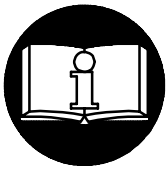
03541414

Form P7225
Edition 3
August, 1997

MAINTENANCE SECTION COVERING CROW FOOT ATTACHMENTS for SERIES D TORQUE CONTROL WRENCHES

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 7-2)

NOTICE

The use of other than genuine Ingersoll-Rand 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 Ingersoll-Rand Authorized Servicenter.

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

Printed in U.S.A.

INGERSOLL-RAND®
PROFESSIONAL TOOLS

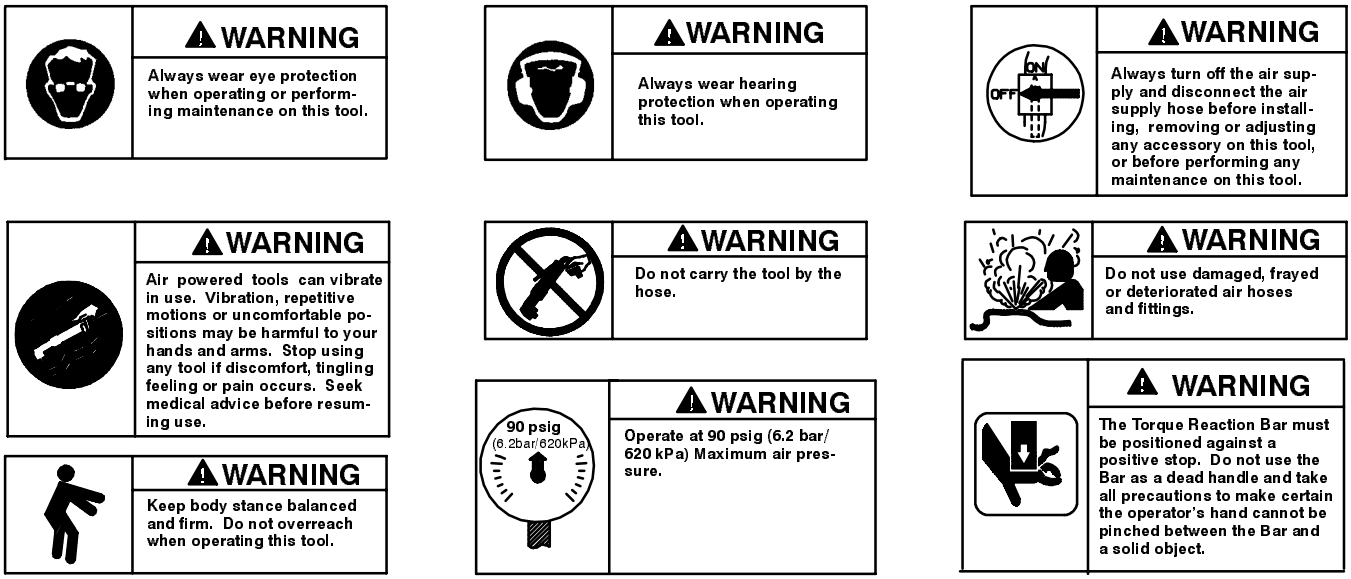
⚠ WARNING

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

USING THE TOOL *(Continued)*

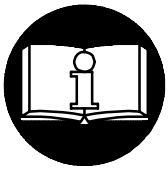
- Do not remove the Inlet Plug without first disconnecting the live air supply.
- Whenever the Angle Head is installed or repositioned, the Throttle Lever must be positioned so that reaction torque will not tend to retain the throttle in the "ON" position.
- When installing or removing the output device on a tool, ALWAYS hold the tool by the hex on the Gear Case while tightening the Coupling Nut. NEVER grasp the composite tool body or handle in vise jaws to restrain the tightening torque of the Coupling Nut. 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



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 Series TMAD 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.**
- **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.
- **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.

(Continued on page 7-4)

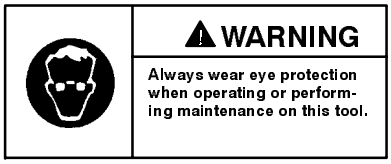
⚠ WARNING

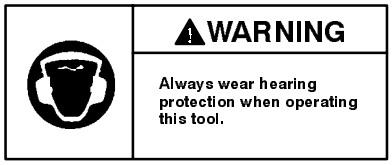
FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

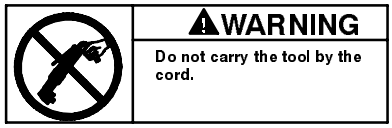
USING THE TOOL *(Continued)*

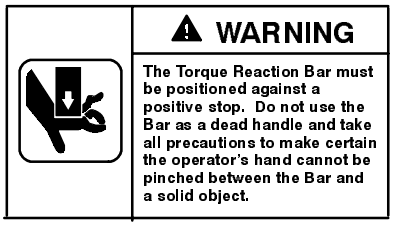
- **Do not drop or abuse the tool.**
- **Whenever a tool is not being used, position the Power Switch to the "OFF" position and unplug the power cord.**
- **Stay alert.** Watch what you are doing. Use common sense. Do not operate tool when you are tired.
- **Check damaged parts.** Before further use 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 a tool, ALWAYS hold the tool by the hex on the Gear Case while tightening the Coupling Nut. NEVER grasp the composite tool body or handle in vise jaws to restrain the tightening torque of the Coupling Nut. 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.**

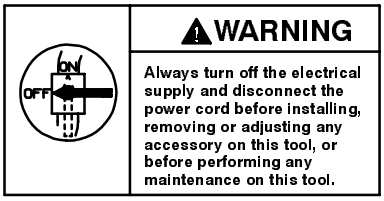
WARNING LABEL IDENTIFICATION

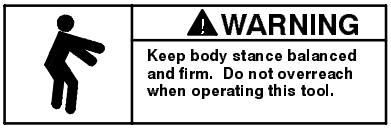




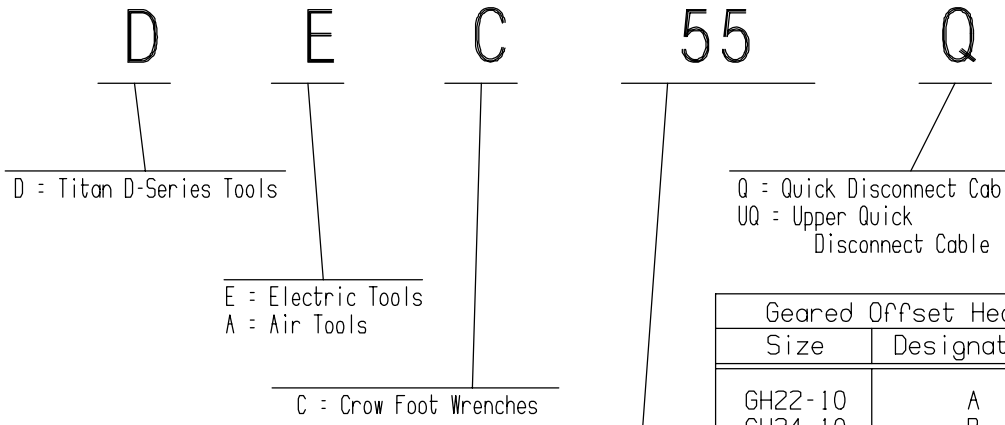








D SERIES CROW FOOT ATTACHMENT SELECTION GUIDE



* Gear Case Size Designation		
40 Series Electric	120 Series Electric	40 Series Air
8	55	9
15	70	14
23	90	25
31	120	35
40		40

* Torque Output Will Vary According To Attachment.
Contact I-R For Specific Recommendations.

