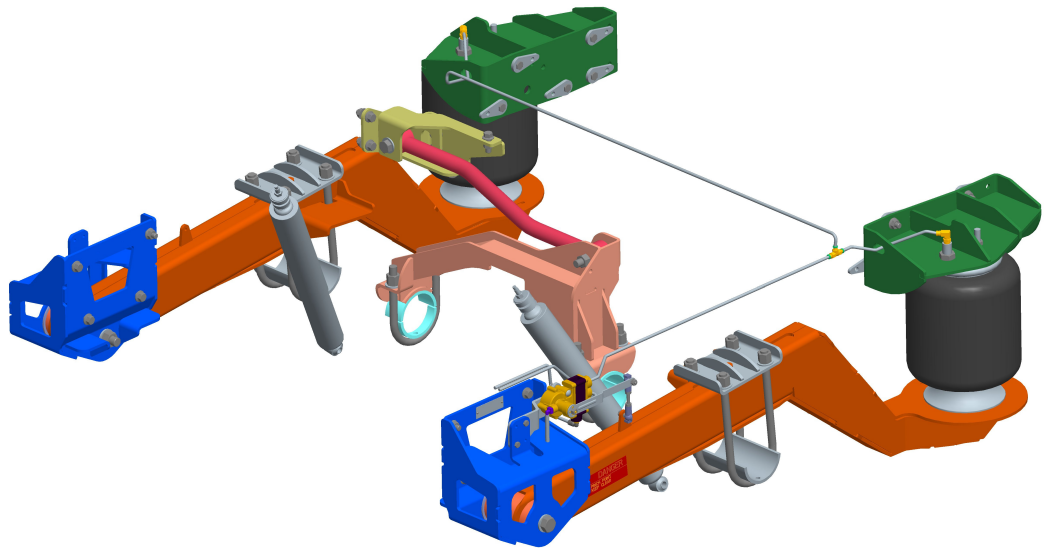




**Link**  
***UltraRide***  
**CHASSIS AIR SUSPENSION**  
**OWNERS MANUAL**

**FORD E450**  
**CUTAWAY**  
**2002-NEWER MODELS**  
(Link Part No. 8M000045)



Link Mfg. Ltd.  
223 15th St. N.E.  
Sioux Center, IA USA  
51250-2120

(712) 722-4874  
Fax (712) 722-4876

**QUESTIONS?**  
**CALL CUSTOMER**  
**SERVICE**  
**1-800-222-6283**

**PROUDLY INSTALLED BY :**

**COMPANY :** \_\_\_\_\_

**INSTALLER SIGNATURE :** \_\_\_\_\_

**DATE :** \_\_\_\_\_

041230  
80000974

# **INSTALLATION INSTRUCTIONS INDEX**

- 1.0 INTRODUCTION
- 2.0 DRIVER SIDE DISASSEMBLY
- 3.0 DRIVER SIDE ASSEMBLY
- 4.0 PASSENGER SIDE DISASSEMBLY
- 5.0 PASSENGER SIDE ASSEMBLY
- 6.0 LATERAL CONTROL ROD
- 7.0 AIR CONTROL SYSTEM
- 8.0 ELECTRICAL
- 9.0 EXHAUST INSTALLATION & FUEL RECOVERY OPTION
- 10.0 FINAL INSPECTION & OPERATION
- 11.0 SERVICE & MAINTENANCE

# 1. INTRODUCTION

**IMPORTANT!** It is important that the entire installation instructions be read thoroughly before proceeding with suspension installation.




**WARNING!** A correct installation must result in the suspension and axle being “loaded” within the range specified by axle and suspension manufacturers. Please check vehicle specifications and intended usage to insure axle will be within Gross Axle Weight Rating (GAWR). No alteration of any suspension component is permitted.

## **PRODUCT INSTALLER RESPONSIBILITIES**

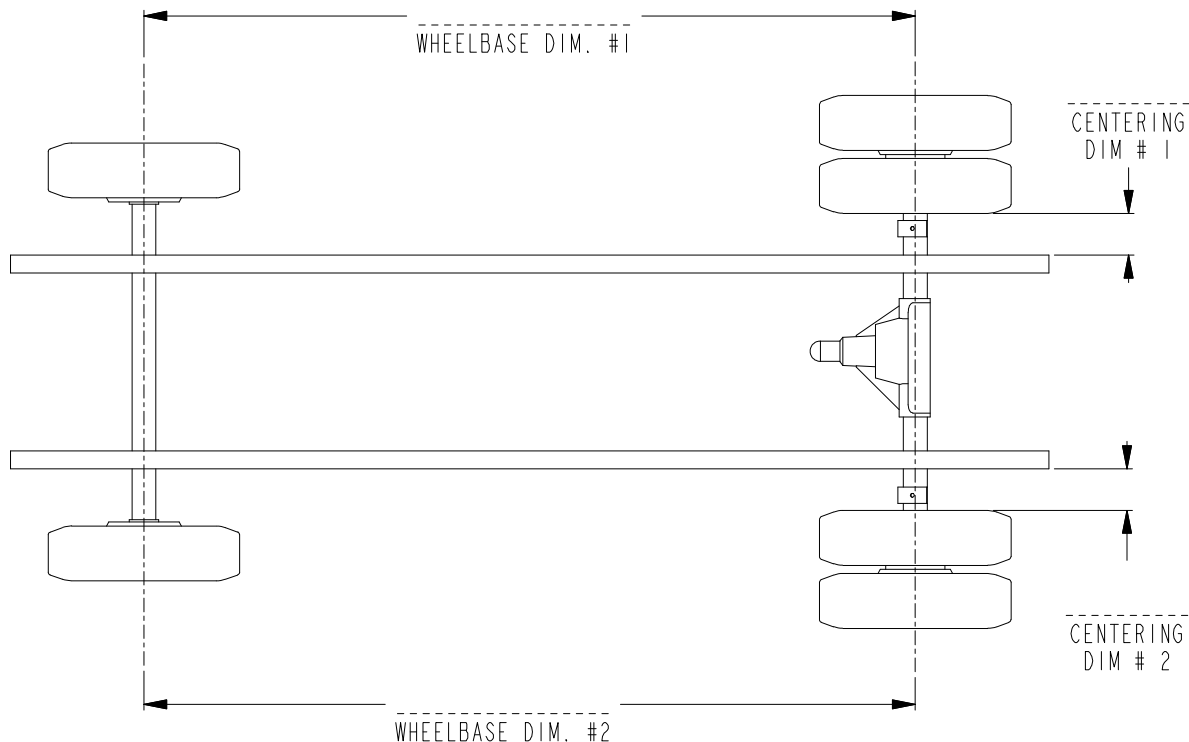
- ❑ Installer is responsible for installing the product in accordance with Link Mfg. specifications and installation instructions.
- ❑ Installer is responsible for providing proper vehicle components and attachments as well as required or necessary clearance for suspension components, axles, wheels, tires, and other vehicle components to ensure a safe and sound installation and operation.
- ❑ Installer is responsible for advising the owner of proper use, service and maintenance required by the product and for supplying maintenance and other instruction as readily available from Link Mfg..

## **INSTALLATION NOTES:**

- ❑ Proper tightening of U-Bolt nuts and mounting nuts are required for proper operation. Need for proper Torque value is indicated by wrench symbol and values will be found in Table 11-1 in Maintenance section of the instructions. Failure to maintain proper torque can cause component failure resulting in accident with consequent injury. 
- ❑ Drilling of new frame holes is required for installation of the suspension.
- ❑ **Exhaust modification will be required for this suspension installation.** Parts and modifications are not included with the suspension.

## PRE-INSTALLATION CHECKLIST

- ❑ Check the vehicle wheel alignment prior to installation to insure no precondition already exists; record the information for verification.
- ❑ Remove the attached body, if applicable. Remember to disconnect all electrical connections to the body, and fuel filler tube, before removing the body. The installation can also be completed using a lift to raise the vehicle. If using a lift, chassis body removal may not be necessary but removal of rear wheels will aid in installation.
- ❑ If not using a lift, block the front wheels and apply the emergency brake so the vehicle cannot roll.
- ❑ Jack up the rear frame of the truck in order to unload the rear leaf springs (or use an overhead hoist). Do not lift the wheels off the ground (if not using a lift to install the suspension). Do not jack on the axle itself.
- ❑ Install the suspension in the listed sequence. Install one side of the suspension at a time. First, install the driver side completely, then install the passenger side. Removal of the rear wheels may aid in installation, but it is not necessary.
- ❑ Measure & record the wheelbase and centering dims before beginning installation.



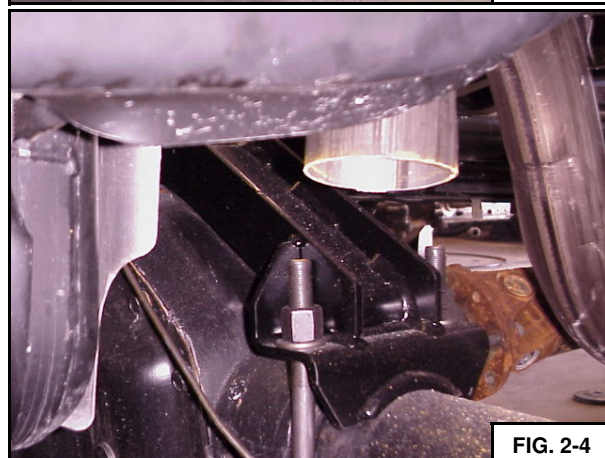
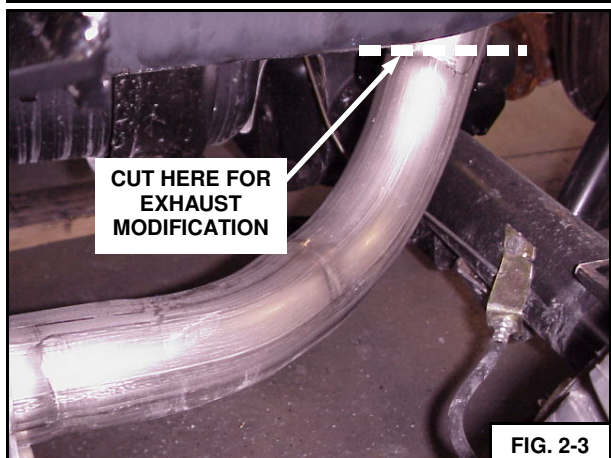
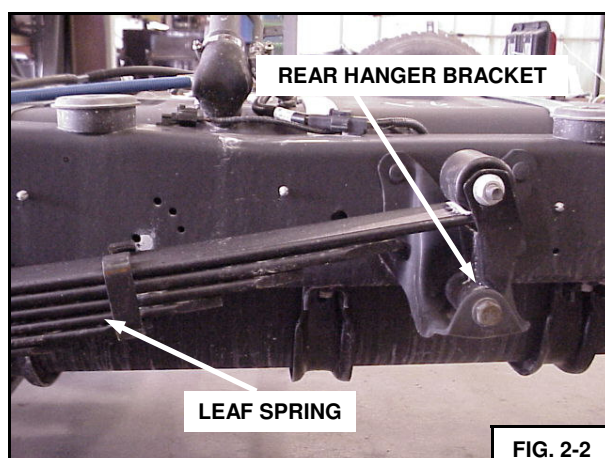
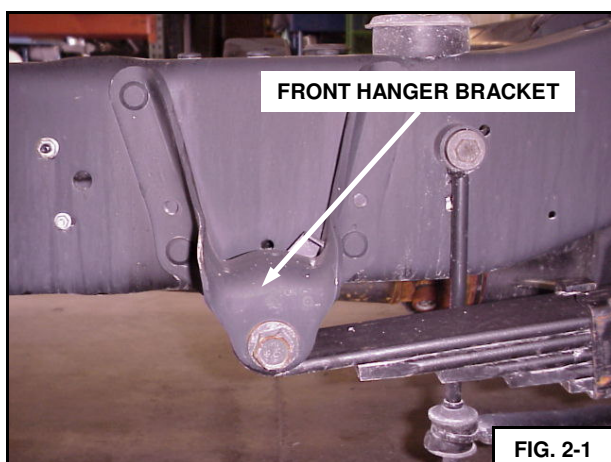
## 2. DRIVER SIDE DISASSEMBLY

