

OPERATION MANUAL

BRC450

Hub Mounted on-the-car Lathe

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Manual P/N 035-80471-00

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I. Introduction

Thank you for your purchase of a BRC450 brake lathe. Congratulations on your choice! The BRC450 is designed to outperform every other comparable hub mounted brake lathe in all respects.

The BRC450 was designed as a completely new product. It is somewhat similar to a lathe supplied by Hunter in the past, but the new BRC450 has many improvements and changes in design. The precision machined components of the BRC450 are produced by RTI's Worldwide partner and affiliate, Hunger in Germany, using the most modern and sophisticated machine tools in the world. For more than 30 years, Hunger has been the leading automotive brake lathe manufacturer in Germany. The new BRC450(E326a) is approved by Mercedes, GM, Chrysler and Ford in Europe. The hub drive transmission system has been completely redesigned and the capacity of the lathe, in terms of maximum rotor diameter and thickness that can be machined has been increased to allow machining of the Dodge Ram rotors. The special hub adaption method designed by RTI for the BRC450 is brand new and substantially improved. The BRC450 uses the same special cutting tips and special geometry developed by RTI for the BRC35 and BRC500 models. The Transport/Setup Lift (not supplied with the BRC450L) is designed and produced in the USA by RTI to make handling the BRC450 easier.

The BRC450 is designed to be easy to use. Once the unit is mounted to the hub it operates in much the same way as a typical bench mounted lathe. (In fact, with a special kit, the BRC450 can be used as a bench mounted disc only brake lathe!) Mounting the unit on the vehicle's hub requires the axis of the BRC450's drive to be aligned or compensated to the vehicle's hub axis. The precision of this alignment or compensation for the BRC450 or any other hub mounted lathe will determine the rotor run out that is finally achieved. The time to achieve the necessary compensation or alignment of the BRC450 is minimized. Less than two minutes per wheel to get around 0.002" (0.005 mm) of run out and only slightly more time to achieve "near zero" or less an 0.001" (0.0025 mm) of run out. The BRC450's hub plate is attached to the vehicle's hub by means of 3, 4, 5 or 7 special "cranks" and the compensation is achieved by simply lengthening or shortening the length of these "cranks" using a dial indicator to determine the correct setting. Minimizing brake disc run out is an important aspect of modern brake service. Elimination of pedal pulsation issues on wheels with pre-loaded wheel bearings requires less than 0.001" (0.0025 mm) of run out. If the wheels do not run on pre-loaded wheel bearings, run out of 0.002" (0.005 mm) is acceptable.

Running the BRC450 is simple. It has one spindle speed and one feed rate. The feed rate is set at the factory for optimum speed and surface finish. It can be adjusted to be faster or slower with instructions from RTI's technical support department but such adjustment is not recommended. An exclusive feature of the BRC450 is Offset Step Feed, where the feed is alternatively turned on and off mechanically. This special Offset Step Feed improves the surface finish of the cut and produces a non-directional finish automatically.

The BRC450 can be used as a "single pass-one cut" machine. However, RTI recommends a "two pass" machining process with a rough "foundation" cut just deep enough to clean up the rotor, and an extra fine finish cut, with a depth of only 0.001-0.002" (0.025-0.05 mm) per side, taking full advantage of the special cutting tool design of the BRC450. This two pass technique will not remove any more material than necessary, and even though it may take a few minutes longer, it will result in a more perfect rotor in every respect.

II. Safety

Before we go to the next step, some reminders about safety:

A. Avoid a major injury because of an unexpected start-up!

Be sure that the BRC450 is not plugged in and supplied with electrical power when the lathe is not operating. This is particularly important when mounting the unit and performing the compensation adjustments. In addition, the BRC450 has a spring loaded rotary “on/off” switch and requires the switch to be held in the “on” position momentarily to start. Turning the switch the opposite direction will turn the BRC450 off immediately, then unplug the power.

B. Avoid a major injury from rotating machinery!

The BRC500 has a spindle motor with a great deal of power and torque. Do not wear loose clothing that could be entangled in the rotating parts. Be sure that long hair is properly secured so that it can not be entangled in the rotating parts. Do not place any part of your body near the rotating parts of the BRC450 when in operation. Always be aware of the location of the on/off switch so that the lathe can be stopped immediately.

C. Protect your eyes!

Small metal chips will fly off from the rotor during machining. Be sure to wear your safety glasses at all times when the BRC450 is in operation. Use the same safety glasses that you are required to use when grinding metal.

D. Avoid possible electrical shock or unsafe operation!

Like any electrical appliance, never operate the BRC450 when it is wet, or when you are standing in water. Be sure the receptacle for the electrical plug is a three prong grounded type, that it is the correct voltage for the BRC450 (110V, 60Hz in the North America), that it is protected by a fuse or circuit breaker with the correct rating (15 Amp maximum in North America), and that it is protected with a Ground Fault Interrupter (GFI) device.

E. Avoid all fire hazards!

If for any reason the lathe spindle is jammed or locked up and stops suddenly, be sure to turn the power off and unplug the lathe immediately, before fixing the cause of the problem.

F. Avoid back or foot injury!

When using the Transport/Setup Lift, be sure the safety locking pin is in place when the lathe is not attached to the vehicle’s hub. If you lift the BRC450 lathe body by hand without the Transport/Setup Lift, be sure to use the handles and use a proper lifting techniques, lifting with your legs and arms, and not with your back.

G. Avoid tip-over!

When using the Transport/Setup Lift, be sure that the lift is always in the lowest position when storing or moving the lift and lathe around the shop. When the lift is up, it is possible for the lift with the lathe to tip over if handled carelessly.

III. Checking out the parts

A. The BRC450 and BRC450L lathe comes standard with:

Main lathe housing assembly.