Example: DC Tool With Crow Foot Head
40 Nm Gearing Std. Tool Configuration
GH24-18-AF20S GOH With 8 mm Extended Socket
Model Number = DEC31UQGGX8

Geared Offset Head	
Size	Designation
GH22-10	A
GH24-10	B
GH22-16	C
GH24-16	D
GH26-16	E
GH22-18	F
GH24-18	G
GH42-20	H
GH44-20	I
GH42-25	J
GH44-25	K
GH62-25	L
GH64-25	M

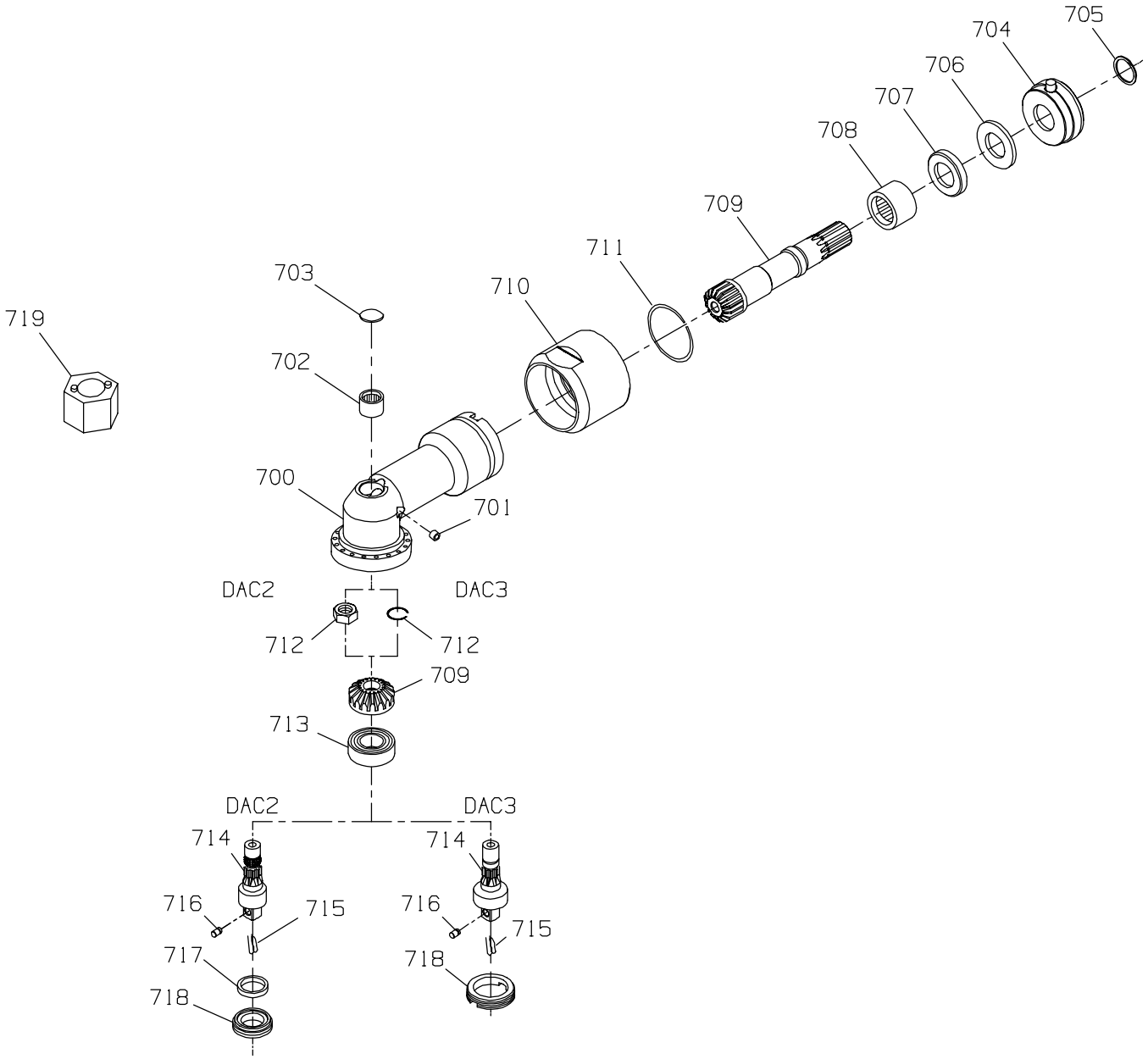
Socket Drive Inch	
Size	Designation
1/4 (AF8S)	AA
5/16 (AF10S)	BB
3/8 (AF12S)	CC
7/16 (AF14S)	DD
1/2 (AF16S)	EE
9/16 (AF18S)	FF
5/8 (AF20S)	GG
11/16 (AF22S)	HH
3/4 (AF24S)	JJ
13/16 (AF26S)	KK
7/8 (AF28S)	LL
15/16 (AF30S)	MM
1 (AF32S)	NN
1-1/16 (AF34S)	PP
1-1/8 (AF36S)	QQ

Output Drive	
Size	Designation
Square Drive	
1/4	S4
3/8	S6
1/2	S8
Hex Bit	
1/4	H4

Socket Drive Metric	
Size	Designation
8 mm (AF8M)	A
9 mm (AF9M)	B
10 mm (AF10M)	C
11 mm (AF11M)	D
12 mm (AF12M)	E
13 mm (AF13M)	F
14 mm (AF14M)	G
15 mm (AF15M)	H
16 mm (AF16M)	J
17 mm (AF17M)	K
18 mm (AF18M)	L
19 mm (AF19M)	M
20 mm (AF20M)	N
21 mm (AF21M)	P
22 mm (AF22M)	Q
23 mm (AF23M)	R
24 mm (AF24M)	S
25 mm (AF25M)	T
26 mm (AF26M)	U
27 mm (AF27M)	V

