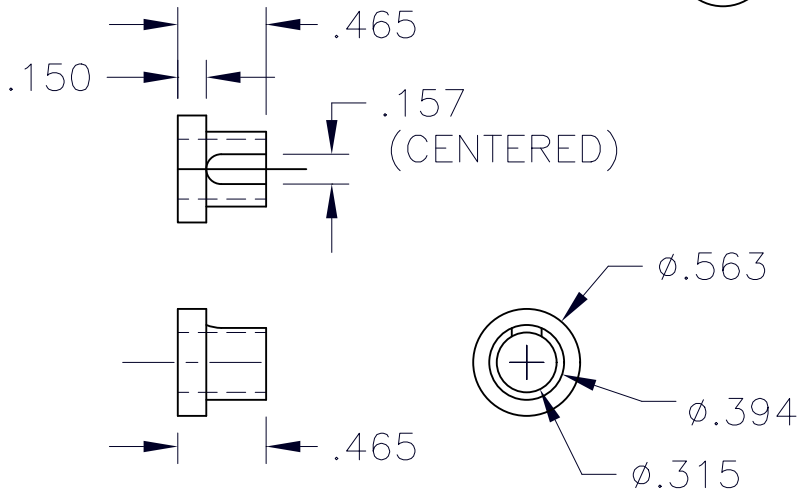
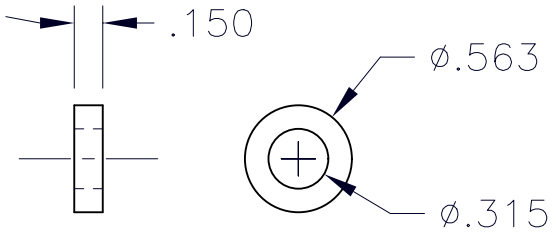


4 SHAFT

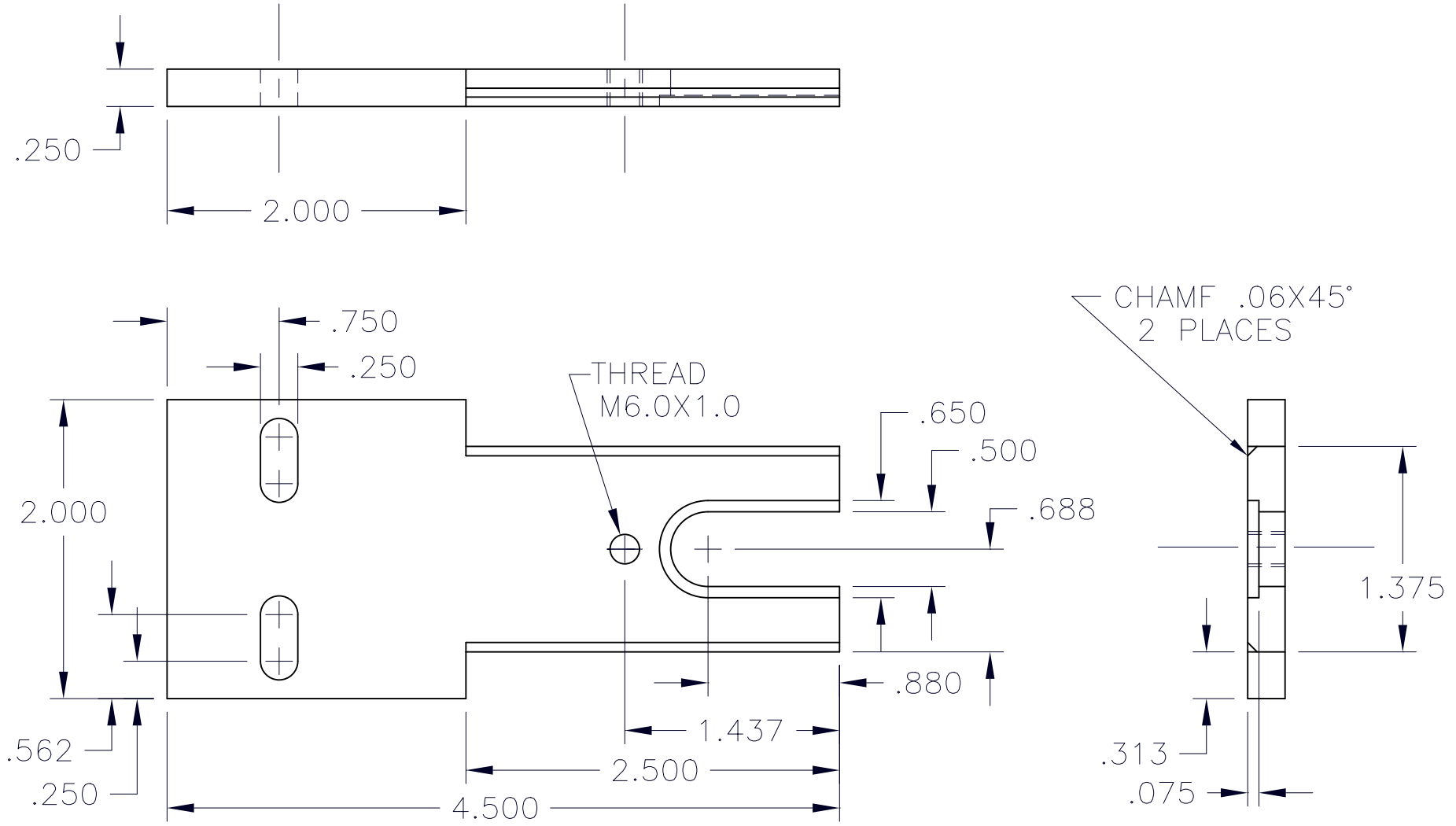


5 SPACER
(FOR 31 TOOTH PULLEY)



5a SPACER
(FOR CUSTOM PULLEY)

7X14 MINILATHE JACKSHAFT SPEED REDUCER



6 MOTOR BRACKET

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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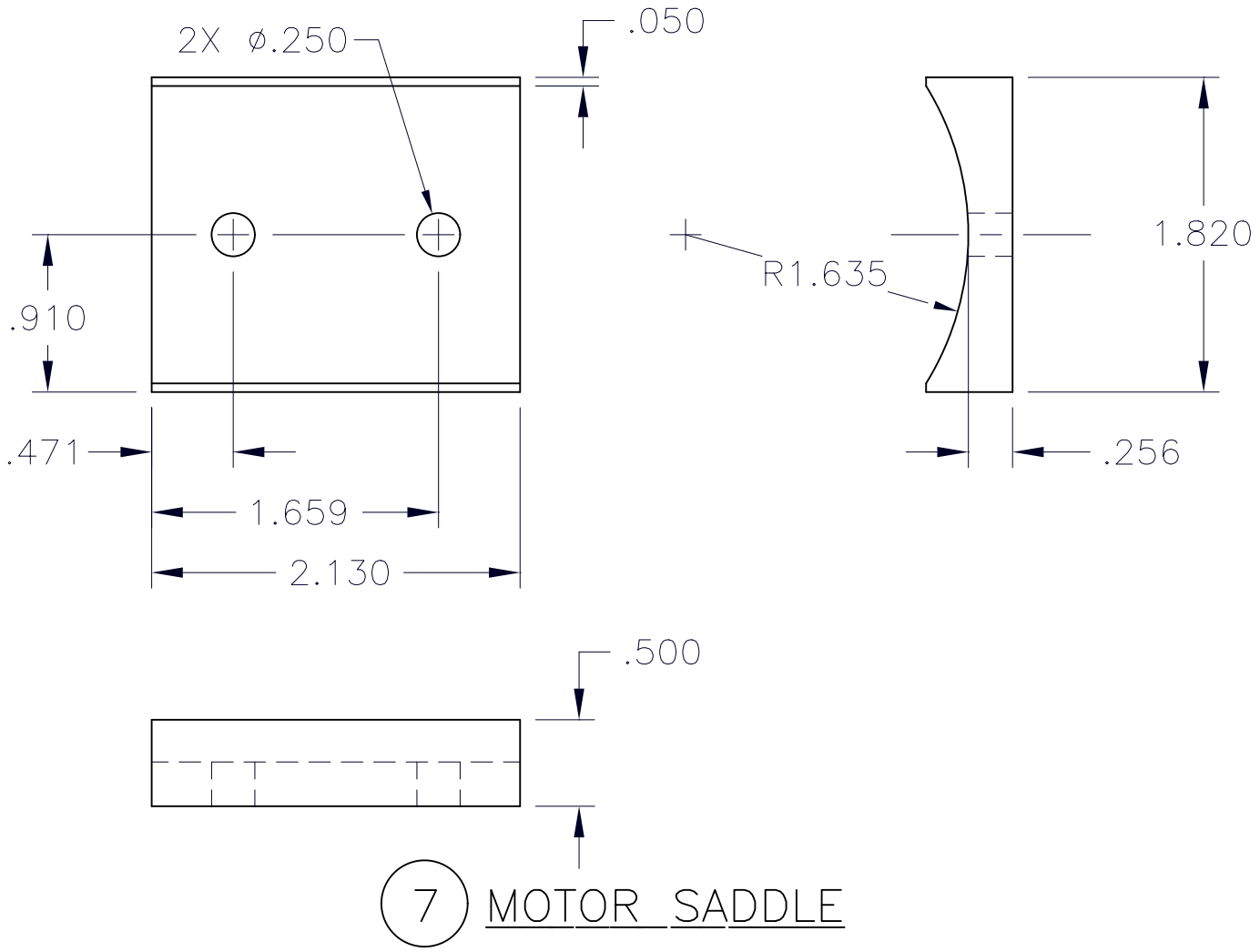

