ARO®

OPERATOR'S MANUAL

SECTION M10
MANUAL 162

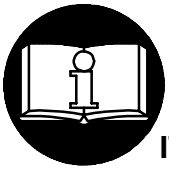
INCLUDING: OPERATION, INSTALLATION & MAINTENANCE

Released: 06–22–92
Revised: 09–01–00

MODELS GHS07A–0( )–( ) and GHS10A–0( )–( )
.70 AND 1.0 H. P. STRAIGHT SANDER/POLISHER

NOTICE

ARO is not responsible for customer modification of tools for applications on which ARO was not consulted.



⚠ WARNING

**IMPORTANT SAFETY INFORMATION ENCLOSED.
READ THIS MANUAL BEFORE OPERATING TOOL.
IT IS THE RESPONSIBILITY OF THE EMPLOYER TO PLACE THE INFORMATION IN THIS MANUAL INTO THE HANDS OF THE OPERATOR.
FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.**

PLACING TOOL IN SERVICE

- Always operate, inspect and maintain this tool in accordance with American National Standards Institute Safety Code for Portable Air Tools (ANSI B186.1).
- For safety, top performance, and maximum durability of parts, operate this tool at 90 psig (6.2 bar/620 kPa) maximum air pressure at the inlet with 5/16" (8 mm) (GHS07A) and 3/8" (10 mm) (GHS10A) inside diameter air supply hose.
- Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.
- Do not use damaged, frayed or deteriorated air hoses and fittings.
- Be sure all hoses and fittings are the correct size and are tightly secured. See Dwg. TPD905–1 for a typical piping arrangement.
- Always use clean, dry air at 90 (6.2 bar/ 620 kPa) psig maximum air pressure. Dust, corrosive fumes and/or excessive moisture can ruin the motor of an air tool.
- Do not lubricate tools with flammable or volatile liquids such as kerosene, diesel or jet fuel.
- Do not remove any labels. Replace any damaged label.

USING THE TOOL

- Always wear eye protection when operating or performing maintenance on this tool.
- Always wear hearing protection when operating this tool.
- Keep hands, loose clothing and long hair away from rotating end of tool.
- Anticipate and be alert for sudden changes in motion during start up and operation of any power tool.
- Keep body stance balanced and firm. Do not overreach when operating this tool. High reaction torques can occur at or below the recommended air pressure.
- Tool accessories may continue to rotate briefly after throttle is released.
- Air powered tools can vibrate in use. Vibration, repetitive motions or uncomfortable positions may be harmful to your hands and arms. Stop using any tool if discomfort, tingling feeling or pain occurs. Seek medical advice before resuming use.
- Use accessories recommended by ARO.
- This tool is not designed for working in explosive atmospheres.
- This tool is not insulated against electric shock.

NOTICE

The use of other than genuine ARO replacement parts may result in safety hazards, decreased tool performance, and increased maintenance, and may invalidate all warranties.

Repairs should be made only by authorized trained personnel. Consult your nearest ARO Authorized Servicenter.

For parts and service information, contact your local ARO distributor, or the Customer Service Dept. of the Ingersoll–Rand Distribution Center, White House, TN at PH: (615) 672–0321, FAX: (615) 672–0801.

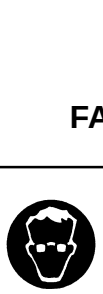
ARO Tool Products
Ingersoll–Rand Company
1725 U.S. No. 1 North ● P.O. Box 8000 ● Southern Pines, NC 28388–8000

IR ARO®

WARNING LABEL IDENTIFICATION

⚠ WARNING

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.



⚠WARNING

Always wear eye protection when operating or performing maintenance on this tool.

⚠WARNING

Always wear hearing protection when operating this tool.

⚠ WARNING

Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.

⚠WARNING

Air powered tools can vibrate in use. Vibration, repetitive motions or uncomfortable positions may be harmful to your hands and arms. Stop using any tool if discomfort, tingling feeling or pain occurs. Seek medical advice before resuming use.

⚠WARNING

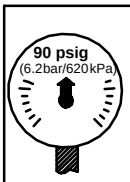
Do not carry the tool by the hose.

⚠ WARNING

Do not use damaged, frayed or deteriorated air hoses and fittings.

⚠WARNING

Keep body stance balanced and firm. Do not overreach when operating this tool.



⚠ WARNING

Operate at 90 psig (6.2 bar/ 620 kPa) Maximum air pressure.

NOTICE

⚠ WARNING: Read manual before operating this tool. Repetitive motion or exposure to vibration or noise may be harmful to your hand, arm or hearing. To avoid injury, wear ear and eye protection. Check R.P.M. before use. Do not use if tool R.P.M. exceeds nameplate R.P.M. Use only recommended guards, equipment and adapters. DO NOT REMOVE LABEL. REPLACE IF DAMAGED.

