

Tech Tip



From your friends at New York Bus Sales

Product Effected –Blue Bird Type “C” & “D” Chassis w/Meritor “Q” Plus S-Cam Brakes, Hendrickson Front Axle and Arvin Meritor Rear Axle

Complaint: *Pre-mature wheel bearing failure*

Cause: *Improperly Adjusted Wheel Bearings*

Correction: *Please make sure that you use the proper sequence and torque as provided in the Service Manual (specific section attached)
I'm afraid “old school” methods have been surpassed with what is “known” to work and we cannot live by what we learned with “old” technology.*

If you can imagine that when you install the inner wheel nut as instructed to the torque instructed and check for play....there is some but when the lock and outer nut are installed and torqued that the play is gone.....What happens when you start with a tight inner nut?

Thank You to Victor Tripp at Carthage Central School for pointing this out!

ALL of our Tech Tips can be found on the New York Bus Sales website at

<http://www.newyorkbussales.com/pages/bulletins.cfm>

Or at the New York Head Mechanic website at

<http://www.nyhma.org/viewforum.php?f=2&start=0>



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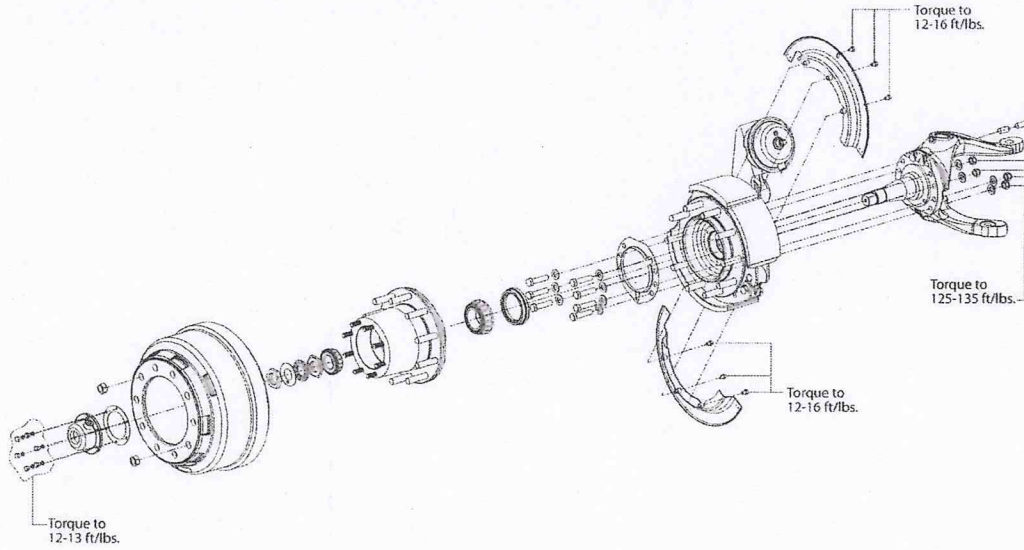
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Air Brakes Wheel Ends, Front

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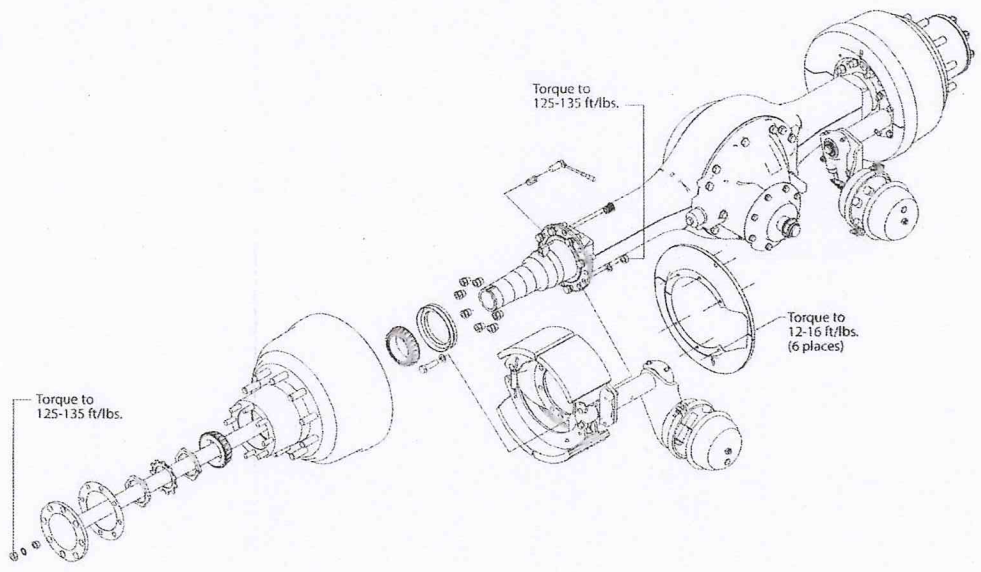


