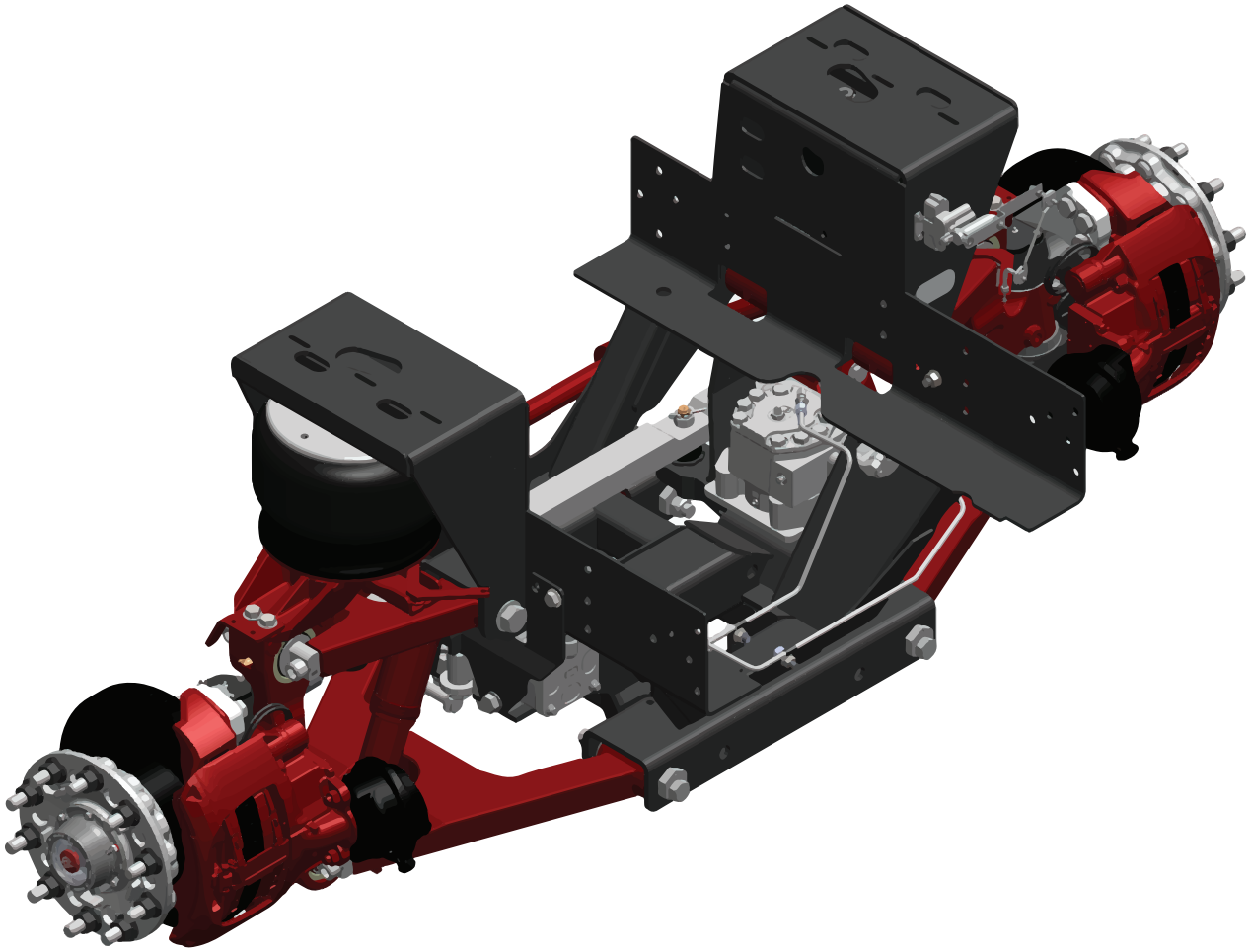
Reyco Granning SUSPENSIONS

Motorhome Suspensions Owner's Manual

IFS 1660S3|1700S3|1800S3|2000S3

Independent Front Suspension



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Reyco Granning Suspensions
1205 Industrial Park Drive
Mount Vernon, MO 65712
Phone: 417-466-2178
Fax: 417-466-3964
www.reycogranning.com

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Revision History

REV	ECR #	DATE	CHANGE DESCRIPTION	BY	CHK	APV
J	22520	5/31/22	Format Update, Add Preset Plus Hub information, Unit Model Options Tables	STM	GMC	JAH
K	23177	10/15/2024	General updates and corrections	STM	RSC	JAH

INTRODUCTION

Service Notes

This Service Manual describes the correct service and repair procedures for the **Reyco Granning**® IFS1660S3 Independent Front Suspension model with 16,600 lbs, the IFS1700S3 Independent Front Suspension Model with 17,000 lbs, the IFS1800S3 Independent Front Suspension Model with 18,000 lbs and the IFS2000S3 Independent Front Suspension Model with 20,000 lbs Gross Axle Weight Rating (GAWR). Overloading the suspension may result in adverse ride and handling characteristics.

You must read and understand all procedures and safety precautions presented in this manual before conducting any service work on the suspension.

Proper tools must be used to perform the maintenance and repair procedures in this manual. Some procedures require the use of special tools for safe and correct service. Failure to use the proper and/or special tools when required can cause personal injury and/or damage to suspension components.

You must follow your company safety procedures and use proper safety equipment when you service or repair the suspension.

The information contained in this manual was current at the time of printing and is subject to change without notice or liability. **Reyco Granning**® reserves the right to modify the suspension and/or procedures and to change specifications at any time without notice and without incurring obligation.

Reyco Granning® uses the following types of notices for potential safety problems and to give information that will prevent damage to equipment.

WARNING

A warning indicates procedures that must be followed exactly. Serious personal injury can occur if the procedure is not followed.

CAUTION

A caution indicates procedures that must be followed exactly. Damage to equipment or suspension components and personal injury can occur if the procedure is not followed.

NOTE

A note indicates an operation, procedure or instruction that is important for correct service.

IDENTIFICATION

The suspension model and serial number are stamped on an aluminum tag that is riveted to the front of the suspension sub-frame assembly (Figure 1). The serial number is used by **Reyco Granning**® for control purposes and should be referred to when servicing the suspension or requesting technical support (Figure 2).

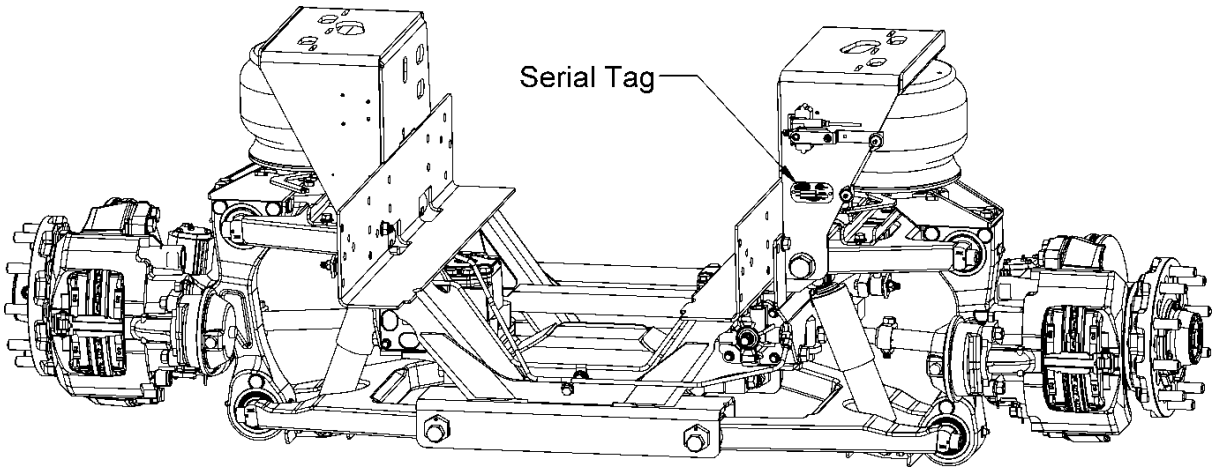


Figure 1 - Suspension Identification Location

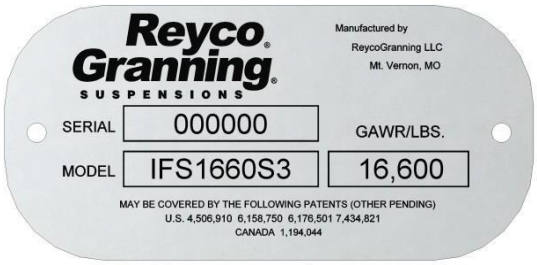


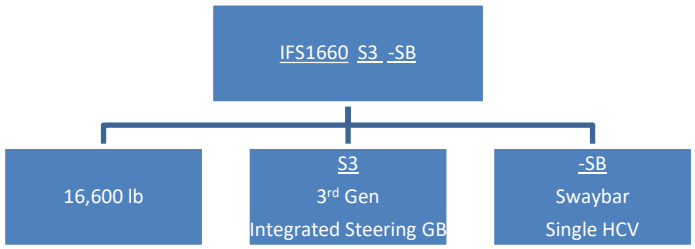
Figure 2 - Suspension Serial Number Tag

MODEL OPTIONS

Original Model Number Format Rev. 1		
Model	Model ID#	GAWR(lb)
IFS1660S3	IFS1660S3 -[Options]	16,600
IFS1800S3	IFS1800S3 -[Options]	18,000
IFS2000S3	IFS2000S3 -[Options]	20,000

Original Model Options Key Rev. 1								
Option	Disc Brakes	Height Control Valve		Sensor Height Control		Sway Bar	Bilstein Shocks	Koni Shocks
Original System	Std	Dual Std	Single w/-SB	Dual -SHC	Single w/-SHCSB	-SB	Std	-F

Rev 1 Example:

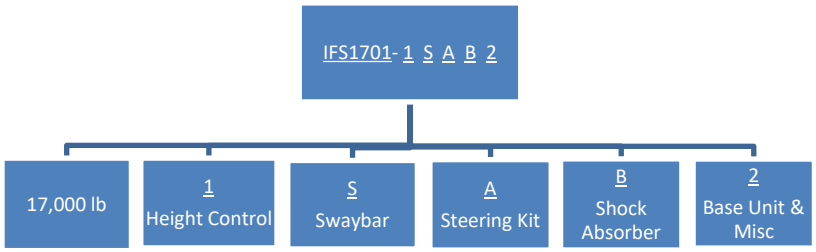


Model Number Format Rev. 2			
Model	Model ID#	GAWR (lb)	Wheel Cut
IFS1700S3	IFS17S3 -#####	17,000	58°
IFS2000S3	IFS20S3 -#####	20,000	58°

Options Key Rev. 2												
Current System	Disc Brakes	Model ID# Suffix Position										
		1st - Height Control System					2nd - Stabilizer		3rd	4th - Shock Absorbers		
		1	2	3	4	5	S	N	1 or 2	1	2	3
Option	STD	Single Valve	Dual Valve	Single Sensor	Dual Sensor Hadley	Dual Sensor Valid	Sway Bar	No Sway Bar	Steering Shaft Kit	Hardware Only	Bilstein	Koni

1) A '0' in Suffix Positions 1,3, or 4 indicates "None"
2) Not all Combinations of Options are Valid Model ID's, Contact RG Sales and/or Engineering for Availability
3) 5th digit denotes non - serviceable options and is purposely excluded from this Table

REV 2 Example:



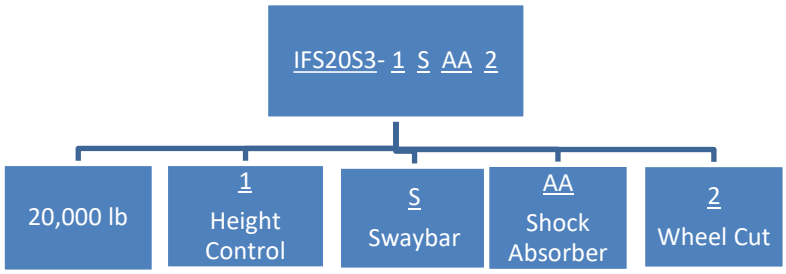
MODEL OPTIONS

Current Model Number Format Rev. 3		
Model	Model ID#	GAWR(lb)
IFS1701S3	IFS1701S3 -#####	17,000
IFS20S3	IFS20S3 -#####	20,000

Current Model Number Format Rev. 3														
Current System	Disc Brakes	Model ID# Suffix Position												
		1st - Height Control System					2nd - Stabilizer		3rd and 4th - Shock Absorber				5th – Wheel Cut	
		1	2	3	4	5	S	N	AA	AB	AC	AD	1	2
Option	STD	Single Valve	Dual Valve	Single Sensor	Dual Sensor Hadley	Dual Sensor Valid	Sway Bar	No Sway Bar	Bilstein Variant				50°	55°

1) A '0' in Suffix Positions 1,3, or 4 indicates "None"
2) Not all Combinations of Options are Valid Model ID's, Contact RG Sales and/or Engineering for Availability
3) 5th digit denotes non - serviceable options

REV 3 Examples:



VEHICLE TOWING INFORMATION

If a vehicle is disabled and needs to be towed by the front end to service center, check the OEM/Coach Builder towing procedures for the recommended method. Check with local authorities and Department of Transportation (DOT) for permissible towing methods before towing. Some states do not permit towing by chains and/or straps.

The preferred towing apparatus is the type that cradles the front tires. If the towing apparatus cannot be attached to the front tires or directly to the chassis frame rails, then the suspension sub-frame may be used for attachment.

WARNING

Attaching towing equipment to improper locations and failure to utilize OEM/Coach Builder recommended towing methods could result in one or more of the following:

- **Loss of vehicle control.**
- **Possible disconnection from tow vehicle.**
- **Damage to the suspension and/or vehicle.**

Do NOT attach tow apparatus (hooks, chains, straps, etc.) to suspension upper and lower control arms, sway bar and brackets, brake components, tie rods, steering arms, or steering knuckle carrier assemblies **(Figure 3)**.

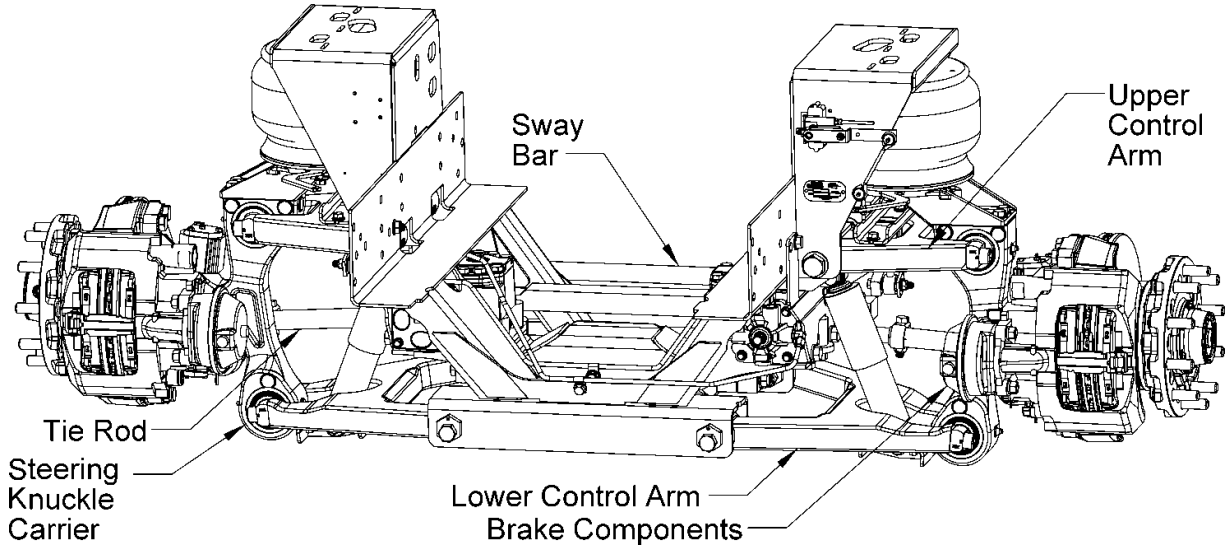


Figure 3 - Improper Tow Equipment Attachment Locations

MAINTENANCE SCHEDULE

GENERAL MAINTENANCE	SERVICE TO BE PERFORMED	MILEAGE IN THOUSANDS							
		12	24	36	48	60	72	84	96
Steering Arm Ball Joints	Check axial endplay				X				X[2]
	Inspect for ruptured seals	X	X	X	X	X	X	X	X[2]
	Check that cotter pin is installed	X	X	X	X	X	X	X	X[2]
Control Arm Bushings	Check bolt torque				X				X[2]
	Inspect for contact between control arm and mount	X	X	X	X	X	X	X	X[2]
	Inspect for bushing wear	X	X	X	X	X	X	X	X[2]
Tie Rod Ends	Inspect ball socket endplay	X	X	X	X	X	X	X	X[2]
	Check for looseness of taper connection	X	X	X	X	X	X	X	X[2]
	Check that cotter pin is installed	X	X	X	X	X	X	X	X[2]
Brake System	Inspect for air leaks using soapy water solution	X							
Air Springs	Inspect for proper clearance (1" minimum all around)	X							
	Check upper mount nut and lower mount bolt torque	X							
	Inspect for signs of chafing or wear	X	X	X	X	X	X	X	X[2]
	Inspect for air leaks using soapy water solution	X							
Height Control Valve and Linkage	Inspect for signs of bending, binding, or slippage	X	X	X	X	X	X	X	X[2]
	Inspect for air leaks using soapy water solution	X							
Shock Absorbers	Check mounting nut torque	X							
	Inspect shocks for signs of fluid leak, broken eye ends, loose fasteners, or worn bushings	X	X	X	X	X	X	X	X[2]
Kingpins	Check for wear				X				X[2]
	Inspect vertical endplay				X				X[2]
Steering Arm Bearings	Check nut torque				X				X[2]
	Inspect bearings for excessive radial play	X	X	X	X	X	X	X	X[2]
Carrier Bearings	Check axial endplay								X[2]
Wheels	Check bearing endplay				X				X[2]
	Check wheel nut torque[1]	X	X	X	X	X	X	X	X[2]
Front Alignment	Inspect toe-in[3]		X		X		X		X[2]
Air Fittings and Air Lines	Inspect for air leaks using soapy water solution	X							
	Inspect for signs of chafing, cracking, or wear	X	X	X	X	X	X	X	X[2]
Sway Bar Bushings	Check mounting bolt torque				X				X[2]
	Inspect for bushing wear	X	X	X	X	X	X	X	X[2]

1. Wheel nuts must be re-tightened to proper torque specifications as per the vehicle or chassis manufacturer's Owner Guide.
2. Continue to perform specified maintenance every 12,000 miles or at previous interval.
3. Final stage manufacturer should complete toe-in inspection and adjustment after completion of vehicle.

MAINTENANCE RECORD

Name of Owner	Address of Owner
Date of Purchase	Name and Address of Dealer
Model of Vehicle	Vehicle Identification Number
Suspension Model Number: IFS_____S3 -_____ (See Serial Tag)	Suspension Serial Number:

Inspection and Maintenance Item	Date	Mileage	Service Performed

Unit Assembly Rev. 1 and 2

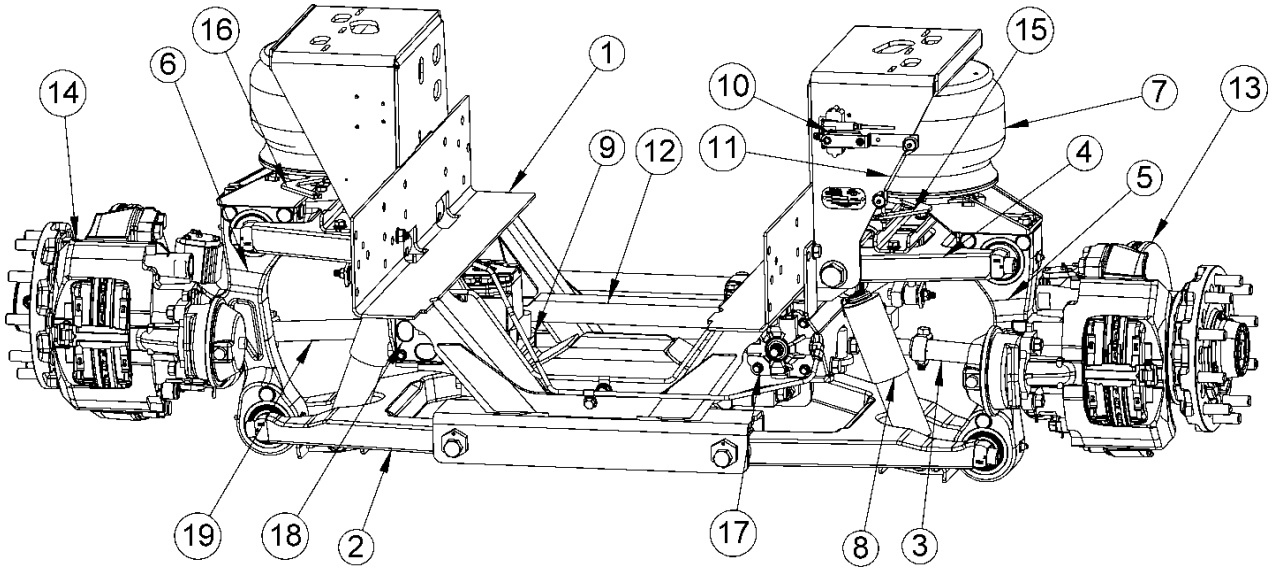
Refer to model option identification section for correct REV

IFS1660S3 & IFS1700S3					
Item	**Part No.**	**Description**	**Item**	**Part No.**	**Description**
1	709736-01	Sub Frame 41.25" Side Rail (IFS1700S3-11)	9	705620-01	Idler Arm
	709736-02	Sub Frame 39.63" Side Rail (IFS1700S3-23)	10	705275-01/02	HCV Assy (Std Single or Dual)*
2	700944-01	Lower Control Arm Assembly		705535-01/02	Electronic Sensor (Hadley Single or Dual)*
3	700973-01	Tie Rod Assembly (LH)		705535-03	Electronic Sensor (Dual Valid)*
4	703182-01	Upper Control Arm Assembly	11	N/A	HCV Linkage Assy Included in Item 10
5	705633-01	Carrier Assembly (LH)*	12	702030-01	Relay Rod
6	705633-02	Carrier Assembly (RH)*	13	705480-01	Assembly, Wheel End and Brakes (LH)
7	705951-01	Air Spring Assembly	14	705480-02	Assembly, Wheel End and Brakes (RH)
8	None	4th Suffix Code 1 or 0**	15	705800-01	Height Control Valve Arm (LH)
	712220-01	Hardware Only (Suffix Code 1)	16	705800-02	Height Control Valve Arm (RH)
	712791-02	Shock Absorber Bilstein 46mm (Suffix Code 2)	17	714691-01	Assembly, Gearbox (IFS16/1700S3-11)
	712220-03	Koni 91 Series (Suffix Code 3)		714693-01	Assembly, Gearbox (IFS1700S3-23)
	712220-04	Shock Absorber Bilstein 60mm (Suffix Code 4)	18	N/A	N/A***
			19	700973-02	Tie Rod Assembly (RH)

* Sway Bar Units (S) have a single (L) HCV/HCS, Non Sway Bar Units (N) have Dual (R&L) HCV/HCS

** Reyco Granning®assumes no responsibility for ride control on units built without shocks, Contact the Chassis Builder for shock specification and support.