7 MOTOR SADDLE

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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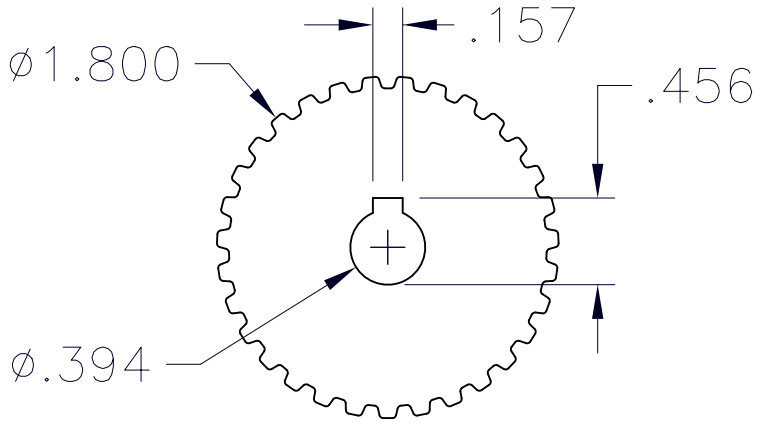
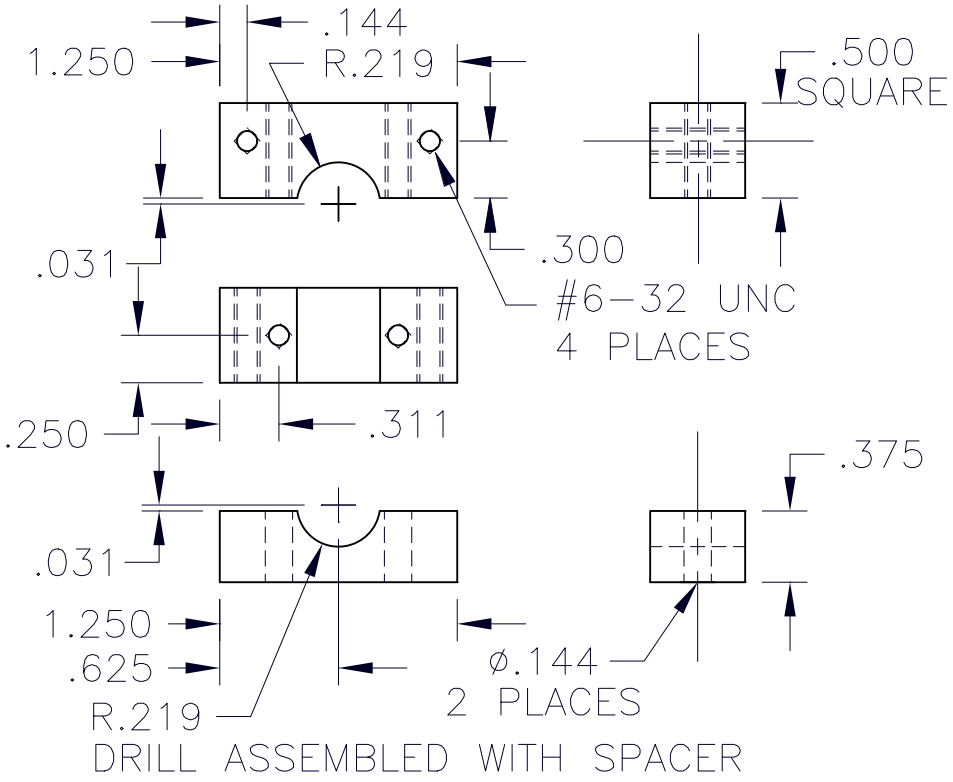


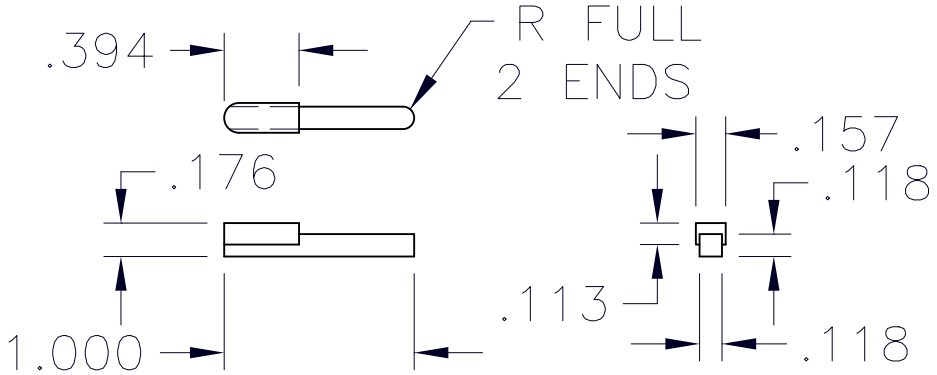
10 PULLEY, STANDARD

(31 TOOTH, 10MM BORE)
LMS P/N 1202



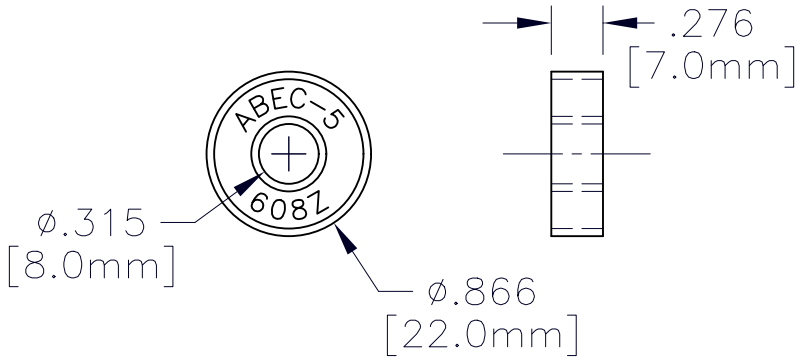
11 CABLE CLAMP

OR SALVAGE FROM OLD MOTOR COVER



9 KEY, DUAL

(FOR 31 TOOTH PULLEY, WITH 10MM BORE)



8 BEARING

REFERENCE DIMENSIONS

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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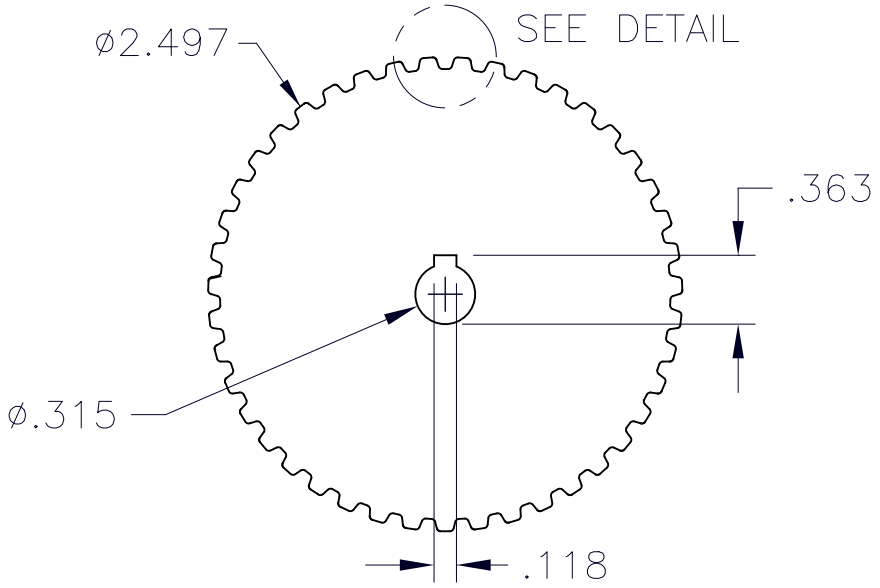
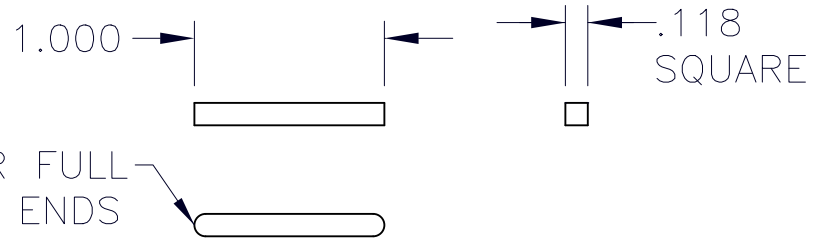


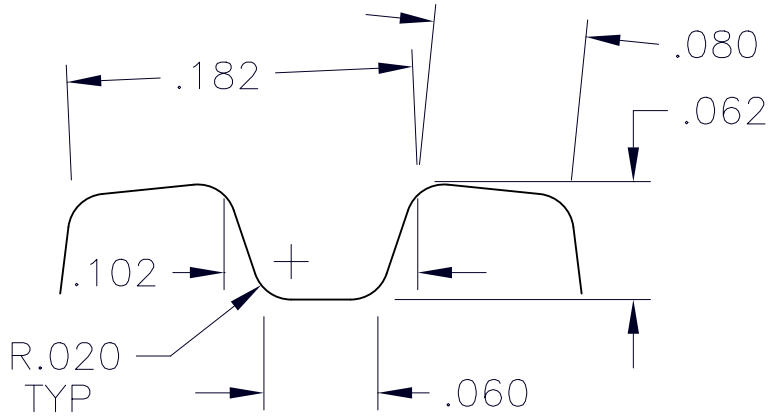
13 PULLEY, CUSTOM

(43 TOOTH, 8MM BORE)



12 KEY, PLAIN

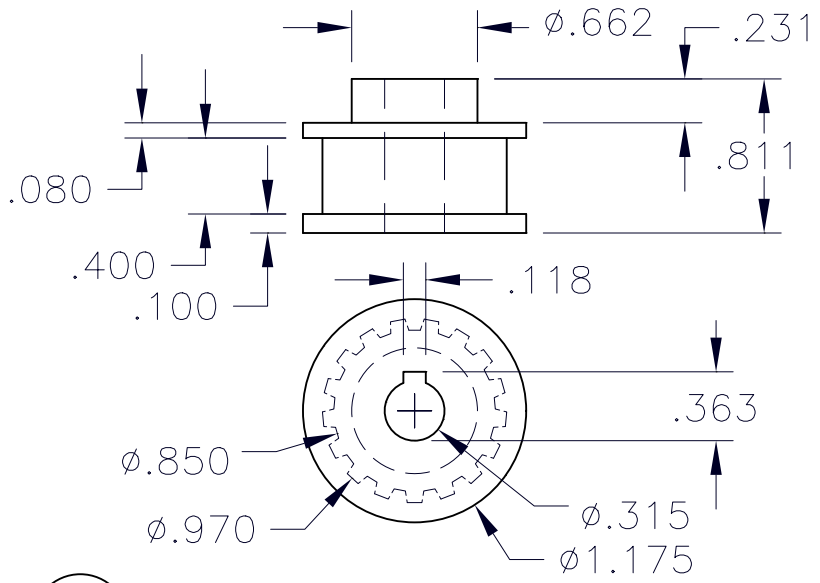
(FOR 43 TOOTH, WITH 8MM BORE)



TOOTH DETAIL

(TOOTHED PULLEY)

