

# MAINTENANCE SECTION COVERING ANGLE HEAD MODULES for SERIES D FIXTURED TORQUE MULTIPLIERS WHEN THIS MODULE IS USED WITH AN ELECTRIC POWERED TOOL

## ! WARNING



**IMPORTANT SAFETY INFORMATION ENCLOSED.  
READ ALL THESE INSTRUCTIONS BEFORE PLACING TOOL IN SERVICE OR  
OPERATING THIS TOOL AND SAVE THESE INSTRUCTIONS.  
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.**

**Disconnect the Power Cord from the receptacle before performing any maintenance on this tool.**



This symbol is to alert the user and service personnel to the presence of uninsulated dangerous voltage that will cause a risk of electric shock.



This symbol is to alert the user and service personnel to the presence of important operating instructions that must be read and understood to prevent personal injury, electrical shock or damage to the equipment.

**WHEN USING ELECTRIC TOOLS, BASIC SAFETY PRECAUTIONS SHOULD  
ALWAYS BE FOLLOWED TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK  
AND PERSONAL INJURY, INCLUDING THE FOLLOWING.**

### PLACING TOOL IN SERVICE

- Use only with Ingersoll-Rand Series Controllers.
- Always operate, inspect and maintain this tool in accordance with all regulations (local, state, federal and country), that may apply to hand held/hand operated electric tools.
- Inspect tool cords periodically and if damaged, have them repaired by an authorized service facility.
- 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.

- Power 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.
- Guard Against Electric Shock. Prevent body contact with earthed or grounded surfaces. For example; pipes, radiators, ranges, refrigerator enclosures.
- Don't abuse Cord. Never carry tool by cord or yank it to disconnect from receptacle. Keep cord from heat, oil, and sharp edges.
- Keep work area clean. Cluttered areas and benches invite injuries.

*(Continued on page 4-2)*

## NOTICE

The use of other than genuine Ingersoll-Rand replacement parts may result in personal injury, decreased tool performance and increased maintenance, and may invalidate all warranties.

Have your tool repaired by a qualified person. This electric tool is in accordance with the relevant safety requirements. Repairs should only be carried out by qualified persons using original spare parts, otherwise this may result in considerable danger to the user.

Repairs should be made only by authorized, trained personnel. Consult your nearest Ingersoll-Rand Authorized Servicenter.

Refer All Communications to the Nearest  
Ingersoll-Rand Office or Distributor.

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**INGERSOLL-RAND®**  
**PROFESSIONAL TOOLS**

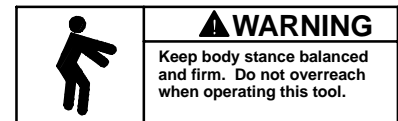
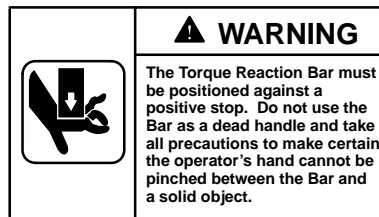
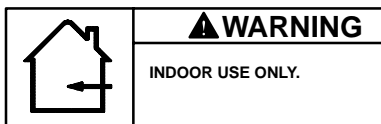
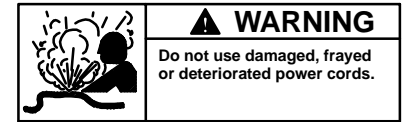
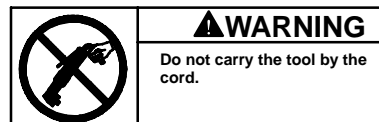
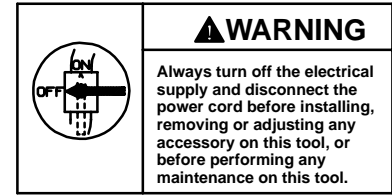
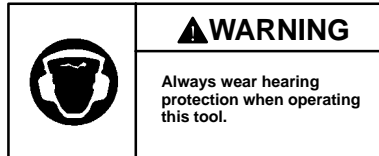
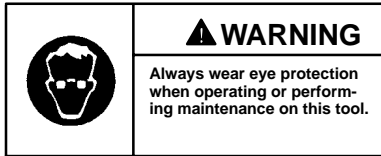


## FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

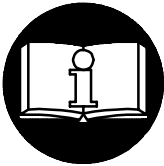
### USING THE TOOL (*Continued*)

- **Consider work area environment.** Don't expose power tools and chargers to water. Keep work area well lighted. Do not use tool in explosive or flammable atmospheres.
- **Keep bystanders and children away.** Do not permit unauthorized personnel to operate this tool, or touch tool or cord.
- **Store idle tools.** When not in use, tools should be stored in a dry, high or locked up place, out of reach of children.
- **Don't force tool.** It will do the job better and more safely at the rate for which it was intended.
- **Use the right tool.** Do not force a small tool or attachment to do the job of a heavy-duty tool.
- **Do not use a tool for a purpose for which it is not intended.** Example: Do not use a screwdriver as a drill.
- **Dress properly.** Do not wear loose clothing or jewelry. They can be caught in moving parts. Rubber gloves and non-skid footwear are recommended when working outdoors. Wear protective hair covering to contain long hair.
- **Secure work.** Use clamps or a vise to hold work. Operators often need both hands to perform job functions.
- **Don't overreach.** Keep proper footing, balance, and a firm grip on the tool at all times.
- **Maintain tools with care.** Keep tools clean for better and safer performance. Follow instructions for lubricating and changing accessories. Inspect tool cords periodically and if damaged, have them repaired by an authorized service facility. Inspect extension cords periodically and replace if damaged. Keep handles dry, clean, and free from oil and grease.
- **Remove adjusting keys and wrenches.** Form habit of checking to see that keys and adjusting wrenches are removed from tool before turning it on.
- **Avoid unintentional starting.** Don't carry tool with finger on switch.
- **Do not drop or abuse the tool.**
- **Anticipate and be alert for sudden changes in motion during start up and operation of any power tool.**
- **Whenever a tool is not being used, position the Power Switch to the "OFF" position and unplug the power cord.**
- **Stay alert.** Watch what you are doing. Use common sense. Do not operate tool when you are tired.
- **Check damaged parts.** Before further use of the tool, a guard or other part that is damaged should be carefully checked to determine that it will operate properly and perform its intended function. Check for alignment of moving parts, binding of moving parts, breakage of parts, mounting, and any other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced by an authorized service center unless otherwise indicated elsewhere in this operation manual.
- **Have defective switches replaced by an authorized service center.**
- **Do not use the tool if the switch does not turn it on and off.**
- **Whenever the Angle Head is installed or repositioned, the Throttle Lever must be positioned so that reaction torque will not tend to retain the throttle in the "ON" position.**
- **When installing or removing the output device on any tool, ALWAYS grasp a metal component of the tool while tightening or loosening the Coupling Nut or Spindle Cap. Acceptable clamping locations include, but are not limited to, the hex on the Gear Case, the Tool Hanger, the Torque Reaction Arm or any metal Mounting Plate. NEVER grasp the composite tool body or handle in vise jaws to restrain the torque of the Coupling Nut or Spindle Cap. Such practice will result in damage to the tool.**
- **Do not use power units and gear trains that exceed the capability of the output device.**
- **The Tube Nut Attachment has an opening on the front side for construction and application purposes. DO NOT, under any circumstance place your fingers in this opening.**
- **The Torque Reaction Bar must be positioned against a positive stop. Do not use the Bar as a dead handle and take all precautions to make certain the operator's hand cannot be pinched between the Bar and a solid object.**
- **When operated continuously for long periods of time, Series DE Nutrunners may become hot at the spindle end of the tool. Take all precautions necessary to avoid skin contact with the hot surfaces. Prolonged contact may result in burns.**
- **All Series D Torque Control Wrenches and Nutrunners with reverse capability have rotational arrows molded into the housing in the area of the reversing mechanism. When the direction switching device is positioned nearest the molded circular arrow with an "F" in the center, spindle rotation will be forward or clockwise direction. When the direction switching device is positioned nearest the molded circular arrow with an "R" in the center, spindle rotation will be reverse or counterclockwise direction.**
- **Use only impact sockets and accessories. Do not use hand (chrome) sockets or accessories.**

