

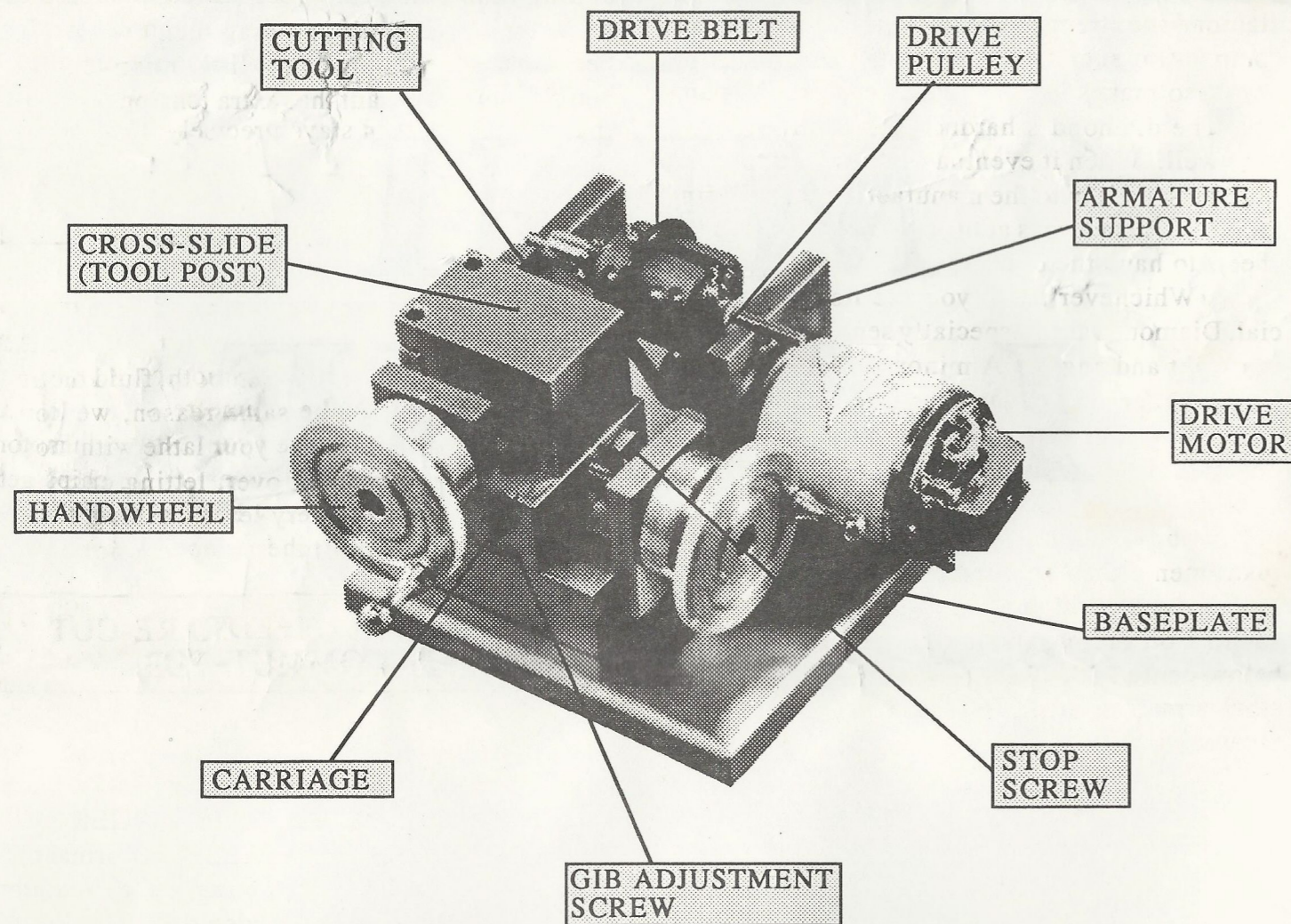
TWISTER

MINI

LATHE

TWISTER MINI LATHE INSTRUCTIONS

Your new TWISTER Pocket Lathe is the smallest most-accurate track-side lathe in the world. It has been designed exclusively for re-cutting the commutator on your modified R/C car motor. Before we begin, familiarize yourself with the names of the lathe parts to avoid confusion later on. **CAUTION: YOU MUST WEAR SAFETY GLASSES OR OTHER SUITABLE EYE PROTECTION WHENEVER OPERATING THIS LATHE.**



