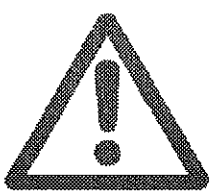
ACCU-610 AUTOMATIC BEDKNIFE GRINDER

ASSEMBLY AND SERVICE MANUAL



WARNING

You must thoroughly read and understand this manual before assembling or maintaining the equipment, paying particular attention to the Warning & Safety instructions.

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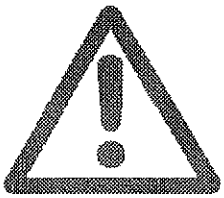
SAFETY INSTRUCTIONS



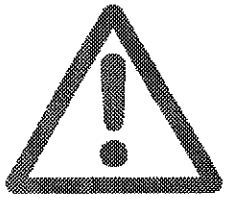
Safety Awareness Symbols are inserted into this manual to alert you to possible ***Safety Hazards***. Whenever you see these symbols, follow their instructions.

The ***Warning Symbol*** identifies special instructions or procedures which, if not correctly followed, could result in personal injury.

The ***Caution Symbol*** identifies special instructions or procedures which, if not strictly observed, could result in damage to or destruction of equipment.

1. **KEEP GUARDS IN PLACE** and in working order.
2. **REMOVE WRENCHES AND OTHER TOOLS.**
3. **KEEP WORK AREA CLEAN.**
4. **DON'T USE IN DANGEROUS ENVIRONMENT.** Don't use Grinder in damp or wet locations, or expose it to rain. Keep work area well lighted.
5. **KEEP ALL VISITORS AWAY.** All visitors should be kept a safe distance from work area.
6. **MAKE WORK AREA CHILD-PROOF** with padlocks or master switches.
7. **DON'T FORCE THE GRINDER.** It will do the job better and safer if used as specified in this manual.
8. **USE THE RIGHT TOOL.** Don't force the Grinder or an attachment to do a job for which it was not designed.
9. **WEAR PROPER APPAREL.** Wear no loose clothing, gloves, neckties, or jewelry which may get caught in moving parts. Nonslip footwear is recommended. Wear protective hair covering to contain long hair.
10. **ALWAYS USE SAFETY GLASSES.**
11. **SECURE YOUR WORK.** Make certain that the bedknife is securely fastened with the centers provided before operating.
12. **DON'T OVERREACH.** Keep proper footing and balance at all times.
13. **MAINTAIN GRINDER WITH CARE.** Follow instructions in Service Manual for lubrication and preventive maintenance.
14. **DISCONNECT POWER BEFORE SERVICING,** or when changing the grinding wheel.
15. **REDUCE THE RISK OF UNINTENTIONAL STARTING.** Make sure the switch is OFF before plugging in the Grinder.
16. **USE RECOMMENDED ACCESSORIES.** Consult the manual for recommended accessories. Using improper accessories may cause risk of personal injury.
17. **CHECK DAMAGED PARTS.** A guard or other part that is damaged or will not perform its intended function should be properly repaired or replaced.
18. **KNOW YOUR EQUIPMENT.** Read this manual carefully. Learn its application and limitations as well as specific potential hazards.
19. **KEEP ALL SAFETY DECALS CLEAN AND LEGIBLE.** If safety decals become damaged or illegible for any reason, replace immediately. Refer to replacement parts illustrations in Service Manual for the proper location and part numbers of safety decals.
20. **DO NOT OPERATE THE GRINDER WHEN UNDER THE** INFLUENCE OF DRUGS, ALCOHOL, OR MEDICATION

SAFETY INSTRUCTIONS



IMPROPER USE OF GRINDING WHEEL MAY CAUSE BREAKAGE AND SERIOUS INJURY.

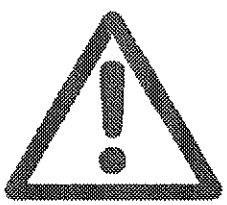
Grinding is a safe operation if the few basic rules listed below are followed. These rules are based on material contained in the ANSI B7.1 Safety Code for "Use, Care and Protection of Abrasive Wheels". For your safety, we suggest you benefit from the experience of others and carefully follow these rules.

DO

1. **DO** always **HANDLE AND STORE** wheels in a **CAREFUL** manner.
2. **DO VISUALLY INSPECT** all wheels before mounting for possible damage.
3. **DO CHECK MACHINE SPEED** against the established maximum safe operating speed marked on wheel.
4. **DO CHECK MOUNTING FLANGES** for equal and correct diameter.
5. **DO USE MOUNTING BLOTTERS** when supplied with wheels.
6. **DO** be sure **WORK REST** is properly adjusted.
7. **DO** always **USE A SAFETY GUARD COVERING** at least one-half of the grinding wheel.
8. **DO** allow **NEWLY MOUNTED WHEELS** to run at operating speed, with guard in place, for at least one minute before grinding.
9. **DO** always **WEAR SAFETY GLASSES** or some type of eye protection when grinding.

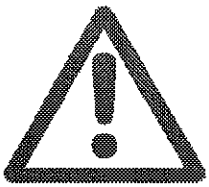
DON'T

1. **DON'T** use a cracked wheel or one that **HAS BEEN DROPPED** or has become damaged.
2. **DON'T FORCE** a wheel onto the machine **OR ALTER** the size of the mounting hole - if wheel won't fit the machine, get one that will.
3. **DON'T** ever **EXCEED MAXIMUM OPERATING SPEED** established for the wheel.
4. **DON'T** use mounting flanges on which the bearing surfaces **ARE NOT CLEAN, FLAT AND FREE OF BURNS.**
5. **DON'T TIGHTEN** the mounting nut **EXCESSIVELY.**
6. **DON'T** grind on the **SIDE OF THE WHEEL** (see Safety Code B7.2 for exception).
7. **DON'T** start the machine until the **WHEEL GUARD IS IN PLACE.**
8. **DON'T JAM** work into the wheel.
9. **DON'T STAND DIRECTLY IN FRONT** of a grinding wheel whenever a grinder is started.
10. **DON'T FORCE GRINDING** so that motor slows noticeably or work gets hot.



AVOID INHALATION OF DUST generated by grinding and cutting operations. Exposure to dust may cause respiratory ailments. Use approved NIOSH or MSHA respirators, safety glasses or face shields, and protective clothing. Provide adequate ventilation to eliminate dust, or to maintain dust level below the Threshold Limit Value for nuisance dust as classified by OSHA.

This machine is intended for grinding the bedknife from a reel mowing unit ONLY. Any use other than this may cause personal injury and void the warranty.



To assure the quality and safety of your machine and to maintain the warranty, you MUST use original equipment manufactures replacement parts and have any repair work done by a qualified professional.

ALL operators of this equipment must be thoroughly trained BEFORE operating the equipment.

Do not use compressed air to clean grinding dust from the machine. This dust can cause personal injury as well as damage to the grinder.

CONTENTS

SPECIFICATIONS

Electrical Requirements ..... 115V 50/60 Hz, 15-amp circuit

Net Weight ..... 600 lbs [275 kg]

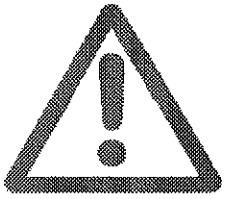
Shipping Weight ..... 780 lbs [355 kg]

Maximum Grinding Length ..... 34 in. [863 mm]

SKILL AND TRAINING REQUIRED FOR SERVICING

This Service Manual is designed for technicians who have the necessary mechanical and electrical knowledge and skills to reliably test and repair the 610 Grinder. For those without that background, service can be arranged through a local distributor.

This Manual presumes that you are already familiar with the normal operation of the Grinder. If not, you should read the Operators Manual, or do the servicing in conjunction with someone who is familiar with its operation.



PERSONS WITHOUT THE NECESSARY KNOWLEDGE AND SKILLS SHOULD NOT REMOVE THE CONTROL BOX COVER OR ATTEMPT ANY INTERNAL TROUBLESHOOTING, ADJUSTMENTS, OR PARTS REPLACEMENT!

If you have questions not answered in this manual, please call your distributor. They will contact the manufacturer is necessary.

TORQUE REQUIREMENTS

Throughout this manual we refer to torque requirements as "firmly tighten" or the like. For more specific torque values, refer to the information below.

Bolts Going into a Nut, or Into a Thread Hole in Steel.
Refer to table at the right.

Bolts Going into a Thread Hole in Aluminum.
Use the Grade 2 values in the table at the right.

Socket-Head Screws
Use the Grade 8 values in the table at the right.

Machine Screw

No. 6 Screws:	11in.-lbs [0.125 kg-m]
No. 8 Screws:	20 in.-lbs [0.23 kg-m]
No. 10 Screws:	32 in.-lbs [0.37kg-m]

	GRADE 2  Smooth Head	GRADE 5  3 Marks on Head	GRADE 8  6 Marks on Head
1/4 In. thread	6 ft-lbs (0.8 kg-n)	9 ft-lbs (1.25 kg-n)	13 ft-lbs (1.8 kg-n)
5/16 In. thread	11 ft-lbs (1.5 kg-n)	18 ft-lbs (2.5 kg-n)	28 ft-lbs (3.9 kg-n)
3/8 In. thread	19 ft-lbs (2.6 kg-n)	31 ft-lbs (4.3 kg-n)	46 ft-lbs (6.4 kg-n)
7/16 In. thread	30 ft-lbs (4.1 kg-n)	50 ft-lbs (6.9 kg-n)	75 ft-lbs (10.4 kg-n)
1/2 In. thread	45 ft-lbs (6.2 kg-n)	75 ft-lbs (10.4 kg-n)	115 ft-lbs (15.9 kg-n)

ASSEMBLY INSTRUCTIONS

NOTE: For clarity, the Grinder is shown on the following pages without the **optional** carriage bellows installed.

UNPACK THE CARTONS

Use care when unpacking. Double-check the packing cartons for any miscellaneous items before discarding.

Inspect all items for shipping damage as they are removed from the shipping containers. If you find any damage, notify the carrier's claims agent and do not proceed further until the damage has been inspected by the agent. Refer also to the "Shipping and Receiving Instructions" packed with the unit.

Remove the Coolant Tank carton from under the machine.

Remove the control box from under the machine. Be careful of the electrical wiring which was preconnected at the factory.

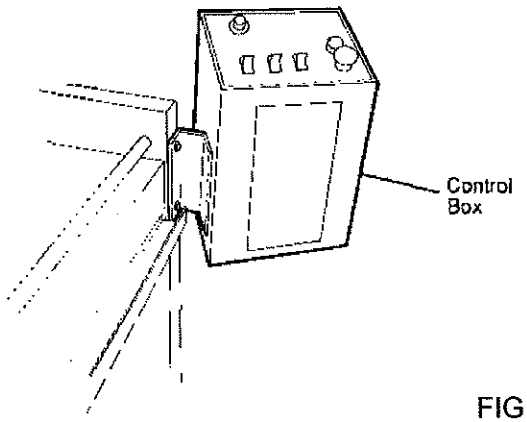


FIG. 1

Install the Control Box

Attach the control box to the right front end of the machine, using the two 3/8-16 x 5/8" hex-head bolts, and two lock washers provided. See FIG. 1. The fasteners are shipped in an envelope inside the control box carton.

Remove the Grinder from the Pallet

To remove the Grinder from the wood pallet:

1. Unbolt the angle brackets that hold each end of the Grinder legs to the bottom of the pallet.

2. The Grinder's four leveling feet (FIG. 2) are seated in countersunk holes in the pallet. Lift one end of the machine until both feet are out of their holes.

3. Prop this first end up with sturdy boards or other supports so the feet remain out of their holes, then lift the other end and remove the Grinder from the pallet.

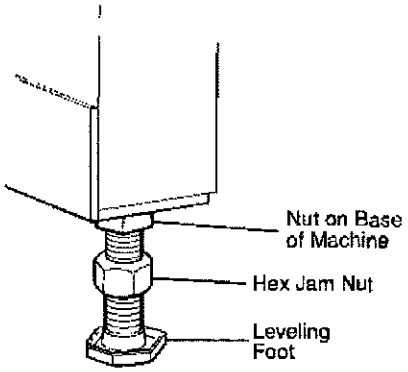


FIG. 2

THE GRINDER WEIGHS 600 LBS [270 KG]. TO LIFT, USE POWER EQUIPMENT OR GET ADEQUATE HELP.

Remove the shipping strap that secures the grinding head and carriage to the left end of the machine during shipment. Reinstall the wiper plate screw which held the right end of the strap. Discard the leg screw and the shipping strap.

NOTE: Before you install the machine, read the following assembly procedure completely. Then study "Getting to Know Your Bedknife Grinder" in the Operators Manual.

ASSEMBLY INSTRUCTIONS (Continued)

LOCATE AND LEVEL THE GRINDER

Set the Grinder on a level concrete floor, on a single uncracked slab of concrete.

PLACING THE GRINDER ON A FLOOR THAT IS BADLY OUT OF LEVEL OR BROKEN WILL AFFECT GRINDING QUALITY.

If the unit must be located near a wall, allow adequate space for operating and servicing. Refer to FIG. 3A and 3B for recommended and alternate locations near a wall.

Place a level on the front carriage rail near the center of the machine and check the level from left to right. See FIG. 4A. Adjust the leveling feet until the machine is level.

Place the level across the front and rear carriage rails near the left end of the machine. See FIG. 4B. Adjust the two leveling feet on the left end until the rear rail (the one closest to the coolant tray) is slightly lower than the front rail--so any coolant on the carriage, main base, or optional bellows will drain back into the coolant tray.

Place the level across the front and rear carriage rails near the right end of the carraige bed. Level the right end in the same way as the left end. For grinding accuracy, the two ens must have the identical backward slant within +/-.001" [.025 mm] so the frame is not twisted.

Recheck the level in both directions. When satisfactory, tighten the hex jam nuts on the leveling feet securely against the nuts welded to the bottom of the base. See FIG. Don't turn the leveling feet when tightening.

Again recheck the level after the nuts are firmly tightened.

FOR GRINDING ACCURACY, THE MACHINE DOES NOT HAVE TO BE PERFECTLY LEVEL. HOWEVER, IT IS CRITICAL THAT FRONT-TO-BACK LEVELING BE IDENTICAL AT BOTH ENDS OF THE MACHINE.

INSTALL THE SPINNING HANDLES

Install the spinning handles on the vertical and horizontal handwheels. See FIG. 5. Handle parts are packed in an envelope taped to the wheel.

To relieve its weight during shipment, the grinding motor was cranked down onto a temporary pad. Crank it up enough to remove the pad.

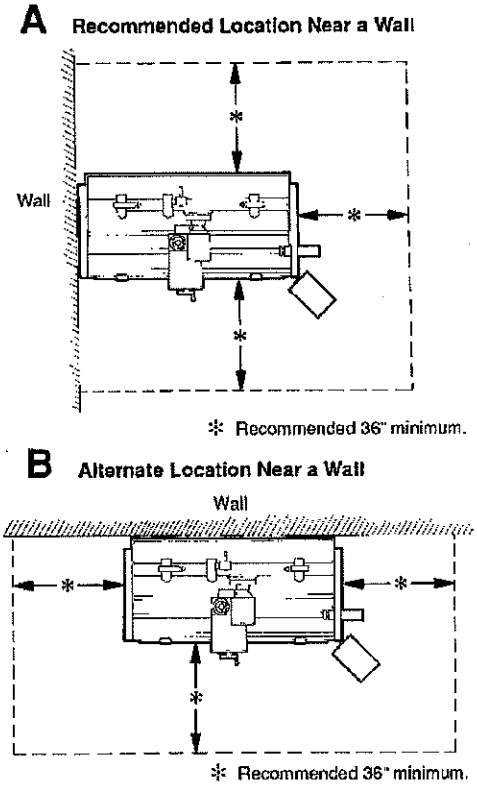


FIG. 3

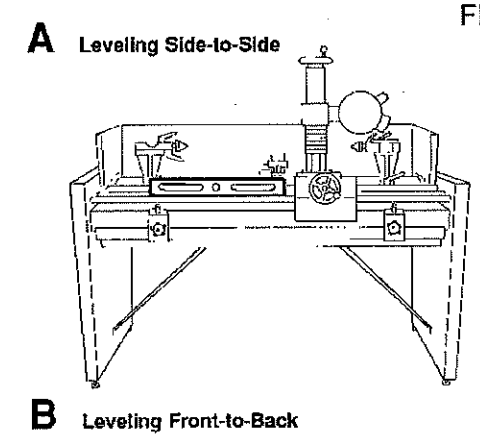


FIG. 4

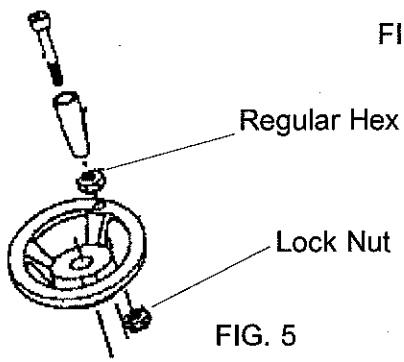


FIG. 5

ASSEMBLY INSTRUCTIONS (Continued)

CHECK ALIGNMENT OF THE CENTERS

See FIG. 6. The centers on the fixed (left) and adjustable (right) supports, which hold the bedknife during grinding, were carefully aligned at the factory. To check that the alignment was not disturbed during shipment, slide the middle support and the adjustable support to the left until the fixed and adjustable centers touch.

If necessary, realign using the center alignment levers on the two supports. See the Operators Manual for detailed instructions.

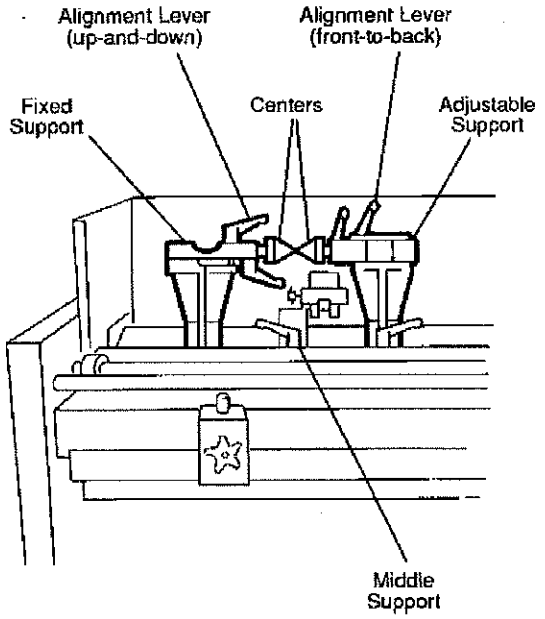


FIG. 6

APPLY POWER

BEFORE YOU APPLY POWER TO THE GRINDER, REFER TO THE "IMPORTANT GROUNDING INSTRUCTIONS" ON PAGE 9.