## WARNING LABEL IDENTIFICATION



## WHEN THIS MODULE IS USED WITH AN AIR POWERED TOOL



### ⚠ 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 all regulations (local, state, federal and country), that may apply to hand held/hand operated pneumatic tools.
- 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 3/8" (10 mm) 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.
- Always use clean, dry air at 90 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.
- Note the position of the reversing lever before operating the tool so as to be aware of the direction of rotation when operating the throttle.
- 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 shaft 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 Ingersoll-Rand.
- Use only impact sockets and accessories. Do not use hand (chrome) sockets or accessories.
- This tool is not designed for working in explosive atmospheres.
- This tool is not insulated against electric shock.

*(Continued on page 4-4)*


**⚠ WARNING**


**FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.**

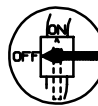
**USING THE TOOL (Continued)**


- Do not remove the Inlet Plug without first disconnecting the live air supply.
- Whenever the Angle Head is installed or repositioned, the Throttle Lever must be positioned so that reaction torque will not tend to retain the throttle in the “ON” position.
- When installing or removing the output device on any tool, ALWAYS grasp a metal component of the tool while tightening or loosening the Coupling Nut or Spindle Cap. Acceptable clamping locations include, but are not limited to, the hex on the Gear Case, the Tool Hanger, the Torque Reaction Arm or any metal Mounting Plate. NEVER grasp the composite tool body or handle in vise jaws to restrain the torque of the Coupling Nut or Spindle Cap. Such practice will result in damage to the tool.
- Do not use power units and gear trains that exceed the capability of the output device.
- The Tube Nut Attachment has an opening on the front side for construction and application purposes. DO NOT, under any circumstance place your fingers in this opening.
- The Torque Reaction Bar must be positioned against a positive stop. Do not use the Bar as a dead handle and take all precautions to make certain the operator’s hand cannot be pinched between the Bar and a solid object.
- When operated continuously for long periods of time, Series D Nutrunners may become hot at the spindle end of the tool. Take all precautions necessary to avoid skin contact with the hot surfaces. Prolonged contact may result in burns.
- All Series D Torque Control Wrenches and Nutrunners with reverse capability have rotational arrows molded into the housing in the area of the reversing mechanism. When the direction switching device is positioned nearest the molded circular arrow with an “F” in the center, spindle rotation will be forward or clockwise direction. When the direction switching device is positioned nearest the molded circular arrow with an “R” in the center, spindle rotation will be reverse or counterclockwise direction.


**WARNING LABEL IDENTIFICATION**


	<b>⚠ WARNING</b> Always wear eye protection when operating or performing maintenance on this tool.
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	<b>⚠ WARNING</b> Always wear hearing protection when operating this tool.
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	<b>⚠ WARNING</b> 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.
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	<b>⚠ WARNING</b> 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.
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	<b>⚠ WARNING</b> Do not carry the tool by the hose.
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	<b>⚠ WARNING</b> Do not use damaged, frayed or deteriorated air hoses and fittings.
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	<b>⚠ WARNING</b> Keep body stance balanced and firm. Do not overreach when operating this tool.
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	<b>⚠ WARNING</b> Operate at 90 psig (6.2 bar/ 620 kPa) Maximum air pressure.
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	<b>⚠ WARNING</b> The Torque Reaction Bar must be positioned against a positive stop. Do not use the Bar as a dead handle and take all precautions to make certain the operator’s hand cannot be pinched between the Bar and a solid object.
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## LUBRICATION

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### Ingersoll-Rand No. 100

**After each forty-eight hours of operation**, or as experience indicates, inject 4 cc of Ingersoll-Rand No. 100 Grease into the Grease Fitting (405) in the Angle Housing (404).

