

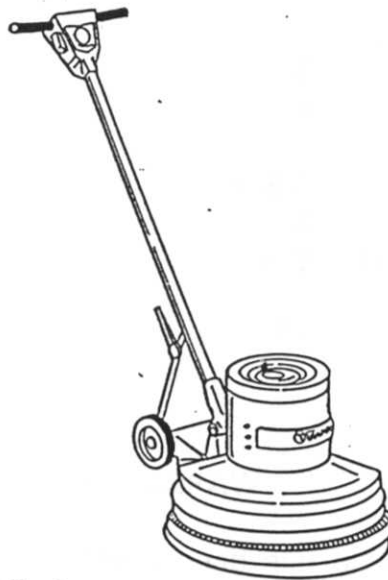
**BREUER/TORNADO® CORP.**

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 **TORNADO®**



**CATALOG NO.**

**98480**

**98473**

**98474**

**U.L. Listed CSA Certified**

***ILLUSTRATED PARTS***

**L2136F FOR COMMERCIAL USE ONLY**

**B/T 8-94**

This illustrated parts book covers:

<b>CATALOG NO.</b>	98480	98473	98474
<b>SERIES</b>	E	E	E
<b>SIZE</b>	20"	17"	17"
<b>VOLTS</b>	115	115	250
<b>H.P.</b>	1 1/2	1 1/2	1 1/2
<b>U.L.</b>	*	*	

\*U.L. Listed CSA Certified

All specifications are subject to change without notice.

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#### WARRANTY

Your Tornado<sup>®</sup> Machine has been thoroughly tested and inspected and is warranted to be free of defects in material and workmanship. Refer below for base warranty. This warranty does not cover normal wear items such as power cords, wheels, and switches. Other items may apply or not apply based on your specific Tornado<sup>®</sup> machine. If such defects occur, this warranty is voided if service is attempted by non Authorized Tornado<sup>®</sup> Service Depots.

The Bi-Speed Floor Machines are warranted as follows:

- 1 year on motor and gear unit
- 1 year on all other components
- 1 year labor

## FOR COMMERCIAL USE IMPORTANT SAFETY INSTRUCTIONS

When using an electrical appliance, basic precautions should always be followed including the following:

READ ALL INSTRUCTION  
BEFORE USING THIS APPLIANCE

### WARNING To reduce the risk of fire, electric shock or injury:

Unplug machine when not in use. If handle switch lever is activated accidentally, high starting torque will cause machine to move and may cause damage or injury.

#### Unplug machine before:

- Leaving machine unattended
- Changing pads
- Attempting any Maintenance or Adjustment

This equipment is equipped with a three-conductor cable and three-prong grounding type plug to fit a grounding type receptacle. Do not break off or pull out the grounding prong on plug. Adapters are available for connecting three-prong grounding wire or terminal extending from the adapter must be connected to a permanent ground such as to a properly grounded electrical Outlet Box. If cord becomes frayed or damaged in any manner, replace. Otherwise possible electric shock may result.

**Do not put hands under base** - rotating parts could cause injury. Always keep hands, feet, and loose fitting clothing away from moving parts to prevent possible injuries. Use care to keep electrical supply cable from contacting moving parts.

To avoid electrical shock, use indoors only. Do not use machine in areas where flammable and/or explosive vapors or dust are present.

Make sure voltage and frequency at wall receptacle correspond with that indicated on nameplate before plugging in machine. 20 amp circuit recommended. Right or left switch levers will independently operate motor.

Never use a device to lock the switch lever in the "ON" position.

Use only 12 ga. three-wire extension cable which have 3-prong grounding type plugs and 3-prong receptacles that accept the machine's plug.

Always operate this machine with all of the cable removed from the handle. Failure to do so will upset the precision balance of the machine.

Do not add weight to this machine - this also will upset the balance and may cause motor overload.

If the pad holder needs to be replaced, be sure to specify genuine TORNADO® pad holder when ordering to assure precision balance of your machine.

To avoid electrical shock do not expose to rain, store indoors.

To avoid fire do not use with a flammable or combustible liquid to clean a floor.

