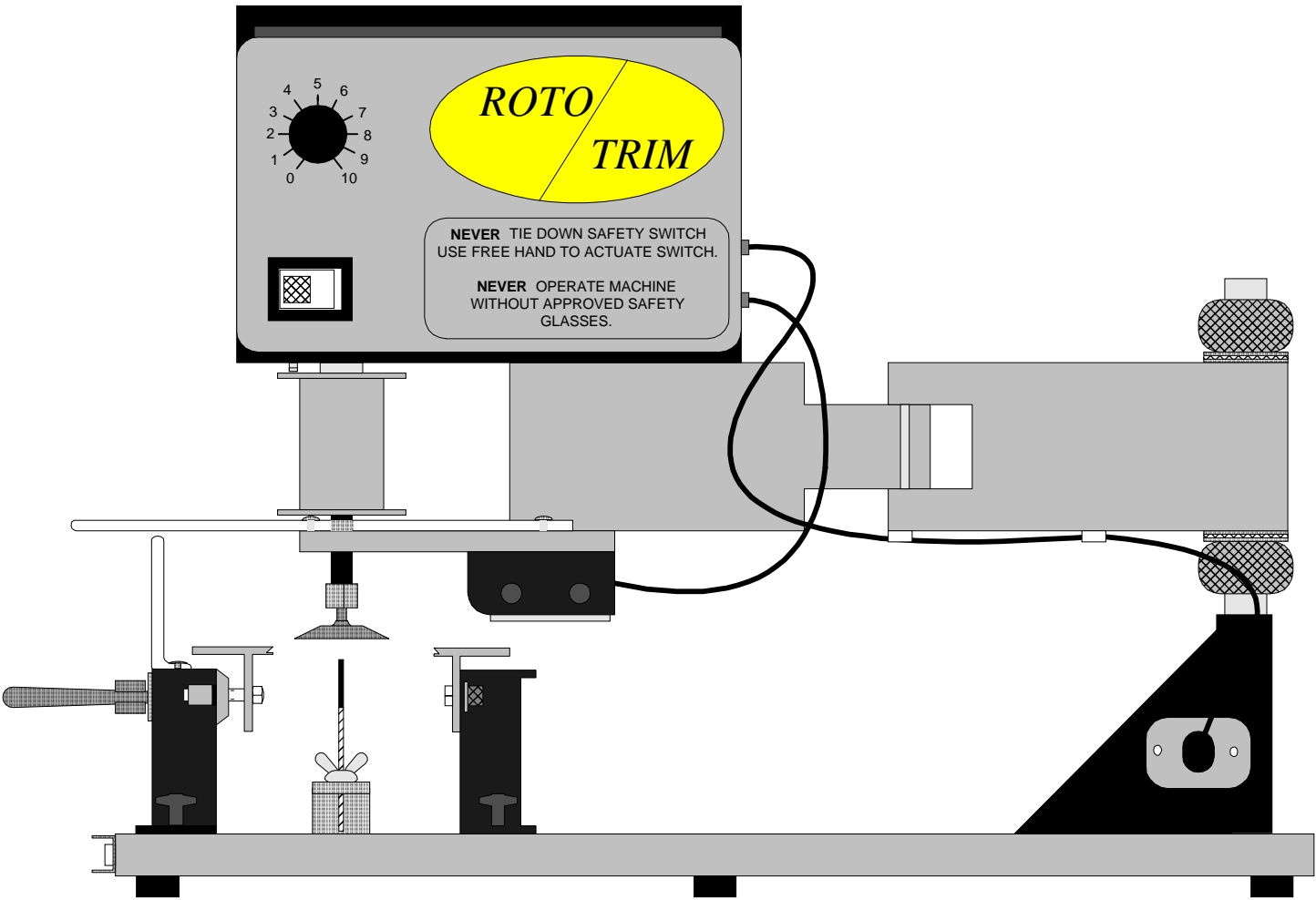


OWNER'S MANUAL

ROTO/TRIM[®], MODEL 272



Roto Form Manufacturing Corporation

ROTO TRIM® OWNER'S MANUAL

Thank you for purchasing the Roto/Trim ®, Model 272 Lead Trimmer from Roto Form Manufacturing Corporation.

Roto Form specializes in designing and building machinery for the assembly of printed circuit boards and has done so since 1972. Currently Roto Form manufactures a complete line of component cutting and forming equipment, circuit board lead trimmers, and automatic soldering machines.

The Roto/Trim ® has proven itself over the years to be a product superior in design, easy to use, and cost effective to own. Applied properly It will be an asset to your operations resulting in both increased productivity and high quality output. Nevertheless, an operator's intelligent input is the key to its superior performance.

The Roto/Trim is easy to set up and to operate. If you will take a few moments to look through this manual, the task will move quickly and you will be trimming boards within the next few minutes.

Of all the tips and suggestions included in this manual there is one which is universally important. PLEASE BE CERTAIN TO LEVEL THE VISE RAILS BEFORE ATTEMPTING TO OPERATE THIS MACHINE. (Section I, Unpacking & Setup).

The Model 272 is designed for selective trimming of printed circuit boards. This design allows the operator to see the board as it is being trimmed and clear "see-through" shields and safety glasses protect the user. A vibration-resistant light located just behind the cutter on the cutting arm illuminates the cutting area.

A cantilevered arm holds the rotating spindle and cutter. The arm is leveled relative to the base of the machine during the manufacturing process and, therefore, requires no adjustment. The height of the cut leads is adjusted by loosening the knurled nuts on the post supporting the arm. Details of this are discussed in Section I of the manual.

Thank you again for purchasing from us. Contact me personally if I can be of assistance.