**Whenever an Angle Attachment is disassembled for repair or replacement of parts**, apply 9 cc of Ingersoll-Rand No. 100 Grease to the Bevel Pinion (406) , Bevel Gear (413) and Bevel Gear Spindle (414).

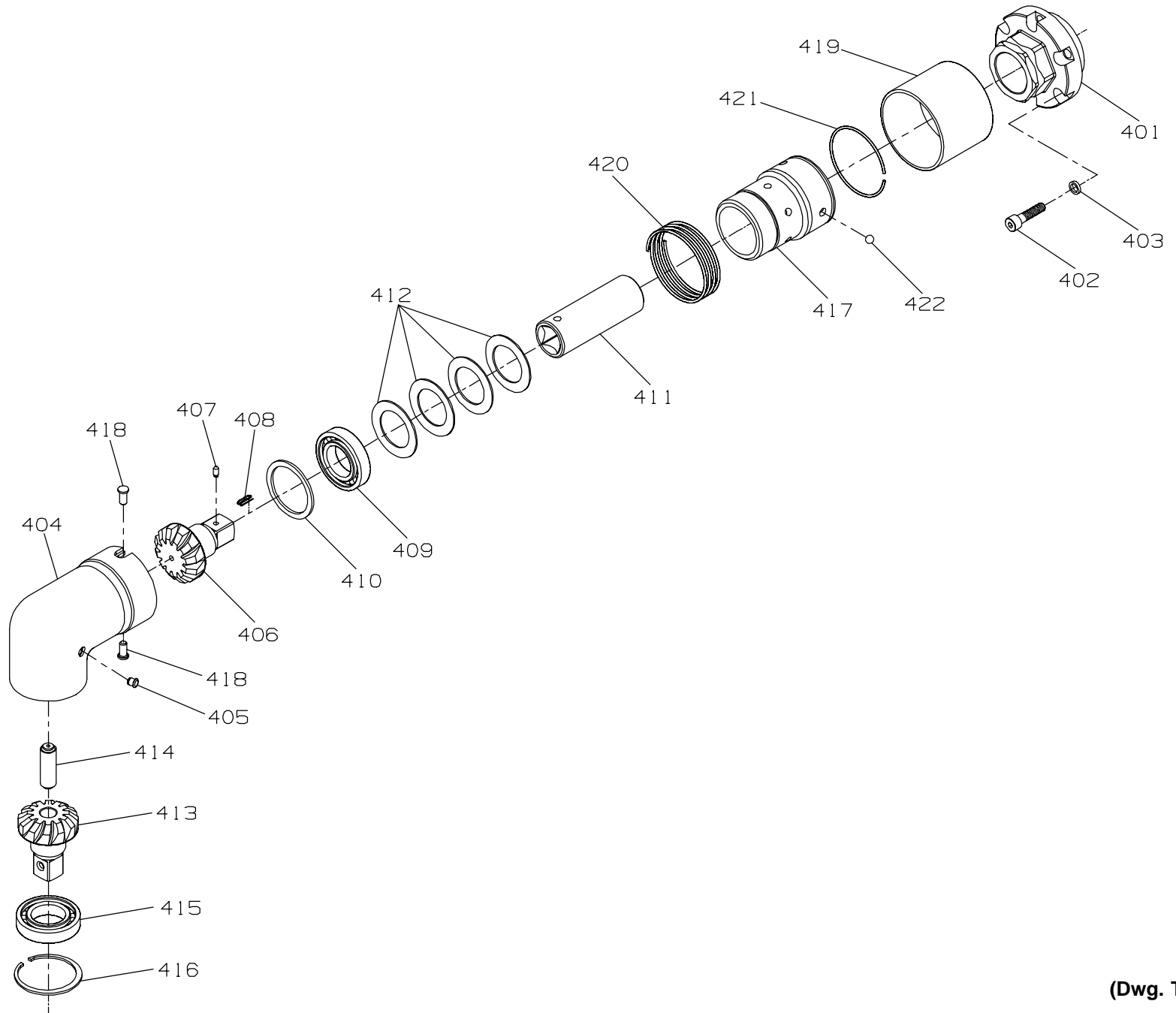
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## INSTALLATION

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These Angle Attachments must be attached to a customer's mounting plate that complies with specific bolt pattern and pilot alignment requirements. Contract Ingersoll-Rand for specific mounting dimensions.