(Dwg. TPD1848–1)

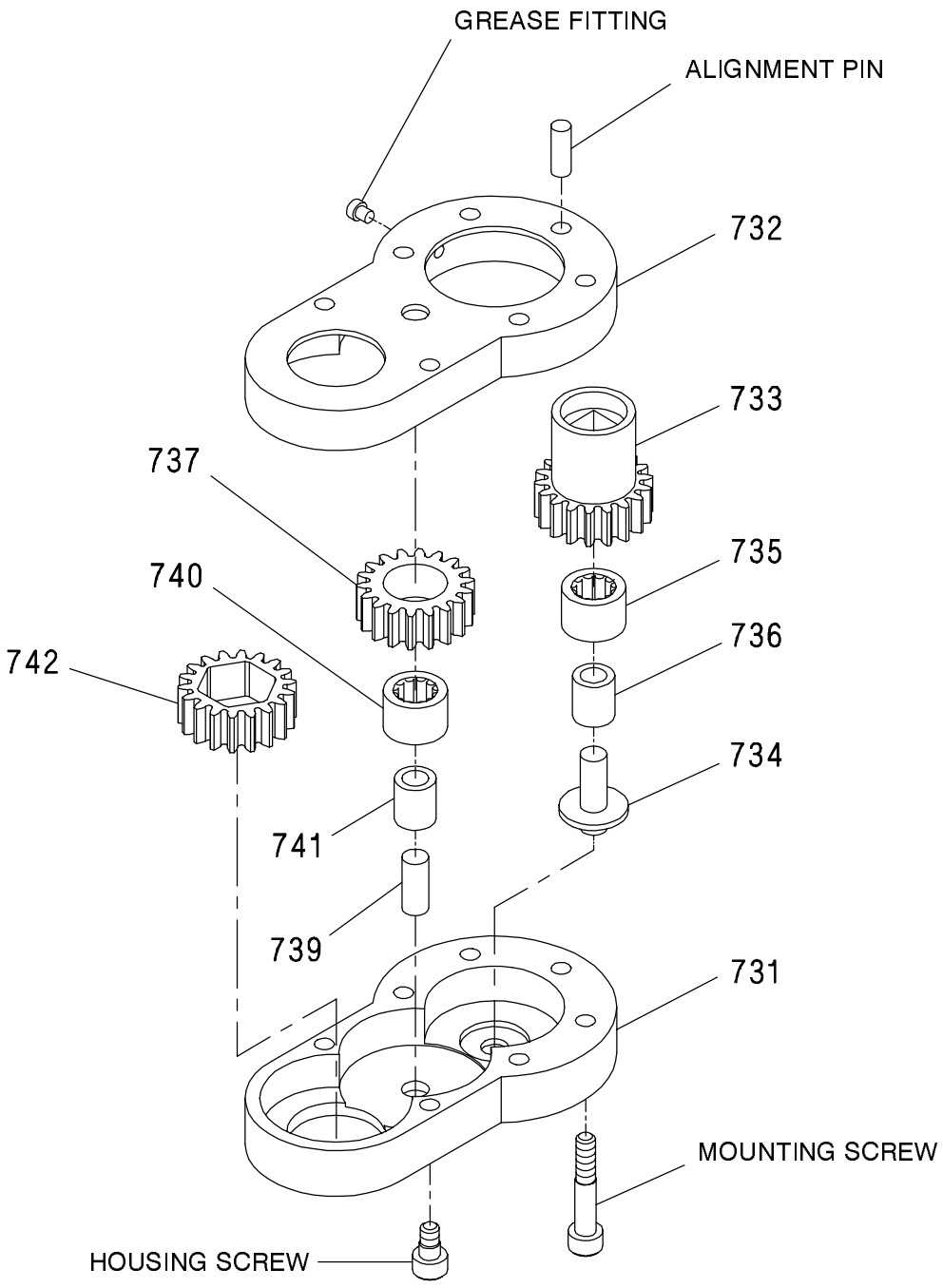
DAC2 AND DAC3 ANGLE HEADS FOR TITAN CROW FOOT ATTACHMENTS



(Dwg. TPB1008)

		PART NUMBER FOR ORDERING		
	Angle Housing Module	DAC22210S6	DAC32210S6	DAC32218S6
700	Angle Housing Assembly	DAC22210-B550	DAC32210-B550	DAC32218-B550
701	Grease Fitting	D0F9-879	D0F9-879	D0F9-879
702	Upper Spindle Bearing	120A4-603	8SA32-603	8SA32-603
703	Angle Housing Cap	---	8SA32-110	8SA32-110
704	Housing Orientation Ring	DAA2-A682	DAA2-A682	DAA2-A682
705	Orientation Ring Retainer	182A53-689	182A53-689	182A53-689
706	Thrust Bearing	R1610-105	R1610-105	R1610-105
707	Thrust Washer	182A53-554	182A53-554	182A53-554
708	Bevel Pinion Bearing	R1410-593	182A53-606	182A53-606
709	Bevel Pinion and Bevel Gear (sold only as a matched set)	DAA2-A552	DAA3-A552	DAA3-A552
710	Coupling Nut	DAA2-27	DAA2-27	DAA2-27
711	Coupling Nut Retainer	DAA2-29	DAA2-29	DAA2-29
712	Bevel Gear Retainer	120A4-578	8SA32-578	8SA32-578
713	Lower Spindle Bearing	6L2D-59	8SA32-593	8SA32-593
714	Spindle Assembly	6L2D-A607	DAA3-P507-3/8	DAA3-P507-3/8
715	Socket Retaining Spring	401-718	401-718	401-718
716	Socket Retaining Pin	5020-716	5020-716	5020-716
717	Spindle Seal	6L2D-720	---	---
718	Spindle Bearing Cap	6L2D-531	8SA32-531	8SA32-531
719	Spindle Bearing Cap Wrench	141A12-26	8SA32-26	8SA32-26