Charles Slover
President

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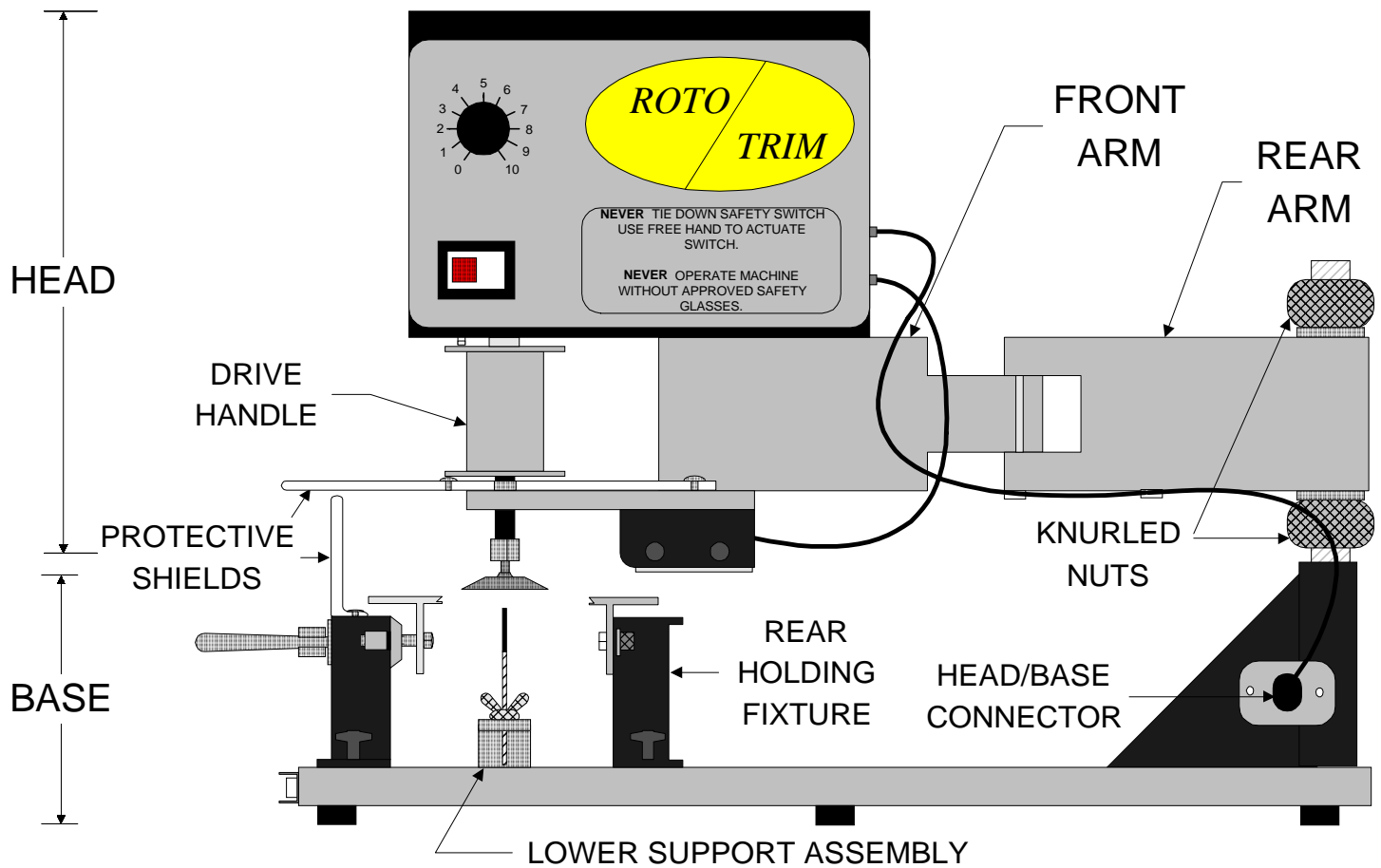
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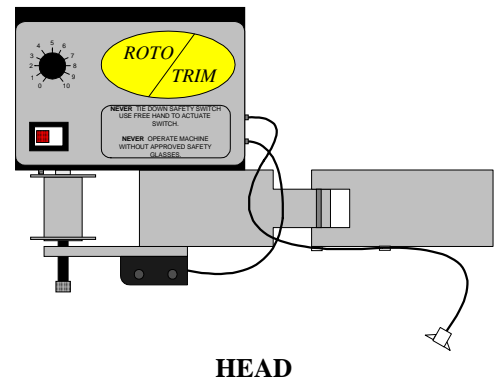
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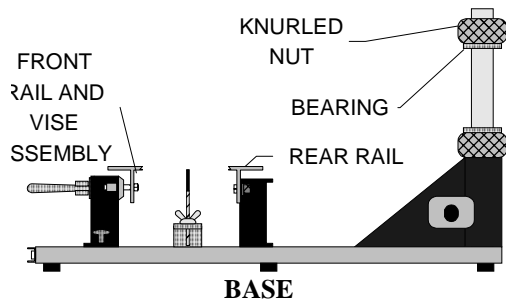
I UNPACKING AND SET-UP



Unpacking and Assembly

- a. Open carton from topside. Remove the top layer of foam.
- b. Lift the head assembly from the carton and set it aside.
- c. Remove the next layer of packing foam. The goggles, blades, wrenches are in the plastic bag. Remove the Lexan® protective shield.
- d. Lift the base of the unit from the carton and place it upright on a level work area.
- e. Remove the protective plastic bags from both the head and base.





f. A plastic band on the upright post separates the upper and lower thrust-bearing assemblies during shipment. Remove this band and the upper knurled nut and thrust-bearing assembly. Place the rear arm over the upright post so that it rests on the

lower bearing assembly. Replace the upper knurled nut and bearing assembly with the thrust bearing between the two washers.

g. Plug the electrical connector from the head assembly into its mating connector, located in the black triangular support at the base of the post. Attach the covering plate with the two screws already in place. The unit should now appear as it does in the following illustration.

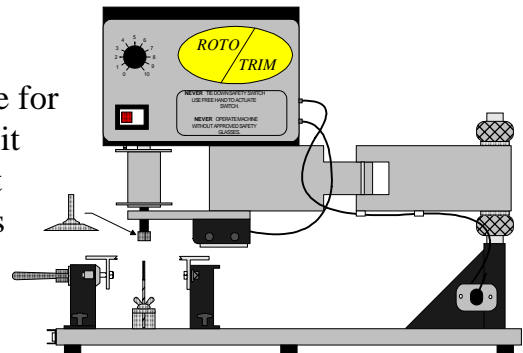
Installing a Cutter

Install the cutter using the two flat wrenches included, be sure that the cutter shaft is inserted all the way into the chuck and that the chuck is secured tightly on the shaft. Remove the protective wax from the cutter.

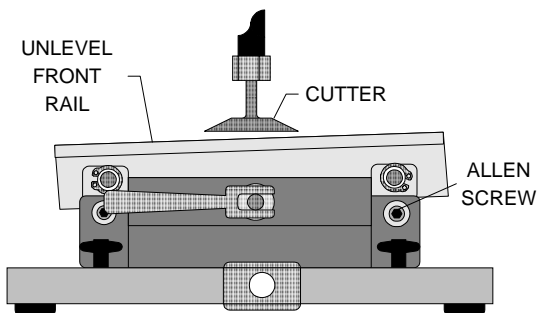
WARNING: The cutters are very sharp, handle them with care.

Leveling the Machine

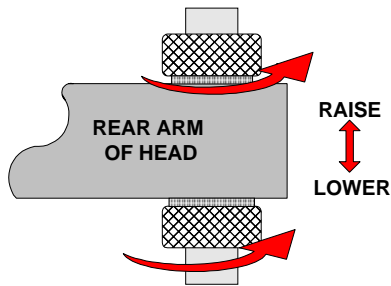
Place the machine on a flat, level work surface for the following leveling process. Ideally, place it where you intend to leave it. Some opt to bolt or clamp the base to the work surface which is fine, however it is not necessary.



1. Leveling the Front Vise Jaw Rail



a. The height of the front rail is fixed. It can only rotate around the shaft of the vise jaw handle for leveling purposes. Therefore, loosen the two 3/16" allen screws which secure the vise jaw rail to the **front** sliding angle enough so that the rail can be pivoted, as illustrated here.

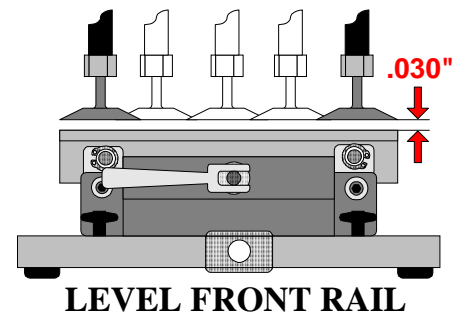


b. Position the cutter directly over the center of the front vise jaw rail. Adjust the height of the head (by turning the knurled nuts on the upright post) so that the cutter just touches the top surface of the rail.

c. Pivot the front vise jaw rail around its shaft so that the cutter slightly touches the top surface of the rail when the cutter moves from side to side across the vise jaw rail. Tighten the allen screws. The cutter should now be level with respect to the front vise jaw rail, as in this illustration. A second adjustment may be necessary to obtain the best setting.

2. Leveling the Rear Vise Jaw Rail

The rear vise jaw rail is leveled only after the front rail has been leveled (see "Leveling the Front Vise Jaw Rail"). Adjust the height of the vise jaw rail to that of the front one. Then level it as you did the front one, with respect to the cutter. The allen screws holding the rear vise jaw rail in place have 7/16" nuts on them. Loosen these before attempting to loosen the allen screws.