1. With weight taken off the rear springs, as noted in pre-installation checklist, remove the **front and rear bolts** from the leaf spring.



**CAUTION:** Be careful that the leaf spring does not spring out of its hanger, or off the frame.

2. Remove existing **U-bolts** and **U-bolt plate** that attach the axle to the **leaf spring**. Remove the **leaf spring** from the axle.
3. Remove the **front spring hanger bracket**, **rear leaf spring hanger bracket**, and any **overload spring brackets**. See Figure 2-1. These can be removed by grinding, or air chiseling, the heads off the factory-installed rivets, and using a hammer and punch to remove remainder of the rivet. See Figure 2-2.
3. Remove the OEM **shock absorbers** and retain the lower mounting fastener for later use.
4. Cut the exhaust as it bends downward after the axle, at its most vertical and straight section. See Figures 2-3 & 2-4. Save the cut-off portion for use in Section 9. Remove the rear exhaust hanger from the frame.



# 3. DRIVER SIDE ASSEMBLY

1. Review Figure 3-1 & Figure 11-2 to acquaint yourself with the various parts of the UltraRide suspension.



2. Fasten the Front Hanger to the frame using the (4) 7/16 x 1 1/4 UNC FLANGE BOLTS and (4) 7/16 UNC TOP LOCK FLANGE NUTS. (See Table 11-1 for appropriate Torque).

3. Loosely secure the suspension Arm to the axle using (2) 5/8 UNF, 4.0 X 10.50 U-bolts, (4) 5/8 WASHERS, (4) 5/8 UNF HIGH NUTS, and the Arm Mount Plate. Make sure the locating pin is properly inserted into the mating hole on the axle pad and that the bottom side of the arm rests evenly on the axle pad. **Note:** Install the axle tube spacer between the U-bolts and Axle when installing on an E350.

4. Insert the Bolt Spacer Tube into the arm bushing and loosely fasten the Arm to the Front Hanger using (1) 3/4 X 7 UNF BOLT, (1) 3/4 UNF NUT, (2) 3/4 WASHERS, and (2) plastic wear washers.



5. Using the enclosed bolt hole template for the Upper Air Spring Mount, align the template to the frame using the appropriate rear spring hanger holes. Mark and drill three (3) new frame holes to 0.47" on each side of the frame.

Bolt the air spring bracket assembly to the frame using (5) 7/16 x 1 1/4 UNC CAPTIVE BOLTS and (5) 7/16 UNC TOP LOCK FLANGE NUTS. (See Table 11-1 for appropriate Torque). **Note:** Use the correct holes designated for either the E350 or E450 chassis. See Figure 3-2.



6. Bolt the air spring to the suspension Arm using (1) 1/2 UNC JAM NUT. Make certain the air spring is not twisted or creased after tightening the nut. (See Table 11-1 for appropriate Torque).

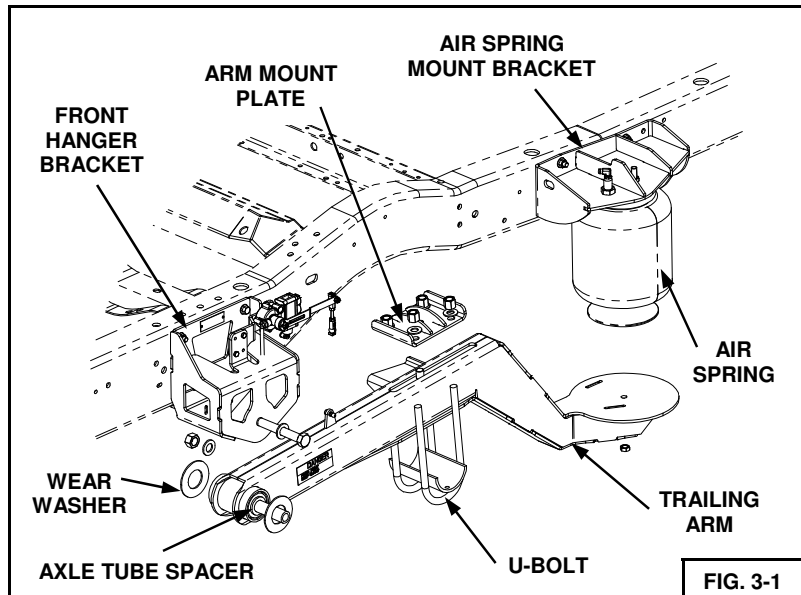


FIG. 3-1

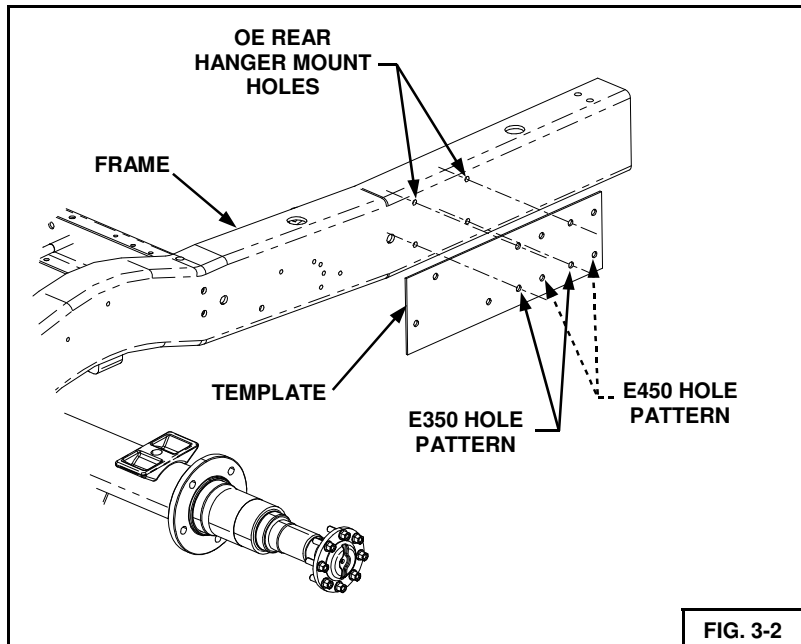


FIG. 3-2

**AFTER BOTH SIDES HAVE BEEN INSTALLED (Sections 4, 5, 6) FINISH THE FOLLOWING STEPS:**



7. Tighten the Arm bushing bolts and the Arm U-bolts **AFTER** the suspension has been installed and brought to Design Height, in Section 9.5. (See Table 11-1 for appropriate Torque).
8. Install the new shock absorbers using the same orientation as factory, with factory and enclosed hardware.
9. **IMPORTANT: Route the brake cable away from the air spring and any other moving components.** It may need to be tied, or slightly repositioned in order to accommodate this.

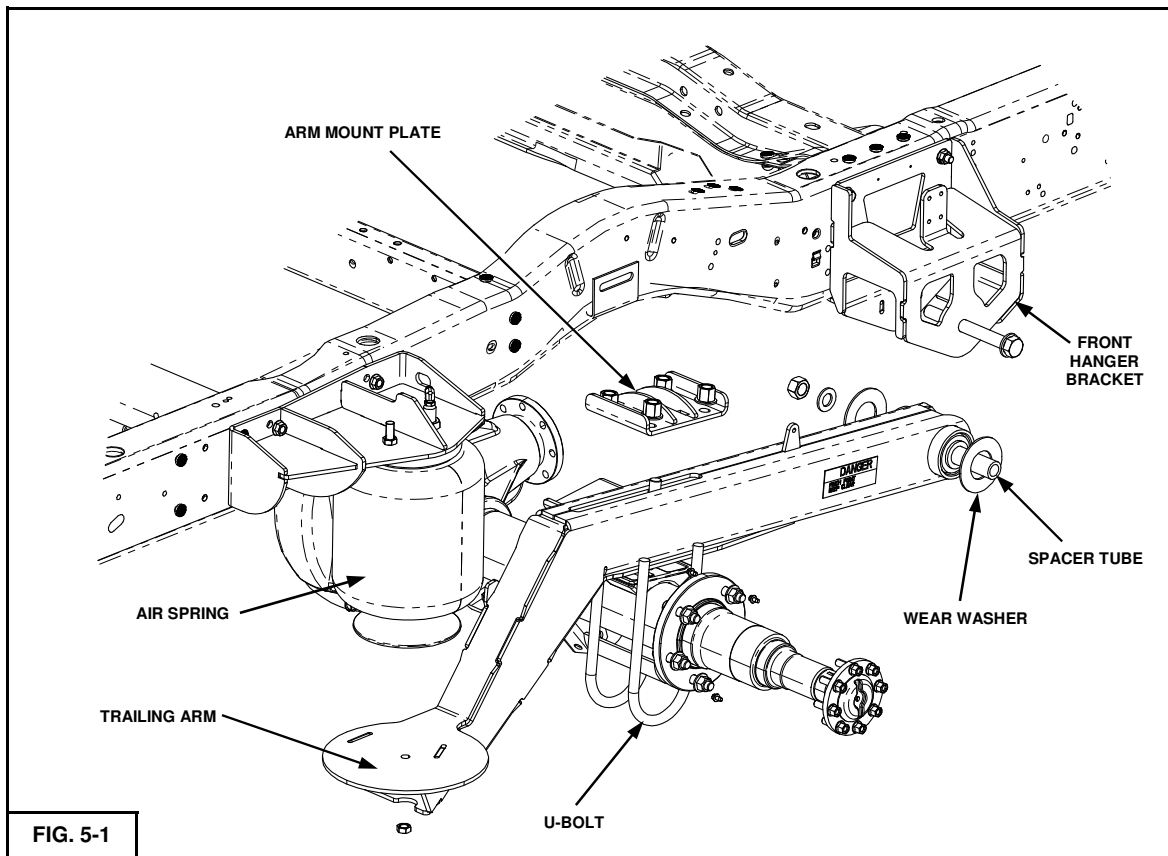
## **4. PASSENGER SIDE DISASSEMBLY**

1. Repeat Section 2 for the passenger's side of the truck.

## **5. PASSENGER SIDE ASSEMBLY**

1. Repeat Section 3 for the passenger's side of the truck.

Double-check all fasteners for proper torque. Check all clearance points and all alignments. See Figure 5-1 for details.