BASIC LATHE PARTS

LATHE TOOLS AND MAINTENANCE

The Twister Pocket Lathe comes standard with a carbide cutting tool. It works well, but requires frequent sharpening. You must have a diamond dressing wheel; or go to a tool shop in order to properly sharpen the tool. The carbide cutting tool will do a quality job, but it cannot match the finish of the cut or the durability you'll get from the optional diamond cutting tool. We strongly recommend that you invest in the diamond cutting tool.

If you bought a diamond cutting tool take good care of it and it will last a long time. The diamond is extremely hard. That's what gives the commutator such an excellent finish. It's hardness also makes it very brittle and easy to damage. The diamond's hardness allows it to wear very well. When it eventually does start to wear, you can send it in to the manufacturer (you'll find the name and address at the end of this instruction sheet) to have the cutting edge re-lapped.

Whichever tool you use its height is crucial. Diamonds are especially sensitive to changes in height and angle. A minor change can make a big difference in the quality of the surface finish.

In either case, the tool must be set dead center to the commutator. Use the flat shim stock provided with your lathe and/ or make your own shims out of plain paper. If you don't have the instruments to measure cutting tool height and are eyeballing it you may err by a few thousandths on the high side but never set the tool below center. It is best to experiment on an old stock armature until you get the quality of cut that pleases you.

GIB ADJUSTMENTS

The gibs are the plastic pieces in the dovetails on the carriage and cross-slide. The gibs both guide and take up slack, and they're designed to wear with use so the other parts of the lathe won't. In order for the lathe to work its best, both gibs should be kept clean, well oiled (use any good light weight bearing oil) and properly

adjusted. The gib adjustments are two small socket-head set screws found on the sides of both the carriage and the cross-slide. Use the Allen wrenches that came with your lathe.

The gib adjustment for the carriage is located on the front of the lathe above the large TWISTER sticker and below the cross-slide handwheel. The carriage should be adjusted so that it is free of play, yet glides smoothly so you get a clean, even cut on your commutators. These adjustments will be properly set from the factory, but you must fine-tune the adjustment as the gibs wear with use.

The cross-slide gib adjustment is located on the left end of the cross-slide, below the cutting tool. Note: the cross-slide gib should be set with more tension and drag than the carriage because it has to move very little relative to the carriage and you want that extra tension to ensure that the cutting tool stays precisely positioned.

CLEANING YOUR LATHE

The best way to clean your lathe is with a small paint brush. When cleaning, always tilt the lathe so that the cutting chips don't fall into the gibs where they can ruin the smooth, fluid motion that's required. For the same reason, we don't recommend that you douse your lathe with motor spray. The spray runs all over, letting chips get into the gibs or at the very least washing the oil from the gibs, ruining their smooth action.

WHEN DO I NEED TO RE-CUT MY COMMUTATOR

The lathe should be used to re-cut the finish on your motor's commutator **AS SOON AS YOU NOTICE A DECREASE IN EITHER PERFORMANCE OR RUN TIME.** Under normal circumstances you should be using a Commutator Cleaning Stick such as Twister #600 or Trinity #4050 on your armature and brushes between races. Nine times out of ten, this and a thorough cleaning and oiling, will bring a motor back to race readiness. But when it won't, then you must re-cut the commutator. When properly done, a

motor with a re-cut commutator should be as fast and efficient as a new motor.