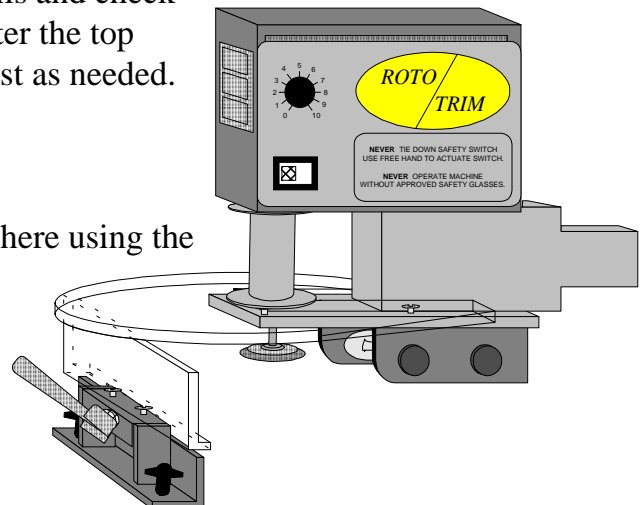


3. Checking the Level

Raise the cutter slightly above the vise jaw rails (about the thickness of a piece of paper). This is accomplished by turning the knurled nuts located on the upright post (top one first) about a half-turn in a counter-clock-wise direction. Tighten the knurled nuts once again, by hand only. Move the cutter completely across both the front and rear vise jaw rails and check visually to see if the gap between the cutter the top surface of the rails is even. If not, readjust as needed.

Installing the Protective Shield

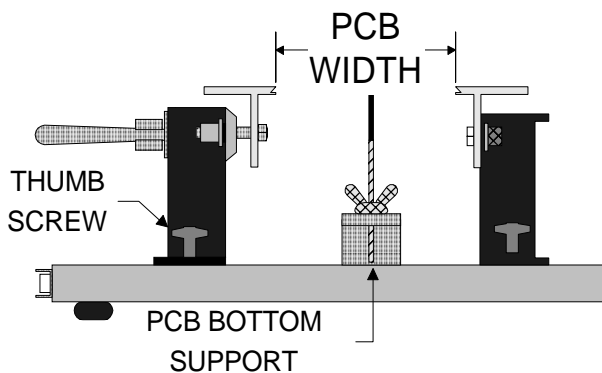
Install the protective shield as illustrated here using the four self-tapping screws provided.



II OPERATING THE MACHINE

When operating the Roto/Trim®, always wear safety glasses. A pair of safety goggles has been included with your new machine for you convenience.

Adjusting the Rails to Fit Your Board



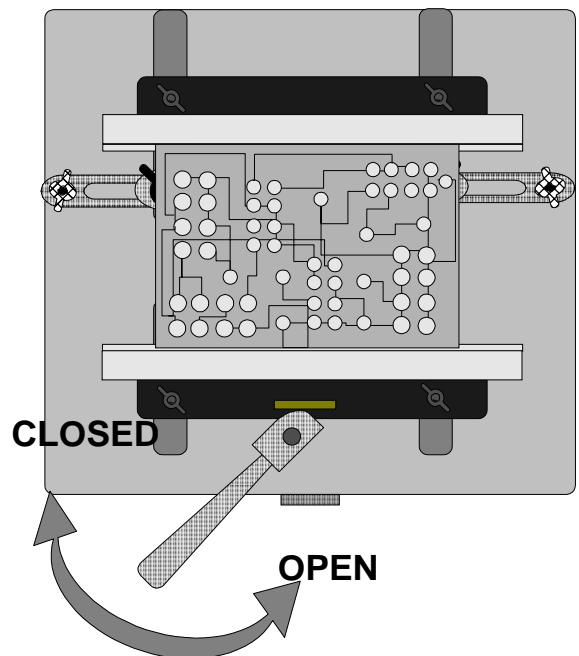
Loosen the thumbscrews that secure the front and rear sliding angles to the base and move the angles so that the distance between the is approximately the width of your PCB. Adjust the distance snugly enough so that the PCB cannot move in the rails, yet not so tightly that the board bends. Tighten the thumbscrews. If the thumbscrews are not properly tightened, the sliding angles may flex relative to the base causing the height of cut to vary.

Using the PCB Bottom Support Assembly (PN 172-110-A)

If the PCB is warped, use one or both of the bottom supports to level. For more severely warped boards, refer to section VII detailing the **Roto-Vac**.

Adjust the height and location of the support so that it pushes upward on the bottom of the board. Locate the support rod in such a way that it makes contact with the PCB lower surface and not a component.

If the bottom supports are not required, simply move them out to the side so that they are not in the way.



Safety Switches

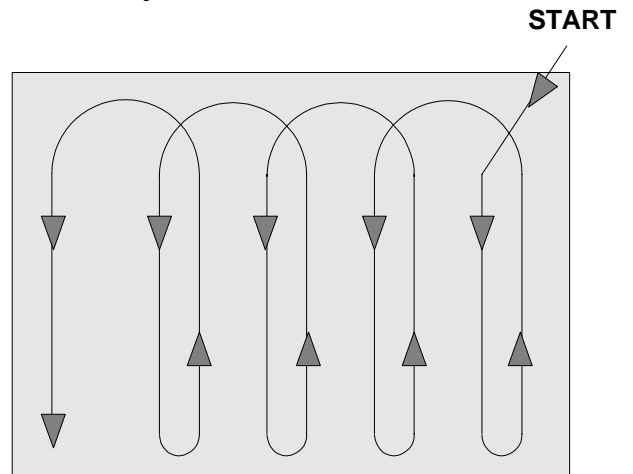
To operate the Roto-Trim®, two switches must be simultaneously activated. Compress the button on the front of the base with one hand and lift the drive handle slightly with the other. This is a safety feature designed to occupy both of the operators' hands while the machine is running. **Never attempt to override this safety feature.**

Cutting Techniques

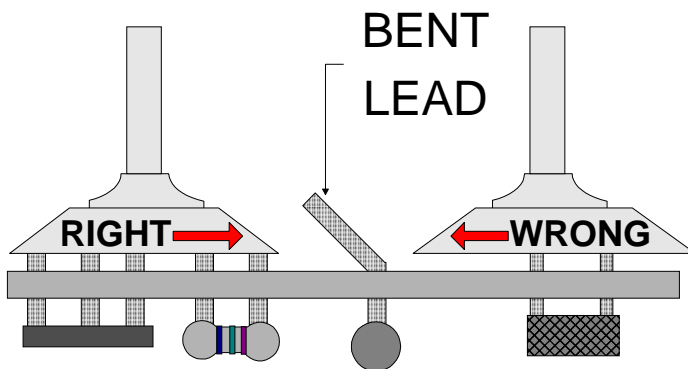
A cutting pattern should be established similar to that shown below to minimize multiple passes over the same area.

Move the cutter through the leads;
approximately two inches (50 mm) per second for light gauge leads and slower for heavier ones, allowing the cutter to work through the material rather than push it.

Vary the cutter's rpm to a speed yielding minimum cut resistance. Optimal speed is usually found between 3 and 7 on the dial. The trimming process should feel smooth and steady, not jarring and erratic.



(OPERATOR)



Bent Leads

Bent leads should be approached from the direction the lead is leaning toward, as indicated in the illustration.

Cutter Speed

Cutter speed varies from 3,600 rpm (0 on the dial) to approximately 9,000 rpm (10 on the dial). By experimenting with different rpm settings, the operator can decide which setting is best.

Choosing the Right Cutter

Two cutters are included with the Roto/Trim®, one is serrated, the other has a smooth edge. Either of these cutters will get the job done, however there are notable differences in their performance. Experiment with both and decide which best suits your application.

Smooth edged cutters are the industry standard, they are less expensive to purchase and to sharpen. A smooth cutter creates less dust but dulls more quickly on heavy gauge wire.

Serrated cutters work better on heavy gauged and/or harder leads such as those made of steel or kovar. Less operator force is required to cut the same diameter lead with a serrated cutter.

Inspection

After cutting, inspect the finished board for quality of cut. It may be desirable to brush the board with a stiff-bristled brush after cutting to remove any cut leads which might tend to adhere to the surface. This is a standard procedure in many companies after hand or machine trimming.

Frequently clean the trimmed leads from the machine so they do not lodge in tight places and upset the tolerances of movable parts. A cutter should be returned to Roto Form for sharpening when its cut becomes unacceptable.