## 6. LATERAL CONTROL ROD

1. On the passenger side, remove the two (2) bolts that fasten the aft of axle cross-member to the fuel tank longitudinal member. See Figure 6-1.



2. Loosely fasten the Lateral Control Rod to the LCR Frame Bracket using (1) 5/8 X 3 1/2 UNF BOLT, and (1) 5/8 WASHER. Slide the LCR Frame Bracket into the cross-member until it is securely contacting the inside of the passenger side frame. Fasten the LCR Frame Bracket to the cross-member using the bolts removed from step 1. (See Table 11-1 for appropriate Torque). **Note:** If you don't assemble the Rod to the Bracket before assembly to the frame, you will not be able to get the bolt inserted properly.

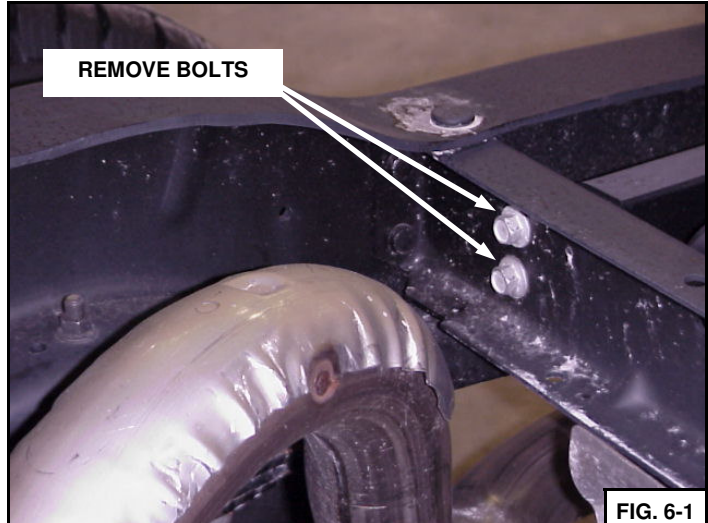


FIG. 6-1

3. Drill two (2) new holes in the passenger side frame where the LCR Frame Bracket is mounted. See Figure 6-2. Drill these holes to 0.47".



4. Fasten the LCR Frame Bracket to the passenger side frame and to the cross-member using (4) 7/16 X 1 1/4 UNC FLANGE BOLTS, and (4) 7/16 UNC TOP LOCK FLANGE NUTS. (See Table 11-1 for appropriate Torque).
5. Loosely fasten the Axle LCR Bracket around the axle using (2) 5/8 UNF, 4 x 7 U-bolts, (4) 5/8 WASHERS, and (4) 5/8 UNF HIGH NUTS. **Note:** Install the Axle Tube Spacers if installing on an E350 chassis. See Figure 6-3.

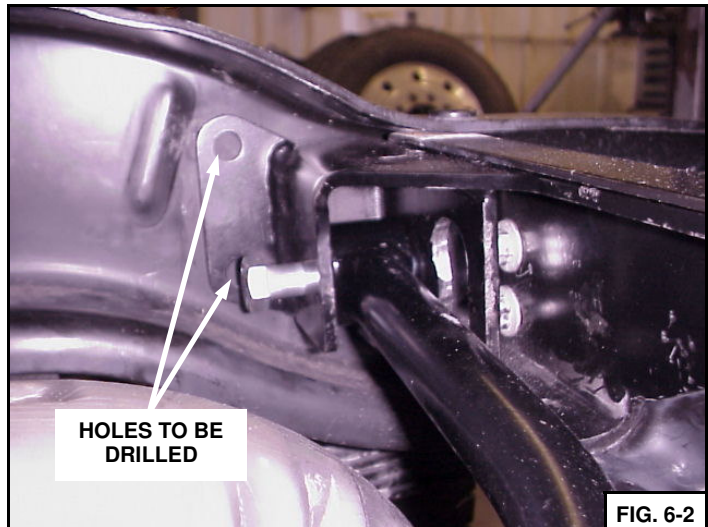


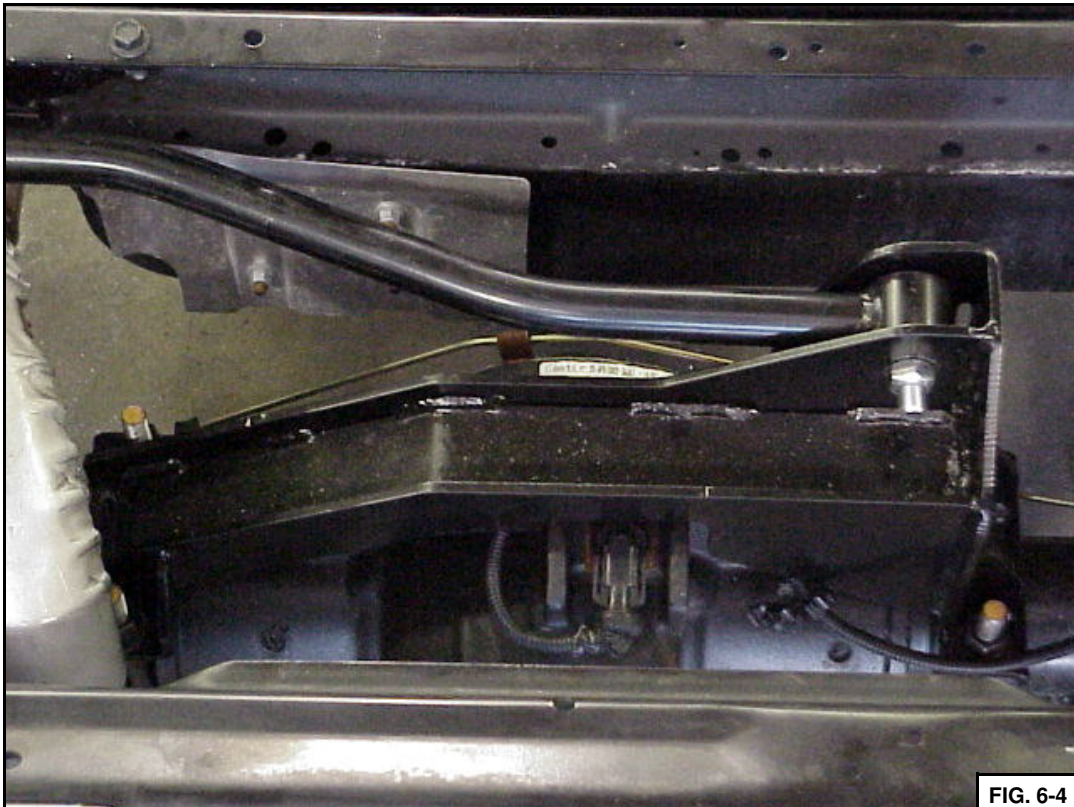
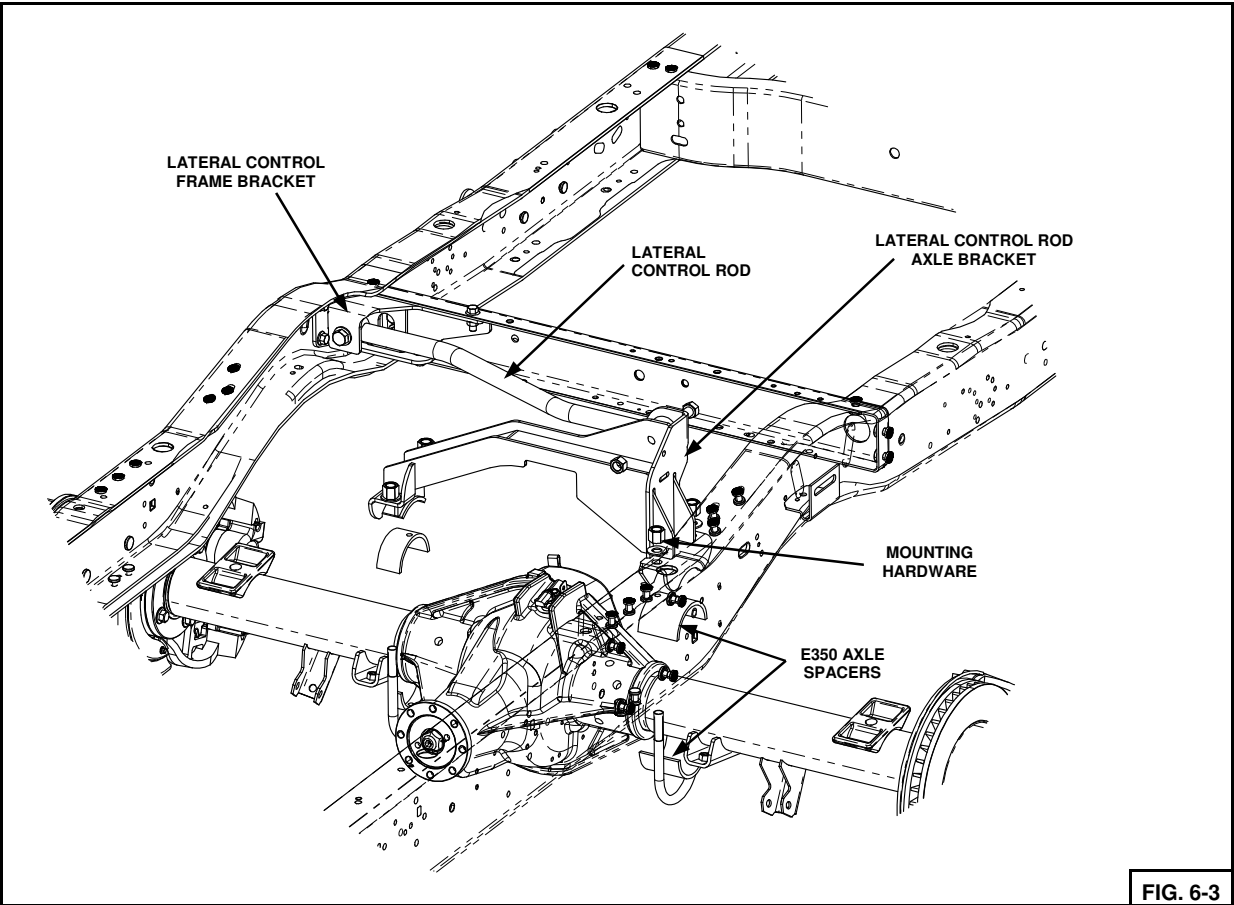
FIG. 6-2

