



PROTERRA



TECHNICAL SERVICE BULLETIN

ISSUE DATE:	10-24-2022
SERVICE BULLETIN SUBJECT:	Alignment Process Update
VINs or MODELS AFFECTED:	Service Specified Buses
COMPLETE BY:	Next Service Opportunity
SERVICE BULLETIN #:	SC-22-130
Labor Operation Code:	SZ42Z

NOTICE! It is expected that this process will require six hours per bus. Please schedule appropriately to minimize vehicle downtime.

ALIGNMENT PROCESS UPDATE

Note all alignments shall take place on an alignment rack approved for the alignment of heavy duty vehicles. This document describes how to prepare a Proterra bus for an alignment as well as how to adjust rear thrust, camber, and toe during an alignment. Note that the means of measuring alignment parameters is determined by the alignment equipment manufacturer.

Tools/Parts Required

Tools and Supplies Required:

- Alignment Machine with Alignment Rack
- Wheel Chocks
- Air Pressure Gauge
- Square Key
- Ratchet Straps (Two Required)
- Step Stool
- T-30 Torx Driver
- Tape Rule
- Ratchet
- 10mm Socket
- Impact Driver
- 19mm Impact Socket
- 19mm Combination Wrench
- 1-1/16 Inch Impact Socket
- 1-5/16 Inch Impact Socket
- 1-1/16 Inch Combination Wrench
- Tie Rod Adjuster
- Mallet
- Calibrated Torque Wrench
- Orange Torque Stripe Paint
- Flat Blade Screwdriver

Kit Parts Required:

- 059608 LONGER UPPER CONTROL ARM BOLTS, FRONT ALIGNMENT (Consisting of)
 - 018830-026 BOLT, DIN 933, STL, CL 10.9, 1000HSS, M20-2.5X65X65 8 EA

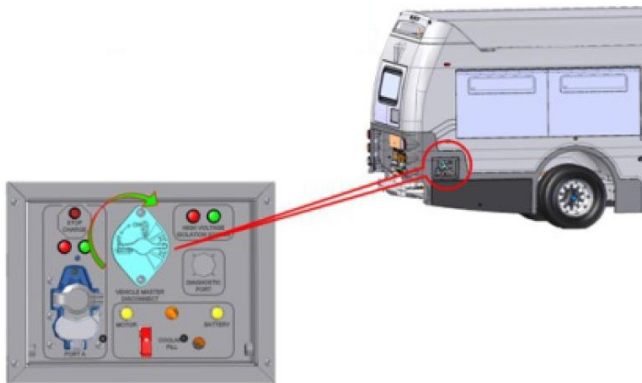
Additional Parts that may be Required:

- 018650 WASHER, HARDENED FLAT, STL, 1000HSS, CLASS 10.9, M20 As Needed

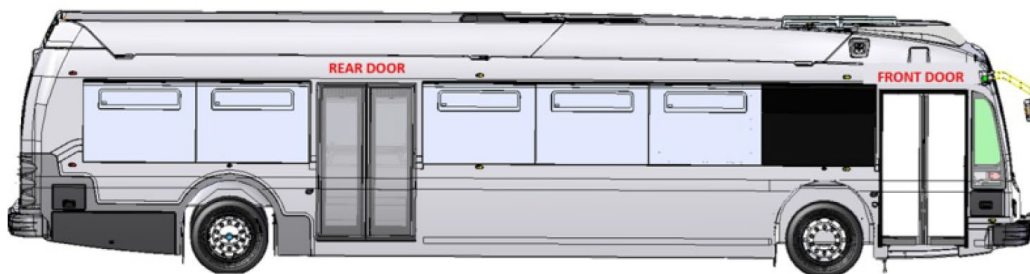
Prior to Alignment:

Prepare the bus for alignment:

