UNITED STATES MARINE CORPS
Logistics Operations School
Marine Corps Combat Service Support Schools
Training Command
PSC Box 20041
Camp Lejeune, North Carolina 28542-0041

LVSM 7207

STUDENT OUTLINE

MAINTAIN THE LVS DRIVE TRAIN

LEARNING OBJECTIVES

1. Terminal Learning Objectives: Given an LVS, TM 2320-20/12A, LI 2320-12/9B, tools, and equipment, perform second echelon maintenance on the LVS drive train, per the reference. (3521.13.18)

2. Enabling Learning Objectives:

a. Given an LVS, TM 2320-20/12A, LI 2320-12/9B, tools, and equipment, perform second echelon maintenance on the LVS transmission, per the reference. (3521.13.18a)

b. Given an LVS, TM 2320-20/12A, LI 2320-12/9B, tools, and equipment, perform second echelon maintenance on the LVS transfer system, per the references. (3521.13.18b)

c. Given an LVS, TM 2320-20/12A, LI 2320-12/9B, tools and equipment, perform second echelon maintenance on the propeller shaft system, per the references. (3521.13.18c)

OUTLINE

1. IDENTIFICATION, LOCATION, AND FUNCTION OF THE COMPONENTS OF THE LVS TRANSMISSION

a. The MK48 employs a Detroit Allison HT 740-D automatic transmission. This model transmission has four forward speeds and one reverse speed. The transmission shifts automatically in all ranges. The name plate is located on the right rear side of the transmission. The name plate displays the transmission serial number, part number, and model number. The transmission's net weight is 840 pounds and it has an oil capacity of 36 quarts. The driving ranges are: Drive, Drive 1, Drive 2, Drive 3, and Reverse.

b. External Filter. The external filter is a spin-on-type filter. It is located on the right fender between the hydraulic reservoir and the fuel tank.

c. Governor. The transmission governor is a centrifugal assembly, driven by a gear attached to an output shaft. Governor pressure is proportional to transmission output speed. Combined with modulator pressure, it regulates automatic shifting in the transmission.

d. Modulator Actuator. An air operated modulator actuator is located on the left side of the transmission. The modulator actuator controls a modulator valve inside the transmission. As previously stated, the modulator valve and governor work together to regulate automatic shifting in the transmission by changing oil pressure.

e. Neutral Safety Switch. The neutral safety switch prevents the engine from being started when the transmission is in any gear other than neutral. The neutral safety switch is attached to the shift lever bracket below the shift control lever, which is cab mounted.

f. HI Idle Neutral Switch. The HI idle neutral switch prevents the engine from going to high idle when the winch is activated and the transmission is in any gear other than neutral. It is located on the left side of the transmission, forward of the modulator actuator.

g. Shift Control. A cab-mounted shift control is used to select the appropriate forward or reverse gear as required by driving conditions. The shift control is connected to the transmission through a cable.

h. Lockup Solenoid Valve. An electrically controlled lockup solenoid valve senses operation of the engine brake and controls the transmission lockup clutch. The lockup solenoid valve is located at the left front of the transmission.

i. Oil Cooler. The transmission oil cooler is mounted on top of the engine radiator. Oil flows from the transmission to the oil cooler. The oil is then cooled as the air is moved past the oil cooler by the engine fan. The cool oil then flows back to the transmission.

j. Breather. The breather is used to vent internal pressure within the transmission. It also will indicate when the transmission is overfilled with oil by blowing the oil through the breather vent. The breather is located on the front of the transmission on the top right side.

k. Temperature Sending Unit. A resistant-type temperature sending unit transmits current to the dash gage. The normal operating temperature is 160-

200 degrees Fahrenheit. The temperature sending unit is on the top right side of the transmission, forward of the breather.

l. Transmission Lockup Switch. The transmission lockup switch is located on the bottom of the transmission. This switch senses when the lockup clutch is engaged. The lockup clutch is located inside of the transmission.

m. Torque Converter Housing. The torque converter housing is machined from cast aluminum. The front of the housing is machined to mate with the engine flywheel housing. The rear of the housing is machined to mate with the front support and valve assembly and the transmission housing. The converter housing encloses and supports the torque converter and an input driven oil pump assembly.

2. PRINCIPLES OF OPERATION OF THE MK48 TRANSMISSION ASSEMBLY

a. The Detroit Allison HT 740-D Transmission is very similar to the Allison MT 654CR Transmission used in the 900 series vehicles. The one major difference between the two is that the HT 740-D transmission is a four-speed automatic and the 654CR transmission is a five-speed automatic. Another noticeable difference is the outside housing. The HT 740-D transmission housing has ribs and the 654CR does not.

b. The Allison HT 740-D automatic transmission includes a hydraulic torque converter, a planetary gear train, and a hydraulic control system that automatically changes gear ratios and supplies pressure to apply the clutches. The torque converter multiplies engine torque during starts and acts as a hydraulic cushion between the engine and gearing. The clutches and gear sets provide four forward speeds and one reverse speed. The torque converter lockup clutch is used for maximum fuel economy and engages automatically after the vehicle is rolling.

3. ORGANIZATIONAL MAINTENANCE RESPONSIBILITIES FOR THE LVS TRANSMISSION ASSEMBLY

a. The organizational mechanic is responsible for the replacement of the following components:

(1) shift control,

(2) shift cable,

(3) governor,

(4) modulator actuator,

(5) internal and external filters,

(6) oil filter bracket,

(7) transmission oil cooler,

(8) breather, and

(9) neutral safety switch.

b. The organizational mechanic is also responsible for repairing the shift control, adjusting and inspecting the shift cable and neutral safety switch, servicing the transmission assembly, inspecting the transmission oil cooler, and inspecting and servicing the breather. Inspection and, if required, replacement of the oil cooler and filter hoses is also an organizational maintenance responsibility.

4. REPAIR AND TEST PROCEDURES FOR THE LVS TRANSMISSION ASSEMBLY

a. Servicing the LVS Allison HT 740-D Automatic Transmission

(1) Spin-on filter. The external, spin-on filter is replaced every 3000 miles or semiannually, whichever comes first. Replacement of the filter is accomplished in the following manner.

(a) Before removing the filter, place a suitable container under it to catch the fluid that will be lost. To remove the filter, turn it counterclockwise until it can be removed. The filter must be discarded in accordance with local EPA regulations when it is removed.

(b) To install a new filter, put a light coat of clean oil on the seal ring. Align the filter with the filter base and turn it clockwise until the seal contacts the filter base. Tighten the filter an additional two-thirds of a turn after the seal has contacted the filter base.

(2) Transmission fluid.

(a) General. Organizational maintenance is responsible for periodically replacing the MK48 transmission oil. The intervals for draining and refilling the transmission oil are prescribed in the lubrication instruction for the MK48, LI 2320-12/9. That LI requires that the transmission oil be changed every 3,000 miles or semiannually while the vehicle is under warranty. After the warranty period, the requirement for changing the transmission fluid will be determined by analysis of oil samples that will be taken after every 25 hours of operation or 30 days, whichever comes first, if laboratory support is available. If oil analysis laboratory

support is not available after the warranty expires, the transmission oil will continue to be changed every 3,000 miles or semiannually.