SERIES GH22 CROW FOOT ATTACHMENT



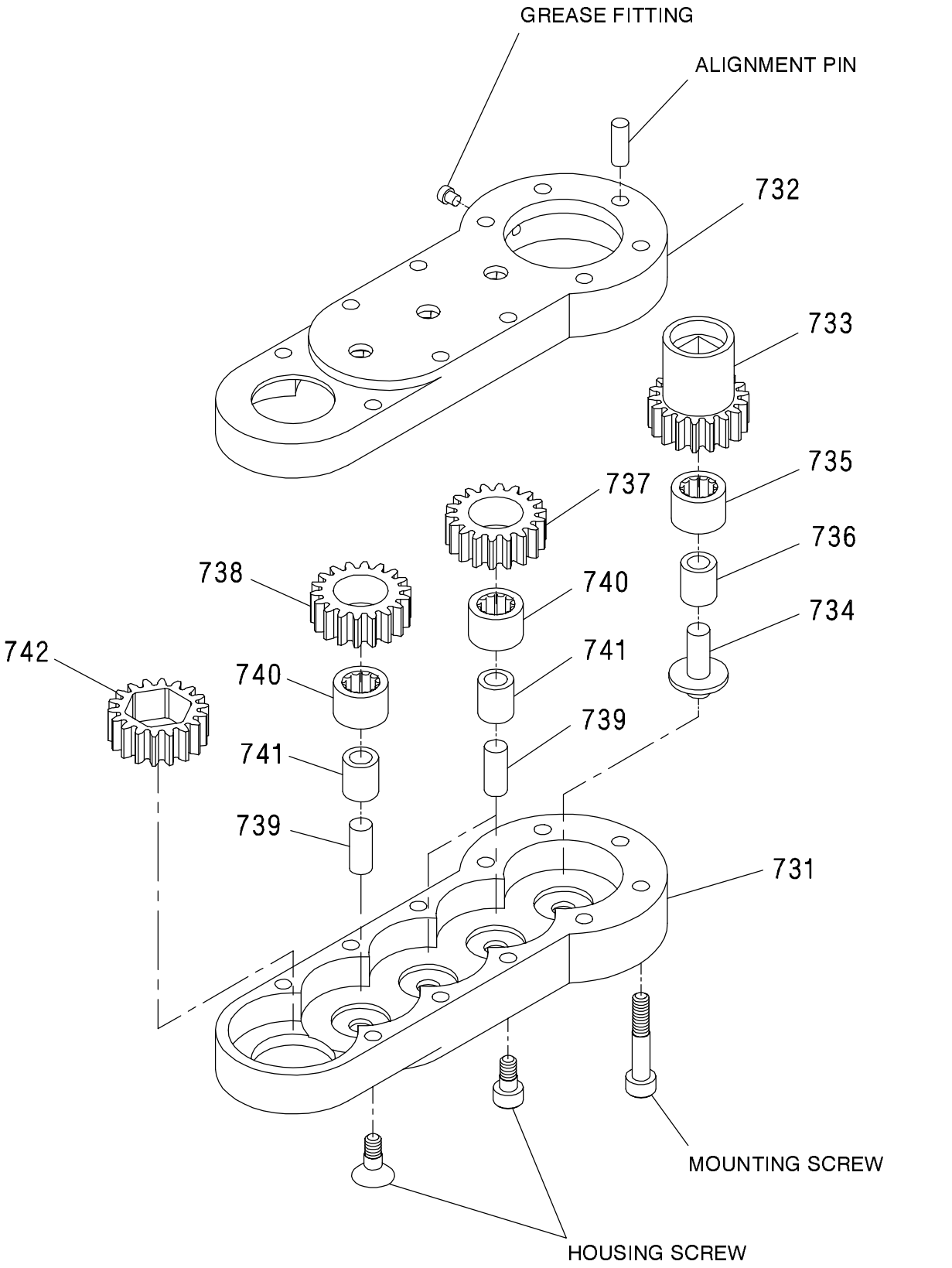
(Dwg. TPC648)

PART NUMBER FOR ORDERING

		SERIES GH22-10	SERIES GH22-16	SERIES GH22-18
	Crow Foot Attachment			
	with 5/16" hex socket	GH22-10-AF10S	GH22-16-AF10S	---
	with 3/8" hex socket	GH22-10-AF12S	GH22-16-AF12S	---
	with 7/16" hex socket	GH22-10-AF14S	GH22-16-AF14S	---
	with 1/2" hex socket	GH22-10-AF16S	GH22-16-AF16S	GH22-18-AF16S
	with 9/16" hex socket	---	---	GH22-18-AF18S
	with 5/8" hex socket	---	---	GH22-18-AF20S
	with 11/16" hex socket	---	---	GH22-18-AF22S
	with 8 mm hex socket	GH22-10-AF08M	GH22-16-AF08M	---
	with 10 mm hex socket	GH22-10-AF10M	GH22-16-AF10M	---
	with 11 mm hex socket	GH22-10-AF11M	GH22-16-AF11M	---
	with 12 mm hex socket	GH22-10-AF12M	GH22-16-AF12M	---
	with 13 mm hex socket	GH22-10-AF13M	GH22-16-AF13M	GH22-18-AF13M
	with 14 mm hex socket	---	---	GH22-18-AF14M
	with 15 mm hex socket	---	---	GH22-18-AF15M
	with 16 mm hex socket	---	---	GH22-18-AF16M
	with 17 mm hex socket	---	---	GH22-18-AF17M
731	Lower Housing	70221502	70224502	70280502
732	Upper Housing	70221501	70224501	70280501
733	Drive Pinion	70901514	70901514	70901530
734	Drive Pinion Shaft	70905503	70905503	70905535
735	Drive Pinion Needle Bearing	42110004	42110004	42110003
736	Drive Pinion Bearing Race	43610001	43610001	43610008
*	Drive Reducer (1/2" to 3/8")	---	---	70908568
737	Idler Gear	70903501	70903511	70903505
739	Idler Gear Shaft	70905502	70905502	70905513
740	Idler Gear Needle Bearing	42110004	42110004	42110004
741	Idler Gear Bearing Race	43610001	43610001	43610001
*	Screw Package (includes housing screws, mounting screws, alignment pins and grease fitting)	80224202	80224201	80280201
742	Hex Drive Socket			
	5/16"	70904819	70904843	---
	3/8"	70904894	70904691	---
	7/16"	70904905	70904816	---
	1/2"	70904817	70904906	70904897
	9/16"	---	---	70904868
	5/8"	---	---	70904869
	11/16"	---	---	70904870
	8 mm	70904599	70904530	---
	10 mm	70904600	70904506	---
	11 mm	70904526	70904601	---
	12 mm	70904501	70904508	---
	13 mm	70904502	70904507	70904659
	14 mm	---	---	70904660
	15 mm	---	---	70904661
	16 mm	---	---	70904662
	17 mm	---	---	70904663

* Not illustrated.