6. Loosely install the Lateral Control Rod to the Axle LCR Bracket using (1) 5/8 X 3 1/2 UNF BOLT, and (1) 5/8 UNF TOP LOCK NUT.



7. **AFTER** the suspension has been installed and brought to Design Height, in Section 9.5., torque the Lateral Control Rod bolts, and Axle Bracket bolts. (See Table 10-1 for appropriate Torque). Make sure the Axle LCR Bracket is positioned to allow free movement of the Lateral Control Rod and is not rotated fore or aft on the axle.

**IMPORTANT:** Inspect Lateral Control Rod for any interference with other components, paying close attention to clearance with any flexible components such as brake and fuel lines.



# 7. AIR CONTROL SYSTEM ASSEMBLY



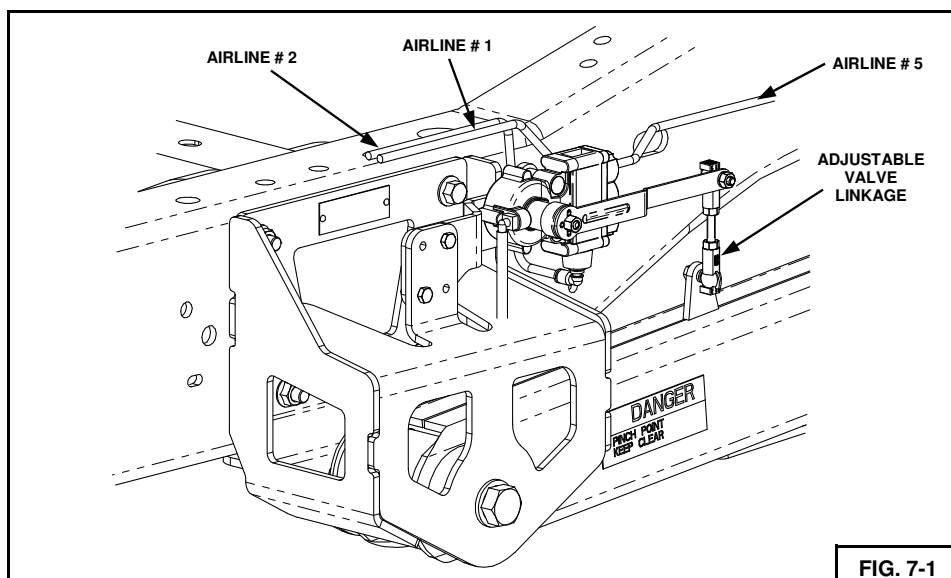
**CAUTION!** Route all airline away from exhaust, moving parts, and sharp objects. Be careful not to crimp the edges of the tubing. When installing the airline, fully insert into fitting and give a slight pull to seat properly and to be sure airline will not pull out.

**Note:** If your vehicle has a frame body that does not allow the air control system box to be located as shown, you will need to determine another location for mounting and drill the necessary holes. If installing on the frame underneath the cab, make sure it is mounted as high on the frame as possible to allow for ground clearance below the tank.

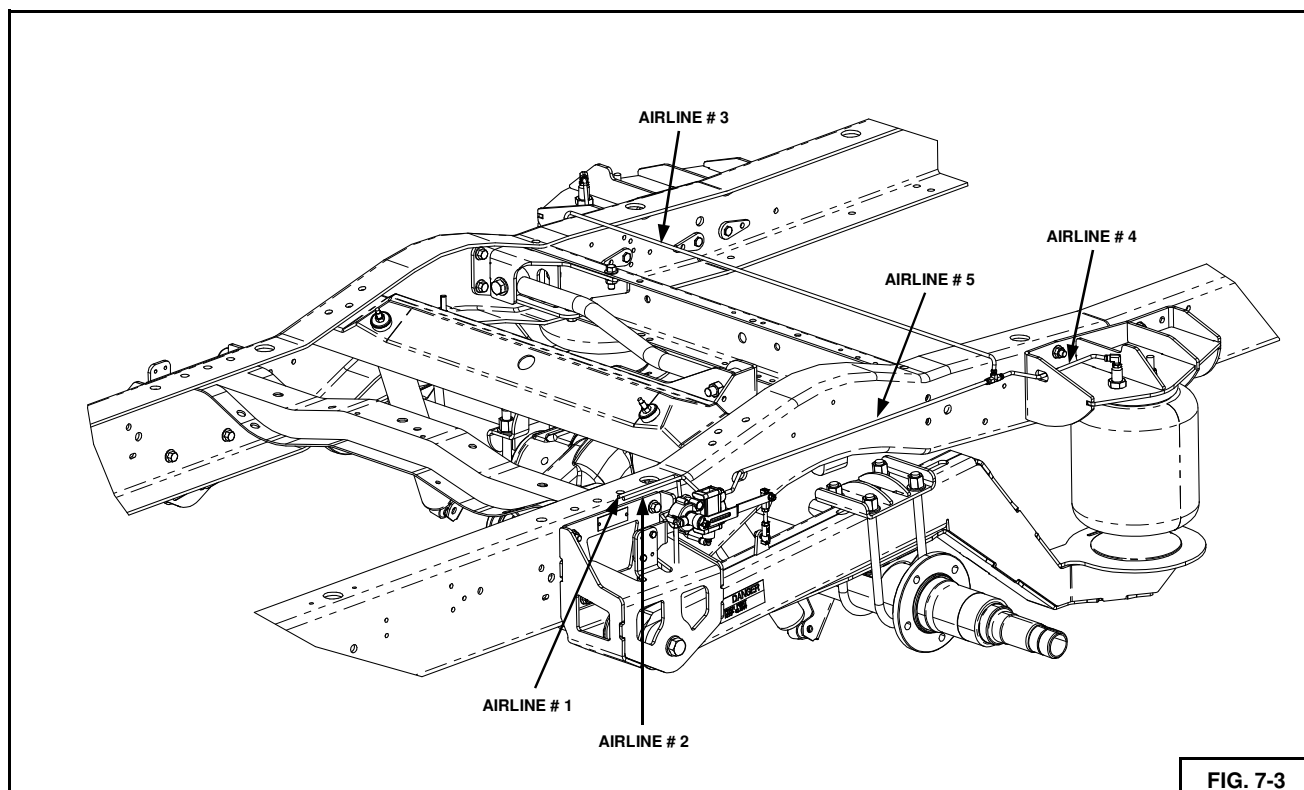
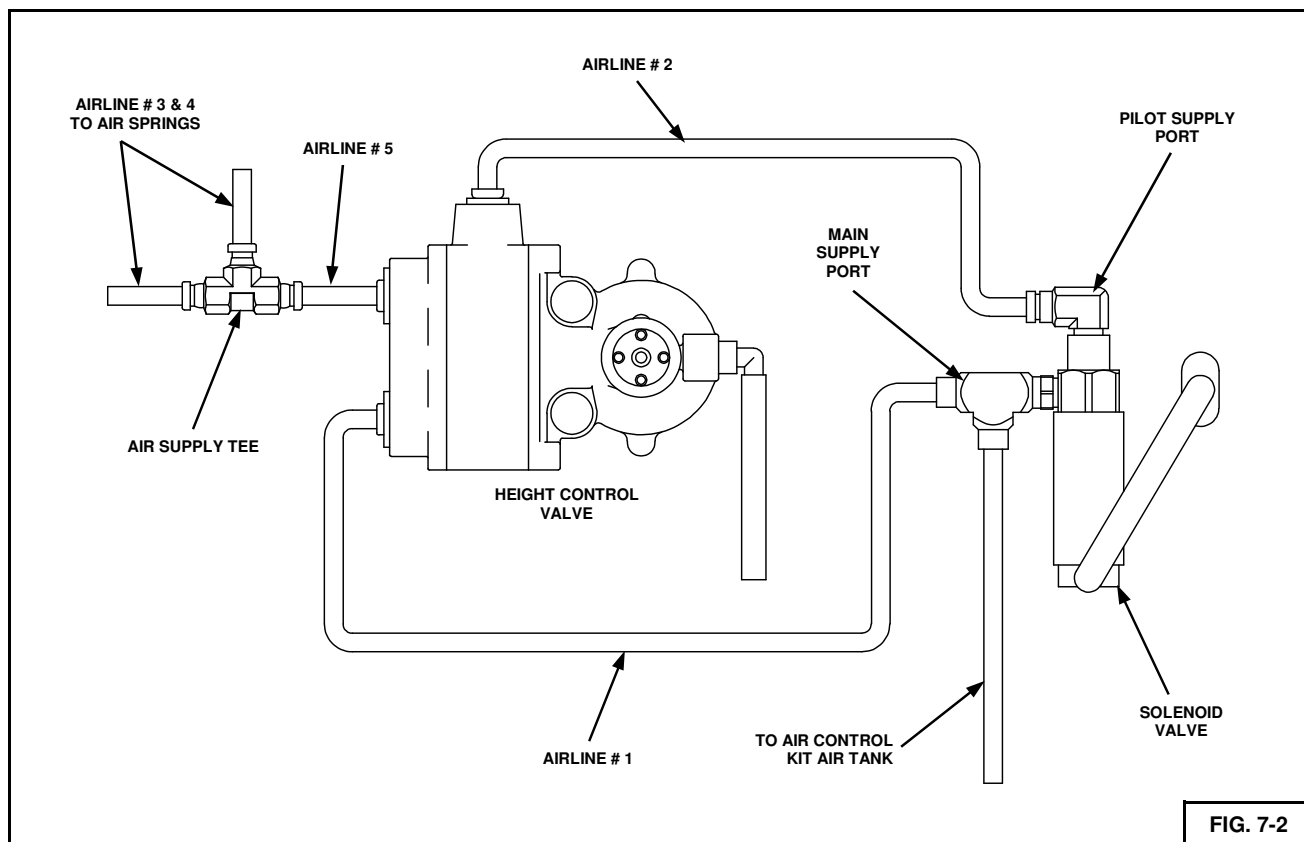
**If installing on the inside of the frame on the driver's side, and the chassis contains the fuel recovery canisters, refer to Section 9 for additional information.**



