Parts and Maintenance Manual

Terrco Carver Division

Northstar Carvers

terrco, inc.

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Important Notice

For Your Protection

The Carrier who delivers the merchandise to your door is responsible for loss and damages to the merchandise. The transportation company has accepted this shipment as being in good condition and properly packed when they loaded it.

How to Handle Damages

Visual Damages

1. Have delivery man note on the freight bill the nature and extent of damages or take pictures of the damaged boxes before opening.
2. Notify the transportation company to come and inspect the damaged merchandise.
3. File a claim for damages at once.

Concealed Damages

If damage is noticed when the merchandise is unpacked, report it immediately to the transportation company and ask to have the merchandise inspected.

How to Handle Shortages

1. Within ten (10) days all shortages must be reported.
2. Check the number of cartons delivered with the quantity on your receipt. If quantities do not correlate, have the driver note the shortage, and if the missing items do not appear in a few days, notify us and we will re-ship.

Important

ALL CLAIMS SHOULD BE FILED IMMEDIATELY WITH THE TRANSPORTATION COMPANY MAKING THE DELIVERY. THEN NOTIFY US AND WE WILL MARK OUR RECORDS ACCORDINGLY. IF YOU NEED HELP WITH THE CLAIM, WE ARE WILLING TO HELP.

NOTE: **DO NOT RETURN THE DAMAGED MERCHANDISE TO THE TRANSPORTATION COMPANY. CONTACT US FOR DISPOSITION.**

Important

CALL OR WRITE US FOR A RETURN AUTHORIZATION: All shipments not authorized for return will be refused. All shipments returned for credit or exchange when the error is not ours, will be subject to:

20% restocking charge – and the material must be returned prepaid to:

Terrco, Inc.
222 1st Avenue Northwest
Watertown, South Dakota 57201

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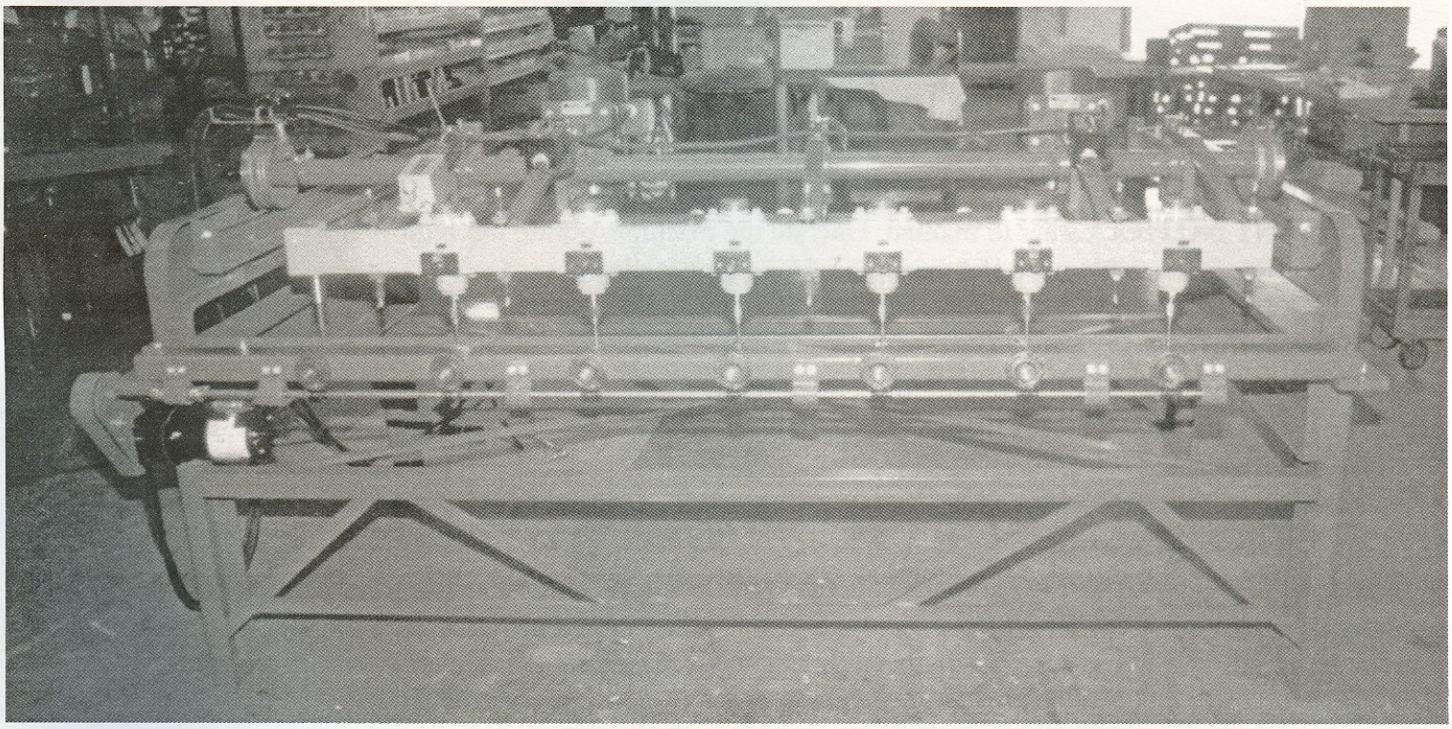


Figure 1: Northstar Carver 10-6 with gear guard removed, electric center turning option

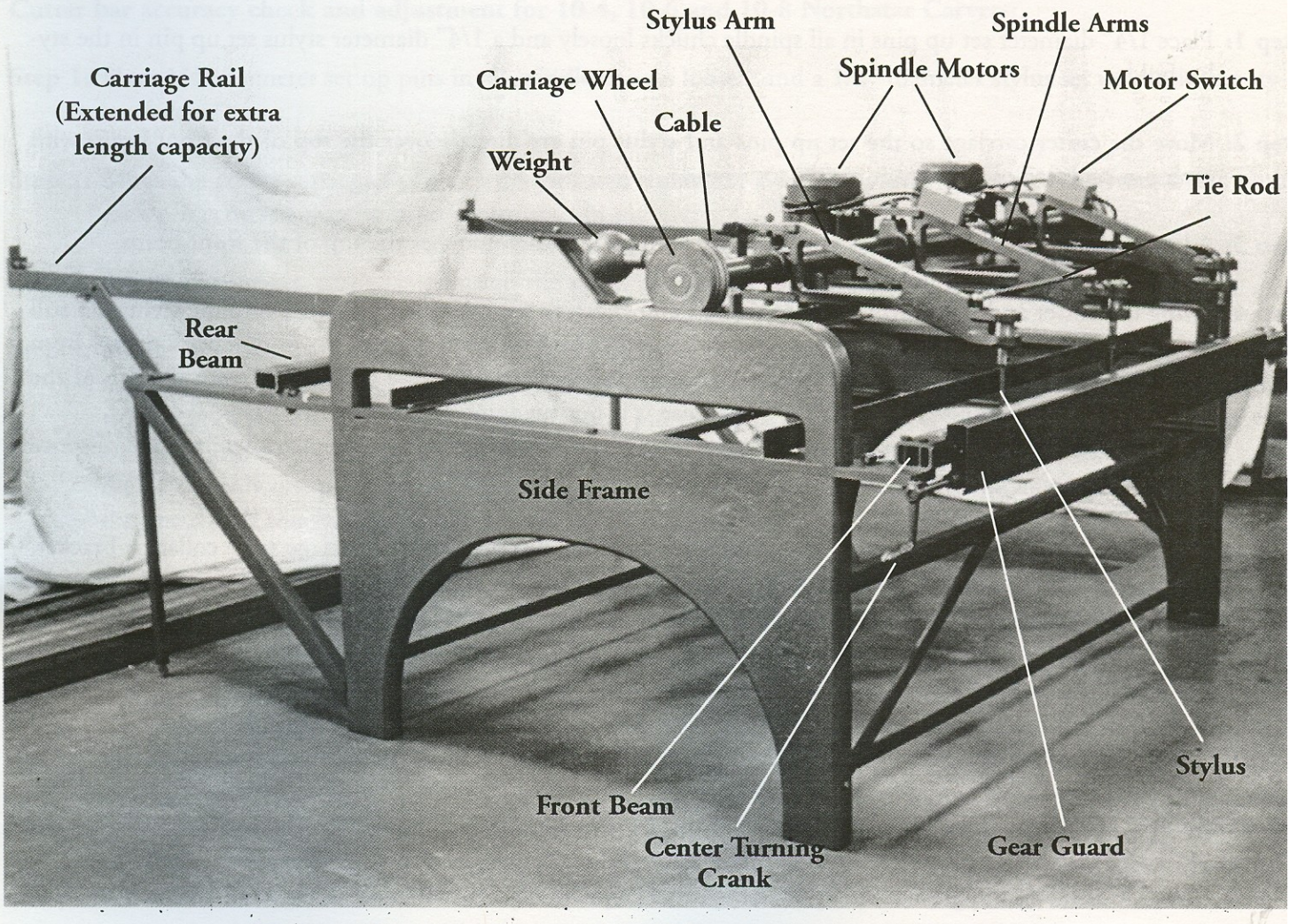


Figure 2: Northstar Carver with 72" length capacity. Model 20-2R.

Section I
Machine Installation & Checkout

UNIT 1: Uncrating

See **IMPORTANT NOTICE** earlier in manual. Uncrate the machine, but do not remove the blocking and ties holding the cutter carriage assembly until the machine is in its proper place.

UNIT 2: Positioning

Position machine on floor where it is going to be used. ***NOTE:*** **BE SURE YOU HAVE ENOUGH ROOM ALL AROUND THE MACHINE FOR OPERATING AND MAINTENANCE. REMOVE CARRIAGE BLOCKING AND TIES.**

UNIT 3: Leveling Machine

Use an accurate level at least 4' long, and level the front and rear beams of the machine using metal shims as necessary under the machine's feet. Leveling pads also work well under each foot. Then level the machine's carriage rails separately by adding shims under feet and after separately level make sure rails are level to each other.

UNIT 4: Checking and Adjusting Spindle Arm or Cutter Bar Accuracy

Spindle arm accuracy and adjustment for Northstar models 10-1, 10-1R, 20-1, 20-1R, 10-2, 10-2R, 20-2, 20-2R, 20-4.

Step 1: Place 1/4" diameter set up pins in all spindle chucks loosely and a 1/4" diameter stylus set up pin in the stylus holder.

