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# Operating Instructions and Service Manual for Right Angle Tube Rolling Motors

**Model Numbers**

Model Number	RPM Free Speed	Minimum Torque		Maximum Torque		Throttle Style
		Ft. Lbs.	Nm	Ft. Lbs.	Nm	
445L1753-190	190	70	95	140	190	Lever
445R1753-190	190	70	95	140	190	Roll
445L1752-90	90	150	200	305	410	Lever
445R1752-90	90	150	200	305	410	Roll

**READ SAFETY RECOMMENDATIONS BEFORE OPERATING TOOL**

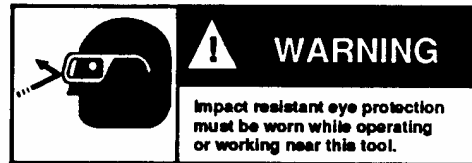
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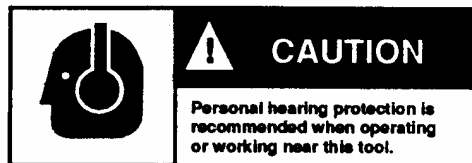
# Safety Recommendations

For your safety and the safety of others, read and understand the safety recommendation and operating instructions before operating.

## ALWAYS WEAR PROTECTIVE EQUIPMENT



For additional information on eye and face protection, refer to Federal OSHA Regulations, 29 Code of Federal Regulations, Section 1910.133., Eye and Face Protection and American National Standards Institute, ANSI A87.1, Occupational and Educational Eye and Face Protection. Z87.1 is available from the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.



Hearing protectors are required in high noise areas, 85 dba or greater. The operation of other tools and equipment in the area substantially contribute to, and increase the noise level in the area. For additional information on hearing protection, refer to Federal OSHA Regulations, 29 Code of Federal Regulations, Section 1910.95, Occupational Noise Exposure, and American National Standards Institute, ANSI S12.6 Hearing Protectors.

These tools are designed to operate on 90 psig (6.2 bar) maximum air pressure. If the tool is properly sized and applied, higher air pressure is unnecessary. Excessive air pressure increases the loads and stresses on the tool parts, sockets, and fasteners and may result in breakage. Installation of a filter-regulator-lubricator in the air supply line ahead of the tool is recommended.

Before the tool is connected to the air supply, check the throttle for proper operation (i.e., throttle moves freely and returns to closed position). Clear the air hose of accumulated dust and moisture. Be careful not to endanger adjacent personnel. Before removing a tool from service or changing sockets, make sure the air line is shut off and drained of air. This will prevent the tool from operating if the throttle is accidentally engaged.

It is essential for safe operation that any operator of an rolling motor use good balance, sure footing, and proper

posture in anticipation of a torque reaction. Insure that the operator's hand will not be wedged or pinched between the work and the tool when operating.

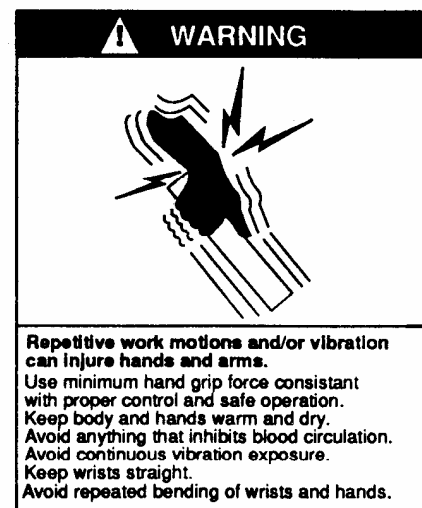


When using right angle motors, be sure the throttle is positioned relative to the right angle head so that the throttle will not become wedged against an adjacent object in the "ON" position due to torque reaction. The angle head may be repositioned with respect to the lever (on tools with levers) to accommodate proper location for task. If tool is to be reversed, locate throttle lever in a neutral position that will prevent entrapment. Refer to operating instructions for additional information.