(b) Engine lubricating oil OE/HDO 10 is prescribed for use in the transmission for all temperatures above zero degrees Fahrenheit. Engine lubricating oil OEA is required when the temperature the vehicle will be operated in is expected to be below zero degrees Fahrenheit.

(c) Again, LI 2320-12/9 explains the oil replacement requirements for the transmission in detail and should always be checked before replacement is accomplished.

(d) Precautionary requirements. There are several requirements that must be satisfied in conjunction with replacing the transmission oil.

1 First, it is necessary to chock the wheels of the vehicle to be serviced to prevent personal injury.

2 Next, it must be remembered that the new oil to be added to the transmission must be handled in clean containers to prevent contaminants from entering the transmission.

3 Also, it is necessary to remember that containers which have been used for antifreeze or engine coolant solutions must not be used for transmission oil.

4 Finally, it is necessary to thoroughly clean around the oil filler tube before removing the dipstick to prevent dirt from entering the transmission. After removal, the dipstick should be placed in a clean area while you are filling the transmission.

(e) To drain and refill the transmission, the following procedures will be used.

1 Start the engine and operate the transmission through its gear ranges to bring the transmission oil up to operating temperature, 160-220 degrees Fahrenheit. This is done so the oil will drain quicker. Shut the engine down when the transmission oil reaches the desired temperature.

2 Place a container under the transmission drain plug to catch the used transmission oil. The capacity of the transmission is 36 quarts so you will need a large container. To drain the oil, simply remove the drain plug. Allow sufficient time for the oil to drain completely.

3 When the transmission is completely drained, reinstall the drain plug and torque it to the proper specifications as prescribed in the technical manual.

4 To fill the transmission, remove the transmission dipstick and pour oil through the filler tube until the oil level is at the bottom of the cold run band on the dipstick.

a You will notice on the SLIDE that the transmission oil dipstick has two bands. The lower band is the cold run band. If the transmission oil temperature is at or below 160 degrees Fahrenheit, as it would be if you were just filling the transmission, the oil level should be at the cold run band.

b If the transmission oil temperature is above 160 degrees Fahrenheit, the transmission oil is at the correct level when it is in the hot run band.

c Replace the transmission dipstick.

d The proper way to check the transmission oil level is to make sure the vehicle is on level ground and then start the engine. Next, operate the transmission shift lever through all its drive ranges to warm the transmission oil to above 160 degrees and fill all the cavities in the transmission. Then, with the engine at idle speed and the transmission in neutral, pull out the transmission dipstick. The transmission oil level should be in the hot run band; if it is not, add or remove oil until the oil level is in the hot run band.

e Replace the transmission dipstick.

f Check the oil level several times to obtain an accurate reading.

g Operation of the vehicle when the transmission is overfilled causes the transmission to overheat and will result in irregular shift patterns.

(3) Per information contained in the lubrication instruction, the internal transmission filter is changed only during transmission overhaul; therefore, we will not go into further detail about it.

5. INSPECT THE LVS ALLISON HT 740-D AUTOMATIC TRANSMISSION AND ASSOCIATED COMPONENTS

a. Begin by checking the transmission housing for cracks, broken holding fixture tabs, and signs of leaks. Also check for elongated mounting capscrew holes and for damage to any threaded surfaces that are visible.

b. Next, inspect the oil pan for cracks, dents or holes. Also check for warpage on the gasket mating surface and damaged capscrew holes.

c. Now, check the transmission output shaft seal for signs of oil leakage.

d. Continue your inspection by checking the shift control and shift control cable.

(1) Make sure the shift control and shift control cable are not binding and that the shift control works smoothly.

(2) Also, check the shift control cable for kinks and the cable cover for gouges.

(3) Complete the inspection of the shift control by making sure it is securely mounted and that the linkage has no looseness or worn parts.

e. The next item to check is the transmission breather. Inspect the breather cap for damage or dents. Check the breather for loose mounting or damaged threads. Check for evidence of leaking through the breather; this is an indication of the transmission being overfilled.

f. Now inspect the transmission cooler. Inspect the cooler for leaks or damaged fins. Check for clogged or bent fins. Check for loose mounting and worn or damaged mounting capscrews.

g. To complete the inspection, inspect the transmission cooler lines and fittings for frays, cuts, and gouges. Check the threads for damage or loose connections.

6. TESTING THE LVS ALLISON HT 740-D AUTOMATIC TRANSMISSION

a. The method that I will describe is not 100% accurate; however, it can be used to help determine if the vehicle should be evacuated to a higher level of maintenance for further testing. Before the actual road test, there are some safety precautions you must consider and some preliminary checks that you must make.

(1) Check the engine maximum no-load governor setting. The engine should be governed at 2250 rpm. To perform this check, set the vehicle's parking brake, place the transmission range selector in the neutral position

and start the engine. When the engine is sufficiently warm, press the accelerator pedal to the floor. The engine should go to its maximum no-load governor setting of 2250 rpm. If the governed speed is not correct, the road test of the transmission cannot be accomplished. Notify your supervisor.

(2) The temperature of the transmission fluid must be between 160-220 degrees Fahrenheit during the test and the tachometer should be operating properly.

(3) To conduct the road test, you should select an area where you can safely start from a standstill and accelerate at full-throttle to road speed. If possible, have an assistant ride with you to observe the tachometer as you drive the vehicle.

b. To conduct the actual test, which in reality is an operational road test, place the transmission range selector in the "D", or drive position and accelerate to full throttle. Note the upshift points; each shift should occur at 100 rpm below the engine maximum no-load governed speed. If the upshifts do not occur at the proper engine speed, notify your supervisor.

7. REPAIR OF LVS ALLISON HT 740-D AUTOMATIC TRANSMISSION ASSEMBLY COMPONENTRY

a. Neutral Safety Switch. The first task you will be required to accomplish is to remove the neutral safety switch. The procedures are as follows.

(1) Disconnect the vehicle batteries.

(2) With the batteries disconnected, remove the access panel next to the shift control and the skid plate grill for accessibility.

(3) Now remove all nylon ties and the electrical tape holding the wires to the shift cable.

(4) Tag and disconnect the three wires from the shift control.

(5) After the wires are disconnected, remove the capscrews that hold the boot in place and slide the rubber boot down and back out of the way.

(6) Now remove the cotter pin and washer from the neutral switch. Discard the cotter pin.

(7) The next step is to remove the hardware that is used to attach the neutral safety switch to the shift lever bracket and remove the neutral safety switch.

b. Shift Control. The removal of the shift control is accomplished in the following manner.

(1) First, remove the cotter pin and washer that attach the cable anchor to the shift lever bracket. Discard the cotter pin. Next, remove the clamp that holds the shift cable to the shift lever bracket. Two bolts, their nuts, and washers must be removed. At this point you can pull the shift cable away from the shift lever bracket.

