TECHNICAL SERVICE INFORMATION BULLETIN

TSIB 15-02, rev C	November 5, 2015
TO:	All Operators
TITLE:	Annual Inspection of the Articulated Joint Flex Plate Bolts
APPLICABILITY:	This TSIB applies to New Flyer Low Floor (LF, LFR & LFA) articulated buses with a flex plate within the ATG articulated joint. **NOTE:** This does not affect the Xcelsior bus model.

This bulletin outlines the steps required for the annual inspection of the articulated joint flex plate bolts and adding Loctite sealant to the hardware to provide a water tight seal to help prevent corrosion. This inspection should be carried out during the annual articulated joint service interval or if the flex plate bolts have been broken in service.

This is a supplement to existing New Flyer preventative maintenance information for the articulated joint flex plate bolts.

Please ensure that the articulated joint flex plate bolts are maintained in accordance with this Technical Service Information Bulletin and the New Flyer Service Manual. This is a highly dynamic area of the bus and inspection compliance is critical. If you experience high failure rates of bolts on individual buses, please contact New Flyer.

Direct all inquiries regarding this bulletin to:

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CONTENTS:

A. ACCESS THE ARTICULATED JOINT

1. Turn the main battery disconnect switch to the “OFF” position.
2. Raise coach in accordance with the New Flyer Service Manual or use a service pit.
3. Open the interior bellows and remove the rear cover plate to gain access to the flex plate.
   a. From the interior of the coach remove the screws holding the bellows.

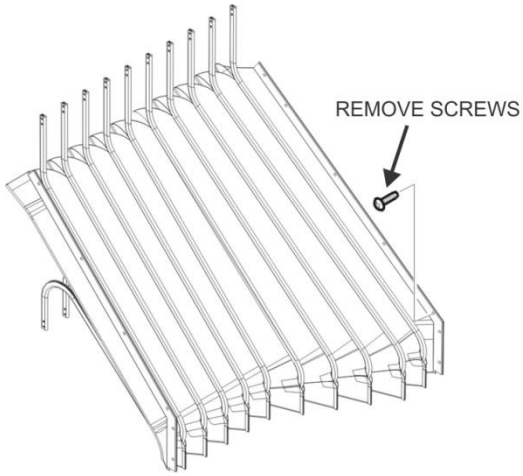


Figure 1: Bellows Removal

   b. Remove the seats and stanchions located on the artic joint if required. Store parts for reinstallation.
   c. Tie the rear half of the bellows to allow more space for ease of work.
   d. Remove the hardware retaining the rear half cover plate. Store cover and hardware for reinstallation.

4. If required, the exterior bellows can be opened to ease access to the flex plate:

   a. Remove the screws retaining the bellows flap to the coach on the underside. Store hardware for reinstallation.

   b. Use a knife or screw driver to pry off the Sika holding the bellows to the rear section of the coach if necessary.

   c. Disconnect J-clip by removing the stud terminal nut and washer. This allow for the bellows to be pushed back. Store hardware for reinstallation.

☞ **NOTE: J-Clip removal and moving the bellows will require two people.**

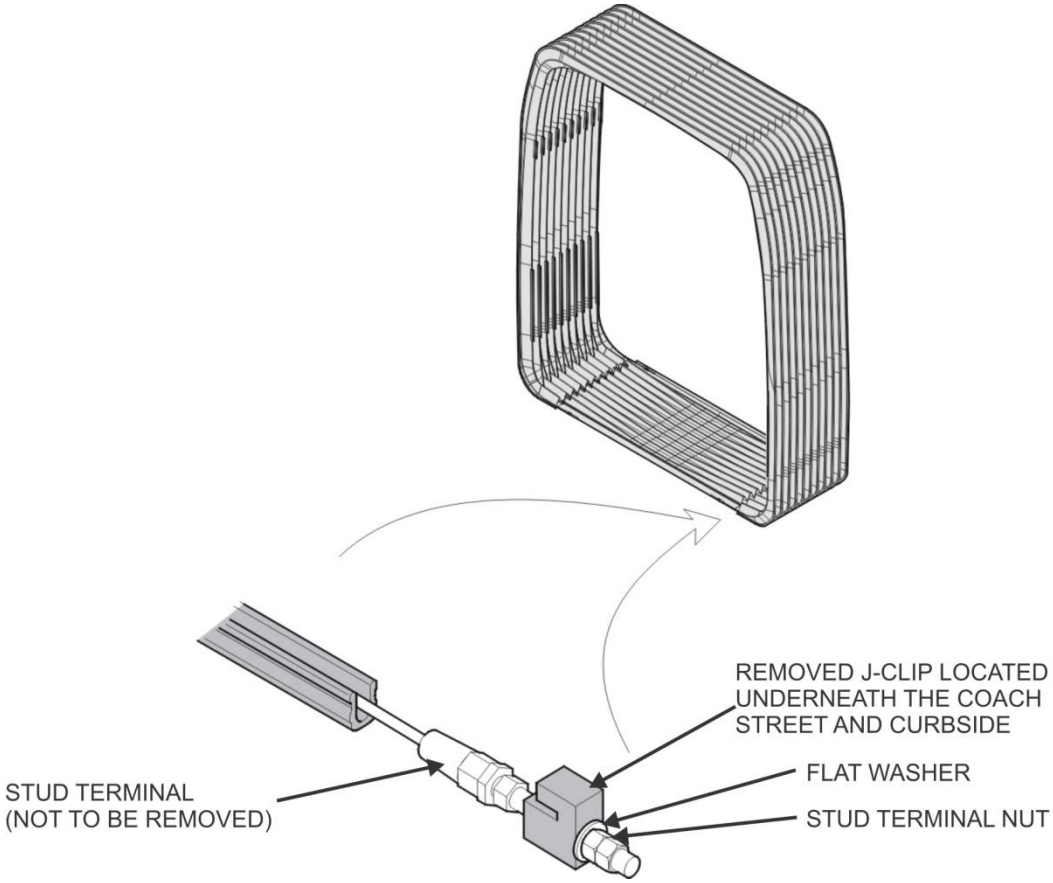


Figure 2: J-Clip Removal

   d. Tie the rear half of the bellows to allow more space for ease of work.

B. INSPECT FOR FLEX PLATE DEFORMATION AND CRACKS

1. Inspect the flex plate for cracks. If any cracks are found, proceed to Section D. “REPLACE THE FLEX PLATE”.

2. Inspect flex plate deformation gap between the articulated joint and the flex plate at the 5/8” bolts that fasten the articulated joint to the flex plate with the 5/8” bolts installed at proper torque. Feeler gauges can be used to measure any gap in this area. If the gap is greater than 0.030” the flex plate requires replacement, proceed to Section D. “REPLACE THE FLEX PLATE”.