115 Volt Model Only. Plug the control box power cord into a standard 115V AC 15-amp grounded receptacle. See FIG. 7.

FIG. 7

220 Volt Model Only. Follow the instructions under "Conversion to 220 Volt 50/60 Hz" on Page 9.

ASSEMBLY INSTRUCTIONS (Continued)

CONVERSION TO 220 VOLT 50/60 HZ

If you order a 220V 50/60 Hz Grinder, install the transformer that was shipped with the unit:

1. Remove the right outside panel of the Grinder.
2. Mount the transformer in the four existing holes on the inside of the right leg. See FIG. 8. Use four 1/4-20 x 3/4" hex head screws, lock washer, and nuts (packed with the transformer).
3. Reattach the right outside panel.
   NOTE: If you also ordered the optional Carriage Bellows, leave the panel off until later.
4. If the 220V plug configuration doesn't fit your electrical receptacle, have a qualified electrician replace it with a plug which meets your local codes.
5. Have a qualified electrician check the transformer output voltage before you connect the Grinder in Step 6. Output voltage to the Grinder is 115V.
6. Plug the main power cord from the control box into the female connector on top of the transformer.
7. Store any excess wire in the leg cavity.

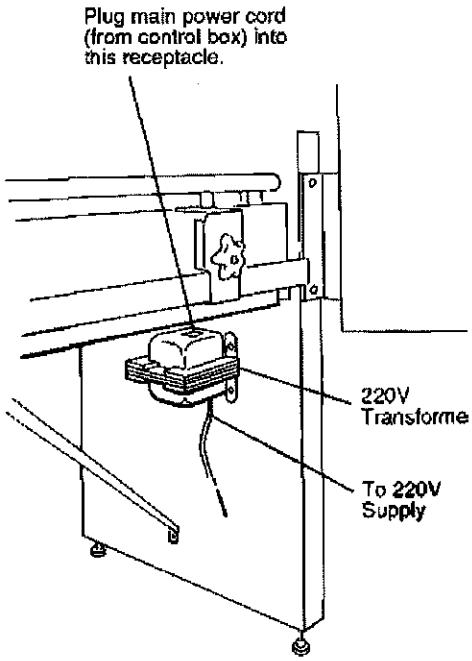


FIG. 8

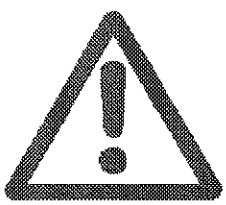
IMPORTANT GROUNDING INSTRUCTIONS

In case of a malfunction of breakdown, grounding reduces the risk of electrical shock by providing a path of least resistance for electrical current.

This Grinder has an electrical cord with an equipment grounding conductor and a grounding plug. The plug must be plugged into a matching outlet that is properly installed and grounded according to all local or other appropriate electrical codes and ordinances.

Before plugging in the Grinder, make sure it will be connected to a supply circuit protected by a properly-sized circuit breaker or fuse.

Never modify the plug provided with the machine--if it won't fit the outlet, have a proper outlet and circuit installed by a qualified electrician.



ALWAYS PROVIDE A PROPER ELECTRICAL GROUND FOR YOUR MACHINE. AN IMPROPER CONNECTION CAN CAUSE A DANGEROUS ELECTRICAL SHOCK. IF YOU ARE UNSURE OF THE PROPER ELECTRICAL GROUNDING PROCEDURE, CONTACT A QUALIFIED ELECTRICIAN.

ASSEMBLY INSTRUCTIONS (Continued)

INSTALL THE OPTIONAL CARRIAGE BELLOWS (if ordered)

Optional carriage bellows are available to keep excess grindings, dirt, etc. out of the carriage assembly. To install the two bellows:

1. Remove the left and right outside leg panels.
2. Remove the formed-steel sheet, See FIG. 11, which supports the rubber splash guard, at the rear of the carriage - two screws.
3. Remove the shaft seal on each side of the linear actuator. See FIG. 9. NOTE: When the bellows are used, the shafts don't get lubricated and the seals would run dry. They would then become noisy and not operate properly.
   To remove the seals:
   a. Crank the carriage all the way toward the front (that is, toward the operator's position).
   b. Remove the actuator mounting screw on top of the carriage. See FIG. 9. Then push the carriage toward the right end of the Grinder.
   c. Loosen the two set screws in the bearing pillow block at each end of the drive shaft. Loosen the two set screws in the drive coupling at the right end of the carriage.
   d. Turn the actuator release lever clockwise 1/2 turn until the actuator is released from the shaft. See FIG. 9.
   e. Slide the drive shaft out the left end of the machine.
   f. Remove the shaft seals from the actuator - two screws each.
   g. Reinstall the drive shaft. The right end of the shaft (inside the coupling) should be 1/8 - 1/4" [3 to 6.5 mm] from the end of the motor shaft. Retighten all set screws.
   h. Push the carriage back to the left, and reattach the actuator with the mounting screw. See FIG. 9. Turn the actuator release lever, 1/2 turn.
4. Remove the two rail wiper brackets from each side of the carriage - two screws each. See FIG. 11.
5. Attach the outer end of each bellows to the Grinder leg panel. See FIG. 10. Use six bolts, and hex nuts, at each end. The bolt heads go on the bellows side of the brackets.
6. Attach the inner end of each bellows to the carriage. See FIG. 11. Use four L-brackets, (two on each side of the last bellows fold), six bolts, and two hex nuts at each end. Nuts are required only for the lower holes of the L-brackets.
7. Press the bellows down until it snaps onto the carriage rails.
8. Reattach the splash guard support. Reattach the left and right outside leg panels.

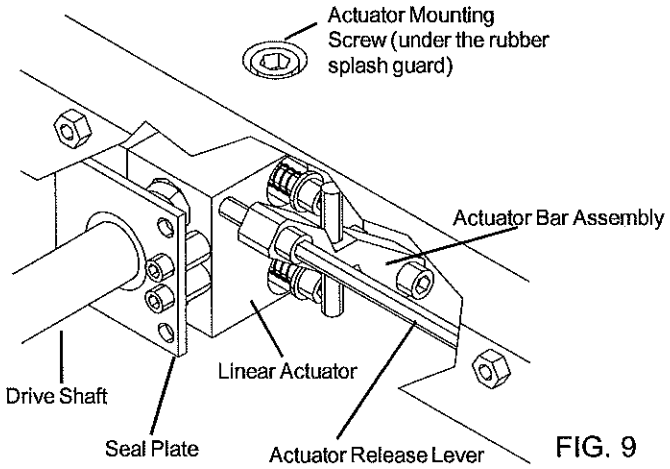


FIG. 9

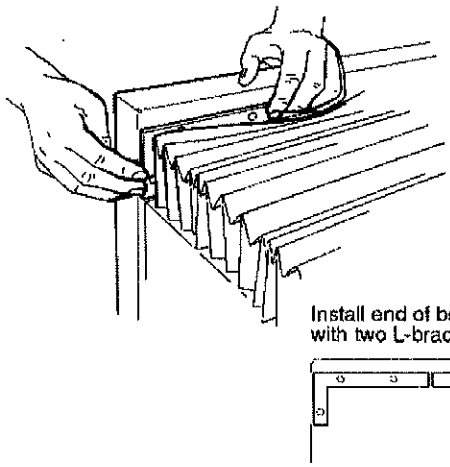


FIG. 10

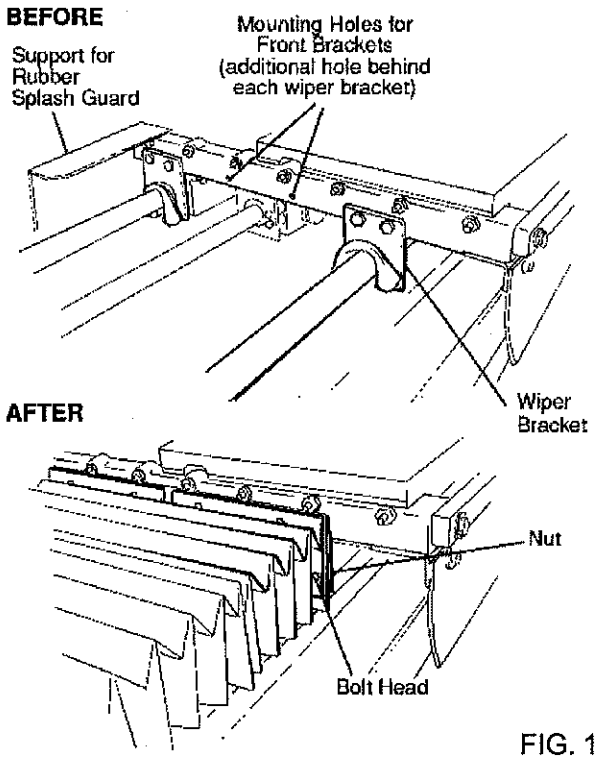


FIG. 11

ASSEMBLY INSTRUCTIONS (Continued)

INSTALL THE COOLANT TANK

Assemble the Coolant Tank as outlined in the instructions (Part No. 7467909) packed with it.

Center the Tank under the Grinder.

See FIG. 12. Install the 1" I.D. drain tubing over the barbed end of the plastic adapter on the coolant tray drain. Cut the tubing to the proper length to reach about 1-1/2" [40 mm] into the large opening on top of the Coolant Tank.

A prefilter sock is shipped with the Tank. Install it onto the tubing, using the plastic tie provided. Drop the other end of the sock into the opening on top of the Tank.

Plug the pump motor cord (from the top of the Tank) to the female connector from the control box.

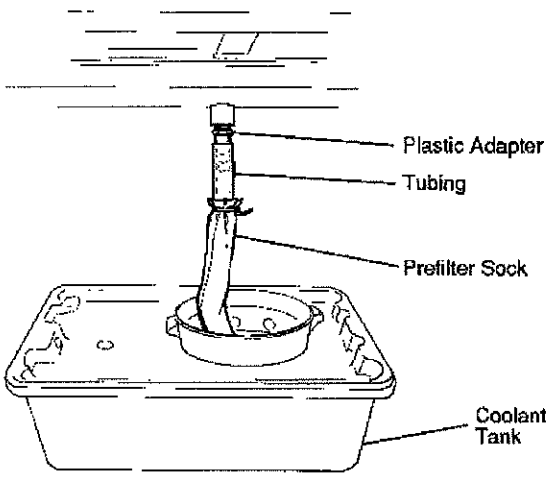
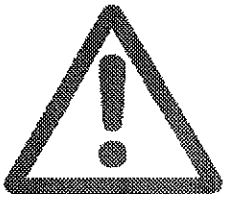


FIG. 12



RISK OF ELECTRICAL SHOCK! MAKE CERTAIN THAT THE ABOVE ELECTRICAL CONNECTION IS SECURED ABOVE AND AWAY FROM POSSIBLE CONTACT WITH THE COOLANT.

Read the coolant mixing directions and the electrical warnings in the Coolant Tank instructions.

CHECK THE COOLANT PUMP

1. Be sure the COOLANT PUMP switch is OFF. Mix coolant in the coolant tank, at a ratio of 50 parts water to 1 part concentrate. This will take about 32 quarts of water and 2/3 quart of concentrate (30 liters of water and 0.6 liter of concentrate).

   Refer also to the label on the coolant container, and the instructions packed with the Coolant Tank.

Turn all control panel switches OFF. Press START. Press Coolant Pump Switch to ON. Check that the Coolant System functions properly. Be prepared to press STOP if there is any problem.

NOTE: If the unit doesn't begin a pump coolant, press the reset button on the motor contactor inside the control box. See FIG. 13.

ASSEMBLY INSTRUCTIONS (Continued)

CHECK THE CARRIAGE TRAVERSE

Move the proximity switch assemblies to about 12" [300 mm] from the ends of the machine, and tighten their knobs.

Visually check that the grinding head will be able to traverse to both sides of the machine without contacting any components.

Turn all control panel switches OFF. Set the TRAVERSE FT/MIN knob to zero. Press START. Press CARRIAGE TRAVERSE to ON. Set TRAVERSE FT/MIN to a low speed, and check that the grinding head runs through a complete traverse cycle. Be prepared to press STOP if there is any interference. Watch carefully for obstructions to the head travel, and check that the grinding motor cord and proximity switch cords are not stretched.

NOTE: If the unit doesn't begin a traverse cycle, press the reset button on the motor contactor inside the control box. See FIG. 13.

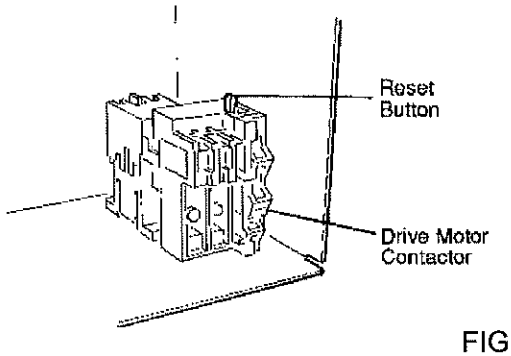


FIG. 13

Secure any excess electrical cord to a crossbar on the underside of the machine.

CHECK THE GRINDING MOTOR

Turn all control panel switches OFF. Press START. Press Grinding Motor Switch to ON. Check that the grinding head run properly. Be prepared to press STOP if there is any problem.

NOTE: If the grinding head doesn't begin properly, press the reset button on the motor contactor inside the control box. See FIG. 13.

MAKE FINAL PREPARATIONS FOR OPERATION

Carefully read the operating instructions in the Operators Manual.

First, study the pages titled "Getting to Know Your Grinder" and "General Operating Information" for important background explanations about the machine and about bedknife grinding. **Then,** read the "Operating Instructions" pages for step-by-step procedures on mounting the bedknife and grinding its top and front faces.

MAINTENANCE

DAILY MAINTENANCE IS SPECIFIED ON PAGE 4 OF THE OPERATOR'S MANUAL, AND IS TO BE PERFORMED BY THE OPERATOR. LISTED BELOW ARE PERIODIC MAINTENANCE ITEMS TO BE PERFORMED BY YOUR COMPANY'S MAINTENANCE DEPARTMENT:

1. Check the gib plate adjustment in the carriage base every 3 months. See Page 22.

2. Relub the ball ends on the Alignment Levers every 3 months.

3. Check the cam follower bearings on the vertical slide for free play and adjust as required every 3 months.

4. Lift the bellows, (See FIG. 14) if used, and wipe off the traverse driveshaft and the bearing rails monthly. When a squeaking noise is coming from the actuator bearings, follow the lubrication procedure for actuator and linear bearings. Generally, this will be every 6 months to a year.

5. Replace the two foam rail wipers (FIG. 15) every 6 months of operation. Note: Wipers are removed if optional bellows are installed.

6. Clean the interior and the top cover of the Coolant Tank as necessary and at least every 6 months.

7. Check the brushes on the auto traverse drive motor once a year. Replace as necessary.

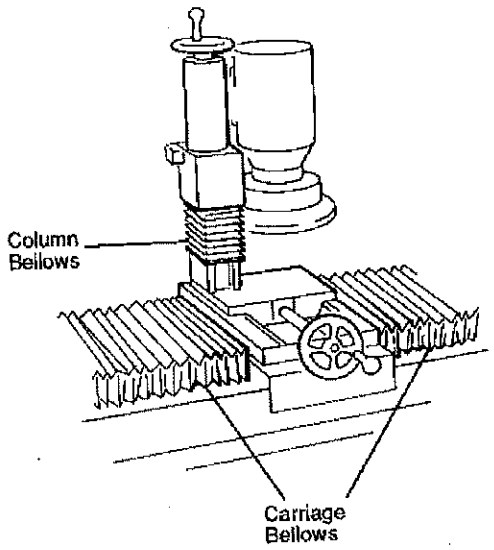


FIG. 14

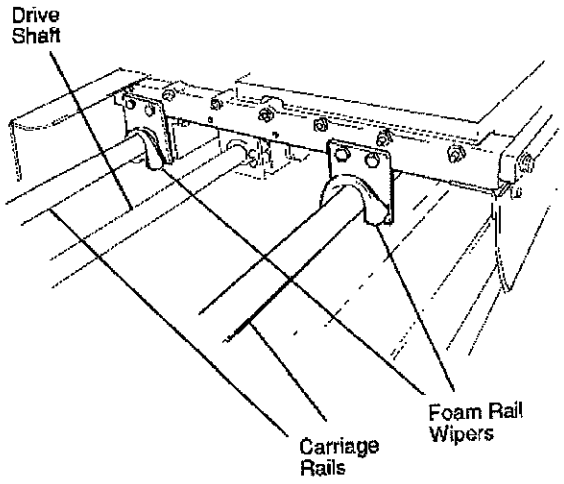


FIG. 15

MAINTENANCE (Continued)

LUBRICATION

Actuator and Linear Bearings
Do the following every six months (or more often if the linear actuator seals are squeaking):

1. Thoroughly clean the carriage rails, drive shaft, and shaft seals. Wipe the shafts and seals thoroughly with a clean rag.

   While cleaning, traverse the carriage several times to clean the full length of the drive shaft and rails.

2. Flood-spray all three shafts with WD-40 or and equivalent lubricant (**do not use a Teflon-based lubricant)**until lubricant drips off the shafts. Then run the carriage back and forth through its range of travel, to carry lubricant onto the outer surface of the actuator bearings and the inner surface of the seals.

   NOTE: Because of the flood of lubricant, you may find that the actuator slips and traversing is erratic or stalls. This is not a problem, as it will be corrected in Step 3.

3. With a clean rag, wipe the excess lubricant from the shafts. Run the carriage back and forth through its range of travel, and wipe the shafts after each traverse. Repeat until the shafts feel dry.

IMPORTANT: If the machine will be shut down for more than two weeks, flood the shafts and other appropriate parts with lubricant as outlined above, and leave the lubricant in place until the unit will be used again. Then repeat the above lubrication procedure before operating.

MAINTENANCE (Continued)

Infeed and Height Adjustment Screws
Spray TRI-FLO, WD-40, or an equivalent lubricant along the infeed and height adjustment screws **every 3 months.**

For access to the height adjustment screw. See FIG. 16.