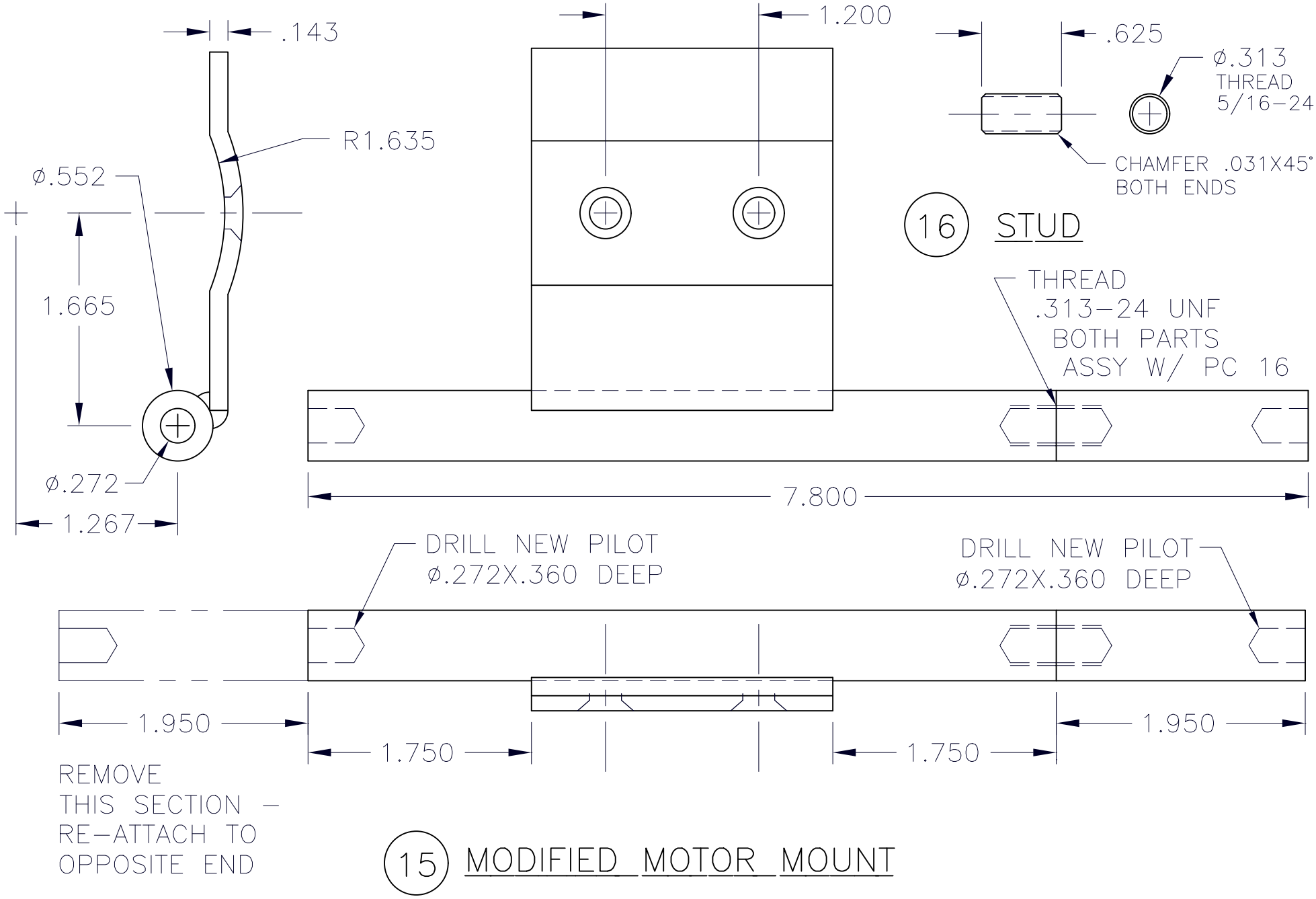
SCALE 10:1



14 MOTOR PULLEY, STANDARD

REFERENCE DIMENSIONS
LMS P/N 1205

7X14 MINILATHE JACKSHAFT SPEED REDUCER



7X14 MINILATHE JACKSHAFT SPEED REDUCER

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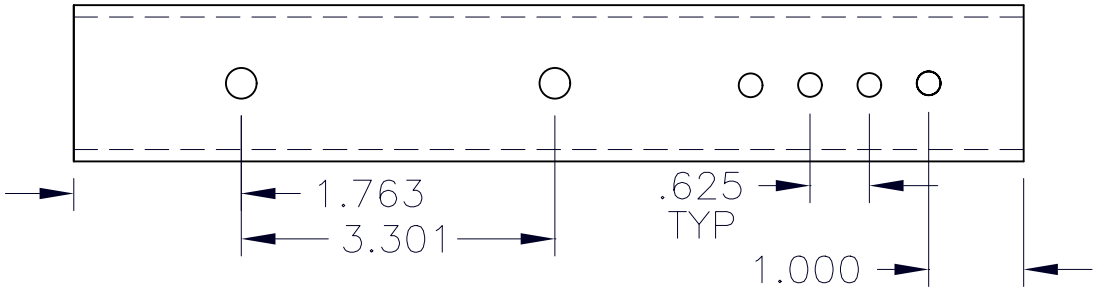
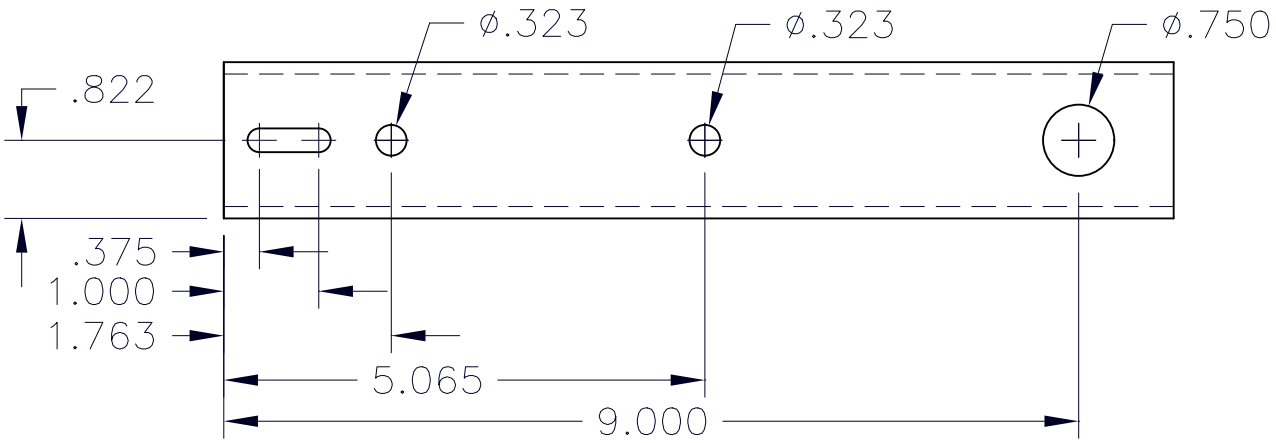
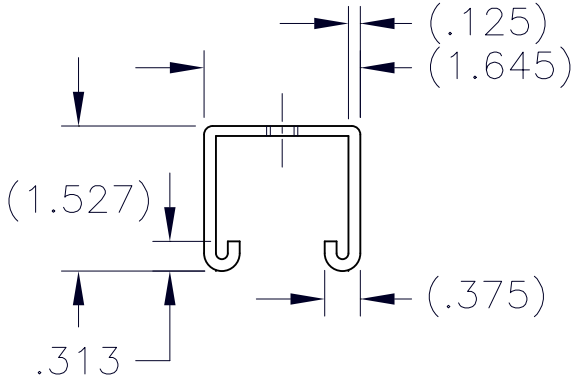
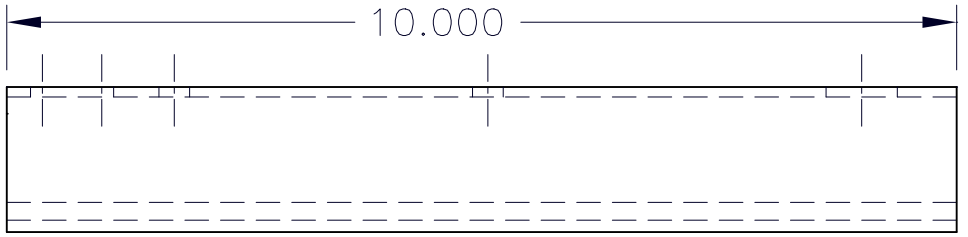


12 FOOT, TS END

DRILL HOLES AS REQ'D
FOR SMALL TOOLS
AND CHUCK KEY







11 FOOT, MOTOR END

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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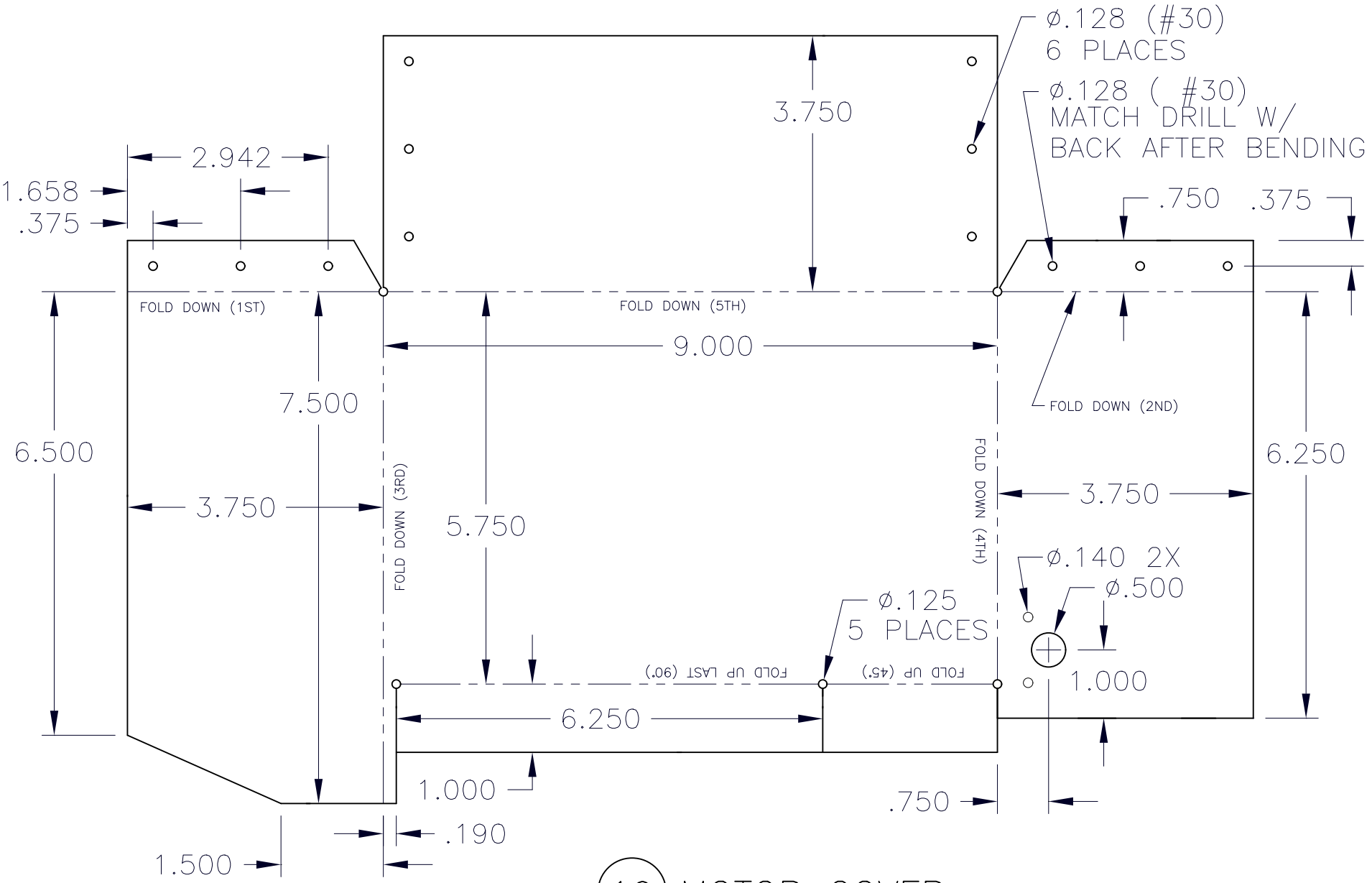