(2) Now, working inside the vehicle cab, remove the four Phillips head screws and the star washers that retain the shift control unit. At this time you would be able to remove the shift control.

(3) Now that the shift control is removed, you can disassemble it, inspect it, replace any defective parts, and reassemble it for installation. The shift control is disassembled for repair in the following manner.

(a) The first step in disassembly is to remove the capscrews and the star washers that retain the cable mounting strap.

(b) Next, you should loosen the capscrew that retains the shift lever and remove the shift lever.

(c) With the shift lever removed, you can remove the gate plate assembly by removing the four locknuts that hold it in place. Discard the locknuts.

(d) Now that the shift lever is disassembled, you can clean and inspect all of its parts. Replace any defective components.

(e) Reassembly of the shift control is accomplished in the reverse order of disassembly. However, all of the attaching nuts must be torqued to a specific torque value. We will not teach the torque values in the classroom. You should always consult the vehicle technical manual to obtain the correct torque specifications during reassembly of any component.

c. Shift Control Cable. To remove the shift control cable, you must accomplish the following steps.

(1) Previously you were taught how to remove the neutral safety switch and the shift control. In the process of accomplishing those tasks you disconnected the shift control end of the shift control cable.

(2) To complete the removal of the shift control cable, remove the two capscrews and locknuts from the clamp at the transmission end of the shift control cable. Discard the locknuts.

(3) Also remove the cotter pin and washer that retain the cable anchor. Now you can detach the transmission end of the shift control cable from the transmission shift lever.

(4) To remove the shift control cable from the vehicle, cut the nylon ties that hold the cable in place and remove the cable.

d. Installation of the shift control and shift control cable.

(1) Installation of the shift control. Place the assembled shift control in its position on the side console and secure it in place with four screws and new starwashers. Tighten the screws securely.

(2) Installation of the shift control cable. Install the shift control cable in the following manner.

(a) Check the shift control cable to make sure it is fitted with jamnuts and cable anchors on each end.

(b) Next, connect the shift control cable to the transmission shift lever and secure it in place with a washer and a new cotter key. Tighten the jamnut on the transmission end of the cable against the cable anchor. Now install the clamp to the transmission end of the shift control cable and secure it in place with its capscrews, washers, and new locknuts.

(c) At this point, check the position of the shift lever and place it in neutral if it is not in that position. You must also make sure the transmission is in neutral. To do so, push the transmission shift lever all the way to the rear and then move it forward one click.

(d) Continue the installation of the shift control cable by placing the rubber boot on the cable, installing the clamp, and attaching the cable anchor to the shift lever bracket with a washer and cotter pin. You may have to turn the cable anchor in or out to make it fit smoothly into the hole on the shift lever bracket. Do not forget to tighten the jamnut against the cable anchor.

d. Installation of the neutral safety switch.

(1) If the switch you are going to install is a new one, you will have to attach male butt connectors to the white and green wires on the switch. You will also have to cut the black and red wires back to within one inch of the neutral safety switch. The black and red wires are not used in this installation.

(2) Position the neutral safety switch on the shift lever bracket and secure it with the capscrew, spacer, washer, and nut, finger tight.

(3) Next, install the plunger of the neutral safety switch onto the shift lever. It will fit into either of two holes. Use the forward hole. Secure the plunger with a washer and a new cotter pin.

(4) Now the switch must be adjusted; you will need a multimeter and it must be conditioned for continuity testing.

a First, place the transmission shift lever in neutral.

b Next, connect the multimeter leads to the white and green wires on the neutral safety switch. Polarity is of no concern during this procedure. Move the neutral safety switch back and forth until you find a position where the multimeter indicates zero ohms. Working carefully so as not to move the switch, tighten the capscrew securely. Recheck to make certain the multimeter still indicates zero ohms after the neutral safety switch is secured in place.

(5) Now you would slide the boot up over the wires and secure it in place with four capscrews and washers.

(6) All that remains to be accomplished is to plug the wires into the connectors and wrap them with electrical tape. Do not forget to install the access cover and skid plate grill.

e. As you know, it is the responsibility of the organizational maintenance mechanic to replace the governor, modulator valve, transmission breather, and oil cooler.

(1) Each of these components is very easy to remove and replace; therefore, we will not cover the procedures in the classroom. The SLIDE that you see shows the location of each of these items.

(2) If you are involved with the replacement of any of the components, consult the vehicle's technical manual.

8. DIAGNOSIS OF MALFUNCTIONS IN THE LVS ALLISON HT 740-D AUTOMATIC TRANSMISSION

a. General

(1) The SLIDE that you see on the screen lists the malfunctions that we will cover.

(2) What I want you to do is to tell me how to diagnose each of the malfunctions. The required information is in your technical manual and that is where you will find the answers to the questions I will ask.

b. Malfunction No. 1. (Transmission oil temperature gage stays above 250 degrees Fahrenheit)

Step 1. Check for a clogged transmission external oil filter. If clogged, replace the filter. If the filter is not clogged, check for a restricted oil cooler.

Step 2. Check for a restriction or clogged oil cooler. If restricted or clogged, clean or replace as necessary. If no restriction is found and the oil cooler is not clogged, check for a damaged breather.

Step 3. Check for a clogged or damaged breather. If clogged or damaged, clean or replace as necessary. If the breather is not clogged or damaged, refer the problem to Intermediate Maintenance. If the student provides the incorrect response, refer him/her to the correct page in the technical manual.

c. Malfunction No. 2 (Transmission Noisy)

Check the fluid level. If the fluid level is not correct, add transmission fluid as needed. If fluid level is correct, refer the problem to Intermediate Maintenance. If the student response is incorrect, refer him/her to the correct page in the technical manual.

d. Malfunction No. 3 (Transmission will not shift into gear.)

e. Malfunction No. 4 (Transmission slips out of gear or operates erratically.)

Check the shift lever and linkage for proper adjustment or damage. If not damaged or misadjusted, notify Intermediate Maintenance. If the student response is incorrect, refer him/her to the correct page in the technical manual.

f. Malfunction No. 5 (Transmission leaks)

Step 1. Check for a loose or damaged oil pan or gasket. If they are loose or damaged, replace or repair as needed. If they are not loose or damaged, check the oil cooler.

Step 2. Check for a loose or damaged oil cooler or lines. If they are loose or damaged, repair or replace as needed. If they are not loose or damaged, check the breather.

Step 3. Check for a clogged or damaged breather. If the breather is clogged or damaged, service or replace the breather. If it is not clogged or damaged, check the transmission housing.

Step 4. Check the transmission housing and seals for damage. If they are damaged, send the transmission to Intermediate Maintenance. If it is not damaged, check inside the torque converter housing.