Power Cord

90 mm (3 9/16") Cranks with Precision Adjusting Nuts and attachment nuts/washers (Qty=5)

Note these are color coded: Blue, Green, White, Black, and Red

27 mm wrench for the Precision Adjusting Nuts on the Cranks

17/19 mm combo wrench

Allen wrench-standard

Allen wrench-two size combo

Centering Plate (3, 4, 5, or 6 lug)

Tommy Bar for loosening Centering Plate

10 mm (3/8 ") thick spacers (Qty=6)

Adjustable Support Cane

Hand-held mini-lubrication pump for slideway nipples.

12 mm (3/8") Positive Rake disc cutting tip holders. (One RH, one LH)

RTI Positive Rake Cutting Tips. (Qty=10)

Vibration dampening rubber ring for discs.

B. BRC450 comes with additionally:

Transport/Setup Lift

Main Body

Casters (Qty=3)

Hydraulic jack assembly with handle

Bottom legs (Qty=2)

Short horizontal arms (Qty=2)

Vertical arm with stop gusset

Long horizontal arm with solid bar

Spring

Platform assembly

Locking pin

Set of assembly/mounting hardware

Dial Indicator Set with Gooseneck Clamp

C. Optional items:

35 mm deep 3,4,5,6 Centering Bell needed for some 4WD.

Set of (5) 90 mm (3 9/16") Cranks (Additional)

Set of (5) 104 mm (4-1/16") Cranks for some 4WD

Set of (2) 90 mm (3-1/16") Cranks (Additional)

35 mm deep 7 hole Centering Bell needed for Ford 7 lug

Set of (2) 104 mm (4-1/16") Cranks for Ford 7 lug (see #3 and 4)

Bench mount kit.

IV. Initial Set-Up

A. Cleaning. The BRC450 is shipped with a rust preventative material on the unpainted surfaces. (See Figure 1). Clean these surfaces, removing the rust preventative with a cleaning solvent. Do not use a solvent that will dissolve the paint. After cleaning, apply a light machine tool oil to lubricate the cleaned surfaces. You will need to move the tool slide outward to its maximum extension with the hand wheel and extend the axial adjustment tube. (Be sure to dis-engage feed engagement.) Re-position the axial adjustment tube so that approximately 3" (75 mm) of the chromed surface is visible. Then, using the supplied hand-held mini-lubrication pump, inject a small amount of oil in the slideway nipples. (This cleaning and lubrication should be done periodically as part of normal maintenance.)

B. Assembling the Transport/Setup Lift. (See Figure 2) Assemble according to drawing. Adjust the screw at the gusset on the top vertical arm so that the long horizontal arm points slightly upward at the end with the solid bar. (This angle can be later adjusted as necessary by adjusting the screw. The lathe will be easier to install if it is installed going slightly up-hill toward the vehicle's hub.) Install spring. Move the assembly up and then down using the hydraulic jack to be sure that the lift operates without binding. Be sure that the hydraulic jack is lowered so that the lower of the two short horizontal arms is touching the round tube on the main body's upright support. Mount the platform to the bottom of the BRC450 main housing with the slotted end of the tube on the same side as the cutting tools of the BRC450. Then carefully place the lathe and platform on the lift, by inserting the solid bar on the long horizontal arm into the tube of the platform as shown in Figure 2. Immediately install the safety pin and tighten the locking handle on the end of the tube to keep the platform and lathe from rotating on the solid bar.

C. Installing the Cutting Tip Holders. First, install the tips on the tip holders with the screws provided. (With positive rake tips, be sure the tips are right side up and the back face is flat against the tip holder machined back surface (See Figure 3). The BRC450 comes with an extra strong and rigid cutting tool holder assembly. The cutting tip holders are inserted into the cutting tool holders (RH and LH) so that the cutting tips are facing down (See Figure 3). Then tighten the Allen screws on the top of the tool holders to lock the tip holders in place.

D. Install the power cord and turn on the BRC450. Check to be sure it operates with no unusual noises and that the spindle turns. Engage the automatic feed briefly to check the operation. Disconnect power cord.