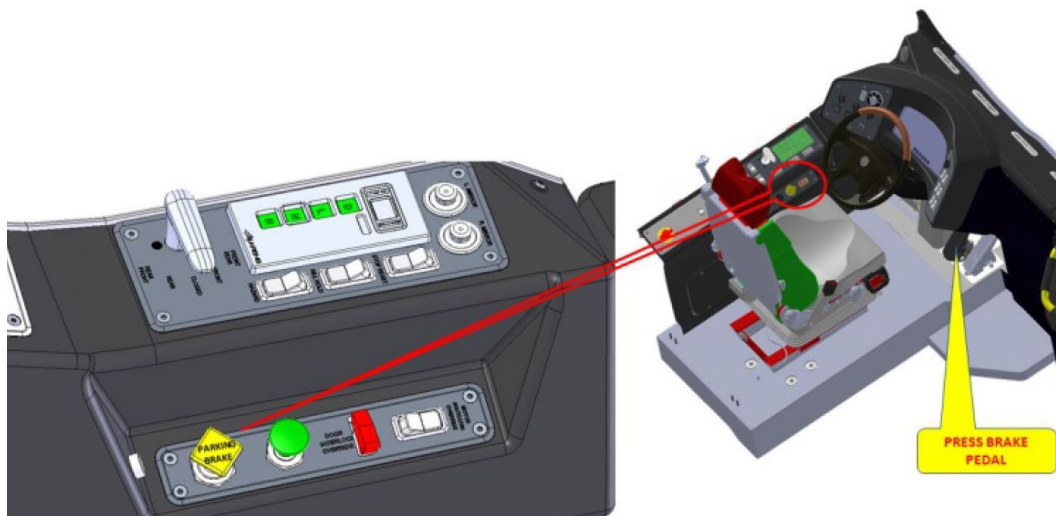
1. Using an Air Pressure Gauge, measure the air pressure on all six (6) tires. Add or release air to set the pressure of all the tires to 130 pounds per square inch.
2. Begin the procedure with two associates inside the bus. Turn the “Master Disconnect” at the curbside rear of the bus on.



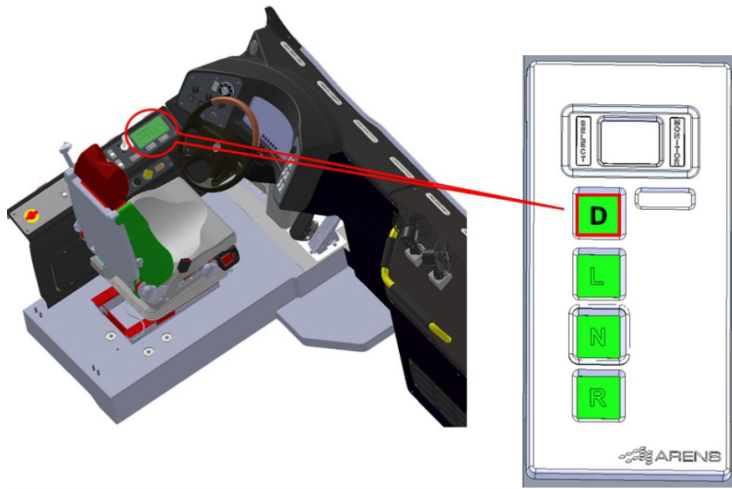
3. Working inside the bus, close all doors.