Step 2: Move the cutter carriage so the set up pins and stylus pin are directly over the top of the front beam with each pin centered over its front center spur head.

Step 3: Adjust and tighten all set up pins and the stylus pin so that each touches the top of the front beam.

Step 4: Swing the cutter and stylus arms fully to the left and check to see if all the set up pins and the stylus pin still touch the top of the front beam. If they are not farther than .006" (two thicknesses of notebook paper) from the top of the beam, that should be okay. If any pin or the stylus is more than .006" from the top of the beam, its are needs adjustment per step 5, because it is not swinging in a perfectly horizontal plane.
NOTE: If only one pin or the stylus pin touched the beam and all others are approximately equal distance away, the one that is touching is off and should be adjusted per step 5.

Step 5: One of the pivot bearings for the arm involved is fastened movably to the carriage tube collar or bracket. Loosen the 2 bolts that hold this movable plate and tap it slightly to one side then check to see if the problem is better or worse. If worse, tap the plate in the other direction until the pin touches the top of the beam. After the arm has been adjusted to swing properly, tighten the pivot bearing adjustable plate holding screws (see Figure 3).

Step 6: Swing cutter and stylus arms fully to the right and repeat steps 4 and 5 if necessary.

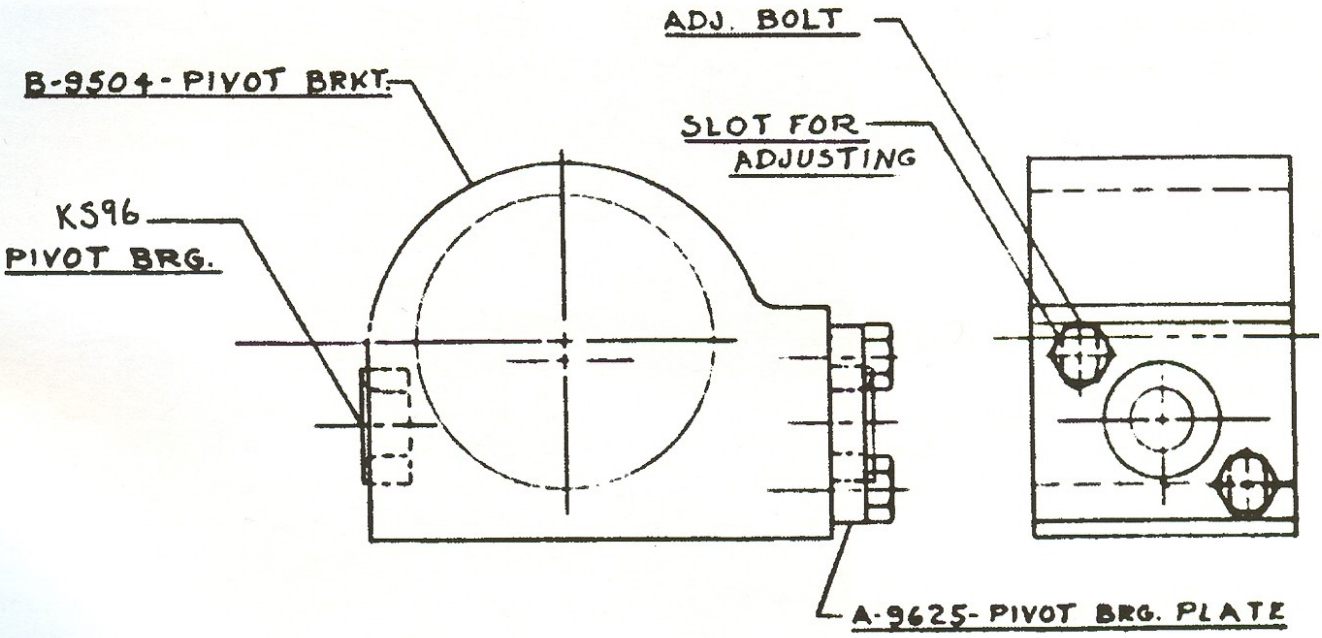


Figure 3: Adjustable Pivot Bearing Plate

Cutter bar accuracy check and adjustment for 10-4, 10-6 and 10-8 Northstar Carvers:

Step 1: Place 1/4" diameter set up pins in all spindle chucks loosely and a 1/4" diameter stylus set up pin in the stylus holder.

Step 2: Move the cutter carriage so the set up pins and stylus pin are directly over the top of the front beam with each pin centered over its front center spur head.

Step 3: Adjust and tighten all set up pins and the stylus pin so that each touches the top of the front beam.

Step 4: Swing the cutter and stylus arms fully to the left and check to see if all the set up pins and the stylus still touch the top of the front beam. If they are not farther than .006" (two thicknesses of notebook paper) from the top of the beam, that should be okay. If any pin or the stylus pin is more than .006" from the top of the beam, its arm needs adjustment per step 5, because it is not swinging in a perfectly horizontal plane.
NOTE: If only one pin or the stylus touched the beam and all others are approximately equal distance away, the one that is touching is off and should be adjusted per step 5.

Step 5: If all the set up pins and the stylus pin are not within a minimum of .006" from the top of the beam when swung fully to the left and to the right, loosen all of the movable pivot bearing plates (See Figure 3), (One plate for each arm) and then hold the set up pins and stylus tightly against the top of the front beam while swinging it again from full right to full left. Be sure that the pins and stylus are in contact with the top of the beam at all times while you are swinging them from right to left. Often this procedure will shift the loose pivot bearing plates into proper position and they can be tightened.

Step 6: If Step 5 doesn't work, loosen the movable pivot bearing plate that is on the end that swings high and tap it towards the low end. Move the bearing plate and keep checking until the set up pins all stay close enough to the beams throughout a full left to right swing. Then tighten all pivot bearing plates.

UNIT 5: Checking and Adjusting Carriage Assembly Accuracy

Lining the cutter carriage assembly up with the front beam:

The cables wrapped around the carriage wheels on all K-Star, Northstar and Master Carvers are there to keep the cutter carriage assembly parallel to the front beam at any position of the carriage. If either of these two cables should get loose or out of adjustment, the cutter carriage would get out of line with the front beam. This lining up procedure is the same for all carving machines that have cables:

Step 1: Insert 1/4" set up pins in all spindles and a 1/4" stylus setup pin in the stylus holder.

Step 2: With decks off the machine, pull the cutter carriage assembly forwards toward the front beam until at least one pin or the stylus pin touches the back edge of the front beam. If all the pins and the stylus are touching or within 1/32" from touching, the alignment is okay. If the stylus or any pin is farther than 1/32" away, proceed to step 3.

Step 3: Loosen the rear cable adjustment bolt on the side of the machine where the set up pin(s) are too far from the front beam.

Step 4: Tighten the front cable adjustment bolt on the same side of the machine until the set up pin(s) touch the front beam.

Step 5: Retighten the rear cable adjustment bolt so the cable is tight and check to see if the set up pins are still up against the front beam. If they are, lock the cable adjustment bolts. If not, readjust the cable per steps 3, 4 and 5.

UNIT 6: Checking and Adjusting Center Turning Gears (Northstar Carvers Only)

Center turning gears and worms should always fit so closely together that almost no rotation play of the spur heads can be felt. If the spur heads have too much rotational play, proceed as follows:

Step 1: Remove the gear guard to expose the mechanism.

Step 2: Locate the worm gear shaft hanger brackets held by two (2) 5/16" bolts. (See Figure 4)

Step 3: Loosen the two (2) 5/16" hanger bracket bolts slightly. While holding and twisting the spur head with one hand, tap the bracket in the direction that pushes the worm closer to the gear with the other hand until you can just barely move the spur head. Retighten the two (2) bracket bolts securely.

NOTE: **DO NOT JAM THE WORMS TOO TIGHTLY AGAINST THE GEARS OR EXCESSIVE WEAR AND TIGHT OPERATION WILL RESULT.**

Step 4: Repeat Step 3 for each spur head that has too much rotational play.

Step 5: Grease all the gears and worms with Lithium-based grease and oil all the shaft bracket bearings with heavy oil or grease them with a grease gun if they have grease fittings.

Step 6: Replace gear covers before starting up machine.

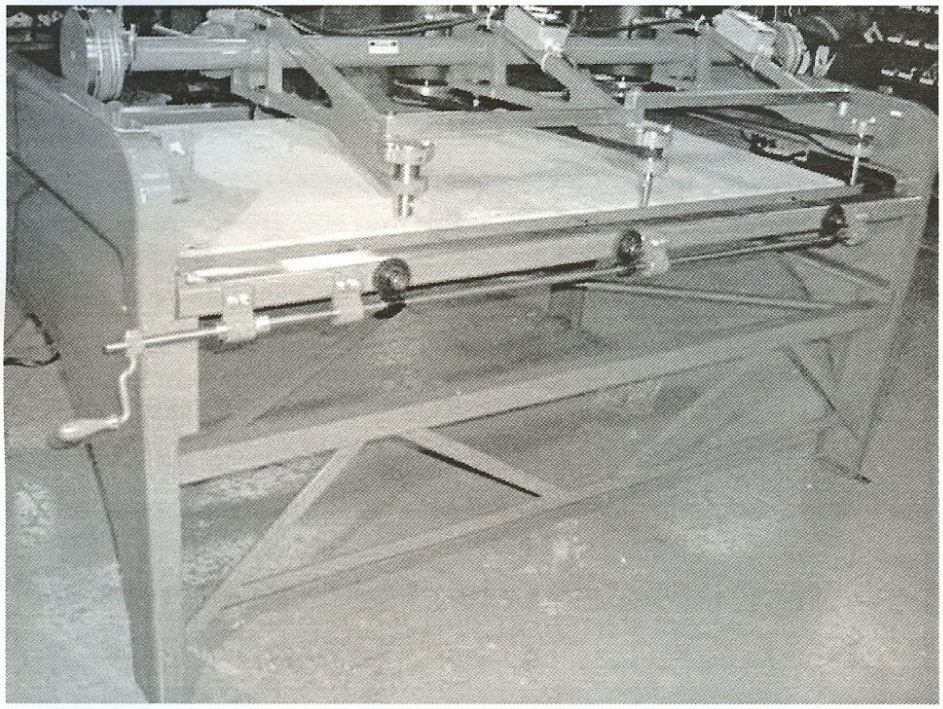


Figure 4: Northstar 20-2 with tables, gear guard off

UNIT 7: Checking and Adjusting Pivot Points

Pivot Point Tightening

Northstar 10-4, 10-6 and 10-8 models have four pivot point bolts and nuts on each carriage arm. Two are screwed into the carriage tube bracket pivot bearings and the other two are screwed into the cutter bar pivot bearings. (See Figure 3 and Figure 5)

If any pivot points come loose, proceed as follows:

Step 1: Check to see if any of the pivot bolt lock nuts are loose.

