

"DOCUMENT UNCONTROLLED IF PRINTED"						
DOC #	PROCESS NAME	PAGE	REVISION	STATION	BY	DATE
AR869	SOE Driveline Gearbox Removal and Replacement	1 of 5	-	SER-E	J.Anderson	6/18/2019

Read process before beginning. If you do not understand any part please contact: Chris Ward, VP of Parts and Warranty at 1-866-953-5555 or by E-mail @ cward@ARBOCsv.com.

Good Mechanics safety practice must be followed on any repairs.

Safety practices should include but not be limited to properly supporting the chassis, axles, blocking tires, and a work area free of clutter.

Complaint: Driveline gearbox failure.

Cause: Component Failure

Correction: Removal and replacement of driveline gearbox.

Vehicles Affected: 2018/2019 Spirit of Equest

Labor Operation Code: 0122202

Labor Time Allowance: 6.0 Hours

Parts Returned: Yes

Tools Required

Hoist
Oil Collection Pan
5/16" Allen Head Wrench
10mm Allen Head Wrench
3/8" drive metric and standard socket and wrench set
Torque Wrench (40-90 ft-lbs.)
Ratchet Strap
Transmission Jack

Parts Required

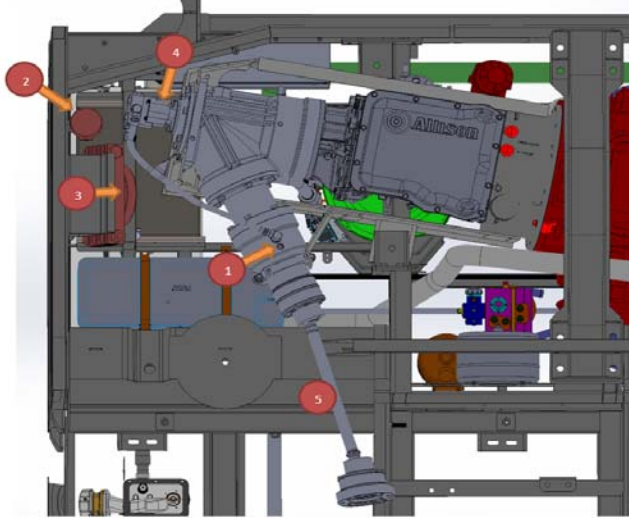
1 2004376 Gearbox, Driveline 56.5 Degree Angle
1 2004703 Filter Cartridge, Buyers 10 Micron U1L3FE
6 + Quarts Hydraulic Oil, AFMA 3S Rated, ISO 100 Standard (Not SAE Standard (Purchase locally)

Removal of Angle Drive (V-Drive)

NOTE: Batteries should be disconnected at the terminals before beginning this procedure. It may be useful to remove batteries and slide tray to allow improved access to the top side of the angle drive.

Step 1: Pull bus onto hoist and raise unit to a comfortable working height to access angle drive.

Step 2: Use 5/16" Allen wrench to remove lower drain plug (1) on angle drive nosecone and collect oil in collection pan. When gear is drained, replace plug. Remove and drain filter cartridge (2). Dispose of oil and filter cartridge appropriately.



Disconnect hose connecting the gearbox cooler (3) to pump (4) at the end of angle drive assembly. Allow to drain. Locate the hose connecting the gearbox manifold block on top of angle drive to the filter head and disconnect it at the manifold block. Allow to drain.

Step 4: Remove driveshaft (5) from angle drive and rear axle, being careful to support joints to prevent damage to joint boots. At each joint use a 10 mm Allen head wrench to remove six M12-grade 10.9 socket head cap screws. Retain screws and locking plates. If shaft is to be reused, safely store shaft to prevent damage to boots.

Step 5: Support angle drive with stand or transmission jack. Use ratchet strap to retain angle drive to stand prior to removing supporting brackets and bolts.

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Step 6: Remove nosecone supporting bracket. Two 3/8"-16 bolts hold the nosecone bracket (6) to the rotating collar (7) on the angle drive nosecone.

Remove the two bolts and washers and retain. Three 3/8"-16 nut and bolt sets retain the other end of the nosecone bracket to the forward support plate (8) and forward arch plate (9). Remove the 3 nuts, bolts and washers and retain.



Step 7: The forward arch plate and the rear support plate (10) are connected by the cross bracket (11) over the top of the angle drive pump, and below the battery box. Four 3/8"-16 nut and bolt sets retain the cross bracket to the forward arch plate and the rear support plate. Remove the nuts, bolts, washers and cross bracket and retain. Now remove the two 1/2"-13 bolts holding the forward arch plate to the angle drive and remove and retain the bolts, washers and forward arch plate.