**Risk of explosion.** Floor sanding can result in explosive mixture of fine dust and air. Use this machine only in a well ventilated area, free from any flame or match.

Do not add weight.

Disconnect before servicing.

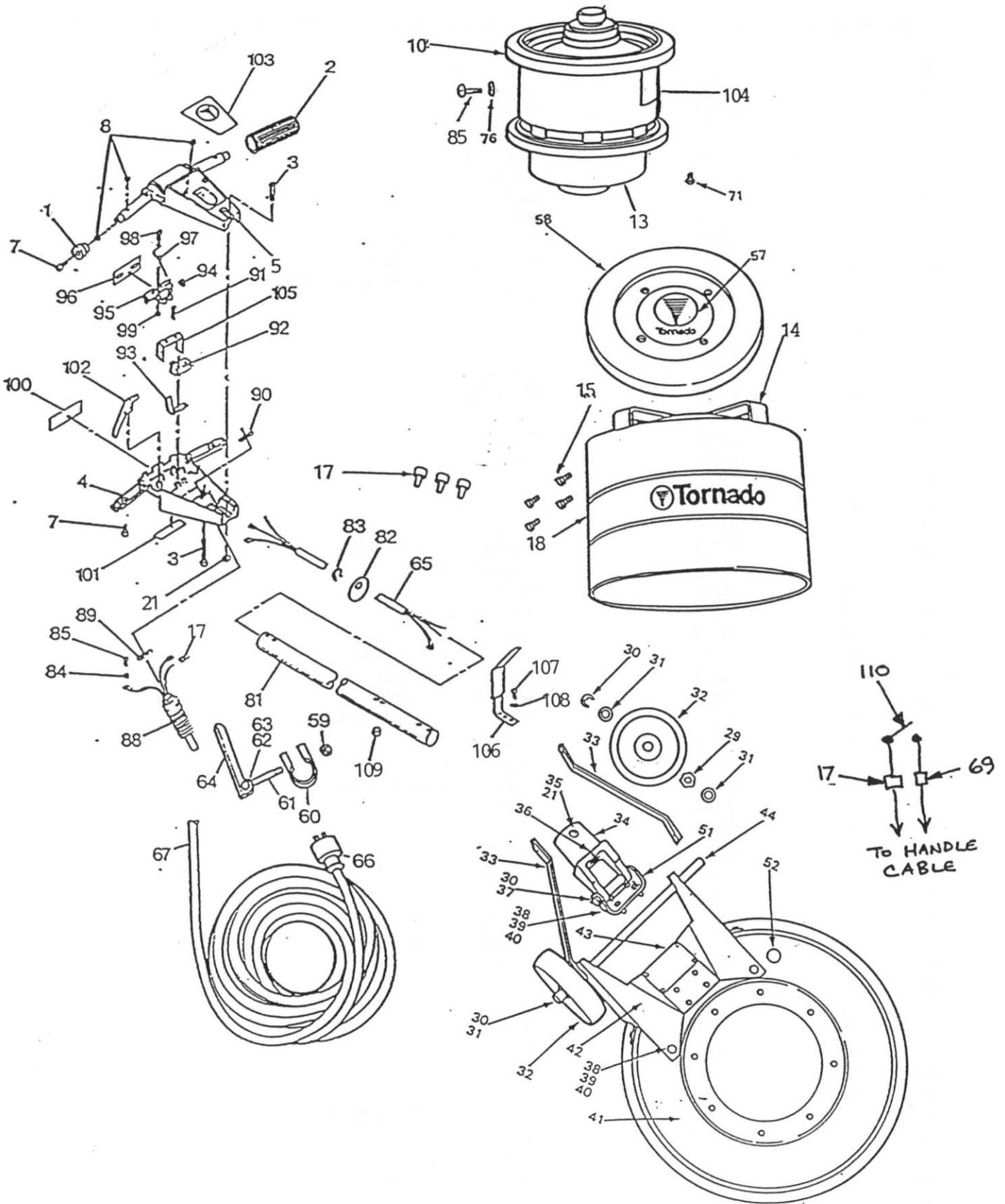
Do not store with pad holder or pad on floor.

