



Tool Products

OPERATOR'S MANUAL

INCLUDING: OPERATION, INSTALLATION & MAINTENANCE

SECTION M32
MANUAL 1

Released: 10-29-90

Revised: 11-10-95

Form: 3490-2

20 SERIES RIGHT-ANGLE SCREWDRIVERS/NUTSETTERS

Models: AR028A-(), NR021B-(), NR023B-(),
SR021B-() and SR023B-().



⚠ 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 servicenter.
- 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

1725 U.S. No. 1 North • P.O. Box 8000 • Southern Pines, NC 28388-8000

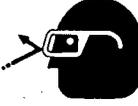
©1995 THE ARO CORPORATION • PRINTED IN U.S.A.



Part of worldwide Ingersoll-Rand

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



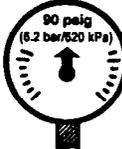
Do not use damaged, frayed or deteriorated air hoses and fittings.

⚠ 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 clutch parts with molybdenum grease (40036-1). 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 3/32 oz. (2.7 g) of grease for double reduction. Right-angle assembly should contain approximately 1/8 oz. (3.5 g) of grease. Clutch should contain approximately 1/16 oz. (1.8 g) of grease.

AIR SUPPLY REQUIREMENTS

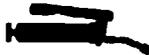
For maximum operating efficiency, the following air supply specifications should be maintained to this air tool:

- 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 |
| Clutches | 40036-1 | 1 lb. "EP" Molybdenum Disulfide |

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.

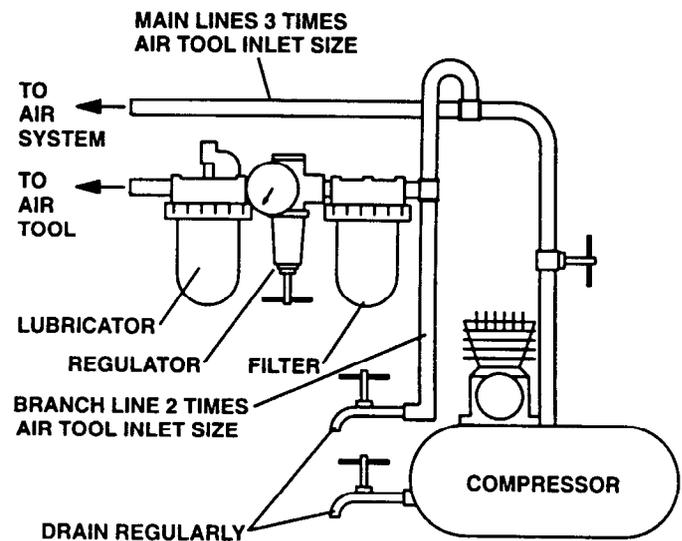
Tool maintenance and repair shall be performed by authorized, trained, competent personnel. Tools, hose and fittings shall be replaced if unsuitable for safe operation and responsibility should be assigned to be sure that all tools requiring guards or other safety devices shall be kept in legible condition. 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.



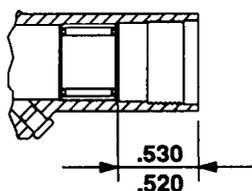
MODEL IDENTIFICATION CHART

| MODEL NUMBER | R.P.M. | GEARING REDUCTION | CLUTCH ASSEMBLY | TORQUE RANGE (IN. LBS) | RIGHT-ANGLE ASS'Y (ITEM NO.) |
|--------------------|--------|-------------------|-----------------|------------------------|------------------------------|
| AR028A-5R-()-() | 500 | 22.87:1 | 48408-3 | 15 - 40 | 96 |
| AR028A-9L-()-() | 900 | 19.28:1 | 48408-3 | 10 - 30 | 95 |
| AR028A-10R-()-() | 1000 | 11.76:1 | 48408-2 | 10 - 26 | 96 |
| AR028A-14L-()-() | 1400 | 11.76:1 | 48408-2 | 8 - 20 | 95 |
| AR028A-17R-()-() | 1700 | 6.67:1 | 48408-1 | 7 - 16 | 96 |
| AR028A-25L-()-() | 2500 | 6.67:1 | 48408-1 | 5 - 10 | 95 |
| AR028A-48L-()-() | 4800 | 3.43:1 | 48408-1 | 3 - 7 | 95 |
| NR021B-5R-()-() | 500 | 22.87:1 | | | 96 |
| NR021B-10R-()-() | 1000 | 11.76:1 | | | 96 |
| NR021B-17R-()-() | 1700 | 6.67:1 | | | 96 |
| NR021B-33R-()-() | 3300 | 3.43:1 | | | 96 |
| NR023B-5R-()-() | 500 | 22.87:1 | 48389-2 | 15 - 40 | 96 |
| NR023B-10R-()-() | 1000 | 11.76:1 | 48389-1 | 10 - 26 | 96 |
| NR023B-17R-()-() | 1700 | 6.67:1 | 48389-1 | 7 - 16 | 96 |
| SR021B-5R-()-() | 500 | 22.87:1 | | | 96 |
| SR021B-10R-()-() | 1000 | 11.76:1 | | | 96 |
| SR021B-14L-()-() | 1400 | 11.76:1 | | | 95 |
| SR021B-17R-()-() | 1700 | 6.67:1 | | | 96 |
| SR021B-25L-()-() | 2500 | 6.67:1 | | | 95 |
| SR021B-33R-()-() | 3300 | 3.43:1 | | | 96 |
| SR021B-48L-()-() | 4800 | 3.43:1 | | | 95 |
| SR023B-5R-()-() | 500 | 22.87:1 | 48389-2 | 15 - 40 | 96 |
| SR023B-9L-()-() | 900 | 19.28:1 | 48389-2 | 6 - 23 | 95 |
| SR023B-10R-()-() | 1000 | 11.76:1 | 48389-1 | 10 - 26 | 96 |
| SR023B-14L-()-() | 1400 | 11.76:1 | 48389-1 | 4 - 17 | 95 |
| SR023B-17R-()-() | 1700 | 6.67:1 | 48389-1 | 7 - 16 | 96 |
| SR023B-25L-()-() | 2500 | 6.67:1 | 48389-1 | 4 - 10 | 95 |
| SR023B-48L-()-() | 4800 | 3.43:1 | 48389-1 | 2 - 5 | 95 |

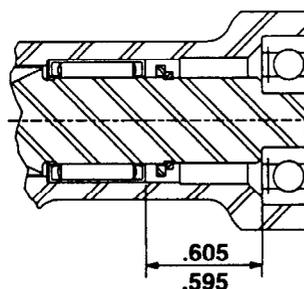
MODELS WITH -EU SUFFIX ARE "EC" COMPLIANT MODELS.

