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SAFETY PRECAUTIONS

IN GENERAL

When using rotating head cutting equipment, basic safety precautions should always be followed to reduce the risk of personal injury.

Operate this tool only in accordance with specific operating instructions.

WARNING: Do not override the deadman switch on the power unit. Locking down, obstructing, or in any way defeating the deadman switch on the power drive unit may result in serious injury.

DRESS CONSIDERATIONS

Use standard safety equipment. Hard hats, safety shoes, safety harnesses, protective clothes, and other safety devices should always be used when appropriate.

Use safety glasses. Do not operate cutting tools without eye protection.

Dress properly. Do not wear loose clothing or jewelry. They can be caught in rotating and moving parts. Avoid slippery floors or wear nonskid footwear. If you have long hair, wear protective hair covering to contain it.

WORK AREA

Keep the work area clean. Cluttered work areas and benches invite injuries.

Consider the work area environment. Keep the area well lit. Keep electrical cords, cables, rags, rigging straps, etc. clear of rotating equipment. Do not use power-cutting tools in the presence of flammable liquids and gasses.

Keep visitors away. Do not let visitors or untrained personnel at or near operating tools. Enforce eye protection requirements for all observers.

Do not over reach. Keep proper footing at all times.

Stay alert. Watch what you are doing. Use common sense. Do not operate tools when you are tired.

TOOL CARE

Maintain tools with care. Keep tools in good operating condition. Sharp tool bits perform better and safer than dull tool bits. Well maintained tools function properly when needed.

Check for damaged parts. If a tool has malfunctioned, been dropped or hit, it must be checked for damage. Run no-load tests and feed function checks. Do a complete visual inspection.

Electric motors. Use only with proper AC voltage power sources and observe all normal electric shock hazard procedures.

Do not abuse power and control cords. Pulling or running over cords and cables can result in electrical shock hazards and malfunctions. Keep control and power cords out of all cutting fluids and water.

Hydraulic drives. Observe proper procedures for electrically driven power sources. Avoid damage to hydraulic lines. Keep quick-disconnects clean. Grit contamination causes malfunctions.

Air tools. Check the exhaust muffler. Broken or damaged mufflers can restrict air flow or cause excessive noise. Use air motors only with a filtered, lubricated and regulated air supply. Dirty air, low-pressure air or over pressure air will cause malfunctions, including delayed starting.

AREA EQUIPMENT

Secure work. Whenever possible use clamps, vises, chains and straps to secure pipe.

Make sure the tool is secured; it is safer to have both hands free to operate the tool.

TOOL USE

Use the right tool and tool bit for the job. Do not use a tool, which is incorrect for the job you are doing.

Keep the tool bits fully engaged in the tool bit holders. Loose bits are a safety hazard.

Disconnect power supply during setup and maintenance. Use all 'Stop' or Shut off' features available when changing or adjusting tool bits, maintaining the tool, or when the tool is not in use.

Remove adjusting keys and wrenches before applying power to the equipment. Develop a habit of checking the tool before turning it on to make sure that all keys and wrenches have been removed.

Do not force tools. Tools and tool bits function better and safer when used at the feed and speed rate for which they were designed.

Do not reach into rotating equipment. Do not reach into the rotating head stock to clear chips, to make adjustments, or to check surface finish. A machine designed to cut steel will not stop for a hand or an arm.

Handle chips with care. Chips have very sharp edges and are hot. Do not try to pull chips apart with your hands; they are very tough.

Avoid unintentional starts. Do not carry or handle tools with your hand on the operating switches or levers. Do not lay the tool down in a manner that will start the drive. Do not allow the tool to flip around or move when adjusting or changing tool bits.

Store idle tools properly. Disconnect tools from the power source and store in a safe place. Remove tool bits for safe handling of the tool.

GENERAL DESCRIPTION

The Model 424 Keyway Cutter is designed to mill 1/4" (6.35 mm) to 1 1/4" (31.75 mm) wide by up to 6" (152.4 mm) long keyway slots in 1 1/2" (38.1 mm) to 24" (609.6 mm) diameter shafts.

The cutter may be used to install new keyways, re-cut keyways after being weld repaired, or install second keyways to bypass a damaged keyway.

The tool uses a Vee block system to auto align and center the tool to the shaft, for shaft sizes up to 4 1/2" (114.3 mm).

The tool mounts with a fixed bottom clamp bar.

For larger shaft sizes a system of spacers and chain clamps are included.

The tool incorporates a graduated depth of cut system and a mechanism to shift the cutter off center to allow milling the sides of the keyway with a light finish cut for optimum width precision and surface finishes.

With this system the keyway width is not dependent on the mill cutter dimensions. For example, a 3/8" (9.5 mm) mill cutter can be used to cut up to a 5/8" (15.88 mm) wide key slot.

Provisions are incorporated to allow use of a dial indicator for adjustments and to verify the setting accuracy.

Axial feed is provided for by a manual ratchet system.

The Model 424 uses standard 1/2" (12.70 mm) shank mill cutters and is provided with a collet reducer bushing to allow use of 3/8" shank mill cutters.

The KEYMASTER™ comes in a custom fitted carrying/storage case, a selection of end mills [1/4" (6.35 mm) to 1" (25.40 mm) in 1/4" (6.35 mm) increments] and clamping systems for 1 1/2" (38.1 mm) to 24" (609.6 mm) diameter shafts.

The standard drive motor is a variable speed 1 HP 115 Volt AC motor.