SERIES GH24 CROW FOOT ATTACHMENT



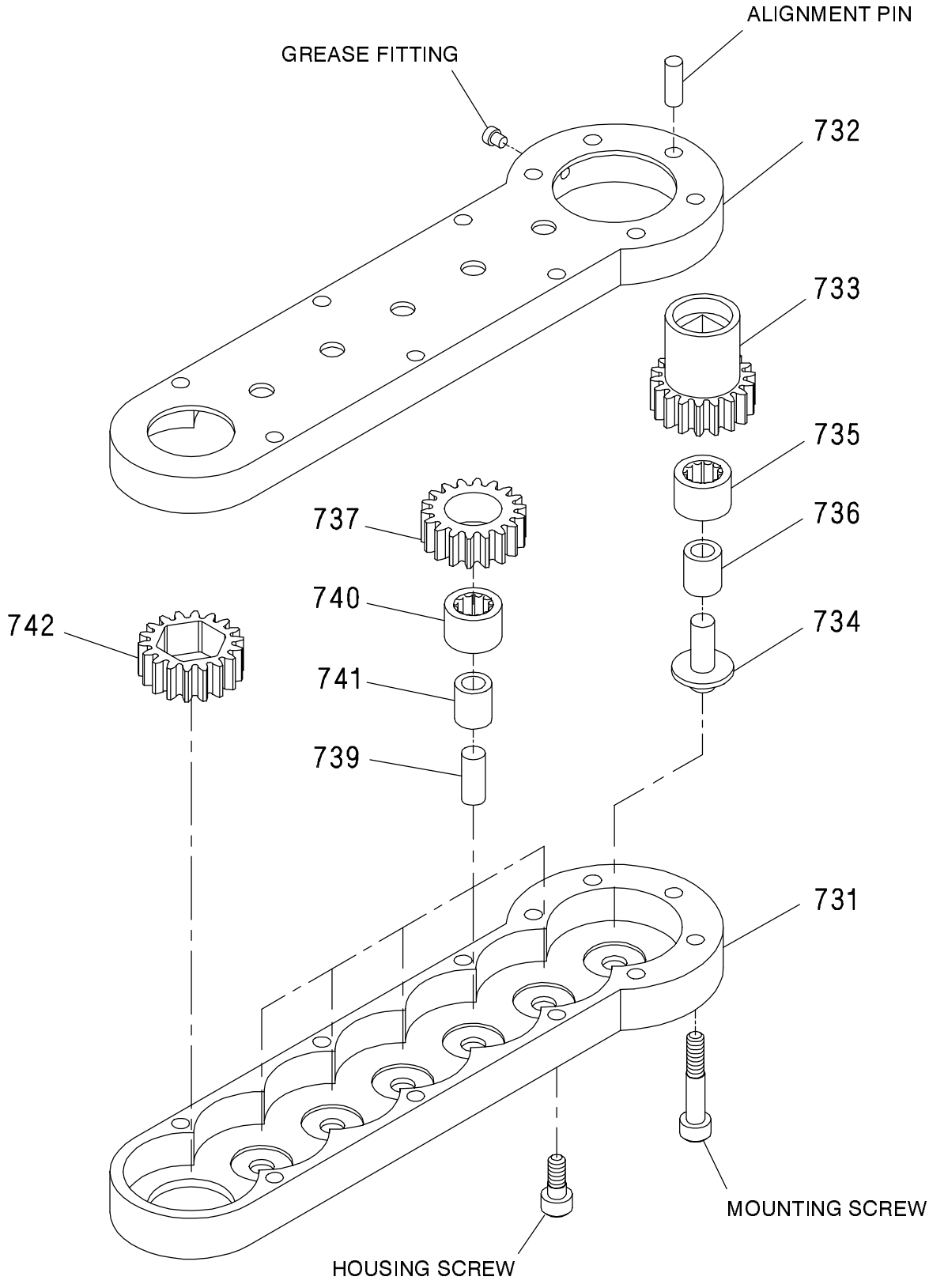
(Dwg. TPC649)

PART NUMBER FOR ORDERING

		SERIES GH24-10	SERIES GH24-16	SERIES GH24-18
	Crow Foot Attachment			
	with 5/16" hex socket	GH24-10-AF10S	GH24-16-AF10S	---
	with 3/8" hex socket	GH24-10-AF12S	GH24-16-AF12S	---
	with 7/16" hex socket	GH24-10-AF14S	GH24-16-AF14S	---
	with 1/2" hex socket	GH24-10-AF16S	GH24-16-AF16S	GH24-18-AF16S
	with 9/16" hex socket	---	---	GH24-18-AF18S
	with 5/8" hex socket	---	---	GH24-18-AF20S
	with 11/16" hex socket	---	---	GH24-18-AF22S
	with 8 mm hex socket	GH24-10-AF08M	GH24-16-AF08M	---
	with 10 mm hex socket	GH24-10-AF10M	GH24-16-AF10M	---
	with 11 mm hex socket	GH24-10-AF11M	GH24-16-AF11M	---
	with 12 mm hex socket	GH24-10-AF12M	GH24-16-AF12M	---
	with 13 mm hex socket	GH24-10-AF13M	GH24-16-AF13M	GH24-18-AF13M
	with 14 mm hex socket	---	---	GH24-18-AF14M
	with 15 mm hex socket	---	---	GH24-18-AF15M
	with 16 mm hex socket	---	---	GH24-18-AF16M
	with 17 mm hex socket	---	---	GH24-18-AF17M
731	Lower Housing	70241502	70244502	70282502
732	Upper Housing	70241501	70244501	70282501
733	Drive Pinion	70901514	70901514	70901530
734	Drive Pinion Shaft	70905503	70905503	70905535
735	Drive Pinion Needle Bearing	42110004	42110004	42110003
736	Drive Pinion Bearing Race	43610001	43610001	43610008
*	Drive Reducer (1/2" to 3/8")	---	---	70908568
737	Idler Gear (2 for Series GH24-10; 3 for all others)	70903511	70903511	70903505
738	Idler Gear	70903501	---	---
739	Idler Gear Shaft (3)	70905502	70905502	70905513
740	Idler Gear Needle Bearing (3)	42110004	42110004	42110004
741	Idler Gear Bearing Race (3)	43610001	43610001	43610001
*	Screw Package (includes housing screws, mounting screws, alignment pins and grease fitting)	80224202	80224201	80281201
742	Hex Drive Socket			
	5/16"	70904819	70904843	---
	3/8"	70904894	70904691	---
	7/16"	70904905	70904816	---
	1/2"	70904817	70904906	70904897
	9/16"	---	---	70904868
	5/8"	---	---	70904869
	11/16"	---	---	70904870
	8 mm	70904599	70904530	---
	10 mm	70904600	70904506	---
	11 mm	70904526	70904601	---
	12 mm	70904501	70904508	---
	13 mm	70904502	70904507	70904659
	14 mm	---	---	70904660
	15 mm	---	---	70904661
	16 mm	---	---	70904662
	17 mm	---	---	70904663

* Not illustrated.