☞ **NOTE: The gap between the flex plate and the bus structure does not need to be measured.**

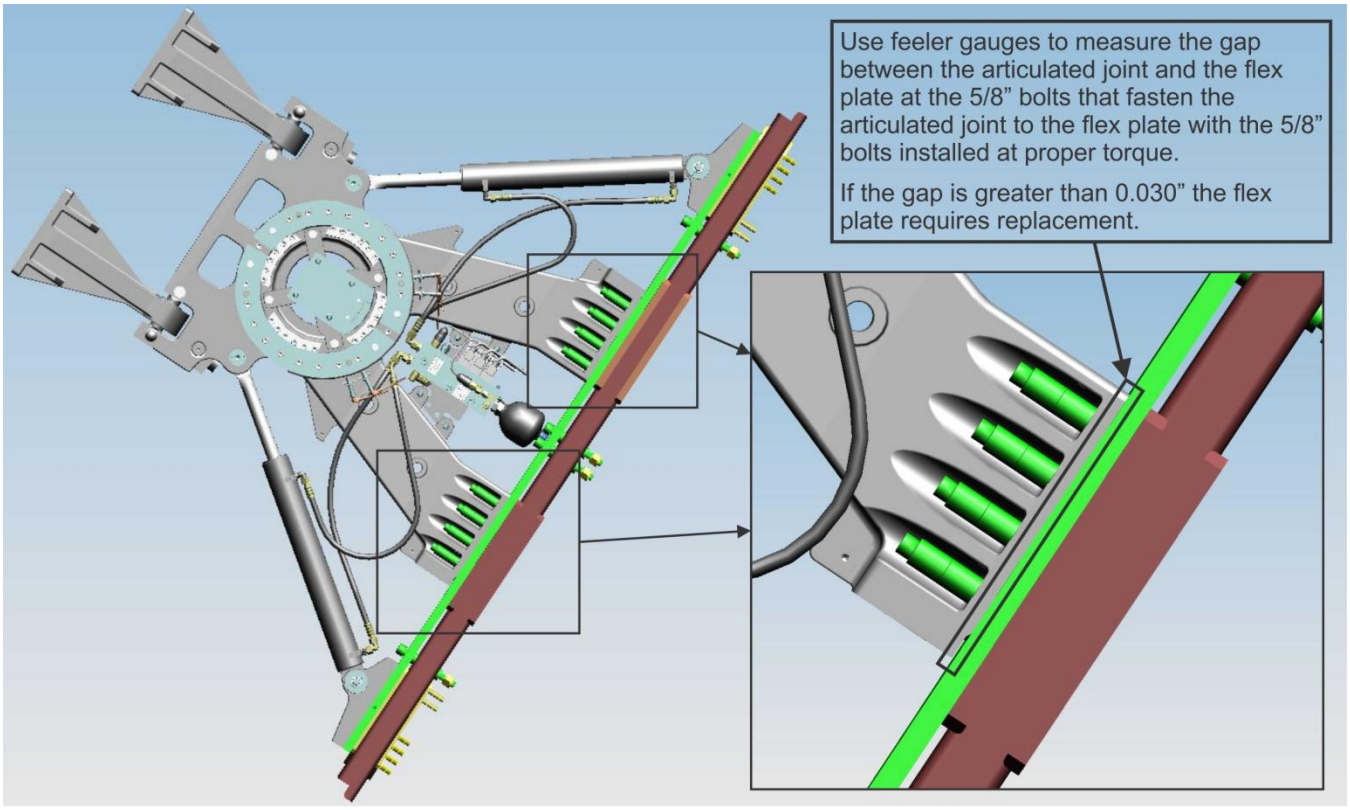


Figure 3: Flex Plate Deformation Gap

C. INSPECT THE ARTICULATED JOINT BOLTS AND REPLACE IF REQUIRED

a) Inspect the Articulated Joint Bolts

1. Inspect 5/8” and 7/8” diameter articulated joint bolts highlighted in Figure 4.
2. If bolt #1 is broken replace bolts 1, 5 and 6 per Section C.b) – “Replace the 5/8” Diameter Bolts (if required)”.
3. If bolt #2 is broken replace bolts 2, 3 and 4 per Section C.b) – “Replace the 5/8” Diameter Bolts (if required)”.
4. If any of bolts # 7, 8, 9 or 10 are broken replace all four per “Section C.c) – “Replace the Four 7/8” Diameter Bolts (if required)”.

☞ **NOTE: Coated hardware provides better corrosion protection. Depending on the operating environment, coated hardware may need to be considered. Refer to Section F for a listing of the coated hardware part numbers.**

☞ **NOTE: Apply Loctite 2047 (NF P/N: 460317) on all mating surfaces (bolts, washers and spacers) and bolt length to ensure connection is water sealed.**

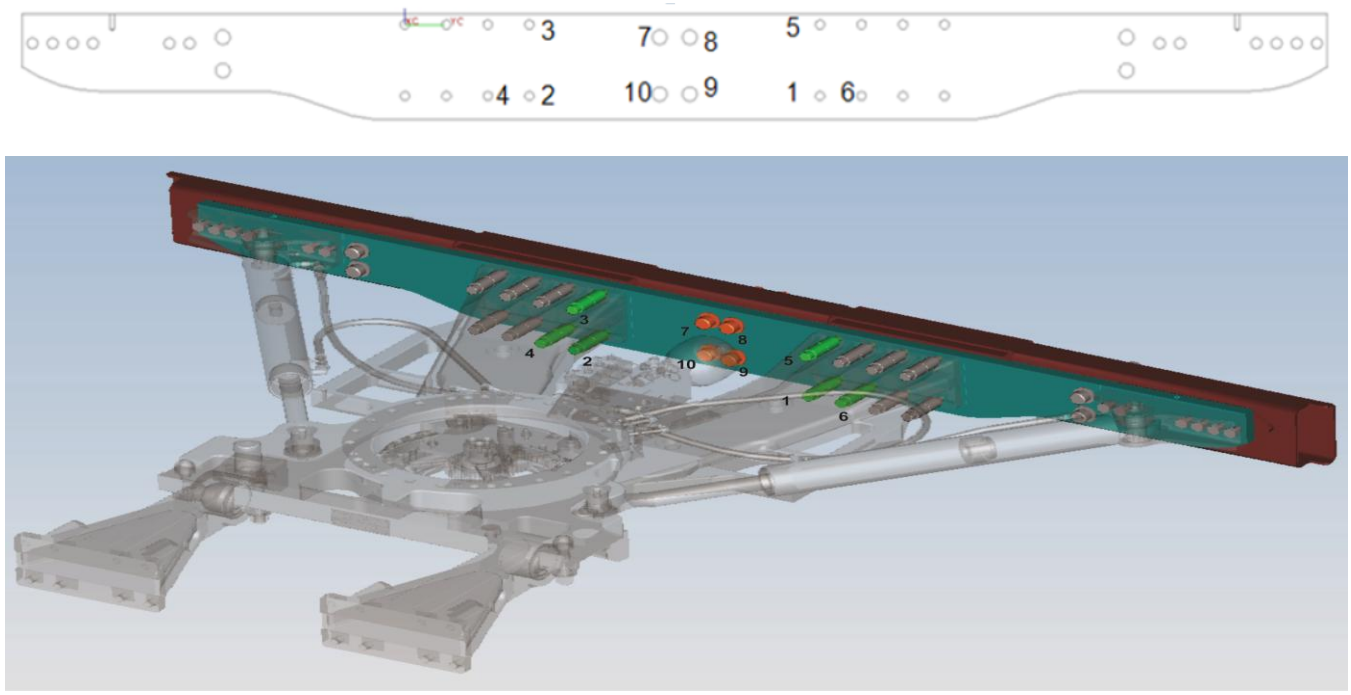


Figure 4: Bolts Requiring Inspection

5. Inspect for missing or misaligned torque stripes. If missing or misaligned, apply a torque stripe (to track rotation), torque to specification as shown in Figure 14, and check for movement.

   i. If movement is greater than an 1/8 turn (45°) to reach final torque, back off 1 full turn, apply 10% of the final torque value, apply a torque stripe (to track rotation), and apply final torque. If the fastener required more than a ½ turn (180°) to reach final torque, the fastener will require replacement.

   ii. If movement was less than an 1/8 turn (45°) to reach final torque, apply a torque stripe. Recheck for signs of misalignment in 1 year (per PM schedule).