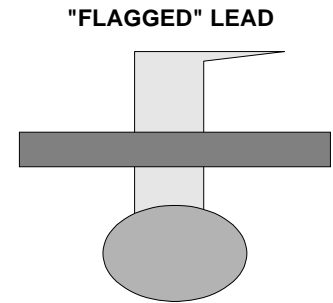
III TROUBLE SHOOTING GUIDE

Observed	Possible Causes
1. Machine will not run.	1. Check fuse and replace if needed. 2. Check both safety switches to see if they are functioning properly. a. If the red light on the On/Off switch illuminates, then the problem is either a faulty safety switch, faulty wiring to the motor, a non-functioning motor, or a faulty speed control. b. If the light on the On/Off switch does not illuminate, then the circuit is broken between the switch and the wall plug. Check this plug, the connections on the back of the On/Off switch, and the electrical connector on the base of the upright post.
2. The light bulb shorts or burns out too quickly.	Check for fragments of cut leads which may be lodged in or around the base of the bulb and it's mating socket.
3. The machine runs but vibrates excessively.	With the machine not running, check for “play” or side to side movement within the spindle or between the spindle and machine housing. If there is any movement within the spindle, a new spindle assembly may be required. Any movement between the spindle and the machine housing must be removed by shimming or replacing the worn parts.
4. The motor turns but the spindle does not.	Check for worn or broken timing belt, motor sprocket, or spindle sprocket. Roto Form recommends changing all three pieces as a kit. Order part # 172-248K.

IV FREQUENTLY ASKED QUESTIONS

Q. What causes flagging of leads?

- A. There are four causes of "flagged" leads:
1. Cutting height of leads exceeds 0.050" and/or
 2. Dull cutter and/or
 3. Vibration due to
 - loosely held PCB and/or
 - a machine problem and/or
 4. Cutting too rapidly through the leads, causing the cutter to push a lead before cutting it.
 - 5.



Q. Why do leads bend rather than be cut?

- A. The cutter being set too high, (i.e. greater than 0.050") usually causes this. See "flagging".

Q. How long do cutters last?

- A. A cutter used properly will trim from 100,000 to 1,000,000 leads before sharpening becomes necessary.

Q. How many times can the cutter be sharpened?

- A. Approximately 8 to 10 times. The real issue is a financial one. The cost effectiveness of sharpening a cutter to less than 3/4" diameter is questionable.

Q. What about warped boards?

- A. **For mildly warped boards:** The Roto-Trim® uses two adjustable PCB support assemblies to support or push up on the board from below and level it.
For heavily warped boards: Use the Roto-Vac® accessory.

Q. What cutter speed setting should I use?

- A. Optimal rpm settings are usually found between 3 and 7 on the speed dial.

Q. How much time does it take to trim a board?

- A. Cutter life is sacrificed when one trims a board too quickly. To achieve the highest blade life, a maximum trimming rate of 2 square inches/second is recommended.

V SPECIFICATIONS

Base width	11 1/2"
Base length	23 1/4"
Overall height	17 3/4"
Shipping Weight	50 lbs.

Electrical:

- **Power Requirements** - 120 VAC, 4 Amp 50/60 Hz (240 VAC optional).
- **Motor** - Wound armature, wound stator brush motor - sleeve bearings - oil impregnated oilite bronze.
- **Fused** - 250v - 5 AMP.
- **Speed Control** - Solid state continuous control to 10,000 RPM.
- **Light** - 25 watt.
- **Safety Switch** - Base mounted.
- **Safety Switch** - Handle mounted.

Mechanical:

- **Dimensions, Basic Overall Unit** - Length 24" x 11 1/2" x 16 1/2" high.
- **Weight** -50 lbs. (shipping weight).

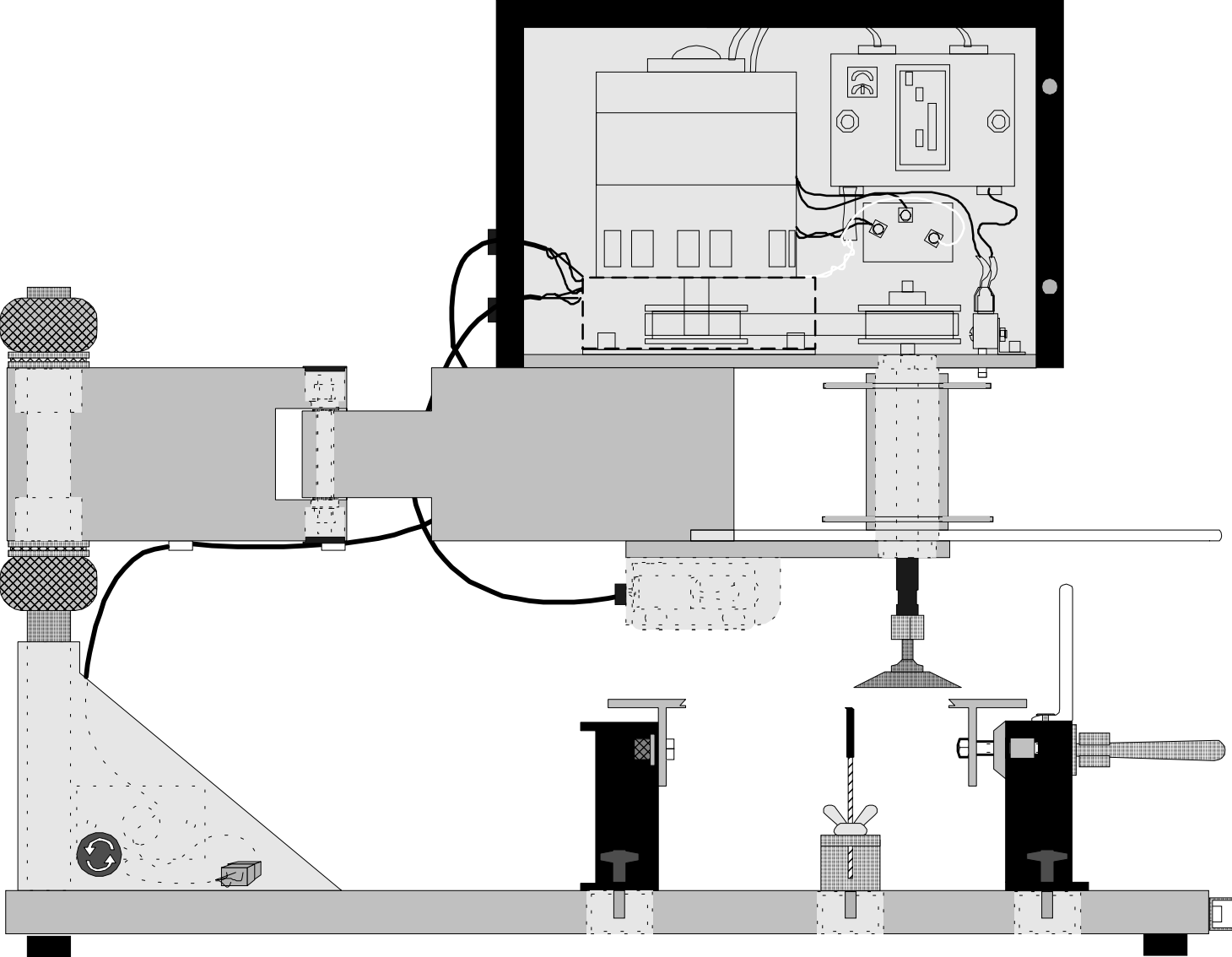
Materials:

- **Base** - Milled/Anodized Aluminum Plate 5/8" thick.
- **Upright Post** - 1.0" plated steel.
- **Arms** - Solid anodized aluminum stock.
- **Housing** - Cold rolled steel with enamel finish.
- **Vise Jaw Rails** - Anodized extruded aluminum.
- **Safety Shields** - GE Lexan® polycarbonate type material.
- **Cutters**- Diamond-ground blended tungsten carbide brazed onto 1/4" diameter stainless steel shank. Various sizes from 3/4" to 2" diameter.
- **Chuck Wrenches** - Flat 3/4" and 1/2".
- **Bearings** - Thrust needle roller, sealed roller and ball bearings.

