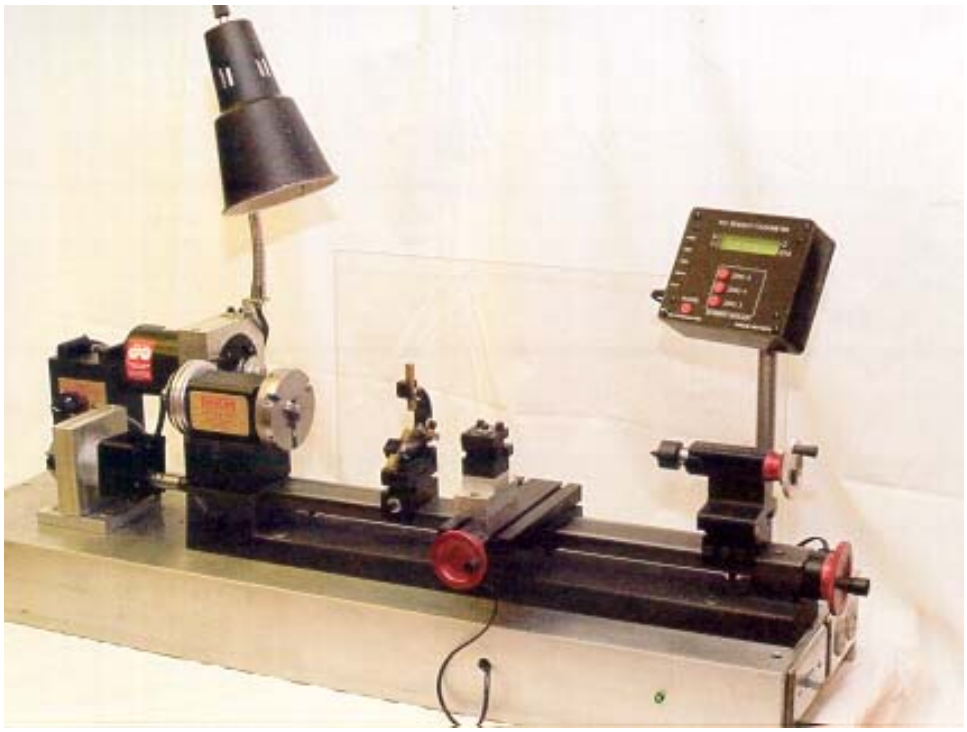
JBK's Lathe Modifications

There have been several people in the forum who have asked me for photos and a more complete description of the modifications I've made to my Sherline 4400 lathe. The following photo shows the lathe in its current form (January 2003).



The base is actually a piece of 10" aluminum channel 36" long. This is perhaps an unusual choice for a base but for me it was fortuitous as it opened up many possibilities I'm sure I would otherwise overlooked. The space underneath the base is used for electrical wiring, a DC power supply and for switches and controls. The right hand controls are visible in this photo and consist of a master on/off switch and two 120 VAC outlets. These outlets are for auxiliary tools such as a grinder or drill motor that use AC power. Also visible is a green LED pilot light that is illuminated when the master switch is in the ON position.

You can see in this photo that this lathe is equipped with the Sherline DRO, the control box being prominently mounted on a stalk made from a length of ½" conduit. The cables from the DRO encoders are passed through small access holes in the base. The cable and hole for the cross slide encoder is clearly visible in this photo. The cable for the leadscrew encoder passes through a similar hole in the top of the base just to the right of the lathe base casting.

The riser blocks are clearly visible in this photo. These are permanently installed. As should be apparent, relocating the main motor made it impossible to use the Sherline's

rotating head capability. Since there are other ways, most notably the compound slide, to cut short tapers the loss of this capability did not concern me greatly.

Mounted on the cross slide is my “semi-quick change” tool post. It is nothing more than a 1.25” riser block supporting the standard Sherline tool posts for 3/8” tools. Very nearly all of the cutting tools used on this lathe are carbide inserts. The only exceptions are the internal threading tool and an internal grooving tool, both of which are Accupro solid carbide units, and the ¾” shank boring bars which do double duty also being used in a 3” boring head on my Asian mill/drill. Lest it be thought an oversight, I use left and right-handed Iscar carbide insert parting tools. The Accupro and Iscar cutting tools are available from MSC.