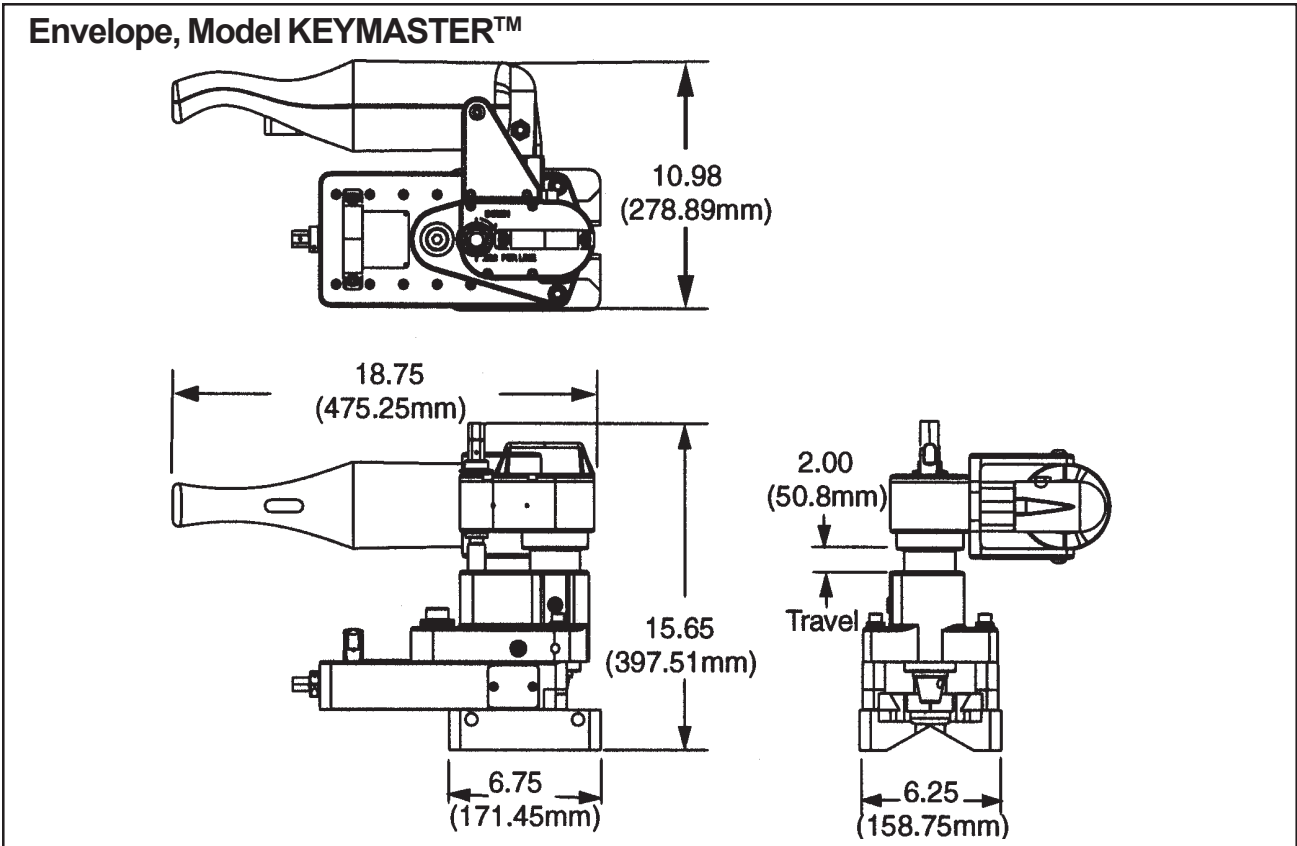
NOTE: 1/8" increments for End Mills are available.

SPECIFICATIONS

- Minimum Axial Shaft Clamp Length: 1" (25.4 mm)
- Shaft Diameter Range: 1 1/2" to 24" diameters (38.1 mm to 609.6 mm)
- Motor Power Requirements: Variable speed, 1 HP, 115 VAC, 10.2 Amps
- Speed Control: Variable speed control in motor
- Weight: 61 lbs. (27.67 kg)
- Axial Feed Travel: 5 1/2" (139.7 mm)
- Vertical Feed Travel: 2" (50.8 mm)

POWER DRIVE OPTIONS

The Model 424 can be supplied with a pneumatic motor or a 230 VAC, 50/60 Hz electric motor.



MAINTENANCE

All components should be cleaned and coated with a light film of oil prior to use.

Use a clean, non-detergent oil, preferably SAE 10 (90 SSU) or lighter.

The air supply for the KEYMASTER™ with an Air Motor should include an adequate filter, regulator and lubricator (FRL).

NOTE:

The Air motor warranty is void if damage occurs from contaminated air or lack of lubrication.

If the KEYMASTER™ is operated in the vertical position (End Mill up), it should be turned upside down and the chips and/or other debris removed after each keyway has been completed.

NOTE:

Tool life may be severely shortened, unless chips and/or other debris that have been deposited on the Base Clamp/Rails during the machining operation are removed.