1. Remove the two sheet-metal dust covers over the cam followers. Shown removed in FIG. 16.

2. Remove the two bolts holding the corners of the top of the column. Drive down the two roll pins about 0.125" [3 mm].

3. Unscrew the handwheel until the adjustment screw and adjusting nut are exposed, and spray them with lubricant.

4. Drive the roll pins back up and reattach the top of the column with the two bolts. If you can't drive the roll pins up, drive them through and reinstall them.

5. Reattach the dust covers.

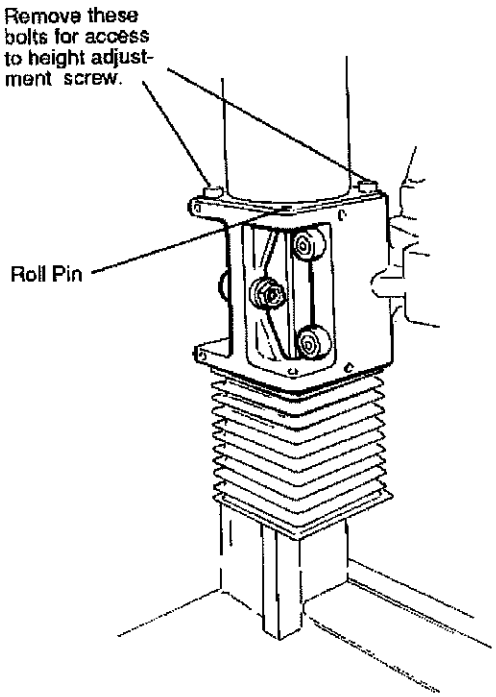


FIG. 16

Centers
Screw out the centers on the fixed and adjustable supports **occasionally,** and spray the threads with lubricant.

ADJUSTMENTS

TO REPLACE THE LINEAR ACTUATOR BEARINGS

NOTE: Never remove the linear actuator from the drive shaft. Only remove the bearings from the actuator block.

1. Crank the horizontal handwheel until the carriage is all the way forward (toward the operator position).
2. Turn the actuator release lever 1/2 turn clockwise to release the linear actuator bearings from the drive shaft. Slide the actuator release lever out of actuator bar assembly by loosening the retainer shaft collar, which preloads the holding spring. See FIG. 18A and 18B.
3. Lift the rubber splash guard to expose the actuator mounting screw (FIG. 17) on the top side of the carriage base. Remove the mounting screw, to disconnect the linear actuator from the carriage.
4. Disconnect the shaft seal plate (FIG. 17) from each side of the linear actuator. Slide the seals down the drive shaft until they are out of the way. (If the optional carriage bellows were installed, the shaft seals may already have been removed).
5. Remove the shoulder bolts holding the six bearings (three on each side) to the actuator block. Remove the old bearings and discard them, but save the inside washers and shoulder bolts.

   Inspect the hole from which the bearing and shoulder bolt were removed, for foreign matter. Clean thoroughly.
6. Wipe the drive shaft clean and dry.

If oil is left on the drive shaft, the pulling force may have to be set too high in the following procedure. This will shorten the bearing life.

7. Insert the shoulder bolts through the new bearings and through the inside washers (saved in Step 6). Then install the complete bearing assemblies into the actuator block and tighten the shoulder bolts.

Be very careful not to cross-thread the bearing bolts!

Reinstall the shaft seal plates if applicable. Be sure the seal plates are mounted concentric to the drive shaft.

8. Slide the carriage over the actuator, and line up the hole in the carriage with the tapped hole in the top of the actuator block. Insert the actuator mounting screw through the self-adjusting bearing, and tighten the screw.

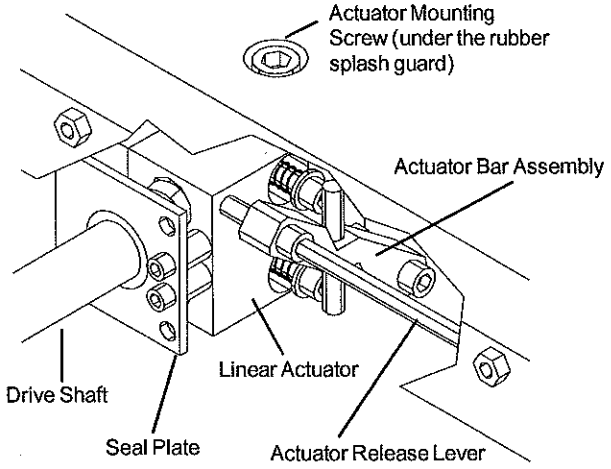
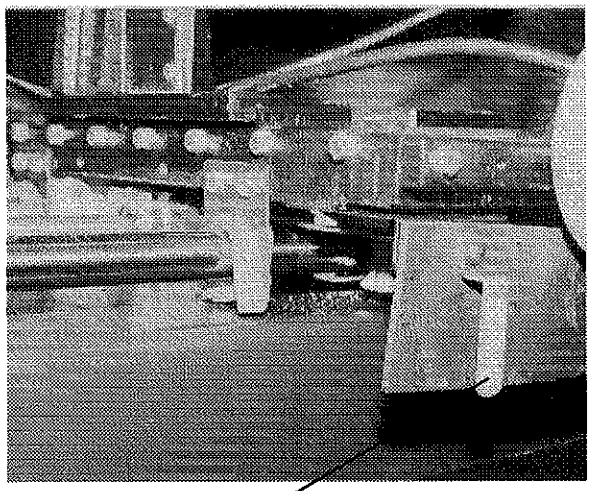
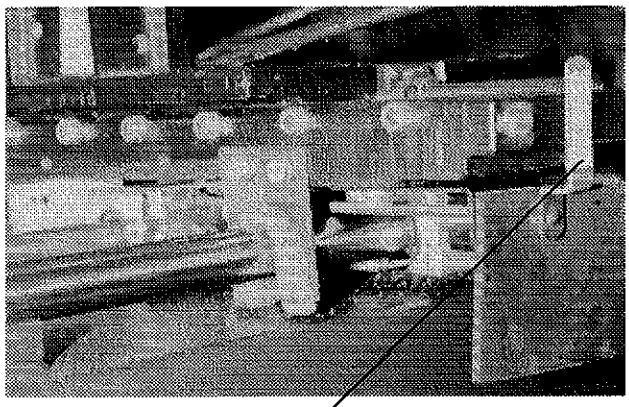


FIG. 17



Actuator Engaged

FIG. 18A



Actuator Released

FIG. 18B

ADJUSTMENTS (Continued)

TO REPLACE THE LINEAR ACTUATOR BEARINGS

9. Install the actuator release lever into the actuator bar assembly. Turn the actuator release lever counterclockwise 1/2 turn to engage the actuator.

10. Connect a spring scale so it pulls on the carriage parallel to the drive shaft. Hold the drive shaft from rotating while you pull on the carriage. See FIG. 19.

    To overcome the actuator, the pulling force should be 45 to 60 lbs (20-27 kg), with 50 lbs (23 kg) being ideal. If not within those specifications, the actuator tension must be adjusted. See "Adjusting the Pulling Force" below.

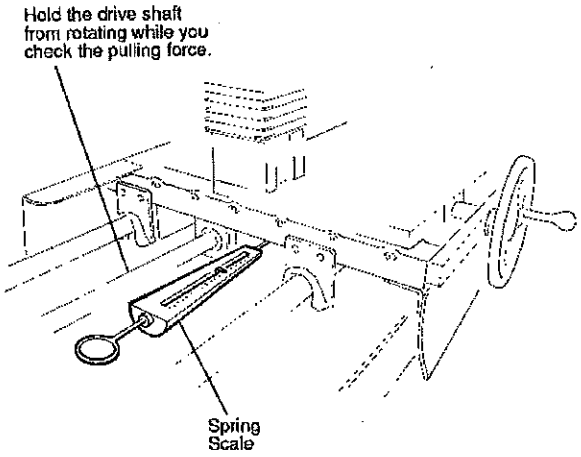


FIG. 19

Exceeding 60 lbs force won't greatly improve drive performance - and it will shorten the bearing life.

Adjusting the Pulling Force

If the pulling force is not within specification (Step 10 above), adjust it:

1. With the actuator bearings engaged to the drive shaft, readjust the two outboard screws with spring that hold the actuator together. To reach these screws, you must remove the actuator bar assembly. See FIG. . Turn each outboard screw an equal amount when resetting. Turn clockwise for more tension.
2. Check the force again (repeat Step 10 above). Continue adjusting and rechecking until within specification.

   NOTE: The factory-adjusted position to reach tension specifications is to compress the spring until there is .22 in. (5.5 mm) clearance between the washer and the actuator block. See FIG. 20. Use this as a starting point unless you are already close to the specified tension.
3. When the tension adjustment is correct, reinstall the actuator bar assembly and actuator release lever.

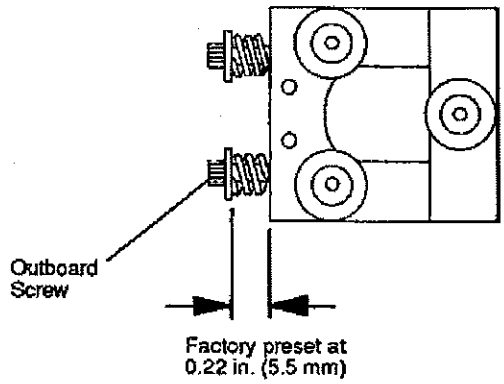


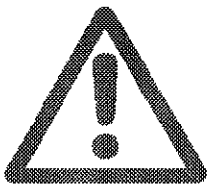
FIG. 20

If the actuator release lever is tightened too much, it will contact the outboard screw heads and override their adjustment, which could cause a traverse malfunction. Make certain that you have full engagement when you reengage the actuator.

TO REPLACE THE CARRIAGE LINEAR BEARINGS

NOTE: Set a small bench or table near the center front of the machine for use in the following procedure.

1. Remove the **optional** carriage bellows (if used) from the carriage.
   Remove the actuator release lever from the linear actuator and remove the sholder bolt from the top of the carriage.
2. Remove the complete carriage assembly from the machine:
   A. Crank the carriage forward further until you expose the actuator mounting screw (FIG. 22) on the top side of the carriage base. Remove the screw, to disconnect the actuator from the carriage.
   B. Remove the bolts which secure the front and rear carriage rails to the Grinder base (six screws for each rail, accessible from beneath the machine).



The carriage assembly weighs about 40 lbs (18 kg). If necessary, get help for the following steps.

   C. Lift the complete assembly (carriage, carriage shafts, vertical column, and grinding head) out onto the table in front of the Grinder. Be careful you don't damage the motor cord.
3. Lift the carriage and slide the rails out of the bearings, one at a time.
4. Remove the three linear bearing pillow blocks (four screws each) from the bottom of the carriage, and discard them.
5. One at a time, slide the three new linear bearing pillow blocks onto a carriage rail.
6. Adjust the tension screw (FIG. 23) on the side of each bearing block so that when you radially rotate the pillow block around the carriage (See FIG. 24) rail there is no free play between the bearing and rail. You should feel a strong drag.

   Repeat this adjustment to all three pillow blocks, and then remove the pillow blocks from the carriage rail.

   NOTE: The tension is too tight if you feel a cogging action when you rotate a pillow block around the rail. This cogging is caused by the bearing skidding on the rail. Rocking the bearing block back and forth should be a smooth uniform motion.

Bearings which are too tight or too loose will cause poor grinding quality. Bearings which are too tight will also have a much shorter life, and could damage the rail.

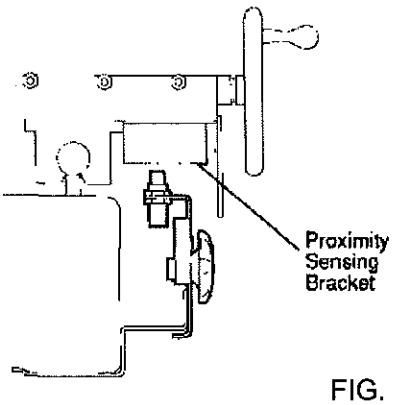


FIG. 21

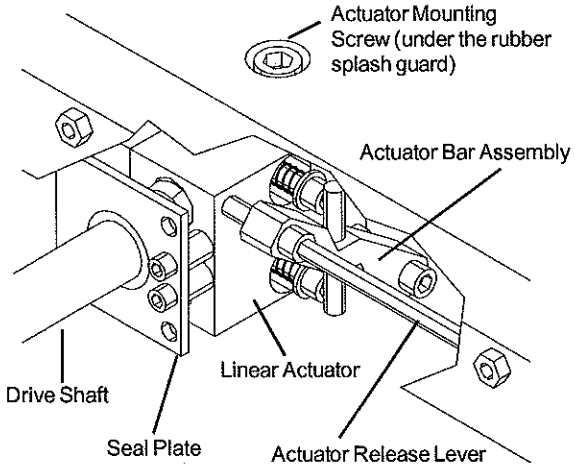


FIG. 22

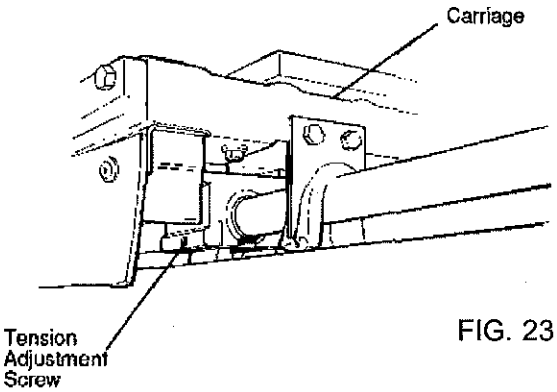


FIG. 23

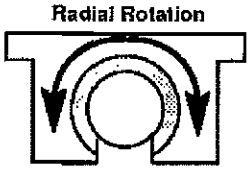


FIG. 24

ADJUSTMENTS (Continued)

TO REPLACE THE CARRIAGE LINEAR BEARINGS

7. Attach the three linear bearing pillow blocks loosely to the bottom of the carriage, with their tension adjustment screws (FIG. 23) facing outward.
8. Clean the carriage rails.
   NOTE: The two rails are interchangeable and are also reversible (end-for-end).
9. Insert a rail through the rear two pillow blocks, and align the rear pillow blocks to each other with a straight edge laid along their sides. See FIG. 25. When aligned, tighten the four socket-head screws which hold each rear pillow block. Slide the other carriage shaft through thefront bearing, but do not tighten the socket head screws.
10. Lift the complete carriage assembly back onto the Grinder main base, and secure the rear carriage rail to its V-groove bosses with the six bolts.
11. With the front rail resting in the V-groove bosses and the carriage approximately centered on the machine, tighten the two outside socket-head screws which secure the front pillow block. Lift the front of the carriage, and tighten the two inside pillow-block screws. Secure the front carriage rail to its V-groove bosses with the six bolts.
12. Recheck the bearing tension. The tension is correct when you try to lift the carriage and can feel no free carriage movement up or down.
    Check for excessive carriage-traverse load by using a spring scale to pull on the carriage parallel to the drive shaft (as in FIG. 19). There should be only about a 3- to 5- lb. pulling force.
    To double-check, manually slide the carriage assembly from one end of its travel to the other. There should be uniform resistance through the full range of travel.
13. Slide the linear actuator under the carriage, and line up the hole in the carriage with the tapped hole in the top of the actuator block. Insert the actuator mounting screw through the self-aligning bearing, and tighten it.
    Be careful not to cross-thread the screw.
14. Reinstall the actuator release lever into the linear actuator.
15. If being used, reattach the two carriage bellows. Refer to the assembly section of this manual.

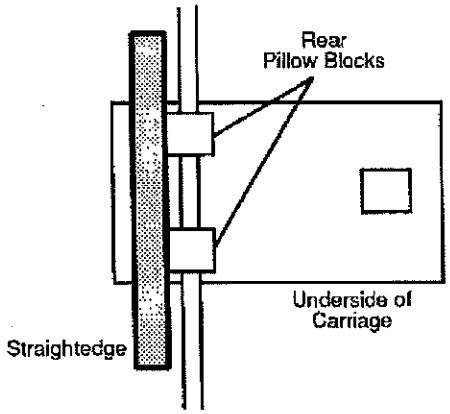


FIG. 25

ADJUSTMENT (Continued)

TO ALIGN THE MOTOR SHAFT AND DRIVE SHAFT

There must be 0.12 to 0.50 in. (3.0 to 12.7 mm) end clearance between the traverse motor output shaft and the drive shaft, inside the flexible coupling (FIG. 27).
To prevent drive shaft "whipping" at higher traverse speeds, the two shafts must be aligned so they are concentric within .010 in. (0.25 mm). To align:

1. Loosen the two set screw in the coupling.
2. Remove the cover on the outside of the right leg.
3. Loosen the two bolts which secure the motor assembly to the leg.
4. Visually align the two shafts, then tighten the motor mounting bolts. Reinstall the leg cover.
5. Check that the spiral gaps in the flexible coupling are equally spaced, then tighten the coupling set screws.
6. Check that the bearing support block is at 90° to the drive shaft (within +/- 1/4 degree). Use a precision square held against the bearing shoulder and the rear rail, as in FIG. 26.

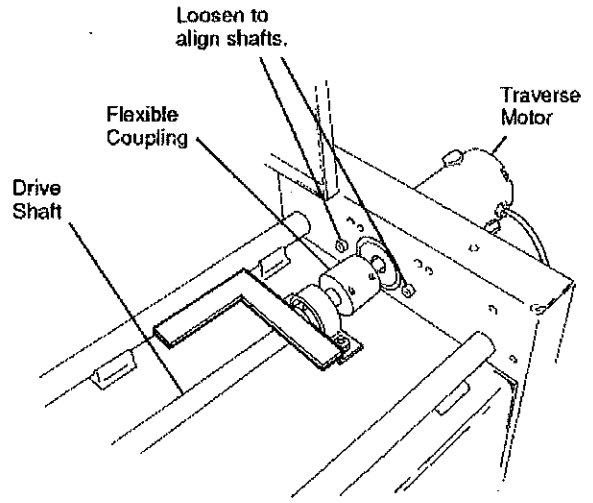


FIG. 26

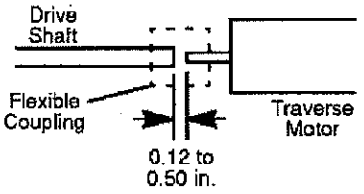


FIG. 27

TO ALIGN THE REAR RAIL AND DRIVE SHAFT

The rear carriage rail and the drive shaft must be precisely aligned:

1. Loosen the two bolts holding the bearing support blocks at each end of the drive shaft. FIG. 28.
2. Align the drive shaft and rear carriage rail (FIG. 29) so the distance between their facing surfaces is 3.375" +/- .010 (85.75 mm +/- 0.25). See FIG. . Then tighten the support block bolts.
3. Check that the bearing support blocks are still at 90° to the drive shaft (within +/- 1/4 degree). Use a precision square held against the bearing shoulder and the rear rail.
4. If you have difficulty obtaining the above alignment, check the straightness of the carriage rails (see below).