1. Mount the Air Control Box to the side of the frame. Frame holes may need to be drilled to mount the air system. Use (4) 5/16 X 1 3/4 UNF FLANGE BOLTS and (4) 5/16 UNF TOPLOCK FLANGE NUTS to fasten the Air Control Box to the frame, placing the rubber isolators between the box and frame. (See Table 11-1 for appropriate Torque). Do not tighten the fasteners so tight that back of the Air Control Box contacts any bolts protruding from the frame. See Figure 7-3 for details.
2. Route the (6) airlines as shown in Figures 7-1, 7-2, and 7-3.
  - 2.1. Route AIRLINE 1 from the supply port of the Height Control Valve to the lower outlet port of the Air Reservoir Solenoid.
  - 2.2. Route AIRLINE 2 from the bottom Elbow in the Height Control Valve to the Elbow in the Air Reservoir Solenoid.
  - 2.3. Route AIRLINE 5 from the "DEL" port of the of the Height Control Valve to the Union Tee supplying the Air Springs.
  - 2.4. Route AIRLINES 3 & 4 from the Union Tee to the Air Springs.
3. Place supplied corrugated loom onto all airlines. Use supplied cable ties and airline clips to secure airline and to keep it away from all hazardous objects. See Figure 7-3 for details



# AIR CONTROL KIT AIR CONTROL SCHEMATIC



## 8. ELECTRICAL SYSTEM



**CAUTION!** All wiring should be routed and secured neatly to avoid any functional or visual issues. Under hood and under-body wire routings should be clear of sharp edges (3/4 inches minimum) and direct sources of heat (4 inches minimum). Wiring located in the passenger compartment should be routed away from high temperature areas over the muffler. Wiring should not be routed through wheel well areas where it may be damaged by tire or road debris, and it should not be routed over the exhaust system. Wiring should not contact the brake lines or fuel lines. Disconnect the battery cables before servicing any electrical components.

1. Refer to **AIR CONTROL SYSTEM INSTALLATION INSTRUCTIONS** for further details on electrical system installation and parts list.

## 9. EXHAUST INSTALLATION & FUEL RECOVERY OPTION

1. Parts and exact modifications to the exhaust system are not supplied with this system. One exhaust modification is documented in these instructions, your modification may be different than depicted due to your application or other factors. In all circumstances, the exhaust must clear the air spring by at least 4 inches.
2. Cut the remaining exhaust portion (saved from Section 1) after the reversing bend. (Fig. 9-1)
3. Install a length of exhaust to extend the tailpipe back approximately 12 inches.
4. Re-attach the remaining portion of the exhaust to the extension.
5. Attach the new exhaust section to the chassis exhaust (Fig. 9-2), such that it will have the appropriate clearance around the air spring and the fuel tank. The OE exhaust hanger may need to be modified to re-attach to the modified exhaust (i.e. reverse the holding bracket, see Fig. 9-3).



FIG. 9-1

6. If the chassis is equipped with fuel recovery canisters located on the inside of the frame rail, driver's side, they may need to be relocated if they interfere with the position of the air control system.
7. One option provided by Link Mfg. is to mount the forward canister to a relocation bracket (Part number 800M0080), and then reroute the hoses and electrical lines such that they are clear of any moving object, will not get pinched, and will not interfere with the drivetrain. See Figures 9-4, 9-5.



FIG. 9-2



FIG. 9-3

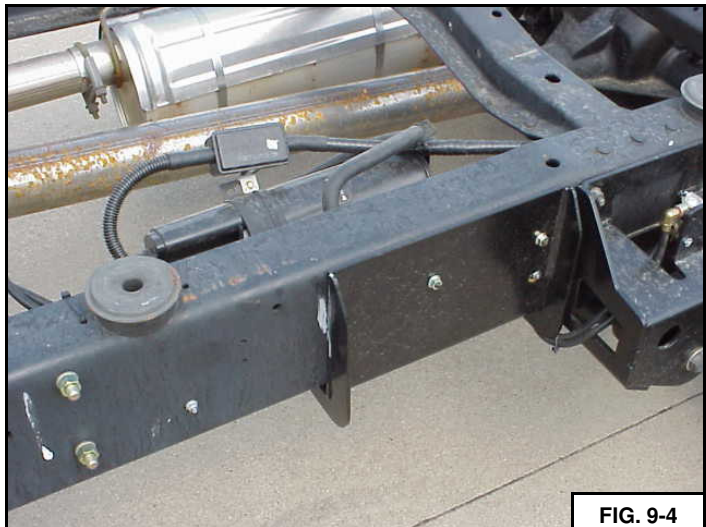


FIG. 9-4

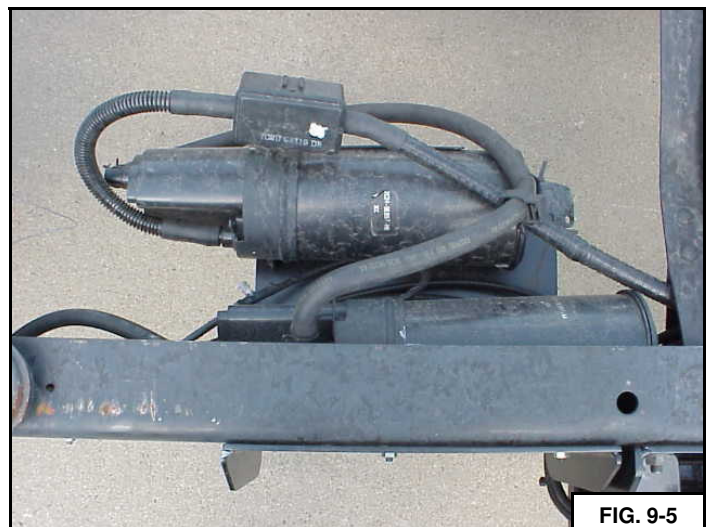




FIG. 9-5

# 10. FINAL INSPECTION & OPERATION

1. Recheck all fasteners for specified torque.
2. Double check all electrical connections and wire routings.
3. Remove all jacks and air system up by either using the fill valve on the air tank or by starting the vehicle and switching the compressor switch to "ON". Note: the maximum allowable pressure in the air tank is 120 psi. It is recommended to fill the air tank using the supplied schraeder valve so that the compressors are not taxed too much by running for a long period of time.
4. Check for proper operation of the height control valves. With one end of the valve linkage disconnected rotate the valve arm down 45°, air should exhaust from the air springs. Rotating the valve arm up 45° should cause the valve to fill the air springs.
5. Measure the "Design Height" of the air springs. The height should be as shown in Figure 10-1, and ***measured at the middle of the air spring***. To adjust the design height (see Figure 10-2) disconnect one end of the valve linkage and adjust accordingly. Turn the plastic ball end joint to change the length of the linkage (increasing the length will increase the Design Height, and vise-versa). Tighten the lock nuts on the valve linkage when complete. See Figure 7-1. **Set the design height by the following sequence:** 1) deflate the passenger side air bag by disconnecting the linkage from the arm, 2) with the driver side linkage connected, measure the design height and adjust accordingly by the methods mentioned above, 3) once the design height is set for the driver side, repeat the same steps for the passenger side, including deflating the driver side air bag. Once the design height is set, reconnect the linkages. Jostle the suspension up and down and then allow it to come back to design height. Recheck the initial measurement and adjust if needed. **Note: this procedure to set design height can be done when empty or under light load.**
-  6. Center the lateral (side to side) location of the axle by adjusting the location of the axle bracket as necessary, moving it on the axle. Tighten the axle bracket u-bolts to lock it in place. (See Table 11-1 for appropriate Torque).
7. Recheck the air spring design height and repeat step 5 if the design height must be adjusted.
-  8. Torque all bushing pivot bolts at this time. Torque the (2) front hangar busing bolts & the (2) lateral control rod bushing bolts. (See Table 11-1 for appropriate Torque).
9. Move the suspension throughout its entire range of motion, by inflating and deflating the air springs to achieve full travel. Check for any interferences with the lateral control rod, axle, shocks, exhaust, frame, brake lines (**especially on the driver side**), fuel lines, etc. Reconnect the valve linkage to the lever. **Note: if contacting the brake lines, hand caulk the line to make clearance at least 1/4".**
10. **IMPORTANT!** Check all fittings and airlines for air leaks.
11. Reinstall the chassis body (if applicable).
12. **IMPORTANT!** During servicing check tightness of all fasteners and for any air system leaks. Immediate corrective action should be taken if malfunctions occur.

13. After all final checks are complete, it is recommended to complete a full four-wheel alignment and drive line angle check. The pages following the installation instructions describe the proper method for checking driveline angles. Note: improper driveline angles may have a detrimental effect on ride, u-joints, and transmission. If any driveline vibration (or out of spec. angle measurement) occurs, use factory axle seat shims to modify driveline angle.
14. If the suspension has the Kneeling Option, moving the switch "ON" to Dump will exhaust all air from the air springs and lower the rear of the vehicle approximately 3-4 inches. Air springs will inflate when the switch is returned to the "OFF" position. **WARNING: Do not drive the vehicle while the Dump Switch is on and the air springs are deflated.**
- ❑ The UltraRide Chassis Air Suspension is fully automatic in controlling the height of the chassis. No manual intervention to control air pressure or ride height is needed during the course of operation.
  - ❑ The Compressor Switch must be on for the compressors to operate. During difficult starting circumstances, (i.e. extremely cold weather) it is recommended to turn the compressor switch off until the vehicle is running, so it will not draw current from the battery. The compressors are controlled by the pressure switch located in the Air Control Box. This switch automatically turns the compressors on when the tank pressure falls below 100 psi, and turns them off at 120 psi.
  - ❑ The Low Pressure Warning Light indicates a severe drop in tank pressure (below 60 psi). Immediate corrective action should be taken to determine the cause of air loss. Compressor switch should be turned off if Low Pressure Warning Light is on, and remains on even after the compressors have run for a normal period of time. **NOTE:** The Low Pressure Warning Light could come on briefly when the "Dump" feature is being used.
  - ❑ It is important to release any moisture contained within the air tank on a daily basis. This is done by pulling on the attached release cable for approximately 5 seconds. See Air Kit instructions for location of this cable. Not releasing the moisture on a regular basis will cause the drain valve to not operate properly.