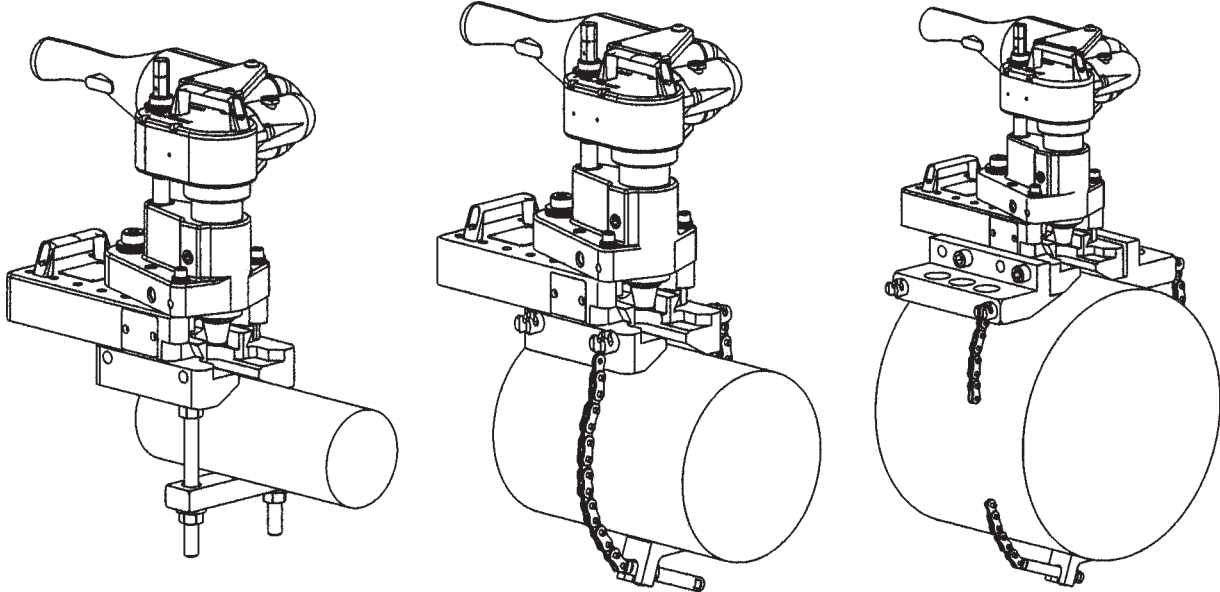
NOTE:

Disassembly of the KEYMASTER™ will void the warranty, except when performed by a TRI TOOL Inc. designated repair technician.

OPERATION

1. Select the right size end mill to cut the desired keyway into the shaft.
2. Configure the KEYMASTER™ for the diameter shaft to be machined.

Mounting Configurations

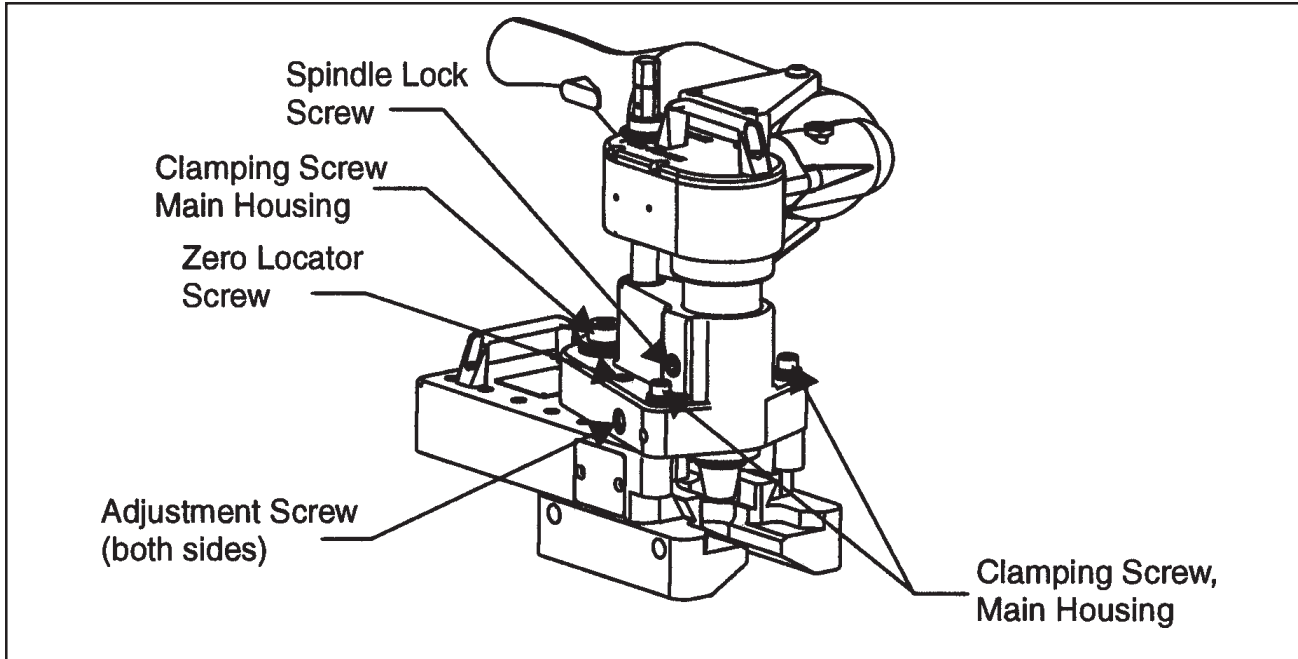


1 1/2" to 4 1/2"

4 1/2" to 12"