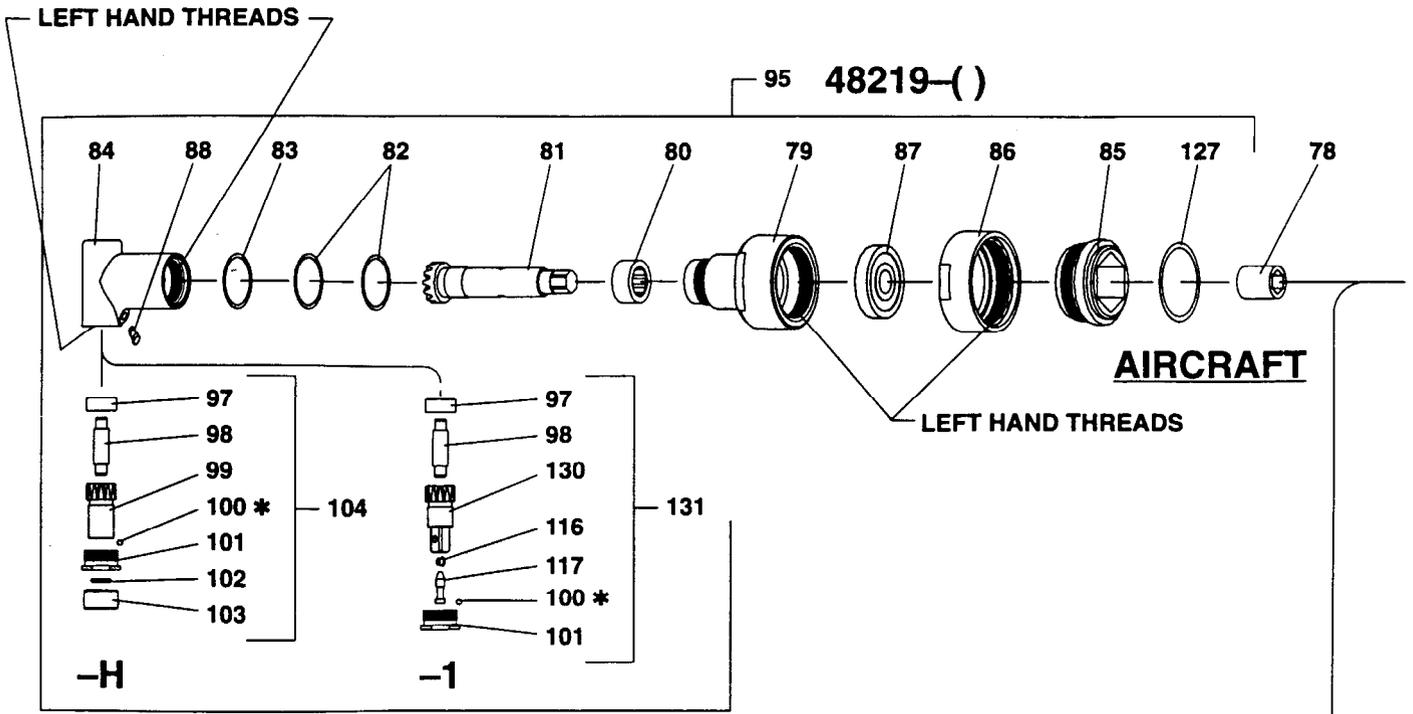
| DRIVE OPTION | DESCRIPTION |
|--------------|-------------------|
| -F | FINDER |
| -H | 1/4" HEX |
| -1 | 1/4" SQUARE DRIVE |
| -2 | 3/8" SQUARE DRIVE |