Tools with clutches can stall rather than shut-off if adjusted over maximum power output of tool, or if there is a drop in air pressure. Operator must then resist stall torque until throttle is released.

Higher torque right angle motors can be equipped with splined torque reaction mounting plates which accept torque reaction bars. These bars can be braced against the work, adjacent tubes, or other suitable points to absorb and relieve the operator of the torque reaction transmitted by the tool. Tool balance arms are also available to absorb the torque reaction of the tool for improved ergonomic applications if work is accessible.



Some individuals are susceptible to disorders of the hands and arms when exposed to tasks which involve highly repetitive motions and/or vibration. Those individuals predisposed to vascular or circulatory problems may be particularly susceptible. Cumulative trauma disorders such as carpal tunnel syndrome and tendonitis can be caused or aggravated by repetitions, forceful exertions of the hands and arms. These disorders develop gradually over periods of weeks, months, and years.

## Notes:

The pinion bearing retainer, No. 869877, should be securely tightened to ensure proper gear make-up.

The driven gear bearing cap should be torqued to 100/110 ft.-lb. (135/149Nm) and the bearing cap lock screw torqued to 10 in.-lb. (11.52cmkg) minimum.

**NOTE:** When assembling the angle head to the complete tool, the clamp nut, No. 869878, (left hand threads) must be torqued to 100/110 ft.-lbs. (135/149Nm).

#### Trip Rod Sizing

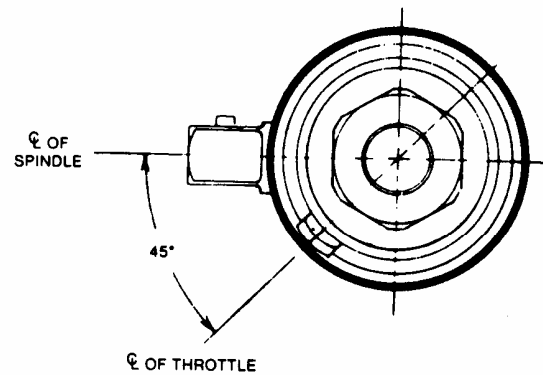
During reassembly of the tools, the trip rod must be

ground flush (+0/-1/32) (+0/-0.793mm) with the end of the rotor. Hold the motor firmly in the handle at the time the trip rod is being sized to length.

#### Safety Check

After repair or replacement of parts, tools equipped with an automatic shutoff device should be tested to verify that they are functioning properly.

**CAUTION:** To prevent hand entrapment from torque reaction, the square drive should be positioned from the throttle as shown below.



REAR VIEW OF TOOL

#### Torque Setting

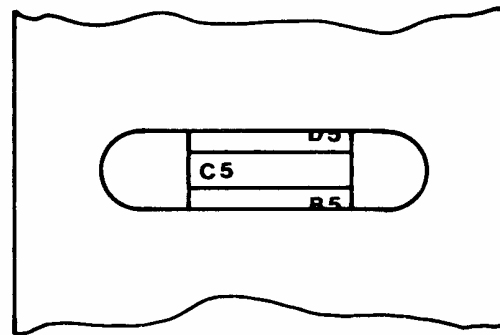
By looking into the clutch adjustment access hole, markings can be seen on the adjusting nut.

**NOTE:** The marking centered in the access slot is the one to read.

Five revolutions of the adjusting nut covers the complete torque range of the tool. The markings start at A-1

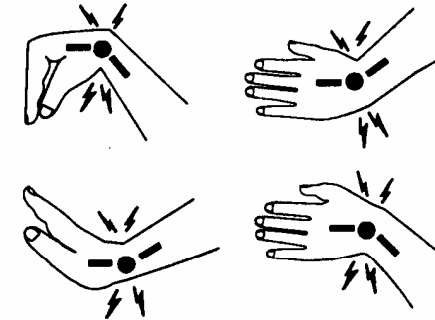
(lowest torque setting) and go thru A-8 on the first revolution of the nut. The second revolution starts with B-1, the third starts with C-1, etc. The fifth revolution ends with E-8 (highest torque setting).