PN 49386 LABEL

This label must appear on the tool at all times. If it is lost or damaged, a replacement label is available at no cost.

SANDER SPECIFIC WARNINGS

- **Use only a sanding pad, buffing wheel or polishing bonnet with these tools. Do not use any grinding wheel, bur or metal removing accessory other than a sanding pad with these tools. Never use an accessory having a maximum operating speed less than the free speed of the Sander in which it is being used.**
- **These Sanders will operate at the free speed specified on the nameplate if the air supply line furnishes 90 psig (6.2 bar/620 kPa) air pressure at the tool. Operation at higher air pressure will result in excessive speed.**
- **Do not operate this Sander away from the work surface.**
- **Check for excessive speed and vibration before operating.**
- **Do not use this tool if actual free speed exceeds the nameplate rpm.**
- **Never exceed the rated rpm of tool.**
- **Repeated prolonged operator exposure to vibrations which may be generated in the use of certain hand–held tools may produce Raynaud's phenomenon, commonly referred to as Whitefinger disease. The phenomenon produces numbness and burning sensations in the hand and may cause circulation and nerve damage as well as tissue necrosis. Repetitive users of hand–held tool who experience vibrations should closely monitor duration of use and their physical condition.**
- **When using a pad having a shank, insert the shank to full depth in the collet. When using a pad on a threaded arbor, make certain the flange nut is tightened securely. Check the tightness of the collet nut or flange nut before operating a Sander to make certain it will not loosen during operation.**

LUBRICATION

Where Used	ARO Part #	Description
Air Motor	29665	1 qt. Spindle Oil
"O" Rings & Lip Seals	36460	4 oz. Stringy Lubricant
Gears and Bearings	33153	5 lb. "EP" – NLGI #1 Grease

Always use an air line lubricator with these tools.

We recommend the following Filter–Lubricator–Regulator Unit:

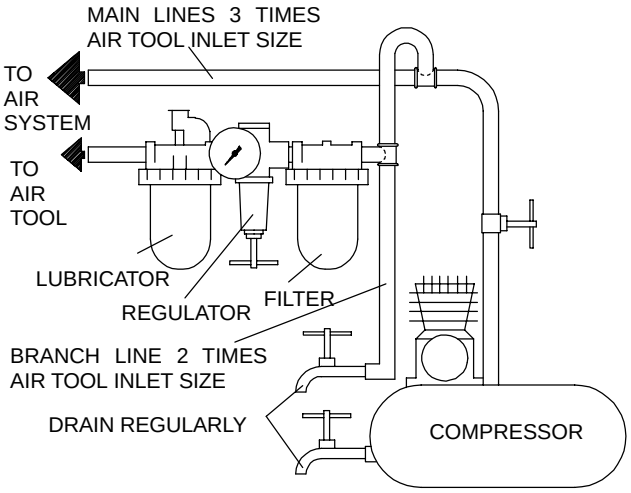
ARO Model C28231–810

Every 2 hours of tool operation – Fill lubricator reservoir of recommended F.R.L. with spindle oil (29665). If an in line or air line lubricator is not used, apply several drops of spindle oil (29665) in air inlet.