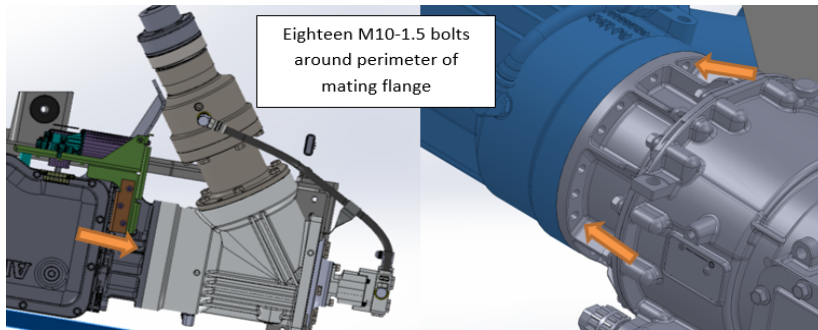


Step 8: Similar to the forward arch plate, three 3/8"-16 nut and bolt sets retain the rear support plate. The other end is held to the gearbox with two 1/2"-13 bolts. Remove all nuts, bolts, washers and the rear support plate and retain.

Step 9: Remove the filter tube (12) from the manifold block on top of the angle drive by loosening the large collar nut (13). This will allow the angle drive to move away from the transmission and to slide under the battery box. Angle drive is now ready to be loosened from the transmission. The angle drive is held to the transmission by eighteen M10-1.5 bolts, through the flange of the transmission and threaded into the gear. Loosen and remove all 18 bolts, taking care to make certain the angle drive is properly supported. The angle drive is nosecone heavy, and will rotate on the transmission shaft if not careful when all bolts are removed.

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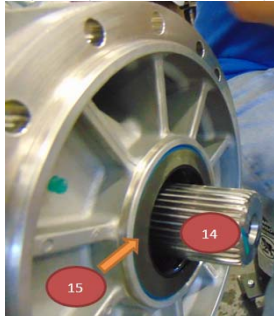
Step 10: The angle drive is now free to rotate but is retained by a splined coupling to the transmission output shaft. Be careful not to overload the transmission shaft as the angle drive is pulled away from the transmission mating flange. The transmission and angle drive must be separated by approximately 3 inches to disengage the splined shaft.



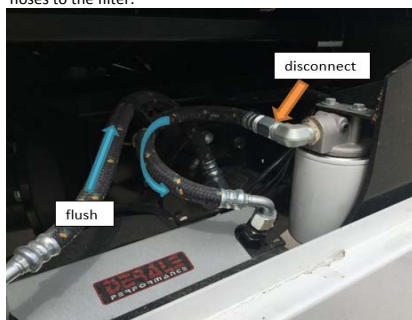
NOTE: Carefully lower the removed angle drive from the bus and secure for transport back to ARBOC.

Removal of Angle Drive (V-Drive)

Step 11: Inspect the transmission output shaft (14) and seal (15) for damage. If seal is torn or damaged, replace. Output shaft should be cleaned oil free and dry and checked for wear.



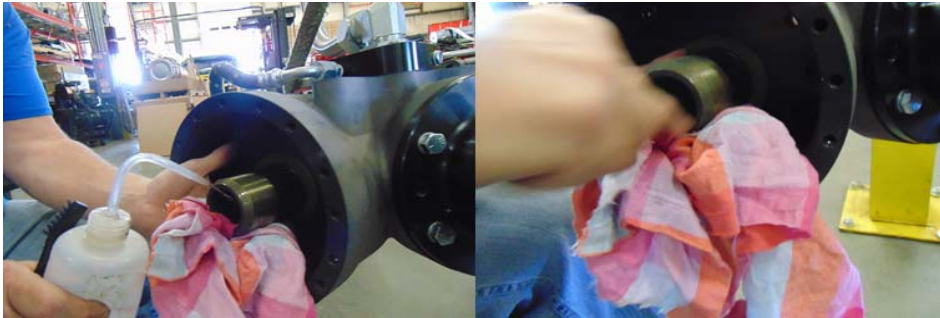
Step 12: The angle drive cooling system should be flushed to remove any metallic particles or debris prior to installing a new angle drive. Disconnect the hoses at the filter head and backflush the cooling radiator from the filter head to the open line with clean fluid until fluid runs clear. Disconnect the output hose from the other side of the filter head and flush this line as well. Reinstall the two hoses to the filter.



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Step 13: Prepare the new angle drive for installation. Remove the filler neck from the new unit using the large collar nut. Clean and dry the splined coupling on the input side of the angle drive to remove any grit or contamination. Lubricate the splined coupling as well as the splined shaft on the transmission with petroleum jelly or transmission fluid. Lubricate the transmission seal lightly with petroleum jelly or transmission fluid.



Installation of Angle Drive (V-Drive)

Step 14: Support angle drive with transmission jack or other lift capable of raising the new angle drive assembly into position under the bus. Use ratchet strap as necessary to prevent falling.