Figure 1 Exploded view of lathe

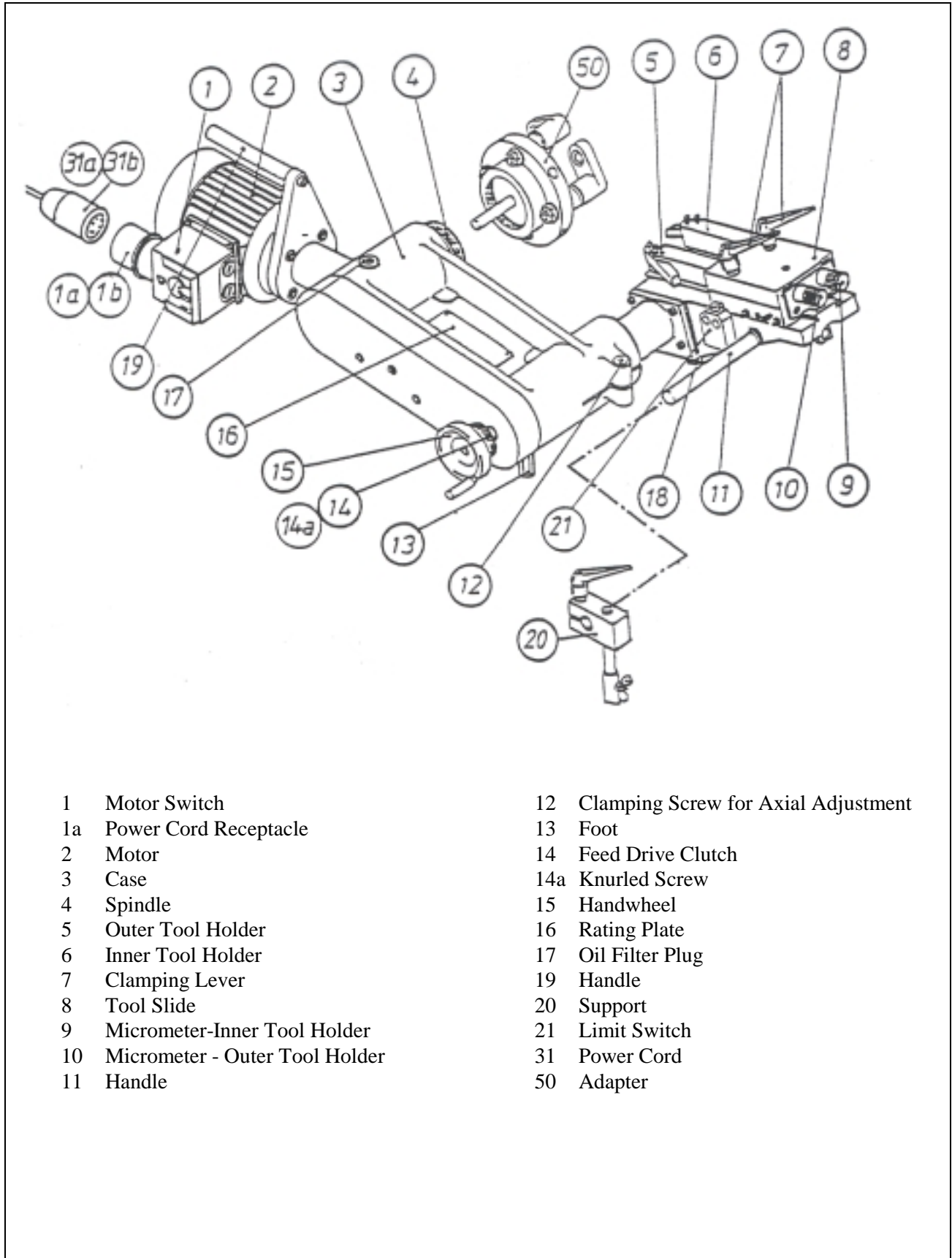


Figure 2 Assembly exploded drawing of Transport/Setup Lift

ID	PART NUMBER	DESCRIPTION	QTY
A	021-80091-10	Bolt 3/8-16 x 2-1/2 lg.	6
	021-80017-07	Lock Nut 3/8-16	6
B	021-80091-08	Bolt 3/8-16 x 2 lg.	4
	021-80017-07	Lock Nut 3/8-16	4
C	021-80085-01	Screw HWH #14-AB x 1/2	3
D	080-80003-04	Bolt SH M10-1.5 x 25 lg.	3
E	021-80122-00	Bolt HH M10-1.5 x 30 lg.	2
F	021-80077-04	Bolt 1/4-20 x 3/4 lg.	4
	021-80017-05	Lock Nut 1/4-20	4
G	021-80091-05	Bolt 3/8-16 x 1-1/4 lg.	1
	021-80017-07	Lock Nut 3/8-16	1
H	021-80091-05	Bolt 3/8-16 x 1-1/4 lg.	1
	021-80005-03	Nut 3/8-16	1

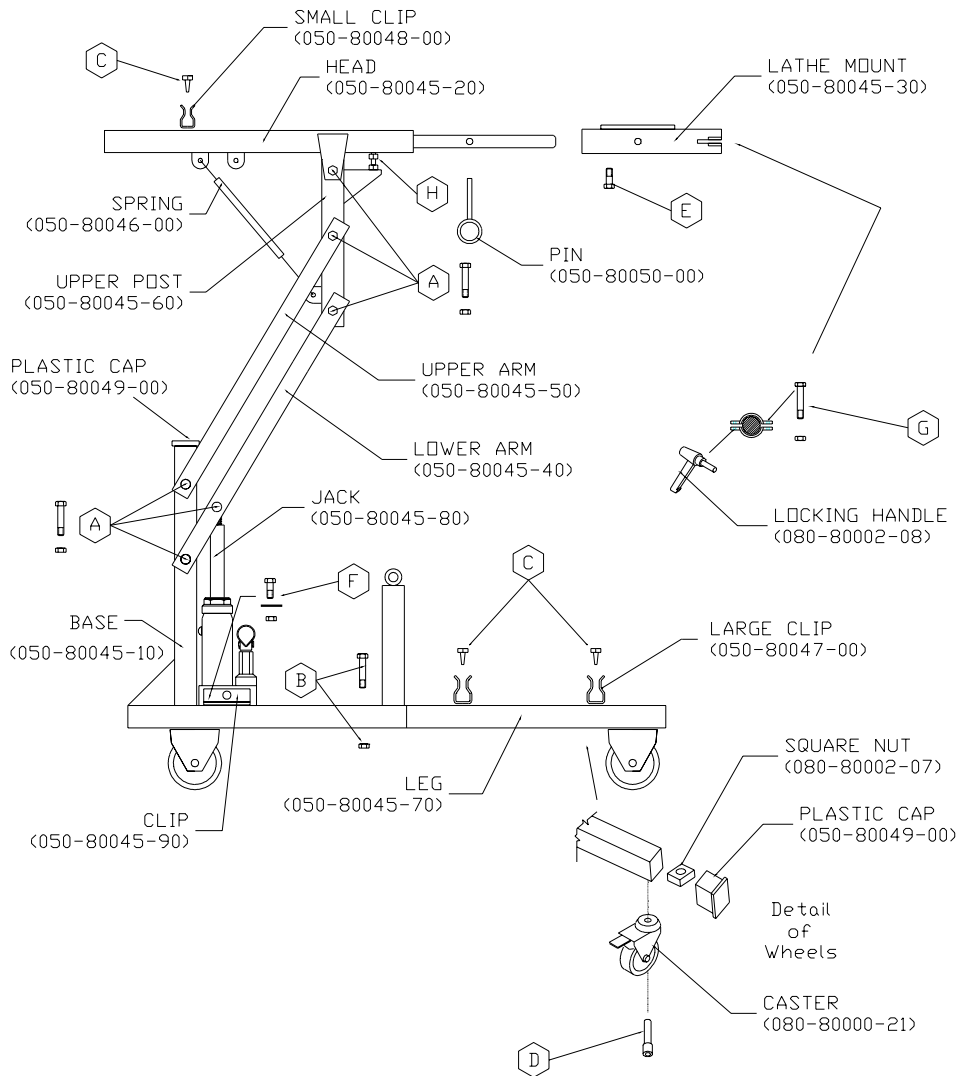
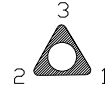
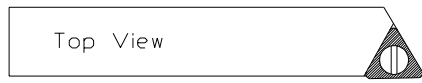
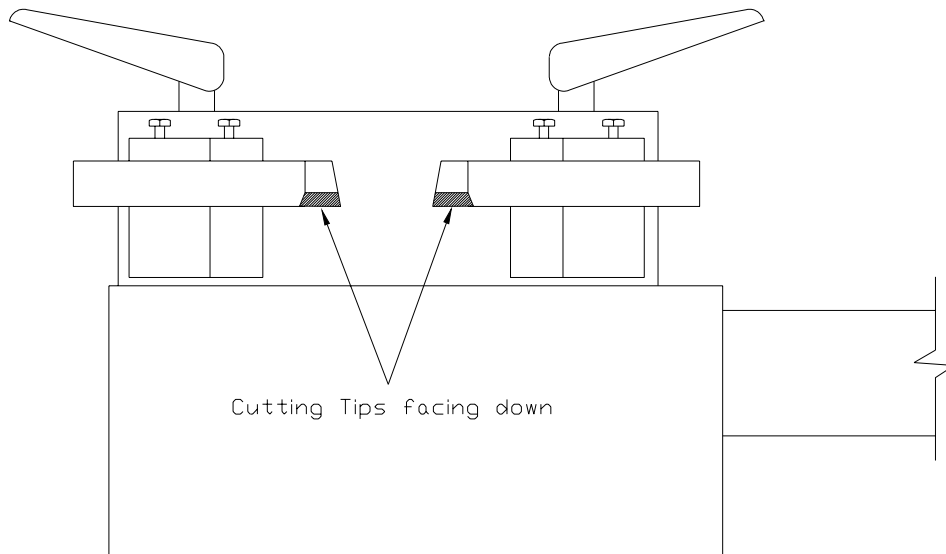
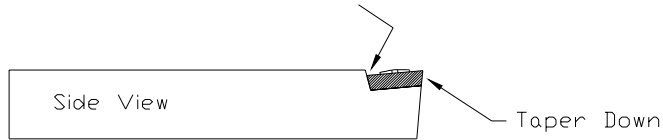