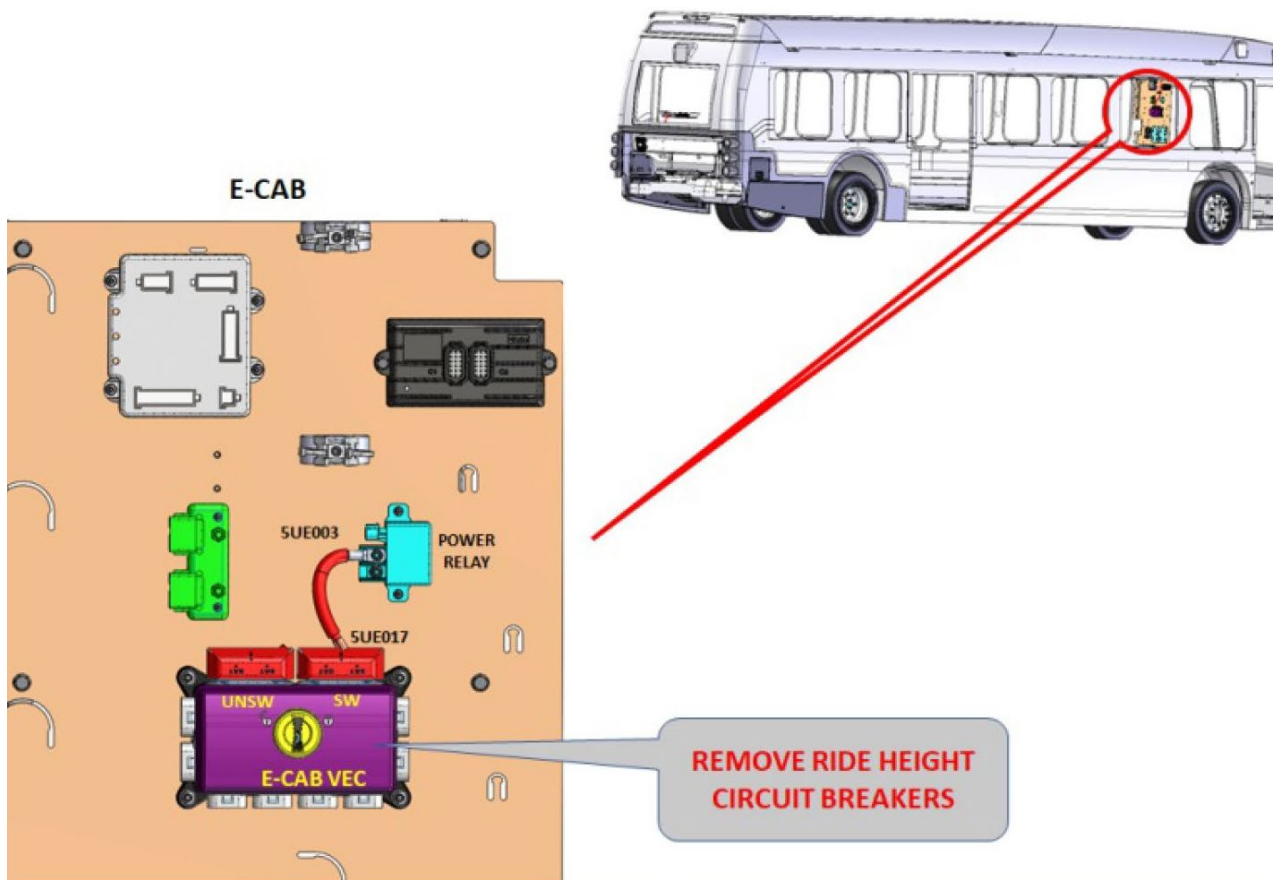
4. Depress the Brake Pedal and push on the yellow “Parking Brake” knob to release the parking brake. Continue to keep the Brake Pedal depressed.



5. While holding the Brake Pedal, push the “D” Button to engage the drivetrain and set the ride height to the driving position.