Step 5. Remove the cover from the top of the torque converter housing and check for oil. If there are signs of oil, notify Intermediate Maintenance. If there are no signs of oil, this problem must then be referred to Intermediate Maintenance. If the student response is incorrect, refer him/her to the correct page in the technical manual.

g. Malfunction No. 6 (Transmission oil being thrown from the filler tube.)

Step 1. Check for a loose, missing, or wrong dipstick. If it is loose, missing, or the wrong type, tighten or replace as needed. If the dipstick is not loose, missing or the wrong one, check the oil level.

Step 2. Check for too high of an oil level. If oil level is too high, drain as needed. If oil level is correct, check the breather.

Step 3. Check for a clogged or damaged breather. If the breather is clogged or damaged, service or replace as needed. If it is not clogged or damaged, refer the problem to Intermediate Maintenance. If the student response is incorrect, refer him/her to the correct page in the technical manual.

h. Malfunction No. 7 (Excessive creep in first and reverse gear.)

i. Malfunction No. 8 (Transmission oil dirty)

Step 1. Check that the oil changes have been done at the proper intervals. If the oil was not changed, change the oil. If the oil has been changed, check the oil filter.

Step 2. Check for a damaged oil filter. If it is damaged, replace the oil filter. If it is not damaged, check for overheating.

Step 3. Check the temperature gage for overheating. If the transmission is not overheating, refer the problem to Intermediate Maintenance. If the student response is incorrect, refer him/her to the correct page in the technical manual.

j. Malfunction No. 9 (Automatic shifts occur at too high or too low a speed.)

Check for a proper oil level. If the oil level is wrong, drain or add oil as needed. If the oil level is correct, refer the problem to Intermediate Maintenance. If the student response is incorrect, refer him/her to the correct page in the technical manual.

k. Malfunction No. 10 (Transmission shifts rough.)

Check for a loose, damaged or misadjusted shift lever and linkage. If they are not loose, damaged, or misadjusted, refer the problem to Intermediate Maintenance. If the student response is incorrect, refer him/her to the correct page in the technical manual.

l. Malfunction No. 11 (Vehicle moves in neutral.)

Check the linkage for looseness, damage or misadjustment. If the linkage is correct, refer the problem to Intermediate Maintenance. If the student response is incorrect, refer him/her to the correct page in the technical manual.

m. Malfunction No. 12 (Transmission slips in all gears.)

Check for low oil level. If the oil level is low, fill to the proper level. If the oil level is not low, refer the problem to Intermediate Maintenance. If the student response is incorrect, refer him/her to the correct page in the vehicle technical manual.

9. INTRODUCTION TO AND PRINCIPLES OF OPERATION OF LVS TRANSFER AND ITS COMPONENTS)

a. The purpose of the transfer assembly, as you should remember from the class on operation, is to provide a means of transferring power to both axles on the MK48 and both axles on the trailer.

b. The transfer employed on the MK48 is a two-speed unit made by the Oshkosh Truck Corporation.

(1) The model number of this transfer is DA-100.

(2) The transfer assembly is mounted in the vehicle driveline immediately behind the transmission. It transfers power downward for distribution to the front and rear propeller shafts.

c. Briefly, this is how power flows through the transfer.

(1) The input shaft receives power from the transmission by way of a propeller shaft and it drives the two-speed shift shaft and the transfer's lubrication pump.

(2) The two-speed shift shaft transmits its power to a lockable differential located in the transfer.

(a) The differential assembly is provided to allow for the different front and rear output speeds that are encountered when the vehicle is cornering.

(b) An air actuated differential locking mechanism allows the operator to lock out differential action for positive transfer of power to both output shafts under wheel slippage conditions.

(3) The differential drives both output shafts. Notice that the front output shaft is driven directly from the differential and that the rear output shaft is driven through an idler gear.

10. IDENTIFICATION, LOCATION, AND FUNCTION OF SELECTED EXTERNAL TRANSFER ASSEMBLY COMPONENTS AND THE TRANSFER CONTROLS

a. The transfer's lubrication pump is mounted at the top rear of the transfer case. It is driven by the transfer input shaft. The lubrication pump ensures the proper lubrication of all the moving parts in the transfer assembly.

b. There is a speedometer transducer mounted on the rear of the transfer case. Its purpose is to convert the rotational speed of the idler gear in the transfer assembly to an electrical signal that the speedometer receives, interprets, and indicates in miles per hour.

c. The two-speed shift linkage connects the cab mounted shift lever to the shifter shaft on the front of the transfer. The shift lever and shift shaft provide for shifting the transfer to either low or direct range.

d. A lockup air chamber located on the right front of the transfer provides for locking and unlocking the differential in the transfer. As previously stated, when traction is poor the differential action in the transfer can be locked out so that both output shafts turn at the same speed. An air operated switch, located in the cab, controls the operation of the differential in the transfer through the lockup air chamber.

11. ORGANIZATIONAL MAINTENANCE RESPONSIBILITIES FOR THE MK48 TRANSFER ASSEMBLY

a. As an organizational maintenance mechanic you are responsible for replacing the following components:

(1) shift linkage,

(2) shift lever,

(3) lockup air chamber,

(4) lubrication pump,

(5) lubrication lines, and

(6) the breather.

b. You are also responsible for servicing the transfer assembly with lubricant, adjusting the shift linkage, and inspecting and servicing the breather.

12. SERVICING THE MK48 TRANSFER ASSEMBLY AND ADJUSTMENT OF THE 2-SPEED SHIFT LINKAGE

a. Servicing the Transfer Assembly

(1) The transfer case housing forms a sump for the lubricating oil.

(a) The oil in the transfer case must be changed between the first 500 and 1000 miles of operation.

(b) After the initial oil change, the oil level must be checked every 3,000 miles or semiannually and changed every 6,000 miles or annually. Lubrication Instruction LI 2320-12/9 explains the oil replacement requirement and it should be consulted before checking or changing the oil.

(2) To drain and refill the transfer case use the following procedures.

(a) First, operate the vehicle in order to get the transfer lubricant to normal operating temperature. Stop the vehicle on a level surface, stop the engine, and chock the wheels. Making certain the transfer oil is warm accomplishes two purposes.

1 One, the oil will drain quicker and more completely when it is warm than it will if it is cold.

2 Secondly, any contaminants that may be present in the oil will be suspended in the oil as a result of the oil being circulated and will leave the transfer with the draining oil. If those contaminants were allowed to settle into the bottom of the transfer case, they might not drain off.

(b) Now, position a drain pan capable of holding at least 10 quarts of oil under the transfer case drain plug. Be careful not to burn yourself on the hot driveline components. Now remove the bottom drain plug and the fill plug to create an air flow, which aids in the flow of the fluid.

(c) After the oil has been completely drained, remove the lubrication line from the strainer elbow.

(d) Next, we will remove the strainer element that is used to remove contaminants before the oil is drawn up to the lubrication pump. To remove the elbow, turn the elbow counterclockwise and pull it out. The strainer is permanently attached to the elbow.

(e) After the transfer case has been completely drained and all plugs have been removed, the next step is to clean all of those parts.