MOTOR DISASSEMBLY

Mark your motor's timing position by marking the can and putting a matching mark on the endbell. These marks will be your reference points for re-assembly. Now remove the springs and the brushes from the brush holders. Next loosen the timing screws in the endbell. Hold the motor with the endbell up. Simultaneously lift and rotate the endbell counterclockwise about 1/4 turn. It should come off. If it won't rotate, loosen the screws some more and try again. Carefully check the inside of the endbell and the armature shaft for motor spacers. Remove them and place them in one spot. Turn the motor over and pull the armature out. Carefully check the inside of the can and the armature shaft for more motor spacers. Place all the shims from this end of the armature in another spot.

CAUTION: Some manufacturers use steel motor spacers (you can recognize them by their dull finish). These spacers magnetize and will adhere to virtually any nook or cranny in your motor. Therefore, you must check very carefully around the magnets to ensure that a spacer or two hasn't tucked itself away only to dislodge at a later time and seriously damage your motor. This is why TWISTER'S use non-magnetic stainless steel and Teflon spacers in all its modified motors. If you're not rebuilding a TWISTER we recommend you use a TWISTER MOTOR SHIM KIT #813 to upgrade your motor.

PREPARING THE ARMATURE

Using the cross-slide handwheel, move the cutting tool far away from the armature support groove on the lathe. The diamond cutting tip is very delicate and all care must be taken to not hit it for it can easily chip and destroy the cutting edge. With the commutator on the left, place the

armature in the grooves on top of the armature supports. Notice the large end play. Now, using the shims which came with your Pocket Lathe, shim both ends of the armature until you have fully eliminated the end play. Two things are very important here. First, use a single Teflon shim on the commutator end (to properly position the armature in relation to the cutter) and use the metal spacers on the long end, making sure the outermost shim is also Teflon. Second, you should completely eliminate end play. Properly done, the armature will be a slightly snug fit between the supports.

SETTING DRIVE BELT TENSION

Remove the armature and place a drop of light oil on each armature support groove. Slip the drive belt onto the armature and set it back onto the armature supports. Using a motor wrench, loosen the drive motor, slide it up and slip the belt over the drive pulley. Now, push down on the motor hard enough to actually stretch the drive belt. Tighten the motor screws and place a drop of bearing oil on each end of the armature where it rides on the armature supports. Make sure the armature is held firmly in the grooves. From now on, to either remove or install the drive belt from the drive pulley, merely roll it over the edge of the pulley as it is being rotated, or use the above method.

SETTING THE TRAVEL STOP

With the armature in the lathe, turn the carriage handwheel until the tip of the cutting tool is at the far right end of the commutator—about 1/16-inch before the armature wire's weld solder joints. If there is a gap between the stop screw and the carriage screw support you will need to turn the screw out, if the carriage won't move that far you must turn the screw in.

Move the carriage to the far left and, using an 11/32 open-end wrench, loosen the locknut on

the travel stop. Now with a pair of needle-nose pliers, or with the Allen wrench provided with your lathe, back the stop screw out enough to fill the afore mentioned gap or turn it in to gain movement. Secure the stop screw with the locknut. Move the carriage to the right until the stop bottoms out. Is the point of the cutting tool at the right end of the commutator, about 1/16-inch from the welds. If not, then repeat the process until you get the carriage travel stop set exactly where you want it. It may take a few tries, but you must get it set right or you may damage your cutting tool as well as your armature by running the cutting tool into the commutator tabs.

POSITIONING THE CROSS SLIDE

Using a wide-tip felt marker, paint the circumference of the left 1/4-inch of the commutator. Using the carriage and cross-slide handwheels, bring the tip of the cutting tool to a point about 1/32-inch in from the left edge of the commutator and 1/32-inch from the commutator's surface. Now connect your Pocket Lathe to either a 4-cell battery pack or a 5-volt power supply. NEVER use any more than 5-volts to operate your Pocket Lathe. Turn the lathe on. The armature should spin smoothly. The direction of rotation should have the commutator's surface traveling upward as it approaches the cutting tool. Viewed from the commutator end, the armature should be spinning counterclockwise. If not, your drive motor, battery pack or power supply is wired backwards. STOP! Check the aforementioned and make sure they're wired properly. You can now proceed to the most delicate part of the operation, the actual cutting of the commutator.