NOTE: The vertical and horizontal straightness of the rails is very accurately set at the factory, so they are unlikely to be incorrect. Contact the factory if you suspect a problem after making the following tests.

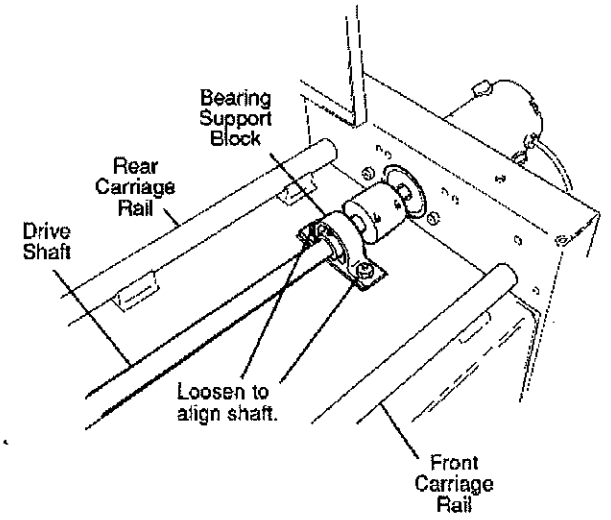


FIG. 28

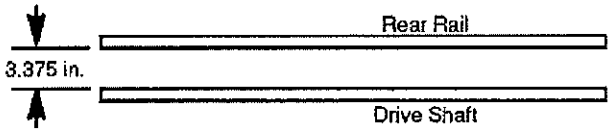


FIG. 29

If the drive shaft is adjusted, you may have to realign the motor shaft and drive shaft (see above).

ADJUSTMENTS (Continued)

TO ADJUST THE CAM FOLLOWERS

Check the grinding head by torquing on the motor assembly with about a 10-lb (5-kg) load. If you note any movement of the motor assembly, adjust the cam follows:

1. Remove the two sheet-metal dust covers over the followers. The covers have been removed in FIG. 30.
2. The grinding head is attached to the top of the vertical column. Inside the column there is a square post mounted on the carriage.

   The cam followers allow you to square up the vertical motor slide to the square post.

NOTE: The grinding head has a 1° angle built in, so that the area of the wheel which contacts the bedknife is on the left side of the motor.

To adjust:

A. Rotate the grinding head to its vertical position.

B. Slightly loosen the lock nut on the shaft of the two adjustable cams - just enough so the cams can be turned (below).

C. With an Allen wrench, tighten one of the adjustable cams **(counterclockwise)** against the column, with a starting torque of about 3 ft.-lbs. (40 kg-cm). **Never overtighten,** or you may dent the vertical column. Then keep the follower from turning (with the wrench), and tighten the lock nut.

D. Tighten the other adjustable cam the same way.

E. Recheck for movement of the grinding head. There should be no movement with about a 3-lb load on the motor.

NOTE: If you remove an adjustable cam follower and nut, don't reverse them when reinstalling. The single (adjustable follower must be **directly opposite** a pair of fixed followers. See FIG. 31.

3. Reattach the two sheet-metal covers. Note that one of the covers has a lip: install the lip **over** the other cover. See FIG. 32.

   Be careful with the cover gaskets, which keep dirt out of the inside of the column.

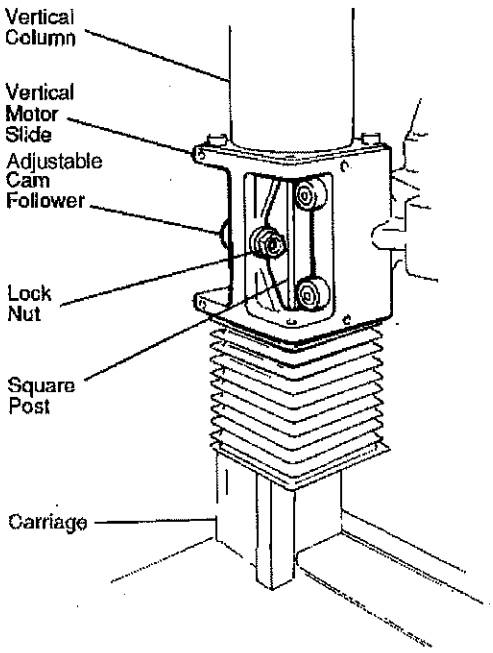


FIG. 30

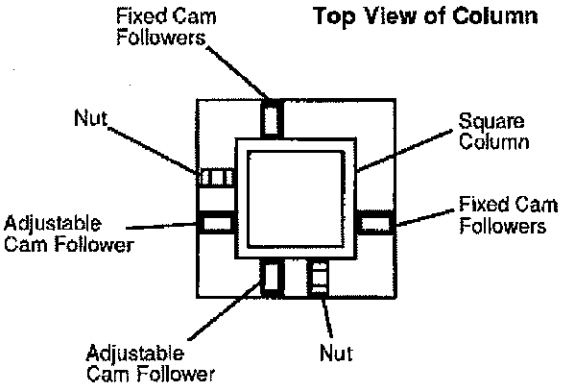


FIG. 31

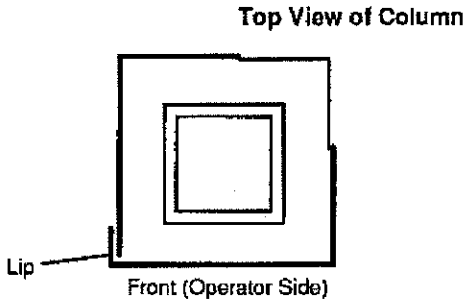


FIG. 32

ADJUSTMENT (Continued)

TO ADJUST THE PROXIMITY SWITCHES

For the proximity switches to work properly and reverse the direction of the carriage at each end of a traverse, a distance of 3/16 in. +/- 1/32 (4.75 mm +/- 0.75) must be maintained between the top of the switch and the actuator bracket on the bottom of the carriage. See FIG. 33.

To adjust the clearance, loosen one of the switch mounting nuts while tightening the other.

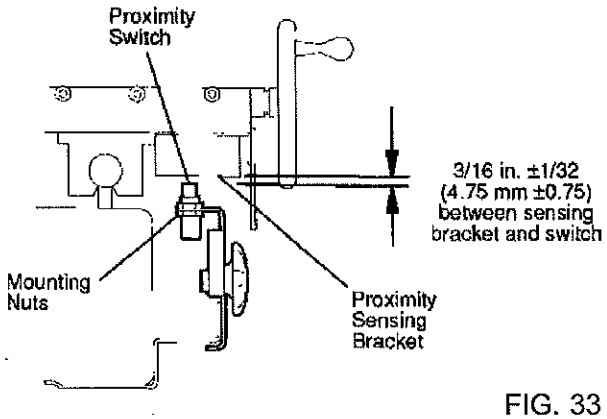


FIG. 33

TO ADJUST THE GIB PLATE

The gib plate must be readjusted occasionally to eliminate free play. Otherwise, the vertical column and grinding head can move from side to side, and the bedknife may be ground unevenly.

The gib must allow the carriage to be cranked freely forward and back without any side play.
See FIG. 34. To adjust:

1. Crank the carrige all the way forward (toward the operator position).
2. Tighten the front gib screw until the carriage has no side play but the horizontal handwheel can still be cranked.
3. Crank the carrige gradually back (away from the operator position), and adjust the remaining gib screws as you go.

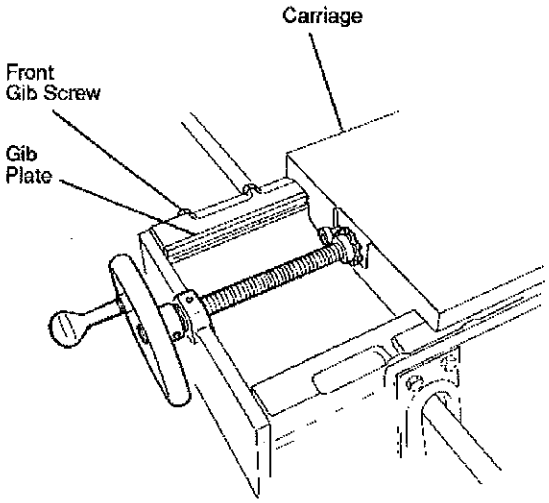


FIG. 34

ADJUSTMENTS (Continued)

TO ELIMINATE CARRIAGE INFEED BACKLASH

If there is backlash in the carriage infeed handwheel (FIG. 35), there are two adjusting points to check:

1. Conical washers behind the shaft adjusting nut:
   A. Unscrew the shoulder bolt.
   B. Hold the horizontal handwheel, and turn the shaft adjusting nut counterclockwise until the conical washers are touching each other. Continue turning the nut counterclockwise until the next notch is centered over the shoulder-bolt hole. Then turn the nut one notch (40°) further.
   C. Reinstall the shoulder bolt to lock the nut in position.

2. Washers behind the handwheel:
   A. Loosen (about one-half turn) the set screw holding the handwheel to the shaft.
   B. Tighten the hex nut which secures the handwheel to 100 in.-lbs (1.15 kg-m), then back it off 1/2 turn.
   C. Check for .015 in. (0.4 mm) gap between the wave washer and flat washer.. See the insert to FIG. 35. Readjust the hex nut if necessary.
   D. Tighten the set screw holding the handwheel to the shaft.

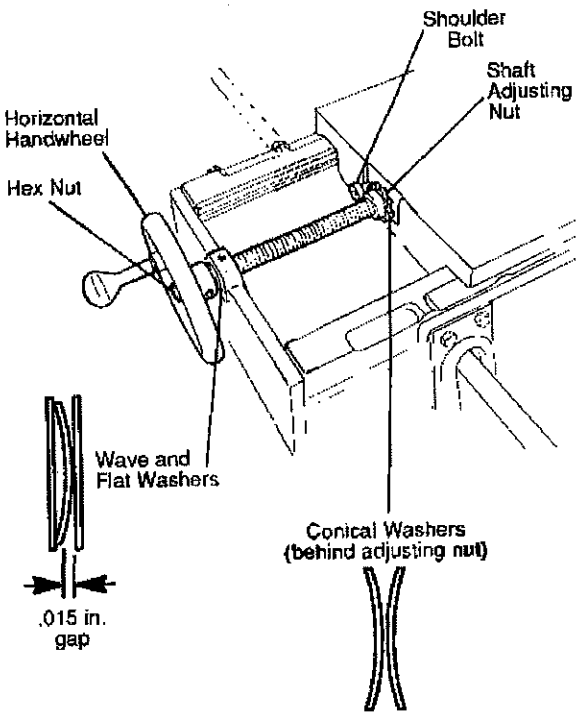


FIG. 35

ADJUSTMENTS (Continued)

POTENTIOMETER ADJUSTMENTS TRAVERSE DRIVE CONTROL (TDC)

Min. Speed--Factory set at full (CCW) 8:30. Do not change this setting.

(Right Traverse) Forward Torque--Factory set at full (CW) 4:30. Do not change this setting.

(Left Traverse) Reverse Torque--Factory set at full (CW) 4:30. Do not change this setting.

IR COMP--Factory set to 9:00. Regulation of a traverse motor may be improved by slight adjustment of the IR COMP trim pot clockwise from its factory-set position. Overcompensation causes the motor to oscillate or to increase speed when fully loaded. If you reach such a point, turn the IR COMP trim pot counterclockwise until the symptoms disappear.

Max. Speed--Set at 3:30 for maximum voltage of 90 Volts DC to the traverse motor. When voltage is above 90 volts DC, the traverse motor will start to pulsate and not run smoothly.

(Right Traverse) Forward Acceleration--Factory set at full (CCW) 8:30. Do not change this setting.

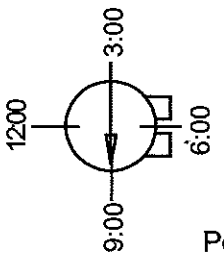
(Left Traverse) Reverse Acceleration--Factory set at full (CCW) 8:30. Do not change this setting.

(DB) Dead Band is the potentiometer setting for the 50 or 60 Hz cycle control. Factory set to 9:00, works for both 50 and 60 Hz. Do not change this setting.

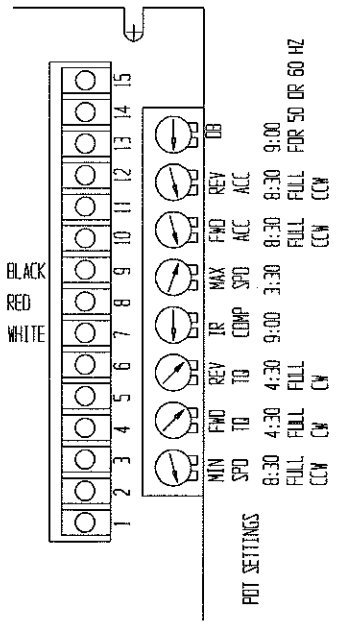
Calibrating the **DWELL TIME** rotary DIP switch adjusts the amount of time the process remains in the stop position after a limit switch is actuated. The **DWELL TIME** range is adjustable from 0 - 4 seconds. A DIP switch setting of 0 sets the **DWELL TIME** to 0 seconds, while a setting of 9 sets the **DWELL TIME** to 4 seconds. Dwell time is preset to #2 setting for a 1 second dwell time when reversing at each end of stroke. A setting of 4, sets the dwell time at 2 seconds, etc.

Diagnostic LED's indicate the function that is currently being performed:

* **POWER indicates that ac power is being applied to the control.**
* **FORWARD indicates that the process is running in the forward direction (traversing left).**
* **REVERSE indicates that the process is running in the reverse direction (traversing right).**
* **PROX 1 FWD LIMIT lights when the forward limit switch is actuated (left prox).**
* **PROX 2 REV LIMIT lights when the reverse limit switch is actuated (right prox).**
* **DWELL lights when the process remains stopped after a proximity switch is actuated.**



Potentiometer
Clock Orientation



--ELECTRICAL--

--PROBLEM--	--POSSIBLE CAUSE--	--REMEDY--	--REASON--
Grinding motor do not function (no apparent power to machine).	**A**--Grinding Motor Switch (GMS) is not on.	Turn switch on.	
	B--Main power source breaker is tripped, power source switch is off, or grinder is not plugged in.	Reset breaker, turn switch on and plug machine in.	
	C--System Start Switch (SSS) is not on.	Press System Start Switch.	
	D--Voltage not going to magnetic starter.	With the volt meter set on AC voltage, check L1 (black) to L2 (white) for lines coming in of 120 volt. Check power source fuse.	AC voltage power source required.
	Solenoid in magnetic starter does not pull in.	Check for loose connections on magnetic starter. Check for 115 Volts AC across starter coil A1 to A2. NOTE: Contactor clicks when engaging.	These wires control magnetic starter voltage for main power.
	Solenoid pulls in, but no voltage out of magnetic starter.	Check for 120 volt AC between terminals T1 (black) and T3 (white). T1 and T3 are main power out lines. NOTE: T2 is jumpered to T3. Check reset overload on starter by pushing down on blue button. Check terminal connections between contactor and overload relay. If no voltage on output, replace magnetic starter.	Overload may have been tripped when moving machine or machine grinding head motor overload or electrical power surge.

--ELECTRICAL--

--PROBLEM--	--POSSIBLE CAUSE--	--REMEDY--	--REASON--
Insufficient hesitation at carriage stops prior to reversing traverse direction for relief grinding.	The dwell time on the traverse drive control not set properly.	Reset dwell time on traverse control board as required; one increment increases dwell time by 1/2 second. See Page 50.	
If the carriage traverses to one end of stroke or the other and it stops and does not reverse direction .	Proximity switch is not working properly or wire connections are loose.	First check to see if proximity light comes on when placing a steel piece over the prox switch. When the light is on it means that there is electricity coming to proximity switch. Left proximity (PROX 1) check Traverse Drive Control (TDC) between terminals #14 (black wire) and #15 (brown wire) Right proximity (PROX 2) check (TDC) between terminals #13 (black wire) and #15 (brown wire). Replace proximity switch if the voltages do not read as above.	The light coming on shows the proximity is getting electrical contact. Proximity light on-- 0 Volts DC Proximity light off-- 12 Volts DC Proximity light on-- 0 Volts DC Proximity light off-- 12 Volts DC
If the carriage traverses past the proximity switch and keeps on traversing in same direction.	The two proximity switches have been reversed on the slide bar. NOTE: This should only happen if the main circuit board has been replaced. Proximity switch is not working properly.	Make sure the proximity light is coming on when placing a steel piece over the prox switch. Check proximity spacing to the sensor. If no light, first check adjustment section for proximity setting. If there is a light, it means that there is electricity coming to the proximity switch. Left proximity (PROX 1) check (TDC) between terminals #14 (black wire) and #15 (brown wire). Right proximity (PROX 2) check (TDC) between terminals #13 (black wire) and #15 (brown wire). Replace proximity switch if the voltages do not read as above.	This will only happen if the main reversing board has been replaced and not rewired to electrical diagram. Proximity light on--0 Volts DC Proximity light off-- 12 Volts DC Proximity light on--0 Volts DC Proximity light off-- 12 Volts DC
Traverse changes directions erratically while running in traverse cycle.	Loose wire to proximity switch.	Check wire connections from the proximity switches and tighten down screws.	A loose wire connection will give intermittent electrical contact.