19 MOTOR COVER

FLAT PATTERN

SCALE 1:2

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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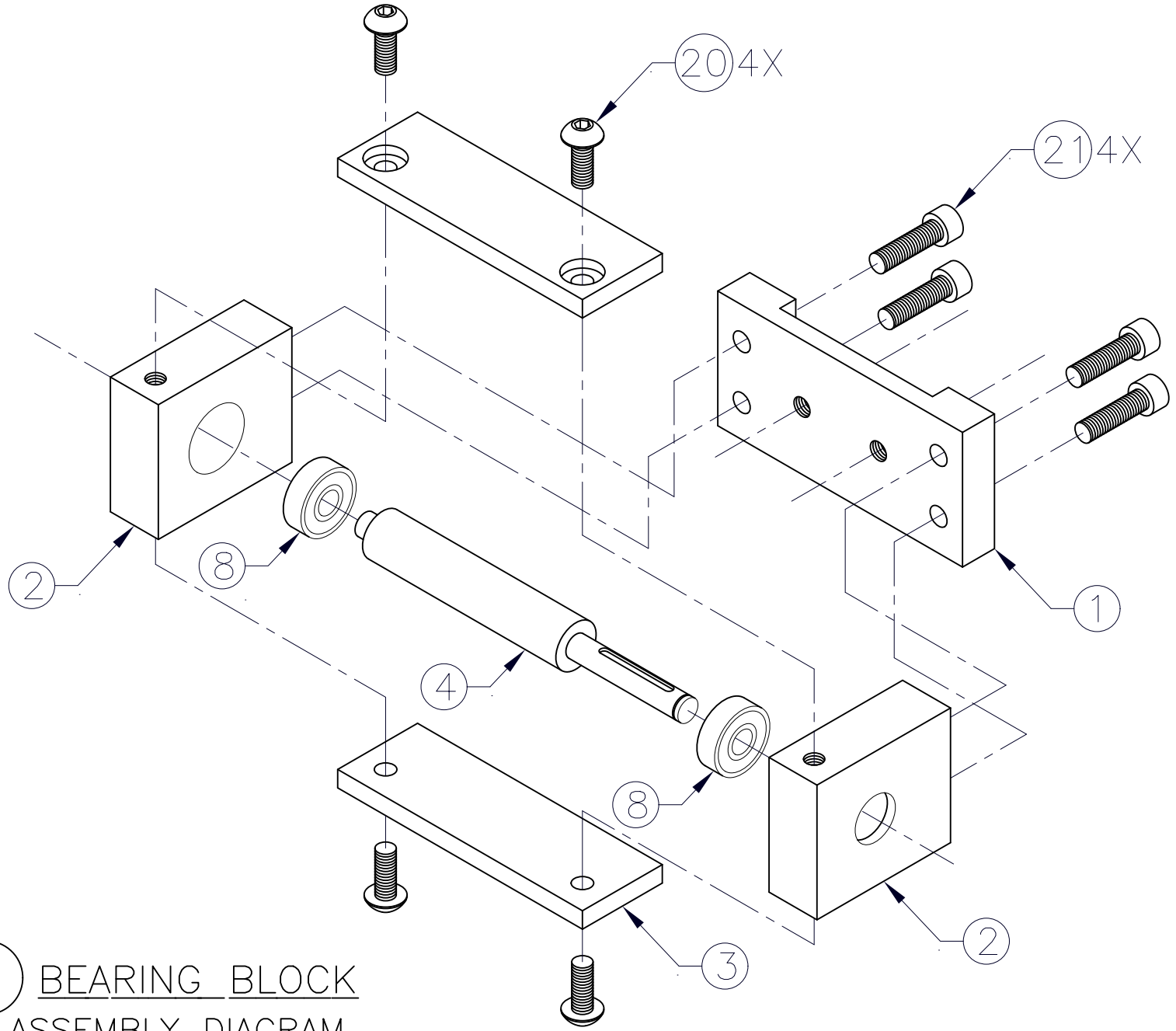

A BEARING BLOCK

EXPLODED ASSEMBLY DIAGRAM

SCALE 1:2

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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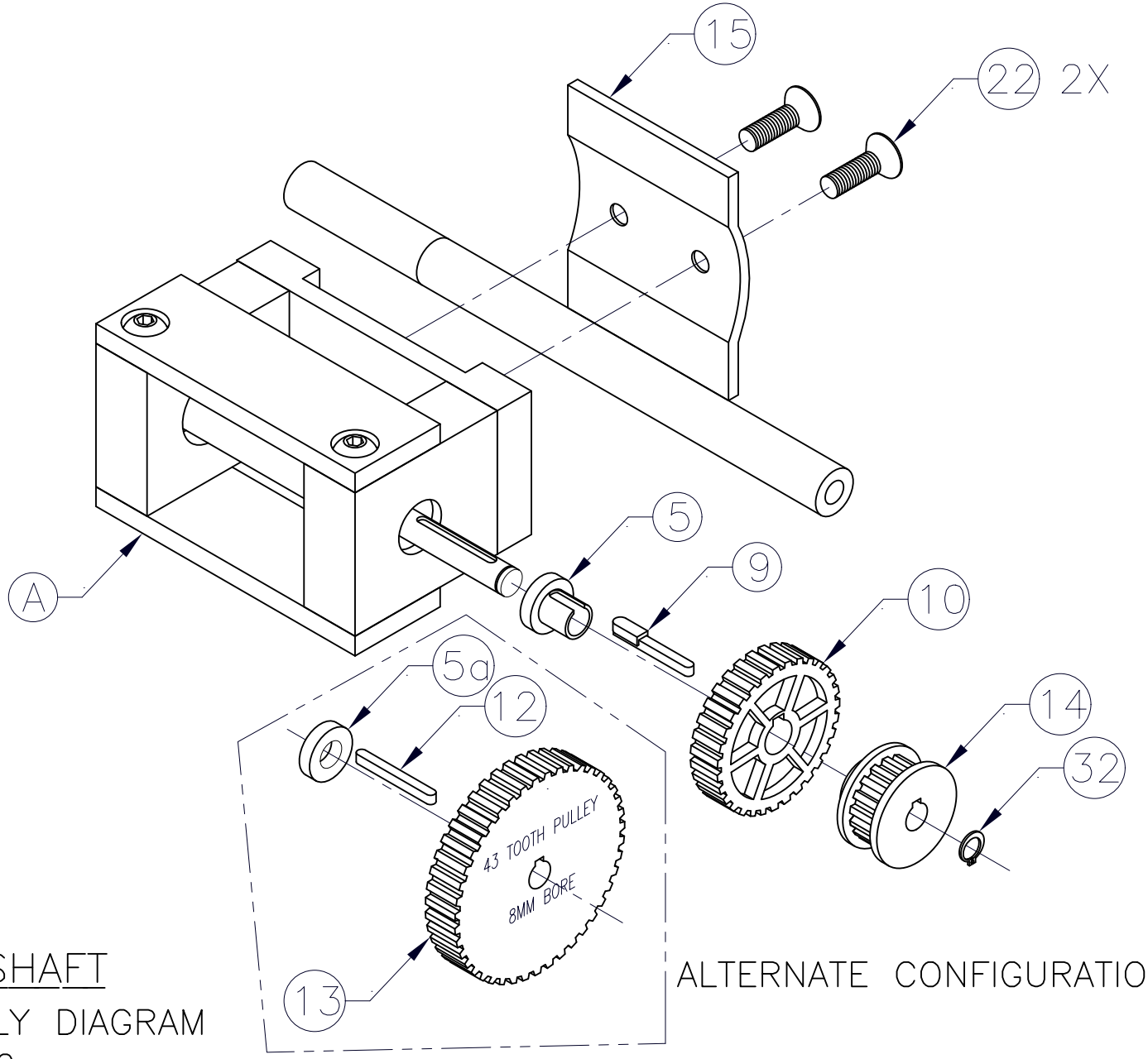

B JACKSHAFT

EXPLODED ASSEMBLY DIAGRAM

SCALE 1:2

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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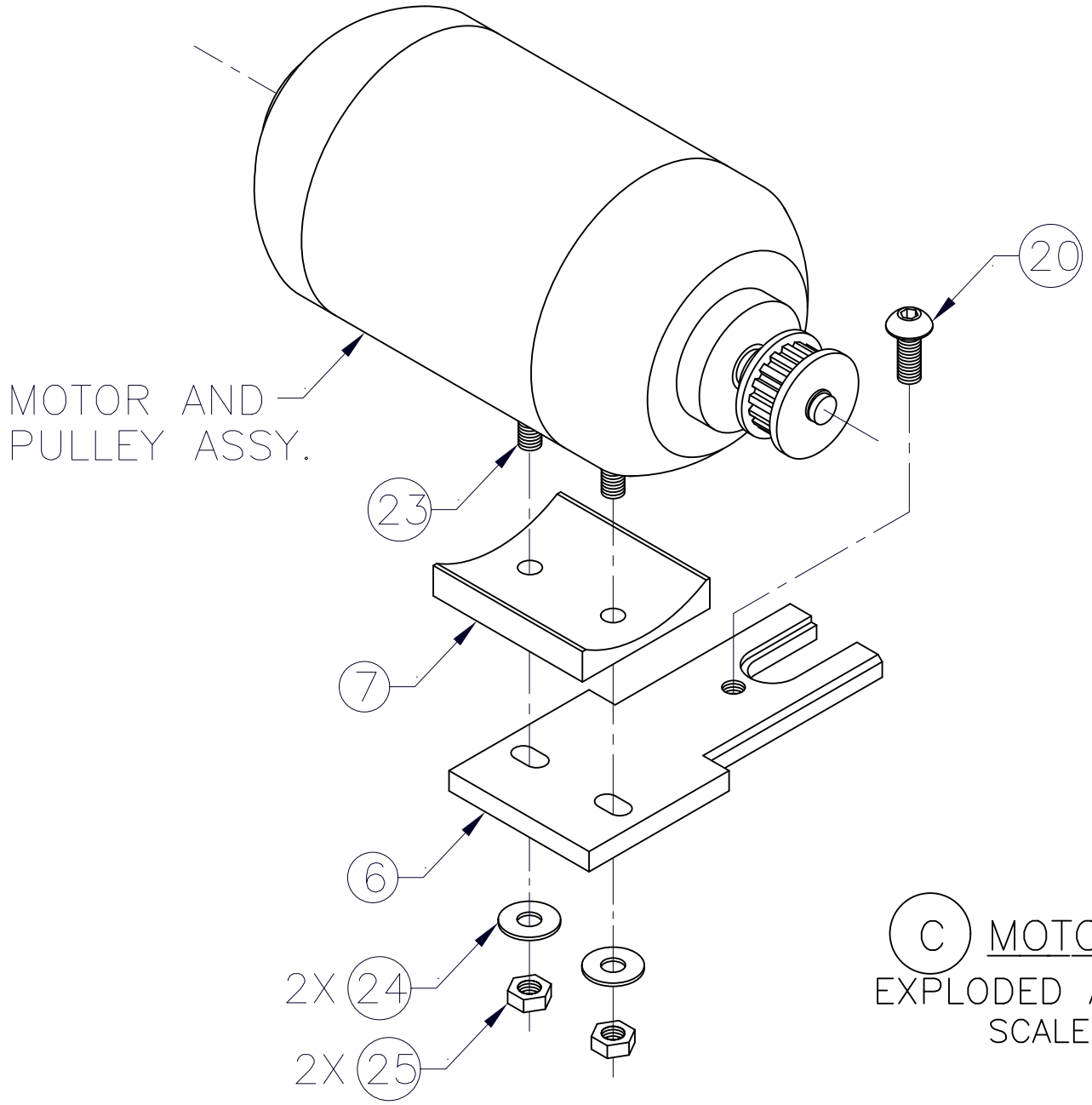