Step 2: If loose lock nuts are found, tighten their pivot bolts until the looseness disappears and lock the nut. Do not touch the pivot bolts whose lock nuts are tight.

Step 3: If an opposed pair of pivot bolts (one directly above the other on the same arm) have loose lock nuts, tighten each pivot equally until the looseness disappears and then lock the nuts. Also if an opposed pair of pivot bolts have tight lock nuts but the points are loose, loosen both lock nuts and adjust each pivot bolt an equal amount until the looseness disappears then tighten the lock nuts.

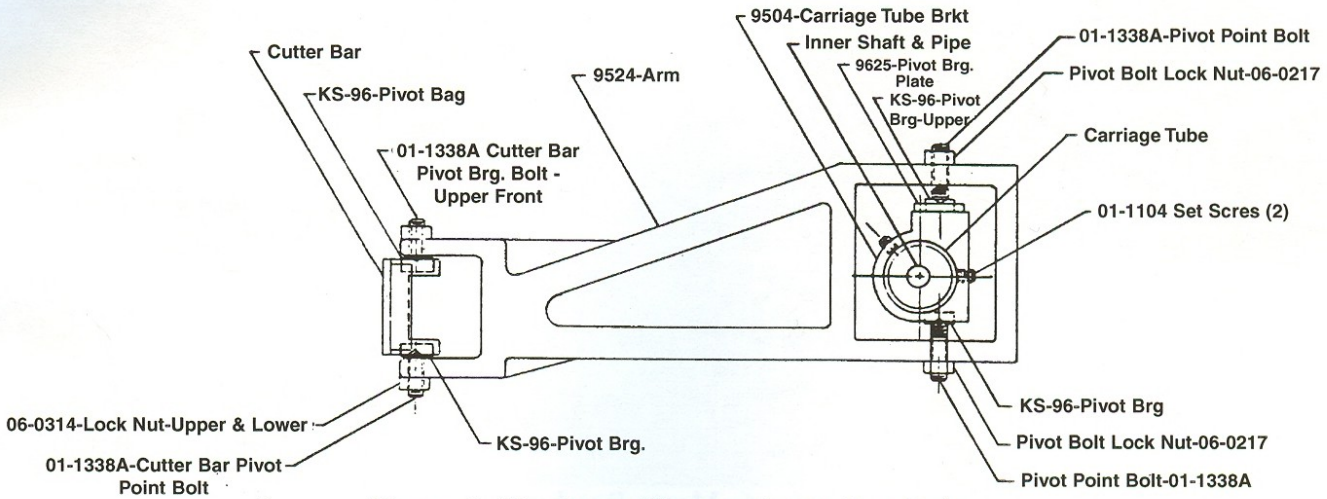


Figure 5: Northstar Pivots - Cutter Bar Style

UNIT 8: Wiring and Motor Rotation Check

Step 1: Be sure you have the proper electrical supply for your machine.

Step 2: Machine with cords and plugs (120V 60 cycle) may simply be plugged into a convenient outlet. All other machines must be wired by a licensed electrician.

Step 3: After the cords have been plugged in or the machine has been wired, check to see that each spindle of a multiple spindle machine is rotating in the proper direction.

NOTE: **SPINDLES MARKED "L" MUST HAVE LEFT HAND ROTATION, AND SPINDLES MARKED "R" MUST HAVE RIGHT HAND ROTATION. ALWAYS CHECK FOR MOTOR ROTATION WITHOUT HAVING CUTTERS IN THE CHUCKS!**

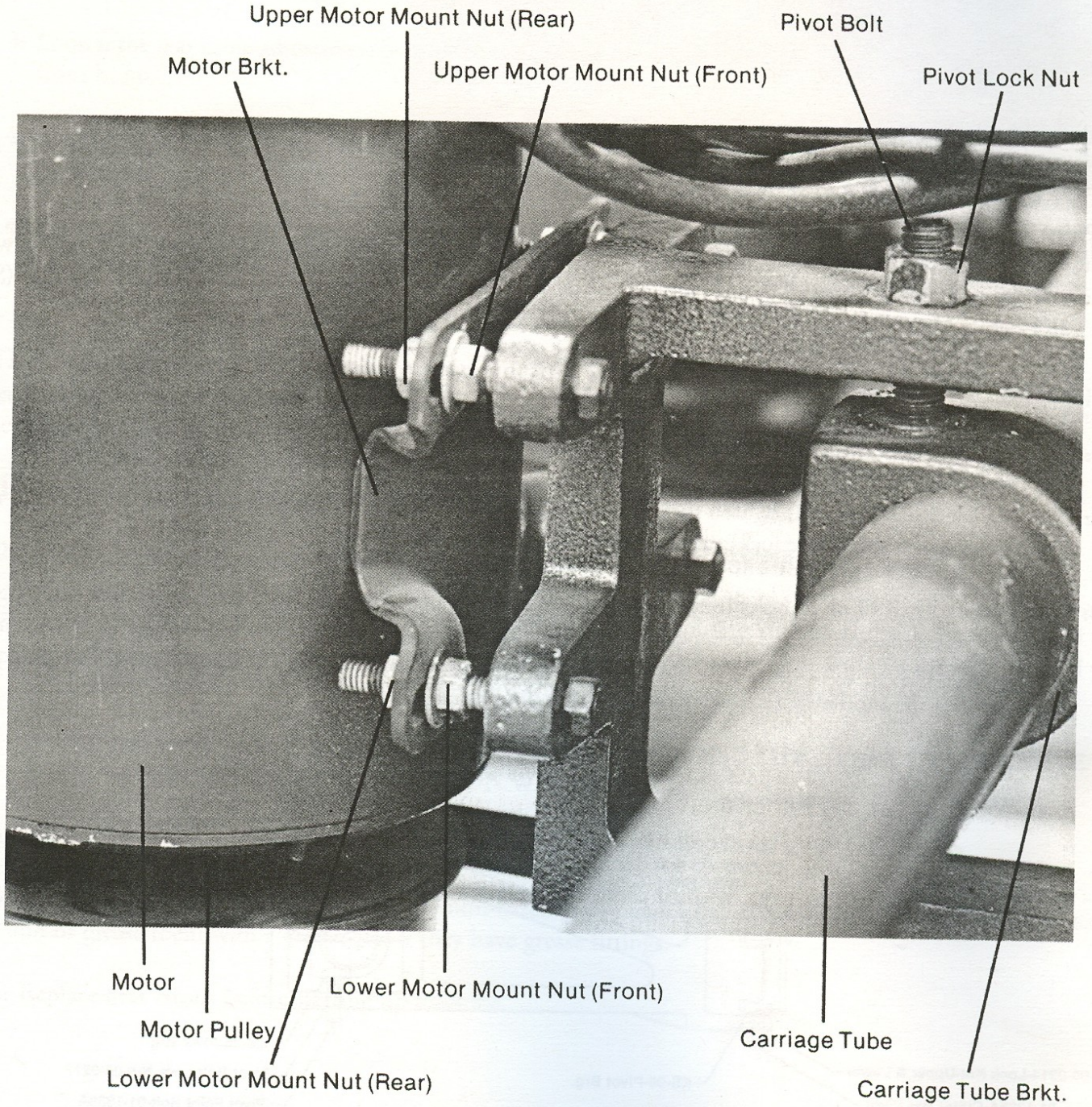


Figure 6: Motor Bracket

UNIT 9: Checking and Adjusting Belt Tightness

Belt tightness and tracking was set up and tested at the factory. If the machine was not damaged in shipment, the belt tightness and tracking should be okay.

With no cutters in the spindles and with the motor(s) not running, check each belt for tightness. When properly adjusted, the belt should turn the motor without slipping when its spindle is turned by hand. If the belt slips, tighten it as follows:

Step 1: Loosen all four outside nuts on the motor bracket one turn. Tighten the four inside nuts so they move the motor bracket and motor rearward, thus tightening the belt.

Step 2: Check the belt for tightness and if it is still too loose, repeat step 1.

UNIT 10: Run-In Testing

If you have a 10-4, 10-6 or 10-8 machine, check to insure that all chuck lock knobs are pulled back and all spindles can rotate freely. (Figure 7)

Before installing cutters and stylus, start the machine's motors and check to see that all belts are tracking properly on the spindle pulleys and on the motor pulleys. The belts should run so they are roughly centered on all pulleys. The belts should run so they are not rubbing on any pulley flanges. If any belt if not tracking properly, see Unit 20 for adjustment instructions.

If the belts are tracking properly, let the motors continue running and listen for any noise other than a soft hum. If any spindle squeals or rattles or its housing gets too hot to hold your finger on without discomfort or if any motor gets hot and stops, shut off the machine and check for motor or bearing problems.

