



Tool Products

OPERATOR'S MANUAL

INCLUDING: OPERATION, INSTALLATION & MAINTENANCE

SECTION M22
MANUAL 70

Released: 5-15-89

Revised: 11-10-95

Form: 3361-2

20 SERIES RIGHT-ANGLE DRILLS

Models: DR021B-()-(),
DR023B-()-() and DR025B-()-().



⚠ WARNING

**READ THIS MANUAL CAREFULLY BEFORE INSTALLING,
OPERATING OR SERVICING THIS EQUIPMENT.**

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

Pneumatic tools should always be installed and used in accordance with A.N.S.I. B186.1 "Safety Code For Portable Air Tools."

⚠ WARNING

- Operate this tool at 90 p.s.i.g. (6.2 bar) maximum air pressure at the air inlet of the tool.
- Disconnect air supply from tool before removing/installing bit, socket or device attached to tool or performing maintenance procedures.
- Keep hands, 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.
- Never exceed rated r.p.m. of tool.
- Wear suitable eye and hearing protection while operating tool.
- Tool shaft can continue to rotate briefly after throttle is released.
- 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.
- Use only accessories recommended by ARO.

⚠ WARNING

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 tools who experience vibrations should closely monitor duration of use and their physical condition.

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.
- ARO is not responsible for customer modification of tools for applications on which ARO was not consulted.
- Tool maintenance and repair should be performed by authorized, trained, competent personnel. Consult your nearest ARO authorized servicerenter.
- It is the responsibility of the employer to place the information in this manual into the hands of the operator.

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

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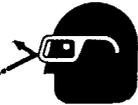
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FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

⚠ WARNING



Wear eye protection when operating or performing maintenance on this tool.

⚠ WARNING



Wear hearing protection when operating this tool.

⚠ WARNING



Turn off air supply and disconnect 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



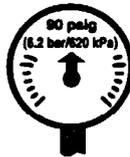
Do not use damaged, frayed or deteriorated air hoses and fittings.

⚠ WARNING



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

⚠ WARNING



Operate at 90 p.s.i.g. (6.2 bar/620 kPa) maximum air pressure.

NOTICE

⚠ WARNING

Read the manual before operating this tool.
Operate at 90 psig/6.2 bar max.

**PN 48176-1 LABEL
(NON-EU MODELS)**



**PN 49883 LABEL
(-EU MODELS)**

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

WARNING = Hazards or unsafe practices which could result in severe personal injury, death or substantial property damage.

CAUTION = Hazards or unsafe practices which could result in minor personal injury or product or property damage.

NOTICE = Important installation, operation or maintenance information.

ROUTINE LUBRICATION REQUIREMENTS

Lack of or an excessive amount of lubrication will affect the performance and life of this tool. Use only recommended lubricants at below time intervals:

EVERY 8 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.

EVERY 160 HOURS OF TOOL OPERATION – Lubricate gearing. Pack bearings, coat shafts and lubricate gears with NLGI #1 "EP" grease (33153). Gearing should contain approximately 1/32 oz. (.9 g) of grease for single reduction and 3/64 oz. (1.3 g) of grease for double reduction. Right-angle assembly should contain approximately 1/8 oz. (3.5 g) of grease.

AIR SUPPLY REQUIREMENTS

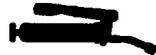
For maximum operating efficiency, the following air supply specifications should be maintained to this air tool:

- AIR PRESSURE – 90 p.s.i.g. (6.2 bar)
- AIR FILTRATION – 50 micron
- LUBRICATED AIR SUPPLY
- HOSE SIZE – 5/16" (8 mm) I.D.

An ARO® model C28231-810 air line FILTER/REGULATOR/LUBRICATOR (F.R.L.) is recommended to maintain the above air supply specifications.

RECOMMENDED LUBRICANTS

After disassembly is complete, all parts, except sealed or shielded bearings, should be washed with solvent. To relubricate parts, or for routine lubrication, use the following recommended lubricants:



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

INSPECTION, MAINTENANCE AND INSTALLATION

Disconnect air supply from the tool or shut off air supply and exhaust (drain) line of compressed air before performing maintenance or service to the tool.

It is important that the tools be serviced and inspected at regular intervals for maintaining safe, trouble-free operation of the tool.

Be sure the tool is receiving adequate lubrication, as failure to lubricate can create hazardous operating conditions resulting from excessive wear.

Be sure that the air supply lines and connectors are of proper size to provide a sufficient quantity of air to the tool.