1 The plugs and fittings must have all of the old pipe sealant removed.

2 After that, thoroughly clean the strainer of any deposits or sludge.

(f) The next step is to apply new pipe sealant to the plug and elbow threads.

(g) Now, install the strainer elbow. The elbow must be at the 2 o'clock position after it is tightened. This allows for the lubrication line to be installed without having to kink or stretch it. Now install the lubrication line onto the elbow.

(h) The next step is to install the drain plug and tighten it securely.

(i) Now, you can replenish the transfer case with oil. Remember to always refer to the lubrication order for the proper oil and procedures before you fill the transfer case with oil. Fill the transfer case with oil until the oil reaches the fill plug hole.

(j) Once the oil starts seeping from the fill plug hole, install the fill plug and tighten it securely.

(k) Check the elbow line and plugs to make sure there are no signs of leaks.

b. Adjustment of the 2-Speed Shift Linkage. Adjustment of the 2-speed shift linkage is a responsibility of the organizational maintenance mechanic and will be covered in detail later in the lesson under component replacement.

13. INSPECTION OF THE LVS TRANSFER ASSEMBLY

a. Begin by inspecting the input flange and the front output flanges for signs of oil leaking around the seals.

b. Next, inspect the lockup air chamber and declutch housing for leaks and cracks.

c. To check the oil level in the transfer case, remove the fill plug and check to make certain that the oil level is up to the bottom of the fill plug hole. Remember that the vehicle must be parked on a level surface.

d. Next, check the 2-speed shift linkage for looseness, misadjustment, or damage.

e. Inspect the transfer assembly air breather. Check to make sure there is no build up of debris around the breather cap. Also, check to see that the breather is not loose in the mounting plate and that it is not damaged or broken.)

f. Also, inspect all of the bearing covers for leaks and cracks.

g. Now, inspect the lubrication pump for loose mounting capscrews, cracks, or signs of leaks at the housing or at the lubrication lines.

h. Continue to inspect the rest of the lubrication lines for frays, cracks, kinks, or damage. Also inspect the fittings for looseness, damaged threads, or signs of leakage.

i. Inspect the rear output flange for signs of cracks and/or leaks.

j. Finally, inspect the speedometer transducer for looseness, leaks and frayed wires.

14. REPAIR OF THE MK48 TRANSFER ASSEMBLY BY COMPONENT REPLACEMENT

a. Lube Pump. The first task we will cover is the replacement of the lube pump. The procedures are as follows:

(1) First, tag and remove the lubrication lines from the pump.

(2) Next, remove the four mounting capscrews and lockwashers.

(3) Before pulling the lube pump out of the transfer case, move the fuel line and clamp out of the way. Now you can pull the pump out of the transfer case.

(4) To install the lube pump back onto the transfer case, you first have to clean the mating surfaces. After the surfaces have been cleaned, apply sealant to the mating surface of the lube pump. Now, aline the drive shaft tang with the drive plate slot in the transfer case and carefully slide the lube pump onto the transfer case.

(5) The lube pump is retained by four capscrews and washers. Coat the capscrews with sealant and install them. Make sure the clamp that retains the fuel line is installed in the upper right corner of the oil pump. Tighten all retaining bolts securely.

(6) To complete the task, reinstall the lubrication lines.

a. 2-Speed Shift Linkage. To remove the shift linkage you must perform the following steps.

(1) Remove the cotter pin, clevis pin, and clevis from the shift lever.

(2) Move the other end of the cable and remove the cotter pin, clevis pin, and clevis from the shift shaft.

(3) To complete the removal of the linkage, loosen the locknuts at the brackets at each end of the linkage and lift the linkage off the brackets. Next, follow along the linkage and remove all of the clamps and nylon ties. Now, remove the linkage from the vehicle.

(4) Remove the brackets only if they are damaged and need replacing.

(5) The installation of the 2-speed shift linkage can be accomplished by reversing the tasks for removal. You must remember that after the linkage is installed, it must be adjusted and checked for proper operation.

(6) Adjust the 2-speed shift linkage using the following procedures:

(a) First, chock the wheels.

(b) Now, position the transfer shift lever all the way forward.

(c) Next, you have to remove the linkage from the transfer case end. Once that is done, push the shift shaft all the way in towards the transfer case.

(d) Have an assistant hold the shift lever all the way forward in the cab. Loosen the linkage locknuts on the bracket. Now adjust the locknuts until you have a free pin fit between the linkage and the transfer case shift shaft. If you cannot get a proper adjustment at the transfer case, you then have to make adjustments on the linkage at the shift lever end.

(e) After the linkage has a free pin fit, install the pin and a new cotter pin and tighten the locknuts on the brackets.

(f) Now, start the engine. Check for proper operation of the shift linkage.

c. Lockup Air Chamber. Prior to replacing the lockup air chamber, you should test it to see if it requires replacement. The lockup air chamber can be quickly tested by using the following procedure:

(1) Testing the lockup air chamber. The left rear exterior access panel must be removed to gain access to the lockup air chamber.

(a) Operate the vehicle's engine and allow the air system to build up to a minimum of 65 pounds of pressure. When the desired pressure is obtained, shut down the engine and remove the pipe plug from the top of the declutch housing on the transfer.

(b) Position yourself on the left side of the vehicle between the wheels so that you can see down inside the declutch housing. Have an assistant move the drive line lockup switch to transfer case lockup. If the shift rod in the declutch housing moves, the lockup air chamber is functioning properly. If further diagnosis indicates that the lockup air chamber is defective, replace it using the following procedures.

(2) Lockup air chamber replacement.

(a) First, drain the air system completely.

(b) Then, tag and remove the two air lines from the air chamber.

(c) Next, remove the capnut and O-ring from the end of the air chamber. Discard the O-ring.

(d) Now, remove the locknut and washer from the capnut hole and discard the locknut.

(e) The last step is to remove the mounting capscrews and the air chamber from the declutch housing. Remove the air fittings.

(3) Before installing the air chamber, make sure the shift shaft is pulled out all of the way. This is so the locknut can be installed.

(4) Now, apply silicone sealant to the mating surface of the air chamber and then carefully install it over the shift shaft. Aline the new locknut and washer with the shift shaft and install them through the capnut hole.

(5) After the locknut is installed, install the mounting capscrews and tighten them securely. Also, install a new O-ring onto the capnut and install the capnut onto the air chamber.

(6) The last step is to apply pipe sealant to the fittings and install them on the air chamber. Install the air lines into their tagged location, start the engine and build up air pressure, and then check for the proper operation of the air chamber.

15. DIAGNOSE MALFUNCTIONS IN THE MK48 TRANSFER ASSEMBLY

a. General

(1) The SLIDE that you see on the screen lists the malfunctions that we will cover.

(2) You will tell me what the correct procedures are for the diagnosis of each of the faults listed. The required information is in your technical manual and that is where you will find the answers to the questions I will ask.

b. Malfunction No. 1 (Constant noise when in low range and/or in direct range)

(1) TEST 1. Check for the correct lubricant type and level.