CUTTING THE COMMUTATOR

Your Pocket Lathe should be firmly supported on all four of its rubber feet. DON'T FORGET TO WEAR YOUR SAFETY GLASSES! Turn the switch on. Your lathe should spin smoothly. Gently advance the

cutting tool toward the painted commutator surface by slowly turning the cross-slide handwheel clockwise. The instant the cutting tool makes contact with the commutator, you will see a thin, shiny cut on the commutator surface. STOP! Don't move the cross-slide any further inward. With the lathe still running, turn the carriage handwheel counterclockwise until you've cut slightly past the left end of the commutator. Turn off the lathe. You've now completed the first step in truing your commutator.

To accomplish the best finish you will need to use a cutting fluid on the commutator. WD-40 will work fine. You will also need a thimble-like container (the WD-40 cap will do) and a small hobby-type brush with which to apply the cutting fluid to the commutator.

Spray some WD-40 into your container. Turn the lathe on. Dip the brush into the WD-40 and gently apply it to the backside of the spinning commutator. It may splatter some so watch your clothes.

After applying the WD-40 begin cutting the commutator by turning the carriage handwheel clockwise in order to bring the cutting tool across the commutator face from left to right. The tool will pass over the previously cut outer 1/32-inch section and then it will begin removing material from the main surface of the commutator.

How fast should you turn the carriage handwheel? It should take about 15-20 seconds to go from the left edge of the commutator to the point where the carriage travel stop bottoms out, turn the lathe off.

Examine the commutator surface by slowly rotating it while still mounted in the lathe. Did your first cut succeed in removing all indications of previous use from the commutator's surface? Probably not. It will usually take 2 or 3 cuts to clean up the commutator surface...even more if it is seriously worn. It is better to make light cutting passes than it is to try and remove a lot all at once. Be patient. Thinner cuts will give you a better surface finish. If you didn't get all of the previously worn commutator surface cut off, use the carriage handwheel to move the cutting tool all the way back to your starting point, off the left side of the commutator.

Now, look at the indicator number lines on the shoulder of the cross-slide handwheel. Each line indicates 1/1000th-inch(.001) of travel for the cross-slide. Turn the wheel clockwise one line or less so that the cross-slide travels forward no more than 1/1000th-inch. Now repeat the cutting process, starting with a re-application of the WD-40. Continue to repeat these steps until you have removed all indications of previous use from the commutator's surface. Shut off the lathe motor.

WHEN 1/1000TH-INCH IS TOO MUCH

As you become proficient with your lathe, you may want to take lighter and lighter cuts to extend the life of your race motor as much as possible. To this end, when making a second or third cut, try moving the cutting tool in only half of 1/1000th-inch(.0005 instead of .001). This is done by looking at the indicator lines on the handwheel and only turning the hand wheel half a line. It takes practice and a delicate hand to know when and how to do this.

Keep in mind that when cutting a circumference (like a commutator) a .001- inch cut actually reduces the diameter by .002-inch. A new commutator measures about .292-inch, and you should never cut a commutator smaller than .275-inch. At .275-inch the commutator is too thin. You can snag a commutator segment and ruin both the armature and your diamond cutting tool. Making two .001-inch cuts per rebuild (thus reducing the diameter by .004-inch) you will get 4 rebuilds per motor. If you are able to clean the commutator with 2 or 3 cuts at .0005-inch each (instead of .001-inch) then you can get 7—8 rebuilds per motor. Just remember that the final cut must leave a clean finish on the commutator surface to achieve maximum performance. It all comes down to practice...and patience.