AIRCRAFT

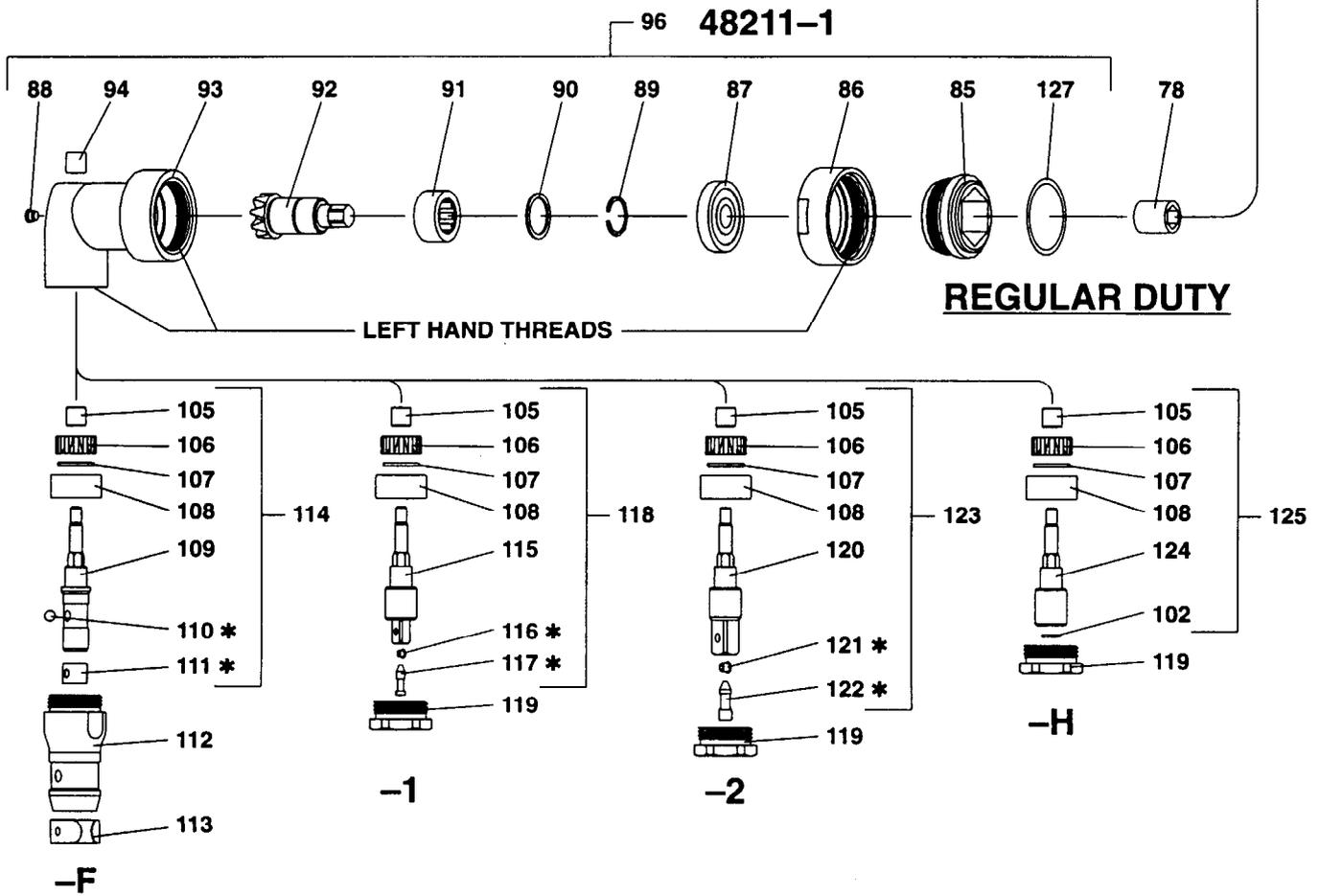


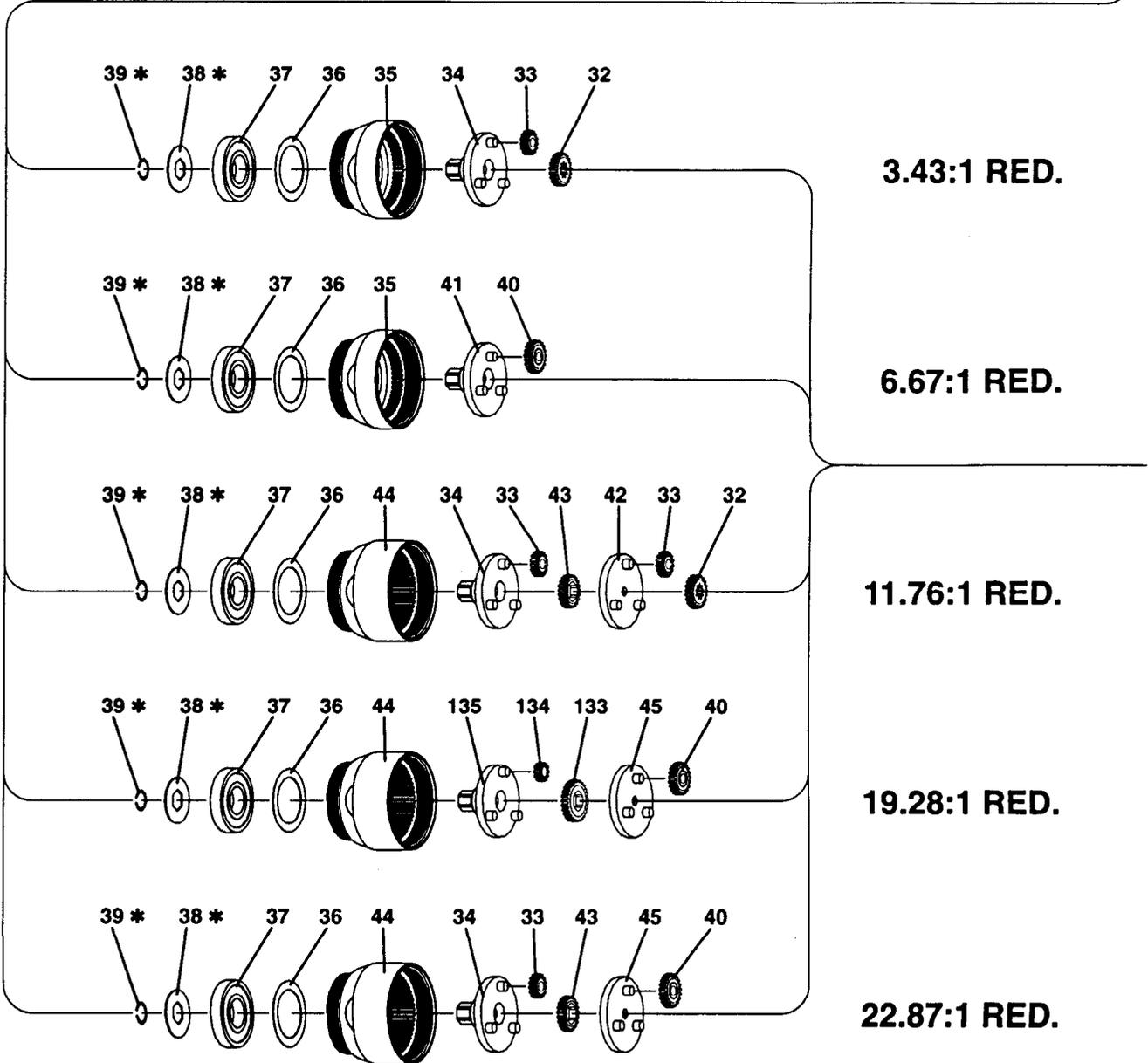
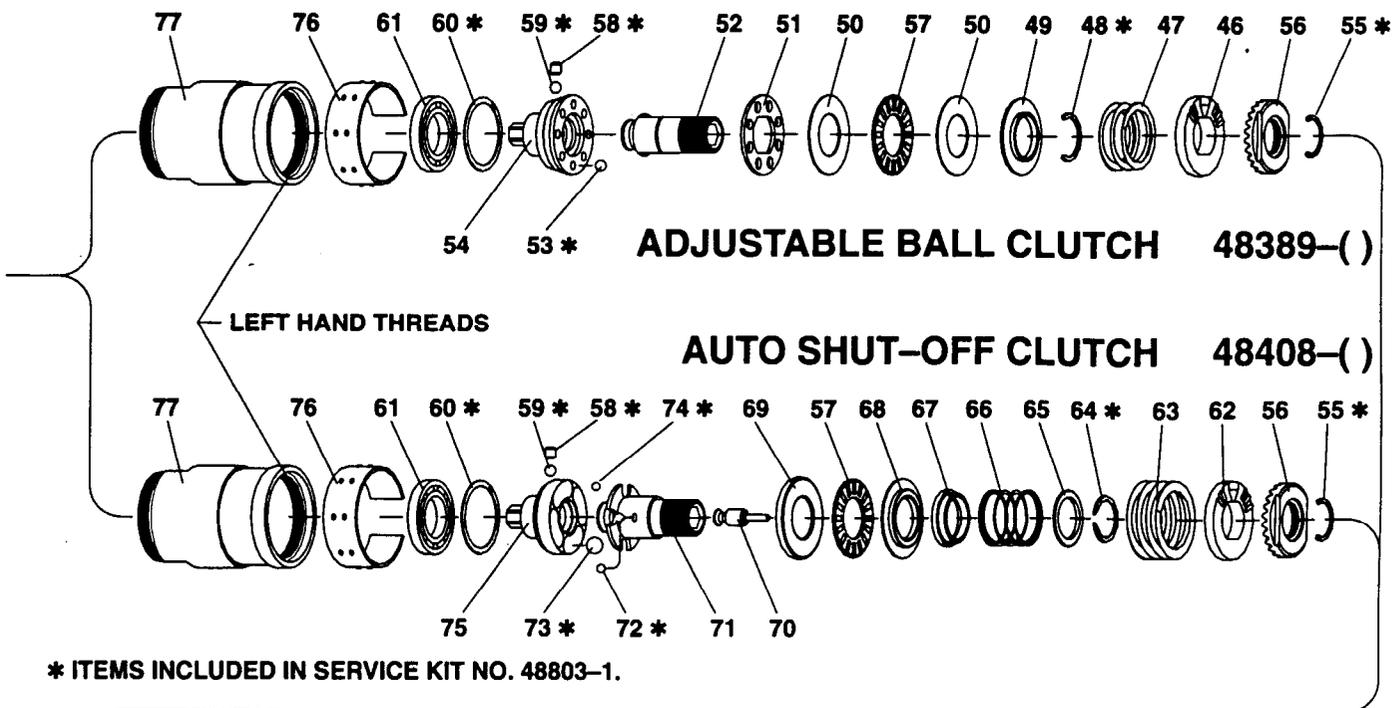
REGULAR DUTY