Tighten the Adapter Mounting Screws (402) between 10.25 and 10.75 ft-lb. (13.9 and 14.6 Nm) torque.





**PART NUMBER FOR ORDERING**



	<b>ANGLE ATTACHMENT</b>	<b>DEF8S12</b>	<b>DEF9S16</b>
401	Angle Housing Adapter . . . . .	DEF8S12-827	DEF9S16-827
402	Adapter Mounting Screw (6) . . . . .	834-638	834-638
403	Mounting Screw Washer (6) . . . . .	34U-58	34U-58
404	Angle Housing Assembly . . . . .	2920A90-A600	436A90-A600
405	Grease Fitting . . . . .	130SR-188	130SR-188
406	Bevel Pinion Assembly . . . . .	2920A90-A602	436A90-A602
407	Retainer Plunger . . . . .	8U-715	8U-715
408	Retainer Plunger Spring . . . . .	5UHD-718	5UHD-718
409	Bevel Pinion Bearing . . . . .	2920A90-593	436A90-593
410	Bevel Pinion Spacer . . . . .	2920A90-608	436A90-608
411	Bevel Pinion Driver . . . . .	DEF8S12-563	DEF9S16-563
412	Bevel Pinion Clamp Washer (4) . . . . .	2920A90-207	808-207
413	Bevel Gear . . . . .	2920A90-601	436A90-601
414	Bevel Gear Spindle . . . . .	2920A90-607	436A90-607
415	Bevel Gear Bearing . . . . .	2920A90-593	436A90-593
416	Bevel Gear Bearing Retainer . . . . .	WBT380N-118	436A90-632
417	Angle Housing Connector . . . . .	2920A90-680	436A90-680
418	Connector Lock Pin (2) . . . . .	436A90-609	436A90-609
419	Connector Retaining Sleeve . . . . .	2920A90-681	436A90-681
*	Caution Label . . . . .	LA-2920B9	LA-2920B9
420	Retaining Sleeve Spring . . . . .	2920A90-682	436A90-682
421	Connector Retaining Sleeve Stop . . . . .	2920A90-303	3BM-303
422	Connector Retaining Ball (3) . . . . .	8U-722	8U-722
*	Socket Retainer . . . . .	RR10034S	RR10015S

\* Not illustrated

## MAINTENANCE SECTION

### Disassembly of the Angle Attachment

1. Slide the Connector Retaining Sleeve (419) toward the output end of the Angle Attachment and pull the assembled Angle Head off the Angle Housing Adapter (401).
2. Grasp the Angle Housing Assembly (404) in leather-covered or copper-covered vise jaws with the connector retaining sleeve end upward.

#### NOTICE

**In the following step, the three Connector Retaining Balls (422) will be free to fall when the Retaining Sleeve is removed. Be careful not to lose them.**

3. Grasp the Sleeve and while pushing it downward, use a thin blade screwdriver to spiral the Connector Retaining Sleeve Stop (421) out of the Angle Housing Connector (417).
4. Lift the Sleeve and Retaining Sleeve Spring (420) off the Connector. Remove the three Retaining Balls from the Connector, if they remained in position.
5. Using a thin blade screwdriver, pry the two Connector Lock Pins (418) from the Angle Housing.
6. Using a spanner wrench in one of the connector lock pin holes, unscrew and remove the Angle Housing Connector from the Angle Head.
7. Pull the Bevel Pinion Driver (411) off the Bevel Pinion Assembly (406).
8. Slide the Bevel Pinion Assembly, four Bevel Pinion Clamp Washers (412), Bevel Pinion Bearing (409) and Bevel Pinion Spacer (410) from the Angle Housing Assembly. Remove the Angle Housing from the vise jaws.
9. Grasp the Angle Housing in leather-covered or copper-covered vise jaws with the output end upward.
10. Using snap ring pliers, remove the Bevel Gear Bearing Retainer (416).
11. Grasp the square driver of the Bevel Gear (413) and pull the Bevel Gear Bearing (415), Bevel Gear and Bevel Gear Spindle (414) out of the Angle Housing.
12. Remove the Angle Housing from the vise jaws.