6. Replace other broken bolts as required per Section D.c) – “Reassemble the Articulated Joint to the Structure”.

b) Replace the 5/8” Diameter Bolts (if required)

☞ **NOTE: Inspect flex-plate threads. The flex plate must be replaced if it has thread damage. Refer to Section D – “REPLACE THE FLEX PLATE” for procedure.**

☞ **NOTE: Apply Loctite 2047 (NF P/N: 460317) on all mating surfaces (bolts, threads, washers and spacers) and bolt length to ensure connection is water sealed.**

☞ **NOTE: Bolts must be clean and free of debris prior to installation. All mating surfaces should be clean of dirt, debris, primer and paint as well.**

☞ **NOTE: Ensure 5/8” bolts do not interfere with counter bore in rear structure. See Figure 11.**

1. Remove, replace, and torque one at a time the six 5/8” bolts and spacers to 135 ft-lbs (Wet, with Loctite) in the sequence as shown in Figure 14. Then torque the six 5/8” bolts to a final torque of 240 ± 10 ft-lbs (Wet, with Loctite) in the sequence as shown in Figure 14. See Section F – “Part Number table” for the list of part numbers. Mark torque stripe across bolt head, washers, spacers, and joint structure.

   Step 1: Torque six 5/8” bolts to 135 ft-lbs (Wet, with Loctite).

   Step 2: Torque six 5/8” bolts to a final torque of 240 ± 10 ft-lbs (Wet, with Loctite).

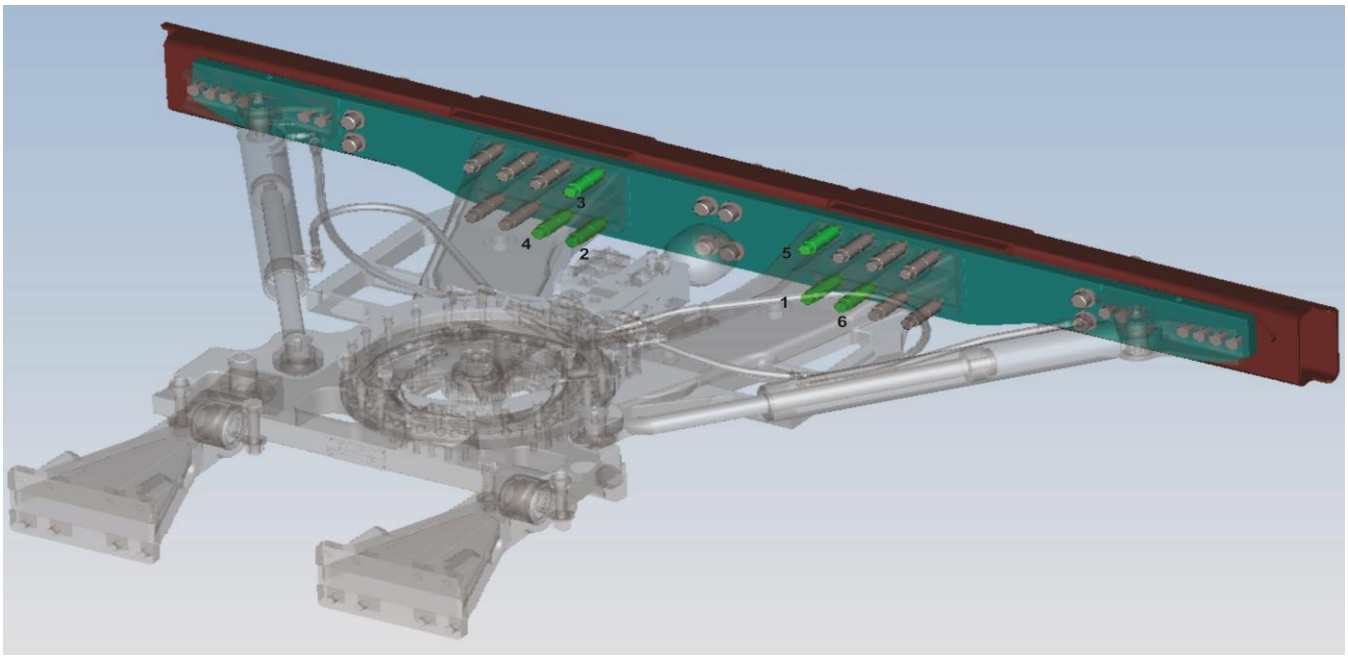


Figure 5: 5/8” Diameter Bolts

c) Replace the Four 7/8” Diameter Bolts (if required)

☞ **NOTE: Apply Loctite 2047 (NF P/N: 460317) on all mating surfaces (bolts, threads, washers, flex plate, structure, nut) and bolt length to ensure connection is water sealed.**

☞ **NOTE: Bolts must be clean and free of debris prior to installation. All mating surfaces should be clean of dirt, debris, primer and paint as well.**

☞ **NOTE: Any shims installed between the bus structure and flex plate must be kept in place.**

1. One at a time, remove, replace, and torque the four 7/8” bolts to 520 ± 20 ft-lbs (Wet, with Loctite) to the bolt head in the sequence as shown in Figure 14. Torque the bolts a second time to 520 ± 20 ft-lbs (Wet, with Loctite) to the bolt head in the sequence. See Section F – “Part Number table” for the list of part numbers. Mark torque stripe across bolt head, washer and flex plate and on the nut side torque stripe across bolt, nut, washer, and tube structure. See Figure 6.