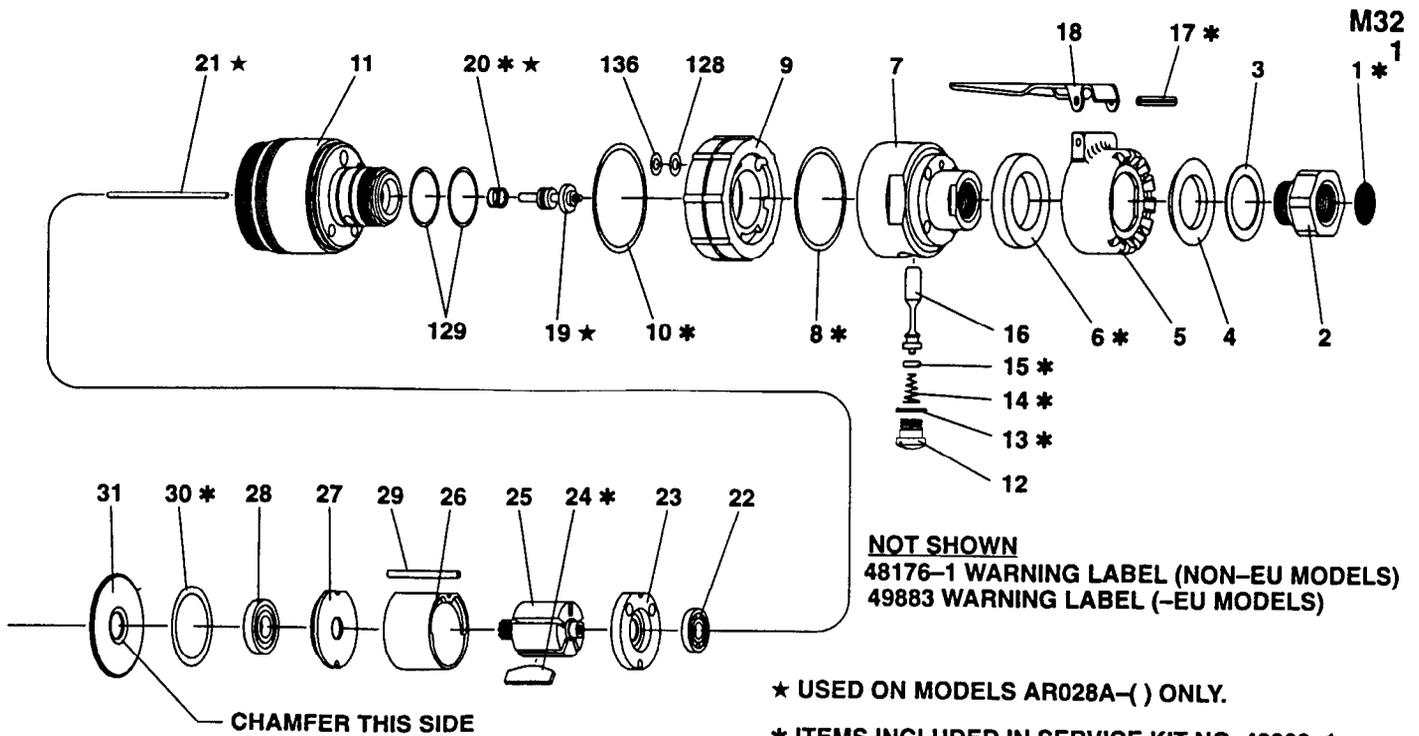




* ITEMS INCLUDED IN SERVICE KIT NO. 48803-1.