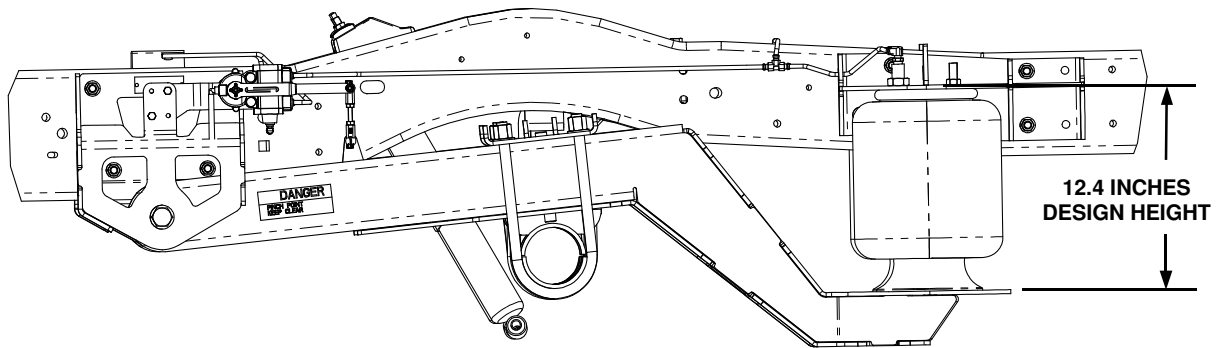
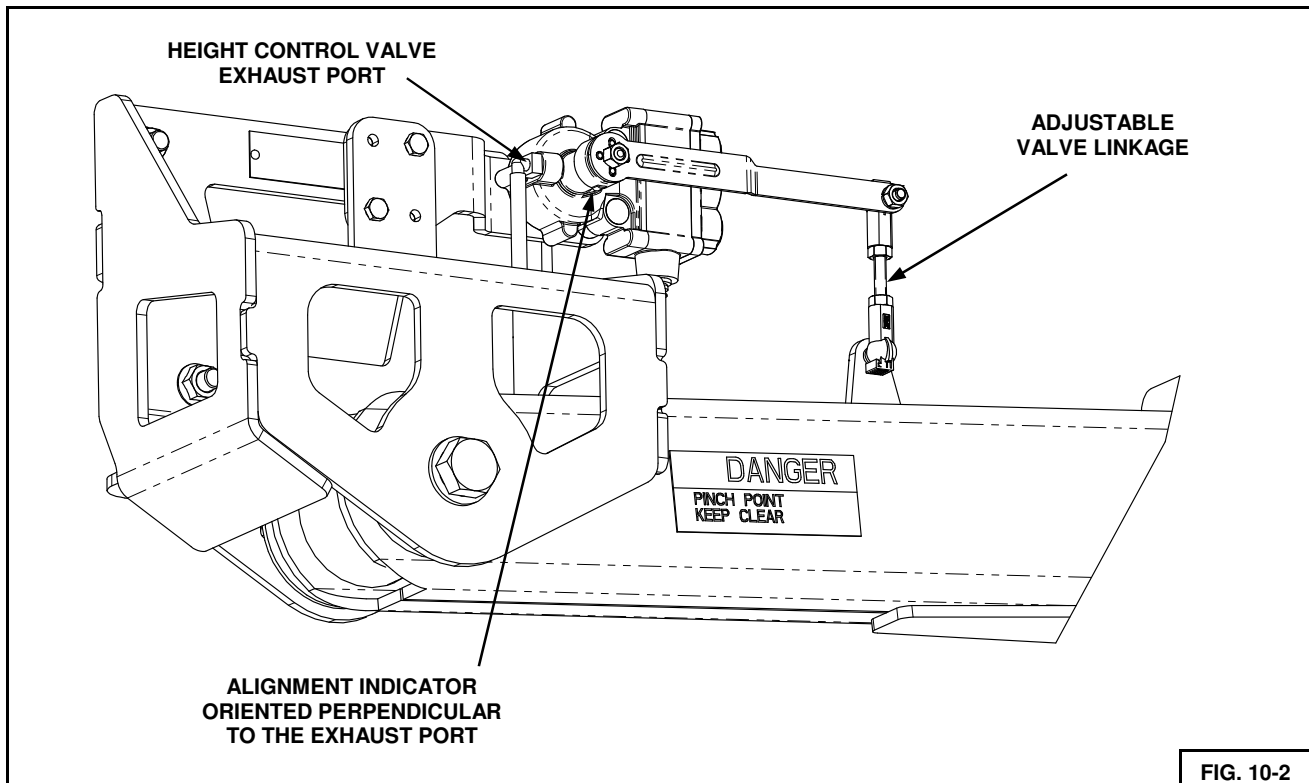


FIG. 10-1



## 11. SERVICE & MAINTENANCE

The UltraRide suspension needs no lubrication and little maintenance. The following components should be checked at the time the truck is being serviced. However, immediate corrective action should be taken if a serious malfunction occurs. See Exploded Assembly on following page for details.



**CAUTION!** If maintenance or service is to be done on the air system, be sure to drain **all** air from system. Serious injury could occur if components are removed while system is full of air.

**Note:** It is important to release any moisture contained within the air reservoir on a daily basis. This can be done by pulling on the cable attached to the drain valve. Not releasing the moisture on a regular basis will cause the drain valve to not operate properly, and may cause the valve to malfunction. Excess moisture in the system can also cause premature failure of other components including the tank itself.

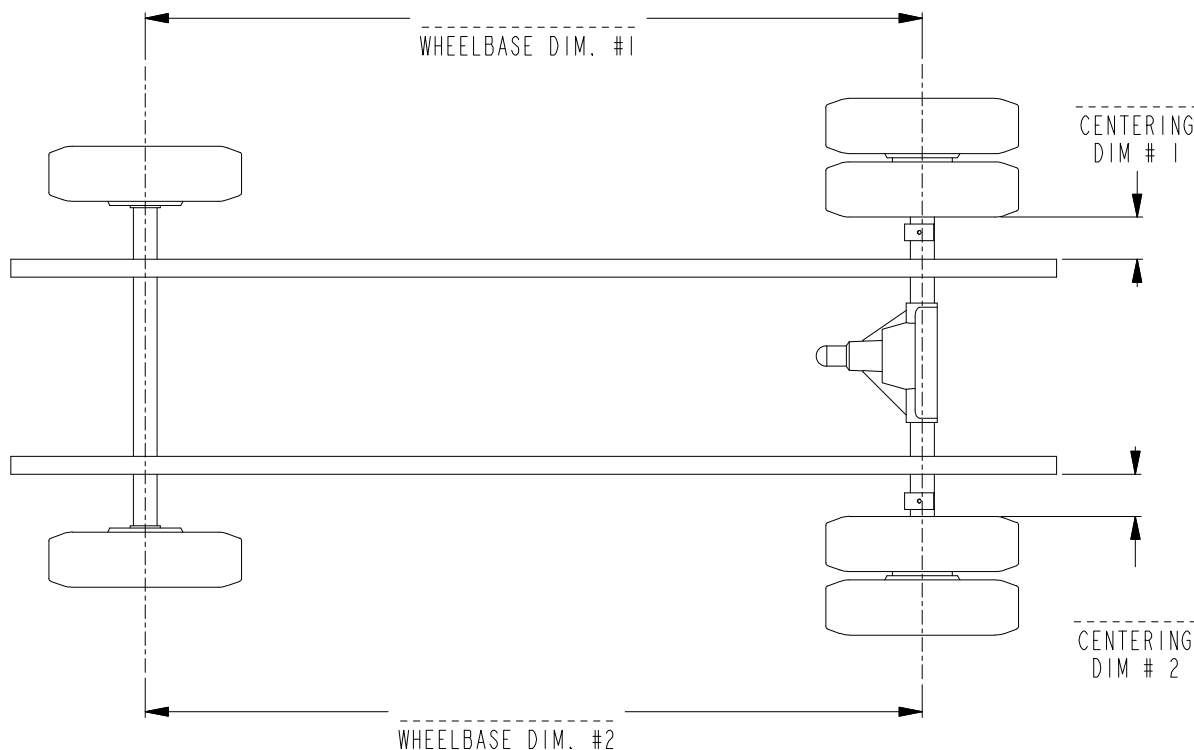
### **INSTALLATION & MAINTENANCE CHECK LIST**

- ☐ Check and document OE rear axle alignment
- ☐ Set Design Height to 11.0 inches
- ☐ Verify suspension function via dump and re-inflation
- ☐ Check for air leaks and system integrity
- ☐ Check clearances throughout suspension motion range
- ☐ Check driveline angle
- ☐ 4 wheel alignment
- ☐ After installation measure and record wheelbase and centering dims below.