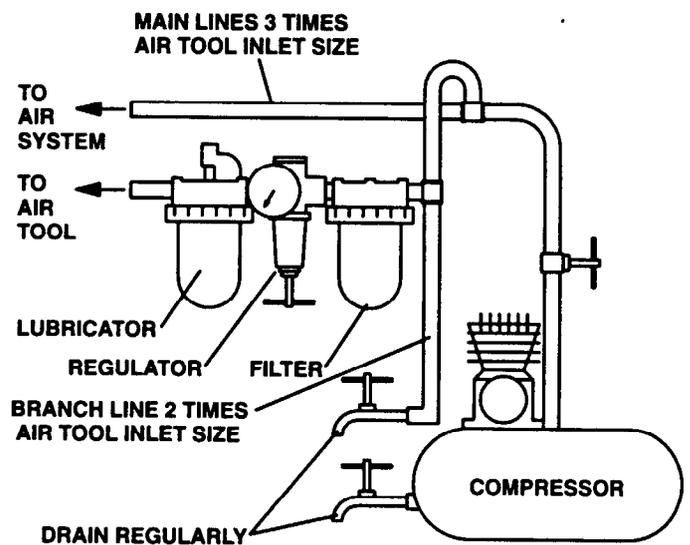
Tool maintenance and repair shall be performed by authorized, trained, competent personnel. Tools, hose and fittings shall be replaced if unsuitable for safe operation and responsibility should be assigned to be sure that all tools requiring guards or other safety devices shall be kept in legible condition. Maintenance and repair records should be maintained on all tools. Frequency of repair and the nature of the repairs can reveal unsafe application. Scheduled maintenance by competent authorized personnel should detect any mistreatment or abuse of the tool and worn parts. Corrective action should be taken before returning the tool for use.

Disassembly should be done on a clean work bench with a clean cloth spread to prevent the loss of small parts. After disassembly is completed, all parts should be thoroughly washed in a clean solvent, blown dry with air and inspected for wear levels, abuse and contamination. Double sealed or shielded bearings should never be placed in solvent unless a good method of re-lubricating the bearing is available. Open bearings may be washed but should not be allowed to spin while being blown dry.

Upon reassembling, lubricate parts where required. Use 33153 grease, or equivalent, in bearings. Use 36460 lubricant for "O" ring assembly. When assembling "O" rings or parts adjacent "O" rings, care must be exercised to prevent damage to the rubber sealing surfaces. A small amount of grease will usually hold steel balls and other small parts in place while assembling.

When replacement parts are necessary, consult drawing containing the part for identification.

Always use clean, dry air. Dust, corrosive fumes and/or excessive moisture can damage the motor of an air tool. An air line filter can greatly increase the life of an air tool. The filter removes rust, scale, moisture and other debris from the air lines. Low air pressure (less than 90 p.s.i.g.) reduces the speed of the air tool. High air pressure (more than 90 p.s.i.g.) raises performance beyond the rated capacity of the tool and could cause injury. Shown below is a typical piping arrangement.



MODEL NUMBER			GEARING RED.
	DR023B-5-()	DR025B-5-()	44.49:1
DR021B-7-()	DR023B-11-()	DR025B-11-()	22.87:1
DR021B-15-()	DR023B-21-()	DR025B-21-()	11.76:1
DR021B-26-()	DR023B-37-()		6.67:1
DR021B-50-()	DR023B-73-()	DR025B-73-()	3.43:1
DR021B-170-()			1:1

MODELS WITH -EU SUFFIX ARE "EC" COMPLIANT MODELS.

DRIVE OPTION	DESCRIPTION	SPINDLE ASSEMBLY
-A	1/4" CHUCK	ITEM 68
-C *	3/16" COLLET	ITEM 69 OR 77
-D	#10 - 32 FEMALE THREAD	ITEM 88
-E	5/16" - 24 FEMALE THREAD	ITEM 90
-F	9/32" - 40 FEMALE THREAD	ITEM 97
-H	1/8" COLLET	ITEM 92
-P	3/8" - 24 THREAD	ITEM 68
-T	1/4" - 28 FEMALE THREAD	ITEM 76 OR 95

* FOR MODELS DR025B-(): 9/32" - 40 FEMALE THREAD (ITEM 82).

DISASSEMBLY/ASSEMBLY INSTRUCTIONS

- 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.

- Assemble lock nut (41) to adapter (40) and assemble adapter to housing, securing pinion - LEFT HAND THREADS.
- Apply approximately 1/8 oz. of grease to right-angle gearing upon assembly.
- Assemble drive assembly (68, 69 or 95) to lock nut (65).
- Assemble lock nut and components to housing - LEFT HAND THREADS.
- Assemble coupling (39) to pinion and assemble "O" ring (91) to adapter (40). NOTE: "O" ring is to be free of oil and grease.
- Assemble right-angle housing and components to tool, securing with lock nut (41) - LEFT HAND THREADS.

RIGHT-ANGLE DISASSEMBLY

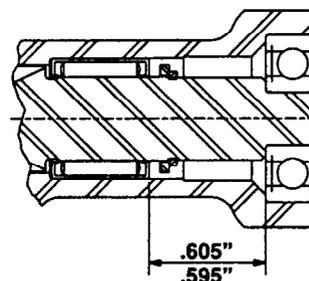
(REGULAR DUTY)

- Using wrenches on flats of ring gear and lock nut (41), unthread and remove right-angle section from tool - LEFT HAND THREADS.
- Remove chuck (66), where applicable.
- To disassemble drive assembly, remove lock nut (65) from housing - LEFT HAND THREADS.
- Remove adapter (40) - LEFT HAND THREADS.
- Do not disassemble further unless damage is evident. To disassemble, pull pinion (47) from housing.
- To remove bearing (46) from pinion, remove snap ring (44) and spacer (45).