(a) If the wrong level or type of lubricant is found, change or add the lubricant as needed.

(b) If the lubricant is correct, check the shifting linkage.

(2) TEST 2. Check for a loose, misadjusted, or damaged shifter and/or linkage.

(a) If the linkage or shifter is loose, misadjusted or damaged; adjust, repair or replace it as needed.

(b) If the linkage shifter is not loose, misadjusted or damaged; check the lubricating pump.

(3) TEST 3. Remove one of the three oil feed lines from the lubrication pump. Have an assistant apply the parking brake, place transfer case in neutral, start the engine and shift to drive. Allow the vehicle to idle. Watch for lubrication to flow from the pump; it may take a moment for the oil to flow.

(a) If lubricant does not flow from the pump, check the pickup strainer.

(b) If lubricant does flow from the pump, send the vehicle to direct support, third echelon maintenance.

(4) TEST 4. Check for a clogged lubrication pump pickup strainer, pump pickup line or lubrication feed lines.

(a) If the strainer, pump pickup line, or lubrication lines are clogged, clean or replace it/them as required.

(b) If the strainer, pump pickup line, or lubrication lines are clear, replace the transfer case lubrication pump.

c. Malfunction No. 2 (Lubricant leaks at drive yoke)

(1) TEST 1. Check for an incorrect lubricant type or overfilled transfer case.

(a) If the lubricant is incorrect, change the lubricant; if it's too full, drain it to the proper level.

(b) If the lubricant is correct, check the breather.

(2) TEST 2. Check for a clogged or damaged breather.

(a) If the breather is clogged or damaged, clean or replace the breather.

(b) If the breather is not clogged or damaged, notify third echelon maintenance.

d. Malfunction No. 3 (Transfer case overheats)

(1) TEST 1. Check for incorrect lubricant type or lubricant level.

(a) If the lubricant is incorrect, change the lubricant or drain it to the proper level.

(b) If the type and level of lubricant is correct, check the breather.

(2) TEST 2. Check for a clogged or damaged breather.

(a) If the breather is clogged or damaged, clean or replace it as needed.

(b) If the breather is not clogged or damaged, check the lubrication lines.

(3) TEST 3. Check for a damaged or restricted lubricant line.

(a) If the line is damaged or restricted, replace the line.

(b) If the lubrication line is not damaged or restricted, notify third echelon maintenance.

e. Malfunction No. 4 (Differential lockup will not engage or disengage)

(1) TEST 1. Check for damaged or restricted air lines to the air chamber.

(a) If the lines are damaged or restricted, replace the air lines as needed.

(b) If the lines are not damaged or restricted, check the air chamber.

(2) TEST 2. Check for a damaged or leaking air chamber.

(a) If it's damaged or leaking, replace the air chamber.

(b) If the air chamber is not damaged or leaking, notify third echelon maintenance.

16. INTRODUCTION TO THE LOGISTICS VEHICLE SYSTEM'S PROPELLER SHAFT SYSTEM

a. As you know, the LVS is an all wheel drive vehicle. Since all wheels drive, each axle must receive power from the engine; that power is delivered by the propeller shaft system.

(1) The No. 1 axle receives its power from the nose gear box. The nose gear box is driven by the front output shaft of the transfer case through a propeller shaft with a conventional cross and trunnion universal joint and companion flange at each end. This section of the propeller shaft also contains a slip joint.

(2) The No. 2 axle receives its power from the output flange on the rear of the No. 1 axle differential housing. This section of the propeller shaft system has a slip joint in its approximate center and yokes are used at its ends rather than flanges. There is, of course a universal joint at each end.

(3) The No. 3 axle is driven by a propeller shaft that receives its power from the output flange on the rear of the transfer case through a cardan joint and pillow block shaft.

(a) Because of the distance between the pillow block shaft and the No. 3 axle, two propeller shaft sections and a center support bearing are used on all LVS rear body units except the MK16. There are three universal joints in these two shaft sections; one at the extreme ends and one in the center where the two shafts connect. Companion flanges are used on these shafts and there is a slip joint aft of the center support bearing.

(b) The previously mentioned cardan joint is a double universal joint that can transmit torque evenly at the greater drive angles that result in vehicles with articulated steering. The pillow block shaft and pillow block bearings provide rigidity to the shaft and prevent side to side movement. The cardan joint and pillow block shaft are mounted in-line behind the transfer case. There is also a slip joint incorporated in the pillow block shaft.

(4) The No. 4 axle receives its power from an output yoke on the rear of the No. 3 axle through a propeller shaft with universal joints at each end and a slip joint near the No. 4 axle end.

b. The universal joints employed within the system provide for the smooth delivery of power from each driving to driven unit even though the drive angles vary. The slip joints compensate for the varying distances between components that results from the up and down movement of the axles and the motion of the articulation joint.

17. PRINCIPLES OF OPERATION OF THE LVS PROPELLER SHAFT SYSTEM

a. The principles of operation of the propeller shaft system in the LVS are the same as those in all the other vehicles you have studied up to this point in your training. That is, through the use of shafting, slip joints and single or double universal joints such as the cardan joint, power from the engine is supplied to the driving axle.

b. Depending on the particular requirements, companion flanges or yokes are used at each propeller shaft connecting point.

(1) In general, companion flanges are used at points that are more frequently disconnected; for example, between the pillow block shaft and the propeller shaft for the No. 3 axle. That is the point where the front power unit and rear body units are separated.

(2) Yokes are used at points where the propeller shafts will be removed infrequently; the propeller shaft between the No. 3 and No. 4 axles is a good example.

18. ORGANIZATIONAL MAINTENANCE RESPONSIBILITIES RELATIVE TO THE LVS PROPELLER SHAFT SYSTEM

a. The organizational maintenance mechanic is responsible for replacing and repairing the cardan joint, the propeller shafts, pillow block, and universal joints.

b. The organizational mechanic is also responsible for inspecting the cardan joint and pillow block, replacing the pillow block shaft, and also for servicing the propeller shafts and universal joints.

19. REPAIR OF THE PROPELLER SHAFT AND UNIVERSAL JOINT ASSEMBLY FEATURED IN THE LVS

a. Inspection of the Propeller Shaft and Universal Joint Assembly.

(1) Clean all parts.

(2) Inspect the propeller shafts for bends, dents, broken welds, or stripped threads.

(3) Inspect the U-joints for pitting, scoring, or signs of damage.

(4) Inspect all yokes and flanges for cracks, stripped threads, and broken or worn splines.

(5) Inspect the slip shaft and spline shaft for twisted, worn, or broken splines.

(6) Inspect the lockstraps for damage.

(7) Replace all parts failing inspection.

b. Replacement of the Propeller Shaft and Universal Joint Assembly Components. The following procedures will be used to repair or replace the components within the propeller shaft system. Before you remove any propeller shaft, block the wheels.

(1) The first procedure we will cover is removing the propeller shafts that contain the companion flange yokes. The removal procedure consists of the following steps.