***Image shown may differ slightly from actual unit



PARTS LIST

IFS1800S3 & IFS2000S3					
Item	**Part No.**	**Description**	**Item**	**Part No.**	**Description**
1	710353-01	Sub Frame 41.25" Side Rail (IFS2000S3-01)	10	705275-01/02	HCV Assy (Standard Single or Dual)*
	710353-02	Sub Frame 39.63" Side Rail (IFS2000S3-02)		705535-01/02	Electronic Sensor(Hadley-Single or Dual)*
2	705847-01	Lower Control Arm Assembly		705535-03	Electronic Sensor(Dual Valid)*
3	700973-01	Tie Rod Assembly (LH)	11	N/A	HCV Linkage Assy Included in Item 10
4	705849-01	Upper Control Arm Assembly	12	702030-01	Relay Rod
5	705853-01	Carrier Assembly (LH) (IFS2000S3-01)	13	See page 27/28	Assembly, Wheel End and Brakes (LH)
	709183-01	Carrier Assembly (LH) (IFS2000S3-02)	14	See page 27/28	Assembly, Wheel End and Brakes (RH)
6	705853-02	Carrier Assembly (RH) (IFS2000S3-01)	15	705800-01	Height Control Valve Arm (LH)
	709183-02	Carrier Assembly (LH) (IFS2000S3-02)	16	705800-02	Height Control Valve Arm (RH)
7	705951-01	Air Spring Assembly	17	714692-01	Assembly, Gearbox (IFS2000S3-01)
8	None	4th Suffix Code 1 or 0**		714694-01	Assembly, Gearbox (IFS2000S3-02)
	712220-01	Hardware only	18	714696-01	Assembly, Slave, Gearbox
	712220-02	Shock Absorber Bilstein 46mm CV (Suffix Code 2)	19	708177-02	Tie Rod Assembly (RH)
	712220-03	Shock Absorber KONI 90 Series (Suffix Code 3)			
	712220-04	Shock Absorber Bilstein 60mm (Suffix Code 4)			

* Sway Bar Units (S) have a single (L) HCV/HCS, Non Sway Bar Units (N) have Dual (R&L) HCV/HCS

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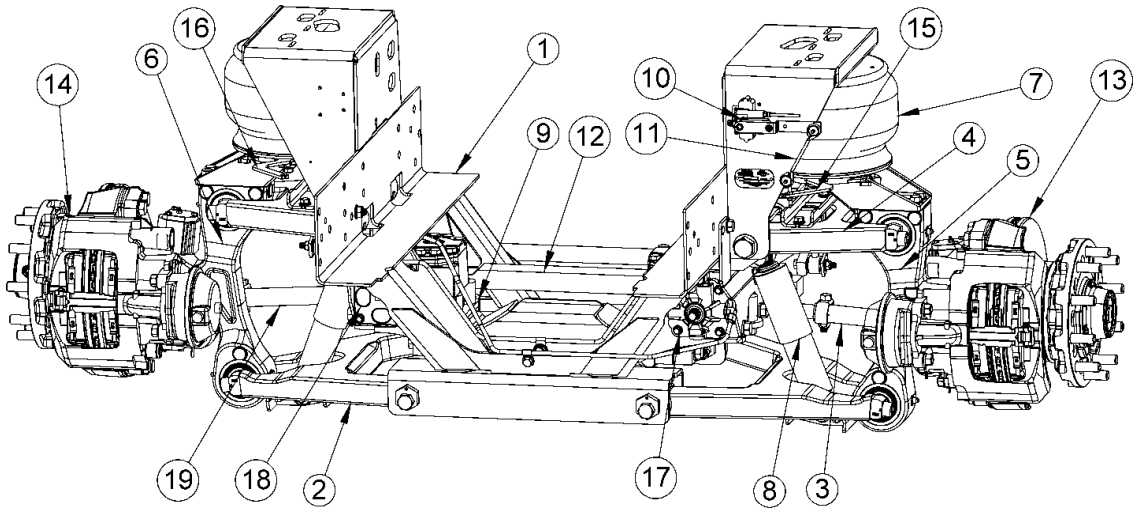
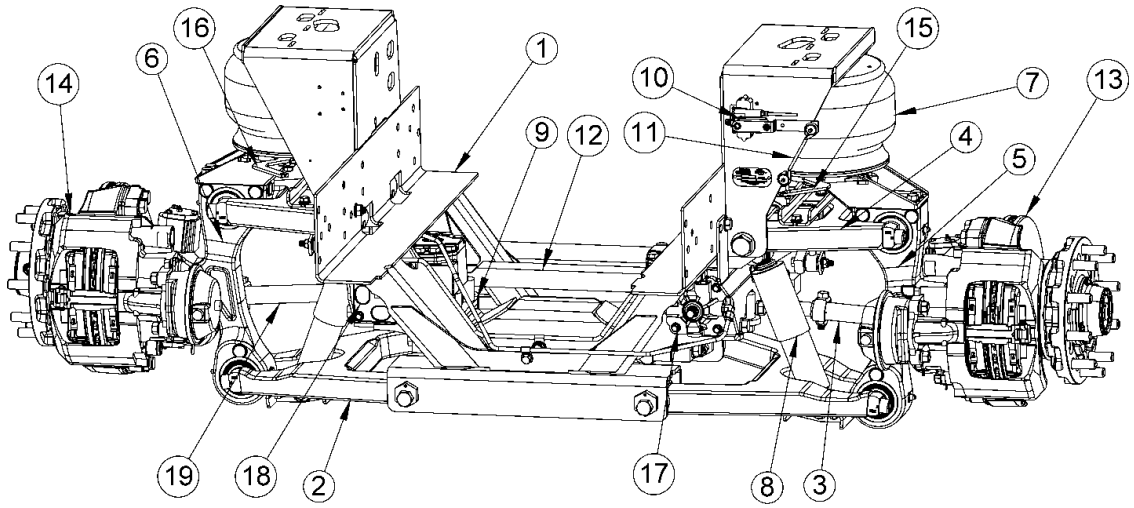


Unit Assembly Rev. 3

Refer to model option identification section for correct REV

IFS1701S3					
Item	**Part No.**	**Description**	**Item**	**Part No.**	**Description**
1	709736-02	Cradle	10	705275-01	Single HCV Assembly(1st Suffix Code 1)*
2	700944-01	Lower Control Arm Assembly		705275-02	Dual HCV Assembly(1st Suffix Code 2)*
3	700973-01	Tie Rod Assembly (LH)		705535-01	Single Hadley Electronic Sensor(1st Suffix Code 3)*
4	703182-01	Upper Control Arm Assembly		705535-02	Dual Hadley Electronic Sensor(1st Suffix Code 4)*
5	705633-01	Carrier Assembly (LH)		705535-03	Dual Valid Electronic Sensor (1st Suffix Code 5)*
6	705633-02	Carrier Assembly (RH)	11	703915-01	HCV Linkage (Included in Item 10)
7	705951-01	Air Spring Assembly	12	702030-01	Relay Rod
8	713967-AA	Shock Absorber Bilstein (3rd & 4th Suffix Code AA)	13	See page 27/28	Assembly, Wheel End and Brakes (LH)
	713967-AB	Shock Absorber Bilstein (3rd & 4th Suffix Code AB)	14	See page 27/28	Assembly, Wheel End and Brakes (RH)
	713967-AC	Shock Absorber Bilstein (3rd & 4th Suffix Code AC)	15	706899-01	Height Control Valve Arm (LH)
	713967-AD	Shock Absorber Bilstein (3rd & 4th Suffix Code AD)	16	706899-01	Height Control Valve Arm (RH)
9	705620-01	Idler Arm	17	714693-01	Assembly, Gearbox
			18	N/A	N/A***
			19	700973-02	Tie Rod Assembly (RH)

*Sway Bar Units (S) have a single (L) HCV/HCS, Non Sway Bar Units (N) have Dual (R&L) HCV/HCS
** Reyco Granning® assumes no responsibility for ride control on units built without shocks, Contact the Chassis Builder for shock specification and support.
***Image shown may differ slightly from actual unit

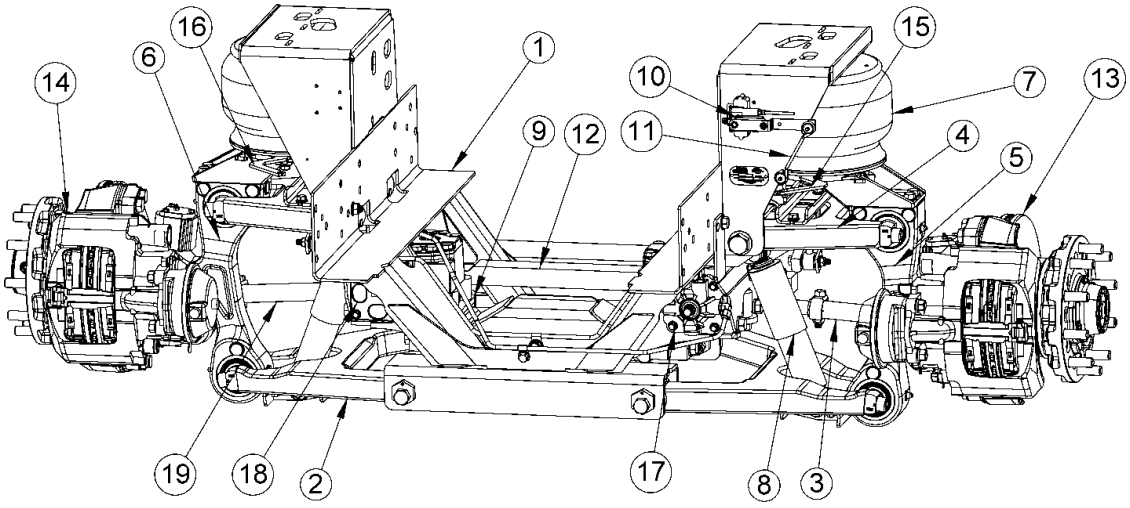


Unit Assembly Rev. 3

Refer to model option identification section for correct REV

IFS20S3					
Item	**Part No.**	**Description**	**Item**	**Part No.**	**Description**
1	710353-02	Cradle	10	705275-01	Single HCV Assembly (1st Suffix Code 1)*
2	705847-01	Lower Control Arm Assembly		705275-02	Dual HCV Assembly (1st Suffix Code 2)*
3	708177-01	Tie Rod Assembly (LH)		705535-01	Single Hadley Electronic Sensor (1st Suffix Code 3)*
4	705849-01	Upper Control Arm Assembly		705535-02	Dual Hadley Electronic Sensor (1st Suffix Code 4)*
5	709183-01	Carrier Assembly (LH)		705535-03	Dual Valid Electronic Sensor (1st Suffix Code 5)*
6	709183-02	Carrier Assembly (RH)	11	703915-01	HCV Linkage (Included in Item 10)
7	705859-01	Air Spring Assembly	12	705867-01	Relay Rod
8	713967-AA	Shock Absorber Bilstein (3rd & 4th Suffix Code AA)	13	See page 27/28	Assembly, Wheel End and Brakes (LH)
	713967-AB	Shock Absorber Bilstein (3rd & 4th Suffix Code AB)	14	See page 27/28	Assembly, Wheel End and Brakes (RH)
	713967-AC	Shock Absorber Bilstein (3rd & 4th Suffix Code AC)	15	705800-01	Height Control Valve Arm (LH)
	713967-AD	Shock Absorber Bilstein (3rd & 4th Suffix Code AD)	16	705800-02	Height Control Valve Arm (RH)
			17	710180-01	Assembly, Gearbox
			18	700973-02	Assembly, Slave, Gearbox
			19	708177-02	Tie Rod Assembly (RH)

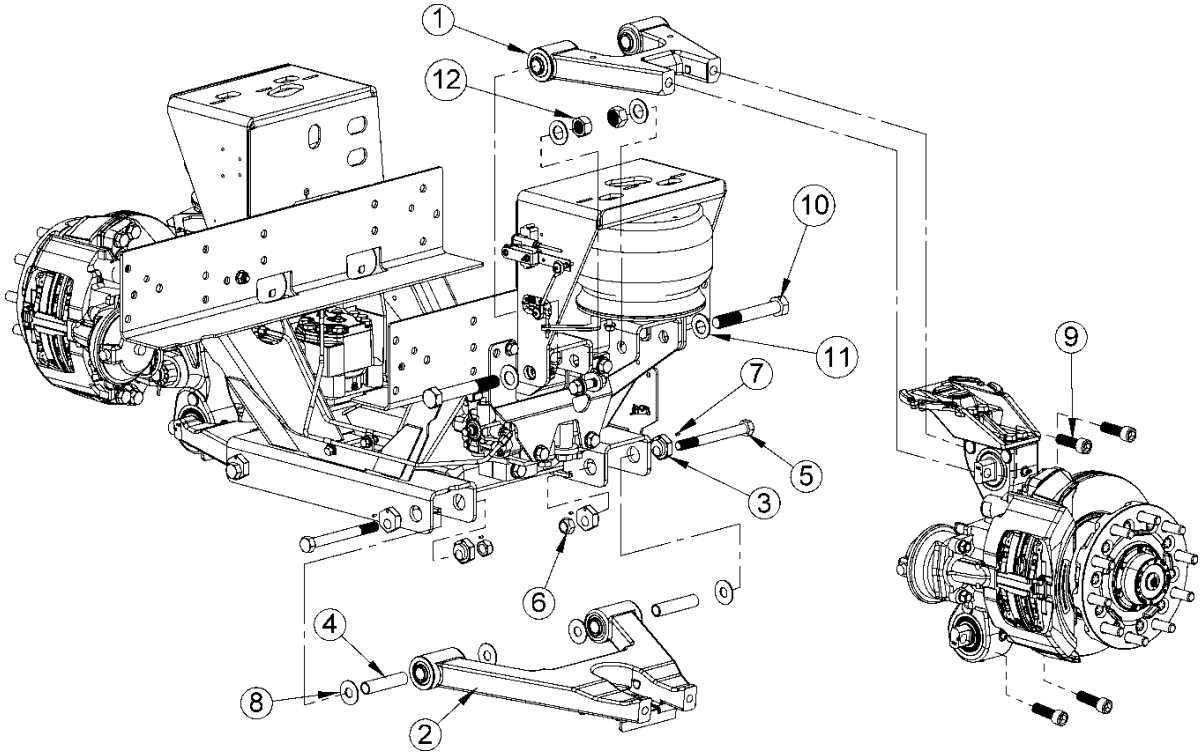
*Sway Bar Units (S) have a single (L) HCV/HCS, Non Sway Bar Units (N) have Dual (R&L) HCV/HCS
** Reyco Granning®assumes no responsibility for ride control on units built without shocks, Contact the Chassis Builder for shock specification and support.



Control Arm Components

Item	Part No.	Description	Item	Part No.	Description
1	703182-01	Upper Control Arm Assembly*	7	293	Socket Set Screw 10 -24 x .38”
	705849-01	Upper Control Arm Assembly**	8	701683-04	Hardened Flat Washer, 7/8”
2	700944-01	Lower Control Arm Assembly*	9	100039-P1	Hex Head Bolt 3/4 -10 x 2.75 GR 8 ZN*
	705847-01	Lower Control Arm Assembly**		705829-01	Socket Head Cap Screw 7/8-9 X 2.75 PH**
3	700245-01	Boss, Eccentric	10	702516-02	Hex Head Bolt 1 1/8 -12 x 7.75 GR 8 ZY
4	8490	Spacer	11	168	Hardened Flat Washer, 1 1/8”
5	292	Hex Head Bolt 7/8 -9 x 8.50 GR 8 ZN	12	166	Lock Nut 1 1/8 -12 GR . C
6	100122-P1	Lock Nut 7/8 -9” GR . C			

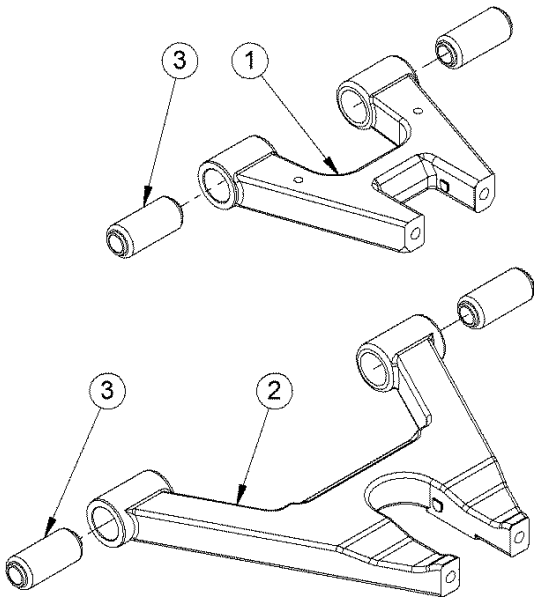
*Used with IFS1660S3/1700S3/1701S3 Units
**Used with IFS1800S3/2000S3/IFS20S3 Units



Control Arm Assemblies – All Revs

IFS1660S3/IFS1700S3/IFS1701		
Item	**Part No.**	**Description**
1	703181-01	Upper Control Arm (LH)/(RH)
2	700939-01	Lower Control Arm (LH)/(RH)
3	8382	Bushing

IFS1800S3/IFS2000S3/IFS20S3		
Item	**Part No.**	**Description**
1	705850-01	Upper Control Arm (LH)/(RH)
2	705848-01	Lower Control Arm (LH)/(RH)
3	8382	Bushing



Unit Assembly REV 1 and 2

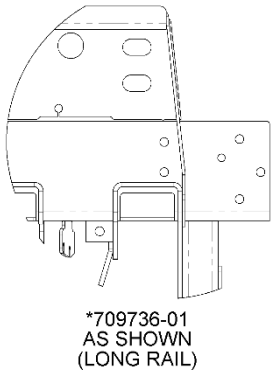
Refer to model option identification section for correct REV

Steering Components (IFS1660S3/IFS1700S3)

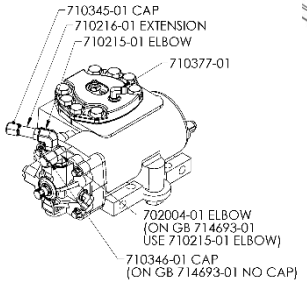
Item	Part No.	Description	Item	Part No.	Description
10	714691-01*	TRW TAS85 Steering Gearbox (see cradle below)	25	705620-01	Idler Arm Assembly (Includes Items Below)
	714693-01**	TRW TAS85 Steering Gearbox (see cradle below)	25.1	700951-01	Machined Idler Arm Casting
11	710174-01	Bleed Line Assembly	25.2	705382-01	40mm Ball Joint
12	714579-01	Bulkhead Assembly	25.3	7348	Bearing Pivot Shaft
	714597-01	Bulkhead Lock Nut	25.4	701378-01	Sealed Ball Bearing
13	714578-01	Cap	25.5	6966	External Snap Ring Ø1-3/4
14	710281-01	Pitman Arm	25.6	8654	Bearing Shaft Shim .004
15	709309-01	Gearbox Mount (LH)	26	702030-01	Relay Rod
16	713070-01	Steering Gearbox/Shock Mounting Plate (LH)	27	705382-02	Slotted Nut M20- x 1.5
17	701671-01	Hex Head Bolt 3/4-10 x 4.50 GR 8 ZN	28	705382-03	Cotter Pin
18	103003	Hardened Flat Washer 3/4	29	103712	Tie Rod End (RH)
19	208	Flange Lock Nut 3/4-10 GR. G, ZN	30	6632	Tie Rod Clamp
20	709386-01	Hex Head Bolt 7/8-14 x 2.00 GR 8 ZN	31	700971-01	Tie Rod Tube
21	713454-17	Nord-Lock Washer, Ø7/8	32	103736	Tie Rod End (LH)
22	709388-01	Hex Head Bolt 3/4-16 x 1.50 GR 8 ZN	33	167	Hex Head Bolt 1.0-14 X 6 GR 8 ZY
23	8223752	Hex Head Bolt 3/4-16 x 2.00 GR 8	34	2571	Hardened Flat Washer Ø1
24	705382-01	40mm Ball Joint	35	89422312	Lock Nut 1-14 GR C Phos & Oil
			36	713454-14	Nord-Lock Washer, Ø3/4

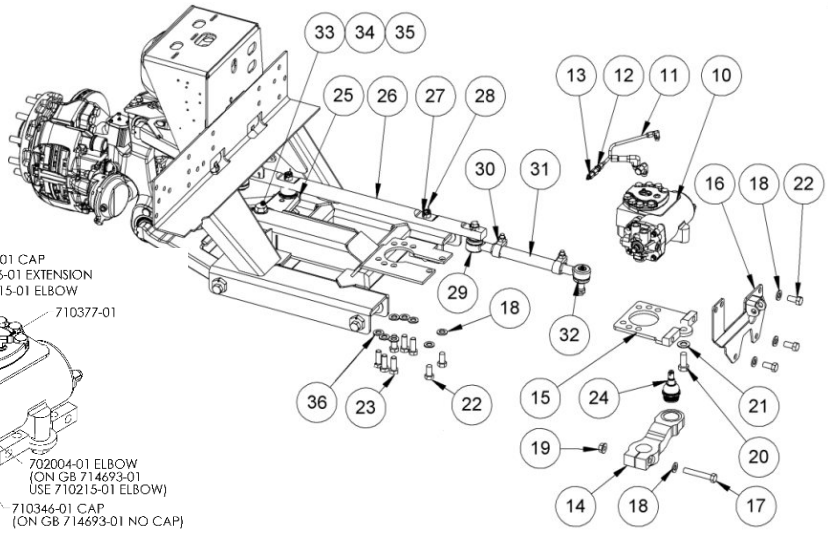
*IFS1600S3/IFS1700S3-11 - Verify Cradle Style

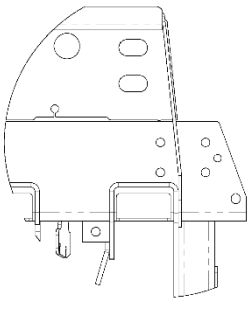
**IFS1700S3-23 - Verify Cradle Style



*709736-01
AS SHOWN
(LONG RAIL)







**709736-02
39-5/8" SIDE RAIL

K705382 – 40mm Ball Joint Kit				K710622 – Idler Arm Bearing Kit		
Item	Part No.	Description	Qty	Part No.	Description	Qty
24	705382-01	40mm Ball Joint	1	89422312	Lock Nut 1-14	1
27	705382-02	Slotted Nut M20- x 1.5	1	167	HHB 1-14	1
28	705382-03	Cotter Pin	1	8654	Bearing Shaft Shim .004	4
				6966	External Snap Ring Ø1-3/4	2
				712869-01	Friction Washer	2
				701378-01	Sealed Ball Bearing	2
				7348-050	Spacer Sleeve	1
				D710623	Bearing Replacement	1

Unit Assembly REV 1 and 2

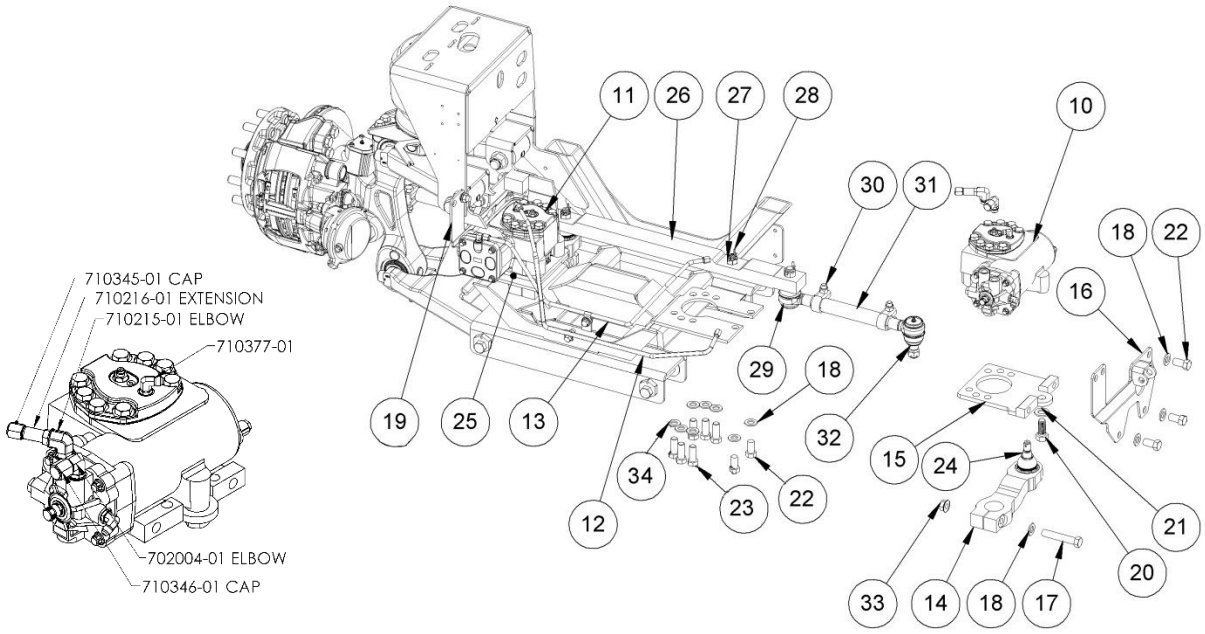
Refer to model option identification section for correct REV

Steering Components (IFS1800S3/IFS2000S3)

Item	Part No.	Description	Item	Part No.	Description
10	714692-01*	TRW TAS85 Steering Gearbox (Master)	22	709388-01	Hex Head Bolt 3/4-16 x 1.50 GR 8 ZN
	714694-01**	TRW TAS85 Steering Gearbox (Master)	23	8223752	Hex Head Bolt 3/4-16 x 2.00 GR 8
11	714696-01	TRW Steering Gearbox (Slave)	24	705382-01	40mm Ball Joint
12	710359-01	Front Steering Line	25	709309-02	Gearbox Mount (RH)
13	710359-02	Rear Steering Line	26	705867-01	Relay Rod
14	709714-02	Pitman Arm (Same LH & RH)	27	705382-02	Slotted Nut M20- x 1.5
15	709309-01	Gearbox Mount (LH)	28	705382-03	Cotter Pin
16	713070-01	Steering Gearbox/Shock Mounting Plate (LH)	29	710671-02	Tie Rod End (RH) (Supersedes 705824-02)
17	701671-01	Hex Head Bolt 3/4-10 x 4.50 GR 8 ZN	30	6632	Tie Rod Clamp
18	103003	Hardened Flat Washer Ø3/4	31	708178-01	Tie Rod Tube
19	713070-02	Steering Gearbox/Shock Mounting Plate (RH)	32	710671-01	Tie Rod End (LH) (Supersedes 705824-01)
20	709386-01	Hex Head Bolt 7/8-14 x 2.00 GR 8 ZN	33	208	Flanged Lock Nut 3/4-10 GR G ZN
21	713454-17	Nord-Lock Washer, Ø7/8	34	713454-01	Nord-Lock Washer, Ø3/4