RIGHT-ANGLE ASSEMBLY

(REGULAR DUTY)

- Lubricate bearings upon assembly.
- Assemble bearing (46) and spacer (45) to pinion (47), securing with snap ring (44). NOTE: Bearing is to be located .600" from shoulder on pinion (see illustration, next column).
- Assemble bearing (42) to pinion. NOTE: Press on inner race of bearing.
- Assemble pinion and components to housing (48). NOTE: Press on outer race of bearing.



RIGHT-ANGLE DISASSEMBLY

(LIGHT DUTY)

- Using wrenches on flats of ring gear and lock nut (41), unthread and remove right-angle section from tool - LEFT HAND THREADS.
- To disassemble right-angle section, grasp right-angle housing (56 or 78) lightly in a vise. Using a wrench on flats of body (51), unthread body from housing - LEFT HAND THREADS.
- Do not remove pinion (55) from housing unless damage is evident. To remove pinion, grasp pinion in a vise and tap housing with a soft face hammer.
- Pull pinion (55) from body (51).

DISASSEMBLY/ASSEMBLY INSTRUCTIONS

M22

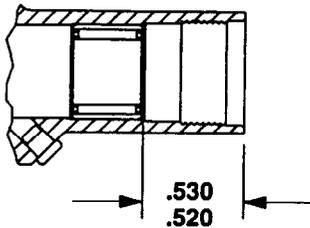
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- Unthread and remove adapter (40) – LEFT HAND THREADS – releasing bearing (42).
- To disassemble drive assembly, unthread lock nut (74) – LEFT HAND THREADS – and pull drive assembly from housing (56 or 78). Do not disassemble further unless damage is evident. NOTE: Drive assembly contains 22 small balls which will fall out if drive assembly is disassembled.

RIGHT-ANGLE ASSEMBLY

(LIGHT DUTY)

- Lubricate bearings upon assembly.
- Assemble bearing (71) and gear (70, 75, 81, 87, 89 or 96) to shaft (72 or 80).
- Assemble gear and components to lock nut (74), securing balls (73) in groove in gear.
- Assemble lock nut (74) to housing (56 or 78) – LEFT HAND THREADS.
- Assemble bearing (42) and lock nut (41) to body, securing with adapter (40) – LEFT HAND THREADS.
- Assemble bearing (54) to pinion (55).
- Assemble pinion to housing (56 or 78).
- Assemble housing (56 or 78) to body (51) to seat needle bearing. Unthread and remove body. NOTE: Bearing is to be located .525" from end of housing (56 or 78)(see illustration below).



- Assemble shims (52 and 53) to body.
- Assemble housing (56 or 78) to body (51) – LEFT HAND THREADS.
- Assemble coupling (39) to pinion and assemble "O" ring (91) to adapter. NOTE: "O" ring is to be free of oil and grease. Assemble right-angle section to tool, securing with lock nut (41) – LEFT HAND THREADS.

GEARING DISASSEMBLY

- Remove right-angle section from tool.
- Remove ring gear (24 or 29) using a wrench on flats.
- Remove snap ring (28) and washer (27).
- Remove spindle(s) and gears from ring gear. NOTE: Keep gears grouped with mating spindle when disassembling double reduction gearing.
- Do not remove bearing (26) or spacer (25) unless damage is evident.
- To remove bearing (26) and spacer (25) from ring gear, press on spacer (25) from inside splined end of ring gear.
- Do not remove gear (37) from carrier assembly unless damage is evident. Gear (37) is press fit onto carrier assembly.

GEARING ASSEMBLY

- Assemble spacer (25) into ring gear.
- Press bearing (26) into ring gear. NOTE: Press on outer race of bearing and press to shoulder of ring gear.
- Coat shafts of spindle with ARO 33153 grease.
- Assemble gears to shafts of mating spindle.
- Assemble carrier assembly to spindle assembly for models with double reduction gearing.
- Lubricate sets of gears liberally with ARO 33153 grease (see "Routine Lubrication Requirements", page 3).

- Assemble spindle(s) and gearing into ring gear. Rotate spindle and gears to align gear teeth with splines of ring gear.
- Assemble washer (27) to spindle, securing with snap ring (28).
- Thread ring gear (24 or 29) to tool, tightening with wrench on flats.
- Assemble right-angle section to tool.

MOTOR DISASSEMBLY

- Remove right-angle section and gearing from tool.
- Remove spacer (22) and "O" ring (21).
- Tap front edge of housing to remove motor assembly. Locating pin (23) should also come out.
- Tap splined end of rotor (17) with a soft face hammer; motor will come apart. NOTE: Bearing (20) is light press fit on rotor.
- Remove end plate (15) and bearing (14) from rotor.