## TORQUE TABLE (Table 11-1)

LOCATION	FASTENER	TORQUE
FRAME MOUNTED FRONT HANGER	7/16 UNC NUTS	65-70 FT-LBS
FRAME MOUNTED UPPER AIR SPRING BRACKET	7/16 UNC NUTS	65-70 FT-LBS
FRAME MOUNTED LATERAL CONTROL ROD BRACKET	7/16 UNC NUTS	65-70 FT-LBS
AXLE MOUNTED LATERAL CONTROL ROD BRACKET	5/8 UNF NUTS	185-235 FT-LBS
TRAILING ARM TO AXLE	5/8 UNF NUTS	200-220 FT-LBS
LATERAL CONTROL ROD	5/8 UNF NUTS	130-170 FT-LBS
AIR SPRING STUD	1/2 UNC JAM NUTS	30 FT-LBS
FRONT TRAILING ARM PIVOT BOLTS	3/4 UNF NUTS	300-320 FT-LBS
AIR CONTROL BOX	5/16 UNF NUTS	15-20 FT-LBS

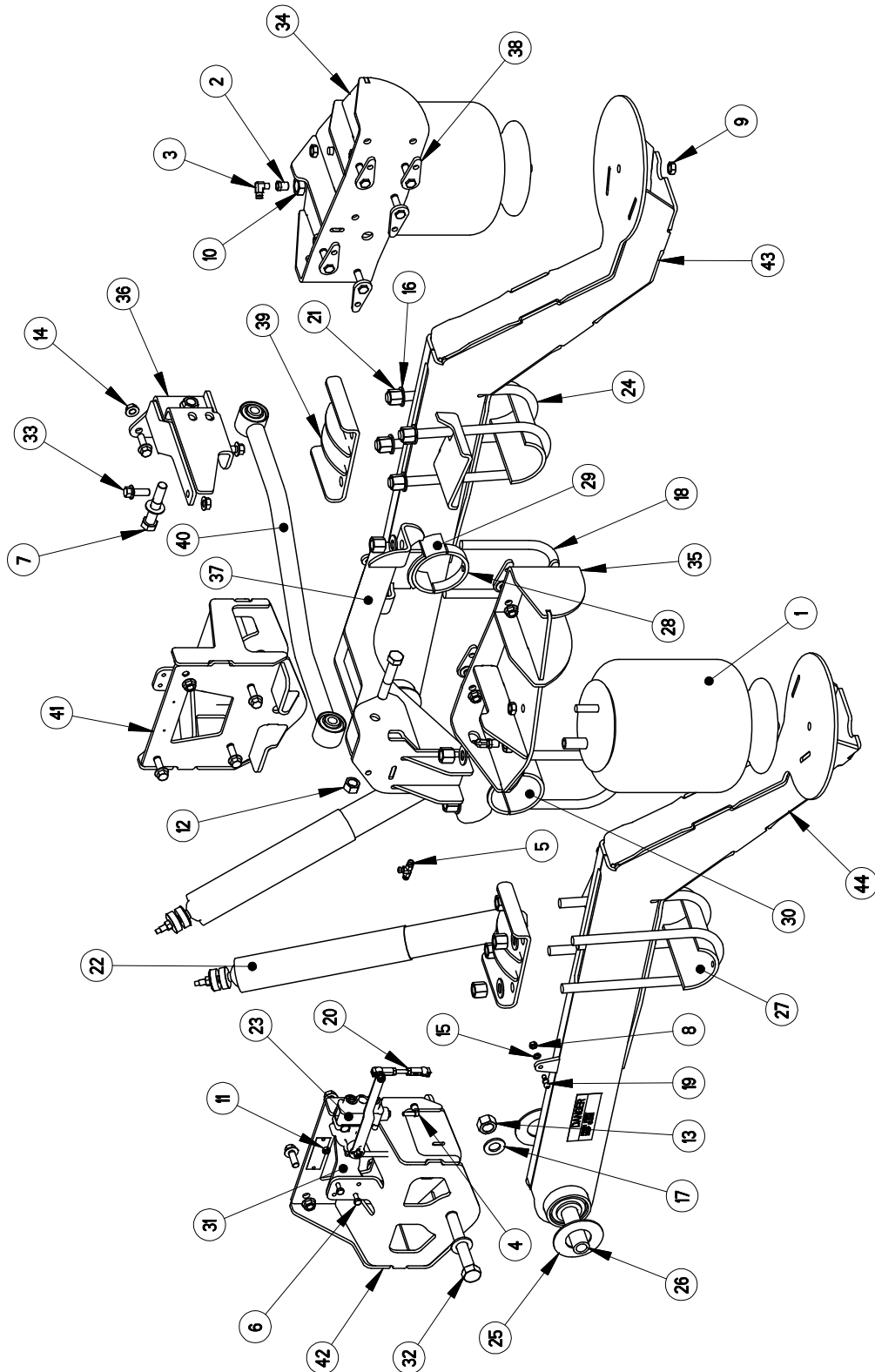


# ***UltraRide* – FORD E450**

## **PARTS LIST**

ITEM	PART NO.	DESCRIPTION	QTY
1	1103-0500	SPRING-AIR	2
2	1302-2014	REDUCER, 1/8 F-NPT 1/4 M-NPT	2
3	1302-5100	ELBOW, 1/4 TB 1/8 M-NPT, PUSH-IN DOT	2
4	1302-5499	ELBOW, 1/4 TB 1/4 PTC, PUSH-IN DOT	1
5	1302-5563	UNION TEE, 1/4 TB, PUSH-IN	1
6	1401-0806	1/4 X 3/4 UNC HEX CAP SCR (GR 5)	2
7	1403-2028	5/8 X 3 1/2 UNF HEX CAP SCR (GR 5)	2
8 *	1470-0800	1/4 UNC HEX NUT (GR B)	2
9	1474-1600	1/2 UNC HEX JAM NUT	4
10	1475-2402	3/4 UNF HEX JAM NUT, O&P	2
11	1476-0800	1/4 UNC HEX CTR LOCK NUT (GR B)	2
12	1477-2001	5/8 UNF HEX TOP LOCK NUT (GR C)	1
13	1477-2406	3/4 UNF HEX TOP LOCK NUT (GR C) O&P	2
14	1480-1404	7/16 UNC TOP LOCK FL NUT (GR G) O&P	22
15 *	1485-0800	1/4 LOCK WASHER	2
16	1488-2002	5/8 SAE HARDENED WASHER	13
17	1488-2402	3/4 SAE HARDENED WASHER	4
18	1495-0018	U-BOLT, 5/8 UNF, 4.094 X 7.00	2
19 *	1500-0224	BALL-PIVOT, THREADED	2
20	1500-0240	LINKAGE-VALVE, HEIGHT CONTROL (3.25)	1
21	1506-0016	5/8 UNF HEX HIGH NUT	12
22	12100508	SHOCK ABSORBER	2
23	13010062	VALVE-CONTROL, HEIGHT	1
24	14950025	U-BOLT, 5/8 UNF, 4.00 X 10.50	4
25	80000130	WASHER-WEAR	4
26	80000135	SPACER-TUBE	2
27	80000555	SPACER-AXLE TUBE, F250	2
28	80000968	SPACER-AXLE	1
29	80000969	SPACER-AXLE	1
30	80000970	SPACER-AXLE	2
31	80001171	BRACKET-ADAPATER, VALVE	1
32	140D-2456	3/4 X 7 UNF HEX CAP SCR (GR 8) O&P	2
33	141A-1410	7/16 X 1 1/4 UNC FLANGE BOLT (GRADE 8) O&P	12
34	800M0073	BRACKET-MOUNT, AIR SPRING	1
35	800M0074	BRACKET-MOUNT, AIR SPRING (LEFT)	1
36	800M0075	BRACKET-MOUNT, LCR	1
37	800M0076	BRACKET-MOUNT, LCR (AXLE)	1
38	800M0077	PLATE-NUT	10
39	800M0078	PLATE-MOUNT, ARM	2
40	800M0079	LATERAL CONTROL ROD	1
41	810M0022	BRACKET-HANGER	1
42	810M0023	BRACKET-HANGER	1
43	820M0009	ARM-TRAILING	1
44	820M0010	ARM-TRAILING	1
* - ITEM NOS. 8, 15 & 19 ARE ORDERED AS LINK MFG. KIT NO. 2991-0024			

# ***UltraRide* – FORD E450** **PARTS LIST**



## ***UltraRide* - TROUBLE SHOOTING GUIDE**

<b>COMPONENT</b>	<b>POSSIBLE PROBLEM</b>	<b>CORRECTIVE ACTION</b>
<b>Airlines</b>	Air leaks	Replace airline
<b>Fittings</b>	Air leaks	Remove fitting and apply fresh joint compound. Re-install fitting, but <b>Do Not Over tighten. Do not use Teflon tape.</b>
<b>Air Springs</b>	<b>A.</b> Improper height <b>B.</b> Air leakage	<b>A.</b> Adjust valve linkage to maintain proper air spring height. <b>B.</b> Replace air spring.
<b>Height Control Valve</b>	Air spring(s) will not inflate when weight is added to the chassis. <div style="text-align: center;"><b>OR</b></div> Air spring(s) will not deflate when weight is removed from the chassis.	<b>A.</b> Inspect valves to insure drive bearing notch is located correctly. The driver side valve notch on " <b>SUPPLY</b> " port side of valve, passenger side on " <b>SUSP</b> " port side. If not, loosen lever screw (but do not remove completely) and pull lever loose from drive bearing, rotate drive bearing until the drive bearing notch is in the correct position and re-secure lever by tightening lever screw. <b>See Fig. 11-3 &amp; 11-4 for orientation details</b> <b>B.</b> Replace valve.
<b>Shock Absorber</b>	Insufficient damping effect	Replace shocks
<b>Lateral Control Rod</b>	<b>A.</b> Loose nuts on lateral control rod bolts <b>B.</b> Worn bushings	<b>A.</b> Tighten securely. <b>B.</b> Replace lateral control rod.

# **FORD E450 OWNERS GUIDELINES**

The UltraRide suspension needs no lubrication and little maintenance. However, immediate corrective action should be taken if a serious malfunction occurs.



**CAUTION!** If maintenance or service is to be done on the air system, be sure to drain all air from the system. Serious injury could occur if components are removed while system is full of air.

## **PRODUCT OWNER RESPONSIBILITIES**

- ❑ Owner is solely responsible for pre-operation inspection, periodic inspections, maintenance, and use of the product as specified in the particular LINK MFG. instructions available by product model, except as provided in this warranty, and for maintenance of other vehicle components. Of particular importance is the re-torque of fasteners including axle u-bolts, torque rod bolts and track rod bolts. This re-torque must be performed within 90 days of the suspension being put in service.
- ❑ Owner is responsible for “down time” expenses, cargo damage, and all business costs and losses resulting from a warrantable failure.
- ❑ The UltraRide Chassis Air Suspension is fully automatic in controlling the height of the chassis. No manual intervention to control air pressure or ride height is needed during the course of operation.
- ❑ The Compressor Switch must be on for the compressors to operate. During difficult starting circumstances, (i.e. extremely cold weather) it is recommended to turn the compressor switch off until the vehicle is running, so it will not draw current from the battery. The compressors are controlled by the pressure switch located in the Air Control Box. This switch automatically turns the compressors on when the tank pressure falls below 100 psi, and turns them off at 120 psi.
- ❑ The Low Pressure Warning Light indicates a severe drop in tank pressure (below 60 psi). Immediate corrective action should be taken to determine the cause of air loss. Compressor switch should be turned off if Low Pressure Warning Light is on, and remains on even after the compressors have run for a normal period of time. **NOTE:** The Low Pressure Warning Light could come on briefly when the “Dump” feature is being used.
- ❑ It is important to release any moisture contained within the air tank on a daily basis. This is done by pulling on the attached release cable for approximately 5 seconds. See Air Control Kit Owners Manual for location of this cable. Not releasing the moisture on a regular basis will cause the drain valve to not operate properly.