Features:

- **Board size** - Up to 12" wide, by any length.
- **Lead Material** - Cutters will trim copper, steel and kovar.
- **Maximum Component Height** - 3.20".
- **Recommended Cutting Height** - .025" to .050".
- **Set-Up Time** - Takes only a few seconds using the sturdy, spring-loaded, vise jaw rails.
- **Speed** - Up to 10,000 RPM will cut up to 2500 leads per minute depending on the material and diameter of the leads.
- **Accuracy** - The Roto-Trim, as designed, operates within a $\pm .003$ " accuracy across it's length and width.
- **Anti-Warpage Fixtures** - Anti-warp mechanical devices will support convex and concave warpage of PCB in a horizontal plane.
- **Safety Features** - Both hands are used. Each hand activates a safety switch. Horizontal shield with skirt protector protects the operator. Safety glasses are also provided. A 25W lamp illuminates the cutting area providing increased visibility.
- **Cutter Blades** - Specially blended tungsten carbide provides long life. Cutters may be sharpened several times.
- **Selective Cutting** - The high visibility design of the Roto-Trim® provides the operator the convenient ability to selectively trim around devices, connectors, mounting hardware, etc.
- **Inspection** - The illuminated design permits easy inspection of the cut leads.

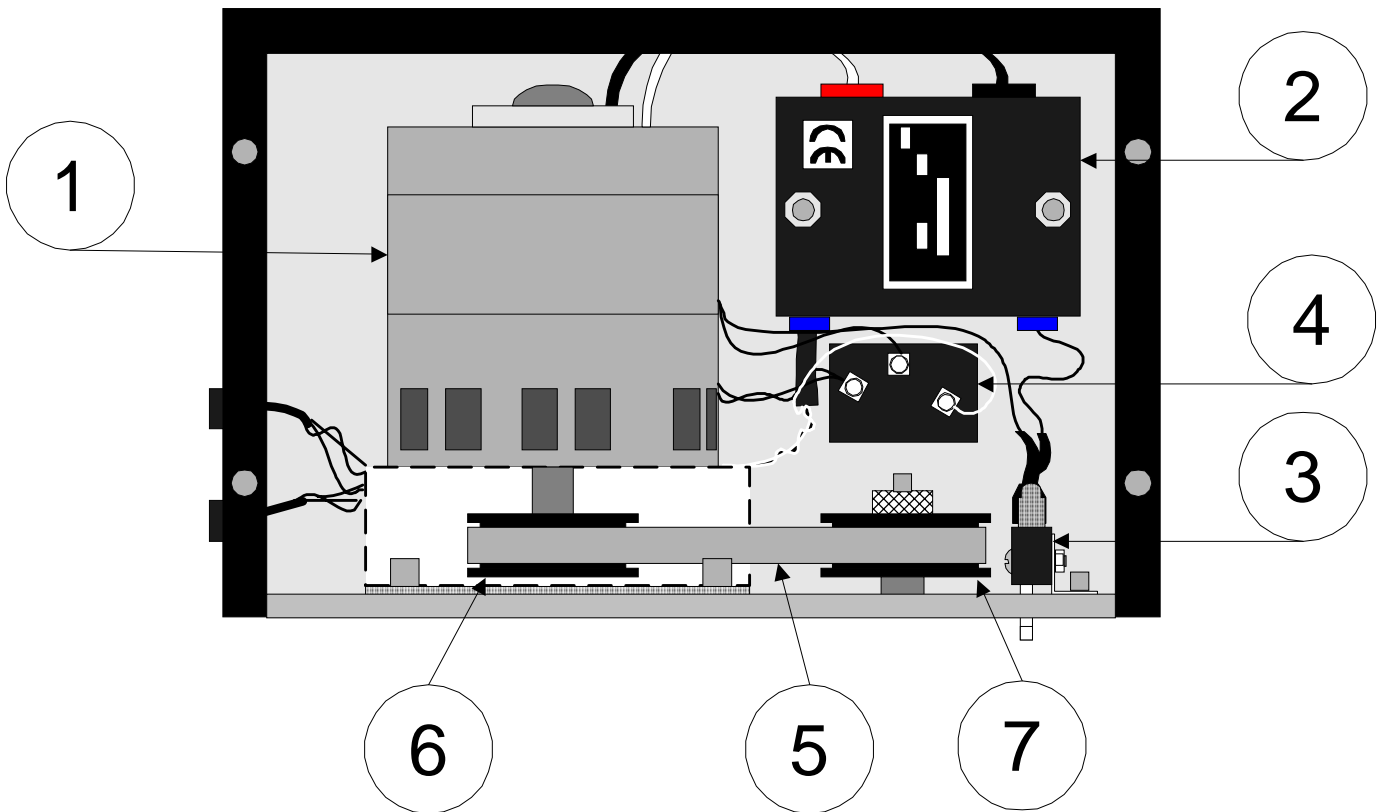
VI PARTS LIST AND DIAGRAMS



Roto Trim®, Model 272

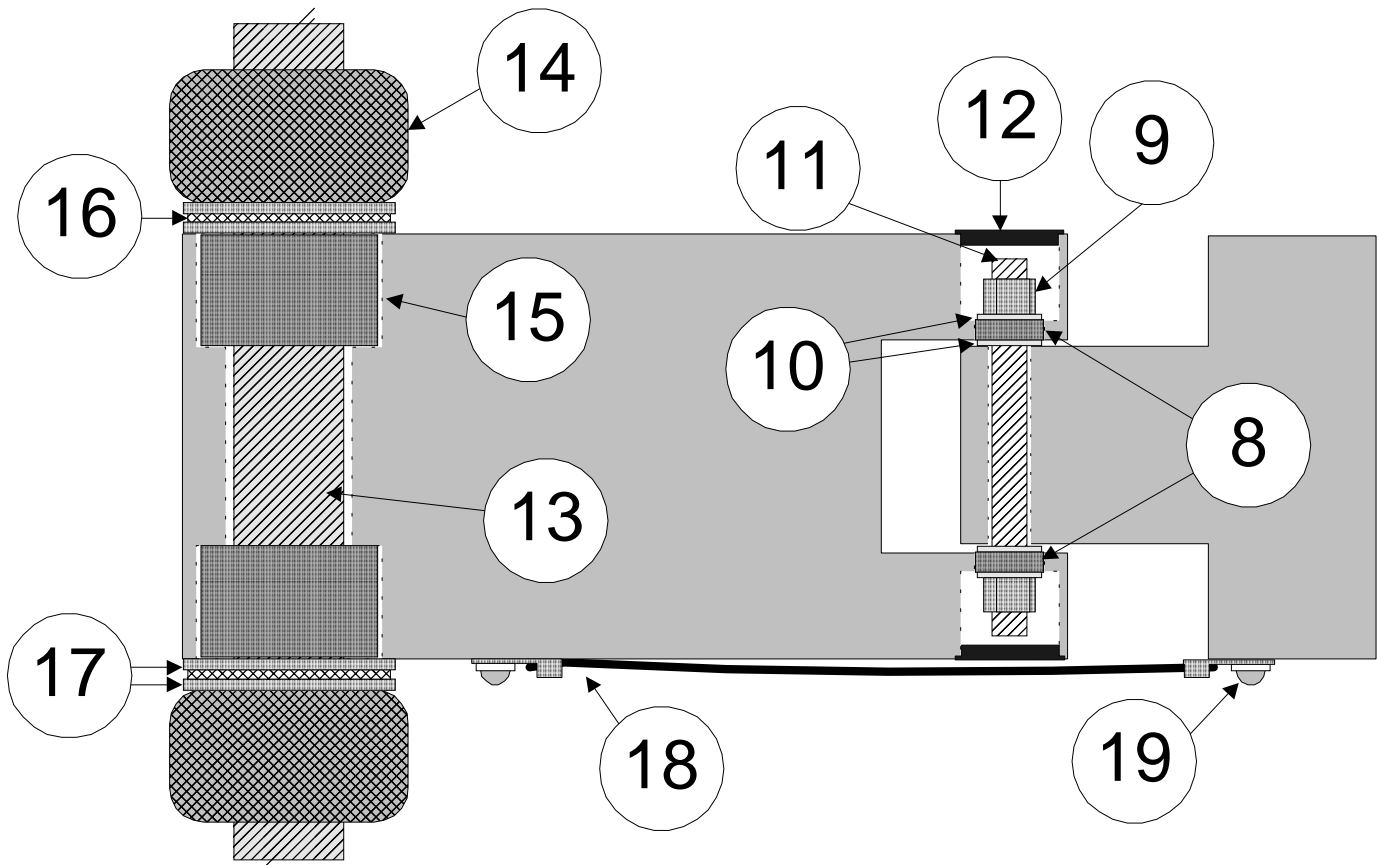
ROTO TRIM, MODEL 272

ITEM	DESCRIPTION	PART #
1	Drive Motor	172-201
	Motor Brushes (set)	172-263
2	Speed Control 120V	172-202
2	Speed Control 230V	172-202B
3	Safety Switch (motor)	172-203
4	On/Off Switch	172-248
5	Timing Belt (teeth) model 272	172-148
5	Timing Belt (round) model 172	172-260
6	Sprocket - Motor	172-150
7	Sprocket - Spindle	172-147
5, 6 and 7	Belt and Sprocket Replacement Kit	172-148K



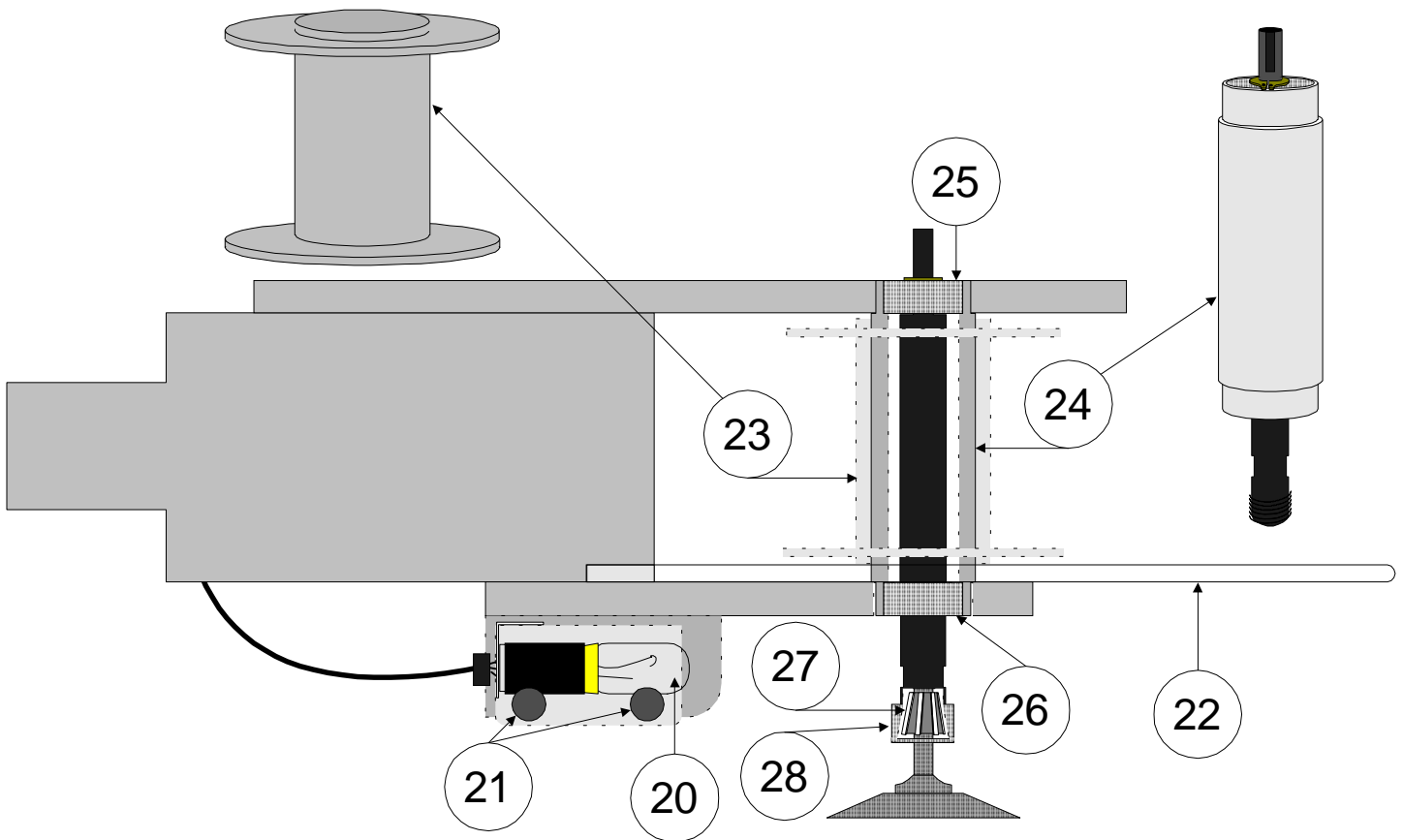
Motor, Sprockets & Electronics

Arm & Upright Post



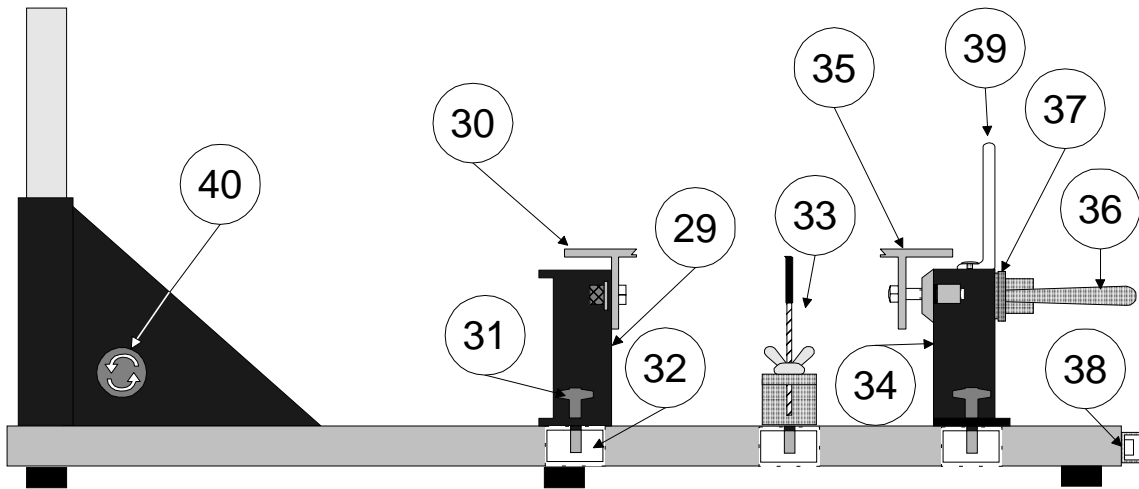
8	Elbow Bearing (2 reqd)	172-212
9	Elbow Nut (2 reqd)	172-219
10	Elbow Washer (4 reqd)	172-220
11	Elbow Shaft	172-125
12	Elbow Plug (2 reqd)	172-204
13	Upright Post	172-111
14	Knurled Adjusting Nut (2 reqd)	172-122
15	Upright Needle Bearing (2 reqd)	172-213
16	Upright Thrust Bearing (2 reqd)	172-214
17	Upright Thrust Washer (4 reqd)	172-215
18	Bunge Cord Assembly	172-1103
19	Shoulder Screws (2 reqd)	150-211