*IFS18000S3/2000S3-01

** IFS200S3-02



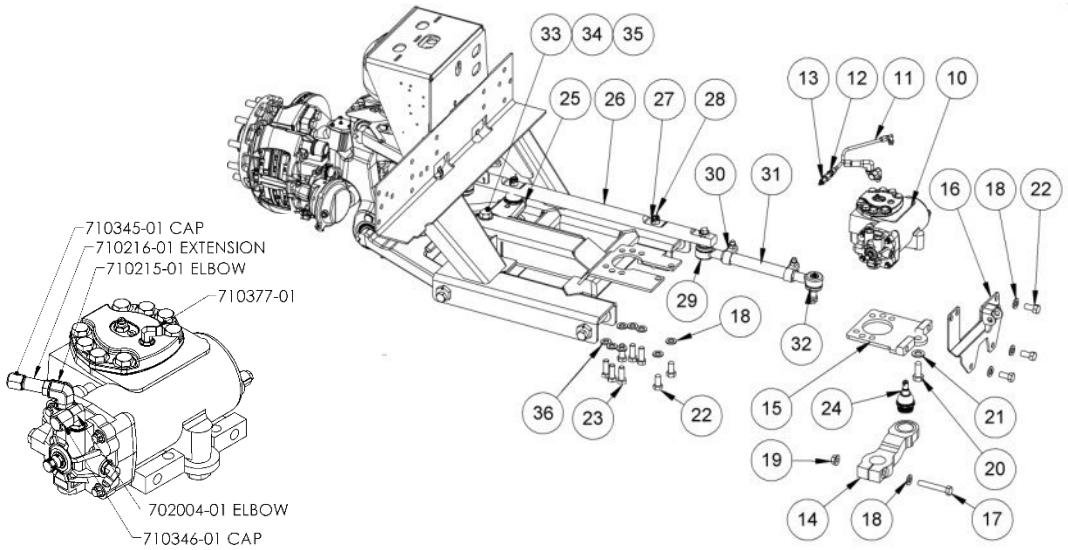
K714416 – 40mm Ball Joint Kit			
Item	**Part No.**	**Description**	**Qty**
24	714410-01	40mm Ball Joint	1
27	705382-02	Slotted Nut M20- x 1.5	1
28	705382-03	Cotter Pin	1

Unit Assembly REV 3

Refer to model option identification section for correct REV

Steering Components IFS1701S3

Item	Part Number	Description	Item	Part Number	Description
10	710135-01	TRW TAS85 Steering Gearbox	25.2	705382-01	40mm Ball Joint
11	700973-02	Bleed Line Assembly	25.3	7348	Bearing Pivot Shaft
12	710171-01	Bulkhead Assembly	25.4	701378-01	Sealed Ball Bearing
13	710172-01	Bleed Port Assembly	25.5	6966	External Snap Ring Ø1-3/4
14	709714-02	Pitman Arm	25.6	8654	Bearing Shaft Shim .004
15	709309-01	Gearbox Mount (LH)	26	702030-01	Relay Rod
16	713070-01	Steering Gearbox/Shock Mounting Plate (LH)	27	705382-02	Slotted Nut M20- x 1.5
17	701671-01	Hex Head Bolt 3/4-10 x 4.50 GR 8 ZN	28	705382-03	Cotter Pin
18	103003	Hardened Flat Washer 3/4	29	103712	Tie Rod End (RH)
19	2088	Flanged Lock Nut 3/4-10 GR. G, ZN	30	6632	Tie Rod Clamp
20	709386-01	Hex Head Bolt 7/8-14 x 2.00 GR 8 ZN	31	700971-01	Tie Rod Tube
21	713454-17	Nord-Lock Washer, Ø7/8	32	103736	Tie Rod End (LH)
22	709388-01	Hex Head Bolt 3/4-16 x 1.50 GR 8 ZN	33	167	Hex Head Bolt 1.0-14 X 6 GR 8 ZY
23	8223752	Hex Head Bolt 3/4-16 x 2.00 GR 8	34	2571	Hardened Flat Washer Ø1
24	705382-01	40mm Ball Joint	35	89422312	Lock Nut 1-14 GR C Phos & Oil
25	705620-01	Idler Arm Assembly (Includes Items Below)	36	713454-01	Nord-Lock Washer, Ø3/4
25.1	700951-01	Machined Idler Arm Casting			



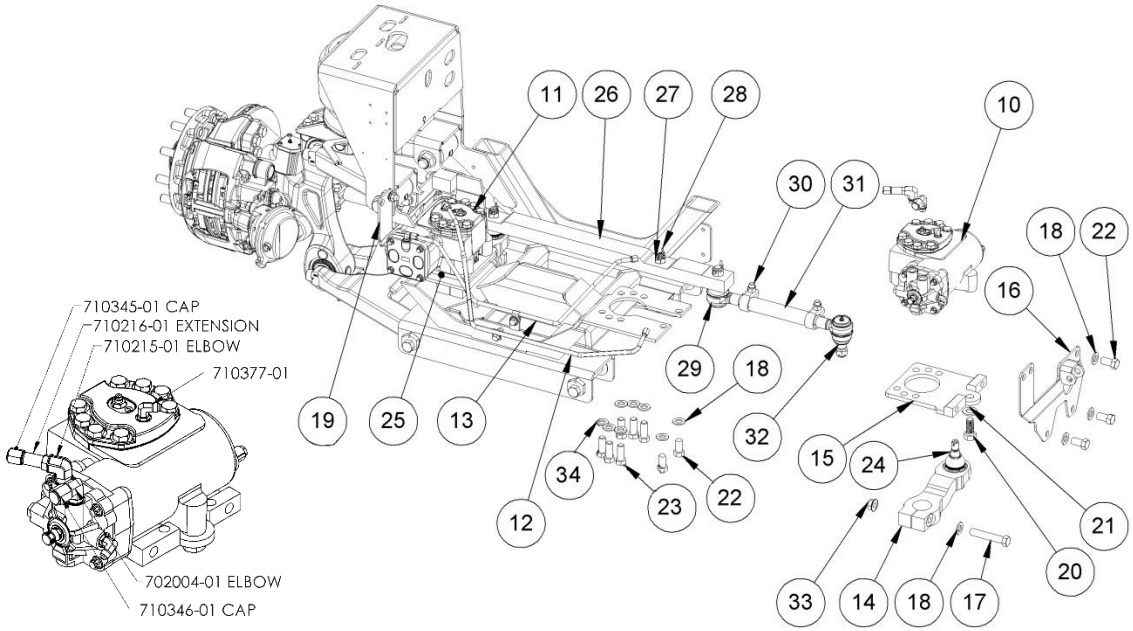
K705382 – 40mm Ball Joint Kit				K710622 – Idler Arm Bearing Kit		
Item	Part No.	Description	Qty	Part No.	Description	Qty
24	705382-01	40mm Ball Joint	1	89422312	Lock Nut 1-14	1
27	705382-02	Slotted Nut M20- x 1.5	1	167	HHB 1-14	1
28	705382-03	Cotter Pin	1	8654	Bearing Shaft Shim .004	4
				6966	External Snap Ring Ø1-3/4	2
				**712869-01	Friction Washer	2
				701378-01	Sealed Ball Bearing	2
				7348-050	Spacer Sleeve	1
				D710623	Bearing Replacement Instructions	1
**Friction washer not used in the original unit, see D710623 instructions for installing with K710622 kit						

Unit Assembly REV 3

Refer to model option identification section for correct REV

Steering Components IFS20S3

Item	Part Number	Description	Item	Part Number	Description
10	710135-01	TRW TAS85 Steering Gearbox (Master)	23	8223752	Hex Head Bolt 3/4-16 x 2.00 GR 8
11	709122-01	TRW RCS85 Steering Gearbox (Slave)	24	705382-01	40mm Ball Joint
12	710359-02	Front Steering Line	25	709309-02	Gearbox Mount (RH)
13	710359-01	Rear Steering Line	26	705867-01	Relay Rod
14	709714-02	Pitman Arm (Same LH & RH)	27	705382-02	Slotted Nut M20- x 1.5
15	709309-01	Gearbox Mount (LH)	28	705382-03	Cotter Pin
16	713070-01	Steering Gearbox/Shock Mounting Plate (LH)	29	710671-02	Tie Rod End (RH) (Supersedes 705824-02)
17	701671-01	Hex Head Bolt 3/4-10 x 4.50 GR 8 ZN	30	6632	Tie Rod Clamp
18	103003	Hardened Flat Washer Ø3/4	31	708178-01	Tie Rod Tube
19	713070-02	Steering Gearbox/Shock Mounting Plate	32	710671-01	Tie Rod End (LH) (Supersedes 705824-01)
20	709386-01	Hex Head Bolt 7/8-14 x 2.00 GR 8 ZN	33	208	Flanged Lock Nut 3/4-10 GR G ZN
21	713454-17	Nord-Lock Washer, Ø7/8	34	713454-01	Nord-Lock Washer, Ø3/4
22	709388-01	Hex Head Bolt 3/4-16 x 1.50 GR 8 ZN			



K714416 – 40mm Ball Joint Kit			
Item	Part No.	Description	Qty
24	714410-01	40mm Ball Joint	1
27	705382-02	Slotted Nut M20- x 1.5	1
28	705382-03	Cotter Pin	1

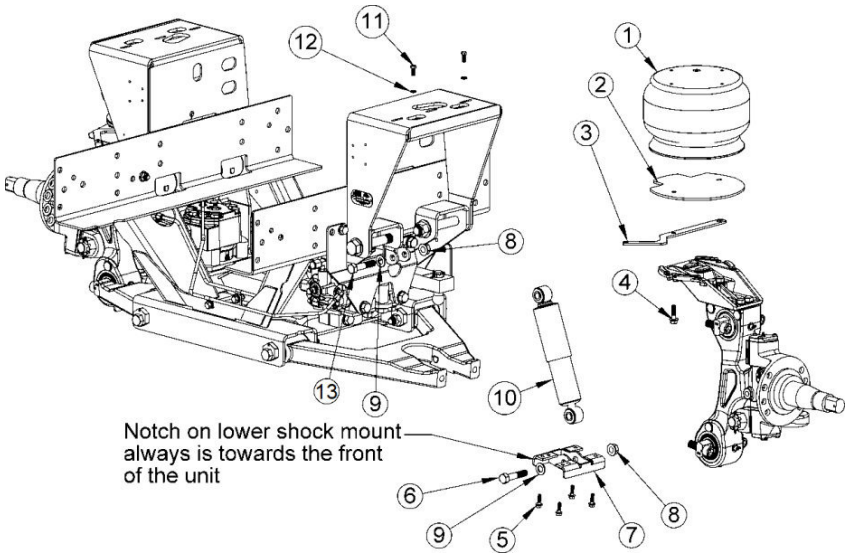
Unit Assembly REV 1 and 2

Refer to model option identification section for correct REV

Air Spring and Shock Components

IFS1660S3 & IFS1700S3					
Item	**Part No.**	**Description**	**Item**	**Part No.**	**Description**
1	705951-01	Air Spring Assembly	10	None	4th Suffix Code 1 or 0*
2	N/A	N/A		712220-01	Hardware Only (Suffix 4th Code 1)
3	706899-01	HCV Arm		712791-02	Bilstein 46mm CV Shock (4th Suffix 2)
4	276	Flanged Hex Bolt 1/2-13 x 1.75 GR 8 ZN		712220-03	Koni 90 Series Shock (-F or 4th Suffix 3)
5	302	Flanged Hex Bolt 3/8-16 x 1.25 GR 8 ZN		712220-04	Bilstein 60mm Shock (4th Suffix 4)
6	100678-P1	Hex Head Bolt 3/4-10 x 3.50 GR 8 ZN	11	100263-P1	Hex Head Bolt 3/4-10 x 2.75 GR 8 ZN
7	707357-01	Assembly, Shock Mount	12	8120382	Split Lock Washer 3/8 ZN
8	208	Flanged Lock Nut 3/4-10 GR G ZN	13	100727-P1	Hex Head Bolt 3/4-10 x 4.00 GR 8 ZN
9	8131017	Flat Washer 3/4" .812 x 1.469 x .134 ZN			

* Reyco Granning ® assumes no responsibility for ride control on units built without shocks, Contact Chassis Builder for shock specification and support



IFS1800S3 & IFS2000S3					
Item	**Part No.**	**Description**	**Item**	**Part No.**	**Description**
1	705859-01	Air Spring Assembly	9	8131017	Flat Washer 3/4" .812 x 1.469 x .134 ZN
2	705860-01	Spacer, Air Spring	10	None	4th Suffix Code 1 or 0**
3	706899-01	HCV Arm		712220-01	Hardware only
4	702638-02	Flanged Hex Bolt 1/2-13 x 2.00 GR 8 ZN		712220-02	Shock Absorber Bilstein 46mmCV (Suffix Code 2)
5	302	Flanged Hex Bolt 3/8-16 x 1.25 GR 8 ZN		712220-03	Shock Absorber KONI 90 Series (Suffix Code 3)
6	100678-P1	Hex Head Bolt3/4-10 x 3.50 GR 8 ZN		712220-04	Shock Absorber Bilstein 60mm (Suffix Code 4)
7	707357-01	Assembly, Shock Mount	11	100263-P1	Hex Head Bolt3/4-10 x 2.75 GR 8 ZN
8	208	Flanged Lock Nut 3/4-10 GR G ZN	12	8120382	Split Lock Washer 3/8 ZN
			13	100727-P1	Hex Head Bolt 3/4-10 x 4.00 GR 8 ZN

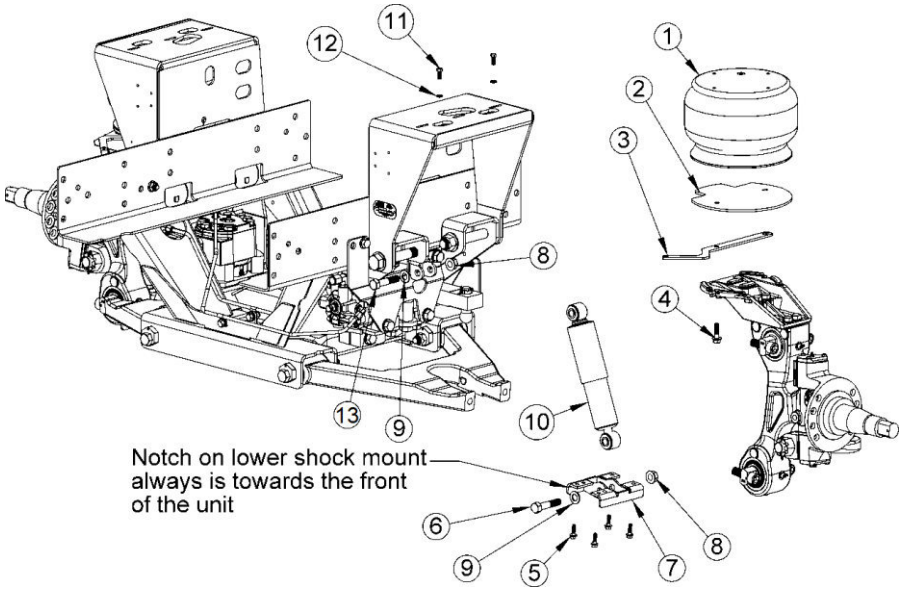
Unit Assembly REV 3

Refer to model option identification section for correct REV

Air Spring and Shock Components

IFS1701S3					
Item	**Part No.**	**Description**	**Item**	**Part No.**	**Description**
1	705951-01	Air Spring Assembly	9	8131017	Flat Washer 3/4" .812 x 1.469 x .134 ZN
2	N/A	N/A	10	713967-AA	Shock Absorber Bilstein (3rd & 4th Suffix Code AA)
3	706899-01	HCV Arm		713967-AB	Shock Absorber Bilstein (3rd & 4th Suffix Code AB)
4	276	Flanged Hex Bolt 1/2-13 x 1.75 GR 8 ZN		713967-AC	Shock Absorber Bilstein (3rd & 4th Suffix Code AC)
5	302	Flanged Hex Bolt 3/8-16 x 1.25 GR 8 ZN		713967-AD	Shock Absorber Bilstein (3rd & 4th Suffix Code AD)
6	100678-P1	Hex Head Bolt 3/4-10 x 3.50 GR 8 ZN	11	100263-P1	Hex Head Bolt 3/4-10 x 2.75 GR 8 ZN
7	707357-01	Assembly, Shock Mount	12	8120382	Split Lock Washer 3/8 ZN
8	208	Flanged Lock Nut 3/4-10 GR G ZN	13	100727-P1	Hex Head Bolt 3/4-10 x 4.00 GR 8 ZN

* Reyco Granning ® assumes no responsibility for ride control on units built without shocks, Contact Chassis Builder for shock specification and support



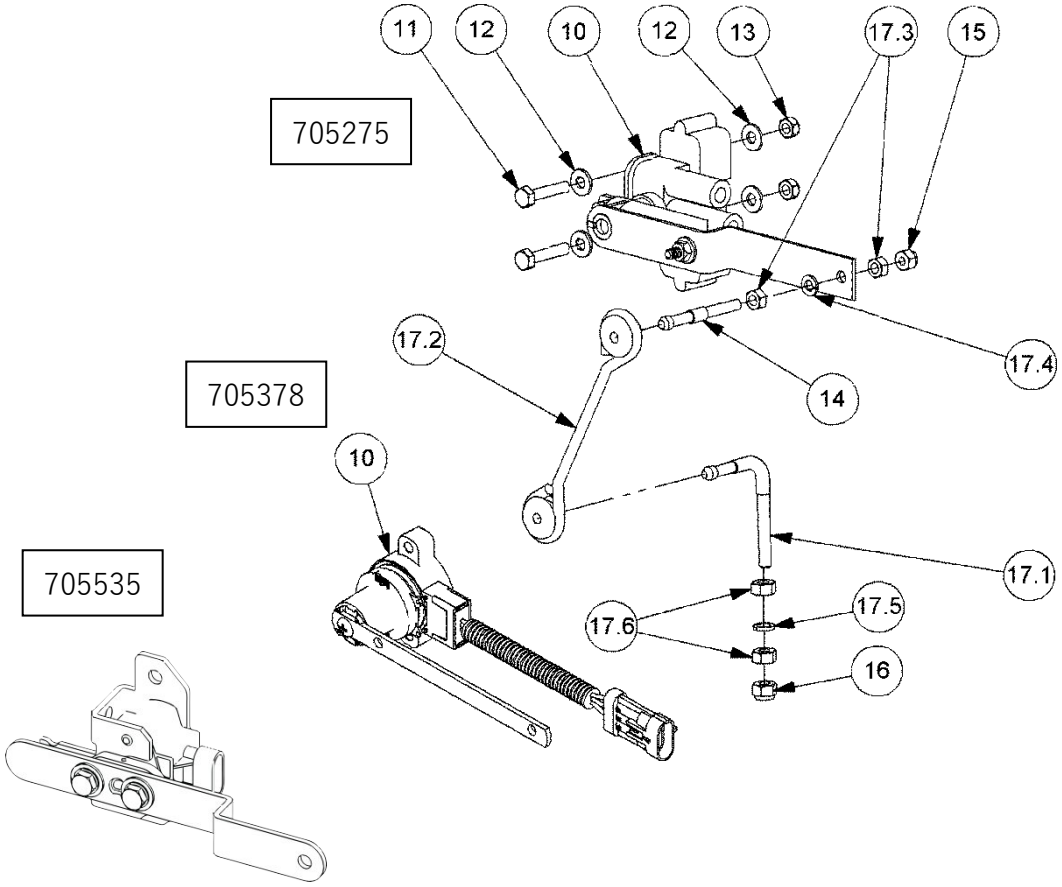
IFS20S3					
Item	**Part No.**	**Description**	**Item**	**Part No.**	**Description**
1	705859-01	Air Spring Assembly	9	8131017	Flat Washer 3/4" .812 x 1.469 x .134 ZN
2	705860-01	Spacer, Air Spring	10	713967-AA	Shock Absorber Bilstein (3rd & 4th Suffix Code AA)
3	706899-01	HCV Arm		713967-AB	Shock Absorber Bilstein (3rd & 4th Suffix Code AB)
4	702638-02	Flanged Hex Bolt 1/2-13 x 2.00 GR 8 ZN		713967-AC	Shock Absorber Bilstein (3rd & 4th Suffix Code AC)
5	302	Flanged Hex Bolt 3/8-16 x 1.25 GR 8 ZN		713967-AD	Shock Absorber Bilstein (3rd & 4th Suffix Code AD)
6	100678-P1	Hex Head Bolt3/4-10 x 3.50 GR 8 ZN	11	100263-P1	Hex Head Bolt3/4-10 x 2.75 GR 8 ZN
7	707357-01	Assembly, Shock Mount	12	8120382	Split Lock Washer 3/8 ZN
8	208	Flanged Lock Nut 3/4-10 GR G ZN	13	100727-P1	Hex Head Bolt 3/4-10 x 4.00 GR 8 ZN

HCV Assembly Components (All)

Refer to your unit/model for identification of correct HCV

Item	Part Number	Description	Item	Part Numbers	Description
10	705275-01/02	HCV Assembly (Std Single or Dual)*	13	100703-P1	Lock Ø 1/4
	705378-01/02	Electronic Sensor (Hadley Single or Dual)*	14	705932-01	Straight HCV Pin Ø 1/4-20 Thread
	705535-03	Electronic Sensor (Dual Valid)*	15	705976-01	Ø1/4 Nylock Nut
11	702606-02	Hex Head Bolt 1/4-20 x 1.25 GR 8 ZN	16	705976-02	Ø 5/16 Nylock Nut
12	8120392	Flat Washer Ø 1/4	17	703915-01	Linkage Assy (Shown for reference, part of item 10)

*Sway Bar equipped Units use a single (L) HCV/HCS; Non Sway Bar Units have Dual (R & L) HCV/HCS

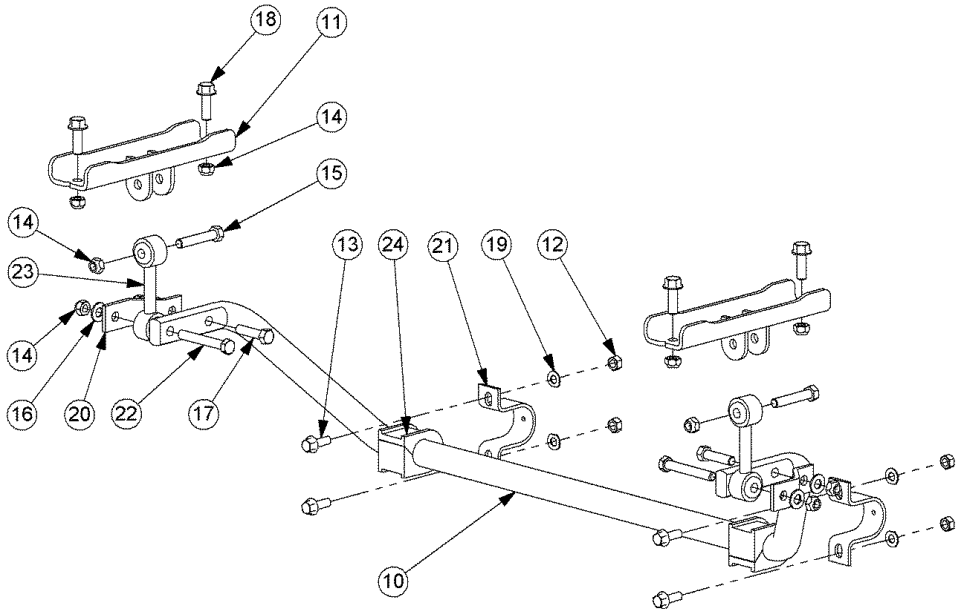


Item	Description
17.1	Lower Linkage 90° 5/16-18
17.2	Height Control Linkage 5 1/8
17.3	Hex Nut 1/4-20
17.4	Split Lock Washer Ø 1/4
17.5	Split Lock Washer Ø 5/16
17.6	Hex Nut 5/16-18

Sway Bar Assembly Components (All)

Item	Part No.	Description	Item	Part No.	Description
10	703124-01	Sway Bar	18	276	Flanged Hex Bolt 1/2-13 x 1.75 GR 8 ZN
11	703165-01	Sway Bar to UCA Mount Assembly	19	702898-01	Washer, Cut, Sway Bar
12	89422299	Lock Nut 7/16-14 UNC GR 8	20	703128-01	Mount, UCA, Sway Bar
13	702797-01	Flanged Hex Bolt 7/16-14 x 1.25 GR 8 ZN	21	702894-01	Mount, D-Ring Sway Bar
14	89422301	Lock Nut 1/2-13 GR 8 ZN	22	700144-23	Hex Head Bolt1/2-13 x3.50 GR 8 ZN
15	102550	Hex Head Bolt1/2-13 x 2.75 GR 8 ZN	23	703127-03	Mount, UCA, Sway Bar (Supersedes 703127-01)
16	118	Flat Washer 1/2" ZN	24	*702895-02	Bushing, Split, Sway Bar
17	8455001	Hex Head Bolt1/2-13 x 2.00 GR 8 ZN			

NOTE: 703127-01 must be replaced in pairs with 703127-03
*Use Aquashield Grease (P/N 716293-01) on 702895-02