| PART NUMBER FOR ORDERING | | PART NUMBER FOR ORDERING | |
|--------------------------|---|--------------------------|--------------------|
| 1 | Screen | 33911 | |
| 2 | Inlet Adapter | 46377 | |
| 3 | Spacer | 47205 | |
| 4 | Diffuser Washer | 46371 | |
| 5 | Exhaust Cap | 46366-1 | |
| 6 | Filler | 46375 | |
| 7 | Head | 48339-1 | |
| 8 | "O" Ring | Y325-23 | |
| 9 | Reverse Ring | 48204-1 | |
| 10 | "O" Ring | Y325-24 | |
| 11 | Housing Assembly (includes Y178-19 Roll Pin) for models AR028A for models NR02()B and SR02()B | 48393-1 48393-2 | |
| 12 | Throttle Valve Screw | 33023 | |
| 13 | Seal | 32886 | |
| 14 | Spring | 31125 | |
| 15 | "O" Ring | Y325-7 | |
| 16 | Valve Stem | 48388-1 | |
| 17 | Roll Pin | Y178-28 | |
| 18 | Lever | 48246-1 | |
| 19 | Valve Assembly (includes Y325-6 "O" Ring) | 48411-1 | |
| 20 | Spring | 47587 | |
| 21 | Throttle Rod for 1700, 2500 and 4800 r.p.m. models (2.535" long) for 500, 900, 1000 and 1400 r.p.m. models (2.910" long) | 46511-14 46511-15 | |
| 22 | Ball Bearing | 41643 | |
| 23 | Rear End Plate | 46245 | |
| 24 | Blade (5 req'd) | 46301 | |
| 25 | Rotor for models AR028A for models NR02()B and SR02()B | 46338-1 46338-2 | |
| 26 | Cylinder | 46244 | |
| 27 | Front End Plate | 47718 | |
| 28 | Ball Bearing | Y65-10 | |
| | MOTOR ASSEMBLY (includes items 22 thru 28) for models AR028A for models NR02()B and SR02()B | 47720 47721 | |
| 29 | Locating Pin | 47719-1 | |
| 30 | "O" Ring | Y325-116 | |
| 31 | Spacer | | 47632 |
| 32 | Sun Gear 3.43:1 ratio (21 teeth) | | 46561 |
| 33 | Planet Gear (3 or 6 req'd) 3.43:1 ratio (15 teeth) | | 46904 |
| 34 | Spindle Assembly 3.43:1 ratio | | 47742 |
| 35 | Ring Gear (single reduction) | | 47633 |
| 36 | Spacer | | 46496 |
| 37 | Ball Bearing | | Y65-13 |
| 38 | Washer | | 47694 |
| 39 | Snap Ring | | Y142-2 |
| 40 | Planet Gear (3 req'd) 6.67:1 ratio (21 teeth) | | 46875 |
| 41 | Spindle Assembly 6.67:1 ratio | | 47741 |
| 42 | Carrier Assembly 3.43:1 ratio | | 46493 |
| 43 | Sun Gear 3.43:1 ratio (21 teeth) | | 46560 |
| 44 | Ring Gear (double reduction) | | 47634 |
| 45 | Carrier Assembly 6.67:1 ratio | | 46336 |
| 46 | Adjustment Washer | | 46295 |
| 47 | Clutch Spring (Adjustable Ball Clutch) for 500 and 900 r.p.m. models (Blue) for 1000, 1400, 1700 2500 and 4800 r.p.m. models (Yellow) | | 46349 36512 |
| 48 | Snap Ring | | Y110-106 |
| 49 | thrust Pad | | 46332 |
| 50 | Thrust Washer (2 req'd) | | 42364 |
| 51 | Ball Carrier | | 46499 |
| 52 | Spindle | | 48381-1 |
| 53 | Ball (8 req'd) | | Y16-204 |
| 54 | Driven Jaw | | 48383-1 |
| 55 | Snap Ring | | Y110-105 |
| 56 | Adjustment Nut | | 46294 |
| 57 | Thrust Bearing | | 42363 |
| 58 | Pin | | 48080 |
| 59 | Ball (9 req'd) | | Y16-204 |
| 60 | Retainer Ring | | 48084 |
| 61 | Ball Bearing | | 46243 |
| | ADJUSTABLE BALL CLUTCH ASSEMBLY (includes items 46 thru 61) for 500 and 900 r.p.m. models using BLUE spring for 1000, 1400, 1700, 2500 and 4800 r.p.m. models using YELLOW spring | | 48389-2 48389-1 |
| 62 | Adjustment Washer | | 48089 |