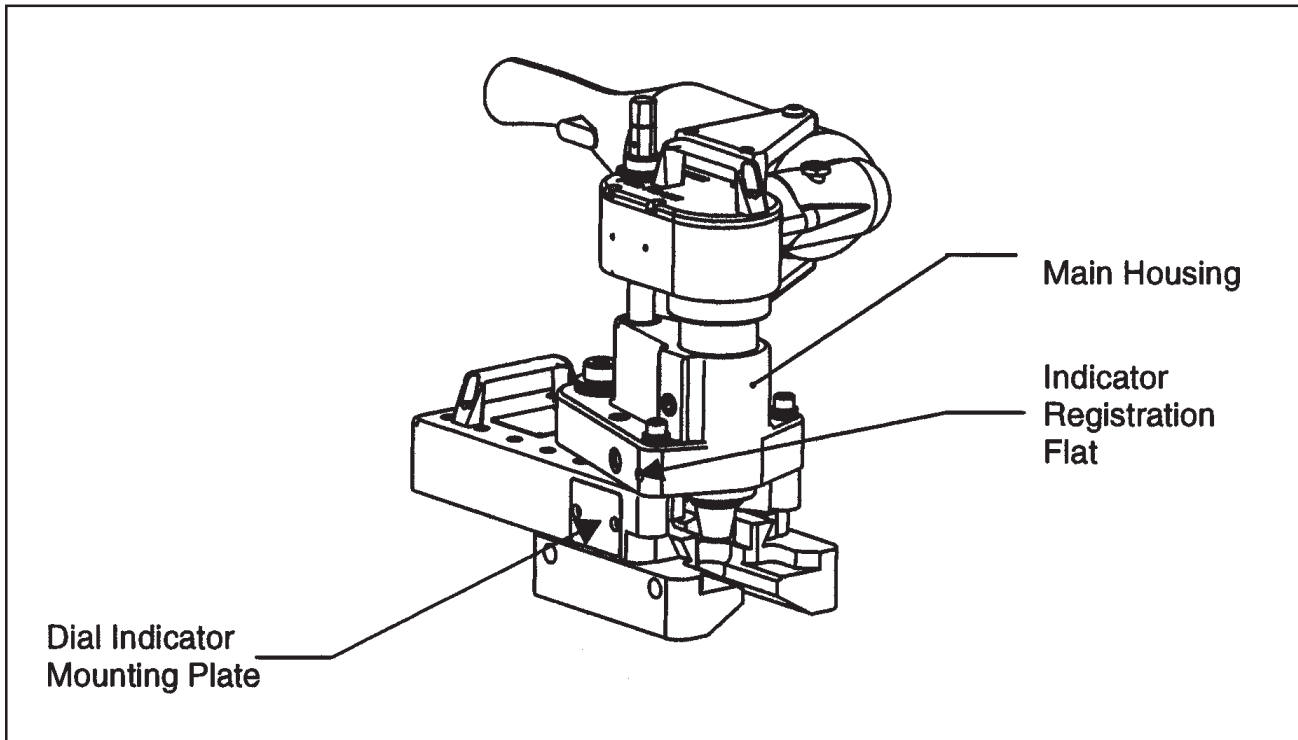
12" to 24"

3. Clamp the KEYMASTER™ to the shaft, leaving enough travel to start on the outside of the end of the shaft.
4. Make sure that the zero locator screw is in its hole and that the KEYMASTER™ main housing clamping screws are secure.
5. Connect the power supply to the motor.
6. Adjust the spindle to the correct depth of cut, and secure the spindle locking screw.
7. Turn the motor on and lock the trigger button.
8. Using the ratchet wrench, rotate the axial feed hex clockwise to advance the end mill into the material.
9. A moderate feed pressure will ensure a better surface finish for a more precision keyway.



ADJUSTMENT FOR KEYWAY WIDTH PRECISION

1. Mount the dial indicator on the side of the KEYMASTER™.
2. Zero in the dial to the main housing.
3. Unscrew the zero locator screw.



4. Loosen the main housing clamping screws, leaving enough pressure on the Belleville washers to get an accurate reading of the adjustment.
5. Unscrew one side adjustment screw and tighten the opposite one and watch the dial indicator.
6. When the correct amount of movement is accomplished, tighten the opposite side adjustment screw.
7. Tighten the main housing clamping screw.
8. Start the cut again until the desired keyway width is achieved.
9. When the keyway is satisfactory, unclamp the tool from the shaft.

END MILLS

END MILLS	
Part No.	End Mill Size
30-2800	1/4" End Mill, (3/8" Shank)
30-2801	3/8" End Mill, (3/8" Shank)
30-2802	1/2" End Mill, (1/2" Shank)
30-2803	5/8" End Mill, (1/2" Shank)
30-2804	3/4" End Mill, (1/2" Shank)
30-2805	7/8" End Mill, (1/2" Shank)
30-2806	1" End Mill, (1/2" Shank)
30-2809	Collet Reducer, 1/2" to 3/8"

TROUBLE SHOOTING

Problem: The Tool Bit Chatters

Probable causes:

- The tool bit is loose or overextended.
- The tool bit is damaged.
- The tool holder is too loose in the slides.
- The cutting speed is too fast.
- The clamping pads are loose on the pipe or tube.
- Cutting fluid is required.
- The main bearing pre-load is loose.

Problem: There is excessive Tool Bit wear

Probable causes:

- The pipe or tube material is too hard or abrasive.
- The cutting speed is too fast.
- Cutting fluid is required.
- A dull Tool Bit is causing surface hardening conditions (Stainless pipe or tubing).
- There is scale or other foreign matter on the pipe or tube, which is dulling the tool bit at the start of the cut.
- The tool bit is incorrect for the material being cut.

Problem: The surface finish is rough

Probable causes:

- The tool bit is dull, chipped, etc.
- Metal build-up on the cutting edge of the tool bit is creating a false cutting edge.
- Cutting fluid is required.

Problem: The tool holder is not feeding

Probable causes:

- The feed pin is broken or out of position.
- The feed sprocket shear pin is broken.
- The feed screw is stripped.
- The feed nut is stripped.
- The slide rails are too tight.

Problem: There is a loss of air power

Probable causes:

- The air supply pressure is too low.
- The air filter is plugged.
- The air line size is insufficient.
- The air line is too long.

Problem: There is a loss of hydraulic power

Probable causes:

- The hydraulic supply pressure is too low.
- The hydraulic filter is plugged.
- The hydraulic line size is insufficient.
- The hydraulic line is too long.