(a) First you must support the end of the propeller shaft that will be removed. To support the end of the propeller shaft, wrap a piece of rope or strap around the propeller shaft and secure it to the vehicle.

(b) Before removing the capscrews, make a scribe mark across the two flanges. This will ensure proper mating of the companion flanges when they are installed. Now, go ahead and remove the nuts, lockwashers, and capscrews from the flanges.

a. If you are working on the propeller shaft between the articulation joint and the No. 3 axle, the support chain and bearing support must be removed from the vehicle.

(2) The procedure used to remove the propeller shaft with other types of yokes consists of the following steps.

(a) At the end of the propeller shaft with a stub yoke, you first have to bend the two lock straps away from the capscrews and then remove the capscrews.

(b) Now remove one of the bearing caps from the stub yoke. You must pay attention to the needle bearings within the bearing cap. These bearings are very small and if you should happen to lose just one of them, the universal joint will have to be replaced.

(c) Next, push the cross into the opposite bearing cap. Make sure that the cross is properly seated in the other cap. Tap the cross down to remove the other bearing cap.

(d) Disconnect the propeller shaft from the stub yoke by moving the cross to one side and then tilting the cross outward. Remove the shaft.

(3) The procedure for disassembling the companion flange universal joint consists of the following steps.

(a) First, bend back the lock straps as previously done on the stub yokes. After the lock straps are bent back, remove the capscrews.

(b) Next, remove one of the bearing caps from the companion flange yoke. Care must be taken not to disturb the needle bearings within the cap.

(c) Now, tap the cross of the universal joint through the companion flange until the other bearing cap is removed. Remember to be careful not to disturb or lose any of the needle bearings.

(d) After the bearing caps are removed, lift and pull the cross out of the companion flange.

(e) If the other universal joint needs to be removed, the previous procedures must be followed. Take extra precautions not to disturb or lose the needle bearings.

(4) The procedures for separating the slip joint are accomplished by performing the following steps.

(a) First, make a scribe mark across the two shafts. This will ensure proper alinement of the two yokes during assembly.

(b) Now, loosen the dust cap and slide it onto the splined shaft. Pull the splined shaft out of the slip joint shaft and remove the dust cap. Inspect the dust cap packing for damage and replace as necessary.

(5) To remove those components, the propeller shaft must be installed into a soft-jawed vise.

(a) To remove the companion flange, first remove the locknut and washer. Pull the companion flange off the shaft. It may be necessary to use a rubber mallet to remove the companion flange.

(b) Slide the center support bearing off the shaft. A rubber mallet may also be needed to remove the support bearing.

(6) The first assembly procedure we will cover concerns the center support bearing. The following steps must be accomplished.

(a) Pack the center support bearing with weatherproof grease and slide it onto the shaft.

(b) Wipe off the splines on the shaft and then slide the companion flange onto the splined shaft.

(c) Now, install the locknut and washer. The locknut has a specific torque which you should obtain from the vehicle's technical manual.

(7) To assemble the slip joint propeller shaft, the following procedures are required.

(a) Slide the dust cap, washer, and packing onto the splined shaft; ensure that the lip of the seal is towards the splined shaft.

(b) Now, aline the scribe marks and slide the two shafts together until the dust cap can be hand tightened onto the slip joint shaft.

(8) We will assemble the universal joint on a companion flange yoke and the stub yoke. The following procedures are required to accomplish this task.

(a) First, tilt the universal joint cross into the stub yoke bearing cap hole.

(b) Before you install the bearing caps onto the yoke, take a little grease and wipe it on the needle bearings. This will prevent the bearings from falling out when you are installing the bearing caps.

(c) Now you can install the bearing caps.

1 To perform this procedure, you have to start one of the bearing caps into the yoke about 1/4 of an inch. Carefully slide the cross into the bearing cap, making sure you do not disturb the position of the needle bearings.

2 Hold the cross into the bearing cap and carefully tap the other bearing cap into the yoke about 1/4 of an inch.

3 Install the yoke assembly into a vise so the bearing caps are positioned between the two jaws. Hold the cross about half way in each bearing cap.

4 Continue to hold the cross in that position and slowly tighten the vise until the bearing caps are seated against the yoke.

(d) After the bearing caps are assembled, install the capscrews and lock straps. Tighten the capscrews securely and bend the lock strap tabs over the capscrew heads. This will prevent the capscrews from coming loose.

(e) Complete the task by installing the cross into the companion flange yoke. Install the bearing caps into the yoke, following the same procedures as just outlined.

(9) To install the companion flange type propeller shaft, you must have an assistant and perform the following steps.

(a) Position the propeller shaft under the vehicle. Have a strap or a rope secured to the vehicle at the end of the propeller shaft with the companion flange. This is needed to support the one end of the propeller shaft while you are installing the other end.

(b) First, slide the end yoke of the propeller shaft into the axle or component.

(c) Have the assistant mate the companion flanges and check to make sure the scribe marks line up. If the marks do not line up, there are two ways to aline them.

1. The first way is to try and turn the propeller shaft that you are mating the companion flange to.

2. If the propeller shaft will not turn, the second option is to pull the end yoke out of the component and turn the propeller shaft to a different spline.

(d) After the scribe marks are aligned, install the capscrews, lockwashers, and nuts and torque them to the specifications that are given in the technical manual.

(e) When you are installing the propeller shaft between the articulation joint and the No. 3 axle, you must also secure the support bearing to the frame of the vehicle.

c. Purging the Universal Joint Bearing Cap Seals. Use the proper lubricant to purge the bearing cap seals of each universal joint. This flushes the abrasive contaminants from each bearing and assures that all four bearings are lubricated properly.

(1) General. The organizational maintenance mechanic is responsible for lubricating the propeller shafts at specific intervals. These intervals and locations can be found in the lubrication instruction, LI 2320-12/9. The lubrication instruction should always be referred to whenever you are performing any lubrication procedures.

(2) To purge the seals, apply grease to the fitting until all the seals pop. If any of the seals fail to purge or pop, move the propeller shaft from side to side while applying the grease. This will allow for greater clearance on the thrust end of the bearing that is not purging.

(3) If a seal still does not purge the seal tension must be relieved. To relieve the seal tension, use the following procedure.

(a) First, loosen the capscrews that hold the unpurged bearing. It may be necessary to loosen the bearing assembly approximately 1/16 of an inch. Try purging the seal again.

(b) If the seal still does not purge, you must remove the universal joint and carefully inspect the universal joint components to determine the cause of the blockage.

20. REPAIR THE PILLOW BLOCK ASSEMBLY FEATURED IN THE LVS

a. Inspection of the Pillow Block Assembly. The following procedure should be performed to inspect the pillow block assembly.

(1) Begin by inspecting the shaft for dents, broken welds, or cracks. Also, check for loose, damaged, or missing grease fittings.

(2) Next, inspect the slip yoke and companion flange for cracks, wear or loose mounting capscrews.