### Assembly of the Angle Head

1. Grasp the Angle Housing (404) in leather-covered or copper-covered vise jaws with the output end upward.
2. Coat the Bevel Gear Spindle (414) with a light film of Ingersoll-Rand No. 100 Grease and insert the Spindle into the central opening of the bushing pressed into the bottom of the opening in the Angle Head.
3. Press the Bevel Gear Bearing (415) onto the shaft of the Bevel Gear (413).
4. Install the Bevel Gear and Bearing, gear end leading, over the Spindle and into the Angle Housing.
5. Using snap ring pliers, install the Bevel Gear Bearing Retainer (416) into the groove in the Angle Head to retain the Bearing.
6. Re-position the angle head in the vise jaws with the mounting end upward.
7. Install the Bevel Pinion Spacer (410) on the shaft of the Bevel Pinion Assembly (406) and press the Bevel Pinion Bearing (409) onto the shaft.
8. Insert the Bevel Pinion Assembly with the Bearing and Spacer, gear end leading, into the Angle Housing. Make sure that the gear teeth mesh with the teeth on the Bevel Gear.
9. The Bevel Pinion Clamp Washers (412) are Belleville washers and need to be installed in a specific manner to get optimum clamping pressure. Insert two Washers into the Angle Housing, concave side leading, so that the outer edge of the first Washer contacts the outer edge of the Bearing. Insert the two remaining Washers, concave side trailing, until the center of that first Washer contacts the center of the Washers already installed.
10. Thread the Angle Housing Connector (417) into the Angle Housing and using a spanner wrench inserted into one of the connector lock pin holes, tighten the Connector until the Bevel Pinion Clamp Washers bottom out. After bottoming out, reverse the spanner wrench and turn the Connector out until the next set of holes aligns with the notches in the Angle Housing.



## **MAINTENANCE SECTION**

### **Assembly of the Angle Head (*Continued*)**

11. Install the Bevel Pinion Driver (411) onto the square drive of the Bevel Pinion.
12. Install the two Connector Lock Pins (418) into the two holes in the Angle Housing Connector. Make certain the Pins capture the Angle Housing by entering the slots in the Housing.
13. Install the Retaining Sleeve Spring (420) over the Connector and against the Lock Pins.
14. Insert the three Connector Retaining Balls (422) into their respective holes in the Angle Housing Connector. If necessary, apply a daub of heavy grease to each Ball to keep them in position.
15. Slide the Connector Retaining Sleeve (419), large opening leading, over the Angle Housing Connector and while compressing the Spring with the Sleeve, install the Connector Retaining Sleeve Stop (421) in the groove around the Connector.
16. Remove the assembled Angle Housing from the vise jaws, pull the Sleeve toward the output end of the assembly and install the Angle Housing on the Angle Housing Adapter (401).
17. Inject approximately 9 cc of Ingersoll-Rand No. 100 Grease into the Grease Fitting (405).

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### **TROUBLESHOOTING GUIDE**

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<b>Trouble</b>	<b>Probable Cause</b>	<b>Solution</b>
Angle Head gets hot	Excessive grease	Clean and inspect the Angle Head and gearing parts. Lubricate as instructed in the <b>LUBRICATION</b> Section.
	Inadequate grease	Inject 4 cc of grease into the Grease Fitting.
	Worn or damaged parts	Clean and inspect the Angle Head and gearing parts. Replace worn or damaged parts.

**NOTICE**

**SAVE THESE INSTRUCTIONS. DO NOT DESTROY.**

## **NOTES**

## **NOTES**