Problem: The tool bit will not reach the work

Probable causes:

- Incorrect tool blocks are installed for the size of the pipe or tube being worked on.
- Incorrect tool bit is installed.

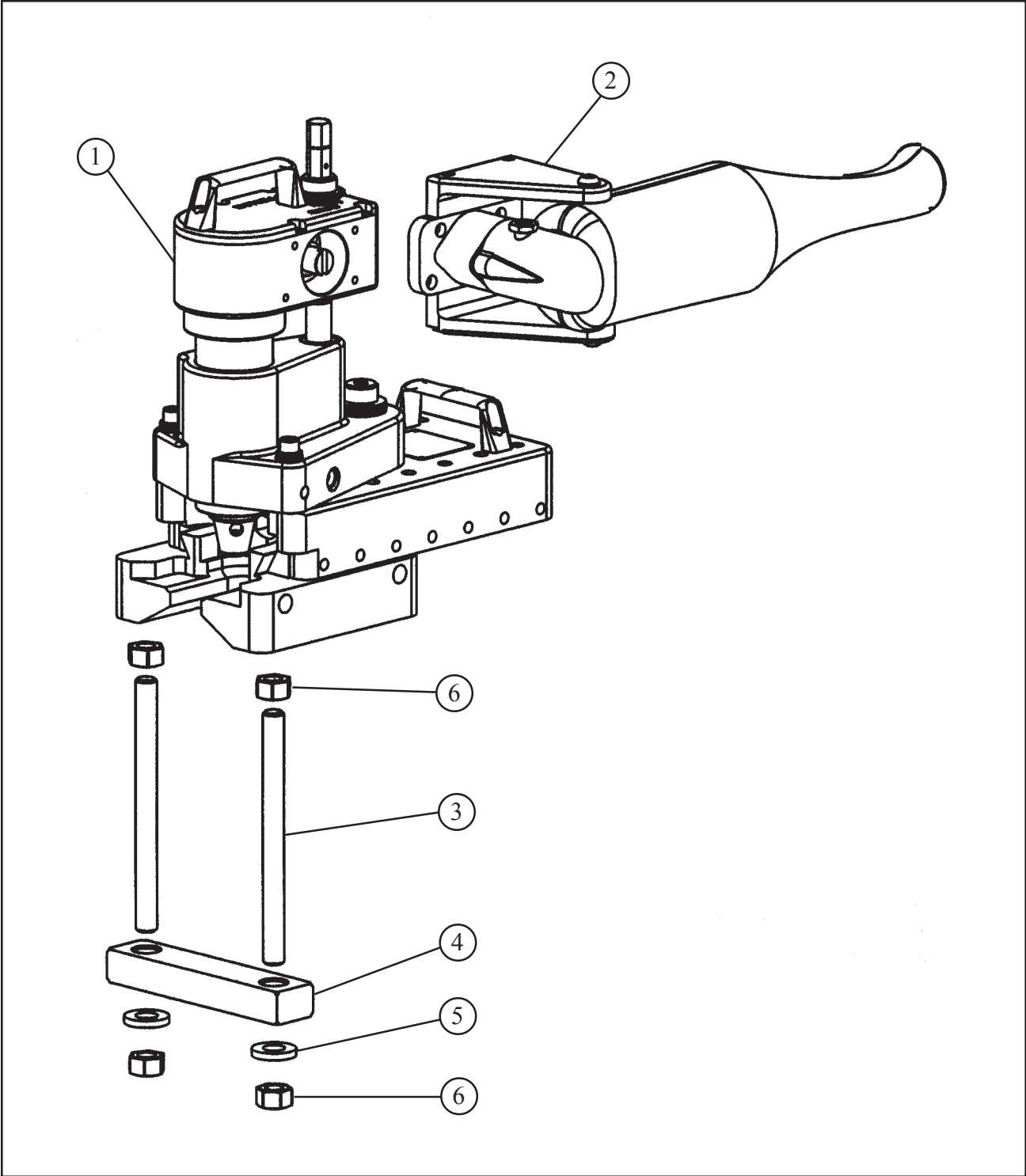
Problem: The hydraulic motor will not start

Probable causes:

- The hydraulic power supply is shut off.
- The hydraulic motor is damaged and will not run free.