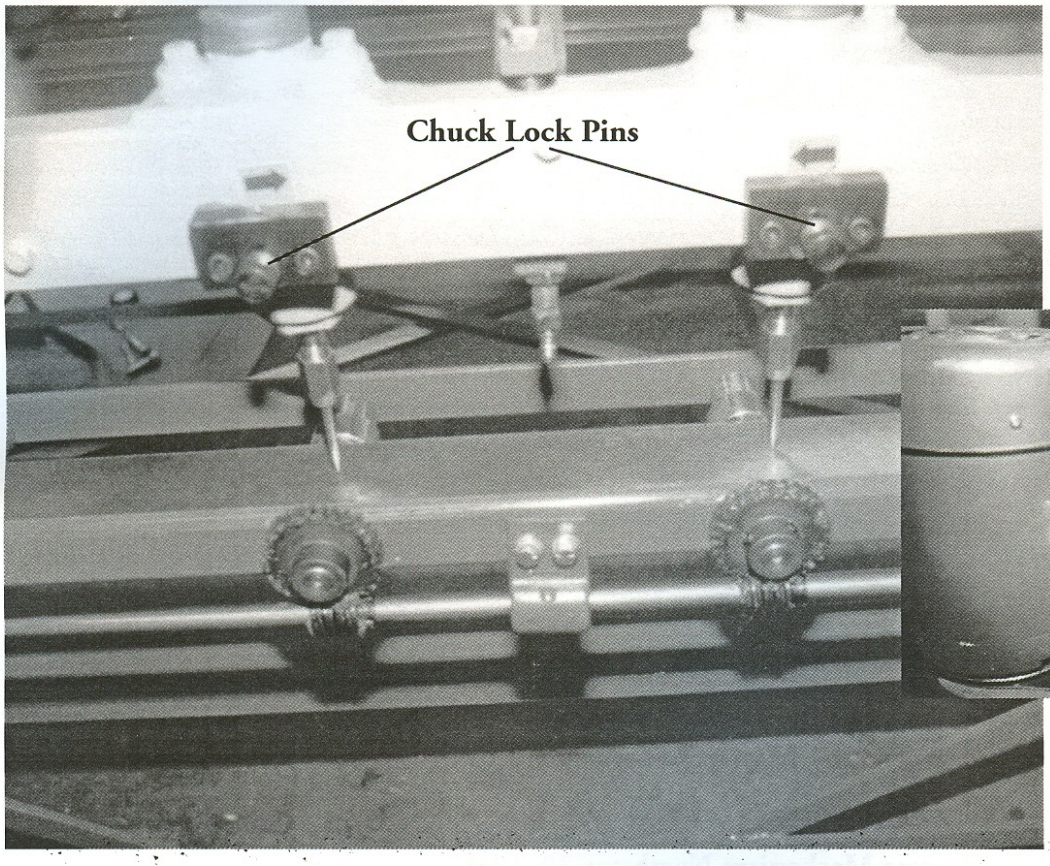


Figure 7

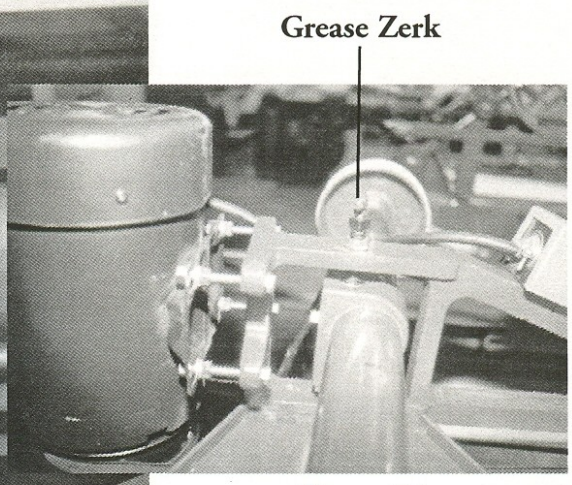


Figure 7A

Section II
Reverse Carving Machines

UNIT 11: General Information

A Northstar "Reverse" type carver is one that can make a left hand copy of a right hand pattern. A two spindle "Reverse" carver can simultaneously make left and right hand copies of either a left or right hand pattern. For example, if one has a flat pattern of a face with the nose pointing to the left, a "Reverse" carver can make a copy of the pattern with the nose pointing to the right.

Reverse type carvers can be used as conventional "straight" carvers or can be set up to make reverse carvings.

1. Reverse Mechanism Sectors
2. Cables
3. Cable Adj. Bolt & Nut
4. Tie Rod
5. Tie rod removed for reverse carving
6. Arms travel in opposite directions when Carver is set up for reverse carving

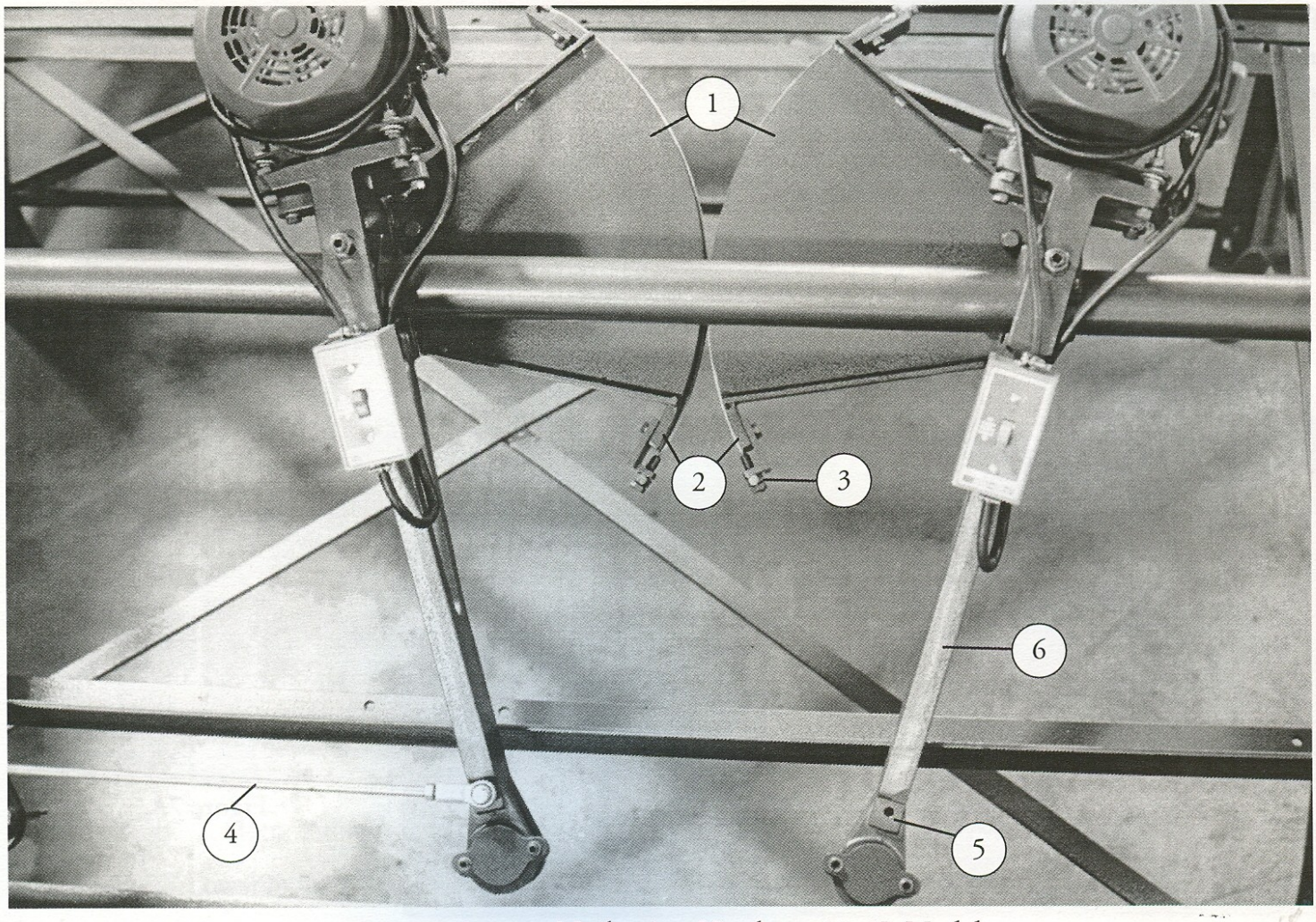


Figure 8: Reverse Mechanism Northstar 20-2R Model

UNIT 12: Changing Machine From Straight to Reverse Carving

If your carver is equipped with reverse carving capability, follow this procedure for change-over from straight to reverse carving:

Step 1: Attach the two short cables on the reversing sectors (See Figure 8). Proper cable hook up is Right Front to Left Rear, and Left Front to Right Rear.

Step 2: Place 1/4" setup pins in each spindle and 1/4" stylus setup pin in the follower holder.

Step 3: Place the setup pins and stylus setup pin on the front beam directly above the center of each spur head.

Step 4: Tighten the two cables only enough to take up all slack and apply a slight tension.

Step 5: Remove the tie rod holding the spindle arms in the straight carving mode. This will allow the arms to move opposite of each other.

Step 6: Place the 1/4" stylus setup pin up against the right hand side of its spur head. The setup pin of the spindle arm attached to the follower arm by the remaining tie rod should also be resting up against the right hand side of its spur head. The pin of the other spindle arm should be up against the left hand side of its spur head. If not, adjust the reverse section cables until it does. Be careful not to over tighten the cable as it could cause distortion of the reversing sections.

To complete the transition, the worm and worm gear must be changed.

Step 1: Remove the gear guard to expose the right worms and gears. (See Figure 2)

Step 2: Loosen the set screws on the hub of the right side worm gear (See Figure 7).

Step 3: Push the shaft back through the gear which will allow it to be lifted out. Be careful not to lose the washer located below the shaft. Leave set screws loose for now.

Step 4: The double worm should now be loosened and slid over so the left hand thread portion is approximately centered below the shaft. Leave set screws loose for now.

Step 5: Place the left hand worm gear into position with the washer behind it. Push the shaft back through the gear and tighten the set screws.

Step 6: Accurately position the worm centered below the worm gear and tighten its set screws.

Step 7: Check worm and worm gear for excessive back-lash. If worm gears can be moved more than 1/64" left and right, the closest hanger bracket should be adjusted.

Step 8: Replace the gear guard and the machine is now ready to do reverse carving.

UNIT 13: Reverse to Straight Carving

Reverse to straight carving is accomplished by removing the two reverse section cables, replacing the tie rod between the spindle arms, and changing the worm and worm gear back to the right hand parts by following the same procedures as for the straight to reverse carving section.

UNIT 14: Set Up and Operation of Reverse Carving Machine

The set up and operation of a Reverse Carving machine is the same as that for a straight machine, **except,** that each work blank must be facing in the direction it is to be carved (either the same way as the pattern of the opposite way).

Section III
Carving Machine Maintenance and Trouble Shooting

Proper and regular maintenance is necessary if carving machines are to be kept in their best working condition. First of all, carving machines produce a great deal of chips and dust, and although most of the machine parts are covered, it is possible for dust to get inside the machine. In order to avoid any trouble with the dust, it is best to have some form of dust and chip removal. Removal of dust and chips will not only help to keep the machine in working order, but will also prevent any work hazard that may be caused by having dust and chips on the floor.

The best equipment for removing dust and chips is some type of vacuum cleaner or vacuum system. Conventional dry type shop vacuum cleaners are suitable for periodically cleaning the K-Star and Northstar carvers, but larger commercial vacuum systems should be used for the Master Carver.