**NOTE:** The torque setting marks are for reference only and do not relate to a specific amount of torque.



EXAMPLE TORQUE SETTING OF C-5

## Safety Recommendations



- Tasks should be performed in such a manner that the wrists are maintained in a neutral position which is not flexed, hyperextended, or turned side to side.
- Stressful postures should be avoided and can be controlled through tool selection and work location.

Any user suffering from prolonged symptoms of tingling, numbness, blanching of fingers, clumsiness or weakened grip, nocturnal pain in the hand, or any other disorder of the shoulders, arms, wrists, or fingers is advised to consult with a physician. If it is determined that the symptoms are job related or aggravated by movements and postures dictated by the job design it may be necessary for the employer to take steps to prevent further occurrences. These steps might include, but are not limited to, repositioning the workpiece or redesigning the workstation, reassigning workers to other jobs, rotating jobs, altering work pace, and/or changing the type of tool used so as to minimize stress on the operator. Some tasks may require more than one type of tool to obtain the optimum operator/tool/task relationship.

The following recommendations will help reduce or moderate the effects of repetitive work motions and/or extended vibration exposure.

- Use a minimum hand grip force consistent with proper control and safe operation.
- Keep wrists as straight as possible.
- Keep body and hands warm and dry.
- Avoid anything that inhibits blood circulation
  - Smoking tobacco
  - Cold temperatures
  - Certain drugs
- Avoid highly repetitive movements of hands and wrists, and continuous vibration exposure.

## OPERATING INSTRUCTIONS AND SERVICE INSTRUCTIONS RIGHT ANGLE TUBE ROLLING MOTORS

### OPERATING INSTRUCTIONS

The Right Angle Rolling Motor is designed to operate on 90 PSIG (t.2 bar) air pressure using a ½" hose up to 8 ft. in length.

**WARNING** HIGH TORQUE TOOL – ALWAYS USE PROPER REACTION BAR

**IMPORTANT:** The reaction bracket, NO. 202484, must fully engage the spline on the right angle head. Position the bracket forward on the small diameter of the head and move it rearward to engage the spline. Securely tighten reaction bar (with pipe wrench), screws and jam nuts.

USE ONLY SOCKETS APPROVED FOR POWER TOOL SERVICE

ALWAYS WEAR APPROVED EYE PROTECTION. (See the latest edition of ANSI Z87.1 American National Standard for Occupational and Educational Eye and Face Protection.

READ, UNDERSTAND, AND PRACTICE the requirement of ANSI B186.1, Safety Code for portable air tools.

Standards are available from the American National Standards Institute, Inc. 1430 Broadway, New York, New York 19918.

The Right Angle Rolling Motors are designed to operate on 90 PSIG air pressure, but does not depend on controlled air pressure to maintain accurate torque. Accurate torque is achieved by setting the clutch to the desired torque on the application. The tool will shut off automatically at the torque. Releasing the throttle will allow the tool to reset for the next cycle.

### Clutch Adjustment

Rotate the adjustment cover until the adjustment slot is uncovered. With the angle head end to the tool facing away, use a 5/32" diameter pin to rotate the adjusting nut clockwise to increase the torque setting and counterclockwise to decrease the setting. After adjustment, rotate the cover over the slot to lock the nut in place.

*NOTE:* See page 10 for torque setting reference.

**CAUTION:** If the clutch is adjusted over the maximum power output of the tool, the clutch will not function and the tool will operate like a stall-type tool. Also, if the tool is being operated at its upper torque limits, a drop in air pressure could cause the clutch not to function due to a loss of motor power and the tool will function like a stall-type tool.

*Operational Check:* Grip tool securely and be prepared to counteract stall torque in case clutch is improperly adjusted. Use proper reaction bar.

### Stall-Type Rolling Motors

The Stall-Type rolling Motor is designed to develop maximum rated torque at 90 PSIG. Torque output is controlled by a pressure regulator in the air supply line. Adjust the regulator until the desired torque is reached.