C MOTOR SUPPORT

EXPLODED ASSEMBLY DIAGRAM

SCALE 1:2

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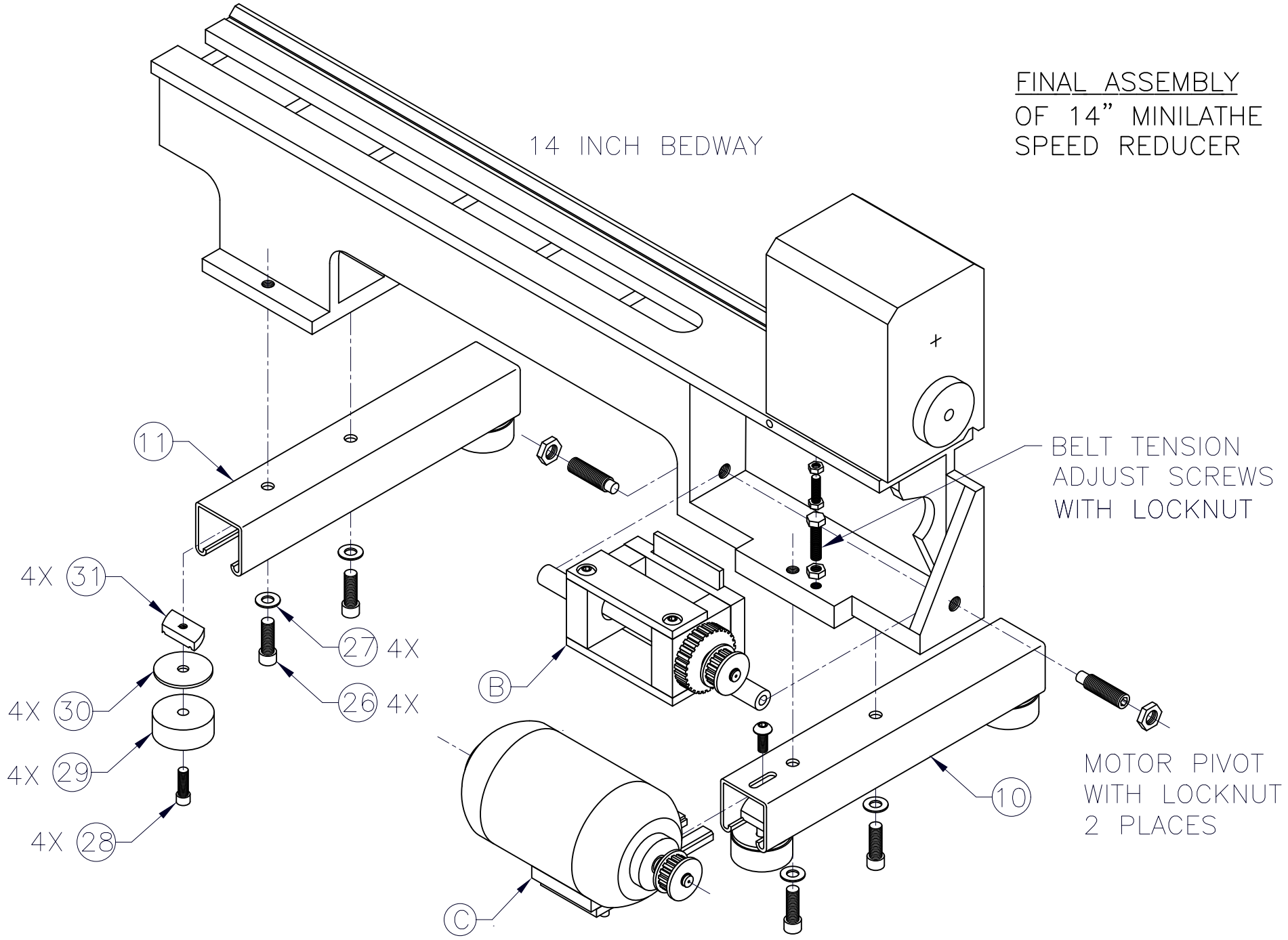

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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GENERAL NOTES:

1. DIMENSIONS ARE IN INCHES, UNLESS CALLED OUT OTHERWISE.
2. STANDARD TOLERANCES: .XX ±.01, .XXX ±.005, ANGLES ±.5°.
3. BREAK OUTSIDE EDGES .01, FILLET INSIDE CORNERS .01 MAX.

CONSTRUCTION NOTES:

4. MAKE BEARING BLOCKS (PC 2) FIRST IN THE 4–JAW CHUCK, MATCH BORES TO BEARING SIZE.
5. MAKE BACK PLATE (PC 1), PILOT DRILL BOLT HOLES.
6. MAKE SHAFT (PC 4) TO DIMENSIONS SHOWN. MAKE A TEST FIT WITH BEARINGS AND BLOCKS.
7. ONCE THE SHAFT, BEARINGS AND SUPPORT PARTS ARE ASSEMBLED, MOUNT BETWEEN CENTERS OF SHAFT TO TURN THE ROUNDED BACK OF PC 1. CHECK FIT WITH PC 15 BEFORE REMOVING FROM LATHE.
8. PC 15 WAS MODIFIED BECAUSE OF A MISUNDERSTANDING OF THE LATHE BED INSTRUCTIONS. IF THE STOCK PIECE IS USED, THE MOTOR ATTACHMENT FLAG WILL BE LOCATED UNDER THE JACKSHAFT, NOT BEHIND. THE BARS (PC 3) WHICH BEAR AGAINST THE ADJUSTING SCREWS WILL REQUIRE RE–LOCATION.
9. THE LATHE FOOT PARTS, PC 17 & 18, ARE ONE OF THE BEST PARTS OF THIS PROJECT. THE LATHE IS RAISED ALMOST 2" ABOVE THE TABLE–TOP, CLEANING AND FINDING DROPPED PARTS IS MUCH EASIER THAN THE NORMAL SPACE.
10. THE WIDER STANCE OF THE RUBBER FEET MAKE THE LATHE TIP–PROOF IN OPERATION, BUT MAY STILL BE EASILY MOVED.
11. DISCARD THE ISSUE CHIP PAN UNDER THE LATHE, BUY A LARGE BAKING SHEET FROM A RESTAURANT SUPPLY STORE.
12. THE MOTOR SADDLE, PC 7, WAS MACHINED IN THE MILL VISE, A FLAT BAR HELD IN THE VERTICAL AND CUT OUT WITH A FLY–CUTTER ADJUSTED TO THE DESIRED RADIUS. SEVERAL PASSES ABOUT .02 DEEP WERE USED.
13. INSTALL JACKSHAFT ASSEMBLY TO THE PIVOT SCREWS, START THE UPPER AND LOWER ADJUSTER SCREWS IN THE BED. SLIP THE FINAL DRIVE BELT OVER THE SMALL PULLEY AND ADJUST THE LATERAL POSITION WITH THE PIVOT SCREWS. TURN THE LOWER ADJUSTING SCREW TO ESTABLISH BELT TENSION. EXTEND UPPER ADJUSTER TO LOCK THE JACKSHAFT IN THE DESIRED POSITON.
14. INSTALL MOTOR ASSEMBLY IN THE END OF THE FOOT BAR. ADJUST THE MOTOR POSITION FOR LATERAL LOCATION, THEN ADJUST FOR BELT TENSION. TIGHTEN THE CLAMP SCREW, PC 20. TIGHTEN ALL FASTENERS IN FINAL POSITION.
15. FIT THE MOTOR COVER WITH TWO M5 SCREWS. ADJUST THE POSITION OF THE STOP BLOCKS FOR SUPPORT.
16. SEE LMS INFORMATION SECTION FOR COLOR MATCHING INFORMATION. PAINT THE NEW EXPOSED COMPONENTS.
17. SPARE PULLEYS FOR MOTOR AND JACKSHAFT, AND A BELT ARE NEEDED TO COMPLETE THE PROJECT. AVAILABLE AT HTTP://WWW.LITTLEMACHINESHOP.COM