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Air Brakes Wheel Ends, Rear



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Brake Shoes & Drums

The Blue Bird All American uses Meritor Q-Plus model S-cam brakes and drums. The front brakes are 16.5" diameter, 5" wide models with cast spiders. Rear brakes are 16.5" diameter, 7" wide with cast spiders.

The brake shoes are mounted on individual pivots at their rear-most end, as mounted on the Blue Bird All American. Half-round notches on the pivot ends of the shoes engage the shouldered ends of individual anchor pins that pass through the casting of the spider plate. The pivoting ends of the shoes are held in place by a heavy-duty spring connecting to both shoes.

The opposite ends of the brake shoes are supported by cam rollers, which ride in the round notches of an S-shaped cam situated between the two shoes. Wire retaining clips hold the cam rollers in the ends of the shoes, and heavy-duty springs again provide pressure to retain the shoes in their position.

When brakes are applied, the slack adjuster rotates the shaft of the S-cam. The S-shape of the cam forces the forward ends of the brake shoes to spread, pressing the shoe linings against the walls of the brake drum.

Maintenance

Brake shoe service life will vary according to operating conditions. The thickness of the brake shoe friction linings can be viewed from the inboard side of the wheel, and should be measured regularly. The brake shoes should be replaced when lining thickness is .25 in. (6.3mm) at the thinnest point. Springs, rollers, cam bushings, and anchor pins should be replaced when replacing brake shoes.

Do not re-bore brake drums. Doing so decreases the strength and heat capacity of the drum.

Appendix 14 contains detailed information on inspection, disassembly and reassembly of the Q Plus brakes used on the Blue Bird All American.

Removal, Front Drums

The same mounting stud nuts that retain the front wheel also retain the front brake drum.

1. Park the bus on a level surface. Stop the engine. Chock all wheels securely to prevent movement in either direction. Means other than brakes must be used to prevent vehicle movement.
2. Open all three tank bleed valves to drain the air brake system to 0 psi.
3. Raise the bus with an appropriate jack and support it with safety stands under the frame rails.
4. Disconnect the automatic slack adjuster to allow the brake shoes to fully retract from the drum. The extra clearance will be required when reassembling with new brake shoes. Refer to the instructions above for kind of slack adjuster (Meritor or Haldex) installed.



4. Remove the wheel nuts. Remove the front wheel. The brake drum can now be removed for access to the brake shoes and other components.

Refer to Appendix 4 for instructions on disassembling, inspecting and reassembling the brake shoes and related components.

Installation, Front Drums

After reinstalling the brake components according to instructions in Air Brakes Appendix 4:

1. Install the brake drum, wheel, and wheel mounting nuts. Draw up the wheel nuts evenly, rotating the wheel a few turns to be sure to remove all free play in the mounting nuts. Then use a calibrated torque wrench to gradually tighten the wheel nuts to 450–500 ft. lbs. (610–678 Nm), working back and forth across the center of the wheel as in the pattern shown:
2. Reconnect the automatic slack adjuster using new clevis pin retainer clips. Adjust the slack adjuster according to instructions in Air Brakes Appendix 3 (for Meritor slack adjusters) or Air Brakes Haldex Appendix on the CD (for Haldex slack adjusters).

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Removal, Rear Drums

The same mounting stud nuts which retain the rear wheel also retain the rear brake drum.

1. Park the bus on a level surface. Stop the engine. Chock all wheels securely to prevent movement in either direction. Means other than brakes must be used to prevent vehicle movement.
2. Open all three tank bleed valves to drain the air brake system to 0 psi.
3. Raise the bus with an appropriate jack and support it with safety stands under the frame rails.
4. Manually disengage the spring brake as described above in Manual Spring Brake Disengagement.
5. Disconnect the automatic slack adjuster to allow the brake shoes to fully retract from the drum. The extra clearance will be required when reassembling with new brake shoes. Refer to the instructions above for kind of slack adjuster (Meritor or Haldex) installed.
6. Remove the wheel nuts. Remove the rear wheels. The brake drum can now be removed for access to the brake shoes and other components.