Be sure that the coupling and retaining hardware are clean. Immediately prior to installation, wipe the lead in chamfer and seal journal section of the coupling with a lint-free cloth. This cleaning will remove any contamination that might cause future leaks around the output seal.

CAUTION: Care must be exercised to avoid transmission output seal or journal damage. Check to ensure that the seal is free of tears and cuts. Nicks and scratches must not exist on the lead-in chamfer or seal journal section of the drive coupling.

Start the coupling onto the output shaft, ensuring the splines are properly engaged and slide freely. Push the coupling assembly into the transmission.

CAUTION: Do not use a hammer or other similar tool to force the coupling onto the shaft. Failure to observe this caution may result in transmission damage.

The angle drive coupling should engage the splined transmission shaft without binding or interference. Using the pilot diameter on the transmission rear cover, the angle drive should slide into full face contact with the machined surface of the rear cover without binding or interference.

CAUTION: Do not tighten the bolts to attach the two components until the mating surfaces on the transmission rear cover and angle drive are in full face contact. Tightening the bolts to force this engagement can cause damage to the transmission or angle drive.

While supporting the angle drive to prevent bending of the transmission output shaft, rotate the angle drive housing as necessary to properly angle the nosecone and line up the mounting bolt holes.

Install the eighteen M10-1.5 bolts that retain the angle drive to the transmission, tightening in a criss-cross pattern.



Step 15: rotate the angle drive output shaft flange to test for signs of binding of the input shaft and coupling joint. When the output coupling rotates without binding, torque the eighteen M10-1.5 bolts to 28 ft-lbs. and mark.

Step 16: begin reassembly of mounting for angle drive. Reinstall filler neck to oil manifold on top of angle drive. Reinstall rear support plate (10) and retained hardware, using the three 3/8"-16 nut and bolt sets to the mating bracket, and two 1/2"-13 bolts and washers to the angle drive mounting flange. Reinstall hand tight at this time.

Step 17: Loosen the two 1/2" bolts and nuts retaining nosecone collar (7) at the output of the angle drive to allow the collar to rotate freely. Reinstall front arch plate (9) and nosecone bracket (6) hand tight using the three retained 3/8"-16 nut and bolt sets at the front support plate (8), and the two retained 1/2"-13 bolts and washers at the angle drive mounting flange. Rotate the nosecone collar until the threaded holes align with the nosecone bracket and install the retained 3/8"-16 bolts.

Step 18: When all mounting plates are installed and aligned, torque the fasteners. Torque the 1/2"-13 bolts to the angle drive flange and on the nosecone collar to 55 ft-lbs. and mark. Torque the 3/8" fasteners between the mounting brackets to 40 ft-lbs. and mark. The angle drive support jack or stands may now be removed.

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Step 19: Reinstall hose from the cooler to the pump fitting on the end of the angle drive. Reinstall hose from the oil filter to the fitting on the oil manifold on top of the angle drive. Install new filter cartridge on to filter head.

Step 20: Reinstall driveshaft. With driveshaft supported, compress the joints as little as possible and set the driveshaft in place. Use a 10 mm Allen head wrench to install the six M12-grade 10.9 Allen head cap screws and locking plates at the axle joint. Rotate the angle drive output coupling as required to align holes, and install the six Allen head cap screws and locking plates at the angle drive as well. Do not overextend either joint or pinch boots when reinstalling. Torque all 12 cap screws to 90 ft-lbs.

Step 21: Using clean correct lubricant (AGMA 3S rated, ISO 100 viscosity hydraulic oil), fill with 6 quarts. Sight glass should now be overfull.

Final inspection: Reinstall batteries and cables and any other items removed during service. Start the bus and allow air system to charge. Inspect driveshaft and boot clearances at normal ride height. Are the boots or inner clamp on the shaft touching the outer boot cup at any point? Are the boots torn or damaged? If so, contact ARBOC for instructions to perform ride height and axle position adjustment procedure.

Road test: Move bus at a slow speed (less than 5 mph) for a short time (2-3 minutes) to charge angle drive lubrication system. Shut the bus down, wait 5 minutes and check oil level. Oil level should be in the middle of the sight glass. If low, refill as required, repeating the procedure until oil level is in middle of sight glass.



Break in service: Angle drive requires a break-in service after the first 25 hours of operation. Alert operator when releasing bus for service. At 25 hours, drain oil and replace filter cartridge. Using clean correct lubricant, fill to the center of the sight glass (approx. 5 quarts plus filter) in working position. Move bus at a slow speed (less than 5 mph) for a short time (2-3 minutes) to charge angle drive lubrication system. Shut the bus down, wait 5 minutes and check oil level. Oil level should be in the middle of the sight glass. If low, refill as required, repeating the procedure until oil level is in middle of sight glass.