TERRCO carving machines are designed and built for long life with a minimum of maintenance and repair. Sealed bearings are used whenever practical and all structural parts are designed for a lifetime of use. We know of numerous St. Paul Machinery Company carving machines (now TERRCO carvers) that are still in daily use after 60 or more years. On the other hand, these machines would not have lasted so long if they had not received the minimum amount of daily care and maintenance that they require. (Carriage wheels and rails are damaged because dust was left on the rails over a long period of time. Pivot bearings are ruined because they were not greased at least once every three months.

Because we know that maintenance costs money and humans forget, we have applied improvements in materials and components into the design and construction of the TERRCO carvers now being built. All these improvements are built into TERRCO carvers to increase their life, improve performance and reduce maintenance. All new TERRCO carving machines built after 1978 have been redesigned and improved so that all daily, weekly, and monthly maintenance other than cleaning has been eliminated. Sealed bearings are used throughout the machines and all gears, worms, chains, and shafts are designed and protected so that only a three (3) month cleaning and greasing is required.

UNIT 15: Regular Maintenance Instructions

1: Cleaning

Clean your carving machine daily, preferable with a suitable vacuum pick up system. Be especially careful to clean the tops of the carriage rails. Do not allow any dust and chips to pack on top of the rails because bumpy operation will result. Also, the carriage will not roll back and forth easily. For the same reason, clean the carriage wheels to be sure that no dust or dirt has packed on their rolling surfaces.

2: Lubrication

Spindle Lubrication - All Northstar carving machines prior to 1979 require spindle oiling after every 4 hours of operation. If your carving machine has oiling cups on the spindles, put 3 to 4 drops of very light machine oil (similar to sewing machine oil) in each cup after 4 hours of operation. All model 10-4, 10-6 and 10-8 Northstar carvers built after 1978 have sealed bearings and do not need greasing.

NOTE: **IF OIL RUNS RIGHT THROUGH ANY SPINDLE BEARING, OR THE BEARINGS ARE LOOSE OR NOISY THEY SHOULD BE REPLACED.** (See Unit 24 for instructions on bearing replacement)

Center Turning Gears - (Figure 1, 4 and 7) The center turning gears, worms, and shaft bearings on all Northstar carvers are covered with guards for safety and cleanliness. Approximately every three (3) months, or sooner if any tight operation is detected, these guards should be removed and greased with a good grade of Lithium-based grease. Use a grease gun if your machine has grease fittings; otherwise, brush grease on the gears with a suitable small brush. After cleaning and greasing all center turning mechanisms, **BE SURE TO REPLACE ALL GEAR GUARDS AND COVERS BEFORE STARTING THE MACHINE.**

Pivot Bearings - You should grease them about once a month. All pivot bolts should be kept snug so that the arms do not rattle and the upper pivot seats should be kept free of chips and dust. (Figure 7A)

Motors - All but the very oldest carving machine motors have sealed bearings and do not require oiling. If your carving machine's motors have oiling cups or oil holes, you should give them a few drops of fine oil after every 4 hours of use or per instructions on the motor plate.

UNIT 16: Spindle Belt Maintenance

Spindle belts should be observed when running to be sure they are tracking properly. The belts should be roughly centered between the motor pulley flanges when running and they should also be centered on the spindle pulleys when running. Frayed or worn belts should be replaced when they fail to track properly or fail to drive the spindles adequately.

UNIT 17: Belt Replacement On All Northstar Models except 10-4, 10-6 and 10-8

To remove belt, first loosen front lower and upper motor mount nuts (Figure 6) until the belt is slightly loose. Rotate motor pulley by hand and force belt off. Install new belt and tighten nuts until belt is tight.

UNIT 18: Belt Replacement for Northstar Models 10-4, 10-6 and 10-8

(Old Style with Spanner Nut 9017 and Saw Cut) Refer to Figure 9.

Step 1: With belt now loose by procedure from Unit 17 above, remove spanner nut (A9017) from spindle assembly large pulley (B9131) using spanner wrench supplied with machine.

Step 2: Replace spanner nut with bearing puller (A9176).

Step 3: Remove 3/8-16 socket head cap screws that hold down top bearing cup (B9032).

Step 4: Tighten 3/8-16 square head set screw in bearing puller until bearing is out of spindle shaft.

Step 5: Now belt can be slipped through saw cuts and around spindle pulleys.

Step 6: Make sure belt is behind spindle assembly small pulley (B9027) as shown.

Step 7: Remove bearing puller from top bearing cup.

Step 8: Replace top bearing cup and 3/8-16 socket cap screws.

Step 9: Put bearing on spindle shaft and replace spanner nut (A9017).

Step 10: Check spindle for free rotation.

Step 11: Slip belt over motor pulley and re-tighten lower and upper motor mount nuts (front) until belt is tight.

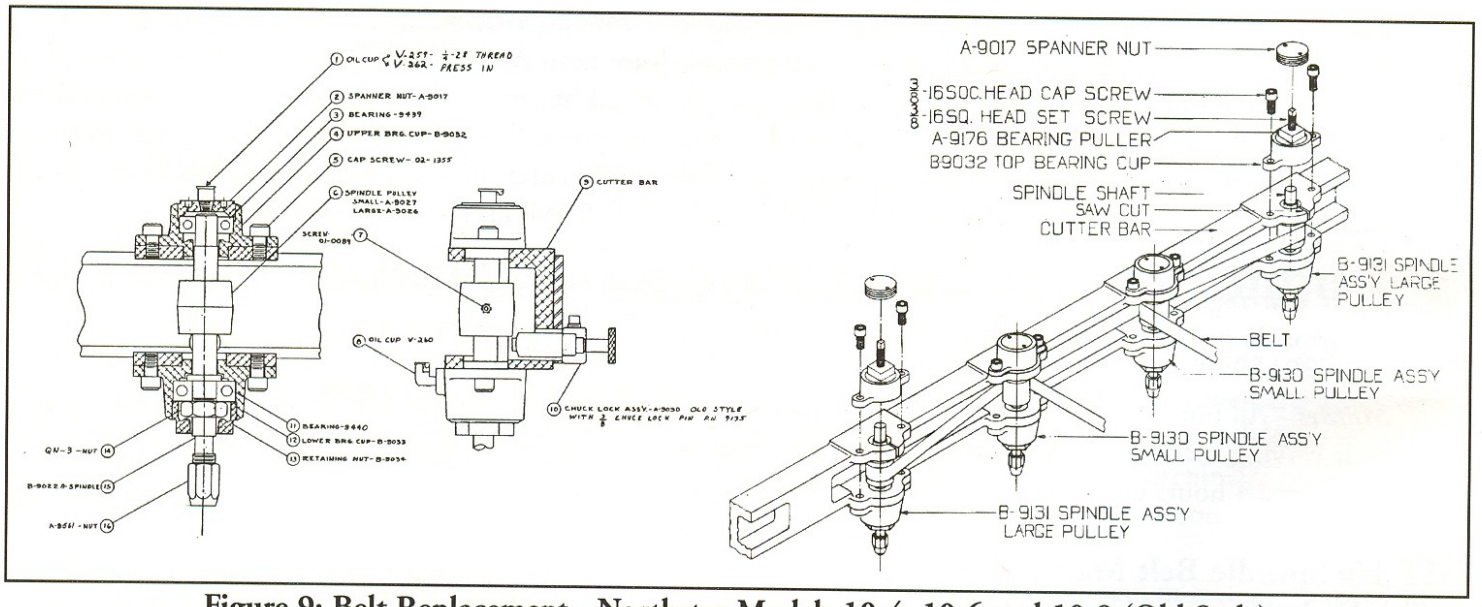


Figure 9: Belt Replacement - Northstar Models 10-4, 10-6 and 10-8 (Old Style)

UNIT 19: Belt Replacement for Northstar Models 10-4, 10-6 and 10-8

(New Style with Floating Upper Bearing, Sealed Bearing and No Saw Cut in the Cutter Bar)

Step 1: To loosen belt, first loosen front lower and upper motor mount nuts (Figure 6) until the belt is slightly loose. Rotate pulley by hand and force belt off.

Step 2: Remove two 3/8-16 bolts from the top bearing cups and remove bearings as an assembly from the two large pulley assemblies.

Step 3: Force the belt from around motor drive pulley so the belt hangs loosely around the spindle pulleys.

Step 4: Loosen the set screw holding the large spindle pulleys so they slide freely on the spindle.

Step 5: Remove the large aluminum hex nut from the two lower bearing cups.

Step 6: Gently tap the top end of the spindle with a soft faced hammer thus allowing the spindle and lower bearing assembly to slip out of the lower bearing cup.

Step 7: Loosen the two 3/8-16 bolts from the lower bearing cups and remove them.

Step 8: Remove the old belt and replace with the new one, making sure belt is behind the two small pulley spindle assemblies.

Step 9: Reinstall spindle and lower bearing assembly into lower bearing cup. Replace large aluminum hex nut and tighten securely. Check that spindle turns freely.

Step 10: Spindle and lower bearing cup assembly may now be reinstalled being sure to pass end of spindle through the large spindle pulleys and through drive belts. Replace two 3/8-16 bolts and tighten.

Step 11: Reinstall upper bearing cap assembly over end of spindle. Replace two 3/8-16 bolts and tighten.

Step 12: Reposition the large spindle pulleys and tighten set screw.

Step 13: Check for free spindle rotation.

Step 14: Reposition drive belt around small and large spindle pulley and then slip drive belt around motor pulley and re-tighten front lower and upper motor mount nuts until belt is tight.

UNIT 20: Belt Tracking Adjustment For All Northstar Models

If belt will not track near the center of the spindle pulley after installation, proceed as follows:

Step 1: Locate the lower motor mount bolts and loosen the nuts nearest the motor housing (See Figure 6).

Step 2: If the belt tracks low on the spindle pulley, turn the nuts on the front side of the motor mount plate so the plate is moved rearward. ***NOTE:*** **A VERY SLIGHT MOVEMENT ON THE NUT IS ALL THAT IS NORMALLY NEEDED TO MAKE THE BELT SHIFT UPWARDS ON THE SPINDLE PULLEY. While turning the nuts, slowly rotate the motor pulley by hand to observe how the belt tracks on the spindle pulley.**

Step 3: If the belt tracks high on the spindle pulley, move the same nut in the opposite direction, thus allowing the motor plate to move forward slightly.