Figure 3 Tip holder and cutting tip set-up for rotors (positive rake)



Cutting Tip can be turned and mounted three ways to use three cutting surfaces

Flat against back of Tool Holder



V. Cutting Brake Rotors/Discs

A. Installing the Cranks and Centering Plate. (See Figure 4) The standard set-up uses the standard Centering Plate and 90 mm long Cranks. Note that on the outside of the Centering Plate, next to each hole are the stamped numbers "3", "4", or "5". For 4 lug hubs, you insert (4) Cranks from the side opposite the stamped numbers into the (4) holes marked "4". For 5 lug hubs, you insert the (5) Cranks into the (5) holes marked "5". For 6 lug hubs, you insert (3) Cranks into the (3) holes marked "3". Then install the washers and nuts finger tight on the studs of the Cranks. The legs of the Cranks should be all pointed in the same counter-clockwise direction. (See Figure 1) Place the large holes in the legs over the hub studs and install the lug nuts finger tight, or as appropriate place the holes in the legs in line with the threaded holes in the hub and install the lug cap screws finger tight. Then tighten the lug nuts or cap screws to the vehicle manufacturer's recommended wheel installation torque.

B. Installing the Cranks and Centering Plate (See Figure 5) The optional set-up, sometimes required for 4WD applications where the hub sticks out more than 90 mm (3 1/2") uses the optional deep 3/4/5/6 Centering Bell. The use of the Centering Bell alone increases the clearance available by 35 mm (1-3/8") to a total of 125 mm (4-7/8"). Note that required clearance can be sometimes reduced by removing the hub cap. The additional use of the 10 mm spacers under the legs of the Cranks provides 135 mm (5-5/16") of clearance which is more than enough for almost all 4WD vehicles. By substituting the optionally supplied 104 mm (4-1/16") Cranks, the clearance can be extended to 139 mm or as much as 149 mm (5-13/16") for the rare 4WD applications that may require this. Note that the Centering Bell provides for the use of (6) Cranks for 6 lug hubs so as to better support the lathe when it is further away from the hub. Note also that there is a special optional 7 Lug Centering Bell available for the new Ford trucks. Installation of the Cranks in the Centering Bell and onto the vehicle hub is the same procedure as described above for the Centering Plate.

C. Vibration Dampening. The BRC450 comes with a Vibration Dampener rubber ring. This should be installed onto the largest outside diameter of the rotor. There are many other types of vibration dampener types, including a device using two (2) rubbing blocks. On any rotor some type of vibration dampening device is recommended to avoid excessive high pitched noise or vibration when machining the rotor.

D. Install the Lathe (See Figure 1) First, be sure that the cutting tool holders are pulled back beyond the tool slide. This is accomplished by operating the feed handwheel manually. Then install the lathe onto the Centering Plate or Bell by first inserting the guide pin on the Centering Plate/Bell into the hole in the center of the lathe spindle. By rotating the Centering Plate/Bell, engage and tighten the Centering Plate/Bell's female threads onto the male threads of the lathe spindle until the threads bottom out. Now install the adjustable cane onto the handle nearest the tool slide, and adjust the length so that it touches the floor, supporting the lathe from swinging around the hub axis. Then, loosen the axial adjustment clamping screw and adjust the axial tube in or out as necessary to position the tool slide so that the center of the rotor is nearly exactly in the center of the tool slide. Tighten the axial adjustment clamping screw.