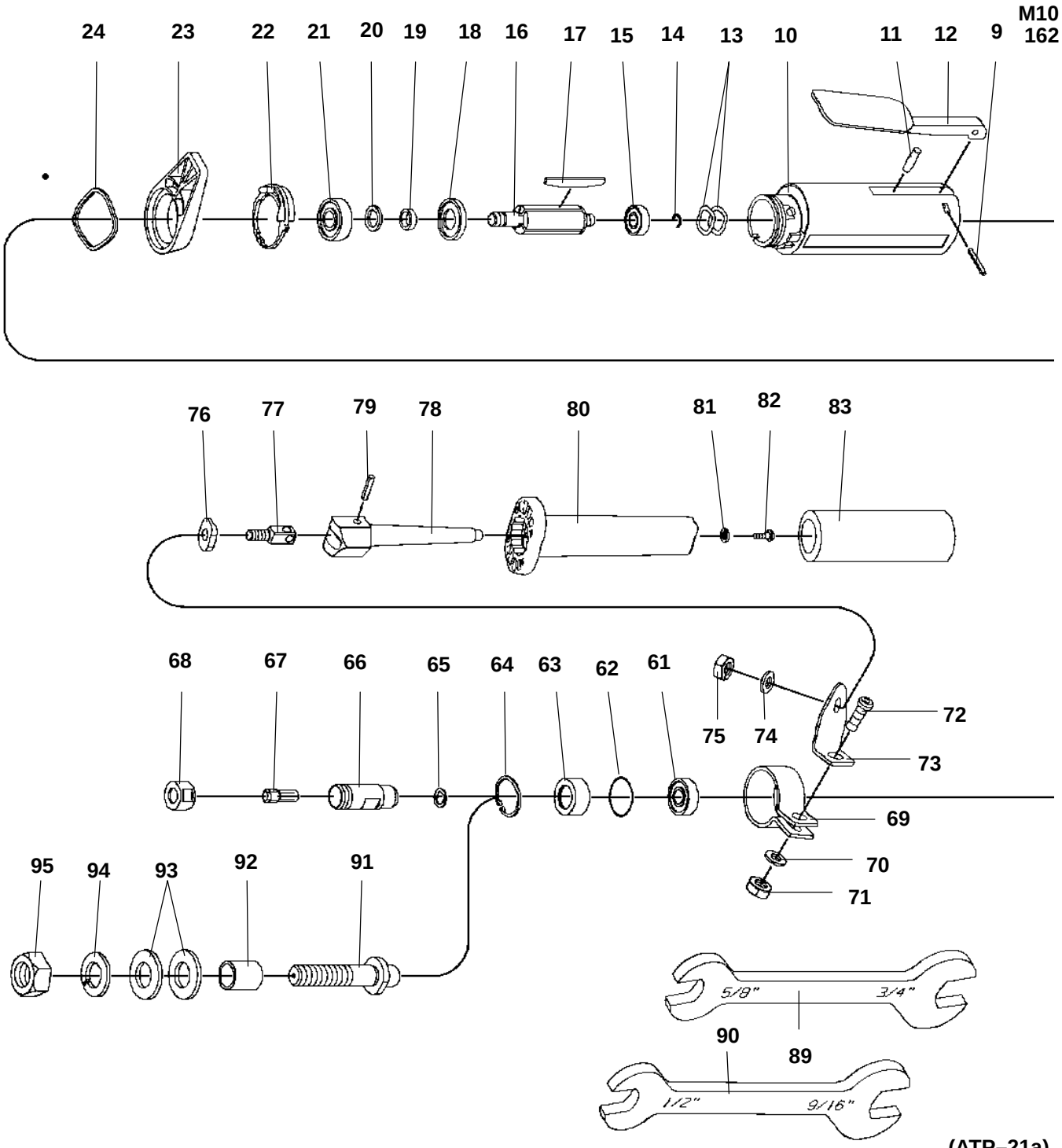
After each 40 hours of operation, Flush tool with a solution of three (3) parts cleaning solvent to one (1) part spindle oil.

CAUTION

Do not mark any nonmetallic surface on this tool with customer identification codes. Such actions could affect tool performance.



(Dwg. TPD905–1)