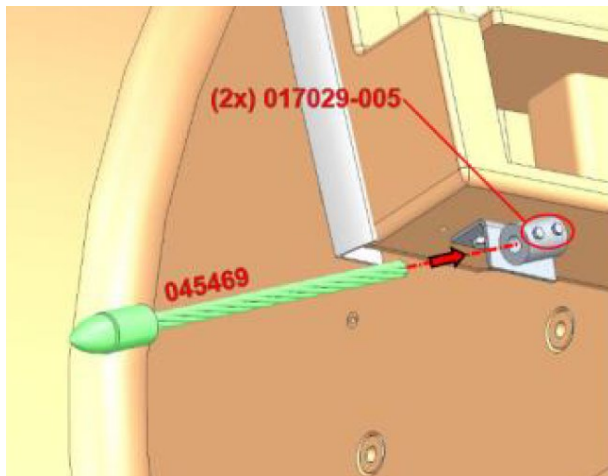


6. Using a T-30 Torx Driver, remove the ECAB Panel and the VEC Cover.



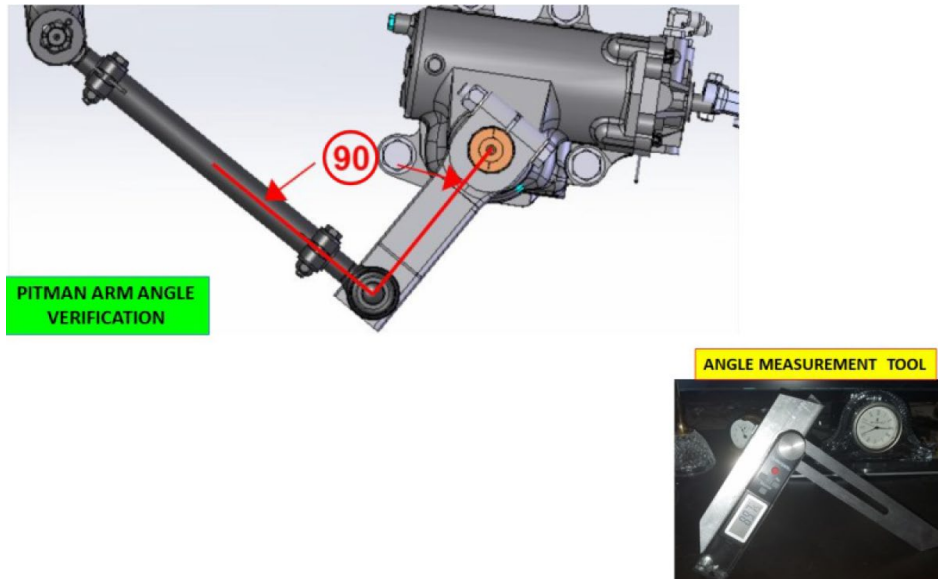
7. While still holding the Brake Pedal, have the second associate remove the two Ride Height Circuit Breakers. Note the position of each Breaker so that they may be reinstalled when the alignment is complete.
NOTE: The ride height will no longer adjust when the door is opened/closed and will remain fixed during alignment.

8. Engage the “Interlock Override” switch to prevent the service brake from engaging when the front door is opened. If service brakes engage during alignment, the results can be corrupted.
9. Shift the vehicle into “N” Neutral and open the front door.
10. Have the second associate exit the bus and verify that the ride height has not changed.
11. Using a Measuring Tape, verify that the Ride Height at all four corners of the bus is 9.75 inches plus or minus 1/8 inch.
NOTE: This dimension is to the yellow jacking pads on the body.
12. Using a 10mm Ratchet/Socket, remove the Curb Feeler and Mounting Bolts if a Curb Feeler is installed. Store these components in a safe place so that they may be reinstalled after the alignment is complete.



Ensure steering is centered prior to alignment:

1. Using an Angle Measurement Tool, verify that the angle shown on the Pittman Arm is very close to 90 degrees.



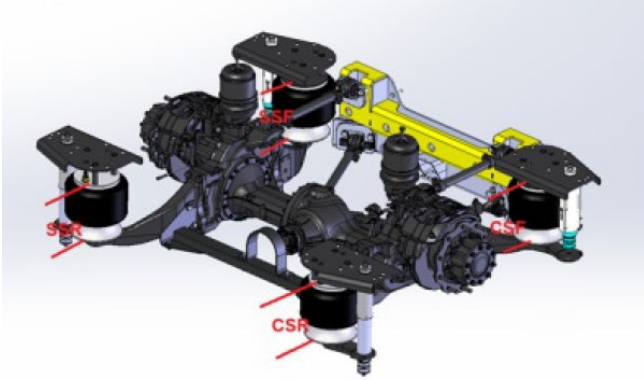
2. If the Steering Wheel is perfectly centered, proceed with the alignment.
3. If the Steering Wheel is not perfectly centered, use a 1-1/4 Inch Ratchet/Socket to remove the Steering Wheel and center it on the Steering Column.



4. Using a Ratchet with a 1-1/4 Inch Socket, replace the nut that secured the Steering Wheel to the Steering Column.
5. Using a Calibrated Torque Wrench with a 1-1/4 Inch Socket, **torque the nut to 50 foot pounds.**
6. Using Orange Torque Stripe Paint, mark the properly torqued fasteners.

How to check/adjust rear axle pitch prior to alignment:

1. Using a Measuring Tape, measure the height of each rear Air Bag. The heights of each Bag should be within 1/4 inch of each other.