Step 4: After adjustment is complete and the belt is running true, draw up the other nuts and tighten securely. Recheck tracking.

Step 5: Check the belt for tightness by turning one of the EMPTY cutter spindles by hand to see if the belt is tight enough to drive the motor pulley and the other spindles on that belt. If the belt is too loose, it will slip on the cutter spindle pulley rather than turn the motor pulley.

Step 6: If the belt is too loose, move the whole motor mount plate backward so the belt will tighten. To do this, adjust the motor mount plate nuts (one at a time) by loosening the rear nut exactly one-half (1/2) turn and drawing up the front nut tight against the plate. After adjusting all 4 corners, check the belt for tightness again. If still too loose, repeat the procedure.

Step 7: After the motor mount plate nuts are all tight, start the motor and listen for any unusual spindle bearing noise. If the belt is too tight, it will usually make the spindle bearings noisy. To loosen the belt, adjust the motor mount plate nuts, just the reverse of Step 4 above (loosen the front nuts and tighten the back nuts).

UNIT 21: Sharp Cutters

The one most important item affecting carving machine maintenance is sharp cutters. Dull cutters cause sluggish operation, machine vibration and wear, and unnecessary extra effort by the machine operator. One should never install dull cutters in his carving machine and he should not continue running it after the cutters become dull.

UNIT 22: Checks While Running

1: ***Listen***

After all setting up checks have been passed, your machine can be started and you can begin to carve. As you operate the machine, you should always listen for any unusual noises such as squeaks, squeals or rattles that might indicate a bad bearing or lack of oil at some point, etc.

2: ***Look***

You also should look to see that all spindle belts are tracking properly and to see that no cutters are smoking. While carving, occasionally look to see that all cutters are cutting properly and doing equal amounts of work on each work blank.

3: ***Feel***

While operating your carving machine, always feel for any unusually jerky, bumpy or unusually difficult operation. Dirty carriage rails or lack of oil or grease can cause such operating problems.

UNIT 23: Back Beam Adjustment

The back beam on Northstar carvers are clamped to the side frames of the machine. To change the position of the back beams in relation to the front beams, just loosen the back beam clamps and slide the beam forward or backward as desired. Before tightening the clamps, be sure that the back beam is parallel to the front beam and then tighten the clamps. With the back beam cup centers fully retracted, the back beam should be set approximately 1" farther from the front spur head than the maximum length of the work blanks you plan to use.

UNIT 24: Spindle and Spindle Bearing Maintenance and Replacement

Removing spindles and spindle bearings - Northstar 10-1, 10-2, 10-1R, 20-2R, 20-1, 20-1R, 20-2, 20-2R and 20-4 (See Figure 10)

Bearing and Spindle replacement - Northstar 10-4, 10-6 and 10-8 (See Figure 9)

Step 1: Remove belt by loosening front lower and upper motor mount nuts (Figure 6) until the belt is loose. Rotate motor pulley by hand and force belt off.

Step 2: Remove two 3/8-16 bolts from the top bearing cup and remove cup bearing as an assembly.

Step 3: Loosen the set screw holding the large or small spindle pulley to the spindle.

Step 4: Remove the large aluminum hex nut from the lower bearing cup.

Step 5: Gently tap the top end of the spindle with a soft face hammer, thus allowing the spindle and the lower bearing assembly to slip out of the lower bearing cup.

Step 6: Remove the two 3/8-16 bolts from the lower bearing cup and remove it.

Step 7: Press out damaged bearing from upper bearing cup and replace with new one.

Step 8: Remove hex nut from spindle just below lower bearing. The lower bearing may now be pressed from the spindle and replaced with a new bearing. After replacing bearing, reinstall the hex nut and tighten securely. Please note new style spindle needs no lower bearing hex nut. Simply press bearing off and new one on.

Step 9: Reinstall spindle and lower bearing assembly into lower bearing cup. Replace large aluminum hex nut and tighten securely. Check that spindle turns freely.

Step 10: Spindle and lower bearing cup assembly may now be reinstalled being sure to pass end of spindle through the spindle pulley. Replace two 3/8-16 bolts and tighten.

Step 11: Reinstall upper bearing cup assembly over end of spindle. Replace two 3/8-16 bolts and tighten.

Step 12: Reposition the spindle pulley and tighten set screw.

Step 13: Check for free spindle rotation.

Step 14: Slip drive belt around motor pulley and re-tighten lower and upper motor mount nuts until belt is tight.

UNIT 25: Carriage Height Adjustment For Northstar Carvers

The Northstar carriage assembly rides on rails that may be raised to provide more carriage and cutter clearance over large carvings. To raise the carriage rails, proceed as follows:

Step 1: Move the carriage assembly all the way back on the rails and block the wheels securely so they cannot roll forward.

Step 2: Remove the front bolt from one carriage rail, raise the rail so the bolt can be reinstalled in the higher hold and reinstall the bolt in the higher hold.

Step 3: Repeat Step 2 on the other carriage rail.

Step 4: Unblock the carriage wheels and pull the whole carriage assembly fully forward and carefully reblock the wheels so the carriage cannot roll backward.

Step 5: Remove the back bolt from one carriage rail, raise the rail so the bolt can be reinstalled in the higher hole and reinstall the bolt in the higher hole.

Step 6: Repeat Step 5 on the other carriage rail.

Step 7: Check the rails with a level to see that they are level. If not, loosen the rail bolts slightly and tap the rails up or down to get them exactly level. Tighten all bolts securely.

Step 8: Unblock the carriage wheels and the machine is ready to use again.

NOTE: **For extra high work, carriage rail height extension bars can be purchased from TERRCO Carver Division.**

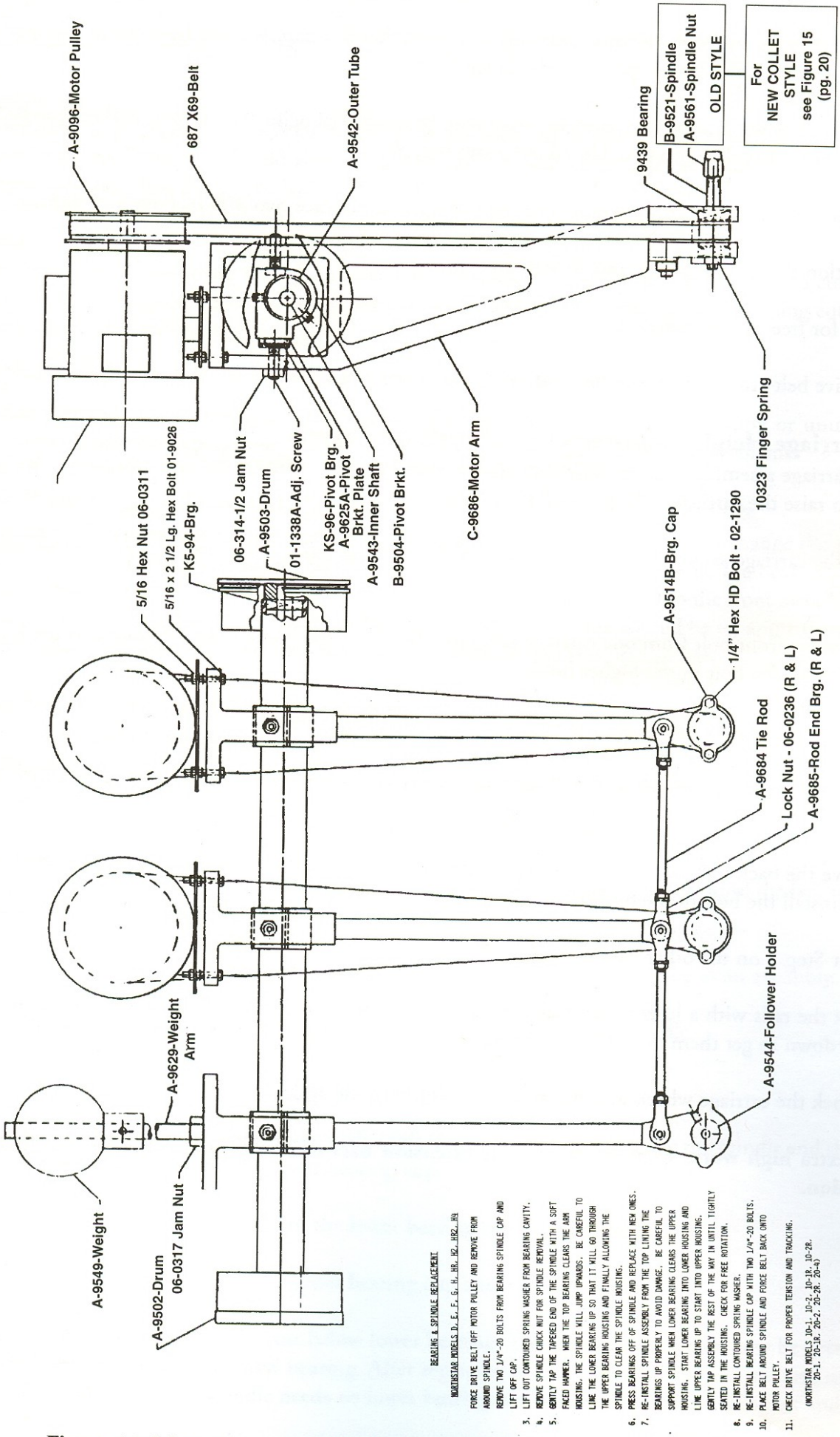


Figure 10: Motor Arm and Spindle Assembly Northstar (non-cutter bar style)