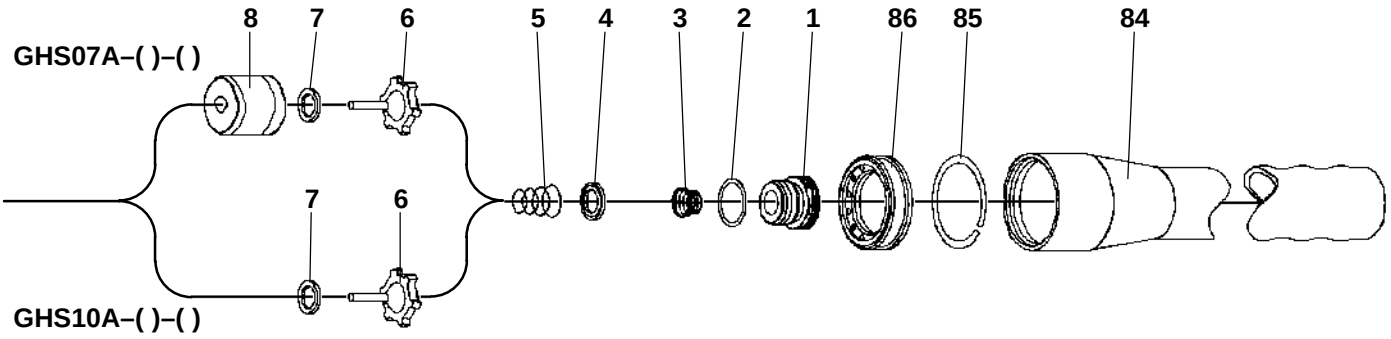


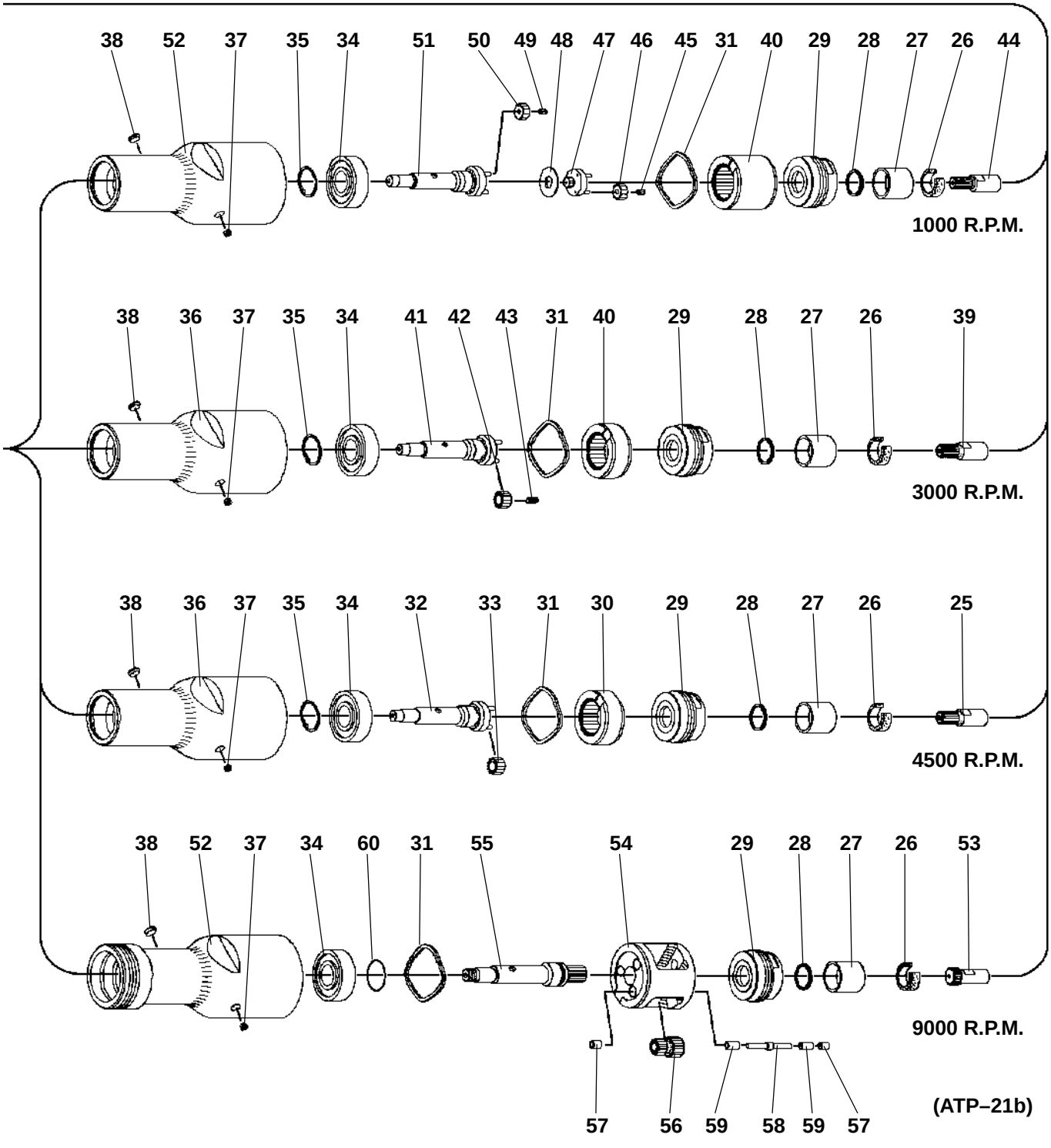
(ATP–21a)

MODEL IDENTIFICATION

MODEL NUMBER	H.P.	R.P.M.	MOTOR HOUSING (ITEM 10)	ROTOR (ITEM 16)	BLADE (ITEM 17)	FLOW RING (ITEM 22)	CLAMP (ITEM 69)	NAMEPLATE (ITEM 88)	WIRE BRUSH (ITEM 91)
GHS07A–03C–2	.70	3000	49450–5	49450–12	49450–13	49450–7	49460–50	49384–23	49460–65*
GHS07A–03W–4	.70	3000	49450–5	49450–12	49450–13	49450–7	49751	49384–23	49747
GHS07A–05C–2	.70	4500	49450–5	49450–12	49450–13	49450–7	49460–50	49384–24	49460–65*
GHS07A–05W–3	.70	4500	49450–5	49450–12	49450–13	49450–7	49751	49384–24	49747
GHS07A–09C–2	.70	9000	49450–5	49450–12	49450–13	49450–7	49460–50	49384–41	49460–65*
GHS10A–01C–2	1.0	1000	49460–8	49460–15	49460–16	49460–21	49460–50	49384–28	49460–65*
GHS10A–03C–2	1.0	3000	49460–8	49460–15	49460–16	49460–21	49460–50	49384–18	49460–65*
GHS10A–03W–4	1.0	3000	49460–8	49460–15	49460–16	49460–21	49751	49384–18	49747
GHS10A–05C–2	1.0	4500	49460–8	49460–15	49460–16	49460–21	49460–50	49384–29	49460–65*
GHS10A–05W–3	1.0	4500	49460–8	49460–15	49460–16	49460–21	49751	49384–29	49747

* 49460–65 WIRE BRUSH ASSEMBLY INCLUDES ITEMS 92 THRU 95.