20	Lamp 120V	172-209
20	Lamp 230V	172-209B
	Lamp Holder (socket)	172-210
21	Rubber Vibration Pads (4 reqd)	172-256
22	Shield (NEW SHIELD USED)	172-905 (272-905)
	Roto-Cutter 1.5" Dia (smooth)	172-1603
	Roto-Cutter 2.0" Dia (smooth)	172-1605
	Roto-Cutter 1.5" Dia (serrated)	172-2603
23	Spindle Sleeve Assy (1reqd)	172-1602
24	Spindle Assembly (1reqd)	172-137
25	Spindle Bearing (top)	172-111
26	Spindle Bearing (bottom)	172-211 (B)
27	Spindle Flexible Chuck (1reqd)	172-270
28	Spindle Nut (stainless)	172-265



Spindle, Front Arm & Light

Base & Vise Jaw Rails



	Rubber Feet (6 reqd)	181-246
29	Rear Sliding Angle (black)	172-1606
30	Vise Jaw Rear	172-104
31	T-Bolt/Spacer (4 reqd)	181-1104
32	Sliding Nut (delrin, 6 reqd)	172-134
33	PC Board Btm Support (2 reqd)	172-110
	PC Board Support Pin (2 reqd)	172-907
	Wing Nut (2 reqd)	172-255
	T- Bolt w/Washer (2 reqd)	172-257
34	Front Sliding Angle (Black)	172-1608
35	Vise Jaw - Front	172-104
36	Handle - Vise Jaw (Assy)	172-1115
37	Thrust Washer	172-245
	Guide Pin Bushing (4 reqd)	172-106
	Guide Pin (2 reqd)	172-105
	Clamp Spring (3 reqd)	172-218
	Retaining Ring (3 reqd)	172-222
38	Safety Switch - Base	150-308
	Base Safety Switch Guard	172-612
	172 Shield - (NEW SHIELD USED)	172-901 (272-905)
39	272 Shield - (NEW SHIELD USED)	272-903 (272-905)
40	Fuse Holder	162-120
	Fuse - 5 Amp	163-121

VII CUTTERS & SHARPENING

Roto Form offers a complete selection of cutter styles and sizes to meet your various trimming requirements. The next page of this manual is a one-page brochure entitled *Roto/Cutters® for the Roto/Trim®* in which our offerings are described. As mentioned earlier, the Roto/Trim®, Model 272 is supplied with one smooth-edge (PN 172-1603) and one serrated-edge cutter (PN 172-2603). Please contact us directly if you have special needs or questions.

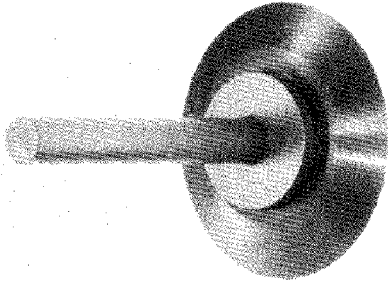
Sharpening Services:

Roto Form Manufacturing operates a complete cutter maintenance service for its customers with fast turn around times. Our machinery is set-up exclusively for making and sharpening Roto/Cutters. Consequently, it is a task with which we are both familiar and experienced in performing. Contact our offices for the current Price List for Sharpening and ask about the special pricing packages designed to save you additional money.

Roto/Cutters® for the Roto/Trim®

Material Specifications: All Roto/Cutters® are manufactured using blended tungsten carbide diamond ground and dynamically balanced for long life. The shafts are 1/4" diameter stainless steel

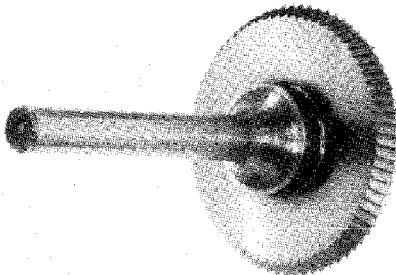
SMOOTH-EDGE CUTTERS



SIZES	PART NUMBER
1½" Diameter	172-1603
2" Diameter	172-1605
Custom sizes available	

APPLICATIONS
Copper, Steel, and Kovar leads. Blade life should last approximately 100,000 leads to more than 1,000,000 before sharpening.

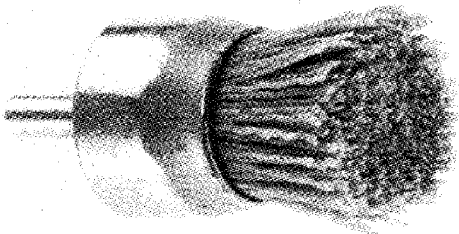
SERRATED-EDGE CUTTERS



SIZE	PART NUMBER
1½" Diameter	172-2603
Custom sizes available	

APPLICATIONS
Steel and Kovar leads. IC and transformer leads. Wire wrap and connector pins. Can be used on small and large diameter leads. Can be sharpened several times.

ROTO / BRUSH



SIZE	PART NUMBER
1" Diameter	172-2000

Manufactured of impregnated filament for removing trimmed leads from PCB.

ROTO SHARPENING SERVICES – F♦A♦S♦T AND ECONOMICAL

Buy the Combination Six-Pack and save money: Six-Pack contains 6 new cutters and 24 sharpenings at significant cost savings. Contact office for current pricing and details.