Refer to Appendix 4 for instructions on disassembling, inspecting and reassembling the brake shoes and related components.

Installation, Rear Drums

After reinstalling the brake components according to instructions in Appendix 4:

1. Install the brake drum, wheel, and wheel mounting nuts. Draw up the wheel nuts evenly, rotating the wheel a few turns to be sure to remove all free play in the mounting nuts. Then use a calibrated torque wrench to gradually tighten the wheel nuts to 450–500 ft. lbs. (610–678 Nm), working back and forth across the center of the wheel as in the pattern shown:
2. Reconnect the automatic slack adjuster using new clevis pin retainer clips. Adjust the slack adjuster according to instructions in Air Brakes Appendix 3 (for Meritor slack adjusters) or Air Brakes Haldex Appendix on the CD (for Haldex slack adjusters).
3. Remove the manual release tool from the spring brake chamber to engage the air spring. Reinstall the tool in its storage socket.

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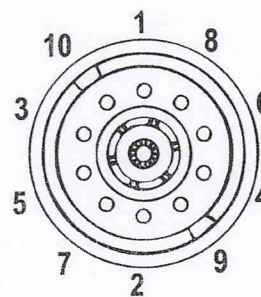
Front brake assembly

1. Clean mating surfaces of both the axle brake flange and the brake assembly.
2. If dustshields are required, install them.
3. Brake assemblies are RH & LH and must be installed on the correct side. Front brake assemblies should be positioned with brake chambers toward the front and on top of the axle and slack adjusters toward the front of the vehicle. Position oil slinger (if required) with the lip turned out and the oil basin pointing down over the axle spindles. Torque mounting hardware in an “x” or crossing sequence.

Wheel Bearing Lubrication

Wheel bearings are precision components which must be kept clean and adequately but not excessively lubricated.

1. Lay out bearings to be used on a clean area.
2. Dip clean bearings in the appropriate sae 50 gear oil until thoroughly saturated.





Inner Bearing And Seal

1. Seat smaller O.D. Of seal in recess of tool.
2. Insert centering plug of tool in bore of inner bearing. Plug insures proper alignment of seal.
3. Insert tool with bearing and seal in the vehicle center end of hub and rotor assembly.
4. Hold tool and handle firmly and strike until sound of impact changes to indicate seal has bottomed in hub seal recess.
5. After seal is bottomed in the bore recess, inspect the face of seal for dents or deformity and check the rubber lip for a smooth even surface. Check for freedom of movement by manually moving interior rubber componts of seal back and forward. A slight movement indicates damage free installation.

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Hub And Rotor Assembly

1. Clean spindles before installing wheel end components.
2. Clean the threads on the spindles with a wire brush.
3. Coat the lip of the rubber seal with a thin layer of wheel bearing lubricant.
4. Carefully slide the hub and rotor assembly straight onto the spindle to prevent damage to the seal.
5. Install the outer wheel bearing. Make sure bearing is properly lubricated.
6. After the hub and bearings are assembled in place on the spindle, install the bearing adjusting nut on the spindle against the outer bearing. The nut must be installed so that the nipple faces outward toward the hubcap. Tighten finger tight.
7. Torque the bearing adjusting nut to 200 ft lb while rotating the hub to seat the bearings. Back off the adjusting nut 1/2 Turn. Re-torque nut to 50 ft lb while rotating hub back and forth. Back off nut 1/4 turn.
8. Install the pierced lock ring so that the inner tab locks into the spindle key-way and the adjusting nut nipple engages the through holes on the lock ring. Nut may be loosened slightly to install lock.

9. Install the lock washer onto the spindle so that the nipple engages one of the through holes on the lock ring.
10. Install the outer nut. Tighten to 240-260 ft lb. Rotate wheel in both directions. Wheel must rotate freely without binding.
11. Bend two opposed lock washer tabs over the outer wheel nut to lock it in position.
12. Install the axle flange gasket.
13. Install hubcap.
14. Remove plug in hub cap and fill with proper oil. Use the sight glass indicator to fill to proper level. Do not overfill!