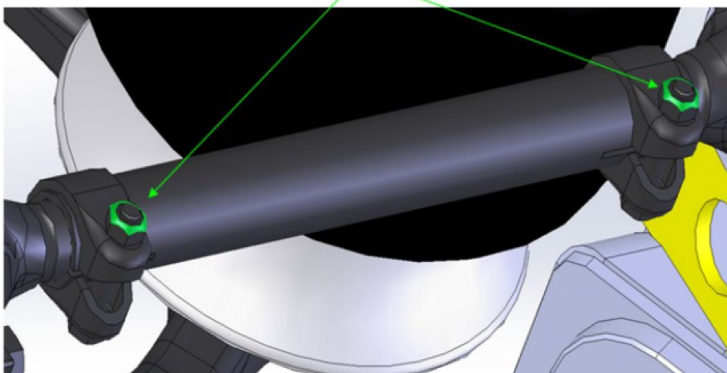


2. If the Air Bags are not within the 1/4 inch specification they must be adjusted using the Connecting Arms shown in green in the following illustration.



3. If the Air Bags are within the 1/4 inch specification, no adjustment is required.
4. If adjustments are required, loosen the Pinch Clamp Retaining Nuts on each of the rear Connecting Rods using an Impact Tool with a 19mm Socket and a 19mm Combination Wrench.

If an adjustment is required, loosen the retaining nuts on each control arm.



5. Use the Special Linkage Adjustment tool shown below to adjust the length of the Connecting Rods to properly adjust the height of the Air Bags.

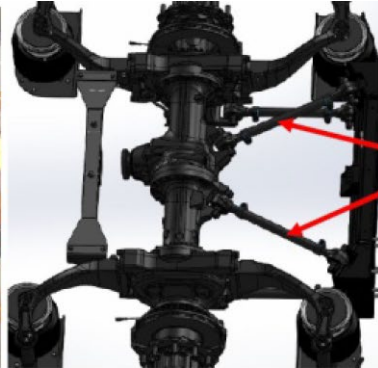


Special Tool for Linkage Adjustment

6. The Connecting Rod adjustments affect the height of the air bags as follows.
 - a. Increasing the length of the upper Connecting Rods and decreasing the length of the lower Connecting Rods will increase the height of the streetside and curbside rear air bags. This will also decrease the height of the streetside and curbside front air bags.
 - b. Decreasing the length of the upper Connecting Rods and increasing the length of the lower Connecting Rods will increase the height of the streetside and curbside front air bags.
7. Use the following guidelines when adjusting the air bag height:
 - a. Adjust both lower and upper control arms by the same amount to ensure the axle remains centered in the wheel well.
 - b. Adjust street and curbside control arms by the same amount to ensure that the thrust angle is not changed.
 - c. You may wish to place a point on each control arm using a paint marker to help identify how many turns have been made.
 - d. Adjust each rod two or three turns at a time and check progress by measuring all four air bags.
8. Repeat as needed until the rear Air Bags are level to within one quarter (1/4) or an inch of each other. Ensure clamp nuts are torqued after alignment is complete.

How to adjust axle offset prior to alignment:

1. Using a Tape Rule, measure the distance from the top of each outer rear tire to the inside of the wheel well. These measurements should be nearly the same, indicating that the rear suspension is centered in the bus body. The tolerance is 1/8-inch. If the measurements are not within this tolerance, centering may be adjusted with the linkages shown below. Use a 19mm Socket on an Impact Tool and a 19mm Combination Wrench to loosen the Pinch Clamp Retaining Nuts on the Connecting Rods. Use the same tools to tighten the clamps after making an adjustment. Adjust the linkages with the special tool shown to center the rear suspension. Do NOT torque the Pinch Clamp Retaining Nuts at this time.