PREPARING THE COMM FOR ASSEMBLY

Now that you have a beautifully cut commutator, back the cross-slide off as far as possible from the commutator. This is to help protect the delicate diamond tip from damage. Slip the drive belt off the drive pulley. Remove the armature from the lathe, slide the drive belt off, and remove the shims from both ends of the armature.

Carefully using an X-Acto knife with a #11 blade, clean out the grooves between the commutator segments of any undesired residue or chips of copper remaining from the cutting operation. Be sure not to touch the commutator surface with the blade. Spray the arm thoroughly with motor spray and let dry.

Clean both the motor can and endbell, paying particular attention to the bearings. Let them both dry. Hold the armature with the long end pointing up. You will have to touch the commutator during re-assembly so make sure your hands are free of oil or use a clean, lint-free cloth. Reinstall the motor shims on the long end of the shaft.

RE-ASSEMBLING THE MOTOR

Still holding the armature as per above, slip the motor can over the top of the armature and slide the shaft through the bearing. You will notice the strong pull of the magnets as you perform this installation. Let the magnets hold the armature in place as you align the shaft with the bearing hole. Once aligned, the magnets will help you pull the armature into the can.

Turn the can over so the short end of the armature is up. Install the short-end shims. Now install the endbell, making sure to push the timing screws down so the aluminum timing ring doesn't "hang up" on the timing notches in the can. Rotate the endbell so that the timing marks you made on the can and endbell line up. If you notice that

they're about 180 degrees out of phase, remove the endbell, rotate it 180 degrees, then re-install it. You should now be able to line up the timing marks without any problem. Once that's done snug down the timing screws. Install new brushes or re-insert the old ones then install the brush springs. Put a drop of bearing oil on each motor bearing and you're ready to break in the motor by following the instructions in the "TWISTER MOTOR TUNING GUIDE" which is included with your lathe.

LATHE TUNE UP OR REPAIR

Proper alignment of the carriage, cross-slide and armature supports is crucial if the lathe is to cut true. Your lathe was assembled using very sensitive measuring equipment to ensure accuracy.

Should your lathe be in need of more than routine cleaning, put the lathe and foam in its original carrying case. Pack it carefully and return it to TWISTER. Our factory technicians will give it a complete tune-up, re-alignment and will replace damaged parts as necessary, for \$40.00 labor plus parts. The lathe will be shipped back immediately UPS COD.

LATHE STORAGE

When not in use, your Pocket Lathe should be stored in the foam in its original factory container. Before storing make sure of the following:

1. The lathe is completely clean and the gibs are freshly oiled.
2. The switch is in the OFF position.
3. The cutting tool should be positioned directly over the left armature support in order to help protect it from accidental damage.
4. The drive belt and all motor shims should be secured in their plastic carrying case.

"TWISTER HOTLINE"

If you have any problems with your lathe or have additional questions, call the "TWISTER HOTLINE" at 818-914-6177. We'll be glad to help.

PARTS LIST

PartNo.	Qty.	Description
5000	1	Complete lathe
5001	1	Base plate
5002	1	Armature support motor mt.
5003	1	Armature support
5004	1	Base dovetail
5005	1	Carriage dovetail
5006	1	Tool holder
5007	2	Lead screw mt. plate
5008	1	Left hand lead screw
5009	1	Right hand lead screw
5010	1	Hand wheel (deg.)
5011	1	Hand wheel (plain)
5012	1	Drive pulley
5013	2	E-clip
5014	4	.250X4-40 Gib set screw
5015	1	.125X4-40 Pulley set screw
5016	2	.187X8-32 Tool post set screw
5017	2	.125X8-32 Wheel set screw
5018	1	.750X8-32 Stop set screw
5019	1	8-32 Stop screw lock nut
5020	6	.375X10-32 Base plate screws
5021	1	Crossslide gib(plastic)
5022	1	Tool holder gib(plastic)
5023	2	3X12mm Motor mt. screw
5024	1	Drive belt
5025	4	Rubber pads
5026	1	Switch

Carter Diamond Tool Company
4475 Hamann Parkway
Willoughby Ohio 44094