Refer to this manual for additional instructions.

SAVE THESE INSTRUCTIONS



EXPLODED VIEW TORNADO 98473 BI-SPEED FLOOR MACHINE  
 98480 BI-SPEED FLOOR MACHINE



Item No.	Qty.	Part No.	Description
1	2	17163	Handle Tip
2	2	17162	Handle Sleeve
3	2	16156	Screw
4	1	17170	Handle Casting
	1	17164	Handle Casting
7	6	07532	Screw
8	8	07533	Locknut
10	1	13000	Baffle
13	1	18576	Gear Unit (See exploded view)
14	1	14188	Cover Ring S/A - 98480
	1	14467	Cover Ring S/A - 98473 & 98374
15	4	01896	Screw
17	5	06824	Connector
18	1	12952	Decal
21	3	00067	Nut
29	2	07723	Wave Washer
30	4	03470	E-Ring
31	6	03658	Washer
32	2	14491	Wheel
33	2	07517	Support Arm
34	1	10019	Yoke Handle
35	1	04349	Screw
36	1	00058	Pin-Handle Tube Locator
37	1	07551	Shaft-Handle Yoke
38	10	02109	Screw
39	10	01577	Lockwasher
40	10	07719	Nut
41	1	11120	Base & Bumper Assy. 20"
	1	18618	Base & Bumper Assy. 17"
42	1	17620	Wheel Bracket-98480
	1	17621	Wheel Bracket-98473 & 98474
43	4	06374	Rivet
44	1	13980	Wheel Shaft
51	1	07519	Handle Mounting Bracket
52	1	04054	Plug Button
57	1	07648	Logo
58	1	12909	Top Cover
59	1	03868	Locknut
60	1	07526	Clamp Band
61	1	07547	Eye Bolt
62	1	01589	Nut, Hex Nylok
63	1	03361	Screw
64	1	07883	Clamp, Lever
65	1	18621	Cable, Handle
66	1	08220	Plug, 115v
	1	02563	Plug, 230v
67	1	04358	Cable & Plug, 115v
69	1	12966	Terminal
71	4	17617	Screw 5/16-18 X 7/8 Hex Hd.
76	1	11007	Lockwasher
81	1	16171	Tube, Handle
82	1	15226	Washer, Strain Relief
83	1	01608	Hog Ring
84	2	01713	Lockwasher
85	2	10886	Screw

Item No.	Qty.	Part No.	Description
88	1	16168	Strain Reliever
89	1	16159	Washer
90	1	16169	Locknut, Conduit
91	2	17167	Screw
92	1	06685	Switch
93	1	17165	Switch-Spring
94	1	17245	Washer
95	1	16154	Safety Lock
96	1	17166	Escutcheon
97	1	17157	Lock Spring
98	1	03660	Screw
99	1	10894	Nut
100	1	15228	Warning Label
101	1	14413	Warning Label
102	2	16152	Lever
103	1	16170	Nameplate, Handle
104	1	18580	Motor - 115v/60hz
	1	18592	Motor - 250v/50hz
105	1	17900	Switch Cover
106	1	10407	Cable Hook
107	2	00685	Nut
108	2	01574	Lockwasher
109	2	10398	Screw
110	1	12965	Speed Switch
*	1	04145	Grommet
*	1	12969	Sleeving
*	1	13403	Strain Relief
*	1	14471	Warning Decal
*	1	16979	Warning Decal
*	1	98548	20" High Speed Pad Holder
*	1	98533	17" High Speed Pad Holder

Motor Parts

*	4	23919	Carbon Brushes
*	1	23934	Rectifier — 24185
*	1	13138	Triac
*	4	21007	Brush Spring
*	1	13134	Bearing
*	1	23923	Armature Assy. (w/fan)
*	4	23924	Thru Bolt
*	1	23935	Fan
*	1	23936	End Bell Assy.