7X14 MINILATHE JACKSHAFT SPEED REDUCER

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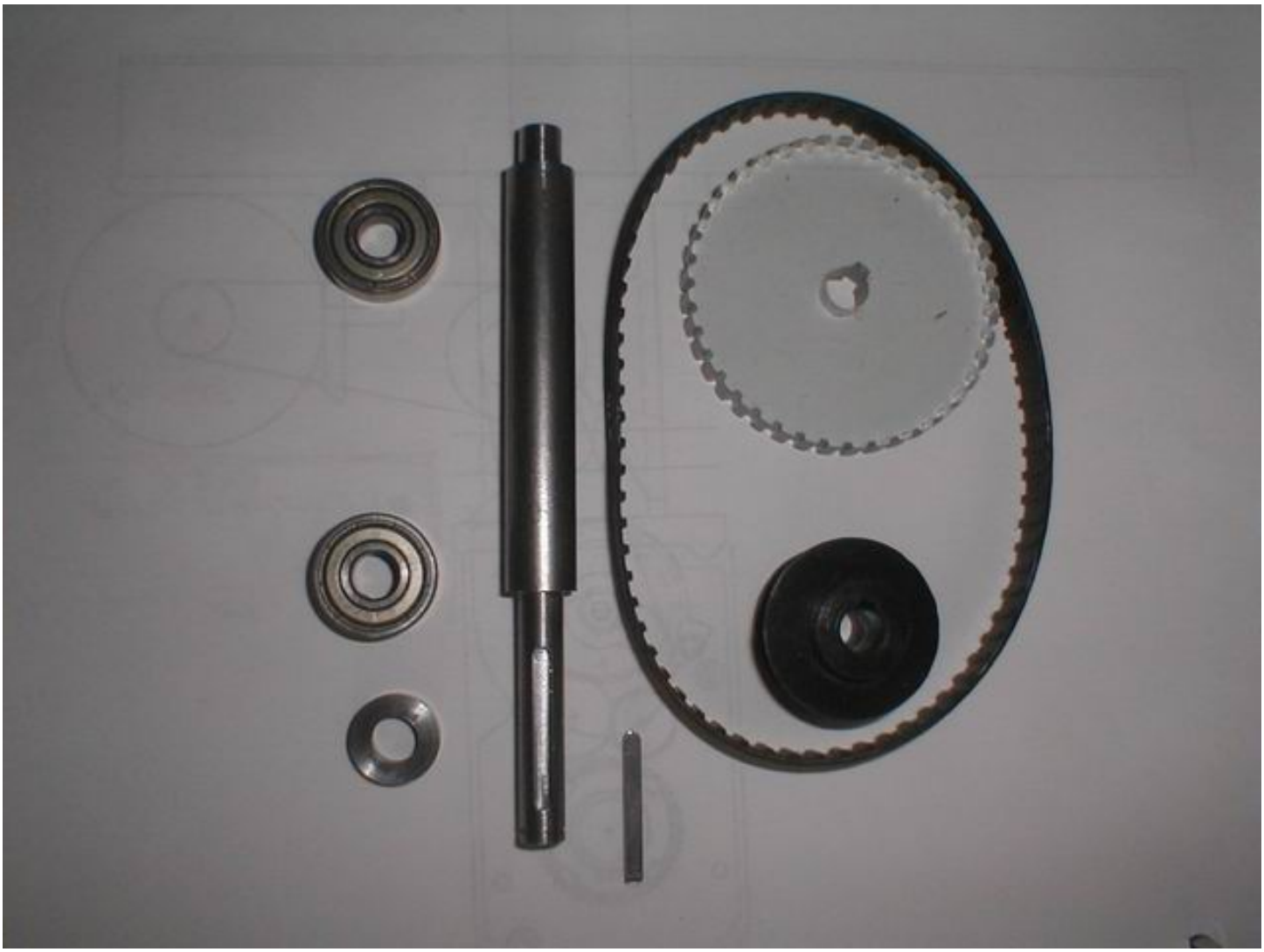
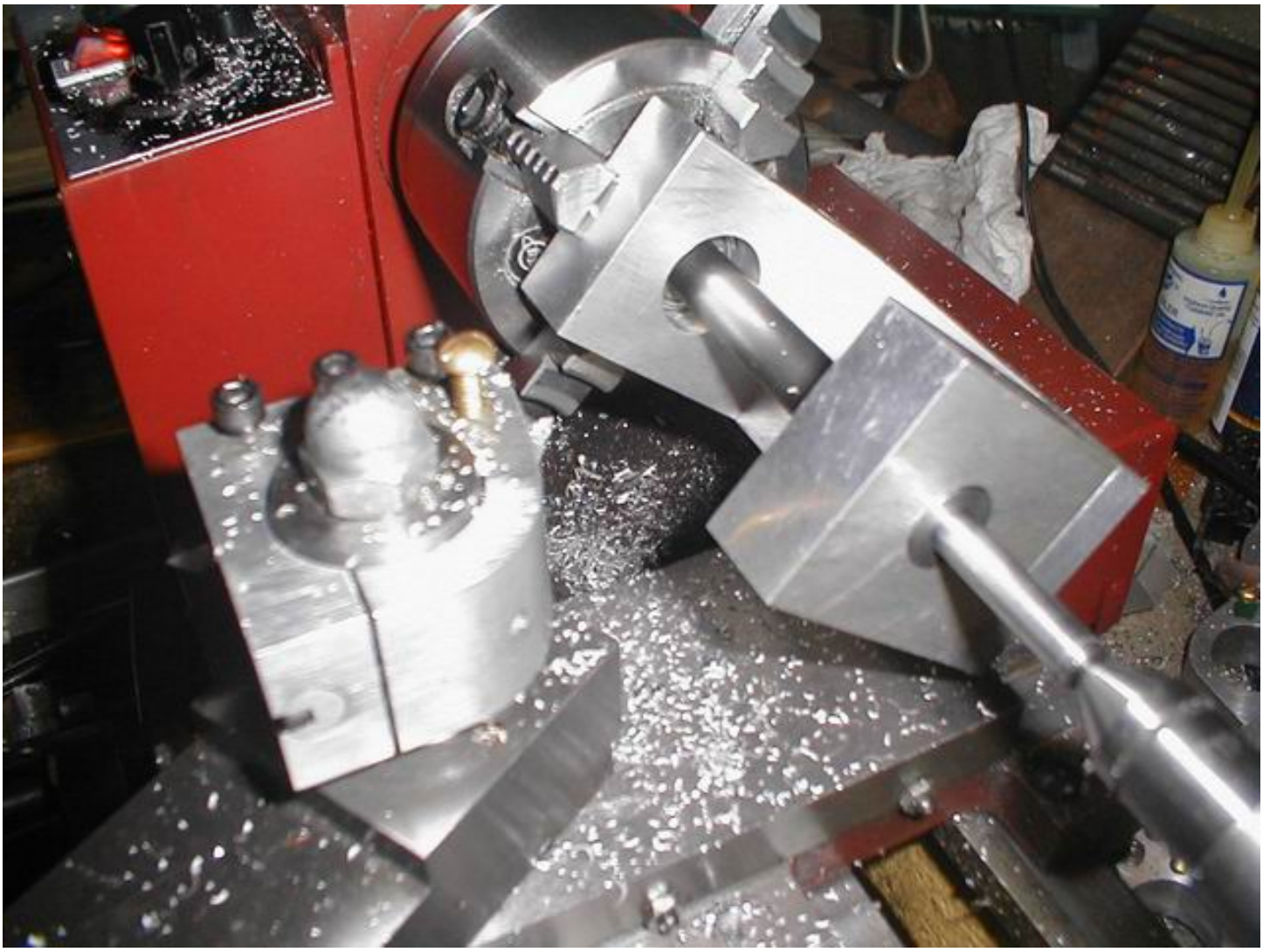
Components required for the jackshaft assembly. Two skate bearings, shaft, spacer, key, timing belt, custom driven pulley (41 tooth), and new motor pulley. In addition to these parts, there are two bearing blocks, one back plate and two stiffener bars, all made of Aluminum, 6061-T6 alloy. The bearing blocks were sawn from a piece of 3/4" thick plate, then mounted on the lathe in the 4-jaw chuck to be squared to dimension. The center of the bearing bore was laid out and scribed on a coating of layout blue lacquer. The center point was dimpled with a prick punch (60 degree angle point). With the marked-out block re-mounted in the lathe chuck, the dimple was brought to center using a dial indicator in contact with a round bar that has a 60 degree point on one end and a center-drilled dimple



in the opposite end. The bar is installed with the point in the marked-out dimple, and the other end is supported by the Tail Stock center. As the work is rotated slowly (and the bar prevented from rotating in case the outside surface is not concentric with the centers), The chuck jaws can be adjusted to bring the relative motion of the workpiece center mark to a perfect zero point. After the jaws are secured, machining of the through hole and the counterbore for the bearing may proceed. Be very sure that the face of the work is exactly perpendicular to the lathe axis. The bearing bore diameter must provide a light press fit for the outside diameter of the bearing. If the bore is too loose, consider using Loctite Bearing Locker solution at the time of assembly.

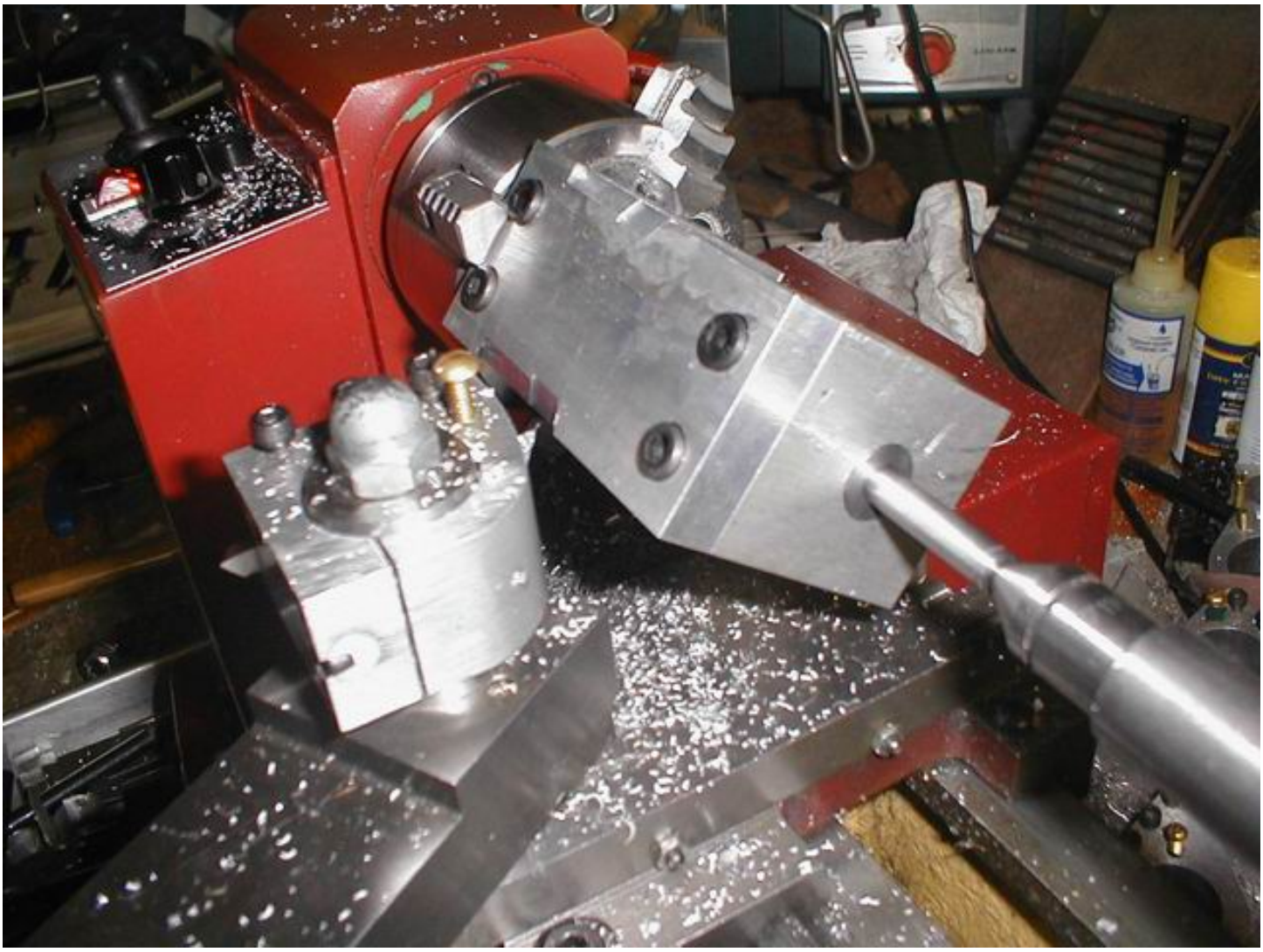
After the machined components of the bearing housing are together, mount the assembly in the lathe with the shaft ends adjusted to center. Now, the contour on the backplate (which simulates the shape of the motor) can be machined to the specified radius. The distance from the middle of the shaft to the cutting point can be measured with a Dial Caliper (and add the shaft radius) to determine when the final radius of the contoru has been reached. In the photo, the left end of the assembly is held directly in the chuck. It can also be setup with no chuck mounted, and a 3MT center inserted in the Spindle bore to support the shaft by it's center dimples. A 1/4" diameter bolt about 3 inches long with two nuts can be mounted in a Spindle flange hole to provide a drive pin for the free-spinning Aluminum parts. Stop rattles with a