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ABS Installation

1. Firmly install the abs sensor clip in the hole supplied on the steering knuckle. The clip is designed to seat in the proper position in the hole.
2. Snap the abs sensor into the clip just installed. The clip is designed to hold the sensor at the proper distance from the tone ring on the hub.
3. Rotate hub assembly to ensure sensor is not contacting the tone ring in any area.
4. Route wire from wheel area to brake ECU. Only tie wrap cable to brake flanges, axle houses or other secure objects. Do not tie to cam shafts.

Rear Brake Assembly

1. Clean mating surfaces of both the axle brake flange and the brake assembly.
2. If dustshields are required, install them.
3. Brake assemblies are RH & LH and must be installed on the correct side. The brake assemblies should be positioned with brake chambers toward the front on the bottom of the axle and rotated such that the chamber is angled horizontal to slightly upward. Torque mounting hardware in a crossing sequence.



Wheel Bearing Lubrication

Wheel bearings are precision components which must be kept clean and adequately but not excessively lubricated.

1. Lay out bearings to be used on a clean area.
2. Dip clean bearings in the appropriate petroleum or synthetic oil until thoroughly saturated.

Inner Bearing And Seal

1. Seat the seal in the appropriate tool.
2. Insert centering plug of tool in bore of inner bearing. Plug insures proper alignment of seal.
3. Insert tool with bearing and seal in the vehicle center end of hub and rotor assembly.
4. Hold tool and handle firmly and strike until sound of impact changes to indicate seal has bottomed in hub seal recess.
5. After seal is bottomed in the bore recess, inspect the face of seal for dents or deformity and check the rubber lip for a smooth even surface. Check for freedom of movement by manually moving interior rubber components of seal back and forward. A slight movement indicates damage free installation.
6. Install the inner wheel bearing on top of the seal.

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Hub And Rotor Assembly

1. Clean spindles before installing wheel end components.
2. Clean the threads on the spindles with a wire brush.
3. Coat the lip of the rubber seal with a thin layer of wheel bearing lubricant.
4. Carefully slide the hub and rotor assembly straight onto the spindle to prevent damage to the seal.
5. Install the outer wheel bearing. Make sure bearing is properly lubricated.
6. After the hub and bearings are assembled in place on the spindle, install the bearing adjusting nut on the spindle against the outer bearing. The nut must be installed so that the nipple faces outward. Tighten finger tight.

7. Torque the bearing adjusting nut to 100 ft lb while rotating the hub to seat the bearings. Back off the adjusting nut one turn. Re-torque nut to 50 ft lb while rotating hub back and forth. Back off nut 1/3 turn.
8. Install the pierced lock ring so that the inner tab locks into the spindle keyway and the adjusting nut nipple engages the through holes on the lock ring. Nut may be loosened slightly to install lock.
9. Install the lock washer onto the spindle so that the nipple engages one of the through holes on the lock ring.
10. Install the outer nut. Tighten to 240-250 ft lb. Rotate wheel in both directions. Wheel must rotate freely without binding.
11. Bend two opposed lock washer tabs over the outer wheel nut to lock it in position.
12. Install the axle shaft gasket.
13. Install the axle shafts that came with the axle into the axle housing making sure the correct length shaft is on the correct side.
14. Install the tapered dowels, star washers and nuts. Torque to 160-185 ft lb in an "X" or crossing pattern.
15. Remove the breather from the top of the bowl and the plug from the backside of the bowl and fill with the proper oil. Add the oil through the breather hole until the oil level is even with the bottom of the hole on the backside of the bowl. If petroleum oil is used, reinstall the plug supplied with the axle on the backside of the bowl. If synthetic oil is used, replace with the new plug as shown. Reinstall the breather on top side of bowl making sure breather cap operates freely.

ABS Installation

1. Firmly install the abs sensor clip in the boss welded to the spindle. The clip is designed to seat in the proper position in the hole.
2. Snap the abs sensor into the clip just installed. The clip is designed to hold the sensor at the proper distance from the tone ring on the hub.
3. Rotate hub assembly to ensure sensor is not contacting the tone ring in any area.
4. Route wire from wheel area to brake ECU. Only tie wrap cable to brake flanges, axle houses or other secure objects. Do not tie to cam shafts.