\* Not Shown

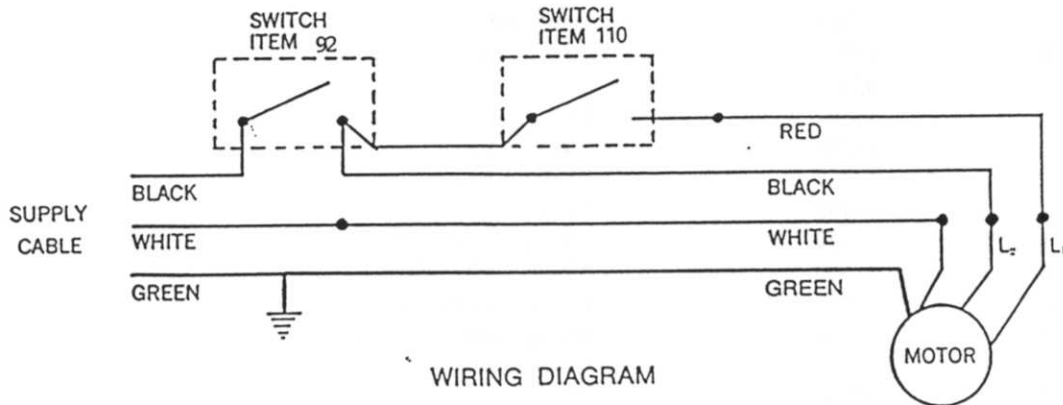
## GEAR UNIT SERVICE INSTRUCTIONS

### ASSEMBLY OF SMALL PARTS:

1. Press bearings (1) on pinion gear (13).
2. Press bearing (15) on cage.
3. Press bearings into cage. Insert planet gear (16) into cage and press spindle through cage into planet gear (16).
4. Press bearing into cover.
5. Be very careful when installing bearing not to damage bearings.
6. Check freedom of gears.

### ASSEMBLY OF UNIT:

1. Lightly press cage with planet gears in drive cover.
2. Fill drive cover with grease.
3. Install pinion with bearings into cage.
4. Assemble rotating cover on drive cover. Install six screws and tighten.
5. Assemble end shield (8) on top of rotating cover. Install spacer (3), and insert screw on with lockwashers (5) and tighten.



WIRING DIAGRAM

## OPERATION AND MAINTENANCE OF YOUR TORNADO® BI-SPEED FLOOR MACHINE

### OPERATION AND MAINTENANCE OF YOUR TORNADO BI-SPEED FLOOR MACHINE

This manual contains vital information for the safe use and efficient operation of this machine. Carefully read this operator's manual before starting the machine, and retain for future reference. Instruct all operators to read this manual. **FAILURE TO ADHERE TO THESE INSTRUCTIONS COULD RESULT IN SERIOUS BODILY INJURY OF PROPERTY DAMAGE.**

#### OPERATOR AND SAFETY INSTRUCTIONS

1. You must be trained in the operation of this machine before use. Please read this manual carefully and obtain operation instructions from your safety director or your authorized Tornado distributor.
2. Your Tornado floor machine is ready for operation as soon as it is unpacked. Remove machine from pallet and discard bolts. No further disassembly or assembly is required.
3. To adjust handle to desire height, loosen clamp lever, adjust handle to desired height and tighten clamp lever.
4. Plug cable to wall receptacle making sure the voltage and cycles correspond with that indicated on nameplate.

Never operate this machine unless plug is grounded, failure to ground could cause electrical shock.

This appliance is equipped with a three-conducted cable and three-prong grounding type plug to fit grounding type receptacle. Do not break off or pull out the grounding prong on plug. Adapters are available for connecting three-prong grounding type plugs to two-prong receptacles. The grounding wire or terminal extending from the adapter must be

connected to a permanent ground such as to a properly grounded electrical Outlet Box. If cable becomes frayed or damaged in any manner replace. Otherwise possible electric shock may result.

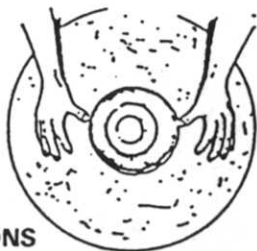
5. Movement of machine in operation is controlled by raising or lowering handles lightly. Raise handle to travel to the right. To make it travel to the left, lower the handle.
6. Do not run brush or pad into or over electrical power cable. The resulting reaction could cause a violent handle reaction to the operator or damage the cable.
7. Do not leave this machine plugged into the power source while unattended.
8. Do not expose to rain-Store indoors. Do not use machine in areas where flammable and/or explosive vapors or dust are present.
9. Always unplug electrical cable from wall outlet before attempting repairs or maintenance.
10. Service repairs or maintenance by qualified personnel only.