8
7
6
5
4
3
2
1
86
85
84
GHS07A–( )–( )
7
6
GHS10A–( )–( )


38
52
37
35
34
51
50
49
48
47
46
45
31
40
29
28
27
26
44
1000 R.P.M.
38
36
37
35
34
41
42
43
31
40
29
28
27
26
39
3000 R.P.M.
38
36
37
35
34
32
33
31
30
29
28
27
26
25
4500 R.P.M.
38
52
37
34
60
31
55
54
29
28
27
26
53
9000 R.P.M.
57
56
59
58
59
57
(ATP–21b)

		PART NUMBER FOR ORDERING
1	Inlet Assembly (includes items 2 and 3)	49450-1
2	Inlet Seal	49450-3
3	Inlet Screen	49440-2
4	Spring Seat	49450-23
5	Spring	49460-5
6	Throttle Valve	
	for models GHS07A–( )	49450-114
	for models GHS10A–( )	49460-6
7	Valve Seat	
	for models GHS07A–( )	49450-112
	for models GHS10A–( )	49460-7
8	Valve Cartridge	49450-113
9	Pin	49440-7
10	Motor Housing	See chart
11	Plunger	49450-8
12	Lever	49450-6
13	Spacer (2 req'd)	49450-10
14	Retaining Ring	49440-11
15	Ball Bearing	49450-9
16	Rotor	See chart
17	Blade (4 req'd)	See chart
18	Front End Plate	49450-14
19	Spacer	49450-15
20	Seal Cup	49450-16
21	Ball Bearing	49450-17
22	Flow Ring	See chart
23	Flange	49450-19
24	Clamp	49450-20
25	Rotor Pinion	49460-29
26	Wick	49460-30
27	Sleeve	49460-31
28	Retaining Ring	49460-32
29	Gear Case Adapter	49460-33
30	Ring Gear	49460-34
31	Clamp	49450-20
32	Spindle	49460-36
33	Planet Gear (3 req'd)	49460-37
34	Ball Bearing	49460-38
35	Retaining Ring	49460-40
36	Extension Housing (includes item 37)	49460-39
37	Grease Fitting	49440-57
38	Plug	49460-41
39	Rotor Pinion	49460-98
40	Ring Gear	49460-83
41	Spindle	49460-99
42	Planet Gear (3 req'd)	49450-98
43	Bearing (3 req'd)	49450-99
44	Rotor Pinion	49460-100
45	Bearing (3 req'd)	49460-93
46	Planet Gear (3 req'd)	49460-95
47	Gear Head	49460-94
48	Spacer	49460-97
49	Bearing (3 req'd)	49460-93
50	Planet Gear (3 req'd)	49460-92
51	Spindle	49460-91
52	Extension Housing (includes item 37)	49460-80
53	Rotor Pinion	49460-72
54	Gear Frame	49460-73
55	Spindle	49460-101
56	Spur Gear (3 req'd)	49460-75
57	Bearing (6 req'd)	49460-76
58	Pin Assembly (3 req'd)	49460-77
59	Bushing (6 req'd)	49460-78
60	Seal	49460-79
61	Ball Bearing	49460-9
62	Seal	49460-42
63	Shield	49460-43
64	Retaining Ring	49450-28
65	Seal Cup	49450-16
66	Collet Body	49450-39
67	Collet	49450-40
68	Collet Nut	49450-41
69	Clamp	See chart
70	Lockwasher	49460-52
71	Nut	49460-53
72	Screw	49460-51
73	Bracket	49460-54
74	Lockwasher	49460-52
75	Nut	49460-53
76	Clamp	49460-56
77	Anchor Bolt	49460-55
78	Handle Arbor	49460-59
79	Roll Pin	49460-60
80	Handle	49460-61
81	Washer	49460-63
82	Screw	49450-74
83	Grip	49460-64
84	Exhaust Hose (available at extra cost)	49440-82
85	Retainer (available at extra cost)	49450-50
86	Hose Adapter (available at extra cost)	49450-18
87	Warning Label (see page 2)	49386
88	Nameplate (not shown)	See chart
89	Wrench (models GHS( )A–( )C–( ) only)	49450-38
90	Wrench (models GHS( )A–( )C–( ) only)	49450-37
91	Wire Brush Adapter	See chart
92	Spacer	49460-66
93	Spacer (2 req'd)	49460-17
94	Lockwasher	49460-68
95	Nut	49460-69

DISASSEMBLY/ASSEMBLY INSTRUCTIONS

⚠ WARNING

Always wear eye protection when operating or performing maintenance on this tool.

Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool or before performing any maintenance on this tool.

NOTICE

- Never apply excessive pressure by a holding device which may cause distortion of a part.
- Apply pressure evenly to parts which have a press fit.
- Apply even pressure to the bearing race that will be press fitted to the mating part.
- Use correct tools and fixtures when servicing this tool.
- Don't damage "O" rings when servicing this tool.
- Use only genuine ARO replacement parts for this tool. When ordering, specify part number, description, tool model number and serial number.

GEARING DISASSEMBLY

1000, 3000 and 4500 R.P.M. GEARING

- Unthread and remove collet nut (68), releasing collet (67).
- Loosen nut (71) and slide handle and components off extension housing.
- Remove retaining ring (64), releasing shield (63).
- Remove plug (38). Insert a 5/32" diameter rod into the hole in the spindle to keep it from rotating and unthread and remove collet body (66).
- Remove seal cup (65) from collet body.
- Unthread and remove extension housing – LEFT HAND THREADS.
- Remove gear head (47), spacer (48) and gears (46), where applicable.
- Remove gears, ring gear (30 or 40) and clamp (31) from extension housing.
- Pull spindle out large end of housing.
- Remove bearing (61) and seal (62) only if damage is evident.
- Remove retaining ring (35), releasing bearing (34).
- Unthread and remove adapter (29) from motor housing – LEFT HAND THREADS – releasing sleeve (27) and wick (26).

9000 R.P.M. GEARING

- Unthread and remove collet nut (68), releasing collet (67).
- Loosen nut (71) and slide handle and components off extension housing.
- Remove retaining ring (64), releasing shield (63).
- Remove plug (38). Insert a 5/32" diameter rod into the hole in the spindle to keep it from rotating and unthread and remove collet body (66).
- Remove seal cup (65) from collet body.
- Unthread and remove extension housing (52) – LEFT HAND THREADS.
- Remove gear frame (54) from spindle (55).
- Do not remove gears (56), bearings (57), bushings (59) or pins (58) unless damage is evident. To remove, press on pin (58) until bearing (57) is released from gear frame.
- Remove pin (58) and bushings (59) from gear (56), releasing gear. Repeat for the remaining two gears.
- Press the remaining bearings (57) from the gear frame.
- Remove clamp (31) from housing (52).
- Push spindle out large end of housing.
- Remove bearing (61) and seal (62) only if damage is evident.
- Remove retaining ring (35), releasing bearing (34) and seal (60).
- Unthread and remove adapter (29) from motor housing – LEFT HAND THREADS – releasing sleeve (27) and wick (26).

GEARING ASSEMBLY

1000, 3000 and 4500 R.P.M. GEARING

- Lubricate bearings with ARO 33153 grease upon assembly.
- Assemble wick (26) into sleeve and against retaining ring (28). Saturate wick with approximately 3/64 oz. of ARO 29665 spindle oil.
- Assemble sleeve (27) over rotor pinion on rotor.
- Assemble bearing (34) to spindle, pressing on inner race of bearing. Secure with retaining ring (35).
- Assemble bearing (61) to spindle, pressing on inner race of bearing.
- Install clamp (31) at the bottom of the large opening of extension housing.
- Grease seal (62) with ARO 36460 "O" ring lube and assemble to the second groove from the small end of housing.
- Assemble spindle and components into housing until bearing (34) seats in the recess.
- Assemble ring gear (30 or 40) into housing. Lubricate teeth of ring gear and planet gears with approximately 1/16 oz. of ARO 33153 grease and assemble gears to shafts of spindle.
- 1000 R.P.M. GEARING: Assemble spacer (48) and gear head (47) into ring gear. Lubricate gears (46) with ARO 33153 grease and assemble to gear head.
- Assemble clamp (24) to gear case adapter (29) and assemble to motor housing – LEFT HAND THREADS – tightening to 20 – 25 ft lbs.
- Assemble extension housing (36 or 52) and components to motor housing – LEFT HAND THREADS – and tighten to 20 – 25 ft lbs.
- Assemble seal cup (65), felt side facing out, to collet body (66). NOTE: Press to shoulder of collet body. Saturate the felt with ARO 29665 spindle oil.
- Assemble collet body to spindle and tighten to 14 – 19 ft lbs.
- Assemble plug (38) to housing.
- Assemble shield (63), large opening first, into housing, securing with retaining ring (64).
- Assemble handle and components to housing and secure by tightening nut to 10 – 12 ft lbs.
- Assemble collet (67) to collet body, securing with collet nut (68).