### Air Supply

An automatic in-line model 6070 filter-lubricator is highly recommended. This will supply the tool with clean, lubricated air; keep it in sustained operation; and increase tool life.

For maximum performance, use a ½" I.D. air hose no longer than 8' in length. If additional length is required, a ¾" or larger hose should be connected to the ½" hose. The air hose should be cleared of accumulated dirt and moisture, then one (1) teaspoonful of pneumatic oil or a good grade of 10W machine oil should be poured into the tool's air inlet before connecting the hose to the tool.

### Lubrication

The in-line lubricator should be checked and filled regularly with a good grade of 10W machine oil.

Application of the tool should govern how frequently it is greased. It is recommended that the right angle gears receive generous amount of No. 2 Moly grease through the grease plug after 40 hours of operation.

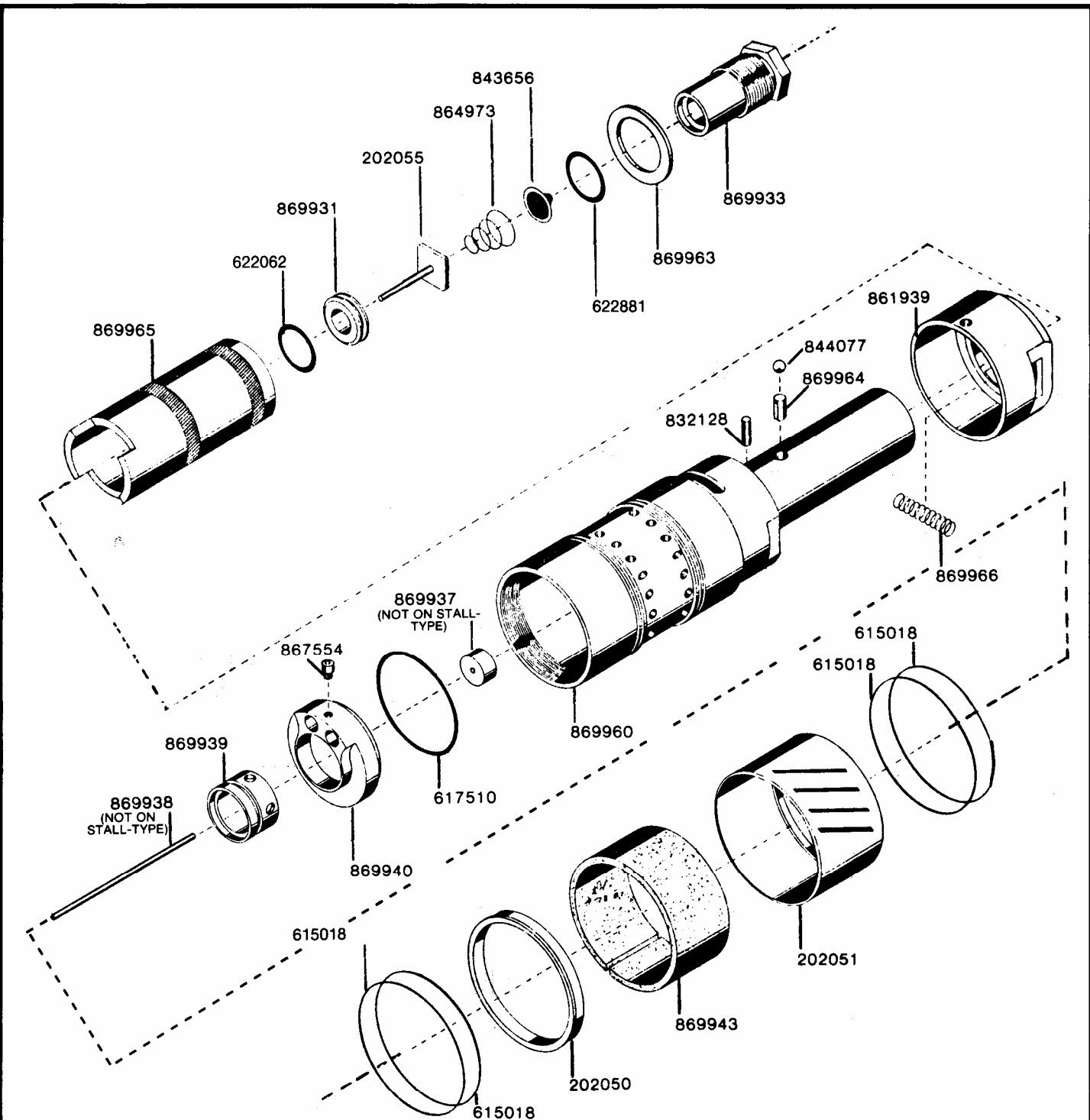
## SERVICE INSTRUCTIONS

### DISASSEMBLY – General

Clamp the flats of the handle in a vise with the tool in a vertical position.

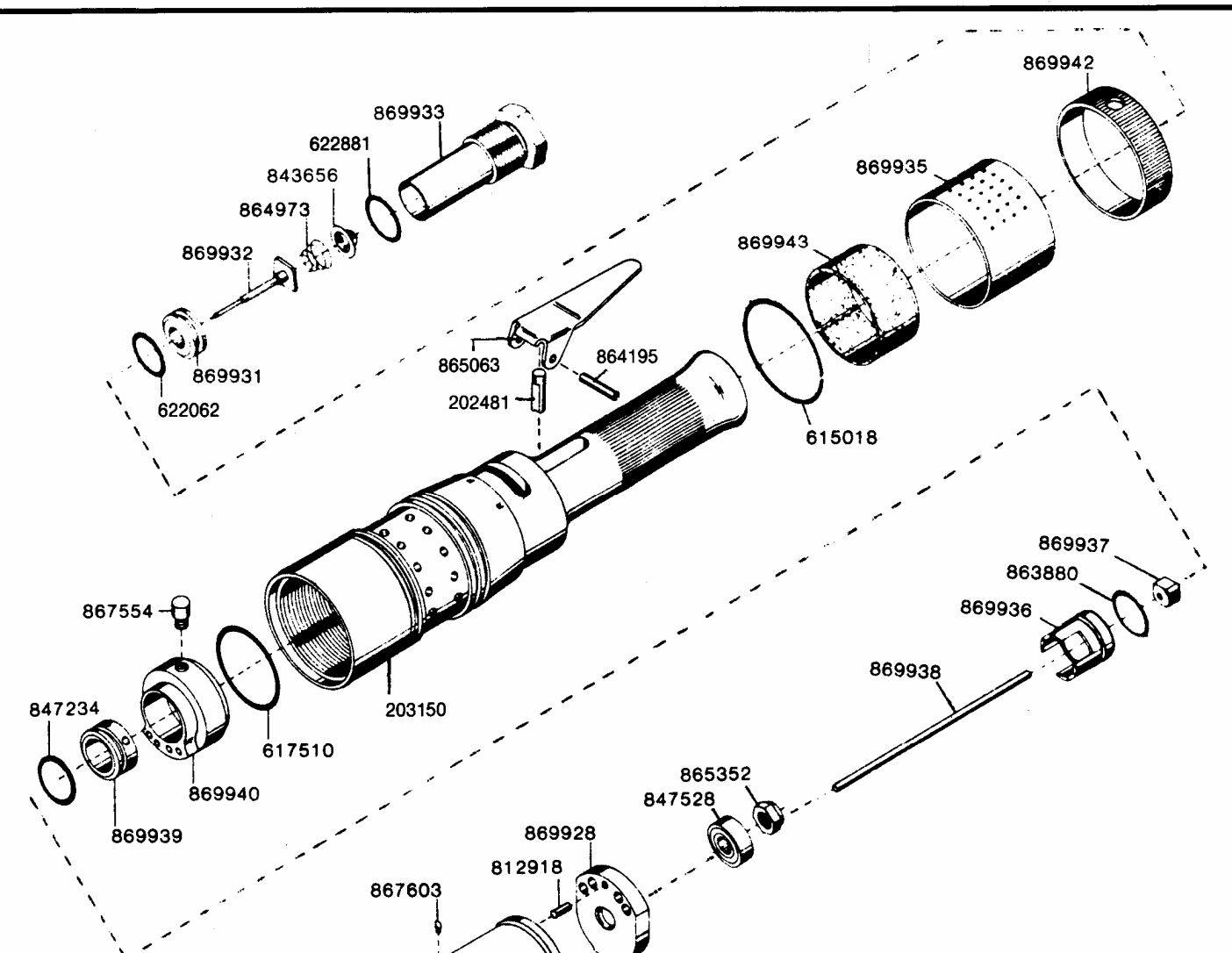
Using a suitable wrench, loosen (left hand threads) the clamp nut, NO. 869878, and remove the angle head assembly. Unscrew and remove the clutch housing and gear case assemblies. Clamp the gear case in the vise and unscrew the clutch housing.