In some cases, during installation, the lathe will need to be rotated to position the tool slide near the section of the rotor where the caliper was mounted. In order to do this, remove the safety pin on the Transport/Setup Lift and loosen the locking handle on the platform tube. Then re-tighten the locking handle when the lathe is in position.

Figure 4 Centering Plate & Crank Attachment

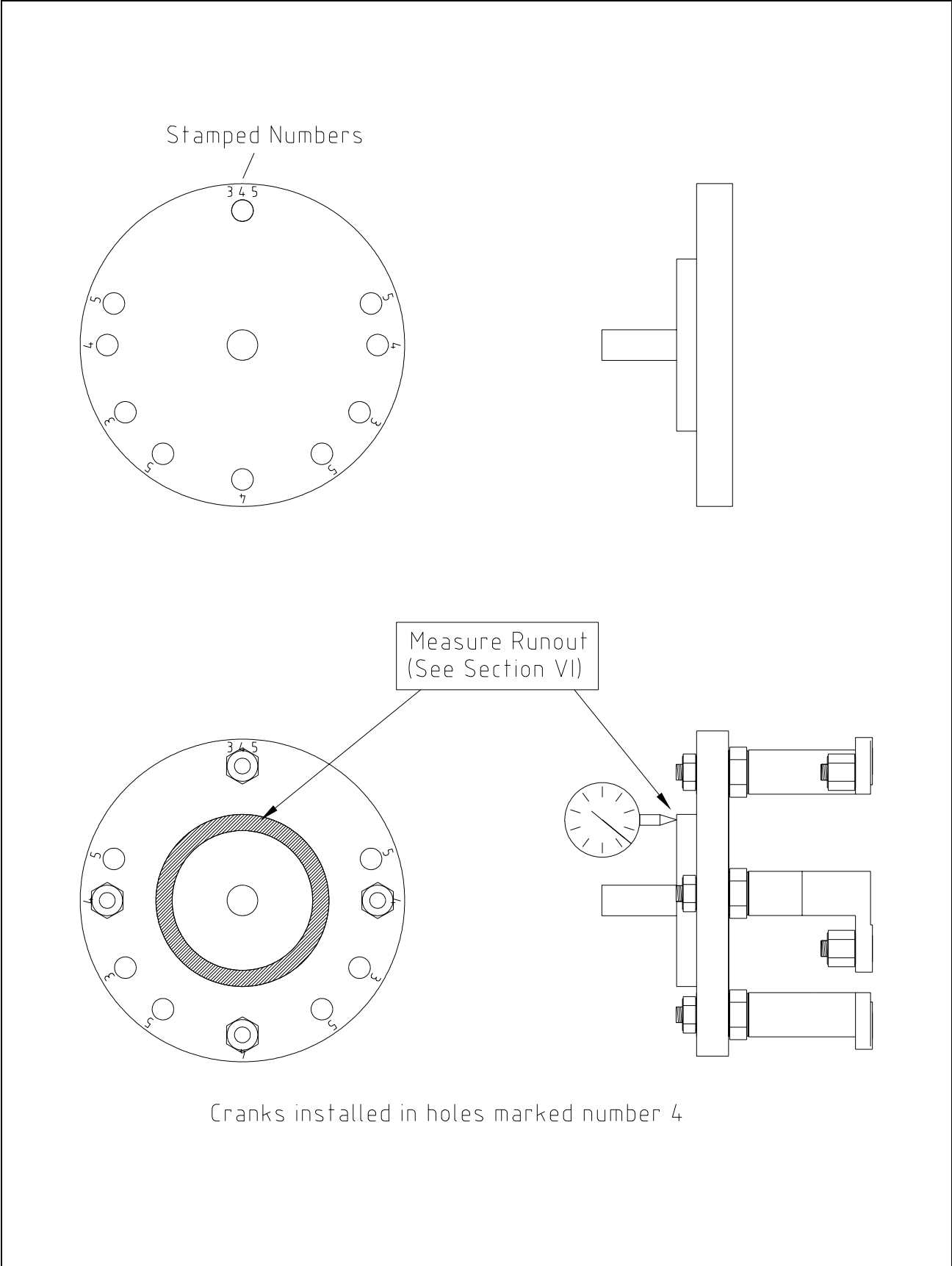
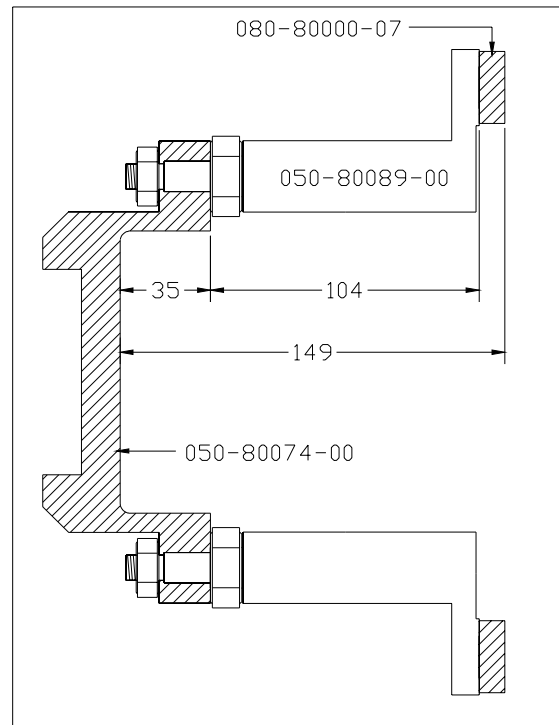
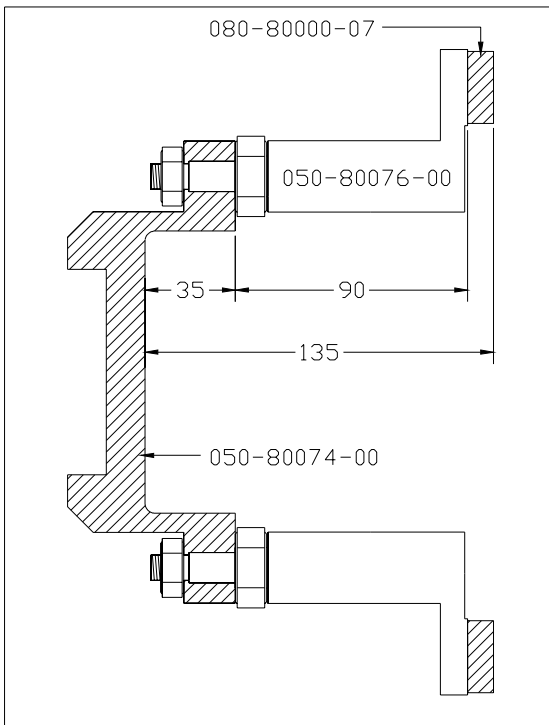
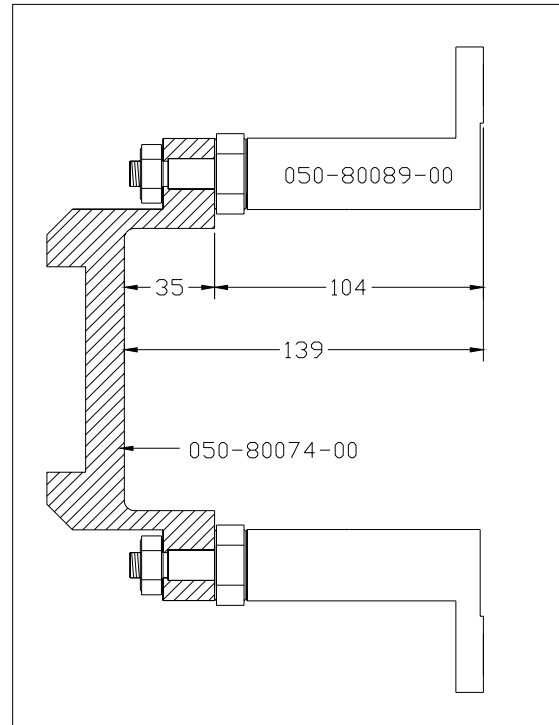
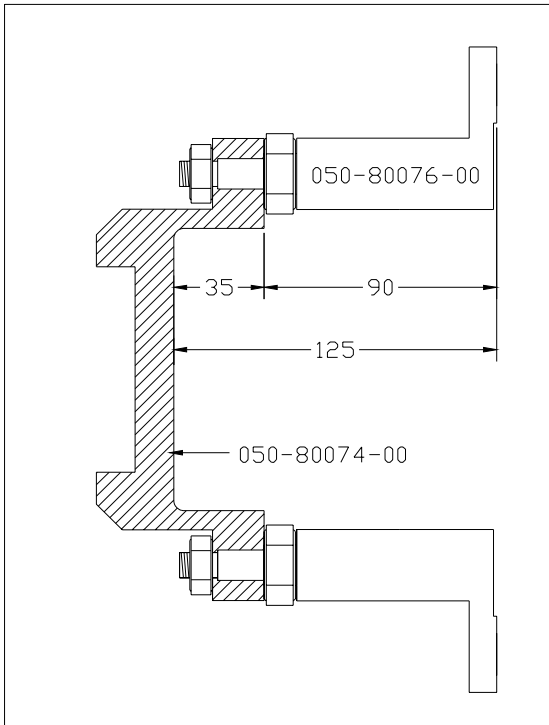