PART NUMBER FOR ORDERING

PART NUMBER FOR ORDERING

| | | | | | |
|----|---|----------|-----|---|---------|
| 63 | Clutch Spring (Auto Shut-Off Clutch) for 500 and 900 r.p.m. models (Brown) . | 48291-1 | 98 | Shaft | 48183-1 |
| | for 1000 and 1400 r.p.m. models (Green) | 48290-1 | 99 | Gear | 48242-1 |
| | for 1700, 2500 and 4800 r.p.m. models (Red) . . | 48289-1 | 100 | Ball (22 req'd) | 32594 |
| 64 | Snap Ring | 48480-1 | 101 | Lock Nut | 48188-1 |
| 65 | Guide | 48295-1 | 102 | Retaining Ring | 38790 |
| 66 | Spring | 47064 | 103 | Retainer | 48241-1 |
| 67 | Ball Sleeve | 48294-1 | 104 | Spindle Assembly | 48240-1 |
| 68 | Thrust Race | 48085 | 105 | Sleeve | 47600 |
| 69 | Thrust Race | 48297-1 | 106 | Bevel Gear | 46735 |
| 70 | Plunger | 48293-1 | 107 | Washer | 47694 |
| 71 | Spindle | 48288-1 | 108 | Ball Bearing | Y65-13 |
| 72 | Ball (6 req'd) | Y16-203 | 109 | Spindle | 48238-1 |
| 73 | Ball (4 req'd) | Y16-206 | 110 | Ball | Y16-204 |
| 74 | Ball (10 req'd) | Y16-203 | 111 | Ball Clip | 47695 |
| 75 | Driven Jaw | 48385-1 | 112 | Finder Housing | 48239-1 |
| | AUTO SHUT-OFF CLUTCH ASSEMBLY | | 113 | Clip Assembly | 47782 |
| | (includes items 55 thru 75) | | 114 | Spindle Assembly | 48236-1 |
| | for 500 and 900 r.p.m. models using | | 115 | Spindle (1/4" square drive) | 48237-1 |
| | BROWN spring | 48408-3 | 116 | Pin | 47028 |
| | for 1000 and 1400 r.p.m. models using | | 117 | Insert | 46749 |
| | GREEN spring | 48408-2 | 118 | Spindle Assembly (1/4" square drive) | 48235-1 |
| | for 1700, 2500 and 4800 r.p.m. models | | 119 | Lock Nut | 48187-1 |
| | using RED spring | 48408-1 | 120 | Spindle (3/8" square drive) | 48233-1 |
| 76 | External Adjustment Sleeve | 46390 | 121 | Pin | 30889 |
| 77 | Housing Assembly (includes item 76) | 48395-1 | 122 | Insert | 30890 |
| 78 | Coupling | 48184-1 | 123 | Spindle Assembly (3/8" square drive) | 48234-1 |
| 79 | Right-Angle Body | 48196-1 | 124 | Spindle (1/4" hex drive) | 48231-1 |
| 80 | Needle Bearing | 46222 | 125 | Spindle Assembly (1/4" hex drive) | 48232-1 |
| 81 | Pinion | 48178-1 | 126 | Sleeve (included in item 96)(not shown) | 48192-1 |
| 82 | Right-Angle Shim (.005" thick)(2 req'd) | 48197-1 | 127 | "O" Ring | Y325-19 |
| 83 | Right-Angle Shim (.003" thick) | 48197-2 | 128 | "O" Ring | Y325-6 |
| 84 | Right-Angle Housing | 48206-1 | 129 | "O" Ring (2 req'd) | 48882 |
| 85 | Adapter | 48186-1 | 130 | Spindle (1/4" square drive) | 48801-1 |
| 86 | Lock Nut | 48185-1 | 131 | Spindle Assembly | 48802-1 |
| 87 | Ball Bearing | Y65-8 | 132 | Pin Wrench (included with item 95)(not shown) | 48182-1 |
| 88 | Grease Fitting | 35967 | 133 | Sun Gear 2.89:1 ratio (27 teeth) | 46320 |
| 89 | Snap Ring | Y110-5 | 134 | Planet Gear (3 req'd) 2.89:1 ratio (12 teeth) | 46318 |
| 90 | Spacer | 46742 | 135 | Spindle Assembly 2.89:1 ratio | 47743 |
| 91 | Needle Bearing | 48202-1 | 136 | "O" Ring | Y328-6 |
| 92 | Pinion | 48181-1 | | | |
| 93 | Right-Angle Housing | 48203-1 | | SERVICE KIT: includes items 1, 6, 8, 10, 13, 14, 15, 17, 20, 24, 30, 38, 39, 48, 53 55, 58, 59, 60, 64, 72, 73, 74, 80, 82, 83 89, 90, 91, 100, 110, 111, 116, 117, 121 122 and 127 | 48803-1 |
| 94 | Needle Bearing | 46750 | | | |
| 95 | Right-Angle Assembly (includes item 132) | 48219-() | | | |
| 96 | Right-Angle Assembly (includes item 126) | 48211-1 | | | |
| 97 | Ball Bearing | 41643 | | | |

- 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.

RIGHT-ANGLE DISASSEMBLY (REGULAR DUTY)

- Using wrenches on flats of clutch housing or ring gear and lock nut (86), unthread and remove right-angle section from tool – LEFT HAND THREADS.
- To disassemble drive assembly, remove lock nut (119) or housing (112) from housing (93) – LEFT HAND THREADS.
- Remove adapter (85) – LEFT HAND THREADS.
- Do not disassemble further unless damage is evident. To disassemble, pull pinion (92) from housing.
- To remove bearing (91) from pinion, remove snap ring (89) and spacer (90).

RIGHT-ANGLE ASSEMBLY (REGULAR DUTY)

- Lubricate bearings upon assembly.
- Assemble bearing (91) and spacer (90) to pinion (92), securing with snap ring (89). NOTE: Bearing is to be located .600" from shoulder on pinion (see illustration, page 4).
- Assemble bearing (87) to pinion. NOTE: Press on inner race of bearing.
- Assemble pinion and components to housing (93). NOTE: Press on outer race of bearing.
- Assemble lock nut (86) to adapter (85) and assemble adapter to housing, securing pinion – LEFT HAND THREADS.
- Apply approximately 3/32 oz. of grease to right-angle gearing upon assembly.
- Assemble drive assembly (118, 123 or 125) to lock nut (119).
- Assemble lock nut or housing (112) and components to housing – LEFT HAND THREADS.
- Assemble coupling (78) to pinion and assemble right-angle housing and components to tool, securing with lock nut (86) – LEFT HAND THREADS.

RIGHT-ANGLE DISASSEMBLY (AIRCRAFT)

- Using wrenches on flats of clutch housing or ring gear and lock nut (86), unthread and remove right-angle section from tool – LEFT HAND THREADS.
- To disassemble right-angle section, grasp right-angle housing (84) lightly in a vise. Using a wrench on flats of body (79), unthread body from housing – LEFT HAND THREADS.
- Do not remove pinion (81) from housing unless damage is evident. To remove pinion, grasp pinion in a vise and tap housing with a soft face hammer.
- Pull pinion (81) from body (79).
- Unthread and remove adapter (85) – LEFT HAND THREADS – releasing bearing (87).
- To disassemble drive assembly, unthread lock nut (101) – LEFT HAND THREADS – and pull drive assembly from housing (84). 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 (AIRCRAFT)

- Lubricate bearings upon assembly.
- Apply adhesive such as Loctite 609 to shaft (98) and assemble to gear (99 or 130).
- Assemble bearing (97) to shaft (98).
- Assemble gear and components to lock nut (101), securing balls (100) to groove in gear.
- Assemble lock nut (101) to housing (84) – LEFT HAND THREADS.

- Assemble bearing (87) and lock nut (86) to body, securing with adapter (85) – LEFT HAND THREADS.
- Assemble bearing (80) to pinion (81).
- Assemble pinion to housing (84).
- Assemble housing (84) to body (79) to seat needle bearing. Unthread and remove body. NOTE: Bearing is to be located .525" from end of housing (84)(see illustration, page 4).
- Assemble shims (82 and 83) to body.
- Assemble housing (84) to body (79) – LEFT HAND THREADS.
- Assemble coupling (78) to pinion and assemble right-angle section to tool, securing with lock nut (86) – LEFT HAND THREADS.