Slip the motor unit out the front of the handle. It may be necessary to bump the handle on the work bench to loosen the motor.



**PARTS LIST - ROLL THROTTLE HANDLE**

PART NO.	NAME OF PART	QTY.	PART NO.	NAME OF PART	QTY.
202050	Deflector Spacer	1	869933	Inlet Bushing	1
202051	Exhaust Deflector	1	869937	Shut-Off Valve	1
202055	Throttle Valve	1	869938	Trip Rod	1
615018	"O" Ring	4	869939	Motor Spacer	1
617510	"O" Ring	1	869940	Reversing Valve	1
832128	Dowell Pin	1	869943	Muffler	1
843656	Screen	1	622881	"O" Ring	1
844077	Ball	1	869960	Handle	1
861939	Reverse Ring	1	869963	Throttle Retainer	1
864973	Spring	1	869964	Valve Rod	1
867554	Reverse Valve Screw	1	869965	Throttle Sleeve	1
622062	"O" Ring	1	869966	Throttle Return Spring	1
869931	Throttle Valve Seat	1			



**PARTS LIST -  
REVERSIBLE HANDLE AND MOTOR**

PART NO.	NAME OF PART	QTY.
867603	Motor Alignment Pin	1
622062	"O" Ring 7/8" x 1-1/16"	1
869923	Front Bearing Plate	1
203147	Rotor	1
203148	Cylinder Incl. 3812918-9	1
203218	Rotor Blade	5
864195	Lever Pin	1
869928	Rear Bearing Plate	1
869929	Motor Spacer	1
869931	Throttle Valve Seat	1
869932	Throttle Valve	1
869933	Inlet Bushing	1
865063	Throttle Lever	1
869935	Exhaust Deflector	1
869936	Valve Block	1
869937	Shut-Off Valve	1
869938	Trip Rod	1
869939	Motor Spacer	1
869940	Reversing Valve	1
203150	Handle	1
869942	Reversing Ring	1
869943	Muffler	1
622881	"O" Ring 15/16" x 1-1/8"	1
202481	Valve Pin	1
615018	037B00 "O" Ring	4
617510	"O" Ring	1
812918	Cylinder Pin	1
843656	Air Inlet Screen	1
847234	"O" Ring	1
847528	Rotor Bearing	2
847960	Set Screw	1
863880	026B00 "O" Ring	1
864973	Throttle Valve Spring	1
865352	Rotor Lock Nut	1
867554	Reversing Valve Screw	1

**Sub-Assembly Disassembly**

**Right Angle Head**

Remove the bearing cap lock screw (1/16 hex), No. 867997, and unscrew (left hand threads) the bearing cap. Clamp the square drive in the vise and use a soft mallet to drive the angle head off. Press the spindle out of the driven gear and then press the spindle out of the ball bearing.

Unscrew and remove the bearing retainer, No. 869877, and grease plug, No. 867546. Use a suitable driver to drive the pinion gear out of the housing.