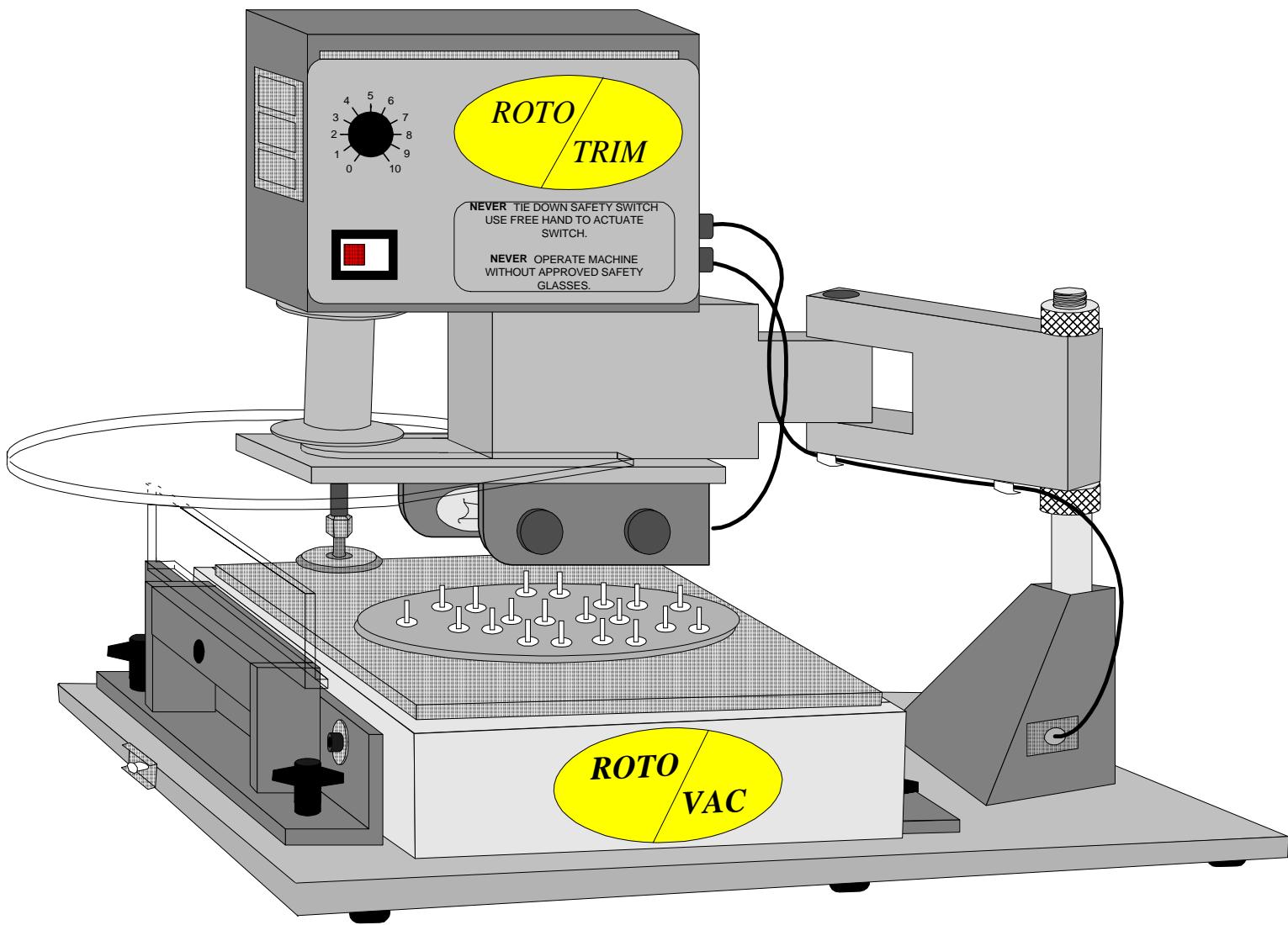


ROTO FORM MANUFACTURING CORPORATION
P.O. Box 118, Signal Mountain, TN 37377
Factory Parts & Warehouse: 113 Stringer Street, Chattanooga, TN 37405
Telephone: 800-343-8433 USA (423) 266-0067 Local
FAX: (423) 266-0105

VIII INSTALLATION AND USE OF ROTO -VAC

Application:

Using the Roto-Vac vacuum fixture is the fastest and easiest way to trim warped boards and boards that are oddly shaped. The Roto-Vac can also be used to trim several smaller boards at once. The Roto-Vac fixture replaces the rails that are ordinarily used to hold the PCB stationary on the Roto-Trim.



Specifications:

Roto-Vac - Vacuum Fixture - The fastest and easiest way to load, unload, and hold heavily warped or irregularly shaped PCBs, and /or multiple boards at one time. The standard Roto-Vac box will accommodate any size PCB within 11" x 12", custom sizes are available as well.

- **Material** - 1/16" thick steel base plate, 3/8" thick milled aluminum sides.
- **Vacuum box size** - 12" x 13". Larger sizes available.
- **Template** - 1/4" thick Masonite® type material easily cut by customers to fit any shape PC board.
- **Stand-Offs** - 3 adjustable height stand-offs with magnetized base for easy positioning. The use of stand-offs prevent larger dimensioned PC boards from being pulled down into open box area.
- **Vacuum Source** - 120 VAC, 1/7 HP, 95 CFM, 7.5 AMP.
- **UL Listed**

Installation of the Vacuum Box

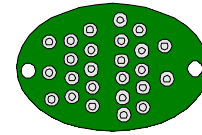
- a. Remove both anodized rails (part # 172-1606) from the black holding fixtures, they are not used when using the Roto Vac. Each of these rails is secured to the holding fixture by two allen screws. The allen screws which hold the rear rail in place have 7/16" nuts on them which need to be loosened first.
- b. Remove both PCB bottom support assemblies from the base, they are not used when using the Roto Vac. Replace the delrin (white) wedges and washers, in the order that they were originally in, and keep track of these for future use.
- c. Loosen the black thumb screws which secure the holding fixtures to the base and slide the fixtures far enough apart so that the vacuum box will fit between them.
- d. Place the box between the holding fixtures. The front and rear rails have different hole patterns, so the box will only fit one way. Facing the Roto-Trim with the base post at the far end, the vacuum hose port should be on the left side of the box, near the front. Secure the vacuum box to the holding fixtures, using the same four allen screws which held the rails in place.
- e. Level the box (as you did the rails) by adjusting the cutter so that it just touches the top surface of the box, at the front, and then leveling each of the four corners of the box with respect to the cutter. Once finished, raise the cutter to an appropriate height.

Making a Template

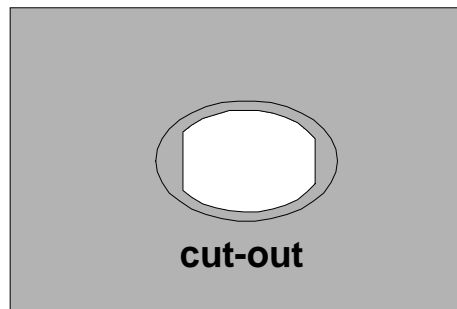
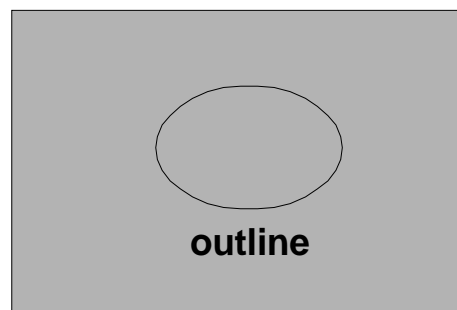
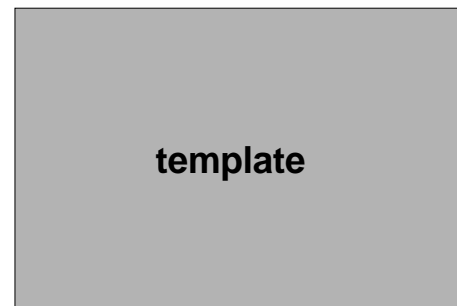
- a. Three Masonite® templates are included with the Roto Vac. Carefully trace the outline of the PCB you intend to trim onto the Masonite®. It is best to avoid making cut-outs too close to the edge of the template. If you plan to trim several boards at once, space the cut-outs evenly.
- b. Drill a hole in the center of the outline with a large bit.
- c. Cut the rest of the shape out with a jig-saw. The hole that you cut should be smaller than the outline of the board, stay an eighth of an inch or more inside the outline all the way around it. This provides a ledge to support the board as the vacuum holds it in place. The ledge should be as large as possible without interfering with the components on the board.

Use of Roto-Vac

- a. Insert the vacuum hose directly into the port on the vacuum box. Place a PCB on the template, and turn the vacuum on. The shop vacuum supplied uses a two stage motor to prevent both cavitation and motor burn-out.
- b. It may be necessary to place Stand-Off pins under the board to keep it level. Be sure to locate these pins so they make contact with the board and not components. This problem can also be solved by covering a portion of the vacuum nozzle to limit its pull, or by drilling a small hole or two in the template to relieve some of the suction.
- c. Trim the board.



PCB



VIII WARRANTY & REPAIRS

Warranty:

The Roto/Trim ®, Model 272 Printed Circuit Board Lead Trimmer is warranted to be free of defects in material and workmanship for 12 months after delivery to the first purchaser for use, providing that the unit has not been misapplied. Since Roto Form has no control over its use, and sometimes misuse, we cannot guarantee against failure. Roto Form's obligations hereunder, at Roto Form's option, are limited to replacement, repair or refund of purchase price, and parts which upon examination prove to be defective within the warranty period specified. This warranty does not apply to damage resulting from transportation, alteration, misuse, or abuse.

Repairs:

If repair services are required, Roto Form provides quick turn around service for your assistance. Package the machine and ship it to Roto Form Mfg, Attention: Repair Dept. 113 Stringer Street, Chattanooga, TN 37405 (freight prepaid - COD **not** accepted). Provide a brief description of the observed problem.

At no charge to you Roto Form disassembles the machine and examines it for needed parts and/or service. Any replacement parts required are identified along with the labor charges and a quote is generated. Roto Form personnel will contact you via telephone or fax and discuss the situation with you.

You may choose any of the three following actions:

1. Authorize the repair. In this case the machine is repaired and returned within 48 hours.
2. Purchase the parts yourself and perform the repairs at your location. In this case the machine is returned to you along with the purchased parts.
3. Not to authorize the repair and have the machine returned. In this case you pay only for the return freight.

All repairs done by Roto Form are warranted for 90 days.