You may also have noticed the power feed motor located just to the left of the headstock, and also that the main motor and controller are not mounted in their normal positions. Their mountings and location is better illustrated in the following photo, which also illustrates the controls at the left end of the lathe.

The two switches control the auxiliary DC power supply located under the base. The rotary switch has 6 dual pole positions wired as follows:

Position 1 – Off
Position 2 – 8 vdc
Position 3 – 16 vdc
Position 4 – 24 vdc
Position 5 – Off (not used)
Position 6 – Off (not used)

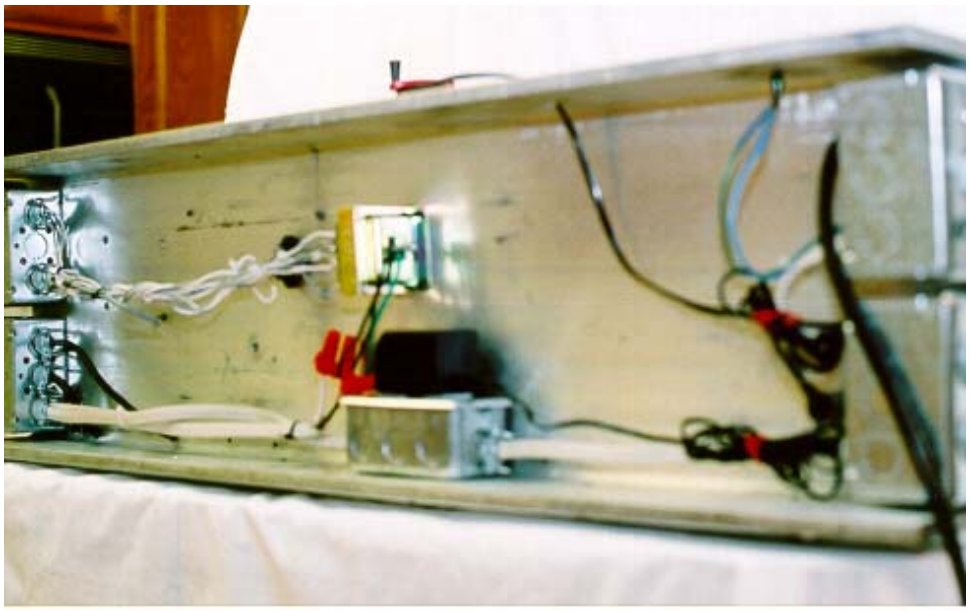
The toggle switch is a DPDT reversing switch controlling the direction of rotation of whatever auxiliary motor is attached at the time.

The box with the blank faceplate is a junction box in which the power cables for the main motor/controller and the work light are joined with the 120 VAC wall current source.

You may note what appears to be an audio patch cord protruding from the base. That is exactly what it is. I used a couple of mono audio patch cords to fabricate the power cords for the auxiliary motors and this is the matching female end. When mounted on the base the auxiliary motors are plugged into this connector thus connecting them with the switches visible in this photo.

While it could be clearer, the above photo shows how the main motor control box is mounted. I relocated it to this perhaps extreme location and oriented it vertically to minimize the possibility of chips, dust, and other debris settling on and getting into the control box itself. It is mounted on an aluminum stalk. The original power cord was cut roughly 12” from the control box. The control box end was passed through a hole in the base into the aforementioned junction box. The longer plug end was used as the main power cord that now connects to the master on/off switch.

These wiring details are better illustrated in the following photo.