--PROBLEM--	--POSSIBLE CAUSE--	--REMEDY--	--REASON--
Traverse motor does not work.	A--Traverse Motor Switch is not on.	Turn on motor switch.	
	B--Blown fuse.	Replace the 2 amp fuse on the control board and decrease stock removal rate.	Extremely heavy grinding cuts cause excessive loading of the motor.
		Replace actuator bearings if they are worn and do not rotate freely. (For more detail, see actuator maintenance in the adjustment section of the manual.)	Worn and binding actuators causes heavy loading to motor.
		Replace the lineal bearings in the main carriage. Carriage should traverse freely with a 3 lb. maximum loading. Also check for excessive bearing preload. (For more detail see carriage bearing replacement in the adjustment section of the manual.)	Grinding grit over a period of time does get into the lineal bearings and causes excessive drive torque of carriage.
	C--No voltage going to motor.	Check for 90 volt DC at the circuit board leads going to the motor. Across terminals A1 and A2, check reading with a voltage meter. When there is voltage from the circuit board but DC motor does not run, check wiring and connections. The voltage reading varies with speed pot setting. NOTE: Make sure speed pot setting is towards the maximum dial reading for 90 volts. Check for incoming voltage at L1 to L2 for at least 105 Volts AC Red power light is on.	This checks to see that voltage is getting to the control board.
	D--Bad traverse motor.	Remove the brushes one at a time and maintain orientation for reinsertion. See if brush is worn short 3/8" [9.5 mm] minimum length, and look at wear pattern on commuter for arcing. Replace brushes if necessary. Replace motor if brushes are good. Remove wires from A1 to A2 from the spin motor. Check with the ohm meter for "0" ohms across the white and black wires.	A short brush does not make an adequate electrical connection to run the electrical motor. NOTE: Brushes are long lived and seldom need replacing.

--PROBLEM--	--POSSIBLE CAUSE--	--REMEDY--	--REASON--
Traverse speed control goes at one speed only.	A--Wiring hookup to potentiometer is improper. (If components have been replaced.)	Check potentiometer wiring for proper hookup. See that speed pot is wired per electrical diagram.	Wrong wire hookup effects traverse control. Reversing red and orange wires to potentiometer the DC motor will run at zero speed but maximum will be too slow. Reversing red and white wires does not affect speed control.
	B--Defective speed control potentiometer.	Check Potentiometer on control panel.	Traverse Drive Control Pin #8 to 7 Pot Full CCW Pot Full CW 0 VDC 9.75 VDC Pin #8 to 9 Pot Full CCW Pot Full CW 9.75 VDC 0 VDC If Yes, pot is O.K. If No, go to step below
		Check Petentiometer for 10,000 ohms. Remove three wires from Traverse Drive Control red from term #8 white from term #7 black from term #9	Check for 10,000 ohms red to white wires Full CCW--10,000 ohms Full CW--0 ohms Red to black wires Full CCW--0 ohms Full CW--10,000 ohms If Yes, pot is O.K. If No, replace potentiometer Wiper inside of potentiometer controls speed. Wiper may be bad and not making contact.
	C--Main circuit board dial pot settings not correct. (If board has been replaced.)	Check all pot settings on circuit board as shown in wiring diagram. (See adjustment section Traverse Motor Control Board Settings.)	Minimum and maximum pot settings effect traverse speed.

--PROBLEM--	--POSSIBLE CAUSE--	--REMEDY--	--REASON--
--MECHANICAL--			
Carriage traversing (varies speed) while grinding.	**A**--Oil on carriage drive shaft.	Wipe oil completely from shaft. Spray down with WD-40 and wipe off.	Driving torque is lost because the oil is decreasing friction for driving linear actuator bearings.
	B--Lineal bearings in carriage do not rotate freely.	Replace the lineal bearings in the main carriage. (For more detail, see lineal bearing replacement in the adjustment section of the manual.)	Grinding grit over a period of time does get into the lineal bearings and cause excessive drive torque of carriage. Abrasive noise is detectable when excessive grit is in the lineal bearings.
Traverse speed is too slow.	**A**--Lineal bearings in the carriage are set too tight.	Readjust bearings for proper tension. (For more detail see lineal bearing replacement in the adjustment section of the manual.)	When bearing preload is too tight, it causes excessive loading to drive the carriage. When lineal actuator is disengaged, the proper traverse load 2 to 3 lb. Use a tension scale to check. (A general guide only.) NOTE: Check with linear actuator released.
	B--Actuator springs set too tight.	Check to see if actuator bearings have been overloaded, causing the bearings to not rotate freely. (For more detail, see actuator setting in the adjustment section of the manual.)	When actuator spring tension is excessive bearings will not rotate freely causing carriage to not run freely.

--PROBLEM--	--POSSIBLE CAUSE--	--REMEDY--	--REASON--
Actuator drive shaft whipping excessively at high traverse speed.	A--Bearing shaft support blocks are not perpendicular to carriage shaft.	Loosen the screws that retain the shaft support blocks on each end of the actuator shaft. Use a square to align bearing face 90 degrees to the front rail and holding the actuator shaft to the front rail to 3.375 dimension. (For more detail, see align front rail and drive shaft in the adjustment section in the manual.	Misalignment of shaft support blocks to carriage traverse rod causes a bow in the rod. This bow will cause an out of balance which in turn will cause it to whip at high traverse speeds.
	B--Drive shaft is bent.	Turn the actuator screw clockwise 1/4 to 1/2 turn to release actuator from the drive shaft. Slide the carriage to one end of the machine. Mount indicator in the middle of the two bearing support blocks. Check for a maximum of .015 indicator reading when you rotate the shaft. Replace shaft if required. NOTE: Item A above must be done proper to this step.	Excessive bend in the shaft will cause the shaft to whip at high traverse speeds.
	C--DC drive motor shaft not concentric to drive shaft.	Loosen two bolts holding the motor. Align the motor shaft concentric to the drive shaft. See if coupling spiral gaps are equally spaced when re-aligned. (For more detail, see Traverse Motor Coupling in the adjustment section.)	Side load at the shaft end will bend the shaft and cause it to whip at high speed traversing.

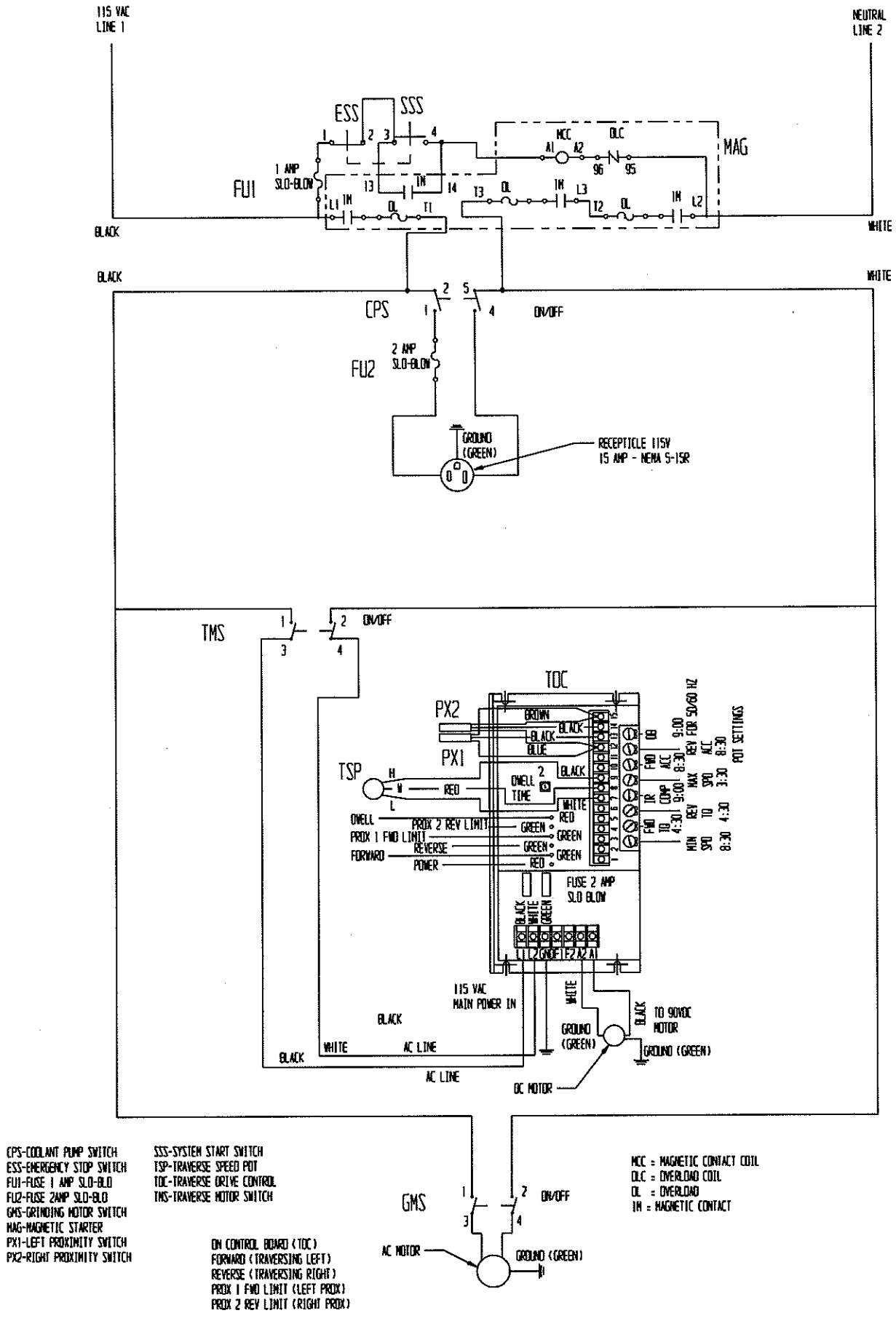
--PROBLEM--	--POSSIBLE CAUSE--	--REMEDY--	--REASON--
Top face of bedknife is ground in a concave shape (low in the center)	**A**--Middle bedknife support is loose.	Square up the magnet against the bedknife, and tighten the tilt lock lever. Then tighten the magnet lock knob. Be sure the locking set screw protrudes .03" [.75 mm] through the casting and into the rod locking clamp half, to prevent slippage. Refer to the Operators Manual for proper bedknife mounting.	With grinding pressure on the bedknife, the middle support moves downward if it isn't rigid.
	B--Bedknife isn't touching the middle support.	Rotate the bedknife down to the support. Refer to Operators Manual for proper mounting of bedknife.	A 3-point support (the two end supports and one in the middle) are required for rigidity when grinding.
	C--Bedknife isn't held rigid by the centers (centers not tensioned properly).	Screw in the centers on the supports until the bedknife is held tightly. Check that the lock lever is tight on adjustable support. Refer also to Operators Manual.	When the centers aren't tight, the bedknife can move under pressure from the grinding wheel. As the wheel passes over the rigid middle support it grinds full-depth; then as it progresses to the ends the bedknife moves away from the wheel.
	D--Grinding wheel loading up with grinding grit.	Dress the wheel prescribed in the Operators Manual.	A loaded wheel creates undue pressure on the surface being ground. Both ends of bedknife move because of this pressure, allowing bedknife to rock on the middle support.
	E--Too heavy a grind on the final grinding pass.	Follow the procedures in the Operators Manual. On the final pass, crank down only about .001" [.025 mm]. Let the wheel spark out for 10-20 passes at about 5 ft/min, with no additional infeed.	For precise grinding, sparking-out process is critical. It eliminates excessive final-grinding pressure on centers and middle support, which helps maintain grinding straightness.
	F--Gib screws loose, or carriage infeed screw loose.	Tighten gib screws to prevent movement (See Page 23). Also check for any grinding grit buildup behind the gib. Eliminate backlash in horizontal handwheel (See Page 24).	A loose gib, backlash in infeed screw, or grit buildup, allows grinding head to move when grinding.

--PROBLEM--	--POSSIBLE CAUSE--	--REMEDY--	--REASON--
Top face of bedknife is ground in a concave shape (low in the center)	**G**--Carriage has varying load in either direction, because of grit buildup inside linear bearings.	With linear actuator released from the carriage, check for a 5 lb [2.25 kg] maximum traversing load in both directions. If load varies, or carriage linear bearings are excessively noisy, replace bearings (See Page 19).	Uneven loading because of grit buildup in bearings can affect the straightness of grinding. When grit buildup is excessive, bearings may be noisy and must be replaced.
	H--Rails not straight vertically.	Check straightness. If not straight, consult the factory through your distributor. (This is carefully checked at the factory, so it is unlikely to be the cause.)	Vertical straightness of rails is critical for accuracy of top face grinding.
Top face of bedknife is ground in a convex shape (high in the center)	**A**--Bedknife isn't supported solidly by the middle support.	Be sure middle support is centered (left-to-right) under bedknife. Square up the magnet against the bedknife, and tighten the tilt lock lever. Then tighten the magnet lock knob. Be sure the locking set screw protrudes .03" [.75 mm] through the casting and into the rod locking clamp half, to prevent slippage.	When the middle support isn't tight, bedknife can move under pressure from the grinding wheel. When the wheel grinds the ends of the knife (held rigid by the two centers), it grinds full-depth; then as it progresses toward the middle, the bedknife moves away from the wheel and isn't ground as deep.
	B--Rails not straight vertically.	Check straightness. If not straight, consult the factory through your distributor. (This is carefully checked at the factory, so it is unlikely to be the cause.)	Vertical straightness of rails is critical for accuracy of top face grinding.

--PROBLEM--	--POSSIBLE CAUSE--	--REMEDY--	--REASON--
The top face of the bedknife is ground unevenly across the width.	**A**--Grinding wheel rim is not completely over the top face being ground.	The wheel rim must extend over the bedknife top face by 1/2" [13 mm] whenever possible. See Operators Manual. If not possible, dress the wheel more often.	When the rim doesn't extend over the top face, it wears unevenly and causes grooves across the bedknife.
	B--Gib screws loose, or carriage infeed screw loose.	Tighten gib screws to prevent movement (see Page 23). Also check for any grinding grit buildup behind the gib. Eliminate backlash in horizontal handwheel (see Page 24).	A loose gib, backlash in infeed screw, or grit buildup, allows grinding head to move when grinding.
	C--Cam followers not tight against the vertical square post.	Adjust the cam followers. See Page 22.	If cam followers are too loose, the grinding head has play - causing an unevenly ground surface.
Too coarse a grind on bedknife.	Grinding head is traversing too fast.	Slow down the traversing speed to 12 FT/MIN.	Traversing speed controls the grinding surface texture. A slower traverse produces grind marks closer together.
The amount of stock removed varies when traversing in opposite directions.	**A**--Rotational movement of grinding head. Cam followers not tight against the vertical square post.	Adjust the cam followers. See Page 22.	If cam followers are too loose, the grinding head has play - causing an unevenly ground surface.
	B--Backlash in vertical feed.	Remove backlash. See Page 24.	Grinding wheel can move vertically, affecting straightness of grind, if there is play in vertical feed screw. More visible with heavy grinds.
	C--Gib screws loose, or carriage infeed screw loose.	Tighten gib screws to prevent movement (see Page 23). Also check for any grinding grit buildup behind the gib. Eliminate backlash in horizontal handwheel (see Page 24).	A loose gib, backlash in infeed screw, or grit buildup, allows grinding head to move when grinding.

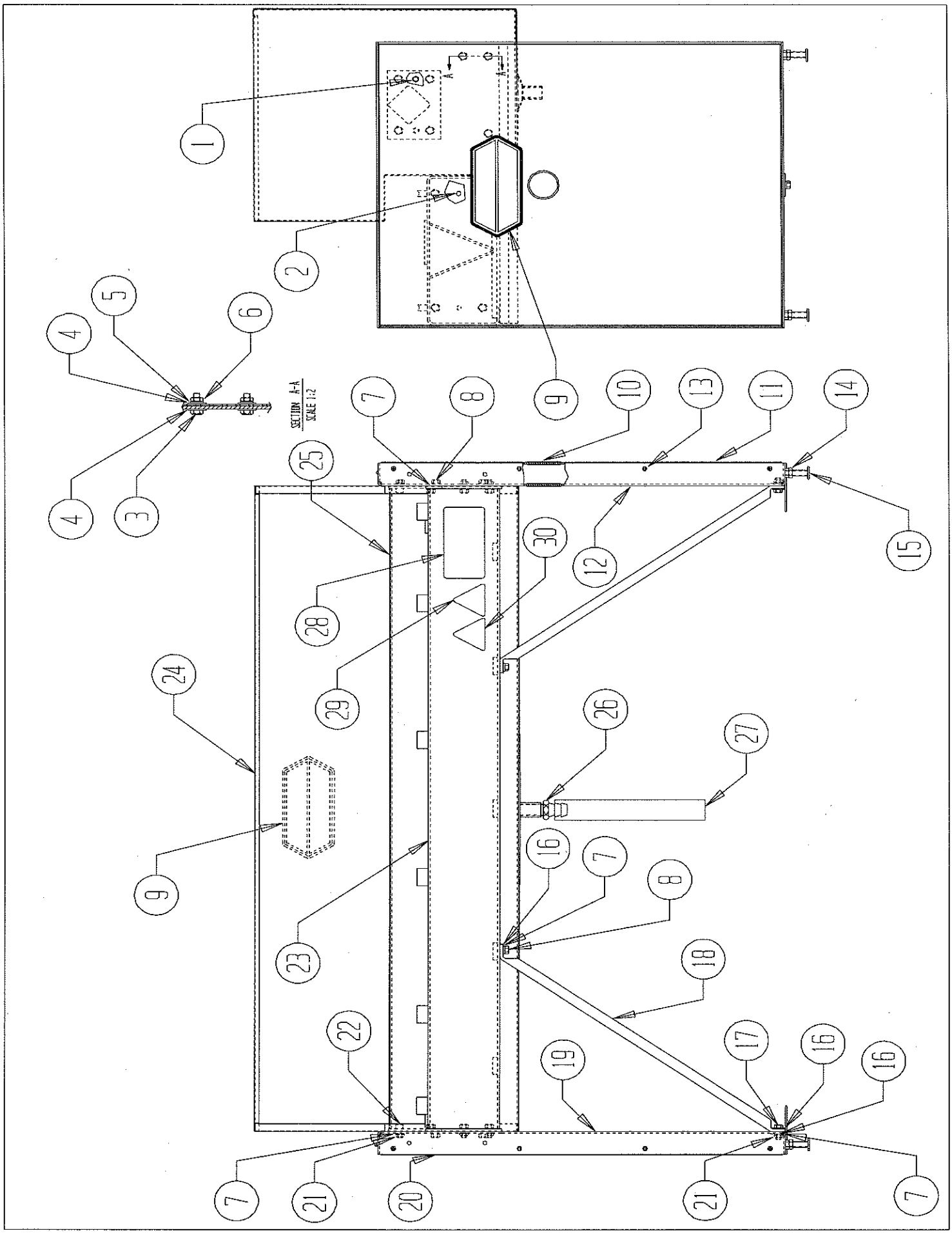
--PROBLEM--	--POSSIBLE CAUSE--	--REMEDY--	--REASON--
The top face of the bedknife shows burn marks from being too hot.	**A**--Coolant not directed onto the bedknife and grinding wheel.	Direct coolant into the grinding wheel, at the point of the grind. See Operators Manual.	When the front face of the bedknife gets too hot, the steel loses its temper (softens).
	B--Too heavy stock removal during grinding.	Take off about .002 to .003" [.05 to .075mm] per pass during rough grind. See Operators Manual.	Too much stock removal in one pass creates too much heat and softens the steel.
	C--Grinding wheel is glazing.	Dress the wheel before the finish-grinding pass on each bedknife. See Operators Manual.	Wheel will glaze if not dressed often enough. Also, as a general rule, use a higher traverse speed for the heavy grind.
Grinding wheel is glazing too quickly.	**A**--Wheel needs dressing.	Dress the wheel before the finish-grinding pass on each bedknife. See Operators Manual.	Wheel will glaze if not dressed often enough. If grinding wheel is not extended 1/2" [12 mm] over bedknife, it will glaze more quickly because there is less dressing.
	B--Too light a cut when rough grinding.	Take off about .002 to .033" [.05 to .075 mm] per pass during rough grind. See Operators Manual.	Too light a grinding cut doesn't permit enough dressing action on the wheel, so it glazes.
	C--Grinding head is traversing too slow.	Set the traversing speed to 12 FT/MIN.	Too slow a traverse speed can cause excessive heat buildup in the grinding wheel, which glazes the wheel.
Grinding motor vibrates excessively.	Grinding wheel is out of balance.	Visually check the outside-diameter runout while slowly rotating the wheel. Also check the motor without a wheel installed. Replace the wheel if out-of -round.	A grinding wheel which isn't properly trued up on outside or inside diameters can vibrate excessively and transfer that vibration to the motor.