K705273 – Sway Bar Hardware Kit (2 Required)				K706842 – Sway Bar Mount Kit			
Item	Part No.	Description	Qty	Item	Part No.	Description	Qty
12	89422299	Lock Nut 7/16-14 UNC GR 8	2	20	703128-01	Mount, UCA, Sway Bar	2
13	702797-01	Flanged Hex Bolt 7/16-14 x 1.25 GR 8	2	21	702894-01	Mount, D-Ring Sway Bar	2
14	89422301	Lock Nut 1/2-13 GR 8 ZN	5	23	703127-03	Mount, UCA, Sway Bar	2
15	102550	Hex Head Bolt 1/2-13 x 2.75 GR 8 ZN	1	24	*702895-02	Bushing, Split, Sway Bar	2
16	118	Flat Washer 1/2" ZN	2				
17	8455001	Hex Head Bolt 1/2-13 x 2.00 GR 8 ZN	1				
18	307	Flanged Hex Bolt 1/2-13 x 1.50 GR 8	2				
19	702898-01	Washer, Cut, Sway Bar	2				
22	700144-23	Hex Head Bolt 1/2-13 x3.50 GR 8 ZN	1				

NOTE: K706842 Supersedes K703129

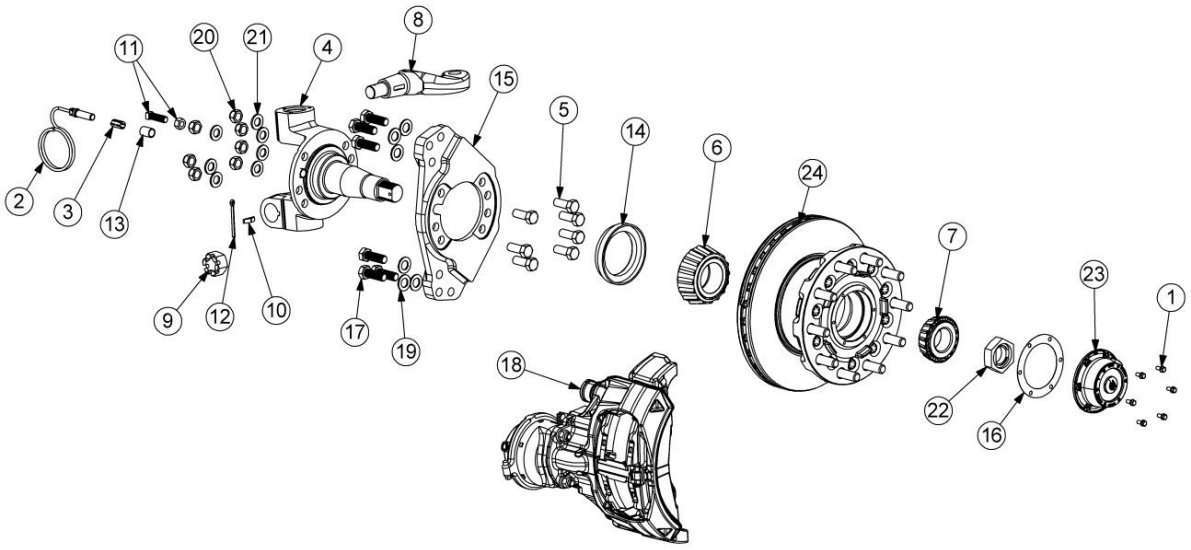
Disc Brake Components (ProTorq© Spindle Nut)

Started in production approx. (08/2009). Refer to your unit/model for identification of correct wheel end

Item	Part No.	Description	Item	Part No.	Description
1	266	Flange Head Bolt 5/16-18x.75, Gr. 5, ZC	13	705011-27	ABS Sensor Bushing
2	7328	ABS Sensor (Straight w/Lead)	14	705084-01	Oil Seal Assembly - Guardian
3	6946	ABS Sensor Spring Retainer	15	705013-15	Torque Plate Assembly, LH
4	705011-01	Steering Knuckle Assembly, LH		705013-16	Torque Plate Assembly, RH
	705011-02	Steering Knuckle Assembly, RH	16	1786	Hub Cap Gasket Stemco
5	126	Hex Head Bolt 5/8-18x2, Gr. 8, ZN	17	700690-04	Hex Head Bolt M20x1.5-50 Gr. 10.9
6	705051-01	Bearing - Inner	18	705013-17	Brake Caliper, LH (Supersedes 705013-03)
7	705052-01	Bearing - Outer		705013-18	Brake Caliper, RH (Supersedes 705013-08)
8	705017-01	Arm, Steering, LH*		715800-01	Brake Pad Service Kit
	705017-02	Arm, Steering, RH*	19	704078-01	Flat Washer 20mm
	708105-01	Arm, Steering, LH**	20	89422308	Locking Flange Nut 5/8-18x.75, Gr. G, PH
	708105-02	Arm, Steering, RH**	21	103003	HFW 3/4"
9	705011-21	Castle Nut 1 1/4 - 12	22	708181-01	Nut, Spindle, Pro-Torq©
10	700525-16	Key	23	708182-01	Hub Cap
11	705011-22	Assembly, Steering Stop	24	707819-01	Hub and Rotor Assembly
12	705011-23	Cotter Pin 3/16 x 2-1/2			

*Used with IFS1660S3/1700S3 Units

**Used with IFS1800S3/2000S3 Units



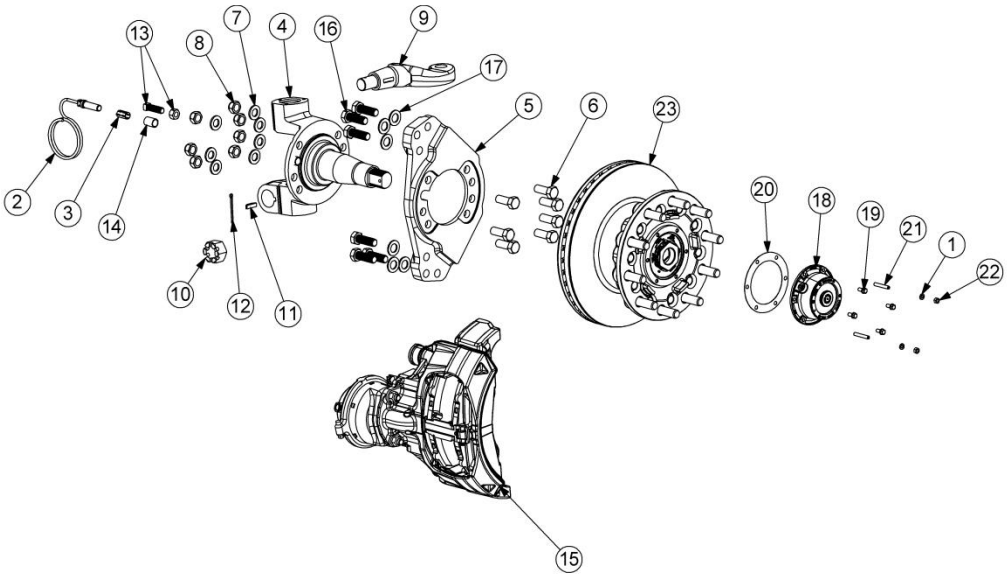
Disc Brake Components (Integral Spindle Nut)

Started in production approx. (02/2020). Refer to your unit/model for identification/verification of correct wheel end

Item	Part No.	Description	Item	Part No.	Description
1	T-2347	SLW 5/16	11	700525-16	Key
2	7328	ABS Sensor (Straight w/Lead)	12	705011-23	Cotter Pin 3/16 x 2-1/2
3	6946	ABS Sensor Spring Retainer	13	705011-22	Steering Stop Assembly
4	705011-01	Steering Knuckle Assembly (LH)	14	705011-27	ABS Sensor Bushing
	705011-02	Steering Knuckle Assembly (RH)	15	705013-17	Brake Caliper (LH) (Supersedes 705013-03)
5	705013-15	Torque Plate Assembly (LH)		705013-18	Brake Caliper (RH) (Supersedes 705013-08)
	705013-16	Torque Plate Assembly (RH)		715800-01	Brake Pad Service Kit (Set of 4 Pads)
6	8223752	HHB 3/4-16 X 2.00	16	700690-04	Hex Head Bolt M20 x 1.5-50
7	103003	Hardened Flat Washer 3/4"	17	703553-02	HFW M20
8	89422308	Locking Flange Nut 5/8-18x.75 GR. G, PH	18	709226-01	Hub Cap
9	705017-01	Tie Rod Steering Arm(LH)*	19	266	Flange Head Bolt 5/16-18 x .75 GR 5 ZN
	705017-02	Tie Rod Steering Arm(RH)*	20	714147-01	Hub Cap Gasket
	708105-01	Tie Rod Steering Arm(LH)**	21	714176-01	Stud, Hub Cap
	708105-02	Tie Rod Steering Arm(RH)**	22	89429048	Nut 5/16-18
10	705011-21	Castle Nut 1 1/4 - 12	23	714781-01	Hub/Rotor Assy, Pre-Adjusted w/ Integral Spindle Nut

*Used with IFS1660S3/1700S3 Units

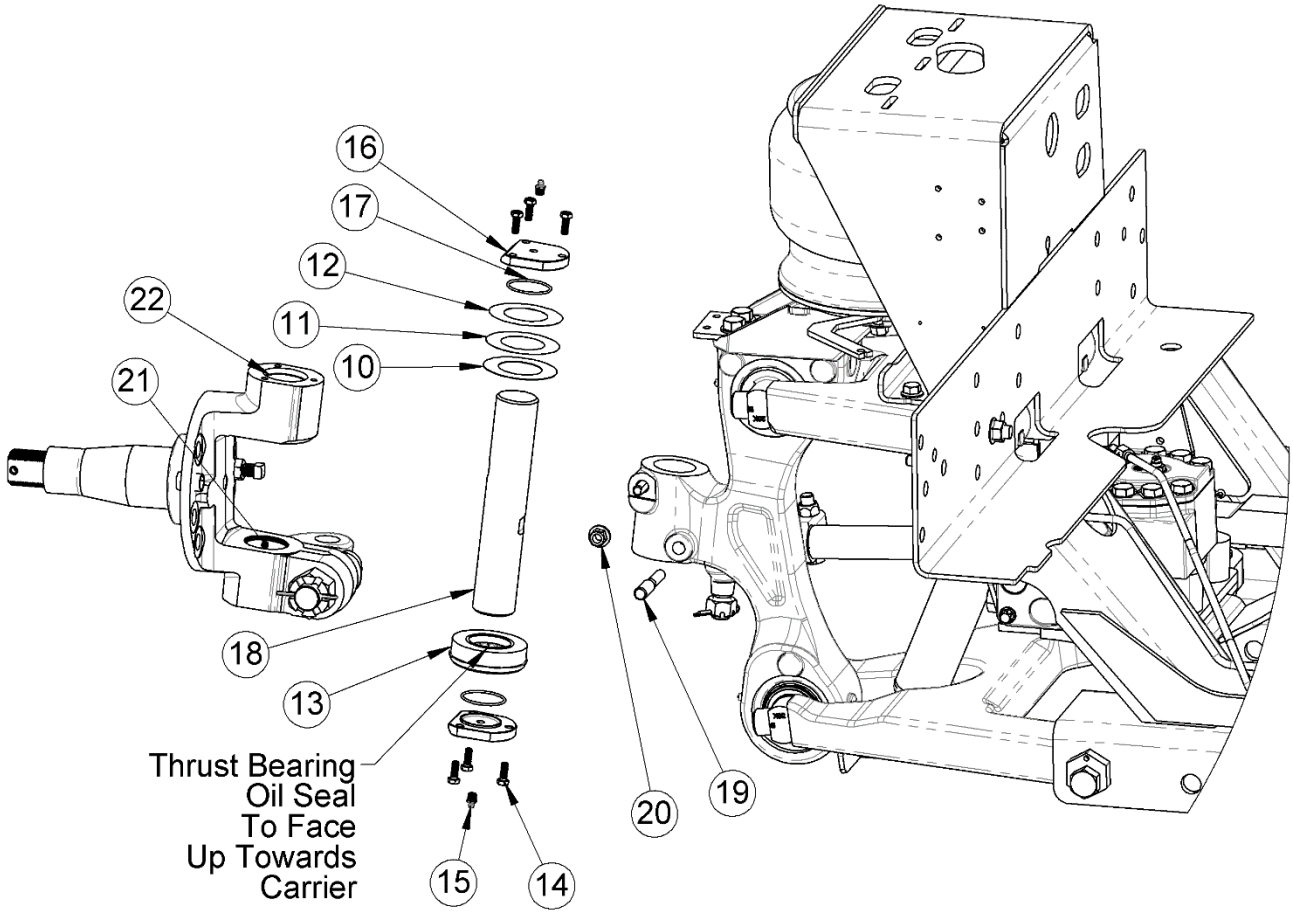
**Used with IFS1800S3/2000S3 Units



Preset Plus 714781-01 Hub/Rotor	
Part No	Description
715262-01	Complete Rebuild Kit (1 hub/rotor) (contains (1) seal, (1) bearing spacer, (1) inner cup/cone and (1) outer cup/cone)
Individual Maintenance Parts	
715262-02	Seal
715262-03	Bearing Spacer
715262-04	Inner Cup & Cone
715262-05	Outer Cup & Cone

King Pin Components (All)

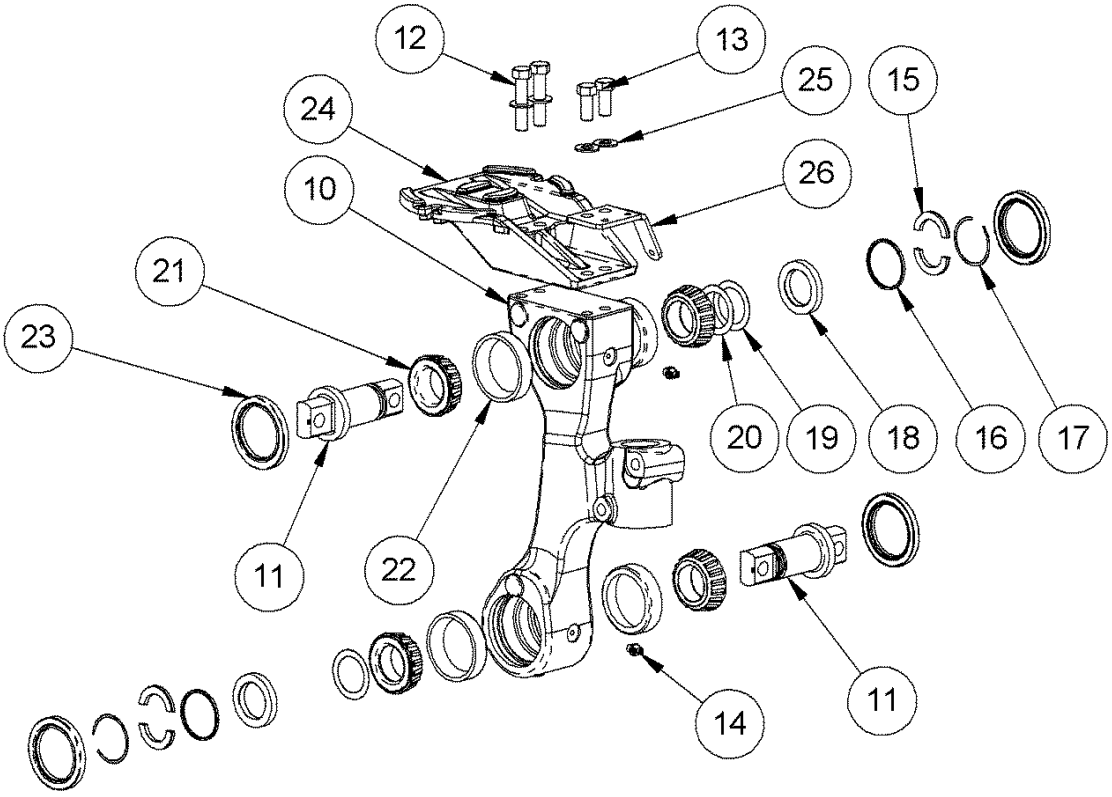
Item	Part No.	Description	Item	Part No.	Description
10	705011-07	Shim, .005” thick	17	705011-18	O-Ring
11	705011-08	Shim, .010” thick	18	705011-19	King Pin
12	705011-09	Shim, .020” thick	19	705315-01	Draw Key 3.80” Lg.
13	705011-14	Assembly, Bearing, Thrust	20	705316-01	Draw Key Flange Nut
14	705011-15	Bolt, King Pin Cap	21	705011-05	Bushing (installed in knuckle bores) (set of two)
15	705011-16	Grease Fitting, Straight	22	705011-06	Seal, King Pin Oil (set of two)
16	705011-17	Cap, King Pin			



Steering Knuckle Carrier Components (All)

Ite	Part No.	Description	Item	Part No.	Description
10	705632-01	Machining, Carrier (LH)*	17	702620-01	Retaining clip
	705632-02	Machining, Carrier (RH)*	18	702622-01	Spacer
	705852-01	Machining, Carrier (LH)**	19	702623-01	Shim, .004
	705852-02	Machining, Carrier (RH)**	20	702623-02	Shim, .010
11	702621-02	Bar Pin*	21	702834-01	Bearing
	705854-02	Bar Pin**	22	702835-01	Cup
12	149	Hex Head Bolt 5/8-18 X 3 GR 8 ZN	23	702836-01	Seal
13	700184-04	Hex Head Bolt 5/8-18 X 1-3/4 GR 8 ZN	24	713169-01	Machining, Lower Air Spring Mount, 1.5° Tilt
14	7352	Grease Zerk, Hydraulic Shutoff	25	89422850	Hardened Flat Washer 5/8 ZN
15	702618-01	Split Collar	26	706026-01	Brake Line Bracket (LH)
16	702619-01	Outer Collar		702026-02	Brake Line Bracket (RH)

*Used with IFS1660S3/1700S3 Units
**Used with IFS1800S3/2000S3 Units



Left Hand Steering Knuckle Carrier Shown

Lubricant Specifications and Intervals

COMPONENT	SERVICE INTERVAL	CHANGE INTERVAL	LUBRICANT SPECIFICATION
Ball Studs on Ends of Tie Rods	Whichever comes first: Every oil change or every 6 months	N/A	Multi-Purpose Chassis Grease Premium Multi-Purpose Chassis Grease NLGI Grade 2
Kingpin	Whichever comes first: Every oil change or every 6 months	N/A	Multi-Purpose Chassis Grease Premium Multi-Purpose Chassis Grease NLGI Grade 2
Carrier Bearings1	Whichever comes first: 50,000 miles (80,000 kilometers) or once a year	N/A	Mobillith AW2 Amoco L Industrial 861 Exxon Ronex MP
Steering Gear Hydraulic Oil	N/A	Whichever comes first: 100,000 miles (160,000 kilometers) or once a year2	Dexron II ATF Mobil ATF 210 Others Per TRW Approved List
Steering Gear TrunnionBearing1	Whichever comes first: Every oil change or every 6 months2	N/A	Premium Multi-Purpose EP Chassis Grease NLGI Grade 2 or 3
Steering Gear Input Shaft	N/A	Every 6 Months2	Mobil Temp 1 or 2 Or Equivalent
Wheel End	1000 miles (1600 kilometers) Check fluid level	Whichever comes first: Seals replaced, brakes relined, 100,000 miles (160,000 km), or once a year	Gear Oil SAE 80W/90 or equivalent

1. Use a Manual Grease Gun only
2. Intervals for commercial usage per TRW Service Bulletin #TAS-108

General Lubrication

Proper lubrication practices are important in maximizing the service life of your ReycoGranning® Independent Front Suspension.

CAUTION

Do not mix lubricants of different grades. Do not mix mineral and synthetic lubricants. Different brands of the same grade may be mixed.

CAUTION

Never mix oil bath and grease packed wheel ends.

Ball Joints

The ball joints are lubricated and sealed for their service life and do not require lubrication. Check for oil or grease marks on the exterior of the seal and if found verify that the seal has not been ruptured. If the seal has been ruptured then the ball joint must be replaced because it cannot be re-lubricated.

Ball Studs on Tie Rods

1. Review lubricant specification and interval requirements before servicing.
2. Apply lubricant to grease fitting until new lubricant discharges from the dust boot (Figure 4).

Carrier Bearing and King Pin

Apply lubricant to both upper and lower carrier bearings and kingpin bushings until new lubricant discharges from the carrier bearing seals and in between the steering knuckle kingpin housing and carrier. King pins should be greased with load on the wheels.

NOTE: Hand Grease Carriers. Grease may not discharge due to hydraulic shutoff

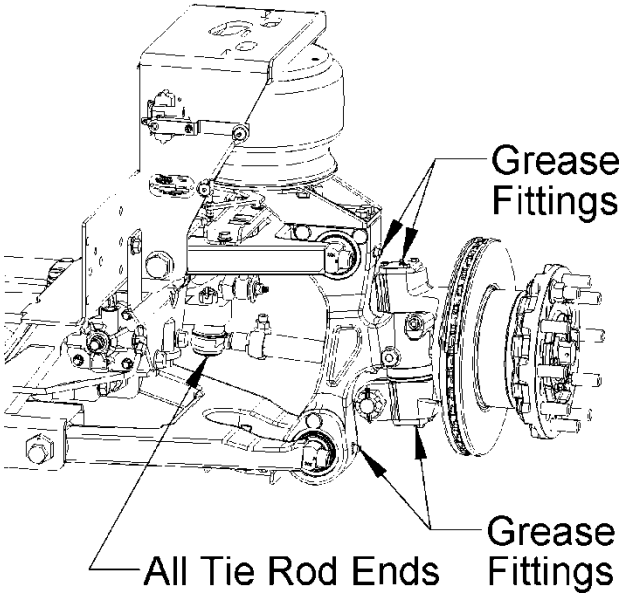


Figure 4 – Location of lubrication fittings. Note: Left side only shown.

Steering Gear Hydraulic Oil

1. Refer to Chassis Builder's documentation for complete information on the hydraulic system and requirements.

NOTE: When changing to different hydraulic oil, the steering gear must be flushed with the new oil prior to filling.

Steering Gear Trunnion Bearing

1. Reference TRW Service Bulletin #TAS-103
2. Review lubricant specification and interval requirements before servicing.
3. Locate the grease fitting on the trunnion side of the steering gear near the output shaft.
4. Use a hand-type grease gun to force grease through the fitting until you can see it past the external dirt and water seal.

CAUTION

Use of a power or automatic grease gun can push grease through internal seals and damage the gearbox. Use only a manual grease gun.

Steering Gear Input Shaft

1. Reference TRW Service Bulletin #TAS-103
2. Review lubricant specification and interval requirements before servicing.
3. Clean old grease from the dirt and water seal near the input shaft and the cavity behind the seal with a lint free cloth.
4. Repack the area using clean, high temperature industrial grease.
5. Reseat the dirt and water seal in its groove behind the serrations and against the valve

Wheel Bearings

1. Review lubricant specification and interval requirements before servicing.
2. Park Vehicle on a level surface (side to side) when checking the hub oil level.
3. Wait until oil has settled in hubs before reading oil level.

NOTE Cold hub oil will require several minutes to settle completely. Failure to allow oil to settle can result in false low readings which can lead to overfilling the hub causing oil leaks.

4. Check oil level through hub cap window while at ride height. If level is below the “add” level line then remove the pipe plug and fill with recommended oil until “full” level is achieved. **(Figure 5)**. Add oil slowly since the heavy weight oil will settle slowly in the hub. (Note: The hub cap window can only be cleaned with mild soap and water. Aromatic solvents should not be used, as they will impair the transparency of the window.)
5. Check the hub cap for external oil marks. The vent plug will normally weep a small amount of oil. Oil marks in other locations should be addressed by replacing the hub cap seal, window gasket, or tightening the pipe fill plug.

CAUTION

Do not remove or twist the red plug on the front of the hub cap. This will damage the hub cap, and cause oil to leak. Add oil only thru the pipe plug or warranty will be void.