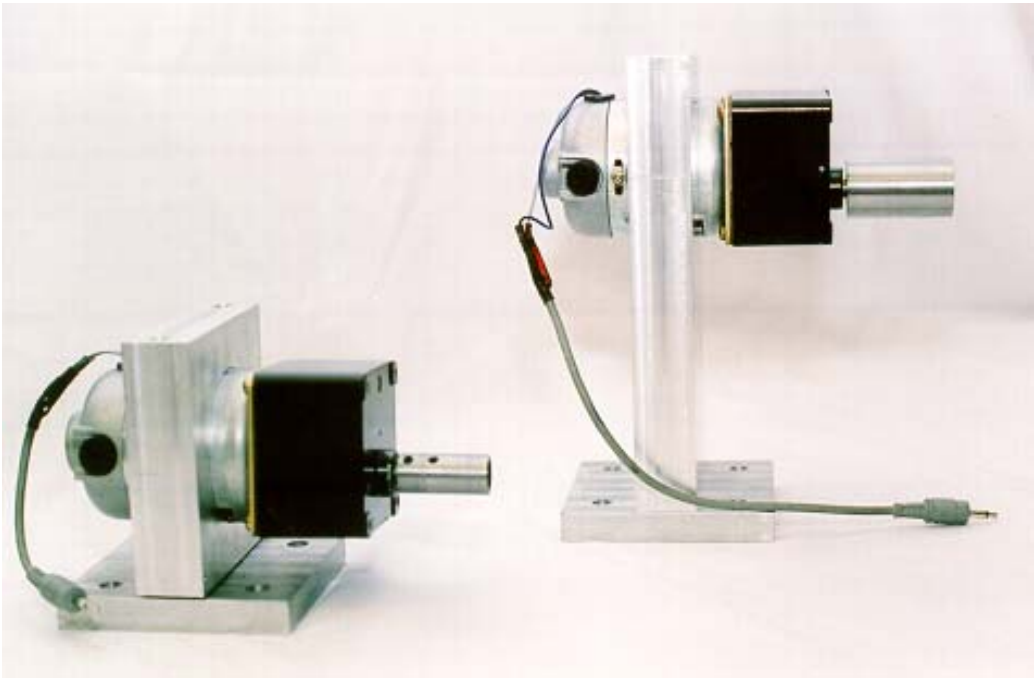
In this photo the two boxes at the left of the photo (the ones that are actually in focus) are the left end controls. The lower box is the junction box. The power cords from the main motor and the work lamp are the black wires emerging from that box. The remaining portion of the original power cord is the black line snaking across the rightmost portion of the photo. The intermediate 120 VAC power cables are Romex from the local Home Depot. The internal outlet box provides power to the DRO wall wart supply, and the DRO encoder cables are the coiled and secured using cable ties. The components of the

DC power supply are visible in the center of this photo, although somewhat out of focus. The transformer is a doorbell transformer also from Home Depot, and the indistinct black blob to its left is a full wave rectifier bridge. That and the switches are from Radio Shack.

The main motor mount and its tension adjusting mechanism is illustrated in the following photo.

The motor is clamped in pillow block fashion in a mount fashioned from 4”x1.5” aluminum. It is approximately 8” tall. The bracket is a 4” length of ¼” aluminum angle. This arrangement moved the motor away from the headstock by about 1” and provided a much more secure and rigid mounting. The longer replacement belt was obtained from a local sewing machine repair shop and is a standard Singer belt. I experimented with what the sewing machine experts called a “cotton” belt which appeared to be a urethane belt similar in appearance to the standard Mitsuboshi item. These “cotton” belts wore out very rapidly and I don’t recommend then. The Singer belt is of similar construction and appearance as automobile fan belts although much smaller. So far it has proven to be entirely satisfactory.

Partially obscured by the headstock is the power feed motor and its mounting. It is better illustrated in the following photo.