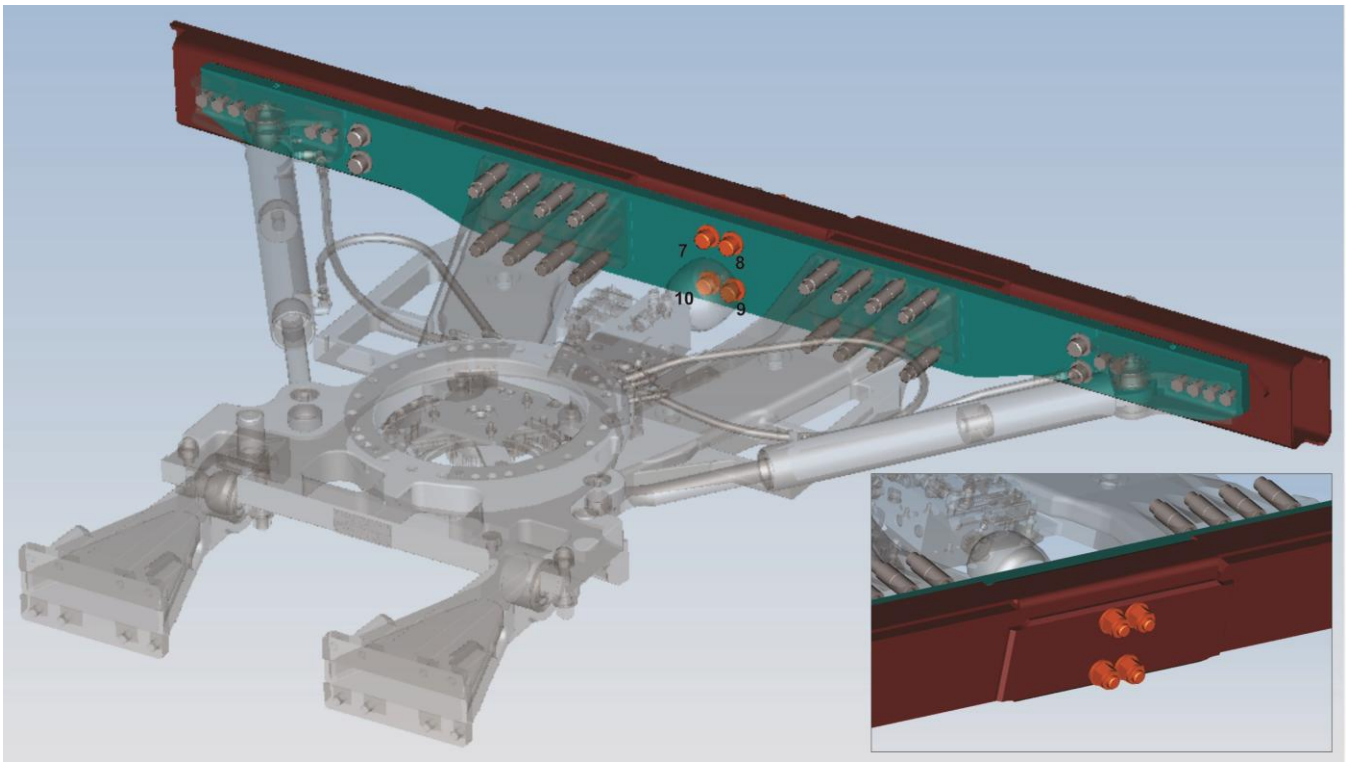


Figure 6: 7/8” Diameter Bolts, Nuts & Washers

D. REPLACE THE FLEX PLATE (if required)

Required only if threads are damaged or if the flex plate deformation gap is >0.030" (see Section B).

a) Separate the Bus at the Articulated Joint and Remove Flex Plate

1. Depressurize the articulated joint system.
2. Disconnect the end of the cylinders by removing the cotter/split pin and hardware. Store hardware for reinstallation. Refer to Figure 7.
3. Remove and discard the 5/8" cylinder bracket bolts.
4. Remove the cylinder brackets NF P/N: 6354539. Store brackets for reinstallation. Refer to Figure 7.

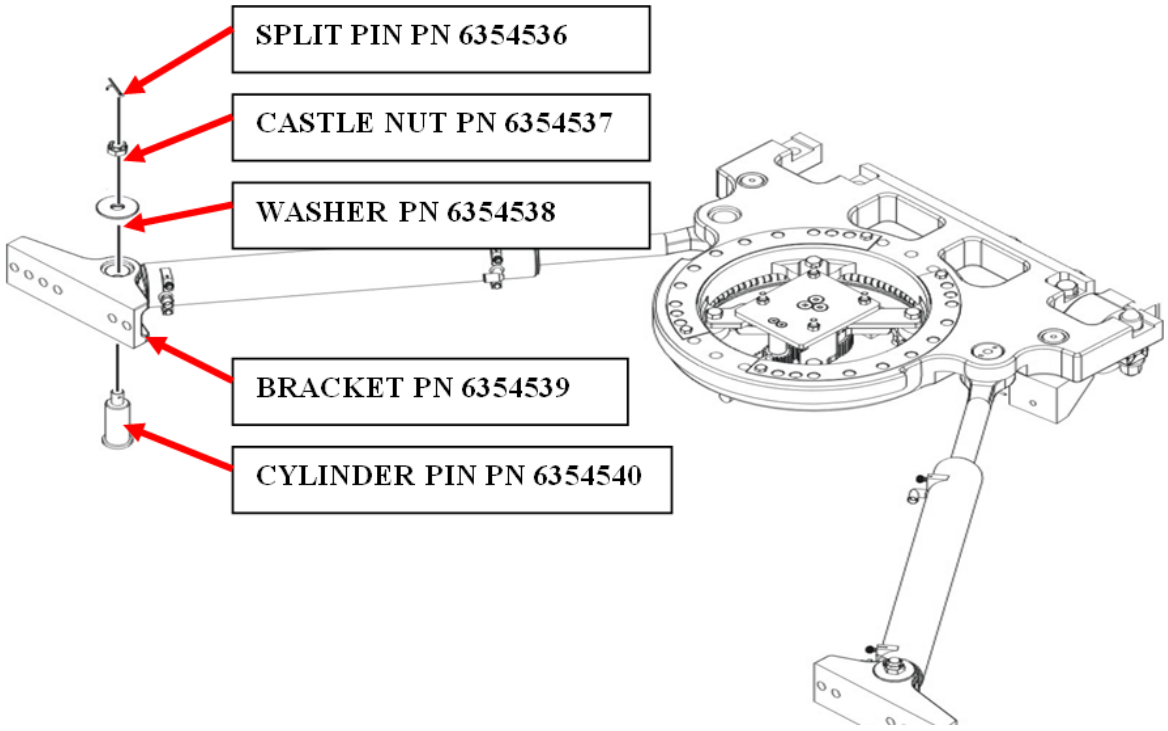


Figure 7: Cylinder Bracket Assembly

5. Remove the screws retaining the valve assembly in place and move the assembly away so it does not interfere when working on the flex plate.
6. Deflate the suspension air springs.

7. Using wheel lifts, raise the bus to allow space to work beneath the vehicle; approximately 2 feet (reference).

8. Ensure all jacking points are supported as shown in Figure 9.

☞ **NOTE: At all times, the articulated joint support frame must move in synchronization with the front half of the bus.**

☞ **NOTE: Maximum height difference between the front half of the bus to the rear half of the bus is 6". Exceeding this height difference may cause harnesses or hoses in the joint to disconnect.**