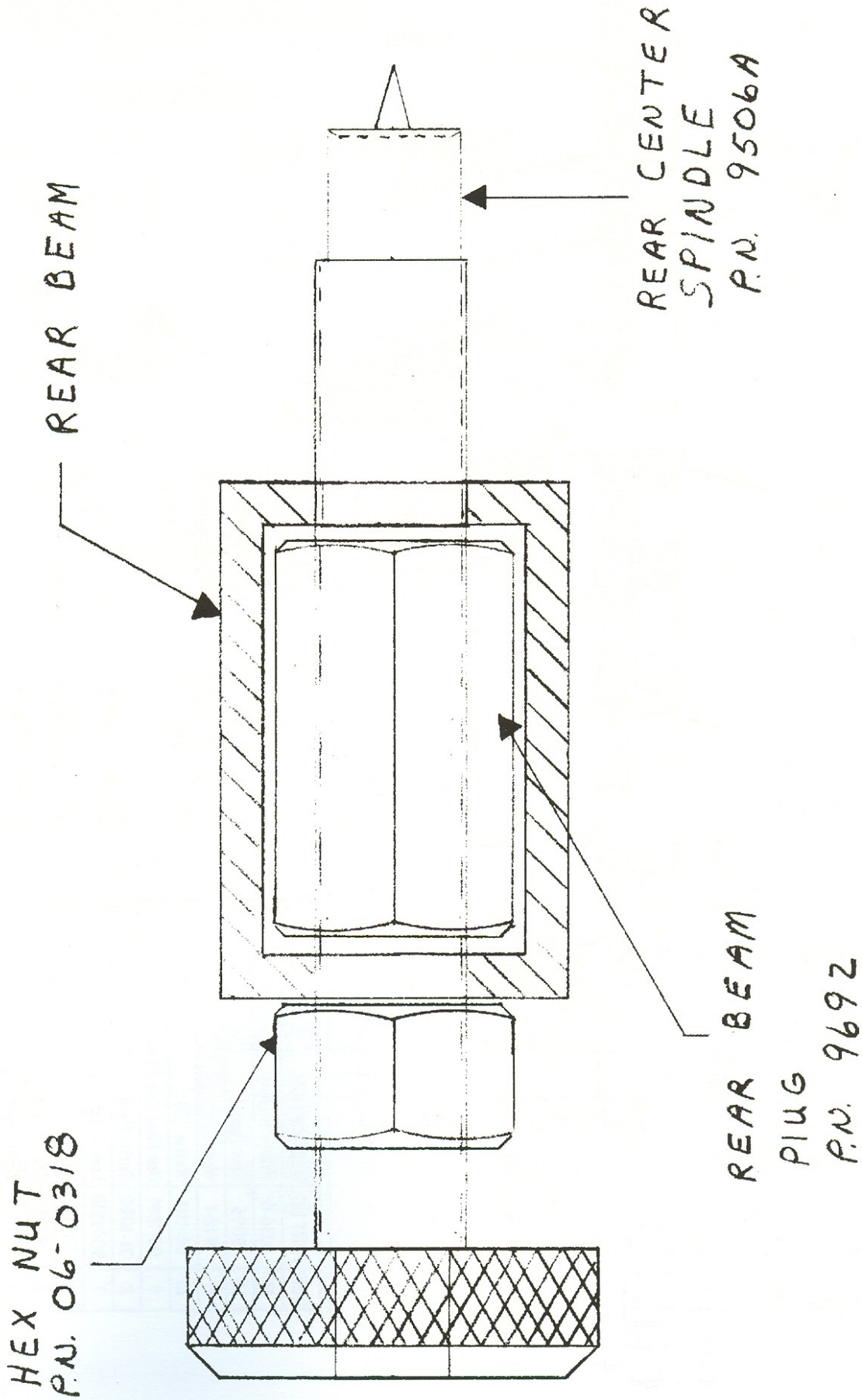
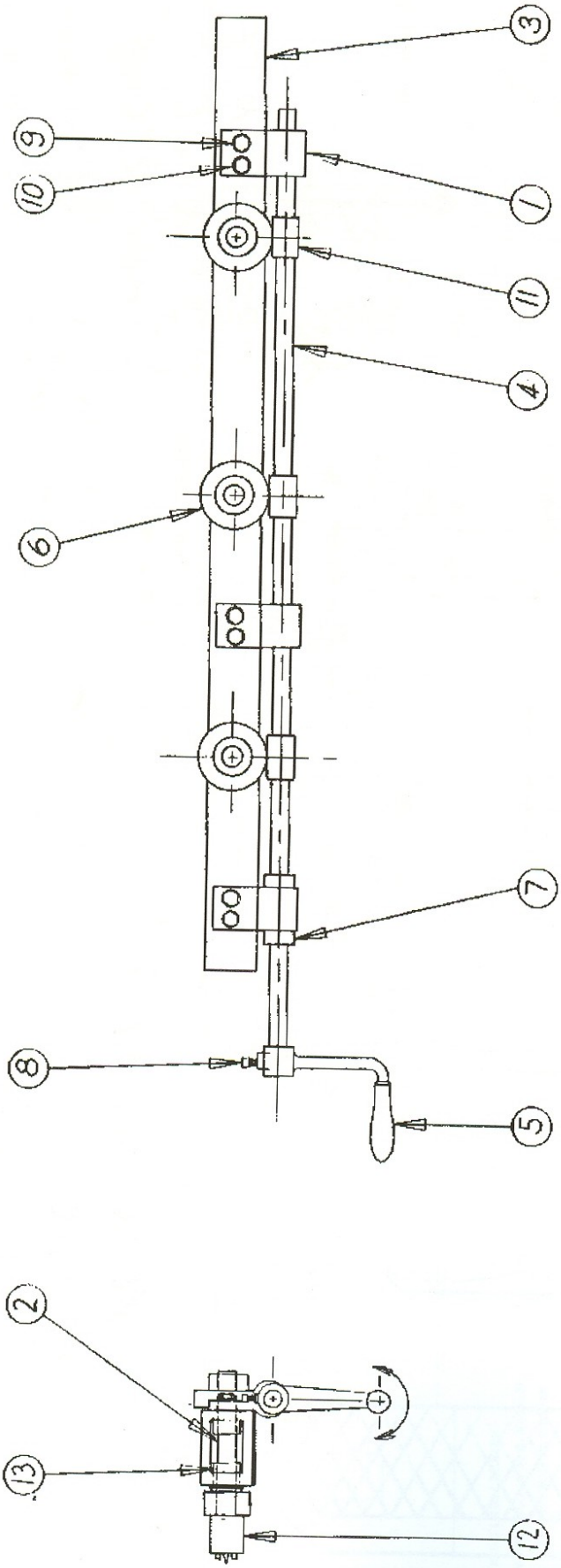


Figure 11: Rear Beam Assembly



REF:	PART NO.	DESCRIPTION
13	1216-6	Bronze Bushing
12	9095	Spur Head
11	W12-1	Worm
10	06-1111	Washer (2)
9	02-1324	Hex Head Cap Screw (2)
8	01-1090	Socket Head Set Screw
7	SC6251D	Lock Collar (2)
6	9155A	Worm Gear
5	9553	Crank Handle
4		Worm Shaft
3		Front Beam
2	9604	Front Center Spindle
1	9518	Worm Shaft Support

Figure 12: Front Beam Assembly

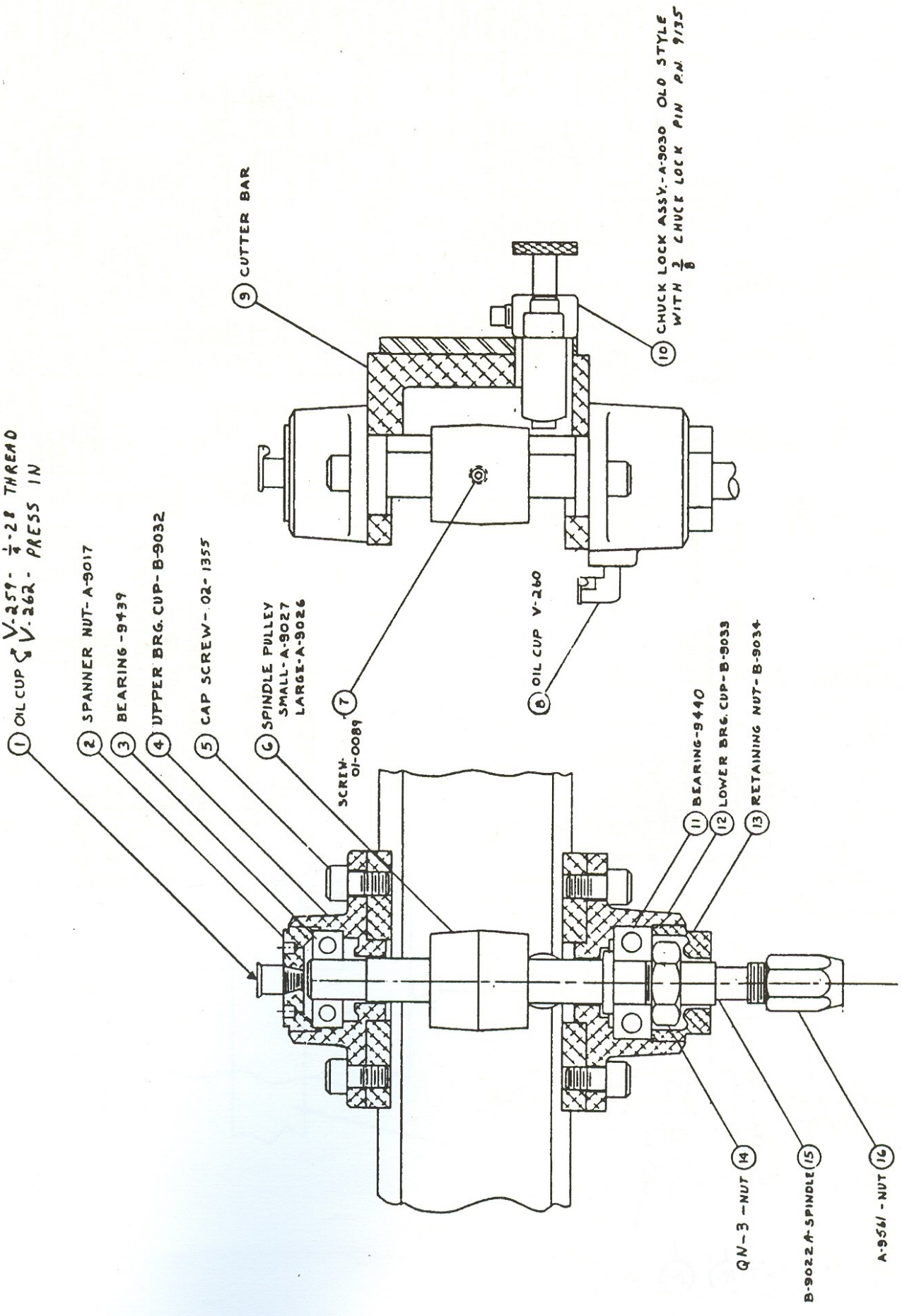
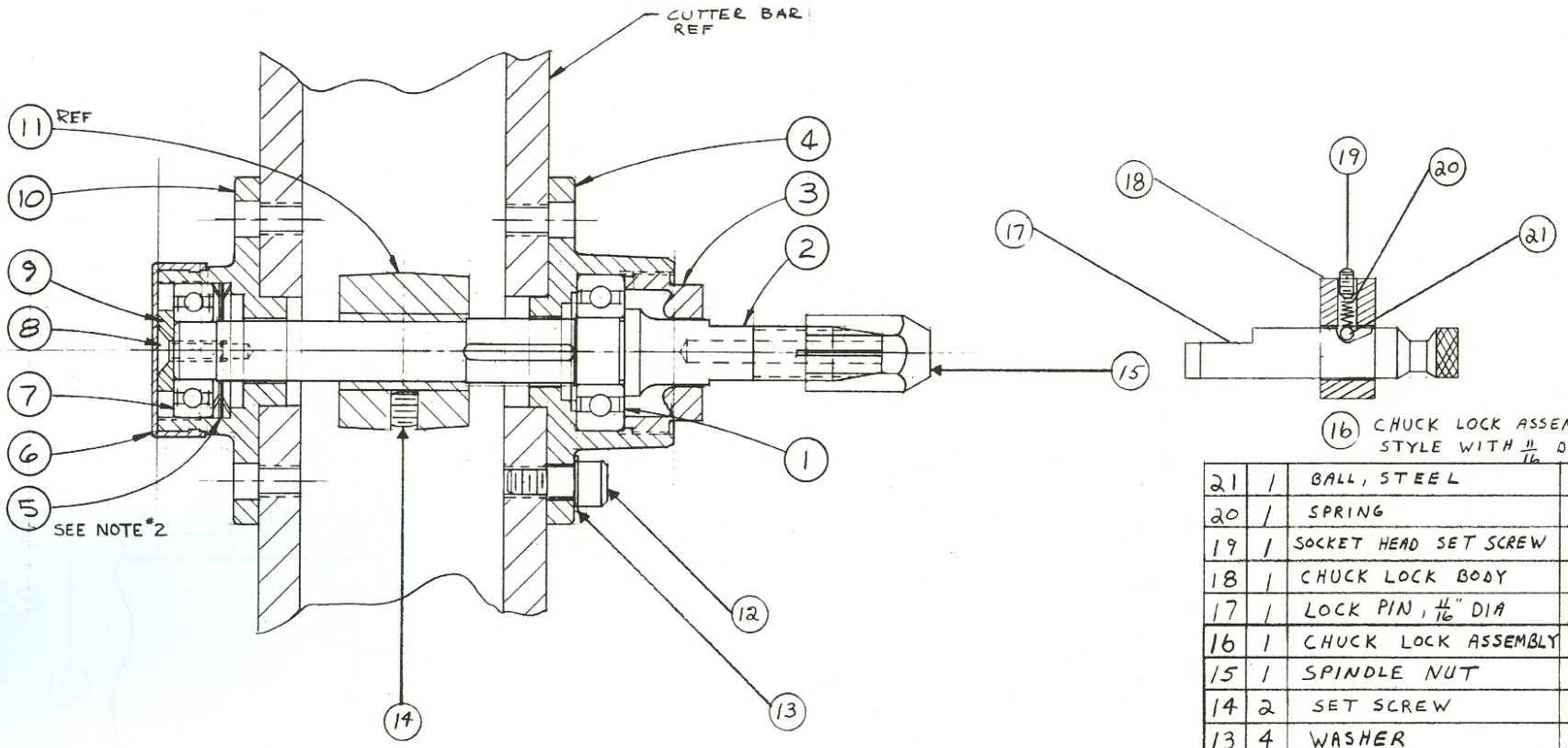