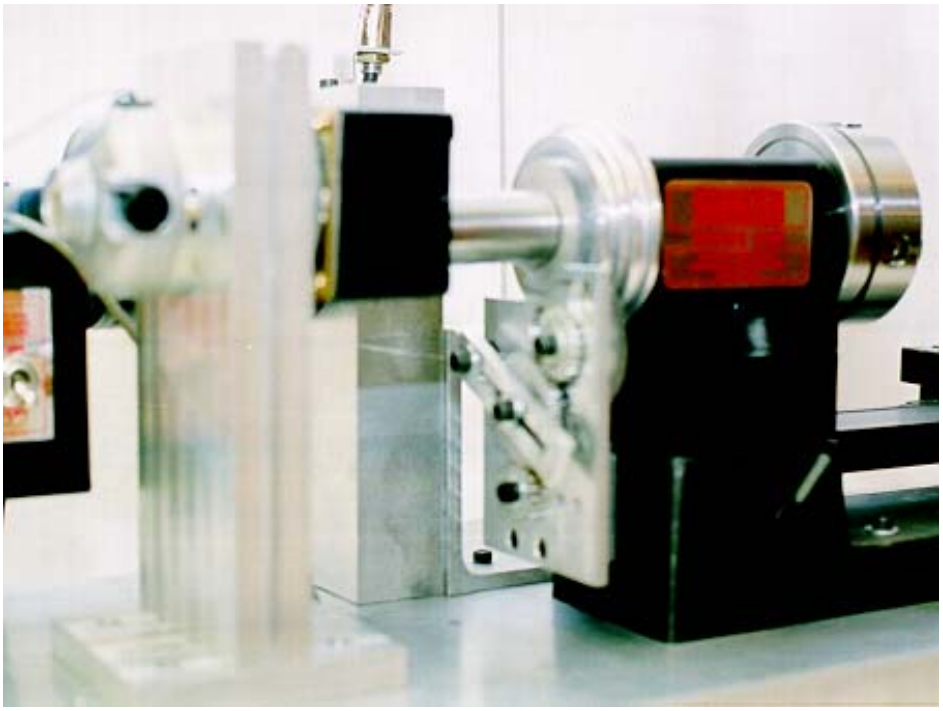


The taller unit is the threading motor. It's connecting shaft matches the size and configuration of the hand crank in the Sherline kit. Both motors are mounted in exactly the same manner and attach to the base using the same threaded bolt holes. These mountings are constructed from 1" x 3" aluminum bar. The bases are ½" x 3" bar stock, also aluminum.

The power feed motor is the shorter of the two units. The audio patch cords are clearly visible as such in this photo. The two motors are identical new surplus Japan Servo gear motors obtained from MPJA. These are rated at 38.5 RPM at 24vdc. They are reversible and when plugged into the DC power supply described above provide three speeds forward and reversed. At 16vdc (the middle setting) the power feed moves the cross slide at approximately the same speed as the standard Sherline unit. At 24vdc the feed rate is about 50% faster and at 8vdc about 50% slower. These are estimates based on casual observation, not actual measurements. These are all useful feed rates depending on the task at hand. Maximum torque is developed at 24vdc. The connector on the feed motor shaft is the functional equivalent of the Sherline part used with their power feed. I fabricated this coupler sized to fit the gear motor's shaft.

This photo illustrates the power feed motor connected and ready to use as well as the location of the controls.

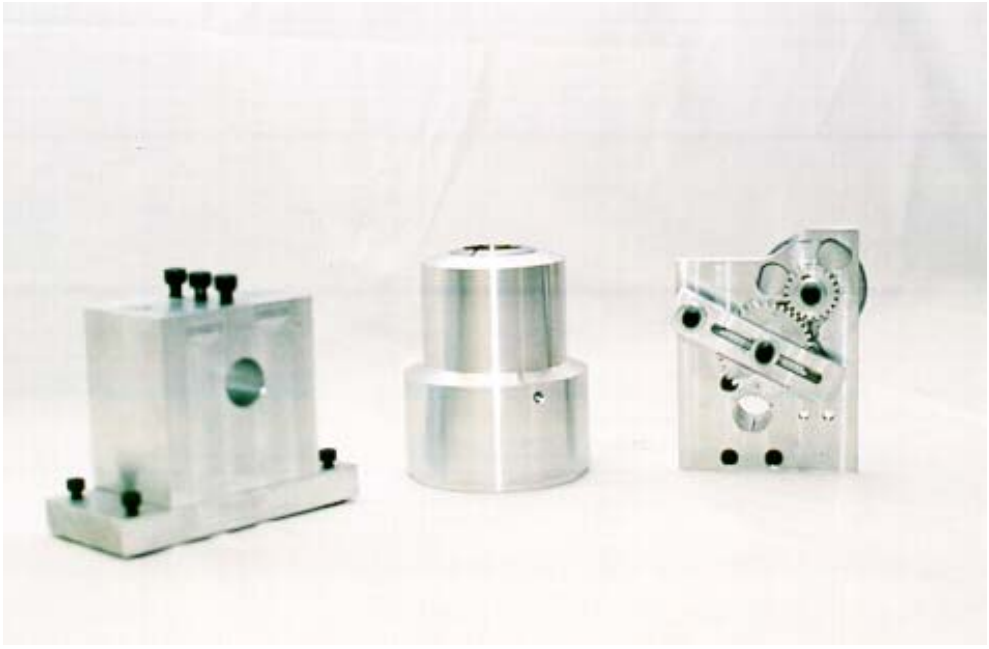
The following photo is not as clear as I wanted but it shows the threading motor in place and the headstock configured for threading.