SERIES GH26 CROW FOOT ATTACHMENT



(Dwg. TPC650)

PART NUMBER FOR ORDERING

		SERIES GH26-16
	Crow Foot Attachment	
	with 5/16" hex socket	GH26-16-AF10S
	with 3/8" hex socket	GH26-16-AF12S
	with 7/16" hex socket	GH26-16-AF14S
	with 1/2" hex socket	GH26-16-AF16S
	with 8 mm hex socket	GH26-16-AF08M
	with 10 mm hex socket	GH26-16-AF10M
	with 11 mm hex socket	GH26-16-AF11M
	with 12 mm hex socket	GH26-16-AF12M
	with 13 mm hex socket	GH26-16-AF13M
731	Lower Housing	70264502
732	Upper Housing	70264501
733	Drive Pinion	70901514
734	Drive Pinion Shaft	70905503
735	Drive Pinion Needle Bearing	42110004
736	Drive Pinion Bearing Race	43610001
737	Idler Gear (5)	70903511
739	Idler Gear Shaft (5)	70905502
740	Idler Gear Needle Bearing (5)	42110004
741	Idler Gear Bearing Race (5)	43610001
*	Screw Package (includes housing screws, mounting screws, alignment pins and grease fitting)	80264201
742	Hex Drive Socket	
	5/16"	70904843
	3/8"	70904691
	7/16"	70904818
	1/2"	70904906
	8 mm	70904530
	10 mm	70904506
	11 mm	70904601
	12 mm	70904508
	13 mm	70904507

* Not illustrated.

⚠ WARNING

Because numerous power units and gear train units are available for use with these Crow Foot Attachments, it is possible to combine units which will output torque that exceeds the capability of the Attachment. Do not mount this Attachment to any unit that will output torque exceeding the maximum torque specification of the Attachment. It may result in operator injury or tool damage. A listing of maximum torques is included below. If you are in doubt, contact Ingersoll-Rand for specific recommendations.

LUBRICATION

Ingersoll-Rand No. 67
Ingersoll-Rand No. 90

CAUTION

Excessive lubrication of the Crow Foot Attachment may result in Attachment malfunctions.

After each thirty hours of operation, or as experience indicates, inject 1/2 cc of Ingersoll-Rand No. 90 Grease into the Grease Fitting of the Crow Foot Attachment having two gear stages and 1 cc of Ingersoll-Rand No. 90 Grease into the Grease Fitting of the Crow Foot Attachment having more than two gear stages.

After each eight hours of operation, or as experience indicates, inject 1 to 2 cc of Ingersoll-Rand No. 67 Grease into the Grease Fitting of the Angle Attachment.

Whenever a Crow Foot Attachment is disassembled for repair or replacement of parts, lightly coat all parts with a film of Ingersoll-Rand No. 90 Grease.

Whenever an Angle Attachment is disassembled for repair or replacement of parts, lubricate the Bevel Pinion and Bevel Gear with Ingersoll-Rand No. 67 Grease in the following amounts:

For DAA2 Angle Attachments . . . . . 4 to 8 cc
For DAA3 and DAA4 Angle Attachments . . . . . 6 to 10 cc
For DAA5 Angle Attachments . . . . . 8 to 12 cc
For DAA6 Angle Attachments . . . . . 10 to 14 cc

INSTALLATION

MAXIMUM TORQUE OUTPUT

The following table lists the maximum torque that can be output by the Crow Foot Attachments listed in this manual.

Attachment	Maximum Torque (Nm)
Series GH22-10 and GH24-10	18
Series GH22-16, GH24-16 and GH26-16	30
Series GH22-18 and GH24-18	52

CAUTION

Do not attempt to increase the torque output by using the Attachment as a hand held box wrench. Such action will damage the Crow Foot Attachment or Angle Head Attachment.

Disassembly of the Angle Attachment

1. Carefully grasp the hex of the Gear Case Assembly in copper-covered or leather-covered vise jaws with the Angle Housing Assembly (700) downward.

NOTICE

In the following step, the Coupling Nut (710) has a left-hand thread.

2. Using a wrench on the flats of the Coupling Nut (710), loosen the Coupling Nut from the Gear Case. Remove the tool from the vise. Unscrew the Coupling Nut and separate the Angle Housing Assembly from the Gear Case.
3. Carefully grasp the Angle Housing Assembly in copper-covered or leather-covered vise jaws with the Crow Foot Attachment facing upward.
4. **For Crow Foot Attachments ending in 10PP or 16PP,** use a 2.5 mm hex wrench to remove the screws that secure the Attachment to the Angle Housing and lift the Attachment off the Angle Housing.
   For Crow Foot Attachments ending in 18PP, use a 3 mm hex wrench to remove the screws that secure the Attachment to the Angle Housing and lift the Attachment off the Angle Housing.
5. **For DAC3 modules,** remove the loose pilot cap from the Angle Housing.

NOTICE

The thread in the following step is a left-hand thread.

6. Using the Spindle Bearing Cap Wrench (719), unscrew and remove the Spindle Bearing Cap (718). **For DAC2 modules**, if the Spindle Seal (717) is damaged, remove it. Withdraw the Spindle from the Angle Housing.
7. Inspect the Lower Spindle Bearing (713) for looseness or roughness. If either of these conditions exists, replace the Bearing as follows:

   For DAC2 modules

   a. Grasp the square drive end of the Spindle in copper-covered vise jaws.
   b. Unscrew the Bevel Gear Retainer (712) and lift the Bevel Gear (709) off the Spindle.
   c. Press the Lower Spindle Bearing from the Spindle.

   For DAC3 modules

   d. Remove the Bevel Gear Retainer (712).
   e. Press the Bevel Gear (709) from the Spindle.
   f. Press the Lower Spindle Bearing from the Spindle.

NOTICE

In the next step, do not remove the Upper Spindle Bearing unless you have a new Bearing ready to install. This type of Bearing is always damaged during the removal process.

NOTICE

The Angle Head used in DAC3 modules will require a new Angle Housing Cap (703) when the Upper Spindle Bearing is installed.

8. If the Upper Spindle Bearing (702) appears rough or loose, press it from the Angle Head.
9. Remove the Orientation Ring Retainer (705) and slide the Housing Orientation Ring (704), Thrust Bearing (706) and Thrust Washer (707) from the pinion shaft.

NOTICE

In the following step, do not remove the Bevel Pinion and Bearing unless you have a new Bearing on hand. After the Angle Attachment is disassembled, check all parts for damage or wear.