9. Remove and discard the sixteen (16) 5/8" bolts, washers and spacers that mount the joint to the flex plate.

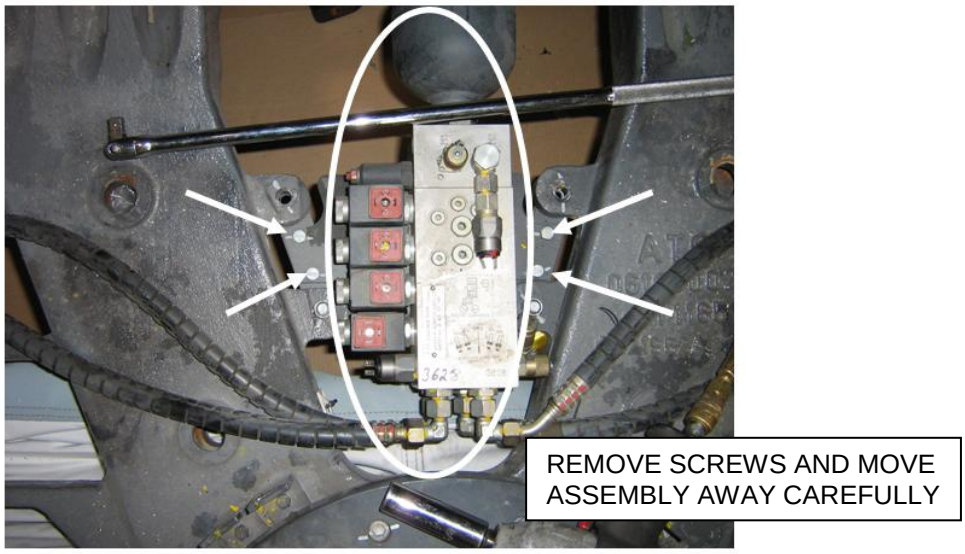


Figure 8: Accumulator Valve Body

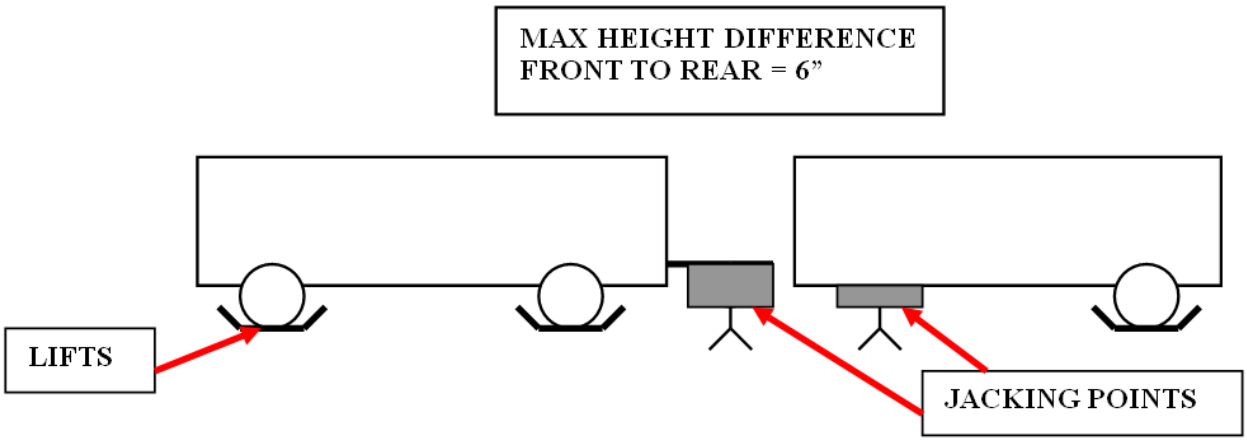


Figure 9: Jacking Points

⚠ **WARNING: HEAVY OBJECT - Ensure the flex plate is supported before removing the 7/8” bolts.**

10. Support the flex plate using floor jacks before removing the 7/8” bolts.
11. Remove and discard the eight 7/8” bolts, washers and nuts that mount the flex plate to the rear structure.
12. Lower the floor jacks to lower the flex plate from the joint assembly. Remove the old flex plate and discard.
13. Clean/remove corrosion from the mating surfaces on the articulated joint and rear structure.

☞ **NOTE: Corrosion must be removed to ensure proper clamp force within the joint.**

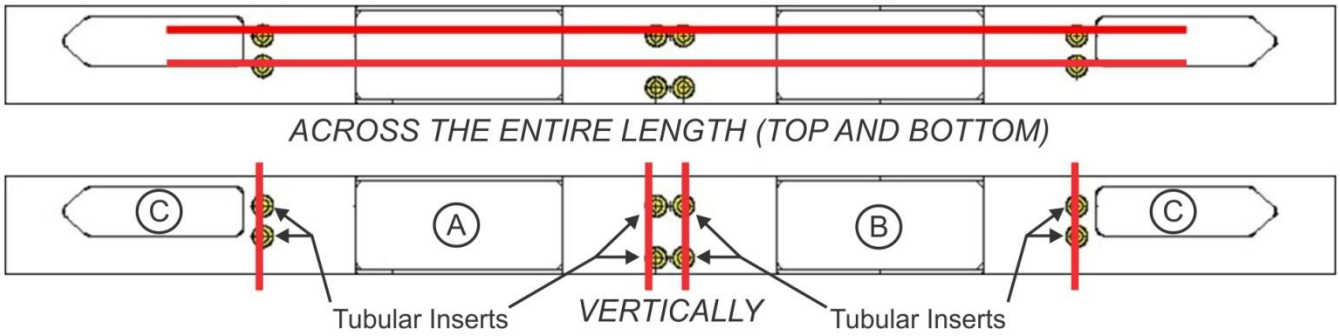
14. If required, one half of the bus may be raised or lowered independent of the other half of the bus, to a maximum 6” height difference, to allow better access for cleaning the mating surfaces on the articulated joint structure and rear structure.

☞ **NOTE: At all times the articulated joint support frame must move in synchronization with the front half of the bus.**

Replace Flex Plate and Apply Shims

1. Inspect the tubular spacer inserts on the structure using a straight edge tool as per Figure 10. Ensure the tubular inserts protrude outward past or equal to the welded blocks (surfaces marked as A and B and C in Figure 10). Use the new flex plate or a straight edge tool placed flush against the surface that protrudes the furthest to determine if shims are required. Use a feeler gauge to measure and record the gap distance and location. Any gap equal to or greater than 0.010" is unacceptable and shims must be applied.

☞ **NOTE: Ensure the tubular inserts and end blocks protrude outward past or equal to the center welded blocks (surfaces marked as A and B and C in Figure 10).**



GOOD - Straight edge tool is placed on the tubular insert flush against the surface that protrudes the furthest, parallel to the rear structure.

BAD - Straight edge tool is placed diagonally against multiple surfaces.