Axle Wheel Bearing Installation Specifications

Conventional Wheel-End Systems					
	Initial Adjusting Nut Torque ①	Final Adjusting Nut Torque ②	Nut Size/Design	Jam Nut Torque Specification	Acceptable End Play Range ④
Drive axles without lock washers	200 lb-ft (272 N•m) Back off 1 turn	50 lb-ft (68 N•m) Back off 1/4 turn	Less Than 2-5/8" (66.67 mm) 2-5/8" (66.67 mm) and Over	200-300 lb-ft (272-408 N•m) 300-400 lb-ft (408-544 N•m)	0.001"-0.005" (0.025-0.127 mm)
Drive axles with bendable lock washers	200 lb-ft (272 N•m) Back off 1 turn	50 lb-ft (68 N•m) Back off 1/4 turn	Less Than 2-5/8" (66.67 mm) 2-5/8" (66.67 mm) and Over	100-150 lb-ft (136-204 N•m) 100-200 lb-ft (136-272 N•m)	0.001"-0.005" (0.025-0.127 mm)
Front non-drive steer axles	100 lb-ft (136 N•m) Back off 1 turn	20 lb-ft (27 N•m) Back off 1/3 turn	1-1/8" (28.6 mm) MFS-06, MFS-07, MFS-08 Over 1-1/8" (28.6 mm), Less Than 2-5/8" (66.67 mm) 2-5/8" (6.67 mm) and Over	150-225 lb-ft (203-305 N•m) 200-300 lb-ft (272-408 N•m) 250-400 lb-ft (339-542 N•m)	0.001"-0.005" (0.025-0.127 mm)
Trailer axles	200 lb-ft (272 N•m) Back off 1 turn	50 lb-ft (68 N•m) Back off 1/4 turn	Less Than 2-5/8" (66.67 mm)	200-300 lb-ft (272-408 N•m)	0.001"-0.005" (0.025-0.127 mm)

Long-Life Wheel-End Systems				
	Inner Nut Torque Specification ①	Outer Nut Torque Specification	Out-of-Service End Play Criteria ②	
Front non-drive steer (Easy Steer Plus™)	500-700 lb-ft (680-952 N•m)	200-300 lb-ft (272-408 N•m)	0.006" (0.1524 mm) or more	
	Inner Nut Torque ①	Outer Nut Torque	Out-of-Service End Play Criteria ②	
Trailer (TB Series)	700-750 lb-ft (952-1020 N•m)	250-300 lb-ft (340-408 N•m)	0.006" (0.1524 mm) or more	
	Initial Adjusting Nut Torque/Back off until loose, then retighten to 25 lb-ft (34 N•m) ①	Retainer Nut Torque	Final Adjusting Nut Torque ③	Acceptable End Play Range ③
Trailer (TRIAD™ wheel-end system)	150-200 lb-ft (204-272 N•m)	25 lb-ft (34 N•m)	200-275 lb-ft (272-374 N•m)	0.000" to 0.005" (0.127 mm)
	Adjusting Nut Torque ①④		Out-of-Service End Play Criteria ②	
Trailer (TL Series)	810-850 lb-ft (1100-1150 N•m)		0.006" (0.1524 mm) or more	
	Inner Spindle Nut Torque ①	Outer Nut Torque	Out-of-Service End Play Criteria	
Trailer (PreSet® by ArvinMeritor)	300 lb-ft (408 N•m)	200 lb-ft (272 N•m)	0.006" (0.1524 mm) or more, service the PreSet hub assembly	

- ① Rotate the hub a minimum of five complete turns while tightening the nut.
- ② After the retightening procedure is complete.
- ③ When you correctly adjust the TRIAD™ wheel-end system using the TRIAD™ adjustment procedure, you will obtain a 0.001-inch (0.025 mm) preload on the wheel bearings, which is not measurable in the field. However, you also can adjust the TRIAD™ wheel-end system using the wheel bearing adjustment procedure for trailer axles with conventional wheel ends, above, which will result in an acceptable end play of 0.001-0.005-inch (0.025-0.127 mm).
- ④ The nut may need to be slightly tightened or loosened to meet the required end play.
- ⑤ Rotated counterclockwise against the retainer nut.
- ⑥ Use a hammer and staking tool to stake the stake washer to the spindle nut in **three** positions.



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