10. Grasp the spline of the pinion shaft in copper-covered vise jaws and while gently tapping the rear face of the Angle Attachment with a soft hammer, pull the Bevel Pinion (709) and Bevel Pinion Bearing (708) from the Angle Attachment.

NOTICE

If the gear teeth on either the Bevel Pinion or Bevel Gear are worn or chipped, replace both parts. These are a matched set and must be replaced with another matched set.

NOTICE

The Bevel Gear and Bevel Pinion are specially matched sets. Some sets are color coded for manufacturing purposes only. Only the Gear and Pinion set furnished as a replacement part or the same Gear and Pinion set removed from one tool, is a matched set. A Bevel Gear from one tool used with a Bevel Pinion from another tool with the same color code IS NOT A MATCHED SET. Replace these parts only as a matched set. Failure to do so will result in unsatisfactory tool performance and damage to the Bevel Gear and Bevel Pinion.

Disassembly of the Crow Foot Attachment

CAUTION

When disassembling the Crow Foot Attachments, do not attempt to pry the sections apart with a screwdriver or similar device. It will make assembly difficult and may damage some parts.

1. **For GH22 Attachments,** grasp the outer sides of the Upper Housing (732) and holding the assembly about 1/2" above a padded work surface with the shaft of the Pinion (733) upward, lightly tap the shaft of the Pinion with a plastic hammer until the Lower Housing (731) separates from the Upper Housing.
   For GH24 and GH26 Attachments, unscrew the housing screws and replace them with longer screws threaded several turns into the screw holes. Holding the outer sides of the Upper Housing (732) and holding the assembly about 1/2" above a padded work surface with the shaft of the Pinion (733) upward, lightly tap the shaft of the Pinion and the screw heads with a plastic hammer until the Lower Housing (731) separates from the Upper Housing.
2. **For GH24 and GH26 Attachments,** remove the disassembly screws and carefully separate the two Housings.

NOTICE

In the following step, Crow Foot Attachment GH24–10PP has one Idler Gear (738) which drives the Hex Drive Socket (742) that is not the same as the other two Idler Gears (737). Mark this Gear so that it does not get installed in the wrong position during assembly.

3. Examine the Idler Gears (737 and 738) and Bearings (735 and 740) and replace any worn or damaged parts.

Assembly of the Angle Attachment

1. **For DAC2 Angle Attachments,** lubricate the Bevel Pinion (709) with 2 to 4 cc of Ingersoll–Rand No. 67 Grease and insert it, gear end first, into the long bore of the Angle Housing (700).
   For DAC3 Angle Attachments, lubricate the Bevel Pinion (709) with 3 to 5 cc of Ingersoll–Rand No. 67 Grease and insert it, gear end first, into the long bore of the Angle Housing (700).

NOTICE

The Bevel Gear and Bevel Pinion are specially matched sets. Some sets are color coded for manufacturing purposes only. Only the Gear and Pinion set furnished as a replacement part or the same Gear and Pinion set removed from one tool, is a matched set. A Bevel Gear from one tool used with a Bevel Pinion from another tool with the same color code IS NOT A MATCHED SET. Replace these parts only as a matched set. Failure to do so will result in unsatisfactory tool performance and damage to the Bevel Gear and Bevel Pinion.

2. Insert the Bevel Pinion Bearing (708), unstamped end first, into the bore of the Angle Housing and onto the bevel pinion shaft.
3. **For DAC2 Angle Attachments,** use a cylinder that has a .573" (14.55 mm) I.D. and a .755" (19.18 mm) O.D. and is 1.411" (35.84 mm) long and press the Bevel Pinion Bearing so the stamped face is a maximum of 1.416" (35.96 mm), but not less than 1.406" (35.71 mm) below the end face of the Angle Housing.
   For DAC3 Angle Attachments, use a cylinder that has a .699" (17.75 mm) I.D. and a .965" (24.51 mm) O.D. and is 1.255" (31.88 mm) long and press the Bevel Pinion Bearing so the stamped face is a maximum of 1.26" (32.0 mm), but not less than 1.25" (31.75 mm) below the end face of the Angle Housing.
4. Install, in the order named, the Thrust Washer (707), Thrust Bearing (706) and Housing Orientation Ring (704) over the splined end of the Bevel Pinion and retain the components by installing the Orientation Ring Retainer (705) on the pinion shaft.
5. If the Lower Spindle Bearing (713) has been removed, proceed as follows:
   a. **For DAC2 Angle Attachments,** using a sleeve that will contact the inner ring of the Bearing, press the Bearing, sealed side first, onto the Spindle (714).
      For DAC3 Angle Attachments, using a sleeve that will contact the inner ring of the Bearing, press the Bearing onto the Spindle (714). Press on the stamped side of the Bearing with the side marked with red toward the spindle shoulder.
   b. **For DAC2 Angle Attachments,** slide the Bevel Gear (709) onto the Spindle.
      For DAC3 Angle Attachments, align the internal flats of the Bevel Gear (709) with the flats on the Spindle and press the Bevel Gear onto the Spindle.
   c. **For DAC2 Angle Attachment,** apply a drop of Permabond Surface Conditioner II * to the threads of the Bevel Gear Retainer (712) and Spindle and allow it to cure for five minutes. Apply Perma–Lok HF–138 * to the threads of the Bevel Gear Retainer and tighten it on the Spindle between 8 and 12 ft–lb (11 and 16 Nm) torque.

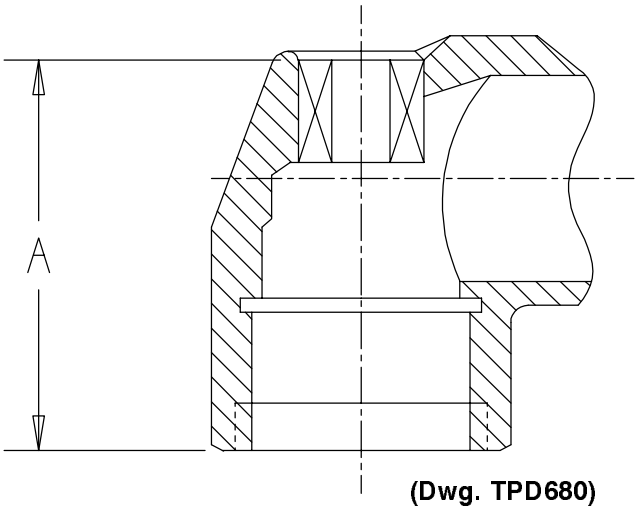
* Product of National Starch and Chemical Corporation.

For DAC3 Angle Attachments, spread the Bevel Gear Retainer (712) and slip it over the end of the Spindle. Slide the Retainer down the Spindle and into the groove around the Spindle to retain the Bevel Gear.