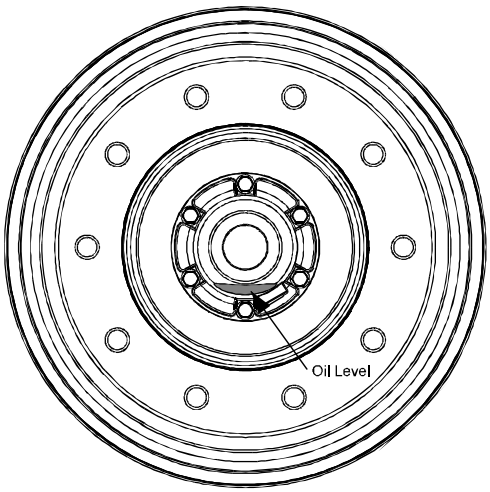


Figure 5 – Wheel Bearing Oil Level

SYMPTOMS	POSSIBLE CAUSES	REMEDIES
Tires wear out quickly or have uneven tire tread wear **Note:** *Wear pattern will indicate possible cause(s). Consult tire manufacturer for guidance.*	Tires have incorrect pressure	Put specified air pressure in tires
	Tires out of balance	Balance or replace tires
	Incorrect toe-in setting	Adjust toe-in to specified setting
	Incorrect ride height	Adjust ride height to specified setting
	Incorrect rear axle alignment	Align rear axle to specified thrust angle
	Incorrect steering arm geometry	Adjust tie rod lengths as required
	Improper (mismatched) tires and wheels	Install correct tire and wheel combination
Vehicle is difficult to steer **Note:** *Engine must be running for power steering to be active and able to provide steering assist.*	Improper oversized tires	Install correct tire and wheel combination
	Tires not uniform	Install correct tire and wheel combination
	Tires have incorrect pressure	Put specified air pressure in tires
	Incorrect steering arm geometry	Adjust tie rod lengths as required
	Steering arms binding	Check steering arm bearings and lubricate as needed
	Steering arm ball joints binding	Inspect ball joints for wear and replace as required
	Tie rod ends binding	Inspect tie rod ends for wear and lubricate as needed
	Kingpin binding	Inspect, lubricate, and repair as required
	Steering column linkage binding	Align or adjust as required
	Steering miter box binding	Check steering miter box and repair or replace as required
	Steering gear valve binding	Inspect, repair or replace as required
	Steering wheel to column interference	Align or adjust as required
	Power steering pump fluid level low and/or possible leak in system	Add fluid, tighten connections and correct as needed
	Power Steering pump pressure and flow below specification	Conduct pump flow and relief pressure tests and adjust, repair or replace as needed
	Air in power steering system	Add fluid, tighten connections and bleed system
	Contaminated or incorrect fluid	Replace with correctly specified fluid
	Obstruction with steering gear pitman arm or within hydraulic lines	Inspect, remove obstruction(s) and repair or replace as required
	Obstruction within wheelhouse	Inspect, remove obstruction(s) as required
	Excessive internal steering gear leakage	Inspect, repair or replace as required

TROUBLESHOOTING

SYMPTOMS	POSSIBLE CAUSES	REMEDIES
Vehicle wanders side-to-side…loose steering **Steering wheel has large amplitude, rotational oscillations when hitting large bumps**	Vehicle overloaded or unevenly loaded driver side to passenger side	Check wheel loads and correct as needed
	Improper (mismatched) tires and wheels	Install correct tire and wheel combination
	Tires have incorrect pressure	Put correct air pressure in tires based on wheel load
	Incorrect toe-in setting	Adjust toe-in to specified setting
	Incorrect wheel caster setting	Adjust wheel caster to specified setting
	Tie rod end connection loose or ball stud worn	Inspect ball stud connections and wear
	Steering arm mounts loose	Check and tighten to specification
	Steering arm ball joints binding or worn	Inspect ball joints for wear or contamination and replace as required
	Kingpin worn	Check and replace as required
	Wheel bearings out of adjustment	Check wheel bearing end play and adjust as required
	Loose steering gear mounting	Check mounting and secure as needed
	Excessive steering gear lash	Check and adjust as required
	Loose pitman arm	Check pitman arm and tighten as required
	Steering miter box binding	Check steering miter box and repair or replace as required
	Steering column linkage worn	Check for wear and repair or replace as needed
	Steering column misaligned	Realign steering column as required
	Worn knuckle carrier bearings	Check, adjust or replace as needed
	Loose knuckle carrier mounting bolts	Check and tighten as needed
	Loose wheel nuts	Check and tighten to specification
Vehicle pulls to one side without the brakes applied	Vehicle overloaded or unevenly loaded driver side to passenger side	Check wheel loads and correct as needed
	Improper (mismatched) tires and wheels	Install correct tire and wheel combination
	Tires have incorrect pressure	Put correct air pressure in tires based on wheel load
	Unequal ride height side to side	Inspect ride height and adjust to specified setting
	Improper brake adjustment	Inspect and adjust as required
	Incorrect rear axle alignment	Align rear axle to specified thrust angle.
	Incorrect caster and/or camber setting	Check and adjust as required
	Wheel bearings out of adjustment	Check wheel bearing end play and adjust as required
	Loose steering gear mounting	Check mounting and secure as needed
	Tie rod end connection loose or ball stud worn	Inspect ball stud connections and wear
	Bent spindle or steering arm	Inspect and replace as required
	Frame or underbody out of alignment	Inspect and correct as required
	Incorrect toe-in setting	Adjust toe-in to specified setting
	Misaligned belts in radial tires	Check and replace as needed
	Steering gear valve binding	Inspect, repair or replace as required
	Steering gear not centered	Inspect and adjust as required
	Excessive internal steering gear leakage	Inspect, repair or replace as required
	Excessive water puddling on road	Avoid water puddles on road

TROUBLESHOOTING

SYMPTOMS	POSSIBLE CAUSES	REMEDIES
Vehicle pulls to one side with the brakes applied	Grease, oil or dirt on brake linings	Replace brake linings as required
	Brake linings are glazed	Deglaze brake linings by burnishing or replace as required
	Brake linings are not a balanced set, different friction codes or lining brand	Replace brake linings as required
	Loose or broken brake linings	Replace brake linings as required
	Uneven brake adjustment side to side	Adjust as required
	Different brake air chamber size or slack adjuster length side to side	Replace with same size brake air chambers and length slack adjusters
	Brake chambers air pressure uneven side to side	Check side-to-side air pressure and correct as needed
	Rear axle brakes misadjusted or contaminated	Check, adjust or replace as required
	ABS system malfunction	Check ABS system for proper function
	Air leak or obstruction in air brake lines	Check fittings with soapy water solution and remove obstructions
	Brake air chamber air leak or diaphragm damaged	Check chamber for air leak and damaged diaphragm
	Excessive water puddling on road	Avoid water puddles on road
Vehicle rolls side to side excessively	Front and/or rear shock absorbers worn	Replace shock absorbers as needed
	Shock mounting loose	Check and tighten as required
	Shock eye bushings worn	Check and replace as needed
	Sway bar bushings worn	Check sway bar bushings and replace as needed
	Sway bar mounting brackets loose	Check sway bar mounting brackets and tighten as needed
	Control arm pivot bushings worn	Inspect and replace as required
	Internal leak in height control valve	Check height control valve and replace as required
Front tires lock up during hard braking or ABS malfunction light remains lit	ABS sensor malfunction	Inspect ABS sensor installation and replace sensor as required
	ABS CPU or system malfunction	Check and repair or replace as required
	ABS sensor electrical connection faulty	Check ABS sensor connection and lead wire
	Tone ring on hub damaged	Check for damage and replace as required

TROUBLESHOOTING

SYMPTOMS	POSSIBLE CAUSES	REMEDIES
Vehicle ride is too harsh and/or suspension contacts stops excessively	Front shock absorbers worn	Replace shock absorbers as needed
	Incorrect ride height	Adjust ride height to specified setting
	Vehicle overloaded	Check wheel loads and correct as needed
	Air spring supply lines leaking or obstructed	Check air line connections and remove obstructions
	Vehicle system air pressure below specification	Check air pressure and correct as needed
	Jounce bumper in air spring worn or broken	Check and replace air spring as required
Vehicle ride is too soft	Front shock absorbers worn	Replace shock absorbers as needed
	Incorrect ride height	Adjust ride height to specified setting
Vehicle has unequal turning radius right to left	Incorrect steering arm geometry	Adjust tie rod lengths as required
	Steering gear not centered	Inspect and adjust as required
	Steering gear poppet valves set incorrectly	Check wheel turn angles and adjust as required
	Tie rod clamps positioned improperly	Check orientation and adjust as needed
Suspension does not maintain ride height	Air leak	Check connections with soapy water solution and repair or replace as needed
	Internal leak in height control valve	Check height control valve and replace as required
	Height control valve linkage loose	Check and tighten linkage as needed
	Air spring chafed or worn	Check air spring and replace as needed
Brakes are noisy	Grease, oil or dirt on brake linings	Replace brake linings as required
	Brake linings are glazed	Deglaze brake linings by burnishing or replace as required
	Brake linings are not a balanced set, different friction codes or lining brand	Replace brake linings as required
	Loose or broken brake linings	Replace brake linings as required

Refer to Bendix Disc Brakes manual BRIP-0300 for troubleshooting of the disc brakes or contact Customer service at 1-800-AIR-BRAKE (1-800-247-2725)

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General Inspection

Perform a through visual inspection of the suspension to ensure proper assembly and to identify broken parts and loose fasteners each time the vehicle suspension is serviced. Do the following during an inspection

- Wheel Alignment - Follow the guidelines in the Front Wheel Alignment section for wheel alignment inspection intervals. Check wheel alignment if excessive steering effort, vehicle wanders, or if abnormal tire wear is evident.
- Fasteners - Check that all the fasteners are tightened to the proper tightening torque. Use a calibrated torque wrench to check torque.
- Wear and Damage - Inspect components of the suspension for wear and damage. Look for bent or broken components. Replace all worn or damaged components.
- Operation - Check that all components move freely through the complete wheel turning arc.

CAUTION

Reyco Granning® recommends replacing any damaged or out-of-specification components. Reconditioning or field repairs of front suspension components is prohibited. Some cast components are heat-treated. These components as well as other non-heat treated castings cannot be bent, welded, heated, or repaired in any way without reducing the strength or life of the component thus voiding the warranty. Only genuine

ReycoGranning® replacement parts are allowed parts are allowed

WARNING

Never work under a vehicle supported by only a jack(s). Jacks can slip or fall over and cause serious personal injury. Always use safety stands. Do not place jacks or safety stands under the lower control arms to support the vehicle. Lower control arms are not stationary components and could move allowing the vehicle drop causing serious personal injury.

The vehicle may be supported on safety stands by the suspension sub-frame or chassis frame for inspections that require removal of the wheel and tires or deflation of the air springs. Always secure the vehicle by setting the parking brake and block the drive wheels to prevent vehicle movement before inspections.

Inspecting Control Arm Bushings

NOTE It is recommended that the bushings in all of the control arms be replaced at the same time if one is found worn.

1. Check clearance between each control arm and sub-frame bushing mount. Look for contact pattern as evidence of bushing wear. Replace worn bushings in both control arm housings as needed.

2. Check for bushing bulging between the control arm and sub-frame mount or presence of small rubber particles near subframe bushing mount
3. Check that the control arm mounting bolts are tight. Recommended torque is **460-490 lb-ft** for lower control arms and **950-1050 lb-ft** for upper control arms (See Torque Table).A loose joint will result in wear between the bushing inner sleeve and sub-frame mount.

Inspecting Tie Rod Ends

WARNING

Do not use a wrench or other object to apply leverage when inspecting tie rod end sockets. Applying leverage can yield incorrect results and damage components. Component damage can lead to the loss of steering control.

1. With the engine on, lightly rock the steering wheel and have an assistant observe any looseness in the two mating tapers or any movement of the stud nut at both ends of the tie rod. **(Figure 6)**. If looseness is found in either place go to step 2, otherwise skip to step 3.
2. Remove the tie rod end ball stud from the taper mount and visually inspect both. If either of the mating tapers shows distortion or wear, then both components must be replaced. Torque Tie Rod castle nuts to **90-100 lb-ft** (See Torque Table).
3. With the engine off and the wheels steered straight ahead grab the tie rod near its end and try to move the socket in a direction parallel to the ball stud axis **(Figure 6)**. Be sure to only apply hand pressure to the tie rod.
4. Measure the axial movement with a scale. If the movement is greater than 1/8 inch (3mm) replace the tie rod end immediately. If the socket moves but the movement is less than 1/8 inch (3mm) then the tie rod end should be replaced before 1/8” (3mm) movement occurs.
5. Check dust boot for damage. Replace as needed.
6. Check the tie rod clamp orientation **(Figure 6).**

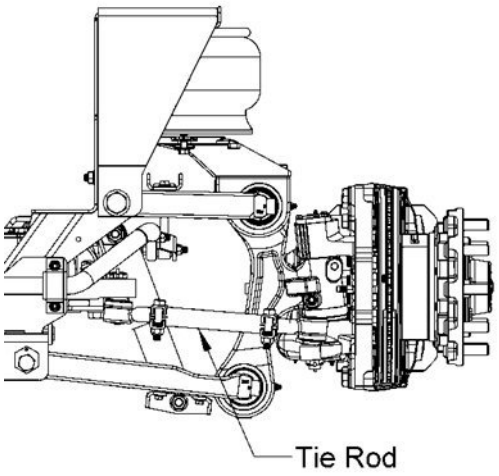


Figure 6 – Tie Rod

Inspecting the ABS Sensor and Tone Ring

1. The tires may be removed if needed to ease inspection of tone ring and sensor.

2. Disconnect the ABS sensor lead from the chassis connector.
3. The ABS sensor test will require a voltmeter that can measure AC voltage on a millivolt scale.
4. Connect the voltmeter to the connector pins of the ABS sensor lead.
5. Set the voltmeter scale to millivolts and the voltage source to AC volts.
6. Rotate the wheel hub by hand and record the voltage output from the ABS sensor. A minimum output of 800 millivolts is normal.
7. If the minimum voltage output is not achieved, check lead wire connections and repeat Steps 3-6. Otherwise, if the minimum voltage output is not achieved after repeating Steps 3-6 then continue with Step 8.
8. Check physical gap between the sensor and tone ring **(Figure7)**.The maximum allowable gap is .027 inch. If the gap is greater than .027 inch, press on the wire lead end of the sensor and push the sensor into contact with the tone ring. Check that the ABS spring retainer and bushing are not unseated. Re-seat components as needed.
9. Inspect the tone ring on the hub for physical damage and proper installation onto the hub. The tone ring should have a maximum run out of .008 inch relative to the hub/spindle centerline.
10. Repeat Step 3. If voltage output is less than 800 millivolts then replace the ABS sensor (Note: Check voltage output of new sensor).

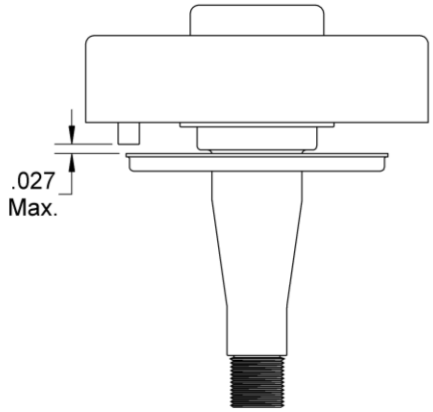


Figure 7 – ABS Sensor & Tone Ring Gap

Inspecting the Shock Absorber

1. Check shock absorbers for oil leakage (light film of oil or misting), bent components, missing or broken components, excessive corrosion, or worn bushings. Replace shock absorbers if any of the above items is present.

Inspecting the Air Spring and Height Control Valve

Air Spring Inspection

1. Refer to Firestone's Preventative Maintenance Checklist for additional air spring information.
2. Check the outside diameter of the air spring for irregular wear or heat checking.
3. Check airlines to make sure contact does not exist between the airlines and the outside diameter of the air spring. Re-secure airlines to prevent contact as needed. Check for airline and fitting leaks with soapy water solution.

4. Check to see that there is a minimum of 1-inch clearance around the circumference of the air spring while it is energized with air.
5. Check the air spring piston for buildup of foreign material. Remove any foreign material that is present.

Height Control Valve Inspection

1. Check the height control valve and linkage for damage. Replace components as needed.
2. Dump and re-inflate the air suspension.
3. Verify the ride height by measuring from wheel center to the bottom of the frame (“A”) or air spring height (“B”). If the dimensions are not within +/-.125” of **(Figure 8)**, readjust.
4. The actuation arm of the height control valve should be horizontal at ride height (Figure 8). See section for adjusting to correct ride height.

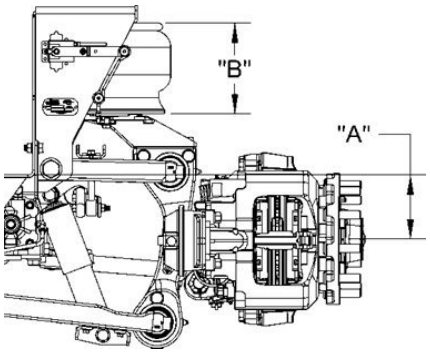


Figure 8 – Ride Height Measurement

Model	Ride Height “A”	Air Spring “B”
IFS1660S3	6.60”	9.25”
IFS1700S3	6.60”	9.25”
IFS1800S3	6.60”	9.25”
IFS2000S3	6.60”	9.25”

Table 5– Ride Height Dimensions

Inspecting the Steering Arm and Relay Rod Ball Joints

Seal Inspection

1. Inspect the ball joint seal outer surface for presence of oil “wetting”. The entire outer seal surface should be dry. Use a mechanics mirror and flashlight to inspect the entire seal. Use a blunt object as needed to inspect between seal convolutes.
2. If oil “wetting” is found, then inspect the entire wet area to confirm the seal has a rupture(s) and oil source is from internal grease leaking from the ball joint. If seal is ruptured, then the ball joint must be replaced.
3. Skip ball joint endplay measurement.

NOTE Care must be taken to not damage ball joint seals during inspection. Seals that are ruptured during inspection must be replaced. Do not apply excessive force to pry ball joints.

Endplay Inspection

1. Install a dial indicator with a magnetic base so that the base is fixed to the steering arm. Place the indicator tip on the flat area of the relay rod adjacent the castle nut.
2. Using a C-clamp, squeeze the relay arm and the steering arm together to seat the ball joint. Do not apply excessive clamp load.
3. Set the dial indicator on “zero”.
4. Release the clamp. Place the pry bar between the steering arm and the relay arm. **Do not allow the pry bar to contact the ball joint seal.** Firmly pry upward using the steering arm as a fulcrum to lift the relay arm. The pry load must not cause the relay arm to rotate thus causing the relay to change orientation.
5. Record the dial indicator reading. A reading greater than .040” will require ball joint replacement.
6. Inspect ball joint seal for damage and replace the ball joint if damaged during measurement process

Inspecting Wheel Bearing Endplay

1. Remove the hubcap, tire and wheel.
2. Attach a dial indicator with a magnetic base to the face of the hub or brake rotor.
3. Place the tip of the dial indicator on the center of the steering knuckle spindle. Set the dial indicator on zero **(Figure 9).**

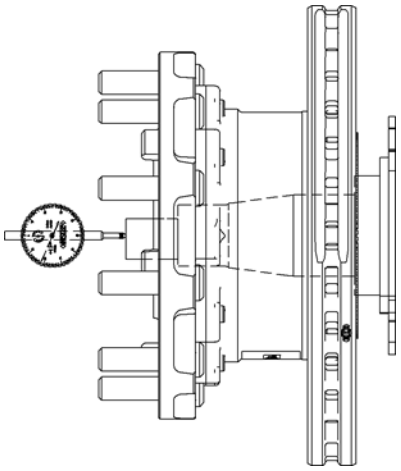


Figure 9 – Wheel End Play Measurement

NOTE: Do not push/pull at the top and the bottom of the tire, rotor, or hub. Pushing or pulling at the top and the bottom will not yield a true measurement of the endplay.

4. Measurethe endplay by simultaneously pushing/pulling on each side of the rotor or hub while observing the dial indicator. The endplay is the total travel observed. If the endplay is not within .001-.005”, see the section on adjusting the wheel bearing endplay.
5. Install the wheel and tire with wheel nuts tightened to the specified torque of **450-500 lb-ft** (See Torque Table)

Inspecting the Knuckle Carrier Bearing and Seal

1. Inspect the seals for damage.
2. Place the magnetic base of a dial indicator on the knuckle carrier and position the tip of the dial on the end of the bar pin such that axial movement can be measured.
3. Set the dial indicator to “0” (zero).
4. Place a pry bar between the control arm and carrier and pry to measure axial movement of the bar pin. Do not pry on seal. Measure and record the dial indicator reading.
5. If the axial endplay is more than .002 inch, then replace the carrier bearings. See repair section on knuckle carrier.

Inspecting the Kingpin Vertical Endplay

1. Steer the unit straight ahead.
2. Place the magnetic base of a dial indicator on the knuckle carrier and position the tip of the dial on top of the king pin bearing cap such that vertical movement can be measured.
3. Place a portable jack and a suitable block (one with clearance for the grease fitting) under the lower king pin grease cap area.
4. Set the dial indicator to “0” (zero).
5. Raise the jack until the dial indicator shows the end of vertical travel. Measure and record the dial indicator reading. Vertical inspection clearance must be .006-.012 inches.
6. If the steering knuckles binds or less than .001 inch endplay is measured, remove shims from the shim pack. See repair section for kingpin.
7. If the vertical endplay measurement is more than .012 inches, then install shims. See repair section for kingpin.

Inspecting the Steering Gear Sector Lash

1. Steer the unit straight ahead and verify alignment of the timing marks on the steering gear.
2. Separate the pitman arm from the relay rod at the ball joint.
3. Using the pitman arm, feel for lash at the sector gear, no lash should be felt.
4. If lash is felt, the steering gear requires adjustment per TRW Steering Gear Manual TRW1108. See the TRW website at www.trw.com for more information

CAUTION

Lash Adjustment should be performed by trained personnel only. Improper adjustment may cause premature gear failure or loose steering.

Adjusting Wheel End Play (PRO-TORQ® style only)

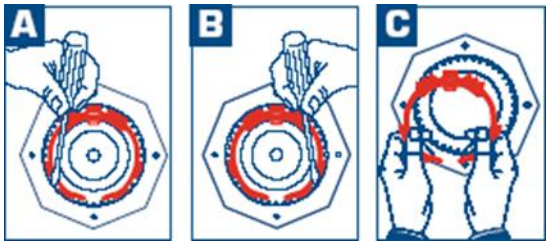
WARNING

Never work under a vehicle supported by only a jack(s). Jacks can slip or fall over and cause serious personal injury. Always use safety stands. Do not place jacks or safety stands under the lower control arms to support the vehicle. Lower control arms are not stationary components and could move allowing the vehicle drop causing serious personal injury.

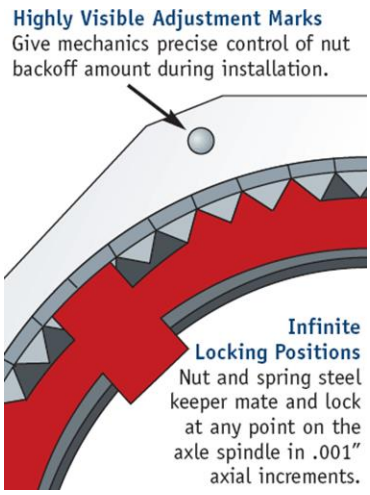
WARNING

Failure to follow this instruction could cause the wheel to come off and cause bodily injury. The PRO-TORQ® Spindle Nut is sold as an assembly with the keeper in place. DO NOT attempt to place the nut on the spindle or tighten or loosen the nut on the spindle while the keeper is locked inside the nut. Doing so may deform the keeper and allow the nut to unthread during operation.

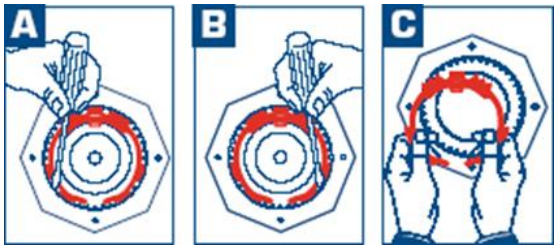
1. Secure the vehicle by setting the parking brake and block the drive wheels to prevent vehicle movement.
2. Raise the vehicle until the front wheels are off the ground. Support the raised vehicle with safety stands.
3. Place an oil drip tub beneath the hub to catch oil. Rotate the hub such that the hubcap drain plug is facing upwards. Remove the drain plug from the hubcap and place it in a container for re-installation.
4. Rotate the hub such that the drain hole faces downward and drain the oil from hub cavity. Wait a few minutes for most of the oil to drain before continuing to the next step.
5. Remove the hubcap bolts, hubcap, and gasket. Take care not to damage the gasket for re-installation. Place the components in a location to prevent contamination. Note that solvents may damage the hubcap window.
6. Remove the keeper from the nut.



7. A, B, C Use a small screwdriver to carefully pry the keeper arm from the undercut groove on each side until the keeper is released.
8. Seat the bearing, with the hub or hub and drum only using a torque wrench.
9. Tighten the nut to **200 lb-ft** Spin the wheel at least one full rotation
10. Repeat step #9 two more times
11. Back the nut off until it is loose.
12. Adjust the bearing by tightening the nut to **100 lb-ft**. Spin the wheel at least one full rotation.
13. Repeat step #12 two more times
14. Back the nut off one raised face mark (1/4 turn)



15. Install the keeper with the orange side facing out.
16. Align the flat of the keeper with the milled flat on the spindle and insert the single keeper tab into the undercut groove of the nut. Install the keeper with the orange side facing out.
17. Engage the mating teeth



18. Compress and insert the keeper arms, one at a time, into the undercut groove with a small screwdriver.
19. Verify the end play
20. Attach a dial indicator with a magnetic base to the face of the wheel, hub, or brake rotor. The dial indicator may also be attached to the bottom of the brake rotor if the wheel is removed.
21. Place the tip of the dial indicator on the center of the steering knuckle spindle. Set the dial indicator on zero.
22. Measure the endplay by simultaneously pushing/pulling on each side of the tire, drum, or hub while observing the dial indicator. The endplay is the total travel observed. If the endplay is not within .001-.004", a readjustment will be required.
23. Install hubcap gasket and hubcap. Tighten the cap screws to **20-30 lb-ft** (See Torque Table). Replace the hubcap vent plug if removed.
24. Fill the hub cavity with the appropriate amount and type of lubricant and secure drain plug
25. Check oil level through the hubcap window (**Figure 5**). If level is below the "add" level line, then fill with recommended oil until "full" level is achieved. Add oil slowly since the heavy weight oil will settle slowly in the hub.