9000 R.P.M. GEARING

- Lubricate bearings with ARO 33153 grease upon assembly.
- Assemble wick (26) into sleeve and against retaining ring (28). Saturate wick with approximately 3/64 oz. of ARO 29665 spindle oil.
- Assemble sleeve (27) over rotor pinion on rotor.
- Grease seal (60) with ARO 36460 "O" ring lube and assemble to groove on spindle (55).
- Assemble bearing (34) to spindle, pressing on inner race of bearing.
- Grease seal (62) with ARO 36460 "O" ring lube and assemble to second groove from the small end of housing (52).
- Assemble spindle into large end of housing (52).
- Assemble bearing (61) onto spindle until it bottoms out in housing (52).
- Assemble clamp (31) into large end of housing, so it encircles bearing (34).
- Press bearings (57), identification markings facing out, into holes in notched face of gear frame (54), one bearing per hole. NOTE: Press flush with counterbored face of gear frame.

9000 R.P.M. GEARING (cont.)

– Assemble one bushing (59) to each end of pin (58) and slide up against spacer in middle of pin. NOTE: Do not move spacer.
– Assemble gear (56) to gear frame and assemble pin (58) and components into gear frame, securing gear.
– Press bearing (57), identification markings facing out, into hole of gear frame, pressing flush with counterbored face.
– Repeat procedure for remaining gears.
– Assemble gear frame and components into housing (52), against bearing (34), until bearing bottoms out in housing.
– Assemble adapter (29) to housing (52) – LEFT HAND THREADS – and tighten to 20 – 25 ft lbs.
– Assemble clamp (24) to adapter (29) and assemble extension housing (52) and components to motor housing (10) – LEFT HAND THREADS – tightening to 20 – 25 ft lbs.
– Assemble seal cup (65), felt facing out, to collet body (66). NOTE: Press to shoulder of collet body. Saturate the felt with ARO 29665 spindle oil.
– Assemble collet body to spindle and tighten to 14 – 19 ft lbs.
– Assemble plug (38) to housing.
– Assemble shield (63), large opening first, into housing, securing with retaining ring (64).
– Assemble handle and components to housing and secure by tightening nut (71) to 10 – 12 ft lbs.
– Assemble collet (67) to collet body, securing with collet nut (68).

MOTOR DISASSEMBLY

– Remove gearing from tool.
– Remove flange (23) and flow ring (22).
– Remove the motor assembly from the motor housing (10).
– Remove two spacers (13) from housing (10).
– Remove blades (17) from rotor (16).
– Unthread and remove rotor pinion from rotor.
– To remove bearing (21), press rotor (16) from bearing (21), releasing seal cup (20), spacer (19) and end plate (18).
– Remove retaining ring (14), releasing bearing (15).

MOTOR ASSEMBLY

– Lubricate bearings with ARO 33153 grease upon assembly.
– Assemble bearing (15) to rotor (16), pressing on inner race of bearing.
– Assemble retaining ring (14) to rotor, securing bearing.
– Assemble end plate (18) to rotor, with counterbored side facing away from rotor.
– Assemble seal cup (20) onto end of spacer (19) without beveled i.d. NOTE Press onto spacer until the felt end of seal cup is flush with the end of spacer. Saturate the felt with ARO 29665 spindle oil.
– Assemble spacer and seal cup to rotor.
– Assemble bearing (21) to rotor, pressing on inner race of bearing. NOTE: The side of bearing with black stain or hash marks must face away from end plate.
– Assemble rotor pinion to rotor and tighten to 14 – 19 ft lbs.
– Inject approximately 1/32 oz. of ARO 33153 grease into the recess at the bottom of the motor housing cavity. Assemble two spacers (13) into motor housing.
– Coat rotor blades (17) with ARO 29665 spindle oil and assemble to rotor slots – straight side out.
– Assemble motor assembly into motor housing (10).
– Assemble flow ring (22) to flange (23). Align notched projection on edge of flow ring (22) with the letter on the housing designating front or rear exhaust.
– Assemble flange (23) and flow ring to motor housing.
– Assemble gearing to tool.

THROTTLE DISASSEMBLY

– Unthread and remove inlet assembly (1).
– Remove seal (2) and screen (3).
– Remove seal (4), spring (5) and throttle valve (6) from motor housing. Do not remove valve seat (7) or valve cartridge (8) (where applicable) unless damage is evident. To remove, pull from housing.
– Remove pin (9), releasing lever (12) and plunger (11).

THROTTLE ASSEMBLY

– Assemble valve cartridge (8), where applicable, and seat (7) into motor housing. Assemble small end of spring (5) to throttle valve (6) and assemble seat (4) to large end of spring. Assemble throttle valve (6) and components into motor housing.
– Assemble screen (3), closed end first, into inlet (1).
– Grease seal (2) with ARO 36460 “O” ring lube and assemble to inlet (1).
– Assemble inlet (1) to housing, tightening to 20 – 25 ft lbs.
– Coat plunger (11) with ARO 29665 spindle oil and assemble into motor housing.
– Assemble lever (12) to motor housing, securing with pin (9).
– Apply several drops of ARO 29665 spindle oil into inlet assembly (1).