NOTICE

In the following step, press on the stamped face of the Bearing. Failure to do so will cause damage to the Bearing.

6. If the Upper Spindle Bearing (702) has been removed, proceed as follows:
   For DAC2 Angle Attachments, press on the closed end of a new Spindle Bearing entering the Bearing into the small bore opposite the threaded end of the Angle Head to the dimension shown in Drawing TPD680.

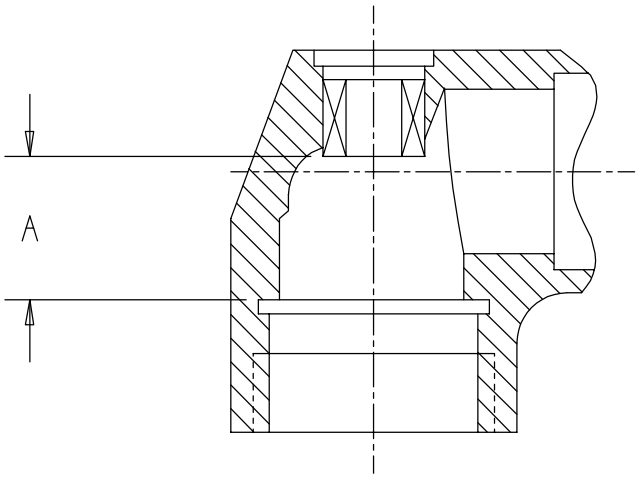


(Dwg. TPD680)

Minimum Dimension "A"	
in	**mm**
1.21	30.75
Maximum Dimension "A"	
in	**mm**
1.27	31.25

   For DAC3 Angle Attachments, press a new Spindle Bearing into the Angle Head from the large threaded end to the dimension shown in Drawing TPD636. Install a new Angle Housing Cap (703) into the top of the Angle Head.

* Product of National Starch and Chemical Corporation.



(Dwg. TPD636)

Minimum Dimension "A"	
in	**mm**
0.718	18.25
Maximum Dimension "A"	
in	**mm**
0.728	18.50

7. **For DAC2 Angle Attachments,** apply 2 to 4 cc of Ingersoll–Rand No. 67 Grease to the Bevel Gear. Lubricate the Upper Spindle Bearing and Lower Spindle Bearing and install the Spindle in the Angle Housing.
   For DAC3 Angle Attachments, apply 3 to 5 cc of Ingersoll–Rand No. 67 Grease to the Bevel Gear. Lubricate the Upper Spindle Bearing and Lower Spindle Bearing and install the Spindle in the Angle Housing.
8. Clean the threads on the Angle Housing and the Spindle Bearing Cap (718) and apply a film of Perma–Lok MM–115* to the threads.
9. **For DAC2 Angle Attachments,** install Spindle Seal (717). Using the Spindle Bearing Cap Wrench (719), install the Spindle Bearing Cap and tighten the Cap between 15 and 20 ft–lb (20 and 27 Nm) torque.
   For DAC3 Angle Attachments, using the Spindle Bearing Cap Wrench (719), install the Spindle Bearing Cap and tighten the Cap between 20 and 25 ft–lb (27 and 34 Nm) torque.
10. If the Coupling Nut (710) was removed, slide the Coupling Nut, threaded end trailing, over the motor end of the Angle Housing. Apply the Coupling Nut Retainer (711) to the external groove on the motor end of the Angle Housing.

Assembly of the Crow Foot Attachment

1. Lightly coat all internal parts with Ingersoll–Rand No. 90 Grease. Do not apply an excessive amount.
2. Install the Idler Gears (737 and 738) and Bearings (735 and 740) in the Lower Housing (731). If you are working with a GH24–10PP Crow Foot Attachment, make certain the Idler Gear and Bearing marked during disassembly are installed adjacent to the Hex Drive Socket (742).
3. Align the Upper Housing (732) with the Lower Housing and the Idler Gear Shafts (739) and Drive Pinion (733) with the openings in the Upper Housing. Push the two Housings together capturing the gearing and bearings between the Housings. The fit is extremely close and some gear or shaft aligning may be required. It may also be necessary to insert small bolts with washers through the screw holes in the Housings to pull them together. Tighten each nut a little at a time in an alternating pattern to avoid binding. Once assembled, remove the bolts and nuts.
4. **For GH24 and GH26 Attachments,** install and tighten the housing screws finger tight.
5. Lightly grasp the assembled Angle Attachment in leather–covered or copper–covered vise jaws with the square driver upward.
6. **For DAC3 Angle Attachments,** insert the loose pilot cap, small end upward, in the angle head against the Spindle Bearing Cap (718).
7. Position the assembled Crow Foot Attachment against the angle head, making certain the square driver of the angle head enters the square in the Drive Pinion (733).
8. Install the four mounting screws finger tight.
9. While continually rotating the Bevel Pinion of the Angle Attachment by hand, gradually tighten all the screws in an alternating pattern until they are tightened to 46 in–lb (5.2 Nm) torque. Make certain the gearing does not bind as the screws are tightened. Should binding occur, disassemble the unit, locate the problem and correct it.
10. Engage the spline on the Bevel Pinion with the matching internal spline of the Spindle Planet Gear Head and thread the Coupling Nut onto the Gear Case. Orient the angle attachment to the desired position and tighten the Coupling Nut between 25 and 30 ft–lb (27 and 40 Nm) torque.
11. **For DAC2 Angle Attachments,** inject 1/2 cc of Ingersoll–Rand No. 90 Grease into the grease fitting located in the Upper Housing of the Crow Foot Attachment.
    For DAC3 Angle Attachments, inject 1 cc of Ingersoll–Rand No. 90 Grease into the grease fitting located in the Upper Housing of the Crow Foot Attachment.

TROUBLESHOOTING GUIDE		
Trouble	**Probable Cause**	**Solution**
Angle Head gets hot	Excessive grease	Clean and inspect the Angle Head and gearing parts. Lubricate as instructed.
	Inadequate grease	Inject 0.5 to 1.5 cc of grease into the Grease Fitting.
	Worn or damaged parts	Clean and inspect the Angle Head and gearing parts. If the Bevel Gear and/or Bevel Pinion is worn or broken, replace both parts as they are a matched set.
Crow Foot gears binding	Worn or damaged parts	Disassemble the Crow Foot Attachment and examine all gearings and parts. Replace any worn or damaged parts.
Crow Foot gears noisy	Inadequate lubrication	Inject 1/2 cc of the recommended grease into the grease fitting of two stage gear units and 1 cc of the recommended grease into the grease fittings of all other units.

NOTICE

SAVE THESE INSTRUCTIONS. DO NOT DESTROY.