Figure 5 Centering Bell and long leg set ups



NOTE:

At this point, the Transport/Setup Lift can be disconnected and moved out of the way if desired.

E. Set-up for Compensation. (See Figure 6) First, note the scribed marks on the large 27 mm nuts and the body on each crank. Using the supplied 27 mm wrench, tighten each nut until the nut bottoms out against the body of the Crank, then loosen the nut one full turn until the two scribe marks are aligned and there is a small 0.5 mm (0.020") gap between the nut and the Crank body. (The small nuts will need to be again tightened finger tight.) Now tighten the nuts holding the Cranks to the Centering Plate/Bell using the wrench supplied. (Do not over-tighten.) Then install the dial indicator as shown in the figure, clamping the base to a sturdy part of the vehicle hub/spindle/knuckle assembly. The dial indicator stylus must be in contact with the flat non-moveable bottom section of the tool holder assembly.

F. Compensation (See Figure 6) Turn the BRC450 on so that the spindle, hub and rotor are rotating freely. Note the total movement of the dial indicator. Move the dial indicator bezel so that "0" is in the middle of the needle's total movement. (See part "a" of Figure 6) Stop the lathe. Using the on/off switch "jog" the rotation so that the lathe stops at a point near the maximum needle travel in either direction from "0". Note the color of the Crank that is furthest away from the dial indicator in the horizontal position. Push on the lathe near the hand wheel and determine the direction of the dial indicator needle. If the needle moves closer to "0" , when pushing on the lathe, the Crank must be lengthened by loosening the small nut and the large adjustment nut. (See part "b" of Figure 6) If the needle moves further away from "0" when pushing on the lathe, the Crank must be shortened by tightening the large nut and the small nut. (See part "c" of Figure 6). Use the supplied wrenches for adjustment.