MOTOR ASSEMBLY

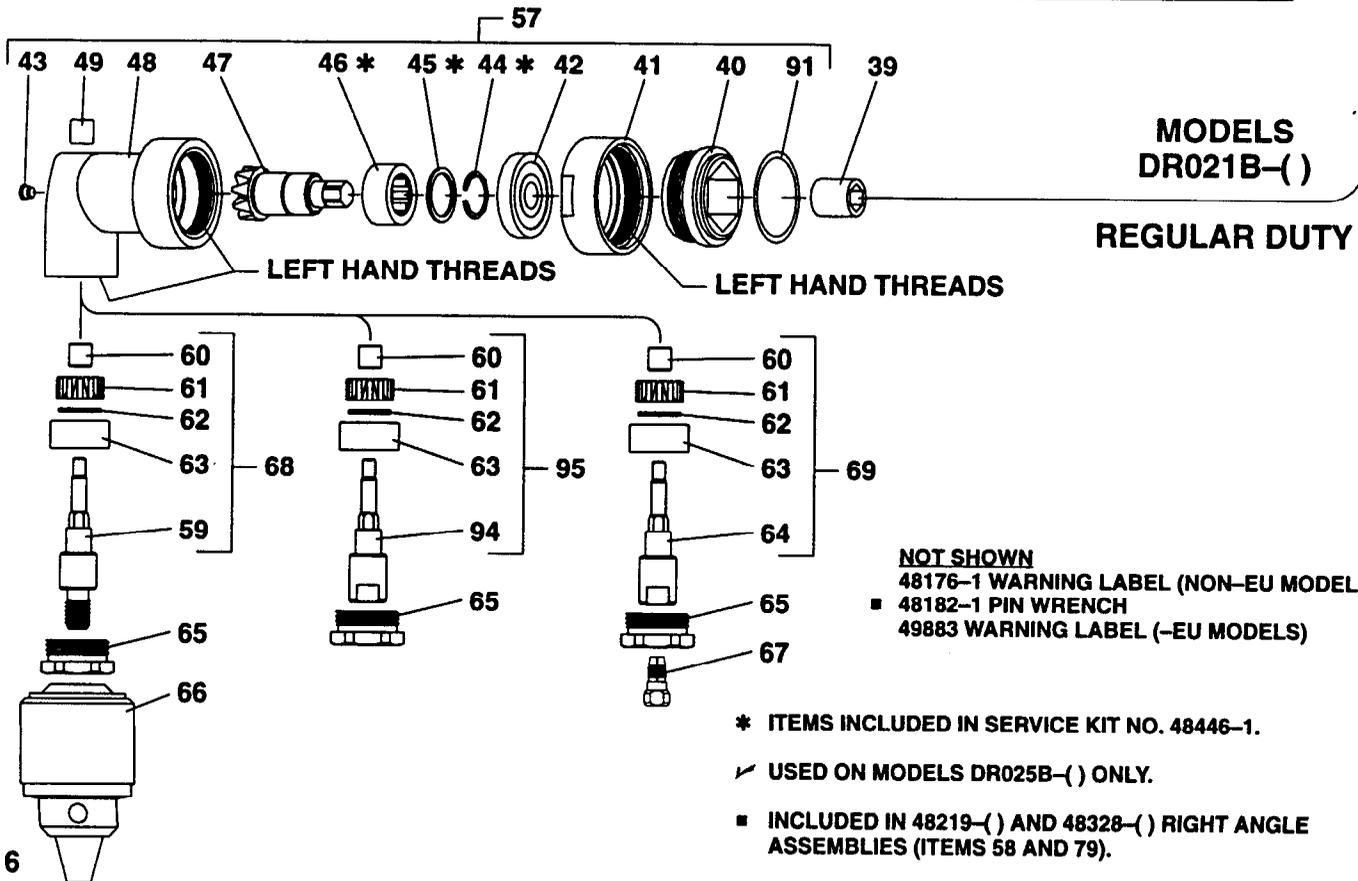
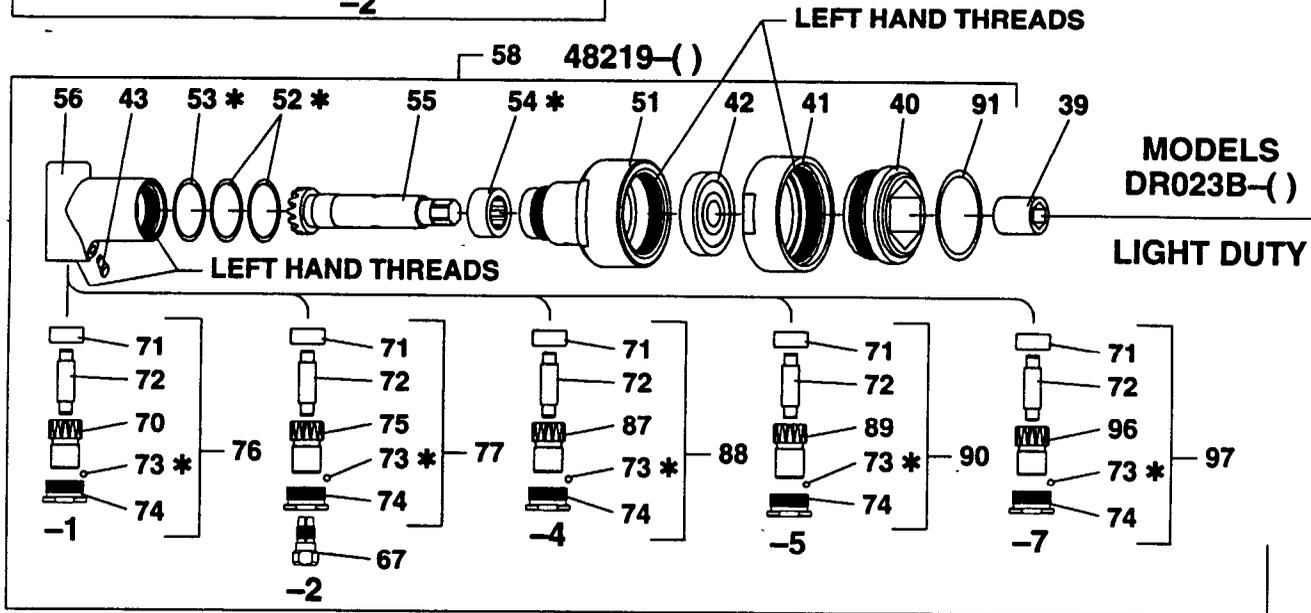
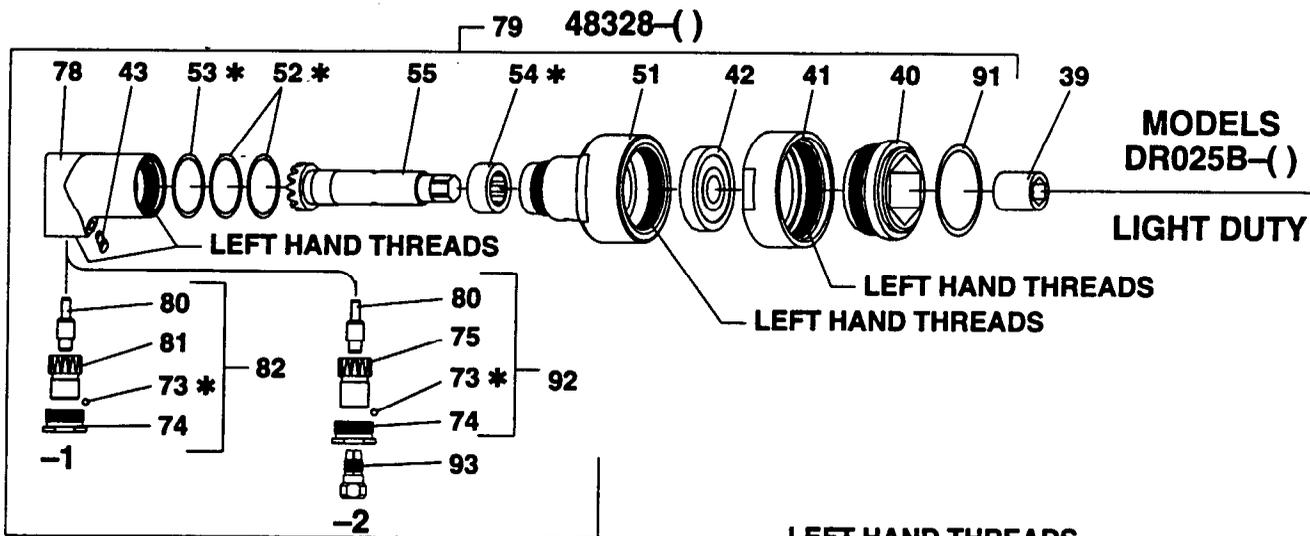
- Lubricate bearing (14) with ARO 33153 grease.
- Assemble bearing (14) to end plate (15). NOTE: Press on outer race of bearing.
- Assemble end plate (15) to rotor. NOTE: Press on inner race of bearing.
- Coat five rotor blades (16) with ARO 29665 spindle oil and assemble to rotor slots – straight side out.
- Coat i.d. of cylinder (18) with ARO 29665 spindle oil and assemble over rotor. NOTE: Air inlet slots in end of cylinder must be aligned with two air inlet holes in end plate (15).
- Assemble bearing (20) to end plate (19). NOTE: Press on outer race of bearing.
- Assemble end plate (19) to rotor. NOTE: Press on inner race of bearing. Be sure rotor turns without binding.
- Insert locating pin (23) into .081" diameter blind hole at bottom of motor cavity in housing.
- Align notches of end plates and cylinder and install motor into housing, aligning notches with locating pin (23).
- Grease and assemble "O" ring (21) to end plate (19).
- Assemble spacer (22) to motor, with chamfer facing motor.
- Assemble gearing and right-angle section to tool.