Adjust These
Linkages for Rear
Axle Offset



Special Tool for Linkage
Adjustment

During Alignment:

Alignment Specifications:

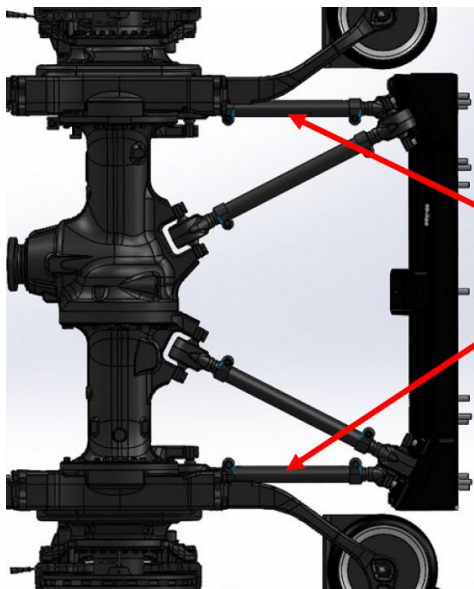
Note that the bus shall be placed on an alignment rack approved for the alignment of heavy duty vehicles while making the following alignment adjustments.

Parameter	Target (Left and Right Side)	Negative Limit (Degrees)	Positive Limit (Degrees)	Variation between left and right side	
				Min	Max
Front Axle Camber (Each Wheel)	0.15	-0.2	0.5	0	0.2
Front Axle Caster (Each Wheel)	2.50 °	1.50 °	3.50 °	0 °	0.75 °
Front Axle Toe (Each Wheel)	0.0375 °	0 °	0.05 °	0 °	0.05 °
Front Axle Total Toe	0.075 °	0 °	0.10 °	NA °	NA °
Steer Ahead	0 °	-0.05 °	0.05 °	NA	NA
Rear Axle Thrust Angle	0 °	-0.03 °	0.03 °	NA	NA
Wheel Cut Angle	Outside 43° ± 1/2	Inside 50° ± 1/2			

Not adjustable

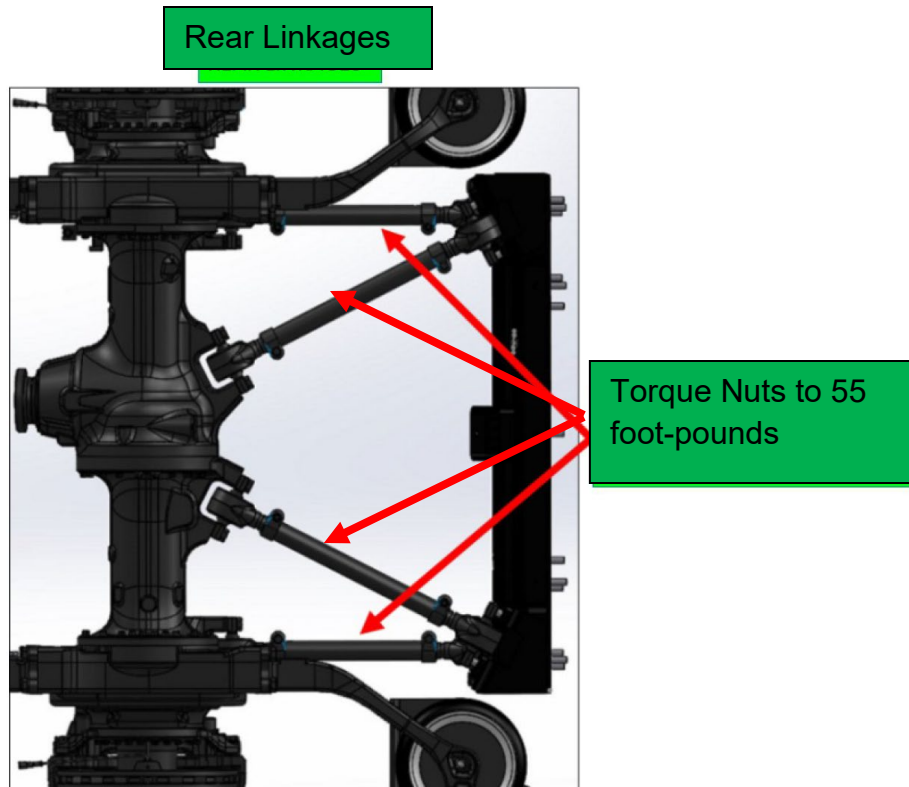
How to adjust the rear axle thrust angle during alignment:

1. Adjust the Thrust Angle using the Linkages shown below. Use a 19mm Socket on an Impact Tool and a 19mm Combination Wrench to loosen the Pinch Clamp Retaining Nuts. Use the same tools to tighten the clamps after making an adjustment. Adjust the linkages with the special tool shown.