Figure 10: Tubular Inserts Flatness Inspection

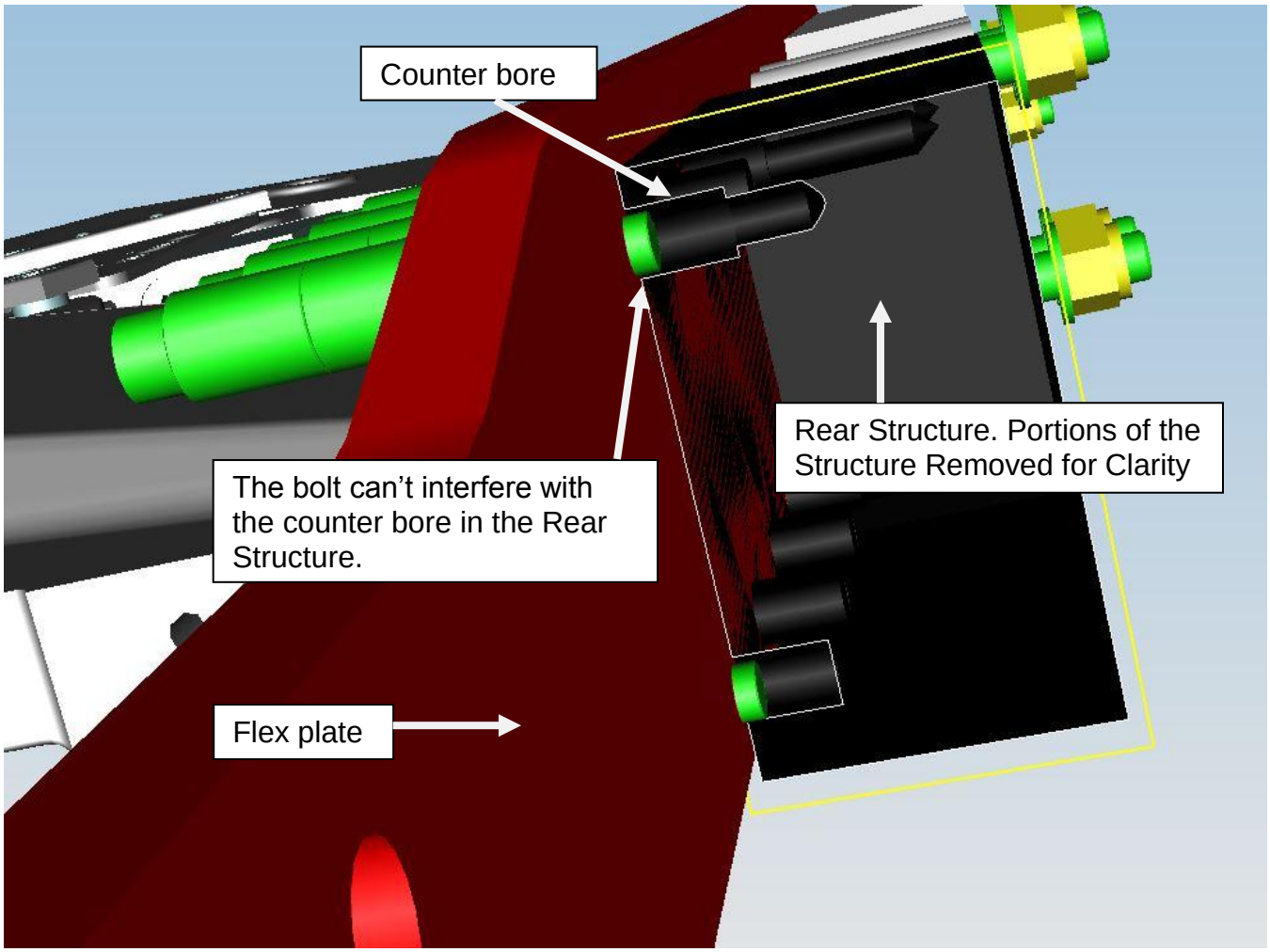


Figure 11: Ensure Bolts Do Not Interfere With Counter Bore in Rear Structure

b) Reassemble the Articulated Joint to the Structure

⚠ **WARNING: HEAVY OBJECT - Prior to installing the flex plate, ensure the flex plate is supported.**

1. Attach the flex plate to the joint first using new 5/8" X 5" bolts (x16) and spacers (x32) (with Loctite). Only screw the new 5/8" bolts far enough so the end of the bolt does not protrude past the end of the flex plate. See Figure 11. See Section F – "Part Number table" for the list of part numbers.

☞ **NOTE: Apply Loctite 2047 NF P/N: 460317 on all mating surfaces (bolts, washers, spacers, flex plate) and bolt length to ensure connection is water sealed.**

☞ **NOTE: Bolts must be clean and free of debris prior to installation. All mating surfaces should be clean of dirt, debris, primer and paint as well.**

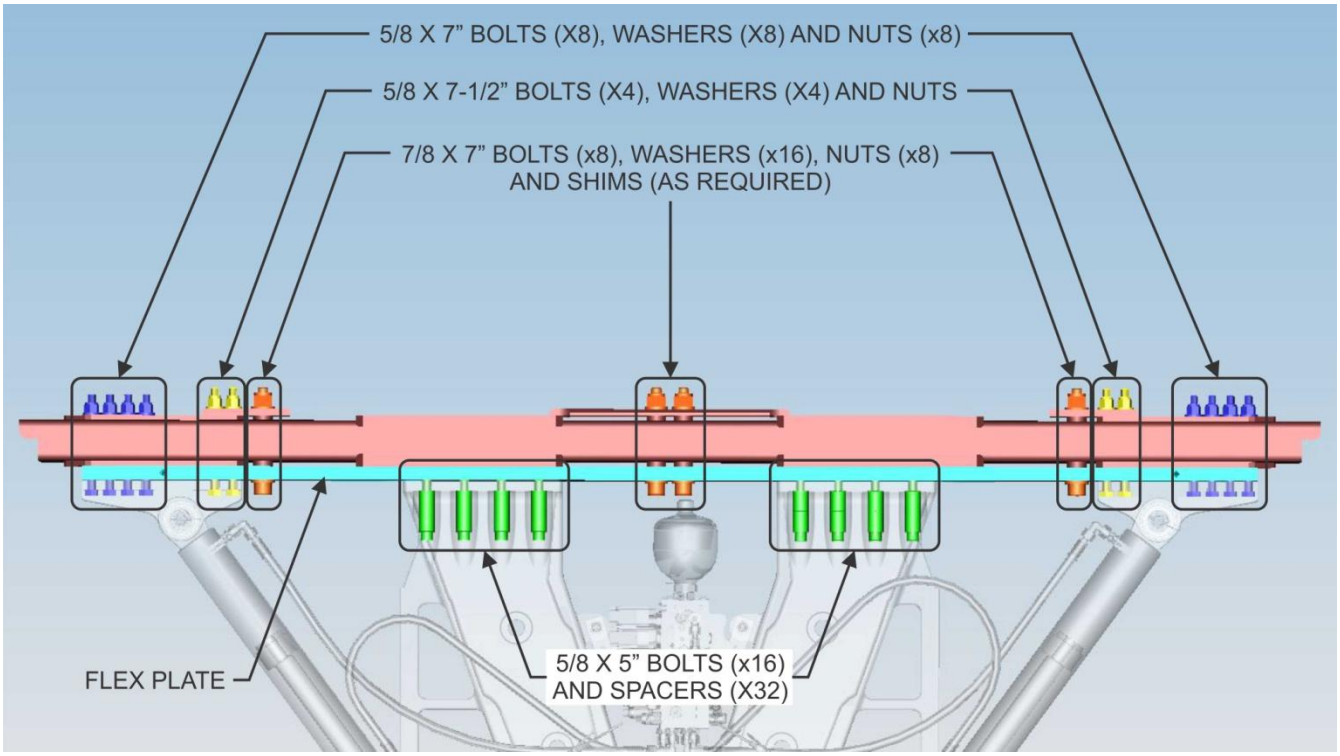


Figure 12: Flex Plate & Hardware (Portions of the Structure Removed for Clarity)

2. Ensure that the mounting holes in the flex plate are flush and aligned with the rear structure’s tubular inserts.
3. As per recorded information in Figure 10, apply the appropriate number and thickness of shims between the flex plate and the rear structure.
4. Secure the flex plate to the rear structure with the 7/8” X 7” bolts, 7/8” washers and 7/8” nuts, inserting the correct sized shims onto the other side of the flex plate between the flex plate and the structure. Only lightly tighten the 7/8” bolts at this time to a torque of 50 ft-lbs (Wet, with Loctite). See Figure 12.
5. Slowly torque the 5/8” bolts (x16) between the articulated joint and flex plate to 40 ft-lbs (Wet, with Loctite). See Figure 11. By hand, check to ensure that the spacers are not free to rotate. Any rotation of the spacers may indicate thread damage or interference with the counter bore in the rear structure; check threads for damage and check for interference.
6. Torque the 5/8” bolts between the articulated joint and flex plate in two steps in the sequence as shown in Figure 14. Mark torque stripe across bolt head, washer, spacers, and joint structure.

   Step 1: Torque to 135 ft-lbs. (Wet, with Loctite)

   Step 2: Torque to 240 ± 10 ft-lbs. (Wet, with Loctite)

7. Torque 7/8” bolts to 520 ± 20 ft-lbs (Wet, with Loctite) from bolt head in the sequence as shown in Figure 14. Torque the bolts a second time to 520 ± 20 ft-lbs (Wet, with Loctite) to the bolt head in the sequence. Mark torque stripe across bolt head, washer and flex plate and on the nut side mark torque stripe across bolt, nut, washer, and tube structure.