**Clutch**

**CAUTION:** The adjustment cover, No. 869918, retains the ball spring, No. 869919, and steel ball, No. 842162, and care should be exercised to prevent their loss.

Use a 5/32" (3.96mm) diameter pin to lower the clutch adjustment. This will allow the clutch retainer ring, No. 869920, to be removed from the clutch housing. Remove the clutch assembly from the housing. Use a suitable bearing puller to remove ball bearing, No. 847528. Remove retainer ring, No. 847022, drive shaft washer, No. 867666, trip sleeve spring, No. 867672, and trip sleeve, No. 867670, from the drive shaft, No. 869915. **NOTE:** Trip Plunger, No. 869916, trip plunger spring, No. 867671, and two (2) balls, No. 842161, should also be removed at this time. Use a sharp pointed instrument to remove the cam retainer ring, No. 869921, from the ball retainer, No. 869914. Slip the drive shaft, No. 869915, and clutch cam, No. 869913, out the rear of the ball retainer, No. 869914.

**Gear Case**

Slip the entire gear train out the rear of the gear case. The 2nd reduction idler gears may be removed for inspection by driving the idler gear pins, No. 869908, out the rear of the spider.

**Motor**

Use a soft faced mallet to drive the rotor out of the front rotor bearing, No. 847528. This will allow the removal of the front bearing plate, No. 203148, cylinder, and five (5) rotor blades, No. 203218, from the rotor, No. 203147. Clamp the rotor lightly in the vise and unscrew the rotor lock nut, No. 865352. Rest the rear bearing plate on the vise jaws and use a soft faced mallet to drive the rotor out of the rear rotor bearing.

**Handle**

Unscrew the inlet bushing, No. 869933, for inspection of the throttle components. The air inlet screen, No. 843656, should be washed in a solvent and blown out in the reverse of normal air flow. Replace if damaged or clogged.

**Reassembly**

The tool is reassembled in the reverse order of disassembly. Clean all parts thoroughly in a solvent and inspect for damage or wear. Check all bearings for wear which can be detected by excessive end play and/or roughness which would indicate a brinelled condition. The rotor blades should be replaced if they measure less than 3/8" (9.5mm) at either end. All gear teeth, bearings, and pins should receive a close inspection and be replaced if necessary. All gears and open bearings should receive a generous amount of No. 2 Moly grease during reassembly.

**Motor Reassembly**

To assemble the motor, install the rear rotor bearing into the rear bearing plate. Make sure the outer bearing race is firmly seated in the bearing plate. Clamp the rotor body lightly in the vise with the threaded end up and slip the rear bearing plate assembly onto the rotor shaft far enough for the bearing lock nut to start. Tighten the lock nut until there is approximately .001"/.0015" (0.025/0.038mm) clearance between the rotor and bearing plate. The outer bearing race should be firmly seated and the rotor bumped forward when checking this clearance. Pack both rotor bearings with a good grade of No. 2 Moly grease after assembly of the motor unit.

**IMPORTANT:** During reassembly of the complete tool, it is important that the motor be free. After the tool is completely assembled, the right angle square drive spindle should turn freely using a small hand wrench. If the spindle does not turn freely, the motor should be checked for proper spacing. Do not run the tool until the spindle turns freely. Failure to do this could result in damage to motor components.

**1st REDUCTION GEAR TRAIN REASSEMBLY**

- 2 Gear Train (13 Tooth Spider)  
21 Tooth idler gears on inner set of gear pins.
- 3 Gear Train (19 Tooth Spider)  
21 Tooth idler gears on inner set of gear pins.

**Clutch Reassembly**

The clutch is reassembled in the reverse order of disassembly. The torque spring bearing, No. 867683, must be assembled so that the solid side of the ball separator is facing the torque spring plate, No. 867669.

**Right Angle Head**

when installing needle bearings, press only on the bearing's stamped end. The pinion needle bearing should be slipped on the pinion gear and pressed into the housing to the following depth:

- # 190 Right Angle Head = 3-3/16" (81mm)
- # 90 Right Angle Head = 3" (76.2mm)