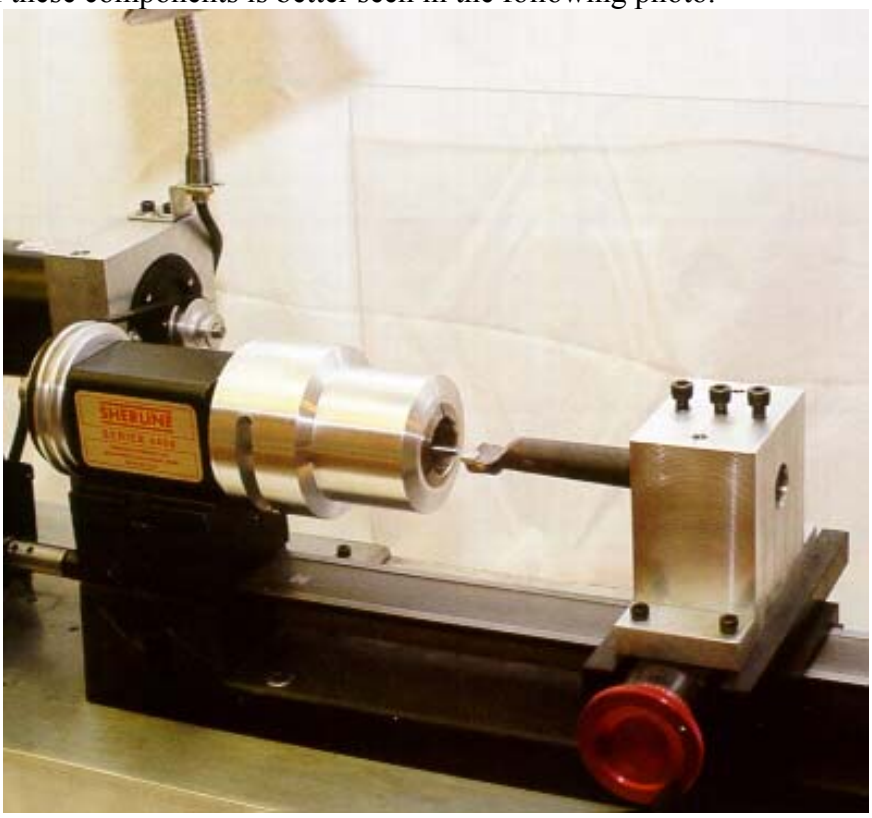
You will note that the bracketry from the Sherline threading kit has been replaced with a more sturdy gear mounting plate. . The gearbox uses the gears from the Sherline kit and in operation functions exactly as does that product, the sole exception being that the threading motor is turning the spindle instead of the hand crank.

I highly recommend this gearbox arrangement. It is designed specifically for lathes with risers and it works superbly. I can't take credit for its design, however. Mr. John Gjertsen, a member of this forum, responded to my inquiries concerning alternatives to the Sherline offering and graciously shared his design with me. This "gearbox" was built to Mr. Gjertsen's design. I am not at liberty to pass his drawings on to others who may be interested in building this most interesting and useful accessory. If you are interested in pursuing this matter please contact Mr. Gjertsen directly at gjertz@yahoo.com. When I last corresponded with him he was considering putting together a parts kit but I don't know where he stands with this endeavor.

The gearbox is more clearly visible in the following photo which also shows s 5C collet chuck I built for the lathe and a ¾" shank boring bar holder used in the chuck's construction.