HOUSING DISASSEMBLY

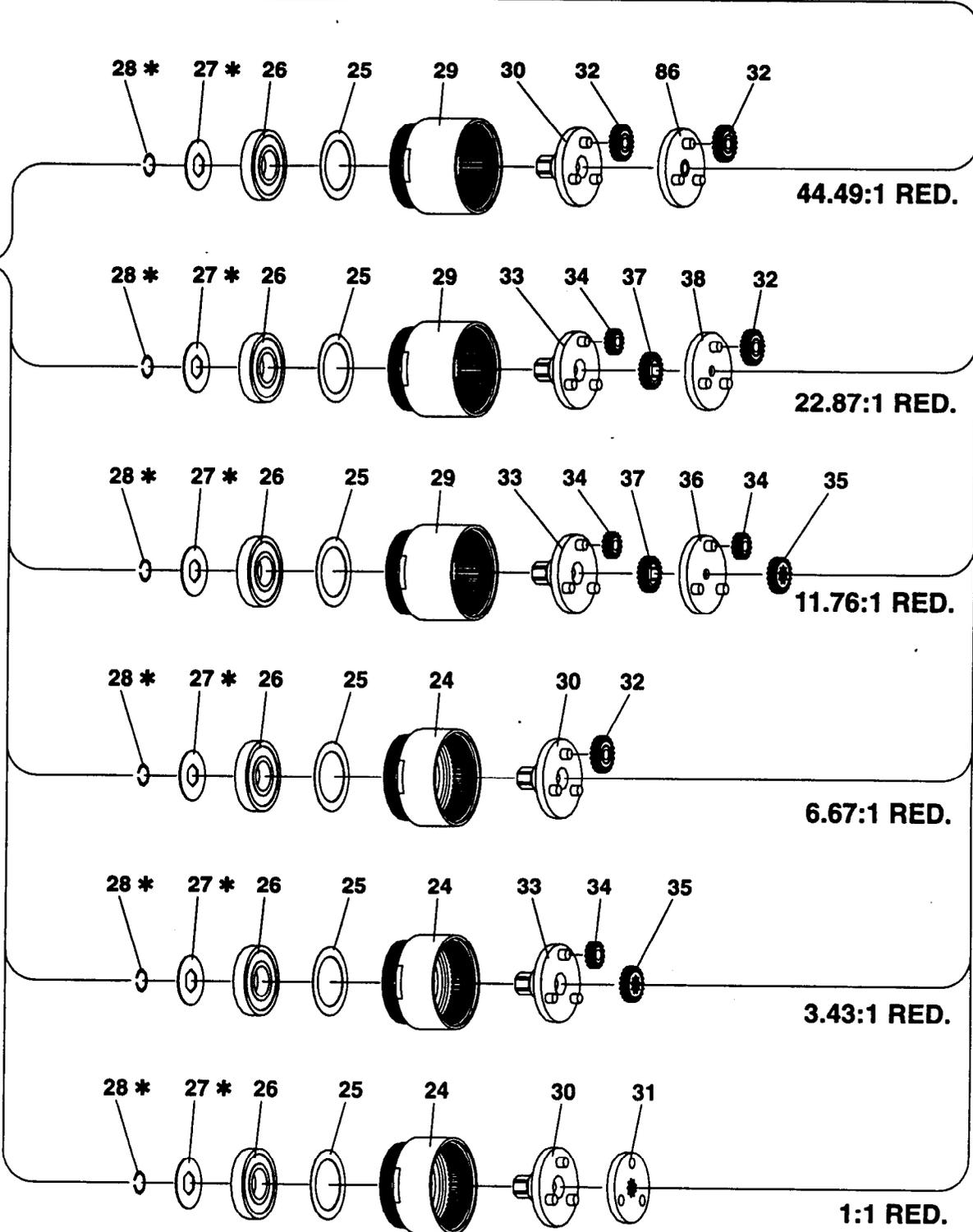
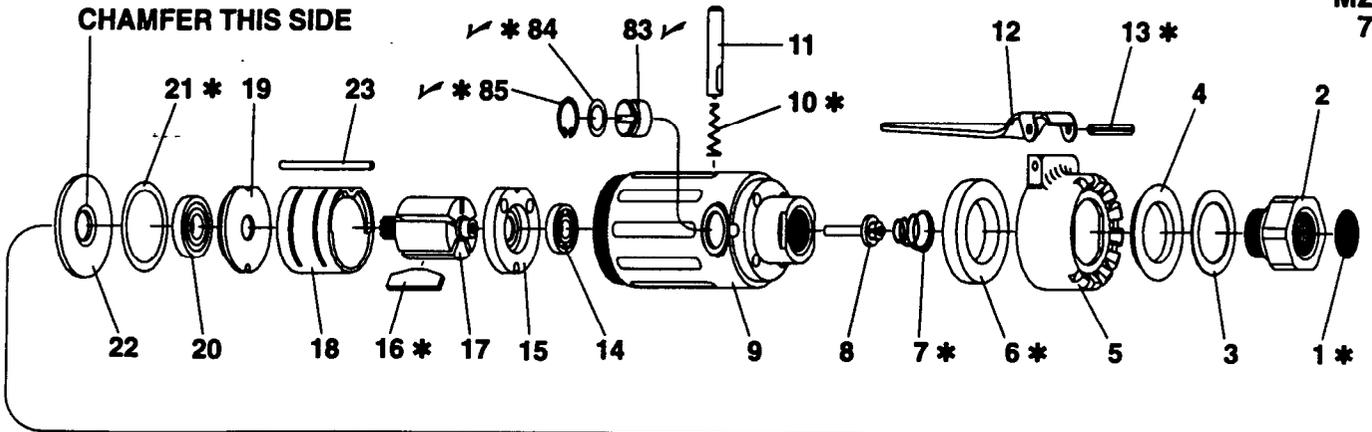
- Clamp air inlet adapter (2) in a smooth face vise.
- Unthread housing (9) with a strap type wrench.
- Remove spacer (3), washer (4), exhaust cap (5), muffler pad (6), spring (7) and valve rod (8). CAUTION: Do not remove or adjust rubber portion of valve rod (8), as it is preset at the factory.
- Remove screen (1) from inlet adapter (2).
- Remove throttle pin (11) and spring (10).
- Models DR025B-() – Do not remove restrictor (83) unless damage is evident.