NOTE: The hubcap window can only be cleaned with mild soap and water. Aromatic solvents should not be used, as they will impair the transparency of the window.)

26. Check the hubcap for external oil leakage at the drain plug or gasket. For leaks at the drain plug check for application of thread sealant to threads and tightness. For leaks at the gasket, replace the gasket. The vent plug will normally weep a small amount of oil.

Adjusting Suspension Ride Height

The height control valve (HCV) or height sensor and linkage should be checked regularly for proper clearance, operation and adjustment.

NOTE: For electronic HCVs follow instructions from the chassis manufacturer.

NOTE: Improperly adjusted ride height will result in incorrect wheel alignment measurements and may result in abnormal tire wear. Check the ride height prior to front suspension alignment.

The ride height of the front suspension is the distance from the bottom of the chassis frame rail to the center of the wheel spindle. An alternate measurement may be taken as the height of the air spring (**Figure 10**).

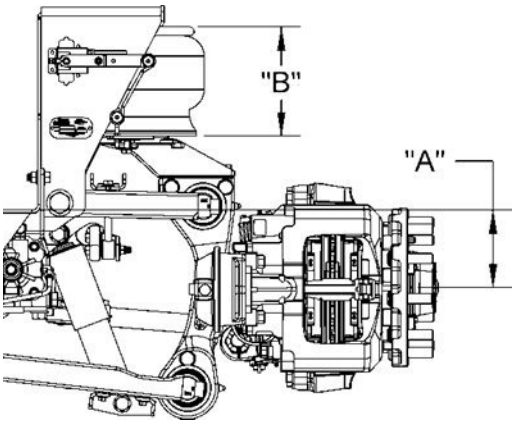


Figure 10 – Measurement at Ride Height

Model	Ride Height "A"	Air Spring "B"
IFS1660S3	6.60"	9.25"
IFS1700S3	6.60"	9.25"
IFS1800S3	6.60"	9.25"
IFS2000S3	6.60"	9.25"

Table 6 – Measurement at Ride Height

Properly adjusted ride height results in correct suspension travel and alignment. The ride height should not be adjusted to adjust chassis rake angle.

CAUTION

Adjusting the ride height can cause the front end to raise or lower unexpectedly due to vertical movements at the connection of the vertical link and the horizontal arm of the height control valve.

1. Park the vehicle on a level surface.
2. Exhaust or "dump" and re-inflate the air suspension. Allow the Suspension to settle.
3. Check ride height of rear suspension:

   A: On vehicles with front suspension equippedwith (2) height control valves, check and adjust the rear suspension first.

   B: On vehicles with front suspension equipped with a single height control valve, check and adjust the rear suspension after finish adjusting the front.
4. Measure either the wheel center to bottom of frame ("A") or air spring height ("B"). If the dimensions are not within ±1/8" of measurements in **Table 6**, adjust as follows:

   A: Loosen the height control valve linkage stud retaining nuts.

   B: Raise or lower the L-shaped linkage stud as necessary.

   C: Tighten the retaining nuts. Note: It is recommended that the upper and

lower studs be positioned parallel to each other. **Torque to 8-12 lb-ft.**

5. After adjusting the length, it is recommended to dump and re- inflate the air suspension to check adjustment. Allow the suspension to settle.

6. If not already completed, adjust the rear suspension per manufacturer's recommendations.

7. Verify at each axle that the side-to-side ride heights are within .25" of each other.

Adjusting the Maximum Wheel Turn Angle

CAUTION

Do not adjust maximum wheel turn angle greater than 55°. Maladjustment of the wheel turn angle can cause damage to steering system components.

The turn angle may require adjustment if the front tires rub against the frame, suspension, body, or the steering gear has been serviced or replaced. Use an alignment machine to check the wheel turn angle. See the measurement procedure of the alignment machine manufacturer.

The steering stop bolt on the steering knuckle controls the maximum turn angle. If the stop bolt is missing, bent, or broken; replace the stop bolt(s) or jam nut(s) and follow the procedure below for adjustment. Inspect other suspension components for damage.

CAUTION

In power steering systems, the hydraulic pressure should relieve or "drop off" when the steered wheels approach the steering stops in either direction. If the pressure does not relieve, the components of the front suspension may be damaged.

If the steering stop bolts are adjusted to reduce wheel turn angle, the steering gear poppet valves will require readjustment. If the poppets are not re- adjusted properly, then the steering gear will not reduce power assist properly and steering components will be damaged. Refer to TRW's TAS Steering Gear Service Manual for readjusting the poppets.

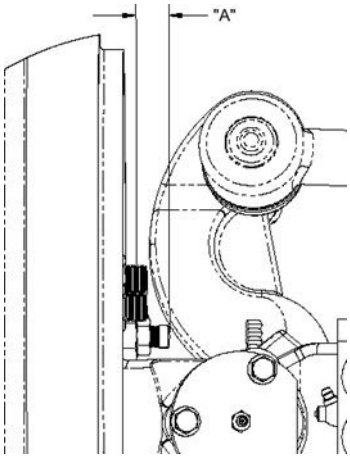


Figure 11 – Steering Stop Bolt

Model	Steering Stop Length "A"
IFS1660S3	1.38"
IFS1700S3	1.38"
IFS1800S3	1.38"
IFS2000S3	1.38"

Table 7 – Steering Stop Dimension

1. Drive the front tires on a suitable device that allows the front wheels to turn and measures the wheel turn angle
2. Secure the vehicle by setting the parking brake and block the drive wheels to prevent vehicle movement
3. Check that the steering gear is centered and the tires are steered straight ahead with equal toe-in side to side. If either of these two conditions is not met, then adjust toe- in first before centering the steering gear. See Adjusting the Toe-In Section and refer to Chassis Builder's chassis service guidelines for centering the steering gear.

NOTE: Unequal toe-in side to side or an out-of-center steering gear can result in unequal turn angles and steering pull while steering straight ahead. Do not adjust the length of the tie rods to center the steering wheel. This can cause the steering gear to become off center.

4. Check that the lengths of the outer tie rods are equal to each other within 1/8 inch. If not, adjust lengths according to the adjusting the toe- in section before adjusting the steering stops.
5. Turn the steering wheel until the steering stop bolt contacts the knuckle carrier or the steering wheel stops turning. Measure the turn angle of the wheel on the same side as the direction of turn.
6. If the wheel turn angle differs from chassis guidelines then adjust as follows.
7. Loosen the jam nut on the stop bolt.
8. Turn the stop bolt until the specified wheel turn angle is achieved and the bolt head contacts the knuckle carrier.
9. Tighten the jam nut to 50-75 lb-ft(See Torque Table).
10. Repeat checking and adjustment for turning the opposite direction.

CAUTION

After readjusting the steering stop(s) check that the steering poppets are reset properly and that the front tires do not contact the frame, suspension, or body. Also check that other components are not abnormally contacting one another.

Inspection Before Alignment

NOTE: Improperly adjusted ride height will result in incorrect wheel alignment measurements and may result in abnormal tire wear. Check the ride height prior to front suspension alignment.

See the General Inspection section and check the following before conducting front wheel alignment measurements.

Wheels and Tires

1. Check that the front tires are inflated to the appropriate pressure based on the tire loading.
2. Check that the front tires are the same size and type.
3. Check that all the wheel nuts are tightened to the specified torque of **450-500 lb-ft** (See Torque Table).

4. Check that the wheel and tire assemblies are balanced.

Front Suspension

1. Check that all fasteners are tightened to the specified torque.
2. Check the suspension ride height and adjust as needed to the specified height.
3. Check for worn ball joints, tie rod ends, steering arm bearings, control arm bushings, knuckle carrier bearings, and damaged suspension components. Replace worn components as needed.
4. Check for loose ball joint and tie rod end tapered connections, tie rod end jam nuts, steering arm mounts, and chassis steering system components. Inspect connections for wear and replace as needed. Tighten connections as needed.
5. Check the wheel bearing adjustment and adjust as needed.
6. Inspect the shock absorbers for wear and damage.

Rear Axle and Suspension

Front tire wear and incorrect steering can be caused by the rear axle and/or suspension.

1. Check that all fasteners are tightened to the specified torque.
2. Check the suspension ride height and adjust as needed to specified height.
3. Check that all connection joints between the suspension and axle are secure.
4. Check for worn suspension bushings or damaged suspension components.
5. Check that the rear axle is correctly aligned.
6. Check that the frame is not bent.
7. Refer to any additional recommendations and specifications from the manufacturer of the chassis on rear axles and suspensions.

NOTE: Total vehicle alignment is recommended when aligning the front suspension.

Front Wheel Alignment

Equipment

Reyco Granning LLC recommends that suitable alignment equipment be used to measure the wheel alignment characteristics: camber, caster, and toe-in. The alignment equipment must be properly calibrated for accurate measurements. Only qualified personnel should conduct the wheel alignment measurements.

General

The overall toe-in of the front wheels should be checked every 24,000 miles or 2 years. When the vehicle does not steer correctly or the front tires develop an abnormal tire wear pattern, the camber, caster, and toe-in should be measured and adjusted as needed. Toe-in typically has the largest effect on tire wear.

The maximum wheel turn angle should be checked and adjusted as needed.

Eccentric adapters are installed in the lower control arm mounts. The purpose of the adapters is to provide

additional adjustment of camber and caster to minimize vehicle drifts or pulls to one side of the road.

The lower bar pin of the knuckle carrier bearing marked with a “B” may also be used to provide additional camber adjustment.

Preparation

1. Follow the alignment equipment manufacturer’s procedures for preparing the vehicle for front and rear wheel alignment measurements.
2. Secure the vehicle by setting the parking brake and block the drive wheels to prevent vehicle movement.
3. Check that the steering gear is centered when the tires are steered straight ahead (i.e. equal toe-in side to side). Center the steering gear according to Chassis Builder’s guidelines.

NOTE: An out-of-center steering gear can result in unequal wheel turn angles. The steering gear should remain centered during toe-in adjustment. Do not adjust the length of the tie rods to center the steering wheel. This can cause the steering gear to become off center.

4. Measure and record the individual wheel camber, caster, and toe-in of the front suspension. Also measure and record the cross camber cross caster, and overall toe-in.
5. If adjustment to camber and caster is required then follow the steps below. Otherwise, go to the “Adjusting the Toe-In” section to adjust the toe-in as needed.

WARNING

Never work under a vehicle supported by only a jack(s). Jacks can slip or fall over and cause serious personal injury. Always use safety stands. Do not place jacks or safety stands under the lower control arms to support the vehicle. Lower control arms are not stationary components and could move allowing the vehicle drop causing serious personal injury.

6. Raise the vehicle until the front wheels are off the ground. Support the raised vehicle with safety stands.

Adjusting the Camber Angle

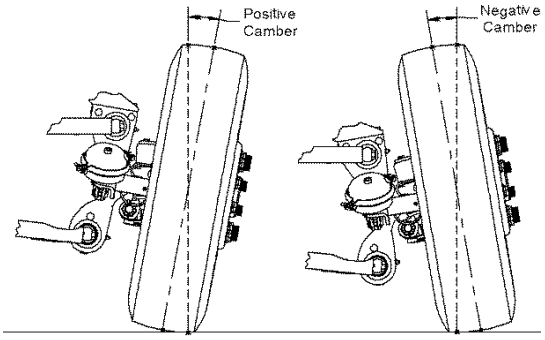


Figure 12 – Camber Angle

CAUTION

Do not alter components to adjust the camber.

Camber is the angle of the wheel with respect to the ground as viewed from the front or rear of the vehicle. **(Figure 12)**. Camber is positive when the distance between centers of the front wheels at top is greater than the distance at the ground.

The wheel camber angle is affected by the ride height of the suspension. If the ride height is set too high, then the camber measurement will be more positive. See the inspecting and adjusting suspension ride height sections before measuring camber.

The table below lists the recommended camber angles.

Nominal Camber Values-Degrees		
	Unloaded	Loaded
Left	+1/4°(±1/4°)	+1/4°(±1/4°)
Right	+1/4°(±1/4°)	+1/4°(±1/4°)

Eccentric Camber Adjustment

The setscrew in the eccentric adapter denotes the orientation of the eccentricity of the adapter. When the setscrew is in the 12 o'clock position, then the adapter is in the "neutral" position. There are two adapters at each lower control arm mount and they must be oriented the same.

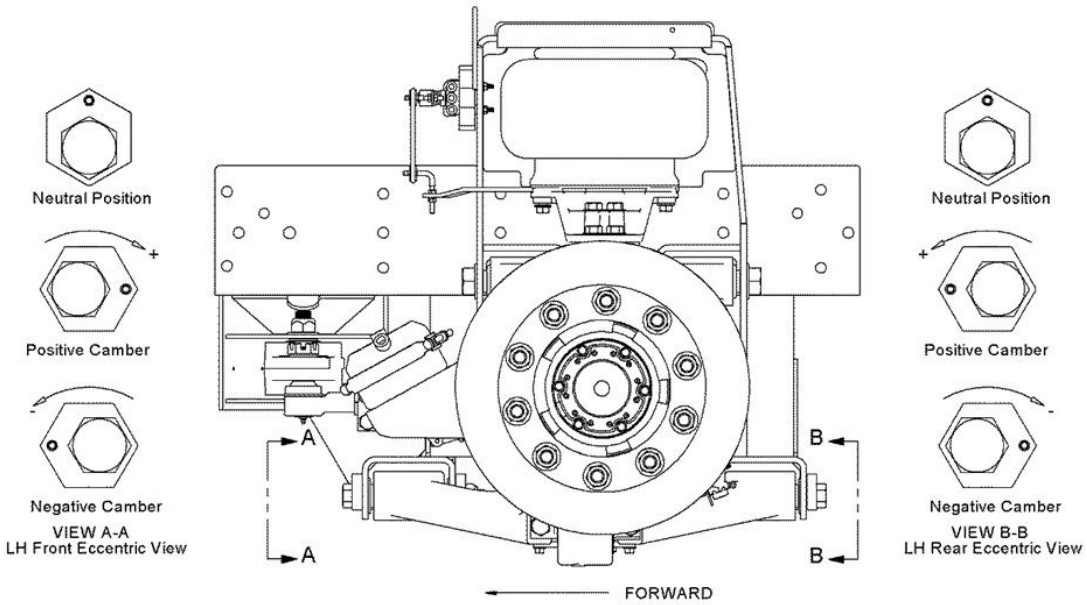


Figure 13 – Eccentric Camber Adjustment

When the setscrews in both lower control arm mounts are oriented closer to the suspension centerline, the tire camber becomes more negative.

When the setscrews in both control arm mounts are oriented farther from the suspension centerline, the tire camber becomes more positive **(Figure13).**The eccentric adapters at both lower control arm mounts must be oriented the same to affect only camber.

1. With the vehicle raised and safely supported, loosen both lower control arm mounting bolts at the eccentric adapters. Do not remove the bolts because the adapters must remain engaged in control arm mounting plate for adjustment.
2. Rotate each eccentric adapter to the same orientation as needed based on measured wheel camber. The eccentric adapters at each control arm mount must have the same orientation.
3. Tighten the adapter locknuts to **460-490 lb-ft** (See Torque Table).
4. Remove the jack stands and lower vehicle completely. Check that the suspension is at the proper ride height.
5. Re-measure the camber and readjust as needed.

Bar Pin Camber Adjustment

The lower bar pin of the knuckle carrier bearing marked with a “B” on the end is configured such that it can be re- oriented to provide camber adjustment. The wheel camber becomes more positive when the lower bar pin is re-oriented such that the “B” is located farthest from the lower control arm (see **Figure 14**).

1. Place a portable jack under the tire to secure and support it.

CAUTION

Do not remove both upper and lower knuckle carrier mounting bolts at the same time. The knuckle carrier must be secured and supported properly if both upper and lower mounting bolts are removed.

NOTE: Lower control arm may move downward due to the internal gas charge in the shock absorber. A portable jack may be needed to align the lower control arm with the knuckle carrier bar pin.

2. Remove the bottom knuckle carrier mounting bolts from the lower control arm. Heat may need to be applied to the control arm to loosen the thread adhesive. The control arm temperature must not exceed 300°F. Do not apply heat directly to the bar pin or mounting bolts.
3. Raise the jack to separate the bar pin from the control arm and re-orient it.

4. Lower the jack to align the bar pin with the control arm. Apply Loctite #242 to mounting bolt threads and tighten to **350-410 lb-ft** for IFS1660S3 & IFS1700S3 Hex Head Bolt, **450-500 lb-ft** for IFS1800S3 & IFS2000S3 Socket Head Cap Screw (See Torque Table)

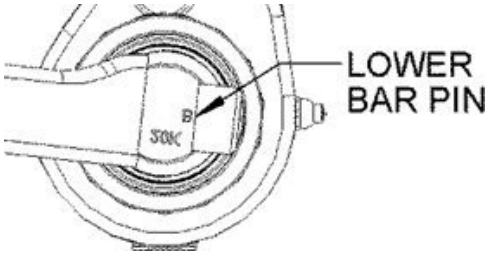


Figure 14 – Bar Pin

Adjusting the Caster Angle

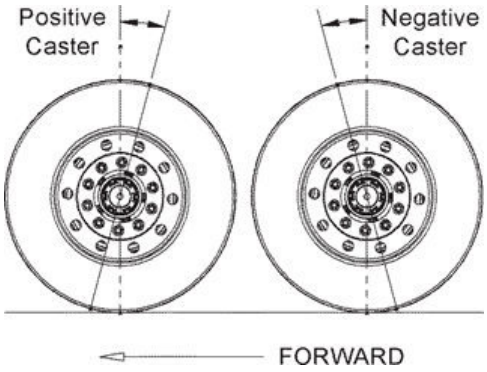


Figure 15 – Caster Angle

CAUTION

Do not adjust the suspension ride height or alter components to adjust the caster.

The caster angle is the angle between a vertical axis and the axis defined by the king pin when viewed from the side of the vehicle. When the king pin axis appears rotated clockwise relative to the vertical axis, then the caster is positive. Positive caster creates a self- aligning moment to stabilize the vehicle when driving straight ahead **(Figure 15)**.

The caster angle is indirectly measured from the change in wheel camber as the wheel is turned through a prescribed turn angle. Therefore, the calculated caster is affected by the ride height of the suspension. See the inspecting and adjusting suspension ride height sections before measuring caster. The table below lists the recommended caster angles.

Nominal Caster Values-Degrees			
		Unloaded	Loaded
Early Model	Left	+3°(+/-1/2°)	+3°(+/-1/2°)
	Right	+3°(+/-1/2°)	+3°(+/-1/2°)
Later Model	Left	+4°(+/-1/2°)	+4°(+/-1/2°)
	Right	+4°(+/-1/2°)	+4°(+/-1/2°)

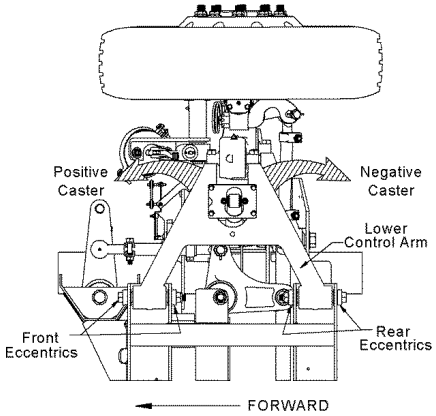


Figure 16 – LCA Movement

Eccentric Caster Adjustment

The setscrew in the eccentric adapter denotes the orientation of the eccentricity of the adapter. When the setscrew is in the 12 o'clock position, then the adapter is in the "neutral" position. There is a pair of eccentric adapters at each individual lower control arm bushing. Each eccentric of a pair must be oriented the same.

When the setscrews in the forward lower control arm mount are oriented closer to the frame rail and the setscrews in the rearward lower control arm mount are oriented farther from the frame rail, the caster becomes more negative **(Figure 16 & Figure 17).**

When the setscrews in the forward lower control arm mount are oriented farther from the frame rail and the setscrews in the rearward control arm mount are oriented closer to the frame rail, the caster becomes more positive.

The eccentric adapters at both lower control arm mounts must be oriented opposite each other to affect caster.

Mid-year 2015, caster was changed from 3.0° to 4.0°. Due to supply-chain timing, units from 2015 to 2016 may fall within the range of these two measurements. If 3.0° caster is not achievable, your unit may be built with 4.0° of caster. If this is the case, please use the 4.0° measurement and tolerance shown in the caster table

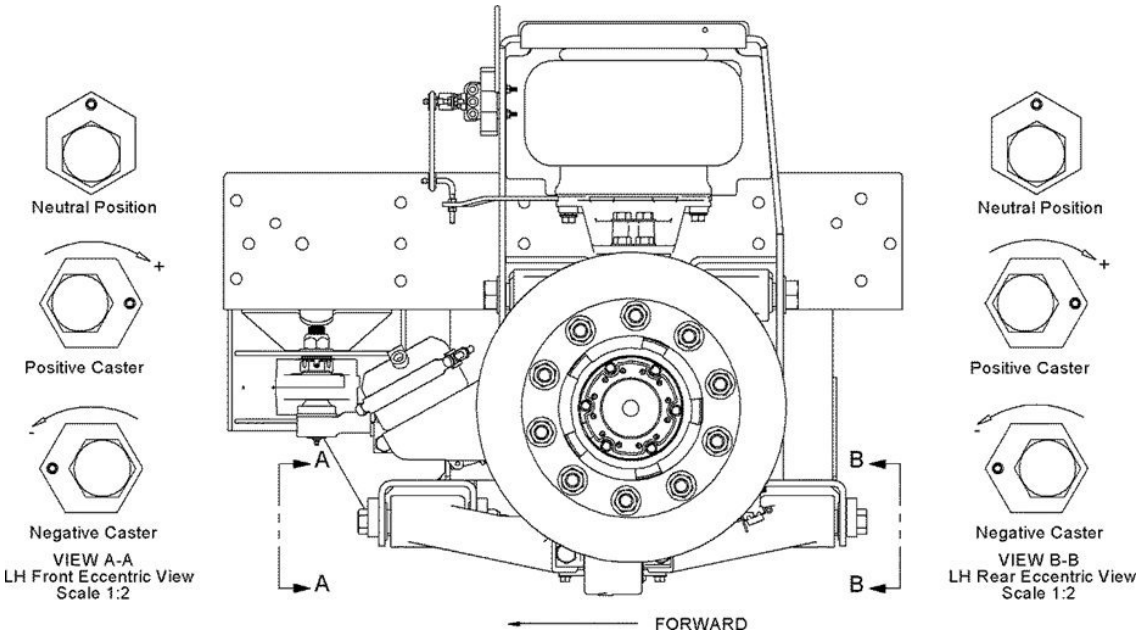


Figure 17 – Eccentric Caster Adjustment

NOTE: Improperly adjusted ride height will result in incorrect wheel alignment measurements and may result in abnormal tire wear. Check the ride height prior to front suspension alignment.

With the vehicle raised and safely supported, loosen both lower control arm mounting bolts at the eccentric adapters. Do not remove the bolts because the adapters must remain engaged in control arm mounting plate for adjustment.

1. With the vehicle raised and safely supported, loosen both lower control arm mounting bolts at the eccentric adapters. Do not remove the bolts because the adapters must remain engaged in control arm mounting plate for adjustment.
2. Rotate the eccentric adapters at the forward and rearward control arm mounts opposite one another as needed based on measured wheel caster. The eccentric adapters at each control arm mount must have the same orientation.
3. Tighten the adapter locknuts to **460-490 lb-ft** (See Torque Table).
4. Remove the jack stands and lower the vehicle completely. Check that the suspension is at the proper ride height.
5. Re-measure caster and readjust, as needed

Adjusting the Toe-In

CAUTION

Do not alter components to adjust the toe-in.

WARNING

Improperly orientated tie rod clamps can cause binding in the suspension steering system.

NOTE: Improperly adjusted ride height will result in incorrect wheel alignment measurements and may result in abnormal tire wear. Check the ride height prior to front suspension alignment.

Wheel toe-in is the relationship of the distance between the centers of the front and rear of the front wheels. When the front distance is less than the rear distance, the wheels are “toed- in”. Toe-in is designed into the suspension to counteract the tendency of the tires to toe-out when the vehicle is driven straight ahead. Incorrect toe-in can result in rapid tire wear.

1. Measure the length of the tie rod assemblies. Reference length is 16.76 inches for all IFS 16Klbs to 20Klbs.
2. If the lengths of the tie rod assemblies are not within 1/8 inch of each other, then adjust their lengths such that they are within 1/8 inch of each other.
3. Loosen the tie rod clamps on each end of the tie rod assembly and turn the center tube to adjust the length.
4. Adjust the length of both tie rod assemblies equally such that the toe- in on each side is 1/16” ± 1/32” and the overall toe-in is 1/8” ± 1/16”.
5. Tighten tie rod clamp nuts to **50-60 lb-ft** (See Torque Table). Refer to **Figure 18** for tie rod clamp position.