The size of these components is better seen in the following photo.

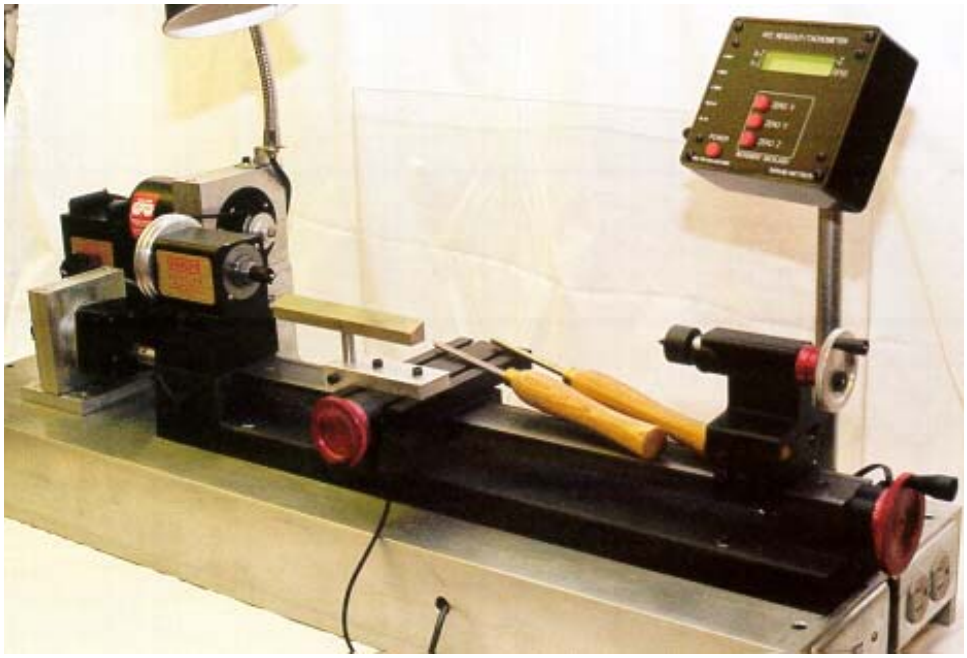


These tools seem disproportionately large to eyes accustomed to normal Sherline accessories but both work well on a lathe this size. In this photo the cross slide is about in the middle of the bed. You can judge for yourself if either the chuck or the boring bar is "too big" for the lathe. In my personal opinion, both are useful accessories that do not stretch the capabilities of the lathe.

There has been some concern expressed about the weight of a 5C chuck. This chuck is constructed of 7075 aluminum and weighs 1 lb 12 oz. It is actually a little lighter than is the Sherline independent 4 jaw chuck. While work held in this chuck generally cannot fit through the spindle, the length of the chuck allows more "wiggle room" than might be expected.

In use, the ¾" boring bar also might seem to be overkill on a lathe this size, but with risers installed it will comfortably swing a 4" diameter blank over the cross slide. How large a bore might you want to cut in a work piece this size? How deep might these bores be? In my experience the 3/8" diameter boring tools are too small and whippy to cut large, deep bores, hence the necessity of using these larger cutters.

Many Sherline lathe owners do wood turning, and I am no exception. The following photo illustrates my lathe in a wood turning configuration.



You will note that the tool rest is of my own design and construction. It is loosely patterned after the Sherline offering. The rest itself is fabricated from 5.5” of 5/8” square CRS and the post is 3/8” O1 drill rod (annealed, not the hard stuff). Not shown is a smaller tool rest 3.5” long but of otherwise identical design and construction.

My lathe is a continual work in progress and its development is in no way complete. There is nothing here that precludes CNC and I’ve thought through the process of conversion if/when the time comes. When that happens none of the current functionality will be lost and the lathe will continue to be operable in a manual mode as it is at present. CNC will simply provide an additional level of functionality. My present focus is on additional accessories that expand the capability and functionality of what is emerging as a very competent and interesting machine tool.

I hope my experience provides food for thought and possibly stimulates your own efforts in expanding the usefulness and utility of your Sherline lathe.

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