## **CHECK AT EVERY VEHICLE SERVICE INTERVAL:**

- ❑ Check Design Height  $\pm 1/4$ ".
- ❑ Check for air leaks around fittings.

## **CHECK AFTER THE FIRST 1000 MILES:**

- ❑ Recheck & tighten any loose fasteners.
- ❑ Check for any loose or worn components.

## **CHECK AFTER EVERY 30,000 MILES:**

- ❑ Check arm pivot bushings and lateral control rod bushings for wear; replace if worn

## Next 3 pages taken from Ford MVE Ship Thru Guide.

### Guideline - Driveline Angles

After vehicle build is complete, the driveline angles must meet the following "rules", both at unloaded, and fully-loaded, vehicle attitudes.

Rule #1: The NET OPERATING ANGLE, at any individual joint, must be at least 1/2 degree, and not to exceed 3 degrees. The net operating angle at any individual joint on an F Super Duty (F250, F350, F450, or F550) must not exceed 4 degrees. The preferred maximum angle is 2 degrees.

The NET OPERATING ANGLE (e) at any one joint is the combination of the joint angles in both the side view and the plan (top) view. This NET OPERATING ANGLE (e) equals:

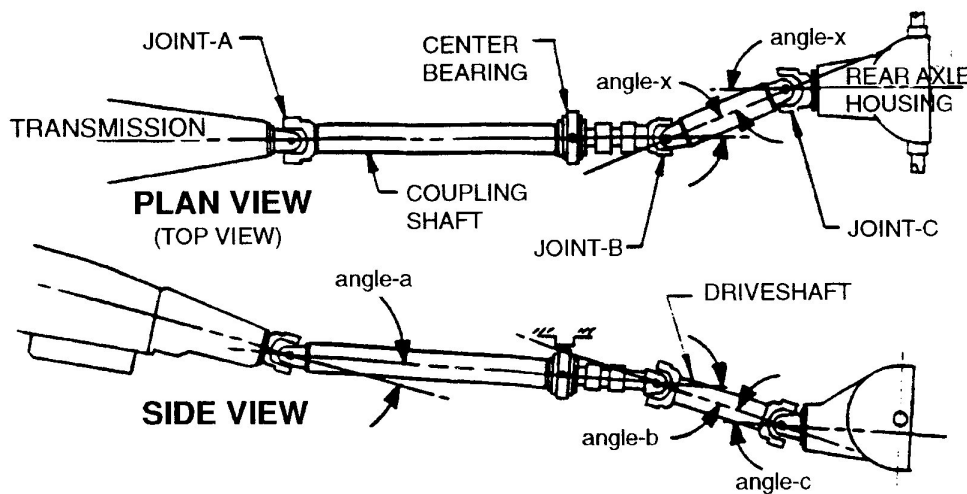
By example, using Figure 1:  
The NET OPERATING ANGLE at **JOINT - A** = (ea) =

The NET OPERATING ANGLE at **JOINT - B** = (eb) =

The NET OPERATING ANGLE at **JOINT - C** = (ec) =

$$\begin{array}{l}
 \left[ \begin{array}{c} \text{Plan View} \\ \text{Angle} \end{array} \right]^2 + \left[ \begin{array}{c} \text{Side View} \\ \text{Angle} \end{array} \right]^2 \\
 \hline
 (0)^2 + (\text{angle} - a)^2 \quad \geq 0.5^\circ \quad \leq 3.0^\circ \text{ or } \leq 4.0^\circ \\
 \hline
 (\text{angle} - x)^2 + (\text{angle} - b)^2 \quad \geq 0.5^\circ \quad \leq 3.0^\circ \text{ or } \leq 4.0^\circ \\
 \hline
 (\text{angle} - x)^2 + (\text{angle} - c)^2 \quad \geq 0.5^\circ \quad \leq 3.0^\circ \text{ or } \leq 4.0^\circ
 \end{array}$$

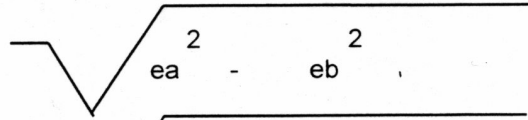
**Fig. 1**



## Guideline - Driveline Angles (Continued)

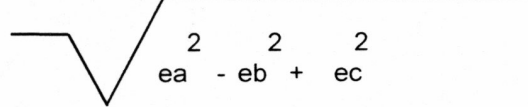
Rule #2: The combination of NET OPERATING ANGLES, throughout the whole driveline, **must** "cancel". It is preferred that the NET OPERATING ANGLES at either end of a shaft be within 1 degree of each other. However, at a minimum, the following formulas must be satisfied for sufficient "cancellation" to occur:

For a 1-shaft driveline:  
(2 - joint)



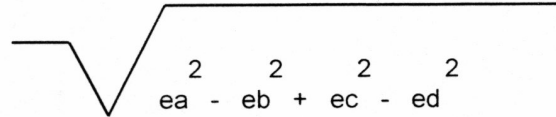
$$\leq 3.0^\circ \text{ or } \leq 4.0^\circ$$

For a 2-shaft driveline:  
(3-joint)  
(as exemplified in Figure-1)



$$\leq 3.0^\circ \text{ or } \leq 4.0^\circ$$

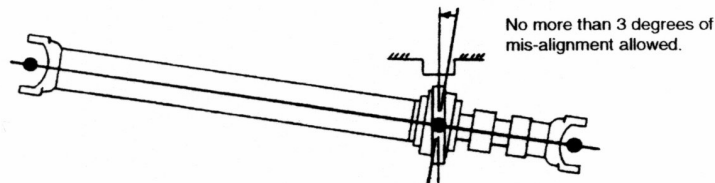
For a 3-shaft driveline:  
(4-joint)



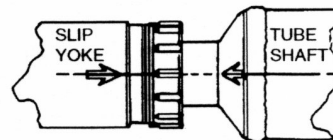
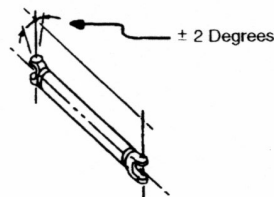
$$\leq 3.0^\circ \text{ or } \leq 4.0^\circ$$

Rule #3: The center bearing mounting bracket, surrounding the rubber insulator, must be **90 ± 3 degrees** to the center bearing. In other words, no more than 3 degrees of mis-alignment can be absorbed by the rubber surrounding the center bearing. See Figure 2.

**Fig. 2**



- A. Ensure that u-joints are in-line to within ± 2 degrees.
- B. Ensure matching alignment arrows between slip yoke and tube shaft



Observe alignment arrows stamped on parts. If there are no alignment marks, then add them before disassembly to ensure proper phasing alignment of shaft and yoke.

## GUIDELINE - DRIVELINE COMPONENT PHASING

**MINIMUM UNIVERSAL JOINT OPERATING ANGLE:**

A slight angle is required to prevent universal joints from brinelling. Therefore, a minimum operating angle of ½ degree is required.

**MAXIMUM UNIVERSAL JOINT OPERATING ANGLE:**

Universal joint operating angles can be quite high, sometimes as high as 12 degrees. But to get a vehicle to operate successfully above 3 degrees often requires larger universal joints, double cardan or constant velocity joints, or restrictions on operating speed. A reduction in universal joint life becomes noticeable when they are operated at more than 3 degrees if precautions are not taken. That having been stated, the F Super Duty series of trucks (F250, F350, F450, and F550) can tolerate angles up to 4 degrees. However, maximum angles of 2 degrees are preferable for all vehicles.

Two shafts connected with a single cardan joint and turning at a constant speed with no joint angle, have no angular acceleration that could cause a vibration. When there is an angle between them and the input shaft is turning at a constant speed, the driven shaft is forced to continuously accelerate and decelerate, twice per revolution, creating a vibration. If the speed changes are small, the vibration is not objectionable. The guidelines in this appendix limit driveline angular acceleration to a maximum of 400 radians per second per second. This is the requirement for all Ford light trucks. (SAE specifies 500.) Some modified drivelines have been measured at over 11,000 radians per second per second causing driveline failures at very low mileage.

**DRIVELINE ANGLE MEASUREMENT:**

Driveline angle measurements should be made with the vehicle supported by the tires and resting on a level surface. Avoid hoisting a vehicle by the frame since this will distort the chassis enough to make any measurements inaccurate.

**MATCH MOUNTING DRIVESHAFTS TO THE REAR AXLE:**

Runout is measured on OEM rear axle input shafts and the maximum measurement is marked with a yellow dot on the yoke or pilot bearing flange. The OEM driveshafts are also marked with a yellow dot on the "light" side. When the parts are assembled, the marks are aligned to aid the overall system balance. Vehicle modifiers should look for these dots and maintain this match when the drivetrain is reassembled after modification. Remanufactured or modified driveshafts should also have their "light" sides matched to the yellow dot.

**DRIVELINE VIBRATION DAMPERS:**

Driveline vibration dampers are sometimes added to driveshafts or axles to reduce noise, vibration, and harshness (NVH). If the chassis has these devices when it is received, they should be retained on the modified chassis.

**USE OF DOUBLE CARDAN UNIVERSAL JOINTS FOR GREATER DRIVE ANGLES:**

In general, the use of these joints can allow increased drive angles up to as much as 8 degrees. However, when used at the rear of a coupling shaft a double cardan universal joint will prevent cancellation from occurring at the forward end of the shaft. Therefore the single cardan joint must still be maintained at less than 3 degrees (or 4 degrees for the F Super Duty series).

**GENERAL COMMENTS:**

It is good practice, for any chassis that will have a driveline modification, to measure and record the driveline angles in each of the following conditions for later comparison.

- a. The chassis as first received from Ford (note that the drive angles may not conform exactly to this bulletin in this incomplete condition).
- b. The completed vehicle, unloaded.
- c. The completed vehicle loaded to GVWR with maximum front GAWR.
- d. The completed vehicle loaded to GVWR with maximum rear GAWR.