strong rubber band to hold the part against the drive pin. Otherwise, it will surely bang hard every time the interrupted cut is entered by the lathe bit. If a dead TS center is used, be sure it is properly lubricated to prevent wear and (horrors) galling of the center-drilled dimple. Make sure that there is no interference anywhere of the rotating parts with any portion of the lathe. Note that the tool holder on the Compound of the lathe is mounted on a round post and is fitted with a brass height-adjusting screw. This arrangement allows the tool cutting point to be adjusted to the exact center-height of the spindle, and the holder can be rotated on the post to make the angle of attack of the cutting edge at the best possible position.

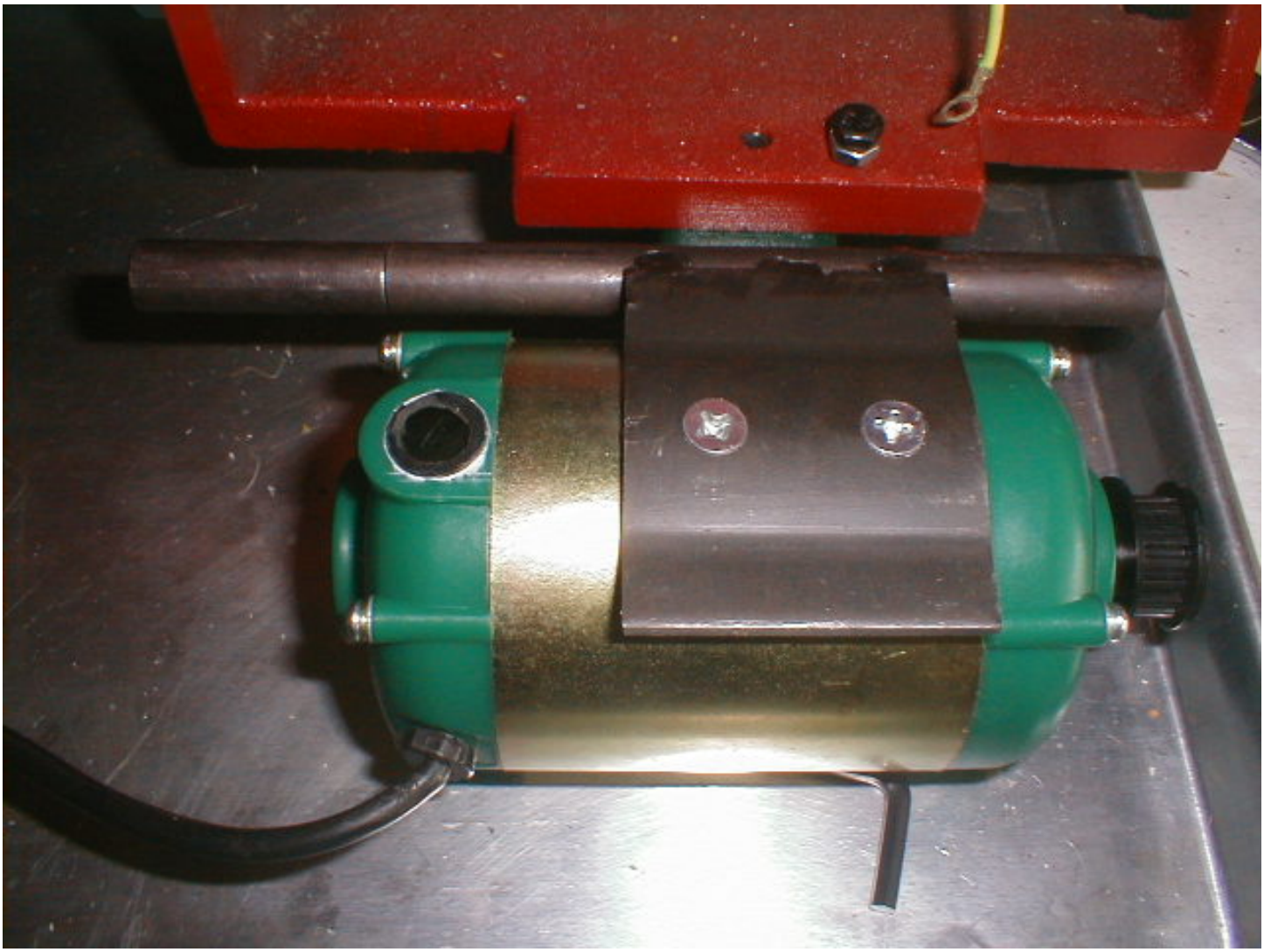
plans can be found at http://www.savefile.com/projects/808585083

Machining of the contour on the backplate has begun. This is the second roughing pass at a depth of approximately .020" (did not keep exact notes, as usual) running from the middle of the backplate toward the left end of the assembly. When a nearly full radius had been achieved, a left-hand cutting tool was substituted in the holder to remove the material from the middle toward the right end of the assembly. The final clean-up cuts were made with a parting tool mounted at a right angle to the work, which left a nice finish from end-to-end and cleaned up the corners where the contour ended. The chuck jaws should have been padded with shims to avoid leaving tracks on the finished part. Tracks on a finished part are embarrassing!
Keep a constant eye on the bearing point at the TS center, lube as needed.



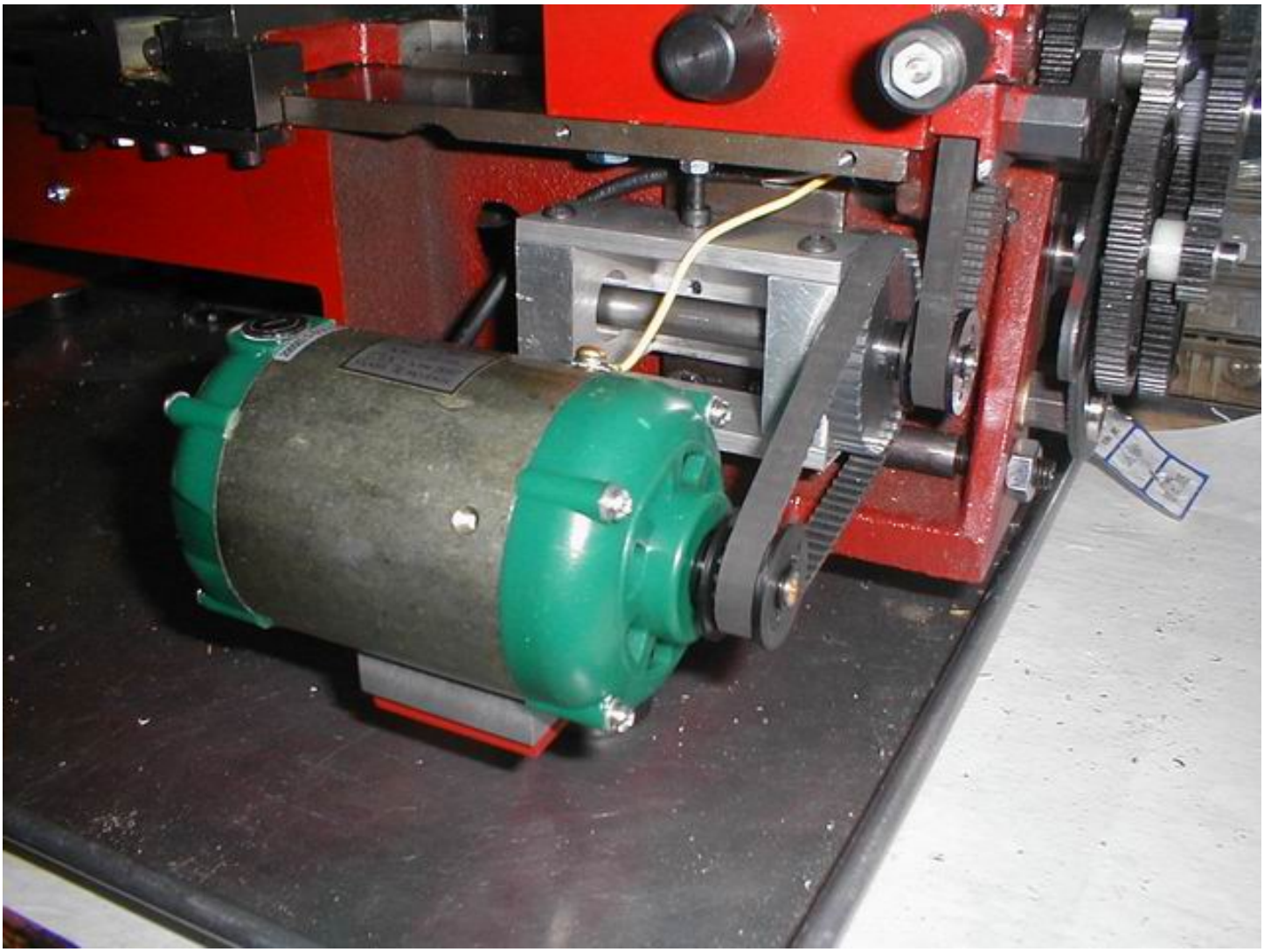
The interrupted cut makes lots of very small chips that fly about at high speed. Be sure to wear good eye protection to avoid an injury emergency!
As the machining nears completion, do a trial fit of the motor-mount flag against the new cut to make sure that you have achieved a good fit. If the radius is too large, there will be a gap between the parts at the centerline, requiring the mounting bolts to spring the flag when fully tightened. This arrangement will be subject to loosening of the bolts because of vibration of the parts when in service on the lathe.