Figure 13: Cutter Bar Spindle Assembly (Old Non Collet Style)



21	1	BALL, STEEL		9136
20	1	SPRING		9133
19	1	SOCKET HEAD SET SCREW		01-1873
18	1	CHUCK LOCK BODY		9134A
17	1	LOCK PIN, 11/16" DIA		9135A
16	1	CHUCK LOCK ASSEMBLY		9030A
15	1	SPINDLE NUT		9561
14	2	SET SCREW		01-0089
13	4	WASHER		06-2112
12	4	HEX HEAD CAPSCREW		02-1355
11	REF	SPINDLE PULLEY	LARGE - A-9026 SMALL - A-9027	
10	1	BEARING CUP UPPER		B-9032A
9	1	WASHER, SPINDLE	9753	A10072
8	1	FLAT HD SOC CAPSCREW 1/4-20NC x 3/4 LG		03-1140
7	1	BEARING BALL # GEO. MULLER 6203-2RSRL ASTA02		9439
6	1	CAP - PLASTIC		10327
5	3	FINGER SPRING # ASSOC. SPRING F1555-01B		A10323
4	1	BEARING CUP LOWER	B-9033	B-10074
3	1	RETAINING NUT		B-9034
2	1	SPINDLE 5/8 - REVISED	9022D	C-10071
1	1	BEARING BALL # GEO. MULLER 6204-2RSRL ASTA02		9440

UNLESS OTHERWISE SPECIFIED	DET.	REQ.	NAME	MAT'L	MATL. SIZE
TOLERANCES FRACT. = ± — DEC. = ± — ANGLE = ± —	SO—		DON'T FORGET SAFETY — MAKE ALL FIXTURES AS SAFE AS POSSIBLE	DWG. NO.	C10073
	KURT MANUFACTURING CO.				
NOTE MARK THIS TOOL & ALL REMOVABLE PARTS WITH TOOL NO. & BIN NO.	NAME SPINDLE ASSY, NEW STYLE				
	FOR MASTER & NORTHSTAR CARVERS				REV.
	DATE 9 NOV 82	DRAWN R.S. SOMERVILLE	TOOL NO.		
	CHKD.	DETAILED			
	APPD.	NO. OF SHEETS 1	SHEET NO. 1		

NOTES:

1. GREASE FOR BEARING AS ORDERED:
   LDS 18 SPECIAL "A"

2. THE BOTTOM (2) FINGER SPRINGS ARE TO BE NESTED TOGETHER WITH THE FINGERS DOWN. THE TOP (1) FINGER SPRING IS TO BE PLACED WITH FINGERS UP.

Figure 14: Cutter Bar Spindle Assembly (New Non Collet Style)

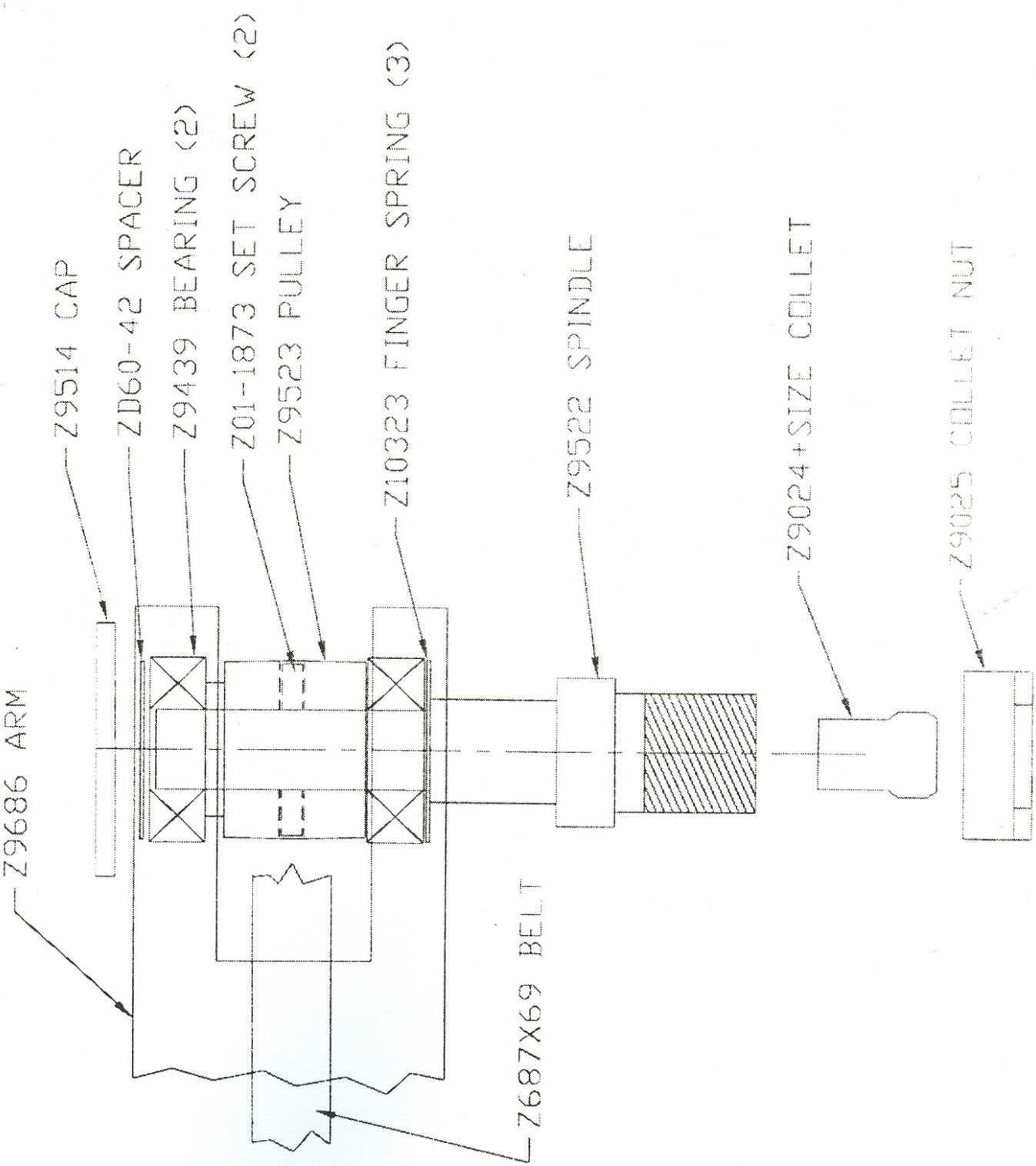


Figure 15: Collet Spindle Assembly for Northstar Models 10-1, 10-2, 20-1, 20-2 & 20-4