ILLUSTRATED PARTS BREAKDOWN

MODEL 424 KEYMASTER™, 110V

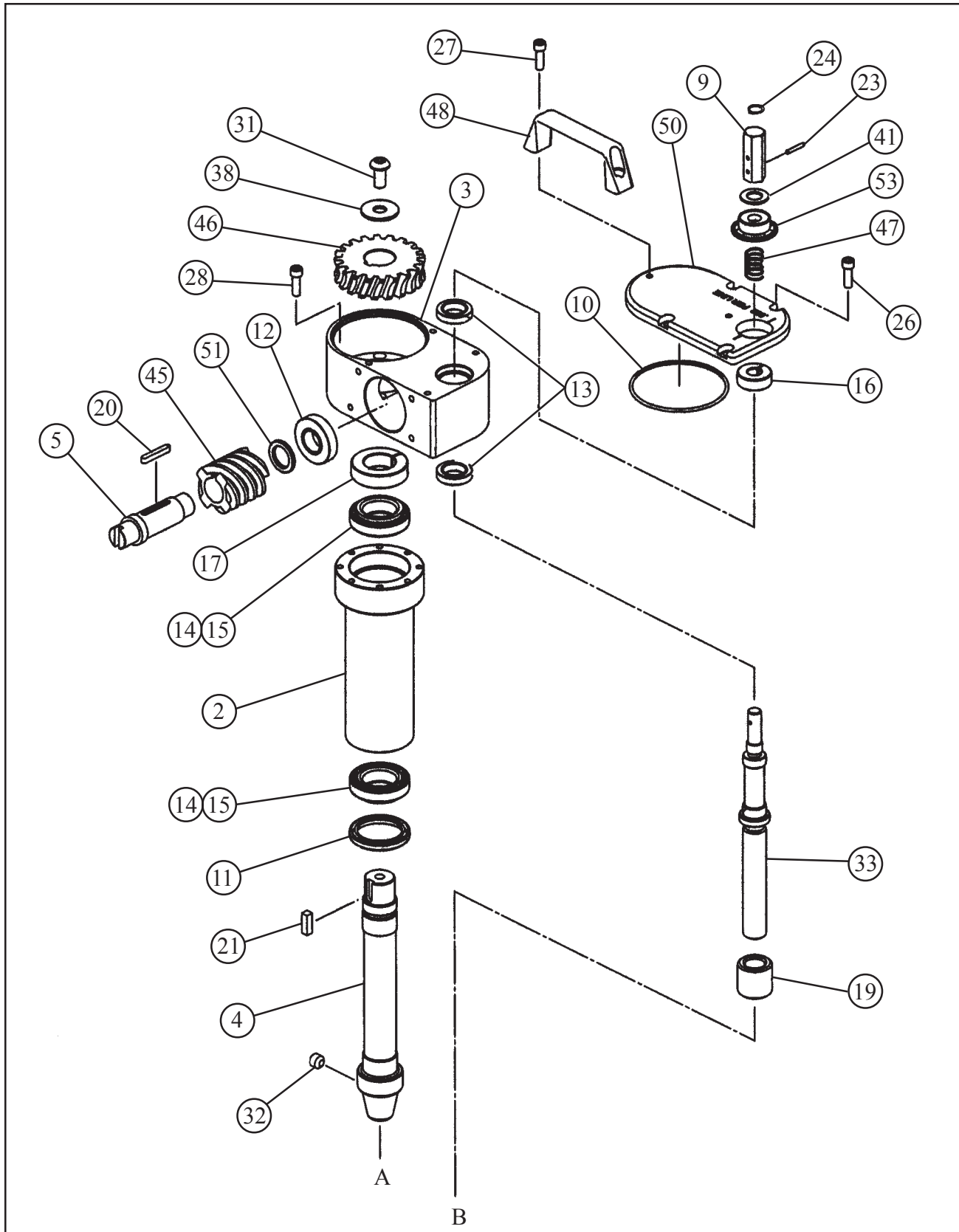


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Parts List, KEYMASTER™, Model 424 (P/N 01-1729)

Item No.	Part No.	Description	Qty
1.	02-2306	MODEL 424 SUB-ASSEMBLY	1
2.	58-0136	MOTOR ASSEMBLY, 110V	1
3.	23-0332	ROD, THD.	2
4.	24-1641	PLATE, CLAMP	1
5.	34-0320	WASHER	2
6.	35-0022	NUT, HEX	4
NOT SHOWN:			
	05-1346	WRENCH KIT	1
	86-0223	CASE	1
	30-0647	GOGGLES	1
	50-0026	DIAL INDICATOR ASSEMBLY, W/ MAG BASE	1
	86-0224	BOX, PLASTIC, SMALL (PARTS)	1
	86-0225	BOX, PLASTIC, LARGE (PARTS)	1

MODEL 424 SUB-ASSEMBLY



Parts List, Sub-Assembly, Model 424 (P/N 02-2306)