#### ATTACHING BRUSH OR PAD HOLDER

Be sure cable is not plugged into wall outlet. To attach on brush or pad holder raise handle to upright position and tighten. Tilt machine back on wheels until handle rests on floor. Rotate brush or pad holder against couple until the three lugs drop into place and turn lightly counter-clockwise until locked. To remove, turn clockwise until lugs of coupler are free and then lift off. For long life and best results always use genuine Tornado parts.



**CAUTION - UNIT MUST BE UNPLUGGED BEFORE SERVICING**



**PAD PLACEMENT INSTRUCTIONS**

1. Remove center section of pad.
2. Place pad on floor.
3. Place pad holder on pad, bristle side down-making sure pad overlaps pad holder uniformly.
4. Turn over pad holder assembly by grasping pad and pad holder together (pad holder will not "grab" pad yet)
5. Firmly depress pad with thumbs to engage Center-Lok mechanism.(Note: Do not force pad below Center-Lok bristles.)
6. Repeat Step 5 while rotating assembly until the pad is uniformly secured.
7. Mount pad holder assembly on machine.

**OPERATION**

Low speed used for wet scrubbing and stripping. Apply cleaning or stripping solution directly to floor surface with a mop. Scrub surface with the proper brush or pad. Be sure the surface does not dry before recovery of solution. Recover solution with wet/dry vacuum.

Do not use Bi-Speed for rotary brush shampooing.

High speed used for polishing and spray buffing. Prior to either procedure clean the floor surface. Polishing or burnishing is a dry procedure. Use proper brushes or pads. Spray buffing with either an aerosol system or hand held trigger sprayer, the spray buff solution should be applied away from the machine. Do not spray solution onto or into the machine. For best results the spray buff material should be buffed out within two to three passes.

**STORING**

Store Bi-Speed in a upright position. Do not store with brush, pad holder and/or mounted on the machine.

**MAINTENANCE**

Clean machine after each use with a damp cloth. If cleaning solution is required, prevent solution from getting into motor. Wrap cable around cable hook and handle by running the cable through a damp cloth. Check for cable damage and repair if necessary.

**MOTOR MAINTENANCE**

This machine is equipped with a permanent magnet motor. Check carbon brush wear every 500 hours of use. Replace when brushes are 3/8" long. (Carbon motor brushes should be replaced only by an authorized service representative.)

**TO INSPECT CARBON BRUSHES**

1. Unplug cable
2. Unscrew (4) screws at top of motor cover. Remove motor cover and cover ring. Brushes (4) are accessible inside large openings near top of motor.

**EXTENSION CABLE**

Use only three wire 12 or 14 gauge extension cables that have three prong grounding type plugs and three-poly receptacles that accept the machines plug. Replace or repair all damages cables.

**OPERATION OF MACHINE**

Your TORNADO Floor Machine is ready for operation as soon as it is unpacked. Remove machine from the pallet and discard bolts. No further assembly or disassembly is required.

To adjust handle to desired height, loosen clamp lever, adjust handle to desired height and tighten clamp lever. Connect cable to wall receptacle making sure that voltage and hertz correspond with that indicated on name plate.

Right or left switch levers will independently operate motor. THE LOCKOUT LEVER MUST BE PUSHED FORWARD FROM THE OPERATORS POSITION TO UNLOCK SWITCH LEVERS. Movement of machine in operation is controlled by raising or lowering handle lightly.

Care should be taken to keep cable away from rotating brush.