LISTED BELOW ARE SOME OF THE MOST COMMON CAUSES FOR TOOL MALFUNCTION. MALFUNCTIONS BEYOND THE SCOPE OF THIS MANUAL SHOULD BE BROUGHT TO THE ATTENTION OF YOUR ARO REPRESENTATIVE OR RETURN THE TOOL TO THE FACTORY FOR REPAIR.

CONDITION		POSSIBLE CAUSE		CORRECTIVE ACTION
Scoring.	1.	Worn spacer (19) or front end plate.	1.	Install a new spacer and front end plate.
	2.	Worn bearing (21).	2.	Install a new bearing.
Leaky throttle valve.	1.	Dirt accumulation on throttle valve or valve seat.	1.	Inject 3/32 oz. of clean, suitable cleaning solution into the inlet, operate the tool for 30 seconds and immediately inject 3/32 oz. of the recommended oil into the inlet and run the tool long enough to coat the internal parts with oil.
	2.	Worn throttle valve or valve seat.	2.	Replace the throttle valve and/or valve seat.
Exhausts at wrong location.	1.	Incorrect orientation of the flow ring (22).	1.	Reverse the face of the flow ring against the motor housing.
Low power or low free speed.	1.	Insufficient air pressure.	1.	Check air line pressure at the inlet of the tool. It must be 90 p.s.i.g.
	2.	Clogged muffler elements.	2.	Disassemble the tool and agitate the bare motor housing and flange in clean, suitable cleaning solution. Back flush the muffler elements by blowing into the exhaust ports with an air gun until all contaminants and obstructions are removed. If the elements cannot be cleaned, replace the motor housing and/or flange.
	3.	Plugged inlet screen (3).	3.	Clean the inlet screen with a stream of air or replace screen.
	4.	Worn or broken blades (17).	4.	Install a complete set of new blades.
	5.	Loose extension housing or gear case adapter (29).	5.	Tighten housing or adapter to 20 – 25 ft lbs.
	6.	Worn or broken motor housing (10).	6.	Replace the motor housing.
	7.	Internal air leakage in the motor housing indicated by high air consumption/low speed.	7.	Replace the motor housing.
	8.	Grit buildup under the lever (12), restricting full plunger (11) movement.	8.	Remove the lever and clean the groove in the motor housing.
	9.	Bent stem on throttle valve (6).	9.	Replace the throttle valve or valve cartridge.
	10.	Front seal cup (20) dragging against the shield of bearing (21).	10.	Reposition or replace the seal cup.
Rough operation or vibration.	1.	Improper lubrication or dirt buildup.	1.	Inject 3/32 oz. of clean, suitable cleaning solution into the inlet, operate the tool for 30 seconds and immediately inject 3/32 oz. of the recommended oil into the inlet and run the tool long enough to coat the internal parts with oil.
	2.	Worn or broken bearings (15 or 21).	2.	Replace the worn or broken bearings. Examine the front end plate (18), spacer (19), seal cup (20) and spacers (13) and replace any damaged parts. If the attached rotor plate is damaged, replace the rotor (16).
	3.	Worn or broken bearings (34 or 61).	3.	Replace the worn or broken bearings.
	4.	Dirt contaminated bearing (61).	4.	Replace the bearing.
	5.	Worn, bent or broken spindle.	5.	Replace the spindle if, when mounted between centers, the runout on the spindle body exceeds .002” T.I.R. or .0005” T.I.R. on the bearing mounting diameters.
	6.	Loose collet nut (68).	6.	Tighten the collet nut until snug.
	7.	Worn or damaged collet (67), collet nut (68) or collet body (66).	7.	Replace the damaged component and retest.
Excessive runout.	1.	Worn, bent or broken spindle.	1.	Replace the spindle if, when mounted between centers, the runout on the spindle body exceeds .002” T.I.R. or .0005” T.I.R. on the bearing mounting diameters.
	2.	Worn or damaged bearing (61).	2.	Replace the damaged bearing.
Bearing (21) runs hot.	1.	Incorrect installation of seal cup (20).	1.	Reposition the seal cup flush with the face of spacer (19).
	2.	Spacer (19) rubbing the bore of front end plate (18).	2.	Replace the front end plate and spacer combination.
	3.	Incorrect bearing (21) installation orientation.	3.	If a black stain or black hashmarks are not visible on the face of the bearing when it is assembled with the end plate and rotor, the bearing is backwards. If possible, remove the bearing and install it correctly or replace the bearing.
Slow tool idle.	1.	Bent or leaky throttle valve.	1.	Replace the throttle valve.
Air leakage around flow ring (22).	1.	Damaged, mutilated or missing flange clamp (24).	1.	Replace the flange clamp.
	2.	Damaged flow ring (22).	2.	Replace the flow ring.