HOUSING ASSEMBLY

- Lubricate throttle pin (11) with ARO 29665 spindle oil.
- Install spring (10) and throttle pin (11) into housing. NOTE: Align slot in throttle pin with air inlet holes in housing.
- Install valve rod assembly (8) into housing. NOTE: Throttle pin (11) should not pull out when valve rod (8) is seated properly.
- Install muffler pad (6) to exhaust cap (5).
- Install exhaust cap (5) to housing, aligning lever with throttle pin (11).
- Assemble spring (7), washer (4) and spacer (3) to tool, securing with inlet adapter (2).
- Clean and replace screen (1) in inlet adapter (2).
- Models DR025B-() – Grease and assemble "O" ring (84) to restrictor (83) and assemble to housing (9) with opening of restrictor positioned towards motor. Secure restrictor with retaining ring (85).



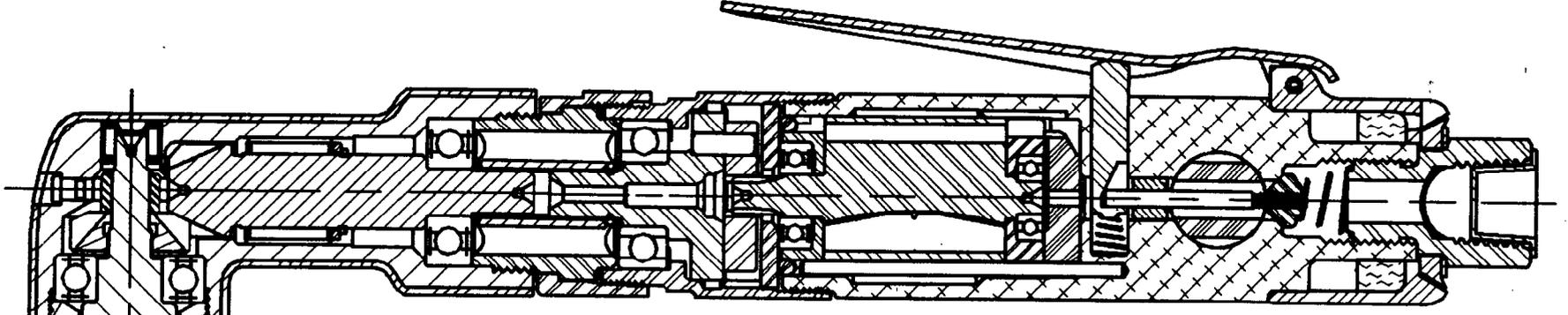
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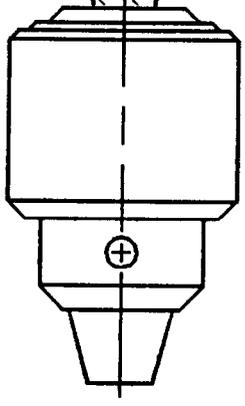
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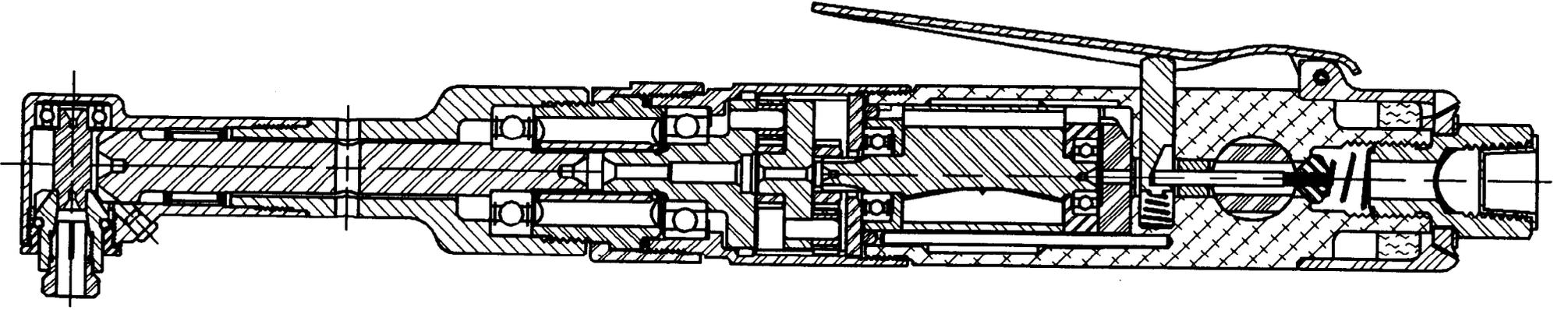
1	Screen	33911	50	Sleeve (not shown)	48192-1
2	Inlet Adapter	46377	51	Right-Angle Body	48196-1
3	Spacer	47205	52	Right-Angle Shim (.005" thick)(2 req'd) .	48197-1
4	Washer	46371	53	Right-Angle Shim (.003" thick)	48197-2
5	Exhaust Cap	46366-1	54	Needle Bearing	46222
6	Muffler Pad	48199-1	55	Pinion	48178-1
7	Spring	41654	56	Right-Angle Housing	48206-1
8	Valve Rod Assembly	46354	57	Right-Angle Assembly	48211-1
9	Housing Assembly for models DR021B-() and DR023B-() for models DR025B-() (includes items 83, 84 and 85)	46722	58	Right-Angle Assembly	48219-()
		48330-1	59	Spindle	48189-1
10	Spring	46374	60	Sleeve	47600
11	Throttle Pin	46296-1	61	Bevel Gear	46735
12	Lever	46326	62	Washer	47694
13	Roll Pin	Y178-28	63	Ball Bearing	Y65-13
14	Ball Bearing	41643	64	Spindle	48191-1
15	Rear End Plate	46245	65	Lock Nut	48187-1
16	Blade (5 req'd)	46301	66	Chuck (1/4" capacity)	31330
17	Rotor	46338-2	67	Collet Insert	43497-169
18	Cylinder	48200-1	68	Spindle Assembly	48213-1