WIRING SCHEMATIC

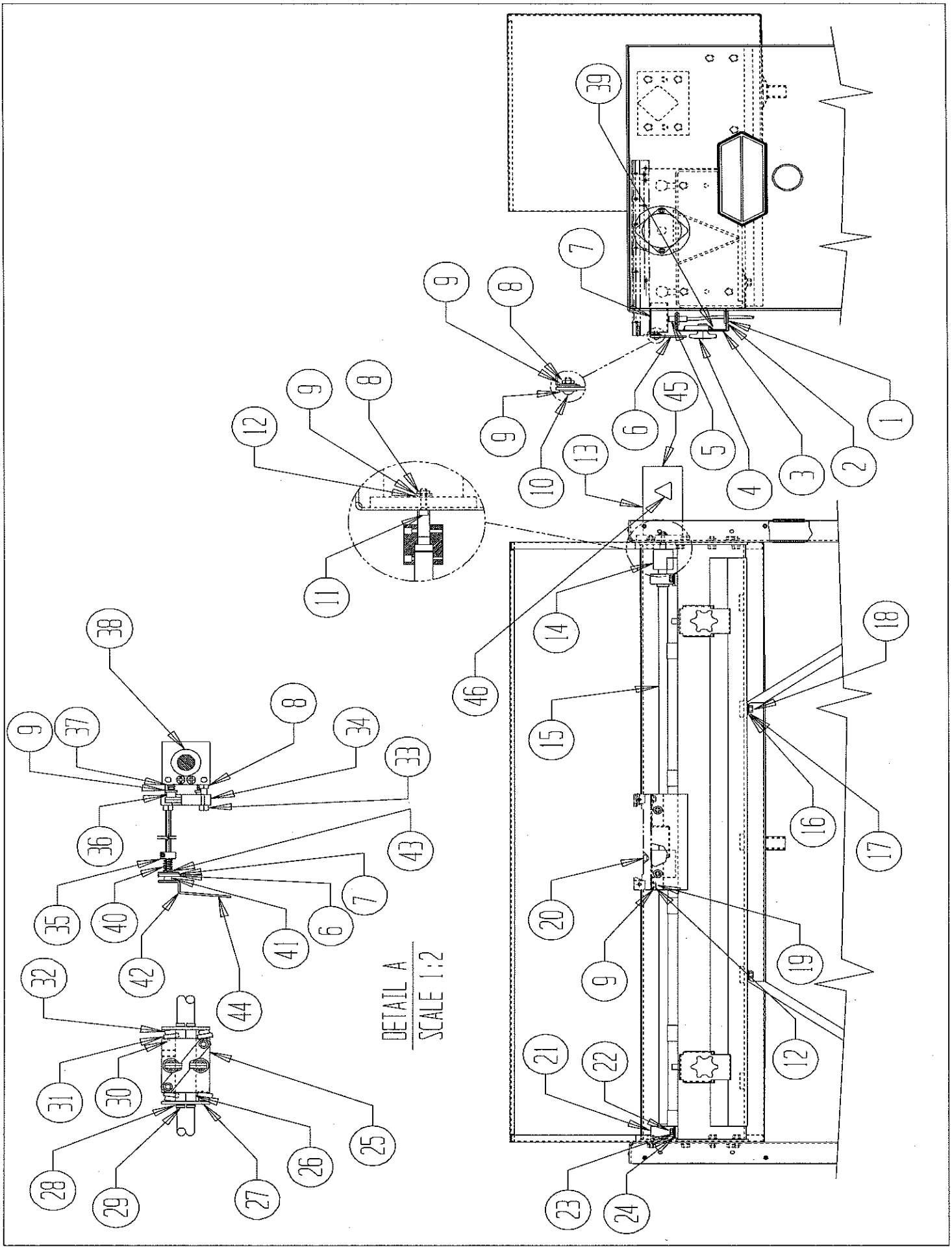


PARTS LIST

6109528 MAIN BASE ASSEMBLY

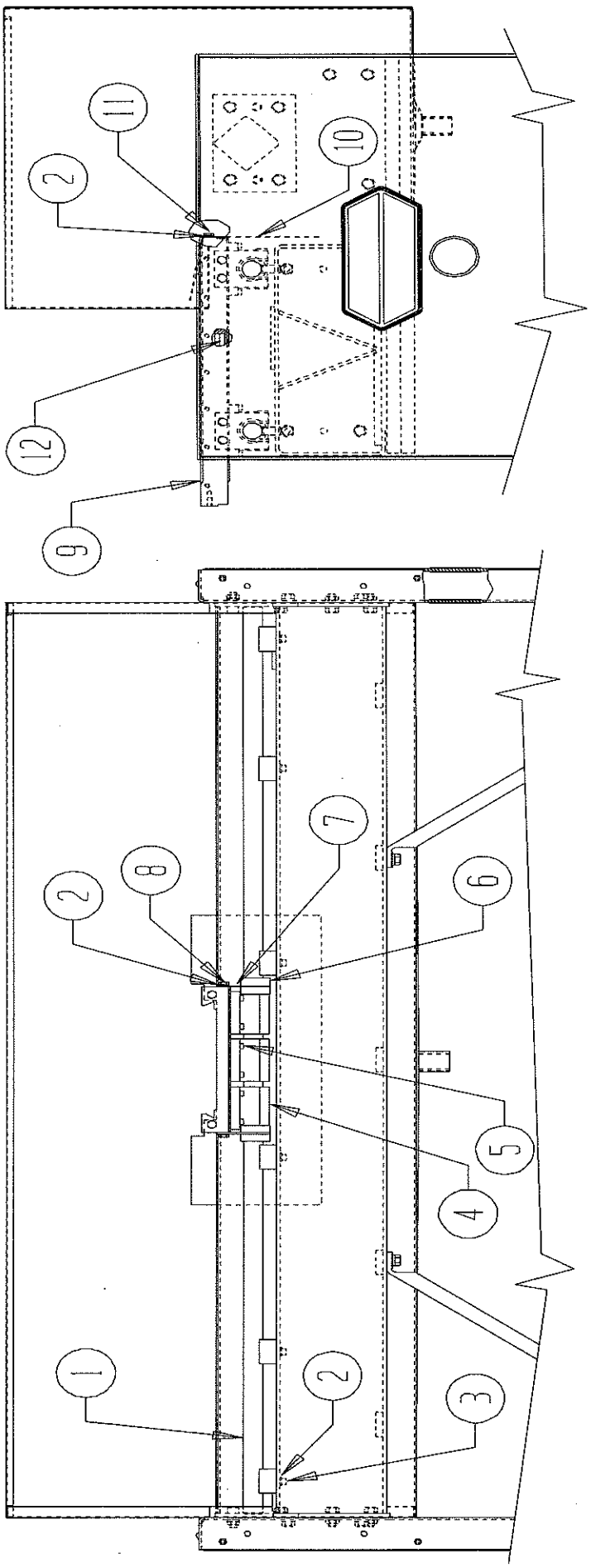


DIA. NO.	PART NO.	DESCRIPTION
1	H310802	Roll Pin, 5/16" x 1/2"
2	H371602	Roll Pin, 3/8" x 1"
3	B251201	Hex Head Cap Screw, 1/4-20 x 3/4"
4	K250001	Flat Washer, 1/4"
5	K251501	Split Lock Washer, 1/4"
6	J251000	Hex Nut, 1/4-20
7	K371501	Split Lock Washer, 3/8"
8	B371201	Hex Head Cap Screw, 3/8-16 x 3/4"
9	3709990	Decal
10	4509457	Grommet
11	6009032	Leg Frame Cover, Left Hand
12	6009510	Leg Frame Weldment, Right Hand
13	D191008	Thread Cutting Screw, 10-32 x 5/8"
14	J501000	Hex Nut, 1/2-13
15	3709563	Leveling Bolt, Adjustable
16	K370001	Flat washer, 3/8"
17	B371601	Hex Head cap Screw, 3/8-16 x 1"
18	6009008	Leg Brace
19	6009509	Leg Frame Weldment, Left Hand
20	6009033	Leg Frame Cover, Right Hand
21	J371000	Hex Nut, 3/8-16
22	B371611	Socket Head Cap Screw, 3/8-16 x 1"
23	6109501	Main Base
24	6109559	Coolant Tray Weldment
25	6109525	Center Support Bar Weldment
26	3708388	Barbed Connector, 1"
27	6109504	Return Hose, 1"


DETAIL A
SCALE 1:2

PARTS LIST (Continued) 6109520 TRAVERSE DRIVE ASSEMBLY

DIA. NO.	PART NO.	DESCRIPTION
1	3708046	Grommet
2	6009068	Proximity Support Rail
3	6009070	Proximity Bracket
4	3709613	Star Knob, 5/16-18
5	6009109	Proximity Switch, RH TRAV W 38
6	6009074	Rubber Pad
7	6009071	Proximity Sensing Bracket
8	J251000	Hex Nut, 1/4-20
9	K250001	Flat Washer, 1/4"
10	B251017	Phillips Round Head Cap Screw, 1/4-20 x 5/8"
11	B251611	Socket Head Cap Screw, 1/4-20 x 1"
12	K251501	Split Lock Washer, 1/4"
13	6009198	Motor Assy--Trav W34
14	3709583	Flexible coupling
15	3849239	Carriage Drive Shaft
16	K370001	Flat Washer, 3/8"
17	K371501	Split Lock Washer, 3/8"
18	B371201	Hex Head Cap Screw, 3/8-16 x 3/4"
19	B250801	Hex Head Cap Screw, 1/4-20 x 1/2"
20	3708147	Shoulder Bolt, 0.375 dia. x 0.62"
21	3709635	Pillow Block Bearing
22	B311201	Hex Head Cap Screw, 5/16-18 x 3/4"
23	K311501	Split Lock Washer, 5/16"
24	K310001	Flat Washer, 5/16"
25	6009155	Linear Actuator
26	3589081	Spacer
27	3969032	Seal Mount
28	K191501	Split Lock Washer, #10
29	B191233	Phillps pan Head Screw, 10-32 x 3/4"
30	3709596	Actuator Spacer [*]
31	3709597	Sealed Bearing [*]
32	3709668	Socket Head Screw [*]
33	B252011	SHCS 1/4-20 x 1.25
34	6009548	Actuator Bar Assembly
35	6009152	Shaft Collar
36	B253211	Socket Head Cap Screw, 1/4-20 x 2" [*]
37	3709469	Compression Spring [*]
38	3709183	Wiper Seal
39	6009572	Proximity Rail Weldment Clamp
40	3619224	Compression Spring
41	6009153	Rubber Washer
42	6009549	Release Arm Weldment
43	K190001	#10 Flat Washer
44	3708454	Decal--Release
45	3708064	Decal--Warning Hot
46	3708457	Decal--Warning Hot Symbol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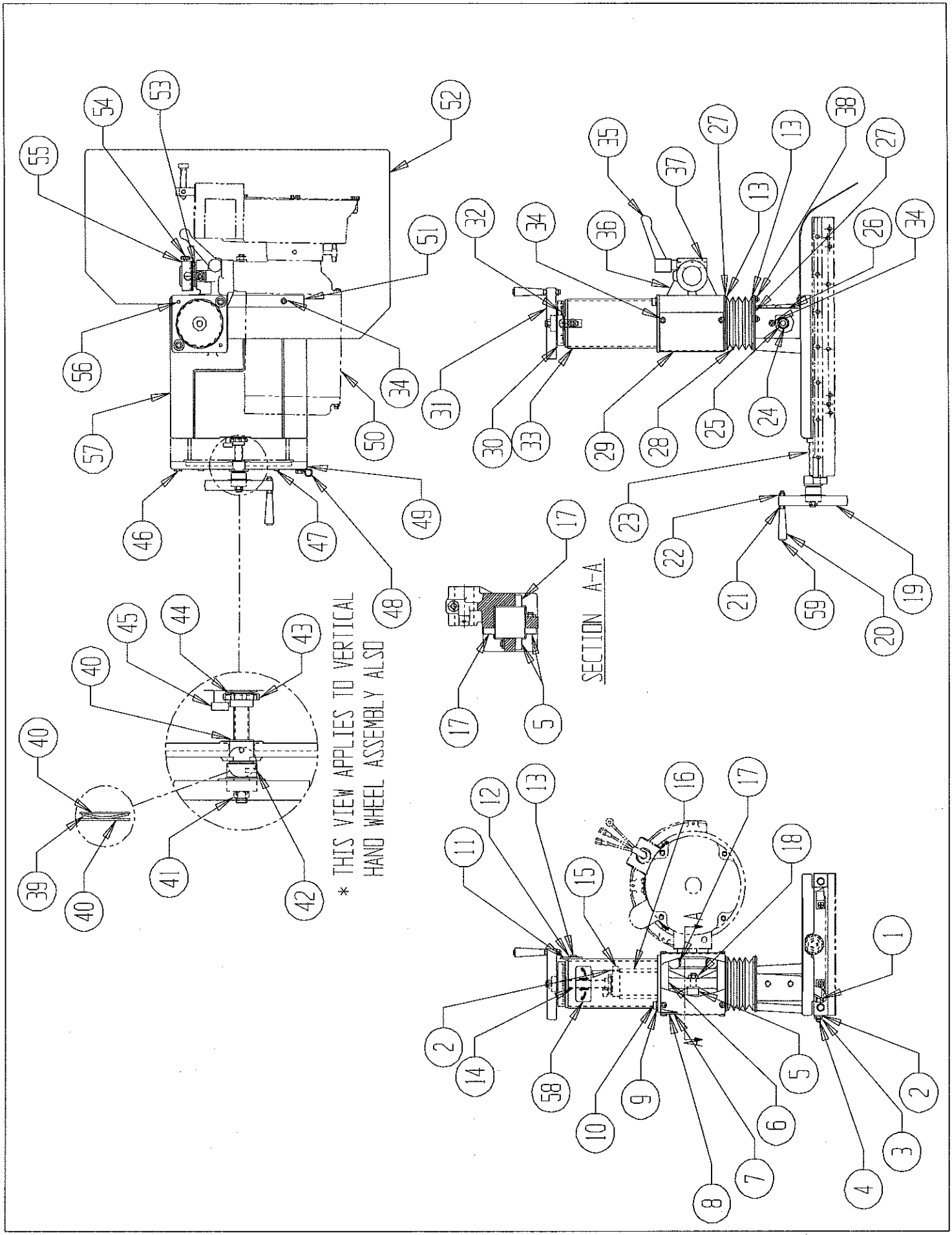
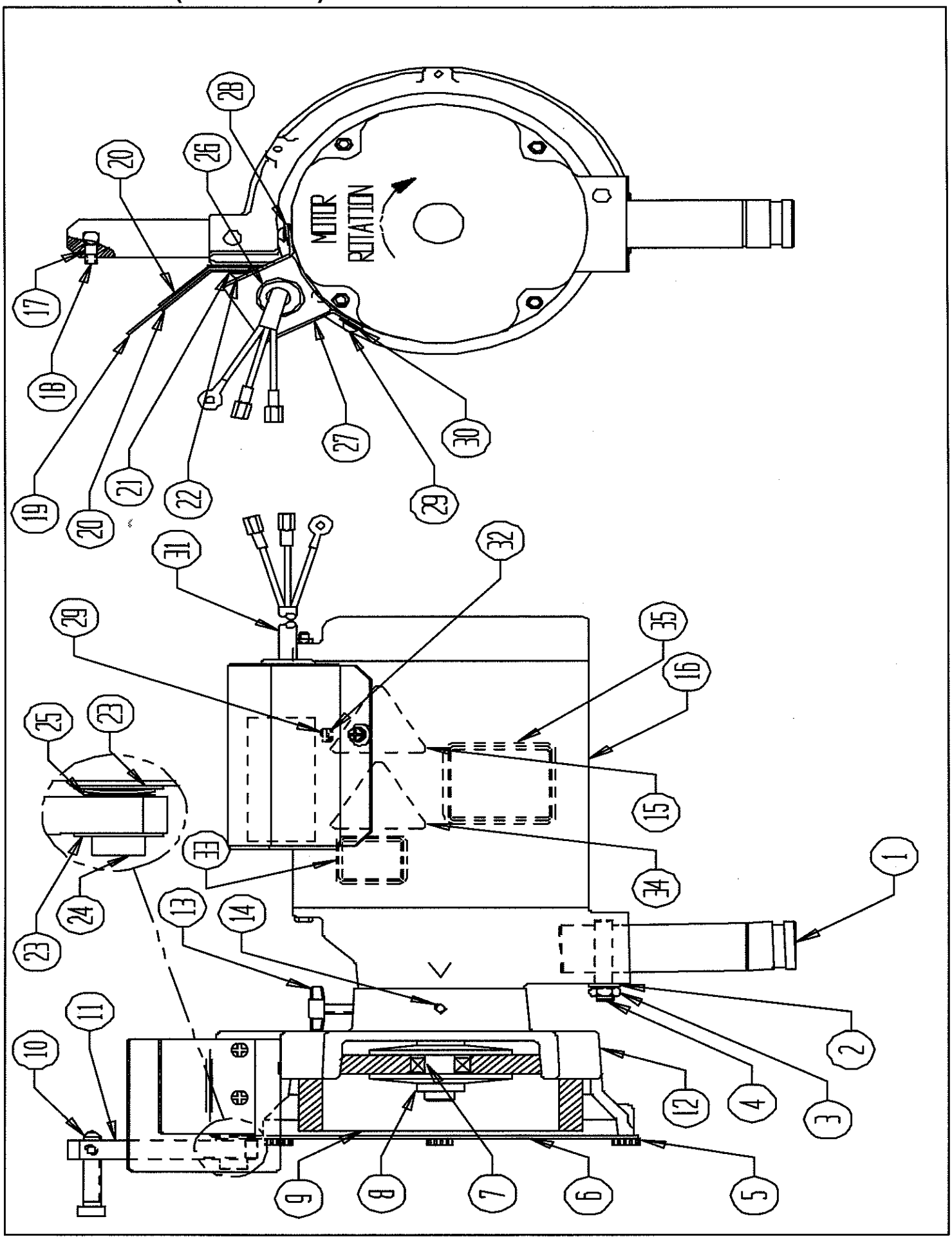
DIA. NO.	PART NO.	DESCRIPTION
1	3559117	Carrier Shaft
2	K251501	Split Lock Washer, 1/4"
3	B252406	Socket Head Cap Screw, 1/4-20 x 1 1/2"
4	3709044	Ball Bushing Bearing
5	B191011	Socket Head Cap Screw, 10-24 x 5/8"
6	3969064	Sponge
7	3969063	Sponge Wiper Holder
8	B250601	Hex Head Cap Screw, 1/4-20 x 3/8"
9	3969004	Carriage Base Assembly
10	6109065	Carriage Splash Guard
11	B250801	Hex Head Cap Screw, 1/4-20 x 1/2"
12	3709040	Spherical Bearing