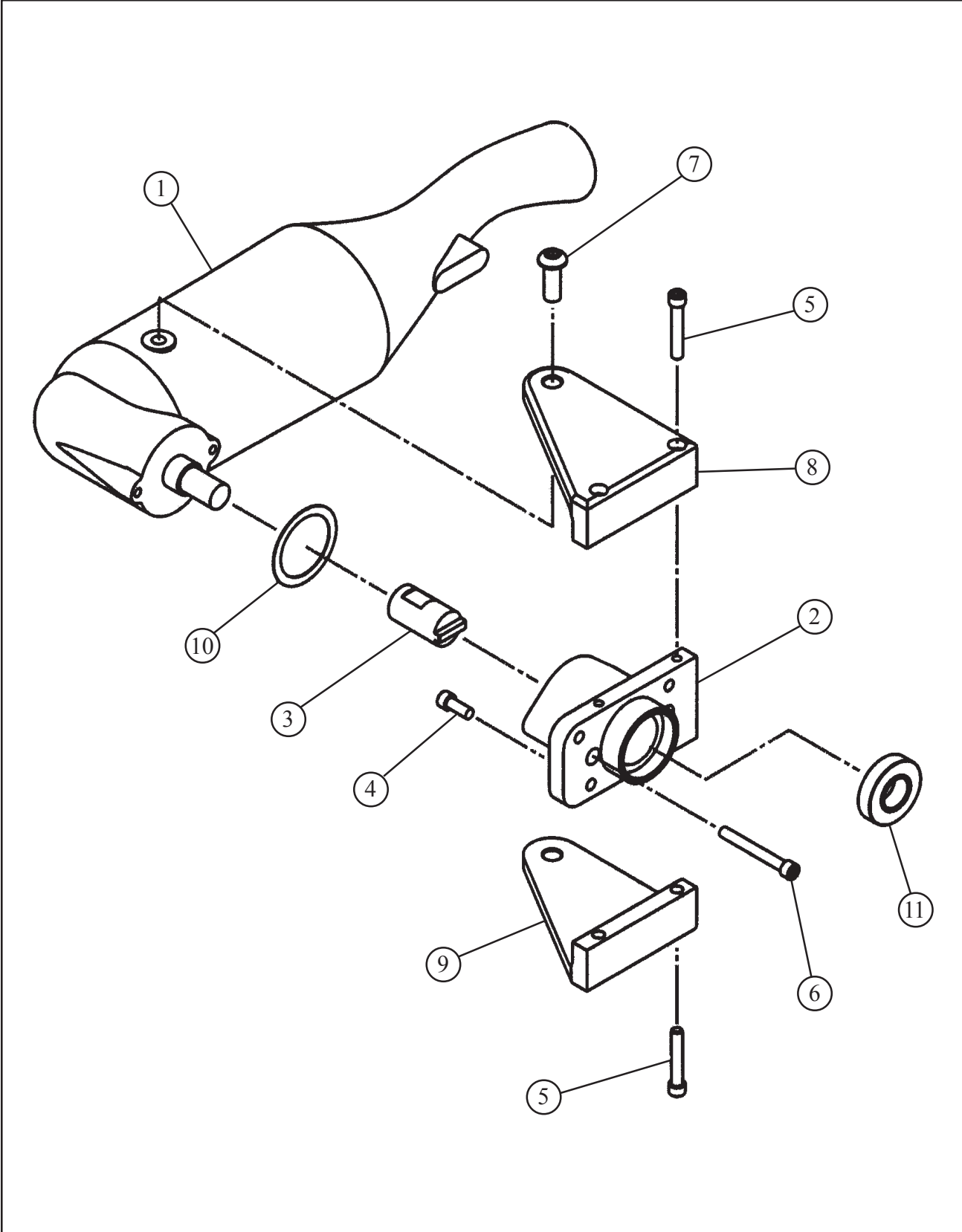
Item No.	Part No.	Description	Qty
1.	19-0849	HOUSING, MAIN	1
2.	19-0850	HOUSING, SPINDLE	1
3.	19-0851	HOUSING, DRIVE	1
4.	20-0727	SHAFT, MAIN	1
5.	20-0728	SHAFT, DRIVE	1
6.	24-1639	PLATE, SADDLE	1
7.	27-0641	ADAPTER, HEX, FEEDSCREW	1
8.	43-0558	COVER, RETAINING	1
9.	27-0643	ADAPTER, HEX, FEEDSCREW	1
10.	28-0293	O-RING	1
11.	28-0290	SEAL	1
12.	29-0020	BEARING, BALL	1
13.	29-0080	BEARING, BALL	2
14.	29-0384	BEARING, TAPERED, CUP	2
15.	29-0385	BEARING, TAPERED, CONE	2
16.	30-2790	COLLAR, SHAFT	2
17.	30-2791	COLLAR, SHAFT	1
18.	30-2793	BUSHING, DRILL	1
19.	30-2794	INSERT, THD	1
20.	31-0189	KEY	1
21.	31-0069	KEY	1
22.	43-0559	COVER, RETAINING	1
23.	32-0025	PIN, ROLL, 1/8 DIA X 5/8"	2
24.	30-2367	RING, RETAIN, EXT	1
25.	32-0492	PIN, DOWEL, 3/4 DIA X 2"	1
26.	33-0037	SCREW, CAP, 1/4-20 X 3/8"	4
27.	33-0038	SCREW, CAP, 1/4-20 X 1/2"	2
28.	33-0040	SCREW, CAP, 1/4-20 X 3/4"	9
29.	33-0044	SCREW, CAP, 1/4-20 X 1 1/2"	14
30.	33-0076	SCREW, CAP, 3/8-16 X 2 1/4"	2
31.	33-0298	SCREW, BUTTON, 3/8-16 X 3/4"	1
32.	33-0539	SCREW, SET, 7/16-14 X 3/8", CUP PT	1
33.	33-2133	SCREW, FEED	1
34.	33-2171	SCREW, FEED, AXIAL	1
35.	33-2146	SCREW, SHOULDER, 3/4 DIA X 1 1/2"	1
36.	33-2159	SCREW, LOCK, ZERO	1
37.	33-2160	SCREW, ADJUSTMENT	2
38.	34-0366	WASHER, FLAT	1
39.	34-0109	WASHER, THRUST	2

TRI TOOL INC.

Parts List, Sub-Assembly, Model 424, Continued (P/N 02-2306)

Item No.	Part No.	Description	Qty
40.	34-0162	WASHER, THRUST	2
41.	34-0163	WASHER, THRUST	1
42.	34-0363	WASHER, BELLEVILLE	3
43.	34-0364	WASHER, BELLEVILLE	6
44.	35-0553	NUT, FEED	1
45.	39-0869	WORM, RH	1
46.	39-0870	GEAR, SPINDLE, BRONZE	1
47.	40-0270	SPRING, COMPRESSION	1
48.	41-0155	HANDLE	2
49.	43-0557	COVER, HELICALLY WOUND	2
50.	43-0538	COVER, DRIVE, HOUSING	1
51.	44-0510	SHIM	1
52.	48-1189	BLOCK, BASE, CLAMP	1
53.	50-0025	DIAL, FEED	1
54.	66-0184	RAIL, GIB	2
55.	33-1269	SCREW, SET, 3/8-24 X 5/8", HDOG	7
56.	33-2161	SCREW, SET, FLAT PT, 5/8-11 X 5/8"	1
57.	44-0517	PLUG, SPACER	1
58.	24-1688	PLATE, INDICATOR	1
59.	33-0347	SCREW, FLAT, #8-32 X 1/2"	2
60.	33-0284	SCREW, BUTTON, 1/4-20 X 3/8"	1
61.	27-0668	ADAPTER, SPRING	2