☞ **NOTE: Apply Loctite 2047 NF P/N: 460317 on all mating surfaces (bolts, washers, spacers, flex plate, structure, nut and threads) to ensure connection is water sealed.**

☞ **NOTE: Bolts must be clean and free of debris prior to installation. All mating surfaces should be clean of dirt, debris, primer and paint as well.**

☞ **NOTE: At all times the articulated joint support frame must move in synchronization with the front half of the coach. Maximum height difference front to rear = 6”.**

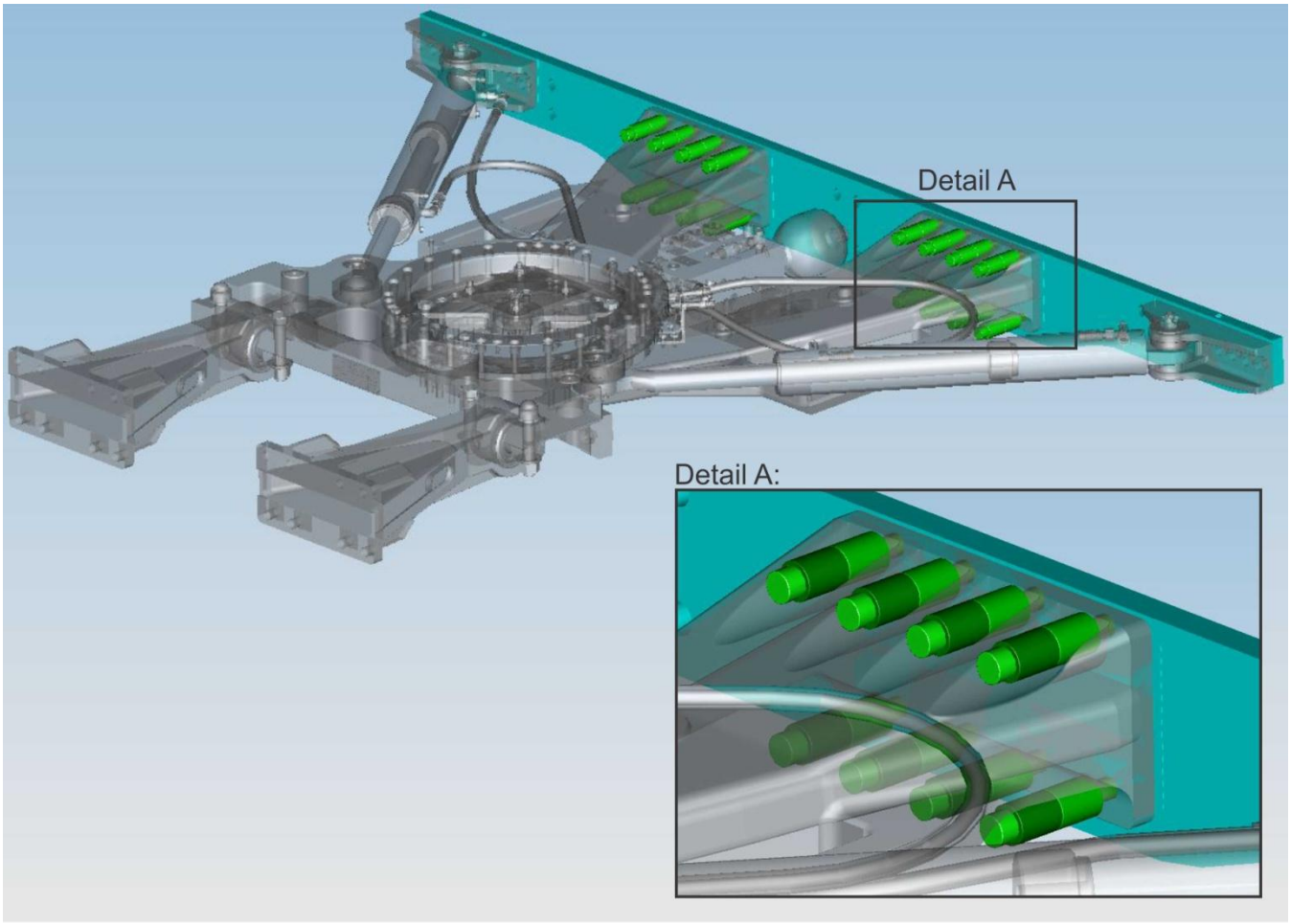
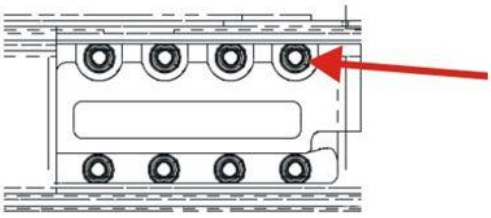


Figure 13: Flex Plate Installation

8. Reattach the hydraulic cylinder bracket back to the flex plate using new 5/8 X 7” bolts, washers and nuts. See Section F – “Part Number table” for the list of part numbers. Torque bolts in two steps to the the sequence as shown in Figure 14. Mark torque stripe across bolt head, and cylinder bracket and on the nut side torque stripe across bolt, nut, washer, and tube structure.

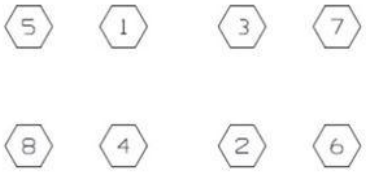
   Step 1: Torque to 135 ft-lbs. (Wet, with Loctite)
   Step 2: Torque to 220 ± 10 ft-lbs. (Wet, with Loctite)

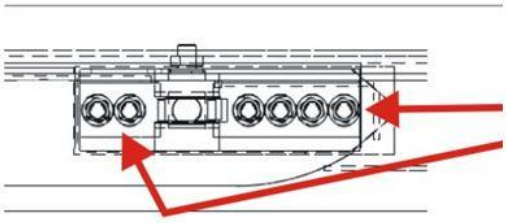
9. Reinstall the articulated joint valve assembly in place and use original hardware.
10. Reattach the cylinder components to the brackets. Torque nut on the cylinder pin to 74 ft-lbs.
11. Re-pressure the articulated joint system to 20.7 Bar and add oil as needed.
12. Reassemble the articulated joint closure per Section E – “Reassemble the Articulated Joint Area”.



REAR BULKHEAD FRAME
5/8 X 5 LG BOLT X 8 TYPICAL 2 PLACES

FOLLOW INCLUDED TORQUE SEQUENCE
APPLY LOCTITE 2047 (NF P/N: 460317) TO BOLTS
STEP 1: TORQUE TO 135 FT-LBS (Wet, with Loctite)
STEP 2: TORQUE TO 240 ± 10 FT-LBS (Wet, with Loctite)





REAR BULKHEAD CYLINDER BRACKET
5/8-11UNC X 7LG BOLT X 4
5/8-11 UNC X 7.5LG BOLT X 2
TYPICAL 2 PLACES

FOLLOW INCLUDED TORQUE SEQUENCE
APPLY LOCTITE 2047 (NF P/N: 460317) TO BOLTS
STEP 1: TORQUE TO 135 FT-LBS (Wet, with Loctite)
STEP 2: 220 ± 10 FT-LBS (Wet, with Loctite)

JOINT FLEX PLATE
7/8-14 UNF 7LG BOLT X 8
FOLLOW INCLUDED TORQUE SEQUENCE
STEP 1: TORQUE TO 520 ± 20 FT-LBS (Wet, with Loctite)
STEP 2: TORQUE TO 520 ± 20 FT-LBS (Wet, with Loctite) TO CONFIRM TORQUE
NOTE: TORQUE FASTENERS FROM BOLT HEAD