Adjust These Linkages for Thrust Angle

- Using an Impact Tool with a 19mm Socket and a 19mm Combination Wrench tighten the Pinch Clamp Retaining Nuts on all four of the Connecting Rods.

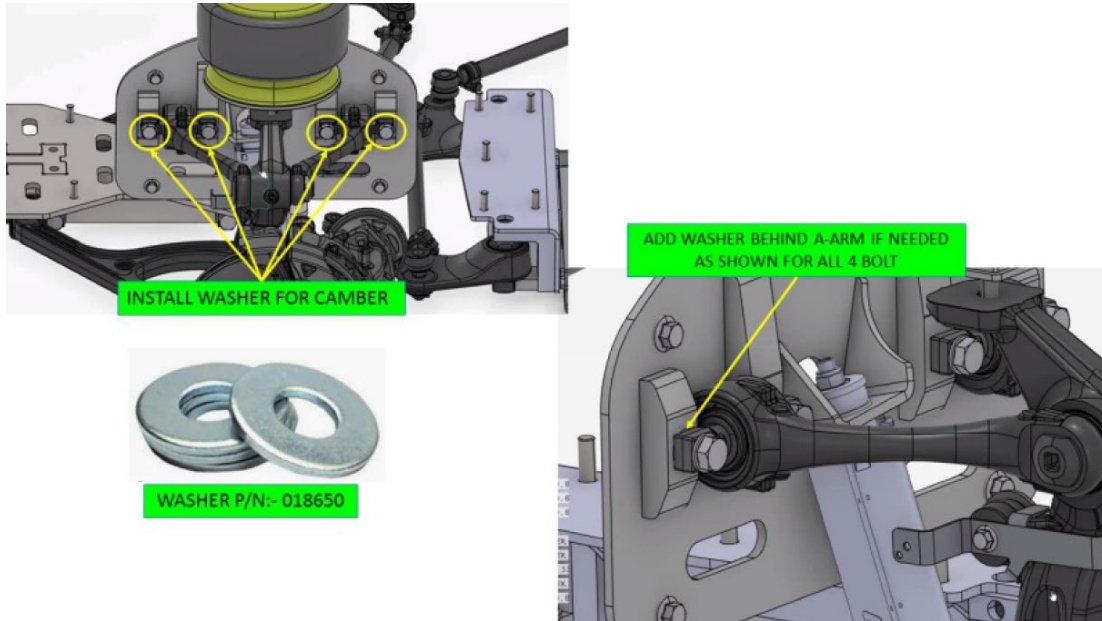


- Using a Calibrated Torque Wrench with a 19mm Socket and a 19mm combination wrench, torque the fasteners to 55 foot-pounds.
- Using Orange Torque Stripe Paint, mark the properly torqued fasteners.

Adjust the Camber:

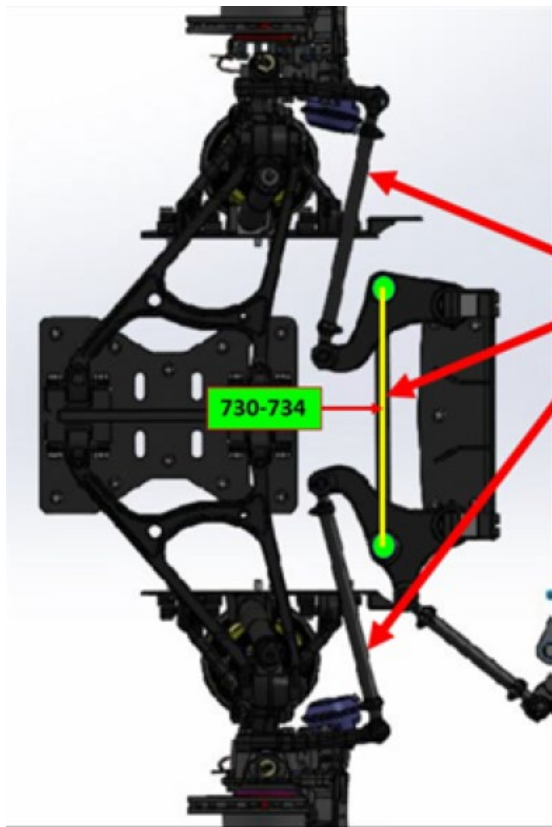
1. Adjust Front End Camber (if necessary) by installing Washers (018650) behind the upper "Control Arm" bolts shown circled below. A maximum of three (3) Washer sets may be used. Longer Bolts (059608) are necessary if using more than one (1) Washer set. If shims are added or the Control Arm bolts are loosened for any reason, torque the upper A-Arm bolts to 304 Foot-Pounds. Mark the correctly torqued bolts with orange torque stripe paint.