19	Front End Plate	47718	69	Spindle Assembly	48215-1
20	Ball Bearing	Y65-10	70	Gear (1/4" - 28 female thread)	48179-1
	MOTOR ASSEMBLY (includes items 14 thru 20) .	48225-1	71	Ball Bearing	41643
21	"O" Ring	Y325-116	72	Shaft	48183-1
22	Spacer	46305	73	Ball (22 req'd)	32594
23	Locating Pin	47719-2	74	Lock Nut	48188-1
24	Ring Gear (single reduction)	46322	75	Gear (9/32" - 40 female thread)	48180-1
25	Spacer	46496	76	Spindle Assembly	48207-1
26	Ball Bearing	Y65-13	77	Spindle Assembly	48208-1
27	Washer	47694	78	Right-Angle Housing (includes item 43) .	48327-1
28	Snap Ring	Y142-2	79	Right-Angle Assembly	48328-()
29	Ring Gear (double reduction)	46323	80	Shaft	48319-1
30	Spindle Assembly 6.67:1 ratio	47741	81	Gear (9/32" - 40 female thread)	48323-1
31	Drive Plate	46709	82	Spindle Assembly	48325-1
32	Planet Gear (3 or 6 req'd) 6.67:1 ratio (21 teeth) .	46875	83	Restrictor	48322-1
33	Spindle Assembly 3.43:1 ratio	47742	84	"O" Ring	Y325-10
34	Planet Gear (3 or 6 req'd) 3.43:1 ratio (15 teeth) .	46904	85	Retaining Ring	Y147-3
35	Sun Gear 3.43:1 ratio (21 teeth)	46561	86	Carrier Assembly 6.67:1 ratio	46720
36	Carrier Assembly 3.43:1 ratio	46493	87	Gear (#10 - 32 female thread)	48516-1
37	Sun Gear 3.43:1 ratio (21 teeth)	46560	88	Spindle Assembly	48515-1
38	Carrier Assembly 6.67:1 ratio	46336	89	Gear (5/16" - 24 female thread)	48683-1
39	Coupling	48184-1	90	Spindle Assembly	48684-1
40	Adapter	48186-1	91	"O" Ring	Y325-19
41	Lock Nut	48185-1	92	Spindle Assembly	48325-2
42	Ball Bearing	Y65-8	93	Collet Insert	43497-165
43	Grease Fitting	35967	94	Spindle	48190-1
44	Snap Ring	Y110-5	95	Spindle Assembly	48214-1
45	Spacer	46742	96	Gear (9/32" - 40 female thread)	49604
46	Needle Bearing	48202-1	97	Spindle Assembly	49605
47	Pinion	48181-1		SERVICE KIT: includes items 1, 6, 7, 10, 13, 16, 21, 27, 28, 44, 45, 46, 52, 53, 54, 73, 84 and 85	48446-1
48	Right-Angle Housing	48203-1			
49	Needle Bearing	46750			



MODEL DR021B-170-A



MODEL DR023B-21-C





Part of worldwide Ingersoll-Rand

PN 49999-181