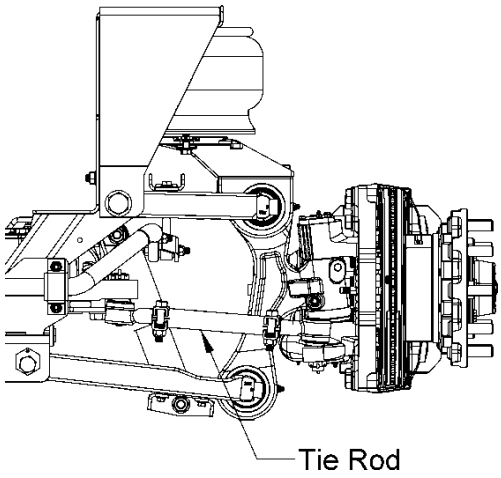


Figure 18 – Tie Rod Clamp Position

General Procedures

Repair or reconditioning of front suspension components is not allowed. Components that are damaged or worn must be replaced. Several major components are heat treated and tempered.

WARNING

The components cannot be bent, welded, heated altered, or repaired in any way without reducing the strength or life of the component and voiding the warranty

The following operations are prohibited on front suspension components.

1. Welding of or to the steering knuckles, control arms, steering arms, knuckle carrier, tie rod assemblies, the brakes, the hubs, and the brake drums.
2. Hot or cold bending of the steering knuckles, control arms, steering arms, knuckle carrier, tie rod assemblies, ball joints, and the sub-frame except control arm and steering arm mounts which may be cold bent to facilitate bushing and bearing replacement.
3. Drilling out control arm and steering arm mounting holes and ball stud tapered holes.
4. Spray welding of bearing diameters on the steering knuckle spindle, steering arm bores and pivot tube. Spray welding of ball studs or tapered holes for the ball joint and tie rod ends.
5. Milling or machining of any component except that control arm bushing bores may be honed to remove any burrs.

WARNING

Never work under a vehicle supported by only a jack(s). Jacks can slip or fall over and cause serious personal injury. Always use safety stands. Do not place jacks or safety stands under the lower control arms to support the vehicle. Lower control arms are not stationary components and could move allowing the vehicle drop causing serious personal injury.

The vehicle may be supported on safety stands by the suspension sub- frame or chassis frame for repairs that require removal of the wheel and tires or deflation of the air springs. Always secure the vehicle by setting the parking brake and block the drive wheels to prevent vehicle movement before performing repairs.

Cleaning the Parts

WARNING

If you use cleaning solvents, hot solution tanks or alkaline solutions incorrectly, serious personal injury can occur. To prevent injury, follow the instructions supplied by the manufacturer. Do NOT use gasoline to clean parts. Gasoline can explode.

Ground or Polished Parts

Use a cleaning solvent to clean ground or polished parts and surfaces. DO NOT clean ground or polished parts with hot solution tank or with water, steam or alkaline solutions. These solutions will cause corrosion of the parts.

Rough Parts

Rough parts can be cleaned with the ground and polished parts. Rough parts also can be cleaned in hot solution tanks with a weak alkaline solution. Parts should remain in the hot solution tanks until they are completely cleaned.

Drying

Parts must be dried immediately after cleaning. Dry the parts with clean paper, clean rags, or compressed air. Do not dry bearings by spinning with compressed air.

Preventing Corrosion

Apply light oil to cleaned and dried parts that are not damaged and are to be immediately assembled. Do NOT apply oil to the brake linings or the brake drums. If the parts are to be stored, apply a good corrosion preventative to all surfaces and place them inside special paper or containers that prevent corrosion. Do NOT apply corrosion preventative to the brake linings or the brake drums/rotors.

Replacing Tie Rod Ends

Removal

1. Remove the cotter pins from the tie rod end ball stud(s).
2. Remove the castle nuts from the tie rod end ball stud(s).

CAUTION

Do not strike the component mating taper directly with a steel hammer. Parts can break and cause serious personal injury. Wear eye protection.

3. Disconnect the tie rod end ball stud from the mating component tapered hole using a suitable tool
4. Inspect the tie rod end ball stud and mating component tapered hole(s). Replace components with worn tapered hole(s). If the grease seal is damaged during removal, replace it before installation.

Installation

1. Clean the mating components tapered hole(s) of any contamination. Insert the tie rod end ball stud into the tapered hole and secure it with the castle nut.

CAUTION

Tighten the castle nuts to the specified torque. If the castle nuts are not tightened to the specified torque, the parts will be damaged and serious personal injury may occur.

2. Tighten the castle nut to **90-100 lb-ft**, then advance castle nut to insert cotter pin. Never loosen castle nut to insert cotter pin.
3. Install the cotter pins.
4. Lubricate tie rod end as needed.

Replacing Pitman Arm or Idler Arm Ball Joint

The thread-in mount type ball joints are installed with a thread adhesive and may require the threads to be warmed to ease removal. If heat is applied to the ball joint threads, the pitman arm or idler arm temperature must not exceed 300°F and the heat should be applied at the bottom of the ball joint base only. Applying heat to the ball joint will damage the ball joint by destroying its internal components as well as the external seal permanently, degrading the lubricant, and restricting ball stud movement.

It is recommended that the appropriate tools be used to remove the ball stud taper from the relay rod and to remove the ball joint base from the pitman arm or idler arm.

Removal

1. Remove the cotter pins from the tie rod end ball stud(s).
2. Remove the castle nuts from the tie rod end ball stud(s).

CAUTION

Do not strike the component mating taper directly with a steel hammer. Parts can break and cause serious personal injury. Wear eye protection.

3. Disconnect the ball joint ball stud from the relay rod tapered hole using a suitable tool.
4. Secure the steering arm and remove the ball joint using a ball joint spanner wrench or similar device on the base. Steering arm may be removed to facilitate ball joint removal. See the steering arm replacement section as needed.
5. Inspect the ball joint stud and relay rod tapered hole(s). replace relay rod if tapered hole(s) are worn

Installation

1. Clean the threaded hole in steering arm of any contamination.
2. Apply thread adhesive Loctite #242 to the ball joint base threads and thread it into the steering arm by hand.
3. Tighten the base of the ball joint to **325-375 lb-ft** (See Torque Table).
4. Clean the relay rod tapered hole(s) of any contamination. Insert the ball joint stud into the tapered hole and secure it with the castle nut.

CAUTION

Tighten the castle nuts to the specified torque. If the castle nuts are not tightened to the specified torque, the parts will be damaged and serious personal injury may occur

5. Tighten the castle nut to **155-170 lb-ft** (See Torque Table).
6. Install the cotter pins. If necessary, tighten the castle nut to align the hole in the ball stud and slots in the castle nut. Do not loosen the castle nut to install the cotter pin.

Replacing the Idler Arm Bearings (1660S3&1700S3)

Replace the idler arm bearings in sets. The replacement bearings should be installed by pressing on the outer raceway only. Pressing on the inner raceway will damage the bearing.

The inner grease cavity of the steering arms should be cleaned when the bearings are replaced.

Removal

1. Follow the procedures for removal of the relay rod from the ball joint in the idler steering arm.
2. Remove the pivot bolt that mounts the steering arm and remove the steering arm from the sub-frame.
3. Remove the retaining rings from the pivot sleeve and remove the sleeve. A rubber or brass hammer may be used to remove the sleeve. Retain shims.
4. Support the steering arm bearing housing and press the bearing out of each end of the steering arm.

Installation

1. Inspect steering arm bearing housing bores and remove burrs by honing. Replace steering arm if the bore is damaged.
2. Inspect the pivot sleeve and remove burrs with emery cloth.
3. Install one retaining ring onto pivot sleeve.
4. Insert the pivot sleeve into the lower bearing. Use a rubber mallet or similar tool to drive the inner sleeve into the bearings such that the bottom-retaining ring is seated against the bottom inner race. Do not use a steel hammer to install the sleeve because bearing raceways can be damaged.
5. Install upper retaining ring. Reseat lower retaining ring against the lower inner race as needed.
6. Determine the number of shims needed by stacking the shims and placing the stack between the upper retaining ring and inner race until a snug fit is achieved. Remove one shim from the stack and this is the number of shims needed. A maximum of six shims may be used.
7. Remove the upper retaining ring, install the shims determined in step 9 onto the inner sleeve at upper inner race, and re-install the upper retaining ring. Check that upper retaining ring is properly seated in the groove of the inner sleeve.
8. Place the steering arm in its mount and install the pivot bolt. Tighten the pivot bolt lock nut to **575-625 lb-ft** (See Torque Table).
9. Follow the procedures for installation of the relay rod or tie rod.

Replacing the Upper and Lower Control Arm Bushings

The sub-frame control arm mounts may require widening to accommodate replacement bushings. A suitable jack may be used to increase the width of the control arm mounts by cold bending. Care must be taken to not exceed 5.00” width after widening. The control arm mounts should

be inspected for damage.

Both control arm bushings and mounting hardware except eccentric adapters must be replaced in a control arm when bushings are serviced. It is recommended to replace the control arm bushings and mounting fasteners in all of the control arms at the same time.

The control arm housings must be properly supported during bushing removal. The bores of the control arm housings may be honed to remove any burrs.

CAUTION

Use of a cutting torch to remove control arm bolts will permanently damage control arm bushings and can result in damage to sub-frame.

It is recommended that the wheel and tire be removed to provide proper accessibility. Disconnect the vertical height control valve linkage from the horizontal arm to prevent unintentional inflation of the air spring.

Upper Control Arm Removal

1. Place a portable jack under the knuckle carrier to secure and support it.

CAUTION

Do not remove both upper and lower knuckle carrier mounting bolts at the same time unless the knuckle carrier is properly secured.

2. Remove knuckle carrier mounting bolts from the control arm. Heat may need to be applied to the control arm to loosen the thread adhesive. The control arm temperature must not exceed 300°F. Do not apply heat directly to the bar pin or mounting bolts.
3. Disconnect sway bar connector at sway bar if so equipped with a sway bar.
4. Loosen and remove control arm mounting locknuts.
5. Support control arm and remove control arm mounting bolts. Remove the control arm.
6. Remove the sway bar bracket and linkage from the control arm and retain for installation.
7. Press the bushings out of the housings. Support the housing properly.

Upper Control Arm Installation

1. Inspect the housing bores and remove any burrs in the housing bores by honing.
2. Press the bushings into the housings using a suitable tool to apply pressure to only the outer metal of the bushing. Support the housing properly.
3. Re-install the sway bar bracket and linkage if removed.
4. Place the control arm in its mount location. Install the control arm mounting hardware and tighten snugly.
5. Orient the control arm at suspension ride height and tighten the bolts to **950-1050 lb-ft** (See Torque Table).
6. Reconnect the sway bar linkage. Tighten mounting bolt to **75-85 lb-ft** (See Torque Table).

7. Apply Loctite #242 to carrier mounting bolt threads and tighten to **370-410 lb-ft** for IFS1660S3 & IFS1700S3 Hex Head Bolt, **450-500 lb-ft** for IFS1800S3 & IFS2000S3 Socket Head Cap Screw (See Torque Table).

Lower Control Arm Removal

1. Place a portable jack under the knuckle carrier to secure and support it.

CAUTION

Do not remove both upper and lower knuckle carrier mounting bolts at the same time unless the knuckle carrier is properly secured.

NOTE: Lower control arm may move downward due to the internal gas charge in the shock absorber. A portable jack may be needed to align the lower control arm with the knuckle carrier bar pin.

2. Remove knuckle carrier mounting bolts from the control arm. Heat may need to be applied to the control arm to loosen the thread adhesive. The control arm temperature must not exceed 300°F. Do not apply heat directly to the bar pin or mounting bolts.
3. Note orientation of lower bar pin in carrier bearing. Raise the jack as needed to separate the bar pin from the control arm.
4. Remove and retain the lower mounting hardware. Shock will extend due to internal gas charge. Rotate bar pin to provide clearance with mounting bracket.
5. Note orientation of eccentric adapters for installation.
6. Loosen and remove control arm mounting locknuts.
7. Support control arm and remove control arm mounting bolts. Retain eccentric adapters for installation. Remove the control arm.
8. Remove spacer tubes from bushings and retain for installation.
9. Press the bushings out of the housings. Support the housing properly. Lower Control Arm Installation

Lower Control Arm Installation

1. Inspect the housing bores and remove any burrs in the housing bores by honing.
2. Press the bushings into the housings using a suitable tool to apply pressure to only the outer metal of the bushing. Support the housing properly.
3. Install the spacer tubes in bushings.
4. Place the control arm in its mount location. Install the control arm eccentric adapters and mounting hardware and tighten snugly. Orient the eccentric adapters the same as before removal.
5. Orient the control arm at suspension ride height and tighten the bolts to **460-490 lb-ft** (See Torque Table).
6. Note orientation of bar pin in carrier bearing. Lower the jack to align the bar pin with the control arm.
7. Apply Loctite #242 to mounting bolt threads and tighten to **370-410 lb-ft** for IFS1660S3 & IFS1700S3 Hex Head Bolt, **450-500 lb-ft** forIFS1800S3 & IFS2000S3 Socket Head Cap Screw (See

Torque Table).

8. Compress shock absorber and connect the lower shock mount to the lower shock bracket using the mounting hardware. Tighten the nuts to **170-190 lb-ft** (See Torque Table).

Replacing Wheel Bearings, Oil Seals & Hub Caps (Pro-Torq® Style Nut)

If the wheel nuts have chrome covers, remove them with special pliers equipped with plastic non-marring jaws. Place them in a container to prevent damage or loss. On aluminum wheels, place a plastic anti-scuff guard over the wheel nuts and loosen the wheel nuts. On steel wheels, remove the wheel hubcap nuts, if present and the wheel hubcap before loosening the wheel nuts. Place the wheel hubcap in safe location to prevent damage. Place the wheel and/or wheel hubcap nuts in a container to prevent contamination or loss.

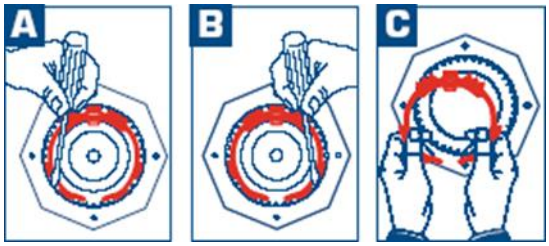
Remove the wheel and tire assembly and place it aside. Mark the tire to ensure it can be identified for installation on same side as removed. Remove the brake caliper assembly and place it aside. Mark the caliper assembly to ensure it can be identified for installation on same side as removed.

Removal

1. Place an oil drip tub beneath the hub to catch oil. Rotate the hub such that the hubcap drain plug is facing upwards. Remove the drain plug from the hubcap and place it in a container for re-installation.
2. Rotate the hub such that the drain hole faces downward and drain the oil from hub cavity. Wait a few minutes for most of the oil to drain before continuing to the next step.
3. Remove the hubcap bolts, hubcap, and gasket. Take care not to damage the gasket for re- installation. Place the components in a location to prevent contamination. Note that the hub cap window may be damaged by solvents

NOTE: When removing or installing the spindle nut, use the correct wrench socket to avoid damaging the nut. Do not use impact driver to tighten spindle nut. Only use a torque wrench to tighten the spindle nut.

4. . Remove the keeper from the nut.



5. Use a small screwdriver to carefully pry the keeper arm from the undercut groove on each side until the keeper is released.
6. Remove the retaining nut
7. Tug sharply on the hub to unseat the outer bearing without completely removing the hub. Wipe up any oil spilled on the brake assembly as quickly and completely as possible. Remove the outer bearing and place it in a container to prevent contamination.
8. Remove the hub from the spindle and place it on the floor with its stud side

facing downwards. Protect the wheel studs from damage. Wipe the excess oil off spindle with a clean shop towel to prevent oil dripping onto the brake assembly. If oil saturates or significantly contaminates the brake lining then replace the lining.

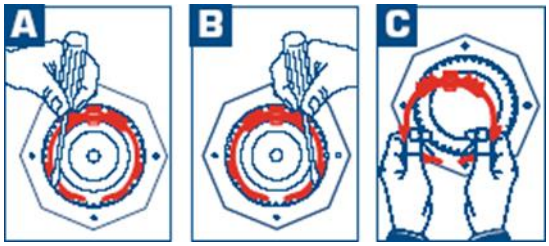
9. Remove the hub seal and discard it. Remove the wear ring from the spindle and discard it.
10. Inspect the inner cup (outer bearing race for the inner bearing) and outer cup in the hub for damage. Replace the bearing cups if worn or damaged.
11. Inspect the bearing areas on the spindle for wear or damage. Burrs may be removed by light application of emery cloth. Replace steering knuckle if the spindle is damaged.

Installation

1. Inspect to be sure spindle shoulder is clean. If pitted apply sealant, Place the hub seal assembly with axle ring onto the spindle so the words “Oil Bearing Side” face outboard. Do not place the seal in the hub bore.
2. Drive the seal onto the spindle using the appropriate seal installation tool and a 3-5lb hammer. (Reference Stemco P/N 0155220) The wear ring is fully seated when it is square and flush with the face of the inner bearing shoulder of the spindle. Reseat the seal onto the wear ring if it becomes dislodged after seating.

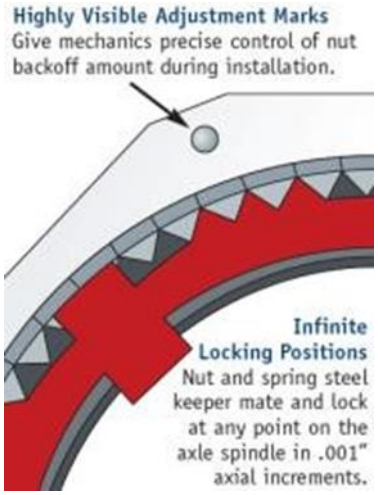
NOTE: Do not drive bearings onto the spindle with a steel hammer or similar instrument. Bearing inner race is a tight slip fit with spindle.

3. Pre-lube the inner bearing and place it onto spindle with small end of taper facing outward. Seat the inner race against the shoulder of the spindle.
4. Press the ABS sensor outward about ¼”. Do not use a sharp tool on lead wire end of the sensor. See section for the inspection of ABS sensor as needed.
5. Clean and Inspect seal bore in hub, Place the hub onto the spindle until it seats on the inner bearing. Do not “ram” the hub onto the seal.
6. Pre-lubed outer bearing and place it onto the spindle until it seats on the outer cup in the hub. The bearing retaining washer may be used to guide the bearing onto the spindle. The hub should be supported to prevent misalignment and binding.
7. Remove the keeper from the nut.

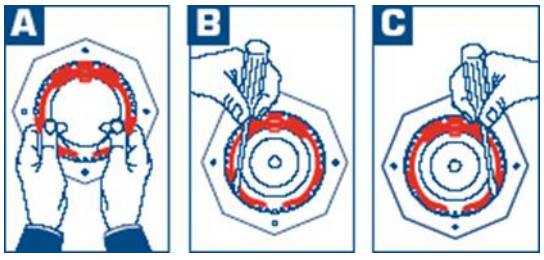


8. Use a small screwdriver to carefully pry the keeper arm from the undercut groove on each side until the keeper is released.
9. Seat the bearing, with the hub or hub and drum only using a torque wrench.
10. Tighten the nut to **200 lb-ft**. Spin the wheel at least one full rotation
11. Repeat step #9 two more times

12. Back the nut off until it is loose.
13. Adjust the bearing by tightening the nut to **100 lb-ft**. Spin the wheel at least one full rotation.
14. Repeat step #12



15. Back the nut off one raised face mark (1/4 turn)
16. Install the keeper with the orange side facing out.
17. Align the flat of the keeper with the milled flat on the spindle and insert the single keeper tab into the undercut groove of the nut. Install the keeper with the orange side facing out.
18. Engage the mating teeth



19. Compress and insert the keeper arms, one at a time, into the undercut groove with a small screwdriver.
20. Refer to the Wheel Bearing Endplay Adjustment section to measure and adjust the endplay to .001-.004 inch. Adjust by loosening spindle nut, re-indexing the spindle nut accordingly, and repeat Steps 8 thru 19 until proper endplay is achieved.
21. Install hubcap gasket and hubcap. Tighten the cap screws to **20-30 lb-ft** (See Torque Table).
22. Fill the hub cavity with the appropriate amount and type of lubricant and secure drain plug. Fill slowly, keeping level below center of the window.
23. Check oil level through the hubcap window at ride height. **(Figure 19)**. If level is below the “add” level line, then fill with recommended oil until “full” level is achieved. Add oil slowly since the heavy weight oil will settle slowly in the hub.

NOTE: The hubcap window can only be cleaned with mild soap and water. Aromatic solvents should not be used, as they will impair the transparency of the window.

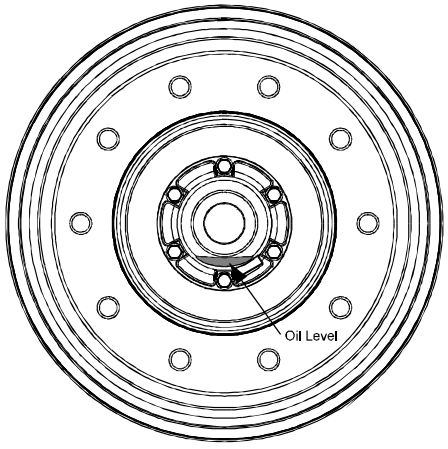


Figure 19 – Wheel

Bearing Oil Level

24. Check the hub cap for external oil leakage at the drain plug or gasket. For leaks at the drain plug check for application of thread sealant to threads and tightness. For leaks at the gasket, replace the gasket. The vent plug will normally weep a small amount of oil.
25. Install the caliper.
26. Install the wheel and tire assembly and the wheel nuts.
27. On aluminum wheels, use a plastic anti- scuff guard over the wheel nuts. Tighten the wheel nuts to **450-500 lb-ft** (See Torque Table for sequence).
28. Replace the wheel hubcap nuts and hubcaps if removed to service the wheel bearings.

Pre Adjusted with Integral Spindle Nut Wheel Hubs

Recommended Service

When inspections indicate that service is necessary on a Pre Adjusted with Integral Spindle Nut Hub, follow the recommended service, inspection, reassembly and reinstallation instructions found in the following section. In order to ensure optimum wheel hub performance, Reyco Granning recommends that only approved Pre Adjusted with Integral Spindle Nut service parts be used to replace all critical components of the system. Refer to the back of this section for a listing of approved parts.

WARNING

Vehicles on jacks can fall, causing serious personal injury or property damage. Never work under a vehicle supported by a jack without supporting the vehicle with stands and blocking the wheels. Wear eye protection.

1. Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.
2. Raise the axle until the tires are off the floor.
3. Place safety stands under the vehicle as specified by the chassis manufacturer.
4. Remove the tire and wheel assembly using procedures specified by the wheel manufacturer.
5. For disc brakes, remove caliper per manufacturers' recommended procedure.
6. Place a container under the hubcap to receive the draining oil, then remove the hubcap or drive axle shaft. Do not reuse the oil. Correctly dispose of the lubricant.
7. Remove the red locking ring. Use caution not to damage the locking ring. Do not remove the spiral snap ring that holds the spindle nut in the hub.

WARNING

Never loosen the axle spindle nuts by striking them directly with a hammer or striking them with a drift or chisel placed

against them. Damage to the parts will occur, causing possible loss of axle wheel-end components and serious personal injury.

8. Use a breaker bar to loosen the spindle nut. Pre Adjusted with Integral Spindle Nut spindle nut installation torque is **300 lb-ft.**

NOTE: Use only 6-point forged sockets for installation and removal of Pre Adjusted with Integral Spindle Nut spindle nuts.

9. After the spindle nut is initially loosened with a breaker bar, continue to unthread the spindle nut to remove the hub from the spindle. The internal snap ring will act as a hub puller and will aid in removal of the hub from the spindle. Do not exceed 50 ft-lbs of torque when removing the hub from the spindle. If the hub will not come off of the spindle without exceeding this torque value, remove the spiral snap ring and the spindle nut assembly and use a conventional hub puller to remove the hub from the spindle.
10. Slide the hub off the spindle. Remove and save the outer bearing cone. Be careful when you remove the hub that you do not damage the outer bearing by dropping it on the floor.

    If the hub is difficult to remove because the seal is stuck on the spindle, use a mechanical puller to remove the hub.

    If part of the seal remains on the spindle, carefully remove the part of the seal that remains on the spindle.

NOTE: If the bearing does hit the floor, while removing the hub, clean and inspect bearing as stated in the section below.

11. Place the hub on its outboard end and remove the seal. Retain the seal if it needs to be returned for warranty consideration.
12. Remove the inner bearing cone and spacer.

NOTE: Component Inspection and Replacement Hazard Alert Messages

Read and observe all hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Observe all warnings and cautions provided by the press manufacturer to avoid damage to components and serious personal injury.

Do not hit steel parts with a steel hammer. Pieces of a part can break off. Serious personal injury and damage to components can result. Use a brass or synthetic mallet for assembly and disassembly procedures.

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride,

and emulsion-type and petroleum-base cleaners. Read the manufacturer's instructions before using a solvent cleaner, then carefully follow the instructions. Also follow the procedures below. Wear safe eye protection.

Wear clothing that protects your skin.

Work in a well-ventilated area.

Do not use gasoline or solvents that contain gasoline. Gasoline can explode.

You must use hot solution tanks or alkaline solutions correctly. Read the manufacturer's instructions before using hot solution tanks and alkaline solutions. Then carefully follow the instructions.