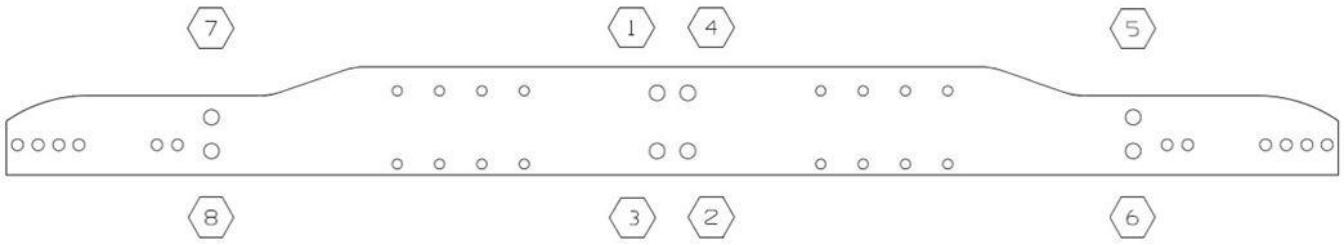
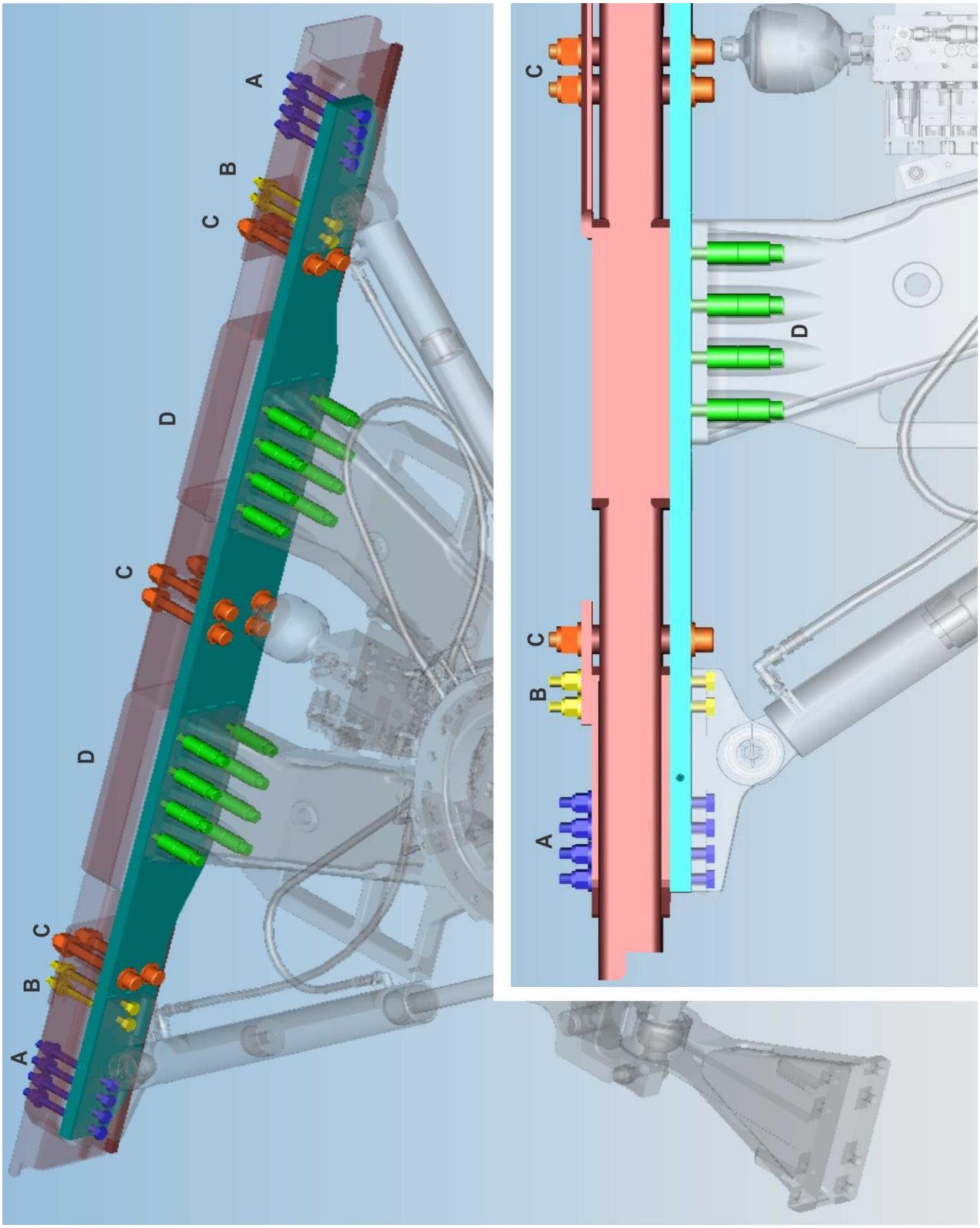


Figure 14: Torque Sequence

E. REASSEMBLE THE ARTICULATED JOINT AREA

1. Reinstall rear half cover plate NF using the original hardware. Apply grease to the support if necessary.
2. Reinstall the inside and outside bellows and tighten the J-channel assembly.
3. Reinstall the screws that hold the bottom flap underneath the coach.
4. Reinstall seats and stanchions in the joint area (as necessary).
5. If necessary, lower coach in accordance with New Flyer Service Manual.
6. Turn the main battery disconnect switch to the “ON” position.

F. PART NUMBER TABLE



	Standard Hardware			Coated Hardware			
Location	P/N	Description	Qty	P/N	Description	Qty	Notes
A	10B10112	BOLT-HEX 5/8 UNC X 7.00	8	551382	BOLT HEX-5/8 UNC X 7.00	8	
	20W10000	WASHER FLAT HARDENED 5/8"	8	551361	WASHER FLAT HARDENED 5/8	8	
	40N10000	NUT LOCK NYLON 5/8" 11 UNC	8	551373	NUT-HEX LOCK 5/8 UNC	8	
B	10B10120	BOLT-HEX 5/8-UNC X 7.5	4	551380	BOLT HEX-5/8 UNC X 7.50	4	
	20W10000	WASHER FLAT HARDENED 5/8"	4	551361	WASHER FLAT HARDENED 5/8	4	
	40N10000	NUT LOCK NYLON 5/8" 11 UNC	4	551373	NUT-HEX LOCK 5/8 UNC	4	
C	321633	BOLT-7/8-14 UNF X 7LG	8	551328	BOLT-7/8-14UNF X 7LG	8	
	20W14000	WASHER FLAT HARDENED 7/8"	16	551357	WASHER FLAT HARDENED 7/8	16	
	41N14000	NUT LOCK NYLON 7/8" 14 UNF	8	551364	NUT-HEX LOCK 7/8 UNF	8	
D	368541	SCREW-SOC 5/8UNRF X 5.0	16	551352	SCREW-SOC 5/8UNRF X 5.0	16	
	340625	TUBE-SPACER SHORT	32	551378	TUBE-SPACER SHORT	32	
Flex Plate	368472	ASSY-JOINT TRANSITION	1	--	--	--	
Shims	342636	SHIM-RING STEEL .005 THK	5	551354	SHIM-RING STEEL .005 THK	5	Shims are to be
	342638	SHIM-RING STEEL .010 THK	10	552082	SHIM-RING STEEL .010 THK	10	used as required.
	342639	SHIM-RING STEEL .015 THK	10	552083	SHIM-RING STEEL .015 THK	10	
	342640	SHIM-RING STEEL .020 THK	10	552084	SHIM-RING STEEL .020 THK	10	
Loctite	460317	LOCTITE-2047 (BLACK)	0.5	--	--	--	