Here is the 7x10 250 watt motor assembled with the motor mount weldment as furnished by Little Machine Shop in the 14 inch bed conversion kit. The two M6 flathead screws are really short, and engage the motor by only about 4 threads. Note that the shaft of the weldment has been modified to place the flag vertical behind the motor when installed, not horizontal under the motor as intended by the maker of the kit. This alteration was done by me in a fit of stupid, I did not study the instructions well enough to understand what was supposed to be done. This alteration did make the new jackshaft design easier to adjust the belt tension, I think, than it would have been if done as directed by the kit instructions. On the bottom of the bed casting you can see the lower belt adjusting screw and locknut, ready for insertion of the motor parts.



I placed the hex key (Allan)under the motor to stop it from rolling to an angle not suited for the photograph, but, got in a hurry and did not position it out of sight for the actual snapshot. Grrr. Note that the lathe does not have the standard chip pan under it. What you see is a large baking pan from the restaurant supply isle of the local Smart and Final box store. The pan is round about 18 x 26 inches by 1 inch deep, made of Aluminum sheet with a steel reinforcing rod rolled into the edges. The first one we had was used as an oil catch pan for occasions when something containing fluids had to be disassembled for repair. Then, the wife wanted one for drying flower seeds and stuff. It is hard to keep one loose for shop needs.

The assembled jackshaft and motor components are test-mounted in the lathe bed to check for the range of adjustments needed for final operation. The upper belt-tension adjusting screw and locknut are installed in the lathe bed, and the jackshaft is in the approximate working position. Since the threaded holes for the adjustment screws are included in the 14" bed kit, it was easiest to make the stop bars for the top and bottom of the jackshaft assembly rather than try to drill and tap new holes for the adjustment screws. The addition of the side bars also stiffen the assembly and reduce the possibility of racking if the belt tension in the various directions is too great for conditions. One less than perfect feature of this geometry is the fact that one of the motor brush ports ends up on the underside of the motor. Servicing the brush will require dismounting the motor, then having to re-do the belt tension. Not really a problem, though.



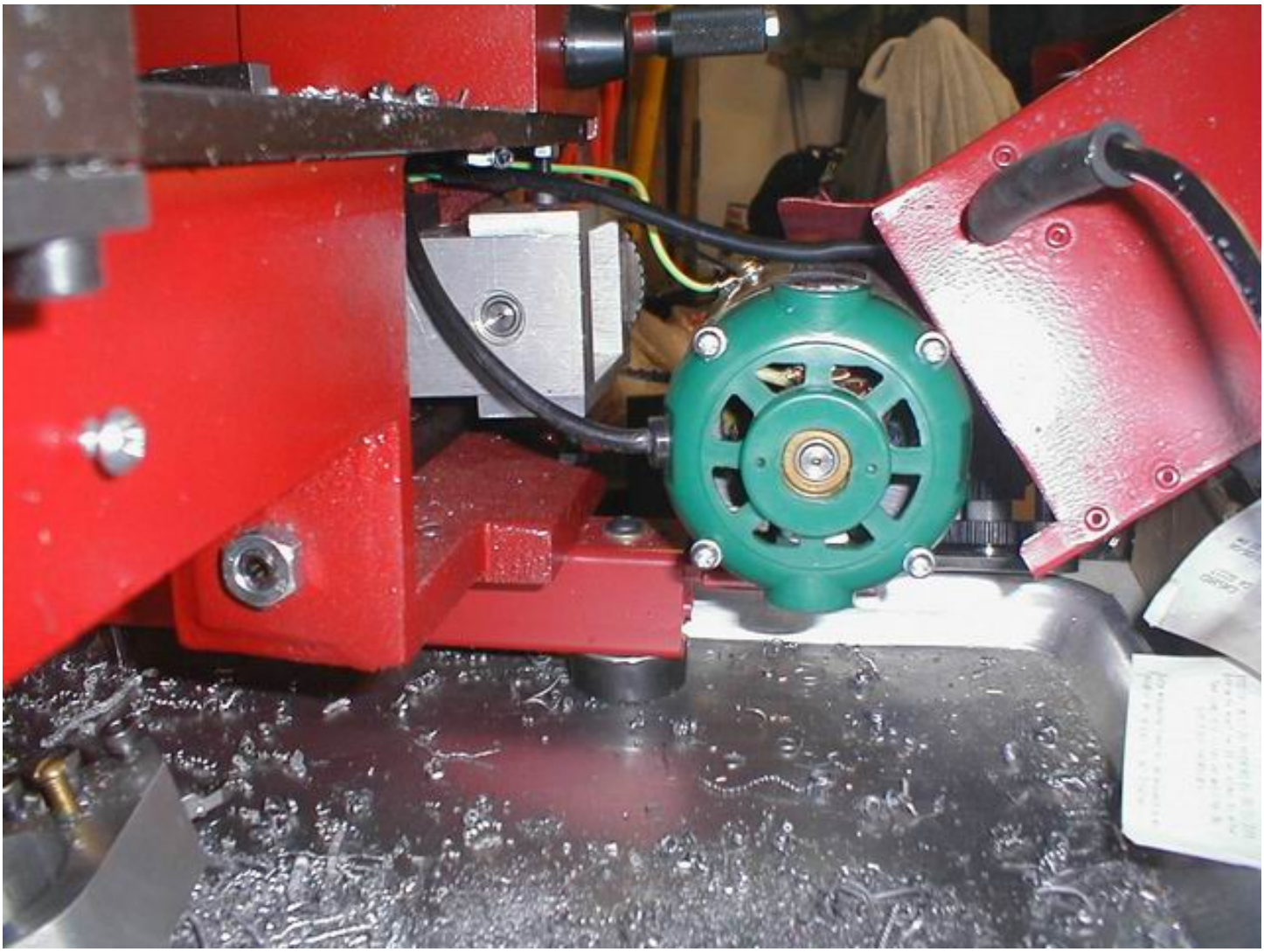
Note that this lathe has had the Change-Gear arrangement modified according to the plan posted by Paul Hackathorn. The B/C idler gear shaft and bushing have been replaced with one that is 24mm long vs the 16mm standard shaft. The shaft is seen in the photo with two gears and a spacer installed to accommodate the speed reducing scheme designed by Paul. Also, note that there is no nut and washer on the Banjo standoff that mounts to the end of the lathe bed. Instead, there is a spacer that has an M6 hole drilled and tapped for a clamping screw. An extra thick washer with 82 degree countersink is used with an M6 flathead hex socket screw. Now, the banjo can be adjusted for mesh of the C/D gear pair using a 4mm ball end hex wrench with a T-handle. Much better than trying to tighten a nut with an open-end wrench.

Another view of the Speed Reducer components installed. Note that there is a fair amount of adjustment available at the motor pivot point that threads through the side of the casting. Visible is the motor power cord that passes through the opening in the bed to reach the attachment points within the controller space. The jacketed cord is a little short of going all the way to the controller terminal strip. Male and female connectors similar to those in use were found to make extensions for the 3 conductors. Bad part - there should be some proctective jacketing around the loose wires, such as a piece of shrink tubing.
The motor and jackshaft components are nice and rigid with this mounting system, and adjustments are quite easy to make. The motor is adjusted from side to side by loosening the

two hex nuts under the mount with a 10mm open end wrench. In this view, the clumsy position of the underside motor brush holder can be seen.

Also note that the long lathe bed provides a lot of extra length between the end of the 250w motor and the end of the motor cover that could be used to mount an auxiliary cooling fan. I have not checked, but there is probably an 120vac fan of about 3" diameter that would do a fine job of improving motor cooling when doing long turning sessions at less than optimum motor speed. If only computer fans of 5vdc or 12vdc were available, a "wall wart" power supply could be pressed into service to operate a fan at safe voltages. A short piece of extension cord with a female connector could be wired directly into the controller terminal strip, to accept the plug-in transformer.

Here is a view of the jackshaft installation from behind the TS end of the lathe. The cover has been completed and has the AC power cord installed. The cable clamp was salvaged from the old motor cover by drilling out the two spot welds. The strain relief sleeve is included.
Both the upper and lower (sort of) jackshaft belt adjusting screws can be seen supporting the jackshaft assembly in the desired location. Access is not too difficult, although the final adjustment is easiest done with the motor set aside. The motor and it's mount are secured to the foot-bar under the lathe by a single M6 button head cap screw. The hex in this size fastener is 4mm, as are most of the adjusting screws now used on this lathe. The issue rubber foot is installed on the underside of the foot (Unistrut rail), in accordance with the drawing details.



Between the rubber foot and the open side of the rail is a large (1.5" OD) extra thick fender washer, happily available in onesies and twosies from the shelf of my local Industrial Hardware store. They stock every fastener I have ever wanted to use in the Minilathe shop, in every quantity from 1 to 1000 and up. Of course, small quantities of fastener are more expensive than buying by the box.
Here, it is possible to see the bumper piece that was added to the bottom edge of the motor cover, needed so that the cover is supported by the bed casting, instead of hanging out in space to vibrate and rattle while the lathe is operated. I can see, as these words are written, that the left end of the cover should have been as long as the bumper extension, to more completely protect the moving parts from wayward chips that would get into the works.

The motor cover is attached to the lathe bed, with all the moving parts well covered. You can see the gap left between the cover and the bed, which could invite the entry of chips. The clamp for the power cord is installed, but the cord is still missing. Final assembly is coming! The cover tends to vibrate and make noise in this condition because the metal stops clatter against the lathe bed. Another piece with a rubber nose has stopped all that. The cover was cut from a handy piece of Galvanized sheet metal that had a former life as an underpan for an electric cooktop. It is interesting what benefit you can realize by taking long walks around the neighborhook every morning. The bumps and holes in the shape were features of theoriginal part. Looks very nice in Minilathe Red. (Rust-Oleum American Accents Colonial Red #7925 Satin Aerosol Paint)

Coupled with adjustments made to the three potientiometers on the controller board, this lathe modification (which requires no changes to the original hardware, save the clamp from the old motor cover) has greatly expanded the versatility of the machine, provides lots of torque at the slowest speeds and runs fast enough for all the jobs we have experiences.
Marty, of the 7x12minilathe list, has expressed concerns about overloading the various gears between the spindle and the motor, but, no symptoms have appeared in several months of usage. Hopefully it will continue to perform for a long time, probably longer than the operator has before him. Look back to the photo on pages 19 and 23. Study the pulley arrangement. You may have noticed that the large pulley on the jackshaft is made of clear polycarbonate plastic sheet. The available sheet was .375, not the standard .394 inches thick. Works, too!