* THIS VIEW APPLIES TO VERTICAL HAND WHEEL ASSEMBLY ALSO
SECTION A-A

PARTS LIST (Continued) 6109529 GRINDING HEAD ASSEMBLY

DIA. NO.	PART NO.	DESCRIPTION
1	6009025	Gib Plate
2	K251501	Split Lock Washer, 1/4"
3	J251000	Hex Nut, 1/4-20
4	C252420	Socket Set Screw, 1/4-20 x 1 1/2"
5	3708383	Cam Follower Eccentric
6	**6109043**	**Rubber Gasket, Long**
7	6109042	Rubber Gasket, Short
8	6109040	Slide Dust Cover, Short
9	K311501	Split Lock Washer, 5/16"
10	B310811	Socket Head Cap Screw, 5/16-18 x 1/2"
11	**3809047**	**Clear Indicator**
12	K190001	Flat Washer, #10
13	B190629	Phillips Head Screw, 10-32 x 3/8"
14	6109039	Adjusting Shaft, Acme, Left Hand
15	B250611	Socket Head Cap Screw, 1/4-20 x 3/8"
16	**6109526**	**Support Post Weldment**
17	3708382	Cam Follower, 0.75" Dia.
18	J371100	Hex Nut, 3/8-24
19	3708148	Handwheel, 4.50" Dia.
20	3709370	Handle
21	**J252000**	**Jam Nut 1/4-20**
22	J257000	Locknut, Nylok 1/4-20
23	6109013	Adjusting Shaft, Acme, Left Hand
24	B371211	Socket Head Cap Screw, 3/8-16 x 3/4"
25	K371501	Split Lock Washer, 3/8"
26	**6109044**	**Post Base Cover**
27	6109016	Column Bellows Flange
28	6109019	Column Bellows
29	6109041	Slide Dust Cover, Long
30	6109009	Calibrated Ring
31	**6009044**	**Handwheel, 4.50" Dia.**
32	C250420	Socket Head Set Screw, Cup-Point, 1/4-20 x 1/4"
33	6109536	Feed Screw Cap Weldment
34	B190833	Phillips Pan Head Screw, 10-32 x 1/2"
35	3709437	Lock Handle
36	**6109087**	**Motor Vertical Slide**
37	6109020	Locking Stud Shaft
38	J191100	Hex Nut, 10-32
39	3709062	Conical Spring Washer
40	3709304	Thrust Washer
41	**J377000**	**Lock Nut, Nylok, 3/8-16, Thin**
42	C310420	Socket Set Screw, Cup Point, 5/16-18 x 1/4"
43	6009024	Backlash Nut
44	3709620	Conical Spring Washer
45	3709809	Shoulder Screw, 3/8" Dia.
46	**B251616**	**Hex Head Cap Screw 1/4-20 x 1"**
47	**B190633**	**Phillips Pan Head Screw 10-32 x 3/8"**
48	3708121	Cord Clip
49	6009136	Feed Screw Guide
50		Motor/Guard Assembly, 1.25 HP (see page 35)
51	**6109038**	**Rubber Holding Plate**
52	6109037	Rubber Cover
53	3708380	Retaining Ring, External, 1.25"
54	6109590	Hand Knob
55	6109017	Calibrated Ring
56	**H180602**	**Roll Pin, 3/16" Dia. x 3/8"**
57	6109088	Motor Base Slide
58	6109080	Decal--Up/Down
59	B255011	SHCS 1/4-20 x 3.125"


MOTOR ROTATION
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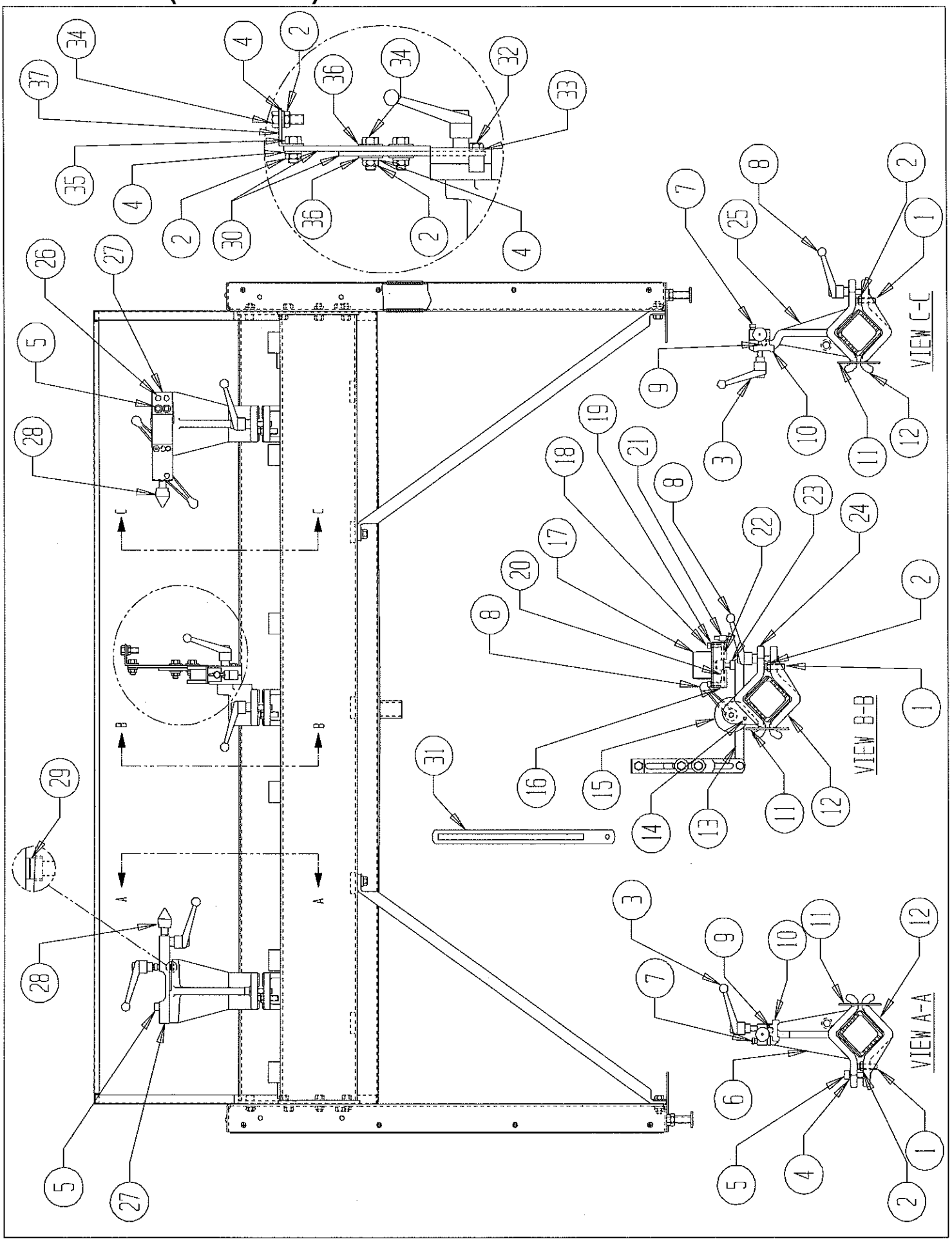
PARTS LIST (Continued) 6109533 MOTOR & GUARD ASSEMBLY

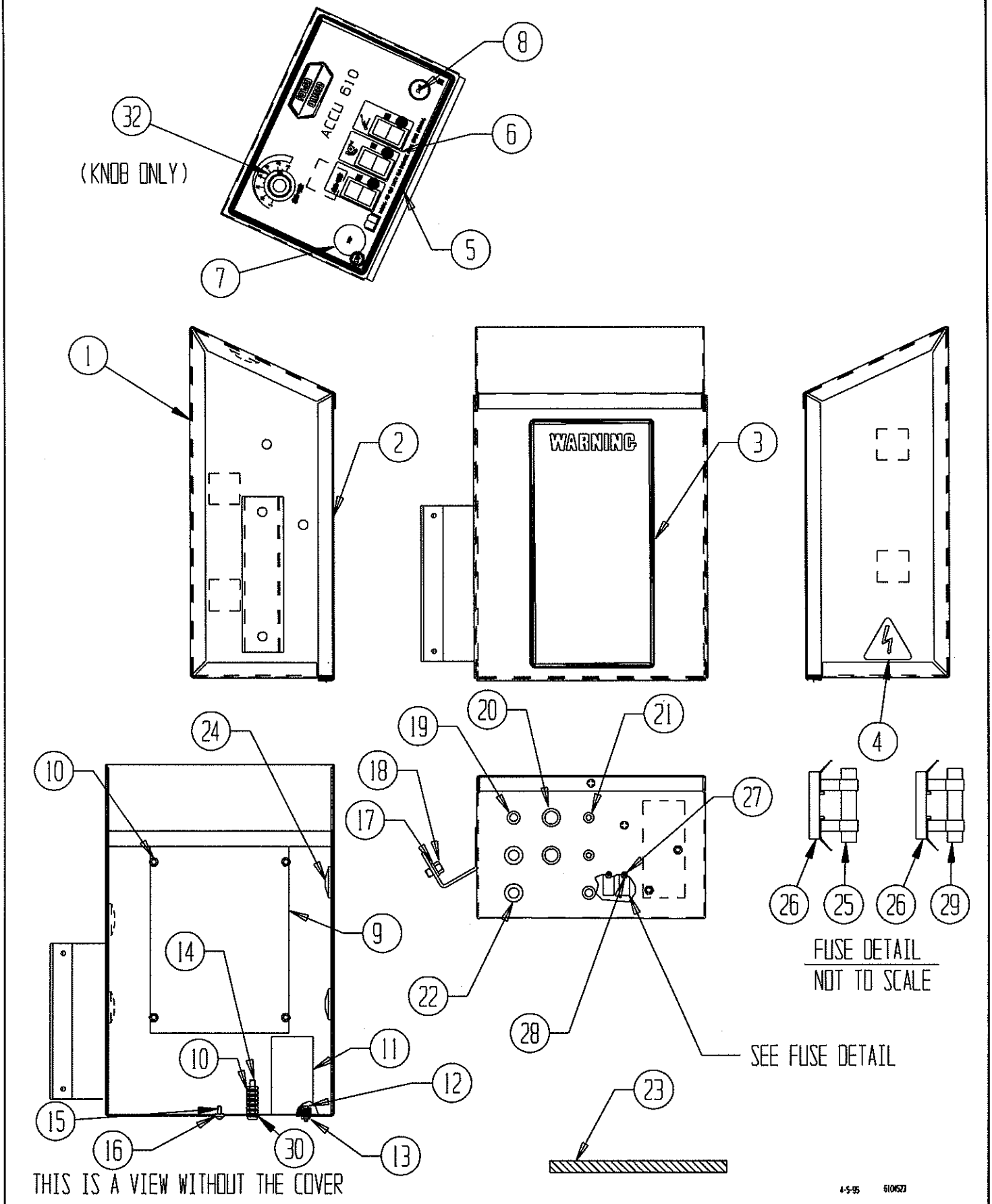
DIA. NO.	PART NO.	DESCRIPTION
1	6109004	Motor Pivot Shaft
2	K371501	Split Lock Washer, 3/8"
3	J371000	Hex Nut, 3/8-16
4	6109020	Locking Stud Shaft
5	6109590	Hand Knob
6	6109000	Wheel Guard Cover
7	3700409	Bushing, 1 1/4" OD x 5/8" ID
8	3559022	Outside Flange
9	3700411	Cupped Grinding Wheel, 6 x 2 x 1.25"
10	6109015	Diamond Dresser 3/8-24
11	6109003	Dresser Arm
12	6109097	Grinding Wheel Guard
13	6109591	Knob Assembly
14	C190667	Socket Set Screw, Cup Point, Nylok, 10-32 x 3/8"
15	3708448	Decal--Warning Electrical
16	6109532	Motor Assembly, 115 Volt, 1.25 HP
17	3579109	Nylon Plug
18	C250424	Socket Set Screw, Knurled Cup, 1/4-20 x 1/4"
19	6109047	Dresser Guard, Rubber
20	6109046	Coolant Deflect Guard
21	K191501	Split Lock Washer, #10
22	B190633	Phillips Pan Head Screw, 10-32 x 3/8"
23	3709304	Thrust Washer
24	3708147	Shoulder Bolt, 0.375" x 0.62"
25	3708214	Conical Spring Washer, 3/8"
26	3707416	Strain Relief
27	6109005	Electrical Cord Box
28	K190001	Flat Washer, #10
29	B190629	Phillips Round Head Screw, 10-32 x 3/8"
30	K191501	Split Lock Washer, #10
31	3707044	Motor Cord
32	R000465	External Tooth Lock Washer, #10
33	3707130	Decal--Warning
34	3708461	Decal--Warning 3600 RPM
35	6109048	Motor Nameplate
36	3707678	Capacitor - 115 Volt

PARTS LIST (Continued) 6109524 BEDKNIFE SUPPORT ASSEMBLY



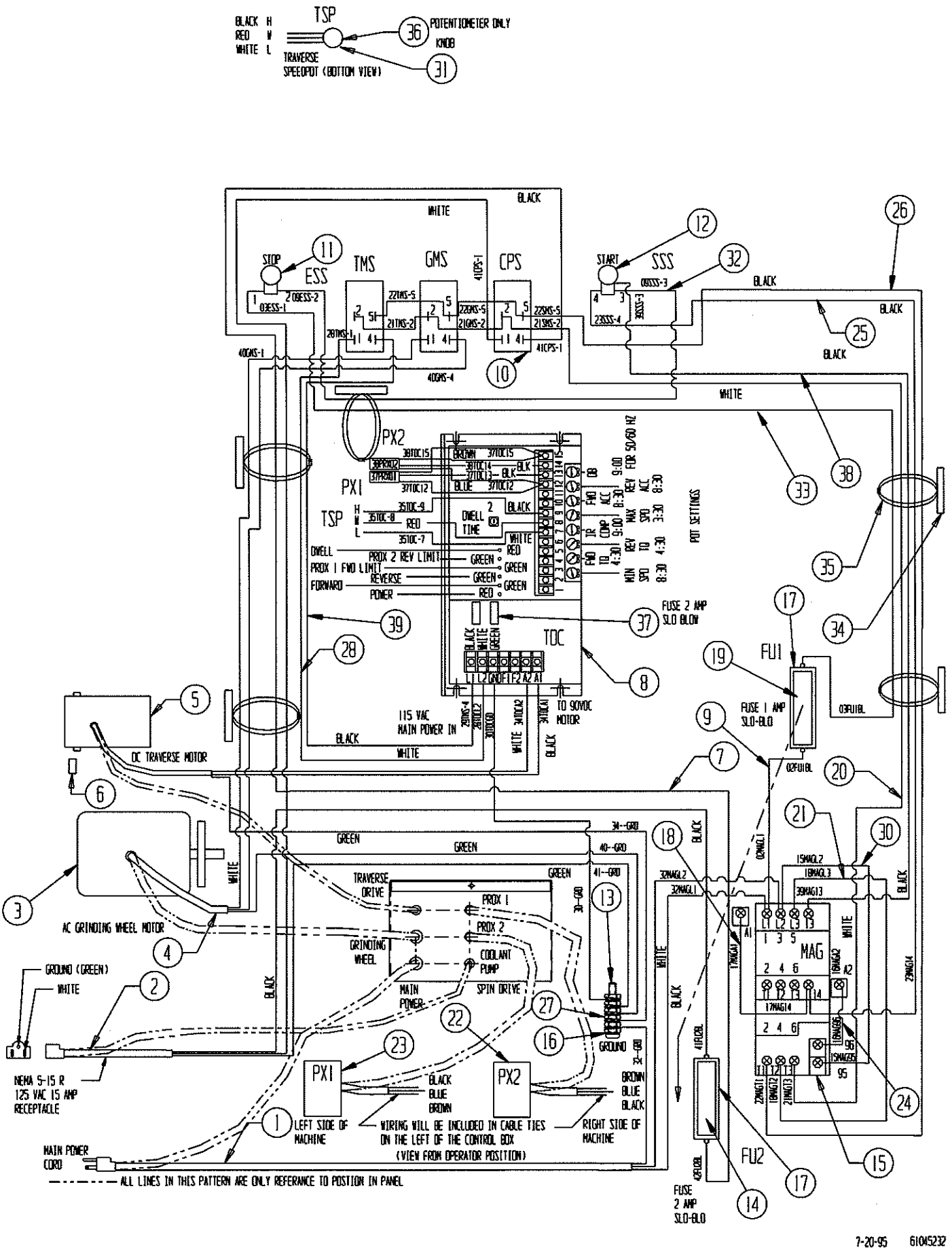
PARTS LIST (Continued) 6109524 BEDKNIFE SUPPORT ASSEMBLY