**TROUBLE SHOOTING HIGH SPEED WOBBLE**

Your Tornado Bi-Speed has been tested and found to be wobble free with the dynamically balanced pad holder supplied with this machine. If you encounter excessive wobbling note the following:

1. Check the pad - you will encounter wobbling if
  - A) The pad is thicker on one side then the other
  - B) Using worn or damaged pads
  - C) Pad is not centered properly on pad holders
  - D) Using non-approved pad holder
  - E) Storing pad and/or pad holder on the machine
  - F) Not storing pad holder and pads properly

**2. New Pad Break In**

Most new pads need a break in time from 5 to 10 minutes in low speed. This levels and smoothes the pad out. You are now ready to use the high speed.

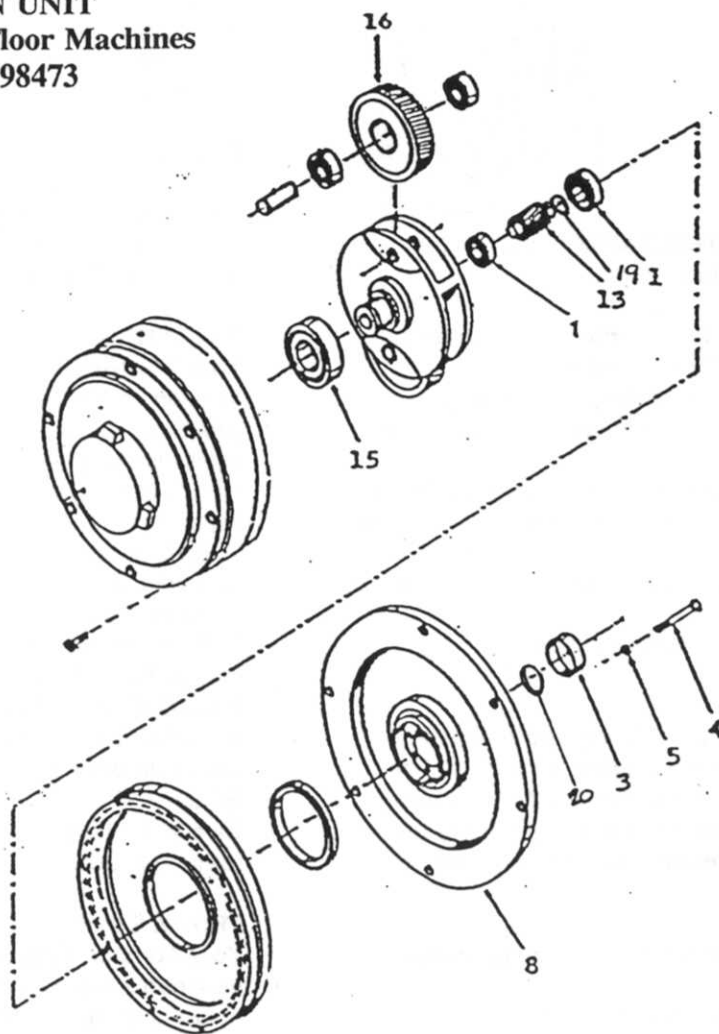
**CAUTION:** If the machine is left unattended, resting on the pad for any period of time you may encounter wobbling. Repeat the above procedure to smooth out pad.

**3. Pad Holder Adjustment**

A) Due to variations, in rubber, the pad holder may initially cause some machine wobble. Heeling machine from side to side will correct this situation.

B) If the wobbling persists with the above precautions and procedures, rotate the pad holder to another lug position. Mark this position with a marker for future placement.

Exploded View of PLANETARY GEAR  
REDUCTION UNIT  
For TORNADO Floor Machines  
Code 98480 & 98473



NOTE: (1) Refill gear unit with 8 1/2oz. of SHELL DARINA EP2 Grease

PLANETARY GEAR  
REDUCTION UNIT  
18576

INDEX NO.	PART NO.	DESCRIPTION	QTY. REQ.
1	04179	Bearing	2
3	11732	Spacer Sleeve	1
4	11733	Cap Screw	6
5	11007	Lockwasher	6
8	23925	End Shield	1
13	11742	Pinion Shaft	1
15	05715	Needle Bearing	1
16	11743	Idler Gear	3
*	11745	Grease (8.5oz.)	1
19	05702	Coupler	1
20	23937	Retainer Ring	1

\*NOT SHOWN