CLUTCH DISASSEMBLY

- Remove right-angle assembly from tool.
- Clamp tool in a smooth face vise, clamping on inlet adapter (2).
- Remove clutch housing using a strap type wrench – LEFT HAND THREADS.
- Remove clutch assembly from tool.

ADJUSTABLE BALL CLUTCH

- Clamp drive end of driven jaw (54) in a vise.
- Remove snap ring (55).
- Using a 5/8" wrench, remove adjustment nut (56).
- Remove adjustment washer (46) and clutch spring (47).
- Remove snap ring (48).
- Slide off thrust pad (49), two thrust washers (50) and thrust bearing (57).
- Remove ball carrier (51) and eight balls (53).
- Remove retainer ring (60) and pin (58), then rotate driven jaw to remove nine balls (59). Separate driven jaw and spindle (52).

AUTO SHUT-OFF CLUTCH

- Clamp drive end of driven jaw (75) in a vise.
- Remove snap ring (55).
- Using a 5/8" wrench, remove adjustment nut (56).
- Remove adjustment washer (62) and clutch spring (63).
- Remove snap ring (64).
- Slide off guide (65), spring (66), ball sleeve (67), thrust race (68) and thrust bearing (57). NOTE: Removal of ball sleeve (67) releases six balls (72) and plunger (70).
- Remove thrust race (69), releasing four balls (73).
- Remove retainer ring (60) and pin (58), then rotate driven jaw to remove nine balls (59). Separate driven jaw and spindle (71), releasing ten balls (74).

CLUTCH ASSEMBLY

- For clutch part lubrication, use ARO 40036-1 grease on parts as pointed out in this section.

ADJUSTABLE BALL CLUTCH

- Lubricate ball groove of clutch spindle (52).
- Assemble spindle into driven jaw (54), aligning ball groove with hole in driven jaw.
- Install nine balls (59) and pin (58) into hole, then secure with retainer ring (60).
- Lubricate ball pockets of driven jaw (54) and install ball carrier (51) and eight balls (53).
- Lubricate and assemble one thrust washer (50), thrust bearing (57), other thrust washer (50) and thrust pad (49).
- Install snap ring (48).
- Install clutch spring (47), adjustment washer (46) and adjustment nut (56).
- Install snap ring (55).
- Lubricate bearing (61) with ARO 33153 grease and assemble to driven jaw, pressing on inner race of bearing.
- Assemble clutch assembly to tool.
- Assemble clutch housing (77) to tool – LEFT HAND THREADS.
- Assemble right-angle assembly to tool – LEFT HAND THREADS.
- See clutch adjustment.

AUTO SHUT-OFF CLUTCH

- Lubricate ball grooves of clutch spindle (71).
- Install ten balls (74) into groove.
- Assemble spindle into driven jaw (75), securing balls.
- Assemble nine balls (59) and pin (58) into driven jaw, then secure with retainer ring (60).

DISASSEMBLY/ASSEMBLY INSTRUCTIONS

- Lubricate ball pockets of driven jaw and install four balls (73) into pockets, securing with thrust race (69).
- Lubricate and assemble thrust bearing (57) and thrust race (68) to spindle.
- Coat plunger (70) with spindle oil 29665 and assemble to spindle, securing with balls (72). NOTE: Assemble two balls per hole.
- Secure balls with ball sleeve (67).
- Assemble spring (66) and guide (65) to spindle, securing with snap ring (64).
- Install clutch spring (63).
- Lubricate face of adjustment washer (62) and install on spindle.
- Thread adjustment nut (56) onto spindle, securing with snap ring (55).
- Lubricate bearing (61) with ARO 33153 grease and assemble to driven jaw, pressing on inner race of bearing.
- Assemble clutch assembly to tool.
- Assemble clutch housing (77) to tool – LEFT HAND THREADS.
- Assemble right-angle assembly to tool – LEFT HAND THREADS.
- See clutch adjustment.

CLUTCH ADJUSTMENT

EXTERNAL:

- Rotate sleeve (76) until opening in housing is visible.
- Rotate drive spindle of right-angle assembly until notch in adjustment washer (46 or 62) is visible.
- Insert no. 1 Phillips screwdriver in notch to turn gear teeth on nut (56).
- Clockwise = decrease torque.
- Counterclockwise = increase torque.

INTERNAL:

- Remove clutch housing and clutch assembly from tool. NOTE: Clutch housing has left hand threads.
- Clamp drive end of driven jaw in a vise.
- Hold clutch assembly from turning, then rotate adjustment nut (56) using a 5/8" wrench.

GEARING DISASSEMBLY

- Remove right-angle section and clutch assembly from tool.
- Remove ring gear (35 or 44) using a wrench on flats.
- Remove snap ring (39) and washer (38).
- Remove spindle(s) and gears from ring gear. NOTE: Keep gears grouped with mating spindle when disassembling double reduction gearing.
- Do not remove bearing (37) or spacer (36) unless damage is evident.
- To remove bearing (37) and spacer (36) from ring gear, press on spacer (36) from inside splined end of ring gear.
- Do not remove gear (43 or 133) from carrier assembly unless damage is evident. Gears (43 and 133) are press fit onto carrier assemblies.

GEARING ASSEMBLY

- Assemble spacer (36) into ring gear.
- Press bearing (37) 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 (38) to spindle, securing with snap ring (39).
- Thread ring gear (35 or 44) to tool, tightening with wrench on flats.
- Assemble clutch assembly and right-angle section to tool.

MOTOR DISASSEMBLY

- Remove right-angle section, clutch assembly and gearing from tool.

- Remove spacer (31), "O" ring (30) and throttle rod (21).
- Tap front edge of housing to remove motor assembly. Locating pin (29) should also come out.
- Tap splined end of rotor (25) with a soft face hammer; motor will come apart. NOTE: Bearing (28) is light press fit on rotor.
- Remove end plate (23) and bearing (22) from rotor.