(3) Now, inspect the pillow block support bearings for loose mounting capscrews, cracks, or signs of overheating. Overheating can be detected by signs of blue colored metal. Also check for loose, damaged or missing grease fittings.

b. Removal of the Pillow Block Assembly

(1) Shift the transfer case into LOW. This will stop the propeller shaft from turning while the companion flange is being removed.

(2) Place a scribe mark across the companion flanges and separate them, following the same procedures previously given.

(3) Now, remove the locknut and washer from the companion flange.

(4) Next, remove the capscrews and nuts that connect the pillow block to the cardan joint. Slide the end yoke towards the rear of the vehicle.

(5) Have an assistant help support the shaft assembly and remove the capscrews and locknuts that attach the support bearings to the articulation joint. **BE CAREFUL! THE PILLOW BLOCK ASSEMBLE IS VERY HEAVY. THE BEARINGS MAY ROTATE AND ALLOW THE SPACERS TO SLIP OUT.**

(6) Lower the shaft assembly and remove the pillow block spacers that are between the support bearings and the articulation joint.

(7) Now, remove the pillow block assembly from the articulation joint.

c. Disassemble the Pillow Block Assembly. The disassembly procedure will be very similar to those which were previously instructed. There are some differences and I will note those as we proceed to disassemble the pillow block.

(1) Position the pillow block into a soft jawed vise so that the jaws of the vise attach to the shaft assembly.

(2) Next, unscrew the dust cap and slide the dust cap onto the shaft. Match mark the end yoke with the shaft and remove the end yoke.

(3) After the yoke has been removed, slide the dust cap, washer, and packing off the shaft. Always discard the packing.

(4) Remove the two Allen screws from each pillow block support bearing.

(5) The next step is to remove the pillow block support bearings from the shaft. In order to do this, you will need to use a rubber mallet or a press, depending on the difficulty of removing them. First, try using the mallet to remove the bearings. If the pillow block support bearings do not move after a couple of tries, it will be necessary to install the shaft

assembly into a press. Remember, when you are using the press, follow the general safety instructions and wear safety glasses to prevent personal injury. Install the shaft assembly into the press and remove the pillow block bearings from the shaft. Only remove one pillow block support bearing at a time.

(6) Tag each pillow block support bearing so they can be reinstalled in their original location on the shaft, if they are going to be reused.

(7) The last step is to remove the grease fittings; if they are clogged or damaged replace them.

d. Assembly of the Pillow Block. The following procedures should be performed to assemble the pillow block.

(1) Place the shaft, threaded end up, in a soft jawed vise.

(2) If the pillow block support bearings are to be reused, they must be installed back into their tagged location. Install the support bearing onto the shaft, so that the long side of the bearing is towards the threaded end of the shaft.

(3) Install and tighten the two Allen screws to secure the support bearing to the shaft.

(4) Now, slide the companion flange on the shaft until it is seated against the pillow block support bearing. Install the spacer and locknut; hand tighten only.

(5) Loosen the vise and turn the shaft assembly around so the splined end is up. Tighten the vise.

(6) Using the same procedure as before, install the other pillow block support bearing.

(7) After the support bearings are installed, slide the dust cap, washer and new packing onto the shaft.

(8) Slide the end yoke onto the shaft, making sure the match marks made during disassembly aline.

(9) Now, screw the dust cap onto the end yoke hand tight.

(10) If the grease fittings were removed, now is the time to install new ones.

e. Installation of the Pillow Block Assembly. The following steps must be accomplished to install the pillow block assembly.

(1) First, place the support bearing capscrews into their holes located in the articulation joint.

(2) Now, place the spacers on top of each support bearing and insert the shaft assembly into the articulation joint. The end yoke must be facing toward the cardan joint.

(3) After the pillow block is in the cavity of the articulation joint, have an assistant help lift the shaft assembly up to the mounting capscrews. Once the shaft assembly is in place, install the washers and locknuts. Hand tighten them only.

(4) Now, slide the slip yoke towards the cardan joint until it is fully seated. Hold the slip yoke tight against the cardan joint and install the capscrews. Tighten the capscrews securely.

(5) At this time, you should torque the support bearing locknuts and the companion flange locknut to their specified torques. These torque specifications are found in the vehicle technical manual.

(6) The last step is to aline the companion flange scribe marks and connect the two companion flanges.

21. REPAIR THE CARDAN JOINT FEATURED IN THE LVS

a. Remove the Cardan Joint. To remove the cardan joint, the following procedures must be accomplished.

(1) Before you start removing the cardan joint, you must make sure the steering is in the straight ahead position. This will create an opening in the articulation joint, allowing you to remove the cardan joint.

(2) Once the vehicle is positioned, remove the nuts, lockwashers, and capscrews from the pillow block side of the cardan joint. Then slide the pillow block end yoke away from the cardan joint.

(3) Now, have an assistant support the cardan joint while you remove the nuts, lockwashers, and capscrews from the transfer case output yoke side of the cardan joint. Pull the cardan joint out of the articulation joint.

b. Disassembly of the Cardan Joint. To disassemble the cardan joint, match mark the universal joints with the center plate and then remove the capscrews and universal joints.

c. Inspection of the Cardan Joint Components

(1) First, inspect the center plate for cracks and signs of wear.

(2) Next, check the universal joint crosses for cracks, burrs, and for bearing caps that are hard to rotate. This is a sign that there was a lack of grease within the bearing caps. You must further inspect the bearing caps for missing, worn or damaged needle bearings.

d. Assembly of the Cardan Joint from Serviceable Components. To assemble the cardan joint, aline the match marks on the universal joints and the center plate. Install the capscrew on one universal joint at a time and torque them to the specifications outlined in the technical manual.

e. Installation of the Cardan Joint

(1) First, insert the cardan joint into the articulation joint until it is tight against the rear transfer case output yoke.

(2) Now, install the shorter capscrews, lockwashers, and nuts and tighten them securely.

(3) Next, slide the pillow block end yoke against the cardan joint and install the remaining capscrews, lockwashers, and nuts. Tighten the nuts securely.

22. DIAGNOSE MALFUNCTIONS IN THE LVS PROPELLER SHAFT SYSTEM

a. Driveline Vibration or Noise

(1) Check for a damaged or worn universal joint.

(a) If the universal joints are damaged or worn, replace them.

(b) If they are not damaged or worn, check the pillow block assembly.

(2) Check for a worn or damaged pillow block assembly.

(a) If the assembly is worn or damaged, repair or replace it.

(b) If it is not damaged or worn, check the propeller shaft.

(3) Check for a damaged or bent propeller shaft.

(a) If the propeller shaft is damaged or bent, replace it.

(b) If it is not damaged or bent, check the cardan joint.

(4) Check for a worn or damaged cardan joint.

(a) If the cardan joint is damaged or worn, repair or replace it.

(b) If the cardan joint is not damaged or worn, refer the problem to intermediate maintenance.

REFERENCES

LI 2320-12/9B
TM 2320-20/12A