NOTE: For each 1mm of shim, the camber will become more positive by 0.14 degrees. The 018650 washers are 3mm thick and thus will induce 0.4 degrees of positive camber.



Adjust the Toe:

1. Using the following illustration as a guide, loosen the Pinch Clamp Retaining Nuts on the Connecting Rods using an Impact Tool with a 19mm Socket and a 19mm Combination Wrench.



Adjust these linkages for toe.

Small adjustments can be done using the center linkage, but typical toe adjustments are done using the outer tie rods.

2. Adjust the toe to spec. Small adjustments may be made using the center linkage only but the outer tie rods are typically used to set toe.
3. Ensure that the outer tie rod lengths are within 5mm of each other.

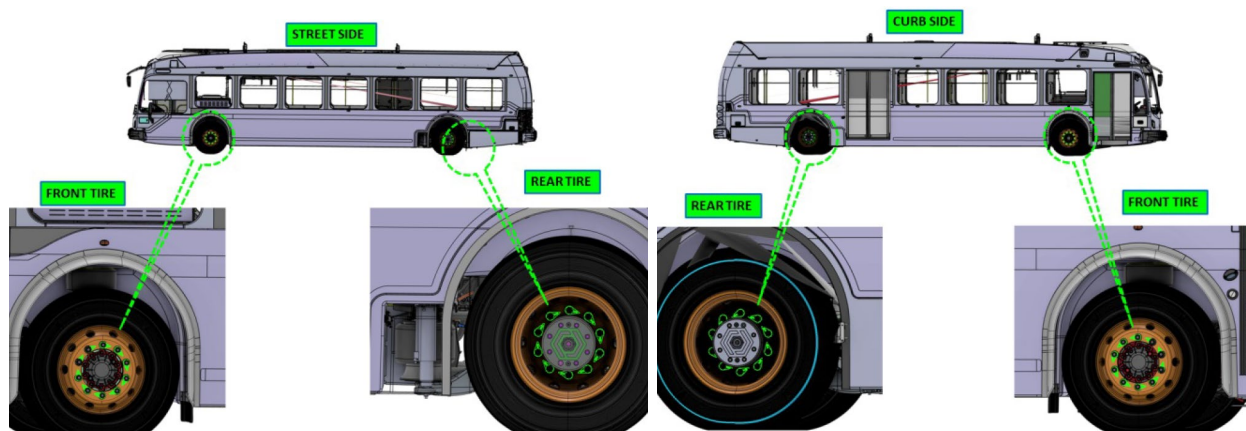
After Alignment is Complete:

1. Ensure that all the parameters are within the limits shown in the table.
2. Ensure that all pinch clamps were re-torqued and torque striped.
3. Be sure that a Spotter is available to assist in removing the vehicle from the Alignment Rack.
4. Get inside the vehicle and depress the brake pedal.
5. Turn off the "Interlock Override" switch.
6. Carefully and slowly, back the vehicle off the Alignment Rack with the assistance of the Spotter.

7. Reinstall the ride height Circuit Breaker in the proper positions in the ECAB.
8. Using a T-30 Torx Driver, replace the ECAB panel.
9. Test the Ride Height System to ensure proper operation by using the kneel and override switch to verify that the vehicle lowers and raises.
10. Apply the Parking Brake and shut down the vehicle.
11. Using a Calibrated Torque Wrench with a 1-5/16 Inch Socket, **torque the Lug Nuts on each wheel to 450 foot-pounds using the pattern shown in the following graphic.**



12. Verify that all Lug Nut Indicators are installed as shown in the following illustrations.



13. Return the bus to service.