DIA. NO.	PART NO.	DESCRIPTION
1	C372420	Socket Set Screw, Cup Point, 3/8-16 x 1 1/2"
2	J371000	Hex Nut, 3/8-16
3	3708414	Handle
4	K371501	Lock Washer, 3/8"
5	B372411	Socket Head Cap Screw, 3/8-16 x 1 1/2"
6	6109089	Vertical Center Support
7	3708125	Shoulder Bolt, 0.375" Dia.
8	3708561	Lock Handle
9	6109021	Locking Stud Shaft
10	3708662	Adjusting Handle, 3/8-16
11	6109014	Connecting Link
12	6109092	Bottom Locking Clamp
13	6109026	Magnet Support Bar
14	C251620	Socket Set Screw, Cup Point, 1/4-20 x 1"
15	6109031	Rod Locking Half Clamp
16	6109029	Magnet Swivel Support
17	3708381	Bi-Polar Magnet
18	B250801	Hex Head Cap Screw, 1/4-20 x 1/2"
19	K251501	Lock Washer, 1/4"
20	C250820	Socket Set Screw, Cup Point, 1/4-20 x 1/2"
21	6009598	Tee Knob Assembly
22	6109030	Retaining Ring, Brass
23	6109027	Spherical Ball, Threaded
24	6109091	Knife Support
25	6109090	Horizontal Center Support
26	3708126	Roll Pin, 3/8" x 1.25"
27	6109028	Flex Spring
28	6109033	Center, Adjustable
29	3708555	Rest Button, 0.375 Dia.
30	3969027	Adjusting Arm, Short
31	3649038	Adjusting Arm, Long
32	B311201	Hex Head Cap Screw, 5/16-18 x 3/4"
33	K311501	Lock Washer, 5/16"
34	B371601	Hex Head Cap Screw, 3/8-16 x 1"
35	B370801	Hex Head Cap Screw, 3/8-16 x 1/2"
36	K370001	Flat Washer, 3/8"
37	3849087	Angle Bracket


ACCU 610
(KNOB ONLY)
WARNING
FUSE DETAIL
NOT TO SCALE
SEE FUSE DETAIL
THIS IS A VIEW WITHOUT THE COVER
4-5-95 610523

PARTS LIST (Continued) 6109523 CONTROL PANEL ASSEMBLY (#1)

DIAGRAM NO.	PART NO.	DESCRIPTION
1	6009585	Electrical Box Weldment
2	6009062	Cover--Electrical Box
3	6009092	Decal--Warning
4	3707130	Decal--Warning
5	6109057	Decal--Control Panel Symbols
6	3707952	Rocker Switch-DPST
7	3707089	Pushbutton--Stop
8	3707088	Pushbutton--Start
9	6009557	Control Board Assy
10	R000553	Kep Nut 10-24 NC
11	3707087	Starter--Magnetic 1 HP
12	B161014	Phil Pan Screw 8-32 x .62"
13	R000558	Kep Nut 8-32 NC
14	A192020	Phil Pan Screw 10-24 x 1-1/4" Long
15	B190809	Phil RHS 10-24 x 1/2"
16	3709864	Tinnerman Nut
17	K371501	3/8 Lockwasher
18	B371001	HHCS 3/8-16 x 5/8"
19	3707275	Strain Relief .37/.43 Wire
20	3708463	Plug Cap
21	3707279	Strain Relief .30 Wire
22	3707066	Strain Relief .22/.24 Wire
23	6009120	Cable Wrap
24	3707224	Cord Tie Down Mounting
25	3707092	Fuse--1 AMP Slo-Blo
26	3707091	Fuse Block
27	B130812	Phil Pan Screw 6-32 x 1/2"
28	R000557	Kep Nut 6-32
29	3707219	Fuse--2 AMP Slo-Blo
30	R000483	Washer Lock #10 INT Tooth
31	3708448	Decal--Warning Electrical


TSP
BLACK H
RED M
WHITE L
TRAVERSE SPEEDPOT (BOTTOM VIEW)
36 POTENTIOMETER ONLY KNOB
31
STOP
11
ESS
TMS
GMS
CPS
START
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SSS
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25
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PX2
PX1
TSP
TOC
FWD ACC 8:30
REV ACC 8:30
MAX SPD 3:30
JR COMP 9:00
FWD TO 4:30
REV TO 4:30
MIN SPD 8:30
POT SETTINGS
DWELL TIME
PROX 2 REV LIMIT
PROX 1 FWD LIMIT
FORWARD
REVERSE
POWER
33
38
35
34
17
FU1
FUSE 1 AMP SLO-BLO
19
9
7
20
21
30
18
39
37
FUSE 2 AMP SLO BLOW
28
8
115 VAC MAIN POWER IN
TO 90VDC MOTOR
5
DC TRAVERSE MOTOR
6
3
AC GRINDING WHEEL MOTOR
4
GROUND (GREEN)
WHITE
2
NEMA 5-15 R 125 VAC 15 AMP RECEPTACLE
TRAVERSE DRIVE
PROX 1
PROX 2
GRINDING WHEEL
COOLANT PUMP
MAIN POWER
SPIN DRIVE
13
27
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16
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PX1
PX2
1
LEFT SIDE OF MACHINE
WIRING WILL BE INCLUDED IN CABLE TIES ON THE LEFT OF THE CONTROL BOX (VIEW FROM OPERATOR POSITION)
RIGHT SIDE OF MACHINE
MAIN POWER CORD
ALL LINES IN THIS PATTERN ARE ONLY REFERANCE TO POSTION IN PANEL
MAG
FU2
FUSE 2 AMP SLO-BLO
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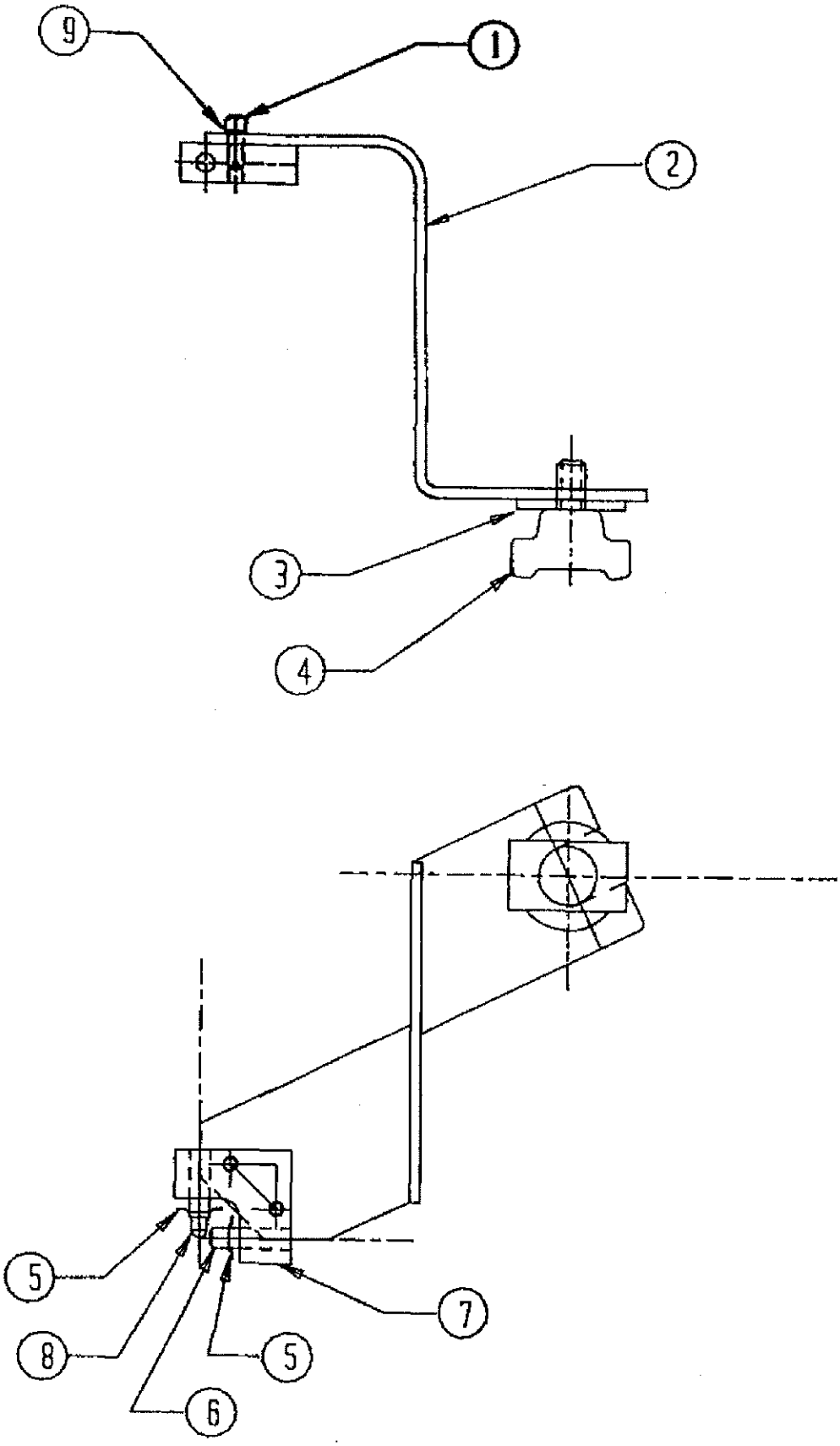
15
24
7-20-95
61045232

PARTS LIST (Continued) 6109523 CONTROL PANEL ASSEMBLY (#2)

DIAGRAM NO.	PART NO.	DESCRIPTION
1	6009196	Cord Assy Main Power W32
2	6109052	Receptacle Cord W41
3	6109531	Motor Sub Assy 1.0 HP 115 V
4	6109052	Cord Assy Motor W41
5	6009198	Motor Assy Trav
6	3707254	DC Motor Brush
7	6109053	Wire Assy--.25F/.25F W42
8	6009557	Control Board Assy
9	6009180	Wire Assy--.25F/#6FK W02
10	3707952	Rocker Switch DPST
11	3707089	Pushbutton--Stop
12	3707088	Pushbutton--Start
13	A192020	Phil Pan Head Screw 10-24 x 1-1/4"
14	3707219	Fuse--2 AMP Slo-Blo
15	3707087	Starter--Magnetic 1 HP
16	R000483	Lock Washer #10 INT Tooth
17	3707091	Fuse Block
18	6009189	Wire Assy--#6FK/#6FK W17
19	3707092	Fuse--1 AMP Slo-Blo
20	6009107	Wire Assy--3 Loop W21
21	6009110	Wire Assy--#6FK/#6FK W18
22	6009109	Prox Switch--RH Trav W38
23	6009108	Prox Switch--LH Trav W37
24	6009113	Wire Assy--#6FK/#6FK W16
25	6009202	Wire Assy--#6FK/#6FK W23
26	6009115	Wire Assy--3 Loop W22
27	R000553	Kep Nut 10-24
28	6009117	Wire Assy--.25F/#6FK W28
29	6009118	Wire Assy--#6FK/#10RG W30
30	6009204	Wire Assy--#6FK/#6FK W15
31	3707288	Switch Knob
32	6009187	Wire Assy--#6FK/#6FK W09
33	6009181	Wire Assy--.25F/#6FK W03
34	3707224	Cord Tie--Down Mount
35	3707225	Cable Tie 6-3/8"
36	6009199	Pot Assy--Trav (TSP) W35
37	3707219	Fuse--2 AMP Slo-Blo
38	6009201	Wire Assy--#6FK/#6FK W39
39	6009104	Wire Assy--.25F/#6FK W29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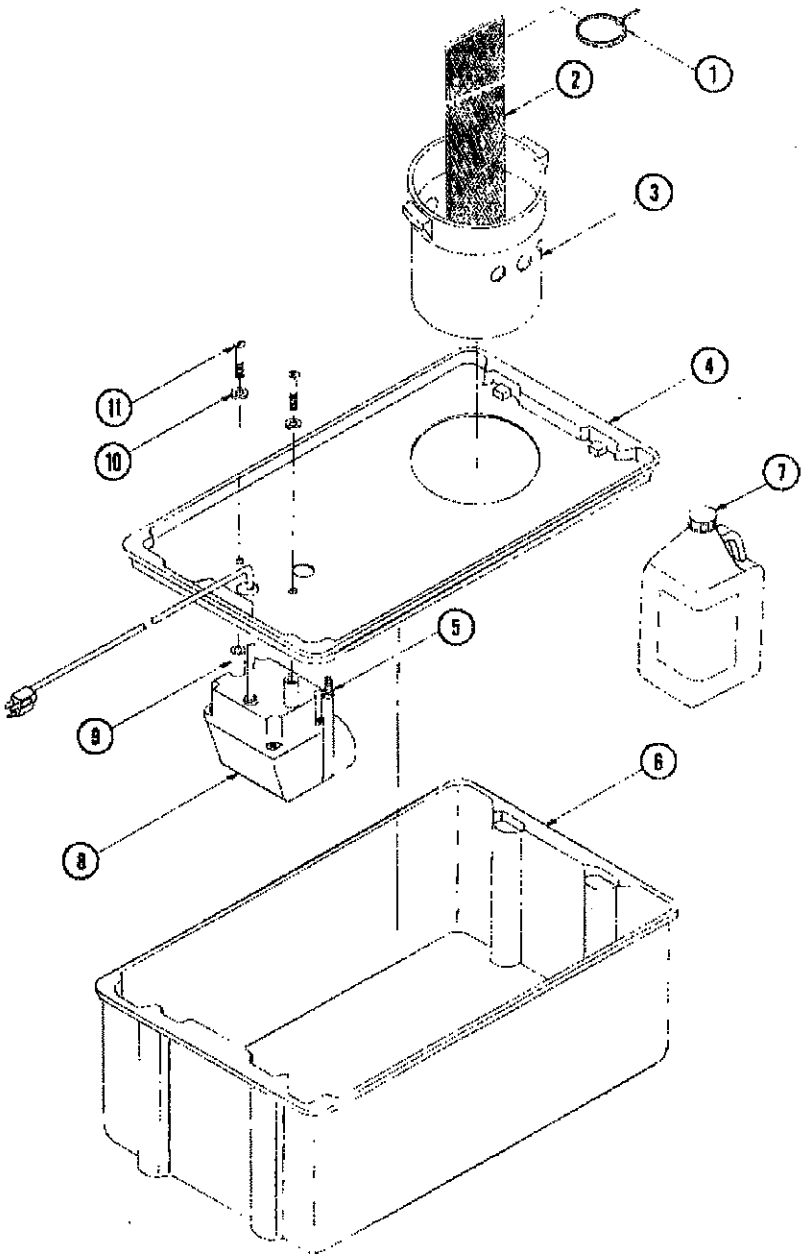
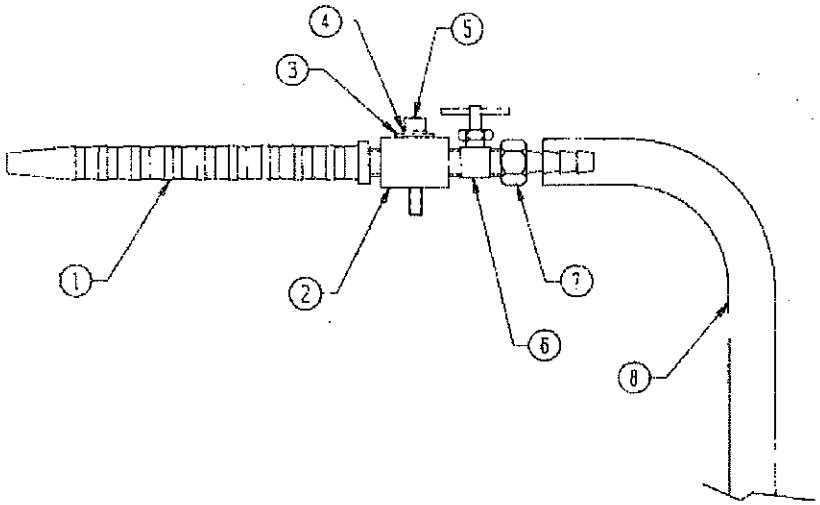
PARTS LIST (Continued) 6109571 TOUCH GAUGE ASSEMBLY

DIA. NO.	PART NO.	DESCRIPTION
1	B190831	Socket Head Cap Screw 10-32 x 1/2" Knurled Black Oxide
2	6109071	Bracket - Touch Gage
3	3589106	Washer .390 x 1 3/8"
4	6109570	Knob Assembly 3/8-16
5	3708464	Pushnut Fastener
6	6109074	Horizontal Slide Pin
7	6109072	Slide Pin Plate
8	6109073	Vertical Slide Pin
9	K191501	#10 Lock Washer

PARTS LIST (Continued) 7469909 COOLANT PUMP/TANK ASSEMBLY





DIA. NO.	PART NO.	DESCRIPTION
1	3707225	Cable Tie
2	3709503	Filter Sock
3	7469190	Filter Container
4	7469191	Coolant Tank Cover
5	3708339	Barbed Connector
6	3709440	Coolant Tank
7	3708200	Flood and Mist Coolant
8	3707532	Pump, 115 Volt
9	3689048	Spacer
10	K160001	Flat Washer #8
11	B162802	Round Head Screw, 8-32 x 1 3/4"

DIA. NO.	PART NO.	DESCRIPTION
1	3709642	Coolant Line Assembly
2	3679116	Shut Off Valve Connector
3	K190001	Flat Washer #10
4	K191501	Split Lock Washer, #10
5	B192031	Socket Head Cap Screw, 10-32 x 1 1/4"
6	3709595	Needle Shut Off Valve
7	3709593	Barbed Connector
8	3389039	Coolant Hose