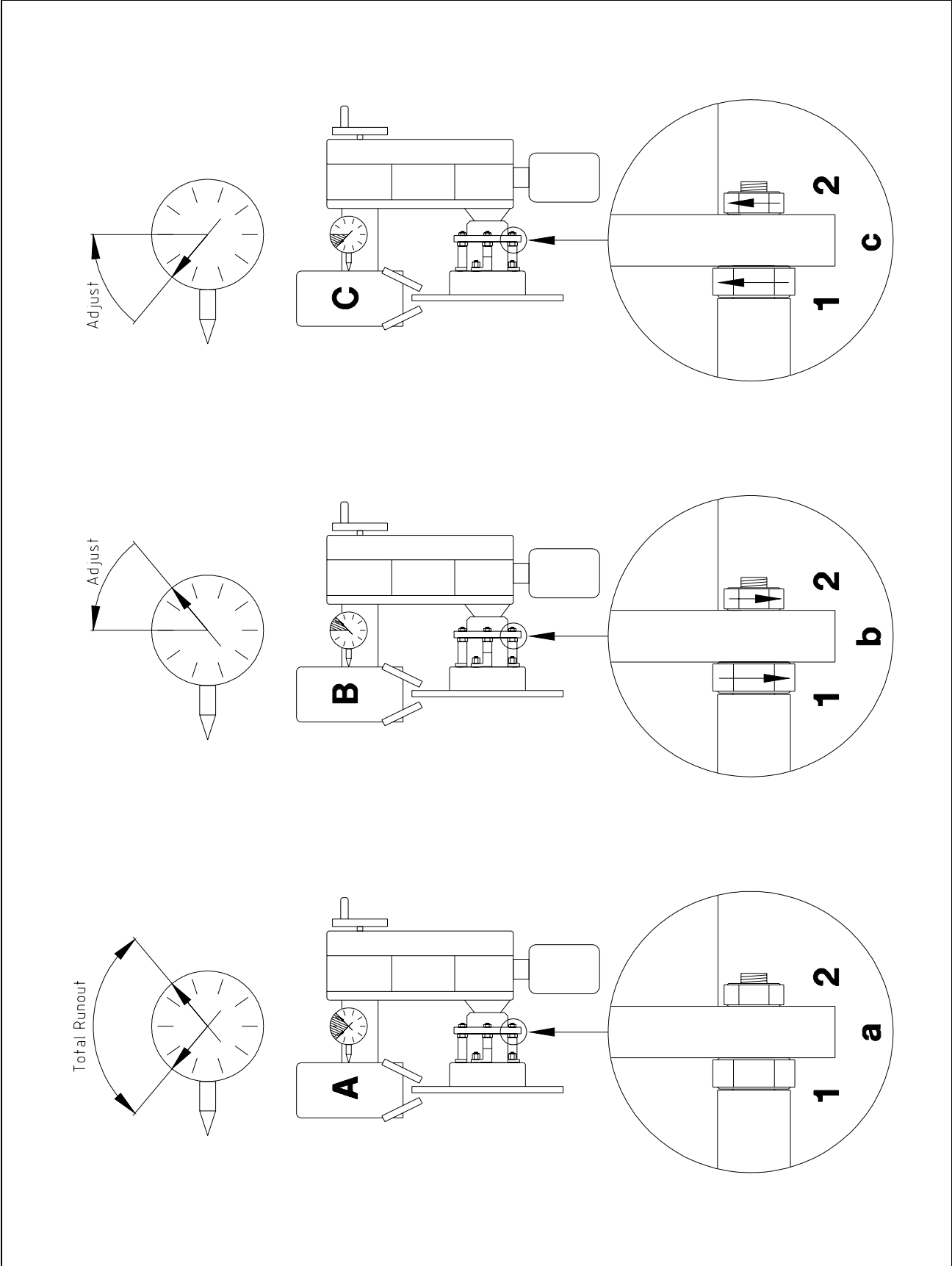
Each time adjustment is made, the goal is to have the adjustment cause the dial indicator to move ½ of the distance closer to "0". Repeat the "jog" rotation and adjustments as necessary so that the total dial indicator movement is no more than 0.004" (0.1 mm). Note the color of each Crank adjusted. If a Crank is lengthened, the opposite Crank(s), one for 4 lugs or two for 3 and 5 lugs, should be shortened approximately the same amount so that the Centering Bell is not deformed. The process is much like the process of adjusting the legs of a table so that the table is level and does not rock.) Note that the total movement is about one-half of the mis-alignment of the lathe spindle axis and the vehicle's hub axis because the dial indicator is positioned twice as far from the center of the hub axis as is the rotor surface. Now turn on the lathe and again read the total movement of the dial indicator. With 0.004" (0.1 mm) total movement of the dial indicator, the resulting run out of the rotor after machining will be one-half of this figure or 0.002" (0.05 mm). This is the maximum recommended. Holding the large nut in place, tighten each of the small nuts firmly and you are about ready to machine the rotor!

For a higher degree of precision, repeat the compensation process, changing the length of the Cranks as necessary so that the total movement of the dial indicator is as close to 0.001" (0.025 mm) as possible or less. With 0.001" (0.025 mm) or less movement of the dial indicator, the resulting rotor run out will be 0.0005" (0.0127 mm) or "near zero".

**ONCE YOU HAVE PERFORMED THIS PROCEDURE SEVERAL TIMES IT WILL BE EASY.
IT IS LIKE RIDING A BICYCLE!**

If there is significant wheel bearing play, precision compensation will be more difficult. If the play can not be removed by adjustment, the play must be measured on the dial indicator and subtracted from the needle movement during adjustment. During the final check with the lathe running, the bearing play can be ignored as the rotor will tend to self center during rotation.

Figure 6 Runout Compensation



G. Setting up for cutting. With the auto feed dis-engaged (See Figure 1) manually turn the wheel, moving the cutting tool slide and the cutting tips to a position almost touching the rotor's largest diameter. Note that there are two locking levers, one on the top of each cutting tool holder along with a graduated adjusting knobs. Move each tool holder so that the cutting tips are very close, but not touching each side of the rotor--then move the tool slide and cutting tips so that they are approximately 1/4" (6 mm) inside the rotor's largest diameter braking surface.