MOTOR ASSEMBLY, 110V

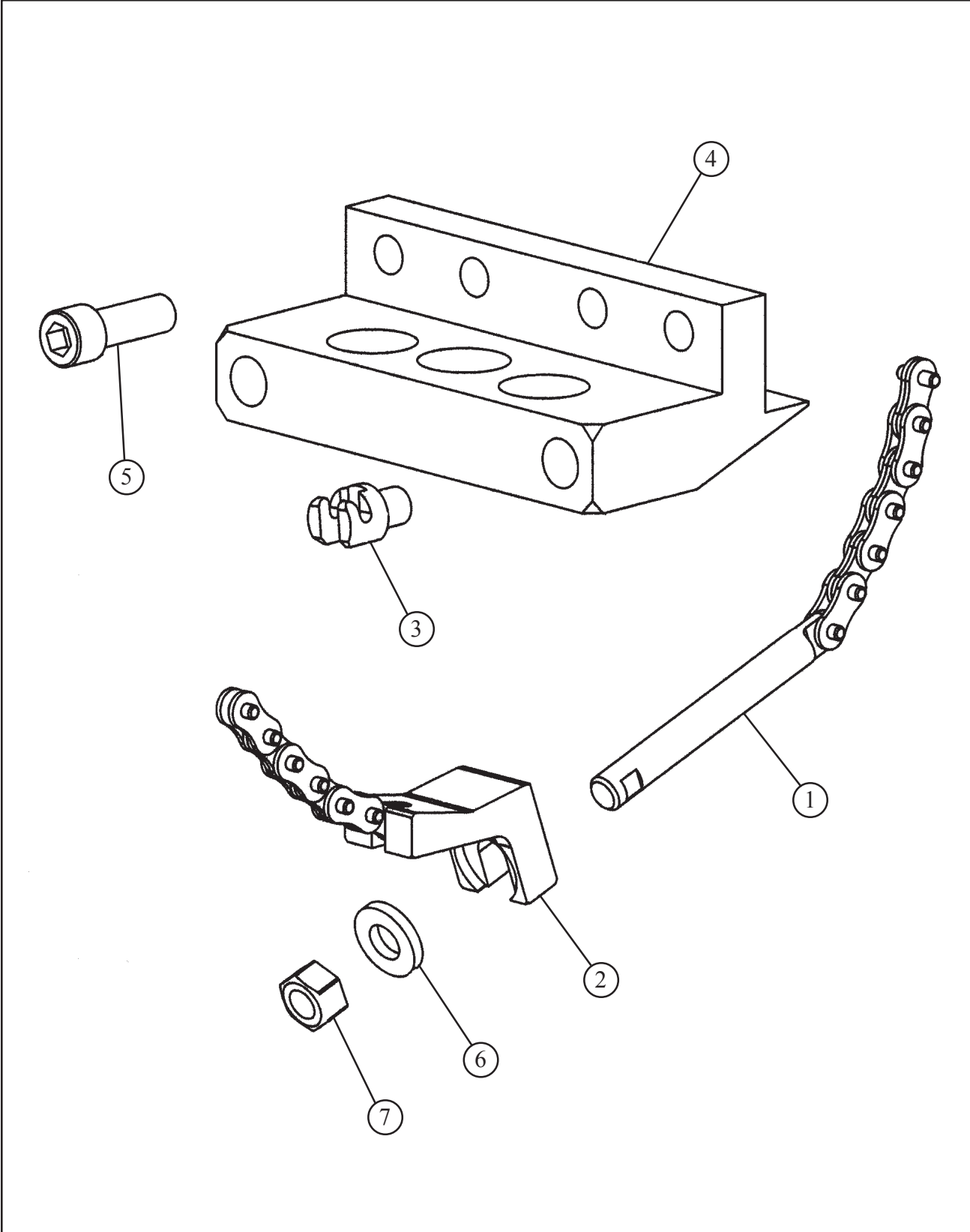


TRI TOOL INC.

Parts List, Motor Assembly (P/N 58-0136)

Item No.	Part No.	Description	Qty
1.	58-0134	MOTOR, ELECTRIC, 110V	1
2.	27-0628	ADAPTER, TORQUE	1
3.	27-0629	ADAPTER, DRIVE	1
4.	33-0039	SCREW, CAP, 1/4-20 X 5/8"	4
5.	33-0044	SCREW, CP, 14-20 X 1 1/2"	4
6.	33-0046	SCREW, CAP, 1/4-20 X 2"	2
7.	33-0300	SCREW, BUTTON, 3/8-16 X 1"	2
8.	47-1244	BRACKET, TOP	1
9.	47-1245	BRACKET, BOTTOM	1
10.	40-0269	SPRING, WAVE	1
11.	29-0020	BEARING, BALL	1
NOT SHOWN:			
	33-0660	SCREW, SET, 1/2-20 X 1/2", CUP PT	1
	35-0117	NUT, JAM	1

KEYMASTER™ EXTENSION KIT



TRI TOOL INC.

Parts List, Extension Kit, KEYMASTER™ (P/N 05-0341)

Item No.	Part No.	Description	Qty
1.	37-0030	CHAIN ASSEMBLY W/ CLAMP SCREW	2
2.	37-0031	CHAIN ASSEMBLY W/ CLAMP BRACKET	2
3.	47-1223	BRACKET, CHAIN	4
4.	47-1247	BRACKET, MTG, EXT	2
5.	33-0127	SCREW, CAP, 5/8-11 X 1 3/4"	4
6.	34-0320	WASHER	2
7.	35-0022	NUT, HEX	2
NOT SHOWN:			
	36-0013	WRENCH, L, 1/2" HEX	1
	36-0075	WRENCH, COMBINATION, 1/2"	1