MOTOR ASSEMBLY

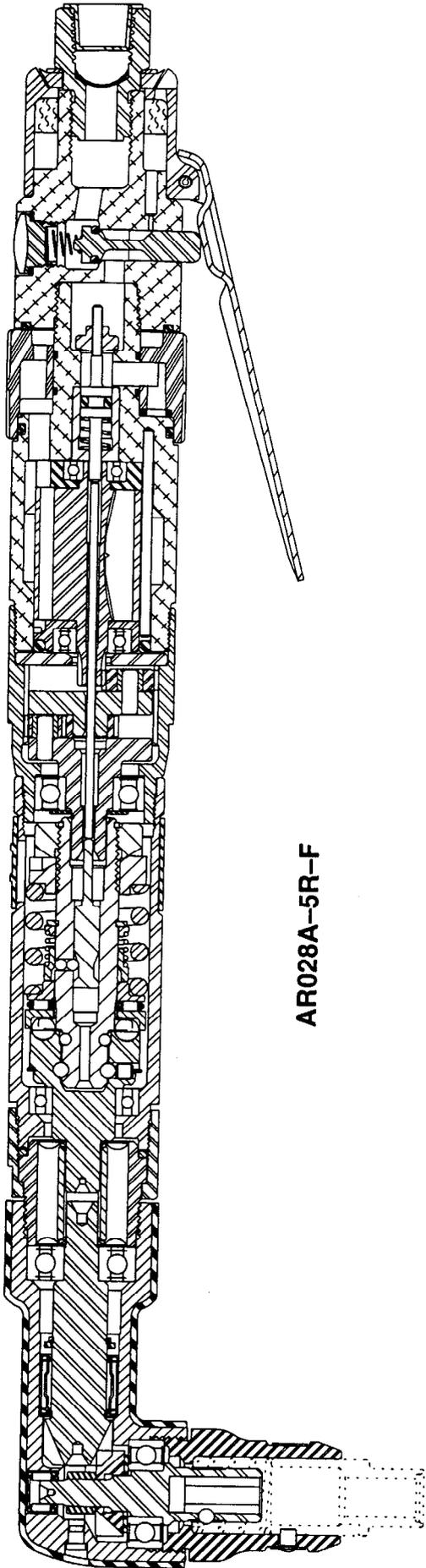
- Lubricate bearing (22) with ARO 33153 grease.
- Assemble bearing (22) to end plate (23), pressing on outer race of bearing.
- Assemble end plate (23) to rotor, pressing on inner race of bearing.
- Coat five rotor blades (24) with ARO 29665 spindle oil and assemble to rotor slots – straight side out.
- Coat i.d. of cylinder (26) 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 (23).
- Assemble bearing (28) to end plate (27), pressing on outer race of bearing.
- Assemble end plate (27) to rotor, pressing on inner race of bearing. Be sure rotor turns without binding.
- Insert pin (29) 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 pin (29).
- Grease and assemble "O" ring (30) to end plate.
- Assemble spacer (31) to motor with chamfer facing motor.
- Coat throttle rod (21) with ARO 29665 spindle oil and insert into rotor.
- Assemble gearing, clutch assembly and right-angle section to tool.

HOUSING DISASSEMBLY

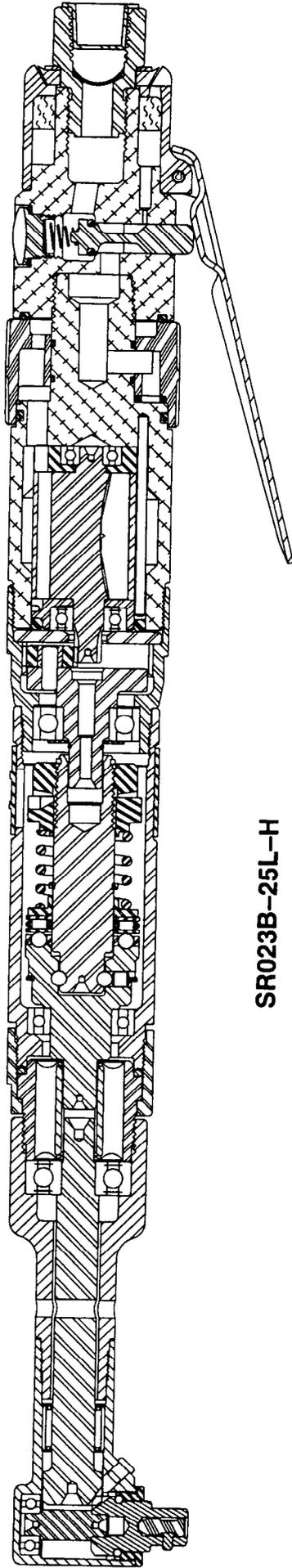
- Clamp air inlet adapter (2) in a smooth face vise.
- Unthread head (7) using a wrench on flats.
- Remove spacer (3), diffuser washer (4), exhaust cap (5) and filler (6).
- Remove screen (1) from inlet adapter.
- Remove screw (12) and seal (13), releasing spring (14) and valve stem (16).
- Clamp head (7) in a smooth face vise, clamping on flats.
- Using a strap type wrench, unthread and remove housing (11) from head.
- Remove reverse ring (9) and "O" rings (136 and 128), allowing removal of "O" ring (10) and "O" rings (129).
- Remove valve assembly (19) and spring (20), where applicable.

HOUSING ASSEMBLY

- Grease "O" ring of valve assembly (19) and assemble spring (20) and valve assembly to housing (11), where applicable.
- Grease and assemble "O" rings (129) to housing.
- Grease and assemble "O" rings (128 and 136) to reverse ring (9) and assemble reverse ring to housing.
- Grease and assemble "O" ring (8) to head.
- Assemble housing (11) to head (7), tightening with a wrench on flats of head and a strap wrench on housing.
- Grease and assemble "O" ring (15) to valve stem (16).
- Lubricate valve stem (16) with ARO 29665 spindle oil and assemble to head (7).
- Assemble spring (14) to head (small diameter towards valve stem), securing with seal (13) and screw (12).
- Install filler (6) to exhaust cap (5).
- Assemble exhaust cap (5) to head, aligning lever with valve stem (16).
- Assemble diffuser washer (4) and spacer (3) to head, securing with inlet adapter (2).
- Clean and replace screen (1) in inlet adapter.



AR028A-5R-F



SR023B-25L-H



Part of worldwide Ingersoll-Rand

PN 49999-043