CAUTION

Do not use hot solution tanks or water and alkaline solutions to clean ground or polished parts. Damage to parts can result.

CAUTION

Clean and dry components Worn or Damaged Components

WARNING

Do not repair or recondition wheel-end components. Replace damaged, worn or out-of-specification components. Do not mill or machine any components. Using repaired, reconditioned, damaged or worn components can cause wheel end failure, which can result in serious injury and property damage.

Hub and Component Cleaning

1. Use a clean filtered solvent to clean the hub and all wheel end components.
2. Clean and inspect the wheel bearing cups and cones, race, spindle bearing and seal journals on the spindle and hub. Bearings should be cleaned with clean filtered solvent and dried with a lint-free rag.

NOTE: Do not spin dry the bearings. The rollers may score due to lack of lubricant and rollers could come off which can result in serious injury.

3. Clean and inspect the spindle. Be sure to clean the full length of the seal journal on the spindle.
4. Parts must be dried immediately after cleaning. Dry parts with clean paper towels or rags. Do not dry bearings by spinning with compressed air.
5. Apply light oil to cleaned and dried parts that are not damaged and are to be immediately assembled. Use only the type of oil used by the manufacturer. Do NOT apply oil to the brake linings or the brake drums.
6. If the parts are to be stored, apply a good corrosion preventative to all surfaces. Do NOT apply the material to the brake linings or the brake drums. Store the parts inside special paper or other material that prevents corrosion.

Inspecting Bearing Cups, Cones & Bearing Spacer

NOTE: Pre-Adjusted with Integral Spindle Nut hubs use a precision-machined spacer in conjunction with specially toleranced bearings to

control wheel end play. Reyco Granning recommends installing a new Pre Adjusted with Integral Spindle Nut service kit when inspection indicates that component replacement is necessary. Pre Adjusted with Integral Spindle Nut service kits are available from a parts dealer or distributor.

CAUTION

If you choose to reuse existing bearings at this service, they must be inspected in accordance with the bearing manufacturers recommended guidelines.

CAUTION

If this inspection indicates that existing bearing component(s) must be replaced, bearing cups and cones must be replaced as a set. Whenever new bearings are installed, replacement of the bearing spacer is also recommended.

1. After components have been properly cleaned, visually inspect the cups, cones and spacer for any wear or damage. Reference materials for proper bearing inspection procedures are available from the bearing manufacturers.

   Bearing spacers should be visually inspected for signs of wear or damage. Carefully inspect the machined ends of the bearing spacer. Wear to the bearing spacer can appear as a sharp ring of standing metal at either edge of the machined surfaces. Replace the spacer if it has visible wear evidenced by a raised edge on the machined end.

2. If removal or replacement is required, follow the steps outlined below.

Removing Cups in Iron Hubs

1. On an iron hub, remove the bearing cup using a large hammer and a mild steel bar or a hydraulic press. Take precaution to avoid damaging the bearing cup bore and shoulder.
2. Inspect the bearing cup bore for evidence of cup rotation or spun cups. If cup rotation exists, replace the hub.

Installing a New Cup in Iron Hubs

Iron hubs do not need to be heated for bearing cup installation. Press the bearing cup into the hub, being certain that it is fully seated. Use a 0.001" to 0.002" feeler gauge to ensure the cup is fully seated against the shoulder of the bearing bore.

Pre-Adjusted with Integral Spindle Nut Wheel Hubs – Reassembly

CAUTION

When using an oil bath system, do not pack the bearing with grease. Grease will prevent the proper circulation of axle lubricant and can cause premature wheel seal and bearing failure.

1. Place the hub, seal end up, on a clean work bench surface.
2. For steer hubs, install the tubular bearing spacer with the tapered

end down

3. Lubricate the inner bearing cone with the same lubricant as will be used in the hub and install it into the inner bearing cup.

NOTE: The seal must be replaced every time the hub is removed from the spindle. Do not apply any gasket sealant to the seal outer or inner diameter. Always use the seal installation tool specified by the seal manufacturer. Using an improper tool can distort or damage the seal and cause premature seal failure.

4. Position the seal into the hub bore. Use a flat plate and a small mallet to install the seal,

NOTE: Seals require the proper tool for installation. For other seals, refer to the specific manufacturers' instructions.

5. When installing the seal, tap the adapter plate of the installation tool around the outer edge to position the seal. Drive the wheel seal into place. Once the tool bottoms out, the seal is installed correctly.
6. Check to be certain the seal is not cocked and that the seal inner diameter and the inner bearing turn freely
7. Lubricate the inner diameter of the seal with a light film of the same lubricant as will be used in the hub.

CAUTION

Failure to lubricate the inner diameter of the seal may result in premature seal failure.

8. Turn the hub over, and place it seal end down on a dry clean surface. Install a bearing spacer. If the spacer has a tapered end, it should face towards the outboard end of the hub.
9. Lubricate the outer bearing cone with the same lubricant as will be used in the hub and install it into the hub assembly.

Spindle Nut and Spiral Snap Ring Reassembly

1. Seat the flat washer into the back of the spindle nut.
2. Position the spindle nut and washer against the outer bearing.
3. Install the spiral snap ring into the snap ring groove in the hub. Make sure that the snap ring is fully seated into the groove in the hub.

Installing the Pre-Adjusted with Integral Spindle Nut

Wheel Hub Assembly

WARNING

Failure to fill the hub with the correct amount of lubricant can cause premature failure of the Pre-Adjusted with Integral Spindle Nut hub assembly, which, if not avoided, could result in death or serious injury

NOTE: Use the proper hubcap for the type of lubricant intended to be used.

1. Clean the spindle to remove any lubricant, corrosion prevention coating, foreign material, or surface

rust that may be present.

2. Lubricate the bearing journals on the spindle, or the inside diameter of the bearing cones with Grade 2 grease or the lubricant that will be used in the wheel end. Do not coat the seal journal on the spindle.
3. Lubricate the inside diameter of the seal with the same lubricant that will be used in the wheel end.
4. If present, remove the red locking snap ring from the spindle nut. Verify that the bearing spacer is in proper alignment. Align the key or flat on the washer with the keyway or flat on the spindle as the hub is placed onto the spindle. Use a smooth firm motion and place the hub onto the spindle. When the threads on the nut engage the threads on the spindle, rotate the nut in a clockwise direction to fully engage the threads.
5. Torque the spindle nut to **300 lb-ft** while rotating the hub. **DO NOT BACK OFF THE SPINDLE NUT.**
6. Visually examine the three holes in the face of the spindle nut. One of the holes will line up with the holes in the inner washer. Install the tab of the red locking snap ring through the hole in the nut and washer that are aligned. Spread the locking ring, push it over the spindle nut and in to the machined grooves in the spindle nut. Use caution not to bend the locking ring permanently. If the locking ring is damaged or bent, replace it with a new one.
7. Install the hub cap with a new gasket. Torque the hub cap bolts in a star pattern to **12 to 16 lb-ft**.

Replacing Brake Components

Brake Rotors

The brake rotors should be replaced if they are damaged or exceed the rotor manufacturers recommended minimum thickness specification. Refer to manufacturer brake rotor guidelines for inspection and specifications. For more information visit the Bendix website at www.bendix.com.

Brake Chambers

The brake air chambers should be replaced if damaged or malfunctioning. Refer to manufacturer guidelines for correct function of the brake air chambers.

Other Brake Components

The brake shoe linings should be replaced when they are worn beyond the manufacturer's limits. When the brake linings are serviced, other components should also be serviced. Refer to the brake manufacturers guidelines for servicing the brakes.

Replacing the ABS Sensor and Tone Ring

The anti-lock brake system (ABS) of the vehicle should be diagnosed by a qualified technician before the anti-lock brake sensors or the tone rings are replaced. Replacement parts must be equivalent to the vehicle manufacturers to ensure proper

function of the anti-lock brake system. The anti-lock brake sensor and tone ring cannot be repaired and must be replaced if damaged or malfunctioning.

Sensor Removal

1. Press sensor out of steering knuckle. Do not pull sensor out by its lead wire.
2. Remove tie straps that secure the sensor lead wire and disconnect the sensor lead wire from the chassis wire harness.

Sensor Installation

1. Check that the sensor bushing is properly seated in the steering knuckle and the sensor spring retainer is seated properly in the sensor bushing.
2. Press the sensor into the steering knuckle until the sensor end contacts the tone ring.
3. Connect a volt meter to the connector pins of the sensor lead wire. Set the volt meter to read AC voltage on a scale of 1-10V.
4. Spin the hub by hand and read the voltage output of the sensor. A minimum reading of 0.8V AC is normal. Skip to step 8 if minimum reading is obtained.
5. If the minimum reading is not obtained then check the volt meter connection and proximity of the sensor and tone ring. The air gap between the sensor and tone ring should not exceed .027”. Repeat step 4.
6. If the minimum reading is not obtained, check the tone ring for damage and its installation. The tone ring should have a maximum run out of .008”. Replace as needed and repeat step 4.
7. If the minimum reading is still not obtained, then replace the sensor and repeat the installation procedure.
8. Route and secure the sensor lead wire the same as the removed sensor.
9. Connect the sensor lead wire to the chassis. Secure wire lead to prevent damage during suspension movement.

Tone Ring Removal and Installation

Follow the hub manufacturer’s guidelines for removal and installation of the tone ring. For more information visit the Bendix website at www.bendix.com.

Replacing the Shock Absorber

WARNING

The shock absorber is gas pressurized and must not be punctured or be subjected to excessive heat which can result in serious personal injury. The shock will expand to its full extended length if not restrained.

Removal

1. Remove the lower thru bolt and retain for installation. Do not remove lower shock mount bracket from lower control arm.
2. Remove upper thru bolt and

retain for installation.

Installation

1. Position shock in suspension such that the thru bolt is connected to the lower shock mounting bracket tabs.
2. Attach upper shock bushing to suspension sub-frame with mounting hardware. Do not tighten.
3. Tighten lower thru mounting bolt and nut to **170-190 lb-ft** (See Torque Table).
4. Tighten upper mounting nut to **170-190 lb-ft** (See Torque Table).

Replacing the Air Spring

The correct air spring must be installed. The use of a substitute air spring is not allowed and may cause unequal load sharing between the air springs and cause adverse ride and handling characteristics.

Removal

1. Lift and support the vehicle.
2. Deflate the air spring by disconnecting one end of the vertical HCV linkage from the horizontal arm. Rotate the horizontal HCV arm downward and secure it in place.
3. Disconnect the airline at the air spring inlet port and remove the connection fitting from the inlet port.
4. Remove the bolts and washers from the upper air spring mount. Note location of bolts and washers.
5. Remove the bolts that secure the air spring to the lower air spring mount.

Installation

1. Attach air spring to upper air spring mount. Tighten mounting hardware snugly.
2. Attach air spring to lower air spring mount. Tighten lower mounting bolts to **20-30 lb-ft** (See Torque Table).
3. Tighten the upper mounting bolts to **20-30 lb-ft** (See Torque Table).
4. Apply Permatex© or equivalent thread sealant (Teflon tape not allowed) to the threads of the air connection fitting and install the fitting.
5. Connect the airline to the fitting.
6. Inflate the air spring by un-securing the HCV horizontal arm and reconnecting the vertical linkage to it.
7. Check the airline and fitting for air leaks.

Replacing the Height Control Valve

The correct height control valve (HCV) must be installed. The use of a substitute HCV is not allowed and may cause unequal load sharing between the air springs and cause adverse ride and handling characteristics.

Removal

1. Drain the air from the supply reservoir on the chassis connected to the front suspension.
2. Disconnect the vertical HCV linkage from the horizontal arm.

3. Mark airlines and connections for re-assembly. Disconnect the airlines from the HCV. If any other plumbing fixtures are connected to the HCV, mark them for re-assembly.
4. Remove the HCV mounting hardware from the sub-frame.
5. Remove any other air fittings or plumbing fixtures from the HCV.

Installation

1. Apply Permatex© or equivalent thread sealant to the threads (Teflon tape not allowed) of the air connection fittings or plumbing fixtures and install the fittings or plumbing fixtures in the HCV. Be sure there is no sealant on the leading edge of the fitting.
2. Attach the HCV to the sub-frame with mounting hardware. Orient the horizontal arm horizontally and tighten the mounting nuts to **7-9 lb-ft** (See Torque Table).
3. Connect airlines as marked during removal.
4. Connect the vertical linkage to the horizontal arm.
5. Recharge system with air and check for air leaks.
6. Check the ride height and adjust per section on adjusting the ride height as needed.

Replacing the Sway Bar and Components

It is recommended that the sway bar mounting bushings and the vertical linkages be replaced all at the same time.

Vertical Linkage Removal

1. Disconnect sway vertical linkage at upper control arm bracket on both sides. Retain hardware for installation.
2. Secure the sway bar to prevent rotation and disconnect the lower connection to the sway bar on both sides.

Vertical Linkage Installation

1. Attach the sway bar vertical linkage to the upper and lower mounts.
2. Tighten the mounting nuts to **80-90 lb-ft** (See Torque Table).

Sway Bar Removal

1. Follow the instructions for removal of the sway bar vertical linkage for both sides.
2. Remove mounting hardware from “D” ring sway bar mounts on rear of suspension sub-frame. Retain hardware for installation.
3. Remove the “D” rings and bushings from the sway bar.

Sway Bar Installation

1. Replace the “D” ring bushings.
2. Apply Aquashield© Grease to the inside of the bushing. Attach the “D” rings and bushings to the sway bar in the same location as removal.
3. Attach the sway bar to the sub-frame using the mounting hardware.
4. Tighten the mounting nuts to **52 lb-ft** (See Torque Table).
5. Follow the instructions for installation of the sway bar vertical linkage for both sides.

Replacing the Steering Knuckle Carrier Bearings

It is recommended to replace all the steering knuckle carrier bearings at the same time.

The wheel and tire should be removed to provide access. The steering knuckle may be removed to provide easier handling of steering knuckle carrier assembly.

CAUTION

The knuckle carrier must be secured and supported properly when upper and lower mounting bolts are removed.

Removal

1. Note installed orientation of the upper and lower bar pin. Steering knuckle/spindle may be removed for ease of handling or placing in press.

NOTE: Lower control arm may move downward due to the internal gas charge in the shock absorber. A portable jack may be needed to align the lower control arm with the knuckle

2. Remove the steering knuckle carrier mounting bolts from the upper and lower control arms. Heat may need to be applied to the control arm to loosen the thread adhesive. The control arm temperature must not exceed 300°F. Do not apply heat directly to the bar pin or mounting bolts.
3. Remove steering knuckle carrier.
4. Support fixed shoulder end of the bar pin.
5. Remove retaining clip and outer collar from the split ring.
6. Apply approximately **400 lbs** press load to the spacer and remove the split collar.
7. Remove spacer and shims.
8. Press bar pin out of bearing cones.
9. Remove outer seals from both sides of bearings.
10. Remove bearing raceways from the steering knuckle carrier. Do not damage bores.
11. Clean the remaining grease from the bearing

Installation

CAUTION

Do not apply excessive preload to the bearings

1. Inspect bearing raceway and seal bores in steering knuckle carrier for burrs or damage. Inspect the bar pin for burrs or damage. Remove burrs and replace damaged components.
2. Press a bearing race into each steering knuckle carrier bore until fully seated.
3. Pack a bearing cone with grease and place it onto the bar pin and seat the inner race on the shoulder.
4. Note the position and orientation of bar pin relative to the carrier. The shoulder end of the bar pin faces forward on the upper bar pin location. The shoulder end of the bar pin faces rearward on the lower bar pin location.
5. Insert the bar pin into the steering knuckle carrier until the bearing cone is seated in the raceway.
6. Turn the steering knuckle carrier over and support the shoulder end of the

bar pin.

7. Pack a bearing cone with grease and place it onto the bar pin end opposite the shoulder and seat it in the raceway.
8. Place the spacer onto the bar pin, then seat it against the inner raceway.
9. Apply approximately **400 lbs** of press load to the spacer. Place the split collar into the groove of the bar pin and against the spacer.
10. Use a "feeler" gage to measure the gap between the split collar and shoulder of the groove in the bar pin. Record measurement.
11. Remove the load. Then remove the split collar and spacer.
12. Using the gap measurement from Step 10, place a number of shims equivalent to the gap measurement onto the bar pin against the inner raceway.
13. Place the spacer onto the bar pin.
14. Apply approximately 400 lbs of press load to the spacer such that the split collar can be inserted into the groove of the bar pin. Make sure the split collar is fully seated in the groove.
15. Remove the press load.
16. Place the outer collar around the split collar. Install the retaining clip around the split collar on the outside of the outside collar.
17. Press a seal into each seal bore until fully seated.
18. Check bearing preload by rotating the bar pin. Slight to medium drag should be felt. If too loose, add one shim. If too tight, remove one shim.
19. Fill bearing cavity with grease.
20. Install steering knuckle carrier mounting bolts in control arms. Note orientation of bar pin. Apply Loctite #242 to mounting bolt threads and tighten to **370-410 lb-ft** for IFS1660S3 & IFS1700S3 Hex Head Bolt, **450-500 lb-ft** for IFS1800S3 & IFS2000S3 Socket Head Cap Screw (See Torque Table).

Replacing the Steering Gearbox/Slave Unit Assembly

This procedure covers one side of the unit. Duplicate for opposite side.

Removal

1. Remove the shock absorber from the gearbox side plate mount and lower control arm shock bracket.

2. Remove the (5) side plate bolts that connect the side plate to the gearbox assembly and cradle.

3. Remove the pitman bolt. Note orientation of the timing mark on the pitman arm to the center spline of the gearbox. Remove the pitman arm and rotate to the side.

4. Disconnect the power steering or bleed port line and cap or plug the ends.

5. Disconnect and drop the steering slip shaft out of the way.

6. Remove the (8) gearbox mounting bolts.

7. Slide the gearbox out of the unit.

8. Disconnect the (1) remaining bolt on the gearbox mounting plate.

Installation

1. Clean all bolts of Loctite before reinstalling into the gearbox.
2. Install the gearbox mounting plate onto the gearbox with the single mounting bolt. Be sure to align all holes on gearbox with plate and tighten to **490-510 lb-ft**.
3. Slide the gearbox back into the unit.
4. Align all holes and tighten to **290-310 lb-ft**.
5. Align the timing mark on the pitman arm and slide back on the gearbox shaft. Install the hardware and tighten to **170-190 lb-ft**.
6. Connect the power steering lines or bleed port line back onto the gearbox.
7. Install the side cover plate back on the gearbox/cradle. Apply Loctite #242 to (3) mounting bolt threads and tighten to **410-430 lb-ft**. Side rail bolts with use nuts.
8. Reinstall the shock absorber onto the gearbox mounting plate and lower control arm bracket. Tighten to **170-190 ft-lb.**

Steering Gear Poppet Readjustment

Steering poppet valves automatically adjust when the unit is turned all the way to the steering stop.

They will need to be readjusted any time the steering stops are subsequently adjusted to reduce wheel cut. Refer to TRW's TAS85 Steering Gear Service Manual for readjusting the poppets. See the TRW website at www.trw.com for more information.

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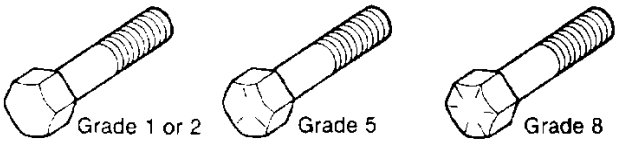
TORQUE TABLES

Most threaded fasteners are covered by specifications that define required mechanical properties, such as tensile strength, yield strength, proof load, and hardness. These specifications are carefully considered in initial selection of fasteners for a given application. To assure continued satisfactory vehicle performance, replacement fasteners used should be of the correct strength, as well as the correct nominal diameter, thread pitch, length, and finish.



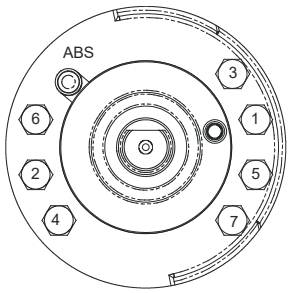
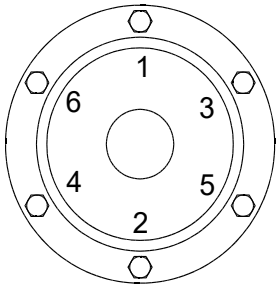
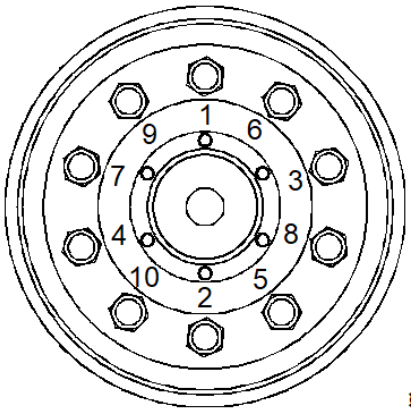
Grade Markings on Bolts

Grade Markings on Lock Nuts		
Grade	Lock Nut Grade B, F	Lock Nut: Grade C, G
Identification	 3 Dots	 6 Dots

Torque Table 1		
APPLICATIONS	**FASTENER SIZE**	**TORQUE SPECIFICATION (lb-ft) (CLEAN AND DRY)**
Upper Control Arm Bushing Pivot Bolt	1-1/8-12 Grade C	950-1050(1)
Lower Control Arm Bushing Pivot Bolt	7/8-9 Grade C	460-490(1)
Eccentric Set Screw	#10-24x3/8	30-40 **(in-lb)**
Steering Knuckle Carrier Mounting Bolt	3/4-10 x 2.75 Gr 8	282(1,4)
	7/8-9 x 2.75 SHCS	545(1,4)
Lower Air Spring Mount Bolt (into carrier)	5/8-18 Grade 8	170-190(1,4)
Air Spring Upper Mount Bolt (into cradle)	3/8-16 x 1.75 Gr 8	20-30(1)
	3/8-16 x 2.00 Gr 8	
Air Spring Lower Mount Bolt	1/2-13 Grade 8	20-30(1)
Idler Arm Mount Lock Bolt (IFS1660/1700S3)	1-14 Grade 8	575-625(1)
Idler Arm Ball Joint Base (IFS1660/1700S3)	M56x1.5	325-375(2)
Idler Arm Ball Joint Castle Nut (IFS1660/1700S3)	M20x1.5	155-170(3)
Tie Rod Castle Nut	7/8-14	90-100(3)
Tie Rod Clamp Nut	5/8-11 Grade B	50-60
Upper Shock Eye Mount Lock Nut	3/4-10 Grade C	170-190
Lower Shock Eye Mount Lock Nut	3/4-10 Grade C	170-190
Lower Shock Mount Bracket Bolt	3/8-16 Grade 8	30-40(1)
Pitman Arm Attachment Bolt	3/4-10 Grade 8	170-190
Steering Gear Attachment Bolt	3/4-16 Grade 8	290-310(1,2)
Steering Gear Attachment Bolt	7/8-14 Grade 8	490-510(1,2)
Steering Gear Side Cover Bolt	3/4-16 Grade 8	410-430(1,2)
Steering Stop Adapter	3/4-10	85-115(2)
Steering Stop Jam Nut	1/2-20 Grade B	50-75
Steering Arm Castle Nut	1-1/8-12 Grade C	550-1025(3)
Sway Bar Mounting Bracket Nut	7/16-14 Grade C	48-56
Sway Bar Linkage Nut	1/2-20 Grade C	75-85
Sway Bar Upper Control Arm Bracket Nut	1/2-13 Grade C	75-85
Kingpin Draw Key Nut	7/16-20 Grade G	30-45
Kingpin Cap Bolt	5/16-18 Grade 8	20-30(1)
Height Control Valve Body Mount Lock Nut	1/4-20 Grade C	10-15
Height Control Valve Linkage Stud Mount Nut	5/16-18 Grade B	8-12
Height Control Valve Adjuster Nut	1/4-20	24-28 **(in-lb)**
Spindle Nut (Pro Torq ©)	1 3/4-12	See Adjusting the Wheel Bearings Section
Preset Plus Nut	Integral	300
Disc Brake Caliper Mount Screw	M20x2.5	325-375
Disc Brake Torque Plate Mount	3/4-16 Grade C	290-320

1. Torque applied to bolthead
2. Apply thread adhesive Loctite #242 or equivalent to threads of fastener threaded into tapped hole
3. Install Cotter pin after tightening, never loosen nut to install cotter pin, only tight for pin alignment
4. Apply thread adhesive Loctite #271 or equivalent to threads of fastener threaded into tapped hole

TORQUE TABLES

Torque Table 2			
APPLICATIONS	**FASTENER SIZE**	**TORQUE SPEC. (lb-ft) (CLEAN AND DRY)**	**TORQUE SEQUENCE**
Torque Plate Mount Cap Screws	3/4-16 Grade 8	290-320	Drivers Side 
Hub Cap Bolt	5/16-18 Grade 5	12-16 (1)	
Wheel Nut	M22x1.5 (Hub Piloted)	450-500(2) (Dry Threads)	

1. Torque applied to bolt head
2. Recheck wheel nut torque after first 50-100 miles.

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SUSPENSIONS

Reyco Granning Suspensions
1205 Industrial Park Drive
Mount Vernon, MO 65712
Phone: 417.466.2178
Fax: 833.896.6997
www.reycogranning.com