H. Initial surface cut. With the cutting tips approximately 1/4" (6 mm) inside the rotor's largest diameter braking surface, with each tip close but not touching the rotor's surfaces, start the lathe by pushing the green start switch. With the rotor now rotating, unlock the lever and turn the adjusting knob to move the tool holder with the lever loosened until the cutting tip just "kisses" the rotor surface. This can be determined by sound and sight. Lock down the lever and loosen the other tool holder lever, moving the cutting tip with the adjusting knob similarly until the second cutting tip also just "kisses" the other rotor surface. Lock down the lever. Now, manually move the tool slide outward by turning the hand wheel very slowly. This will remove any "ridge" on the outside edge of the rotor. (If the ridge is particularly large, this may require that the cutting tips be moved outward and then inward with several passes. In this case, after removing the ridge, stop the lathe rotation and repeat the initial surface cut set up.)

I. Checking rotor surface. Once the initial surface cut set-up is complete and the ridge is removed, manually move the tool slide inward by turning the hand wheel very slowly. (If the depth of cut increases significantly as the cutting tip moves inward, the rotor is warped or tapered. In this case, stop and move the cutting tool outward to compensate.) When both cuttings tips reach past the smallest diameter of the braking surfaces, stop the manual rotation of the hand wheel. (Note that it is common for one cutting tip to reach this point before the other. As long as one tip does not touch the rotor hat, continue until the manual rotation of the hand wheel until both tools are inside the edge of the braking surfaces on both sides of the rotor. If one tip hits the rotor hat before this is accomplished, it will be necessary to slide that cutting tip's tip holder outward by loosening the two Allen locking screws.)

J. Setting Depth of Cut. Note that the adjusting knob is calibrated with numbered "large" graduations. These long lines denote 0.004" (0.10 mm) of tool holder and tip movement. The shorter lines half way in between therefore denote 0.002" (0.05 mm). At this point, the operator has the choice of a "one pass" or a "multi-pass" technique. In order to perform a "one pass" cut, the operator must estimate the depth of cut that will remove run out, taper, and grooves noted during the rotor surface checked during manual hand wheel rotation, and to determine if that cut will or will not result in the rotor being too thin (Less than manufacturer's discard thickness.) Since this is a complex procedure to estimate the exact depth, without cutting more than is needed and wasting valuable rotor thickness, it is recommended that the a "multi-pass" technique be used. To perform the first pass of a "multi-pass" technique, move each cutting tip inward 0.004" (0.10 mm) or one large graduation by unlocking one lever, rotating the adjusting knob, locking that lever and repeating the procedure for the other tool holder. Now engage the auto feed. The tools will move outward while cutting. Note that the BRC450 can cut much deeper than 0.004" (0.10 mm) on each side. The depth of cut is limited only by the drive motor's torque and the condition of the rotor. It is suggested that the maximum cut on each side be limited to 0.008" (0.20 mm) particularly for the first pass. If this first "rough cut" does not cut the entire surface of the rotor and remove all grooves, then move the tool slide inward manually and repeat the procedure as required. Once there is a rough cut surface over the entire rotor surface and all grooves are removed, now check to see if the rotor is too thin.

K. Finish cut. If another at least another 0.008" (0.20 mm) could be removed without the rotor being thinner than the discard thickness, then up to 0.004" (0.01 mm) can be removed (0.004" = 0.10 mm each side) leaving some material for future wear of the rotor. If so, move the tool slide inward manually and set each tool for a 0.002" (0.05 mm) "finish cut".

L. Cutting the other side. On one side of the vehicle the BRC450 will need to be positioned up-side-down. Otherwise, setup and operation are the same.

VI. Alternate Compensation

There is an alternate method of performing the compensation. This alternate method is somewhat easier but not as precise, so the run out achieved will not be as low. It may be appropriate however if run out of as much as 0.003" (0.075 mm) is deemed to be acceptable. The alternate method is to attach the dial indicator clamp to the knuckle as in the standard technique, but to place the dial indicator stylus on the machined surface of the Centering Plate (See arrows in Figure 4). Adjust the cranks as in the standard technique so that the maximum total movement of the dial indicator needle is less than 0.001" (0.025 mm). Since the position of the stylus from the hub axis in this case is one-half or less of the distance from the hub axis to the rotor surface, the actual run out of the rotor will be twice to three times the reading of the dial indicator (Unlike the standard technique where the actual run out of the rotor is one half of the dial indicator reading). This alternative technique can also be used as a rough set up technique before the lathe is installed, with the standard technique used for checking and/or setting the fine and final adjustment.

VII. Changing Cutting Tips

RTI's Positive Rake Cutting Tips have three corners. There is a top and bottom. The tips will only work when the top is up when viewing the tip holder from the side, with the tip on the top of the tip holder. When viewed from the side, the top is evident based on the fact that the taper should from the top edge to the bottom with the top protruding out the furthest. The cutting tip edge on each corner is worn and should be changed when the surface finish no longer meets requirements or when the corner is chipped or damaged. When one corner is worn, simply loosen the tip, turn it 120 degrees and re-install (See Figure 3). Note that the tip holders are installed on the BRC450 so that they face down, in other words the top of the tip and the tip holder are facing down when installed in the tool holder.

VIII. General Maintenance

There is no suggested maintenance to the BRC450 other than: 1) Keep the entire lathe and especially the slideways clean, removing cutting chips with the cleaning a brush after each use; and 2) Clean and lube the slideways as noted in the Initial Set Up Section at least once per week.

IX. Technical Support

For the life of the BRC450, you are entitled to free over the phone technical support. Please call if you have any questions. Our number is 800-486-2321 or 717-840-0678 (Ext. 259). If we are not immediately available, we will call you back the same day. (8 AM to 5 PM ET) We look forward to speaking to you. We are happy to hear from our customers. Thanks for buying our product!