
**INSTALLATION OF A CENTRE
MOUNTED FUEL TANK IN THE GM
1500 SERIES PICKUP TRUCK**

Prepared for: Dr. Ken Digges
Automotive Safety
Research Institute

Author: Ed Fournier
Jim Kot

Date: August 19, 2003

Report No. : R01-21c

1. GENERAL

The installation instruction contained herein apply specifically to the developmental centre-mounted retrofit fuel tank system for GM 1500 ½ ton pickup trucks. A complete parts list for the system is contained in Appendix A.

A review of the feasibility of installing the centre mounted tank system in other models of the pickup truck, such as four wheel drive and extended cabs, is summarized in Section 5.

The retrofit tank system was designed and tested under contract with the Automotive Safety Research Institute. The results of the testing are available through their WEB site : www.autosafety.org.

The removal of the existing tank and the installation of a specially fabricated tank in the vehicle centre between the frame rails are most easily performed by first removing the truck box. Many of the figures presented in the following instructions were photographed with the truck box removed. However, if it is not practical to remove the box, the procedures described may still be followed.

2. REMOVAL OF THE EXISTING TANK

Warning: Always use protective eyewear when working under a vehicle.

Warning: Gasoline is extremely flammable. Always work in a well ventilated area, free of all possible sources of ignition, such as, open flame, cigarettes, sparks or natural gas appliances with pilot lights.

- 2.1 Empty the existing fuel tank of as much fuel as possible. This may be accomplished by siphoning the tank or by driving the truck until nearly empty.
- 2.2 Disconnect the negative battery terminal.
- 2.3 Support the truck on jack stands.

Warning: Always securely support a vehicle before working underneath of it. Never rely on a jack to support a vehicle.

- 2.4 Open the fuel door and remove the cap. Unscrew the bolts from the filler neck and side panel of the box (see Figure 1). Reinstall the cap.

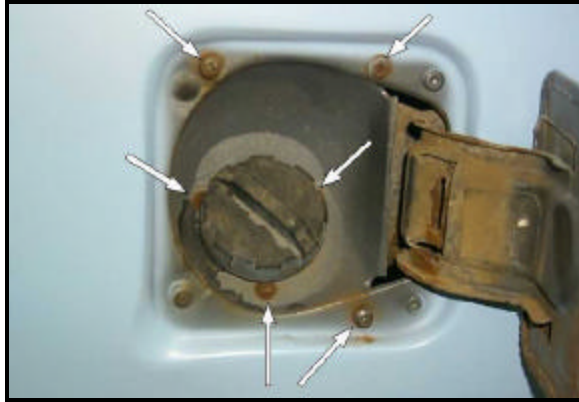


Figure 1: Removal of filler neck.

- 2.5 Disconnect the ground strap that connects the filler neck to the vehicle frame.
- 2.6 Repeat steps 2.4 and 2.5 for a dual tank system.
- 2.7 If the truck box is to be removed, do so at this time by removing the eight carriage bolts that secure the box to the frame rails.
- 2.8 If equipped, remove the plastic fuel tank shield.
- 2.9 For trucks with dual tanks, remove the cover from the switching valve.
- 2.10 Support the tank using a transmission jack or similar.
- 2.11 With the tank supported, unbolt the tank brackets from the frame rail. The bolts for the rear tank bracket are shown in Figure 2.



Figure 2: Bolts attaching the rear tank brackets to the frame rail.

- 2.12 Lower the tank sufficiently to facilitate access to the electrical and fuel line connections on the top of the tank.

- 2.13 Disconnect the electrical connections to the tank. This includes the sending unit wire and the grounding wire and possibly the fuel pump connection on fuel injected models.
- 2.14 Cut the fuel supply, return and vent hoses. Cap the cut ends of the fuel lines at the tank and at the truck to prevent spillage.
- 2.15 Lower the tank to remove it from the vehicle.
- 2.16 If the truck is equipped with two fuel tanks, remove the second following the steps described above.

3. *FUEL LINE*

Warning: Gasoline is extremely flammable. Always work in a well ventilated area, free of all possible sources of ignition, such as, open flame, cigarettes, sparks or natural gas appliances with pilot lights.

Note: For fuel injected trucks use high pressure hose clamps for all fuel line connections.

- 3.1 If the truck was equipped with dual side mounted tanks, remove the tank switching valve. This is accomplished by disconnecting the electrical connector, cutting the fuel hoses and unbolting the valve from the frame rail.
- 3.2 Inspect the remaining fuel lines for corrosion and replace as required. Use the existing steel fuel lines if possible and new fuel line hose at all junctions. New steel lines or fuel hose may be used. If replacement is necessary:
 - 3.2.1 For fuel injected systems, remove the metal fuel line back to the steel braided line. Relocate the fuel filter to the front of the transmission cross member, replace if required (see Figure 3). Connect 4 to 6 inches of steel fuel line to each side of the filter for ease of connecting fuel hoses. Install the new fuel line hoses and connect to the fuel filter.

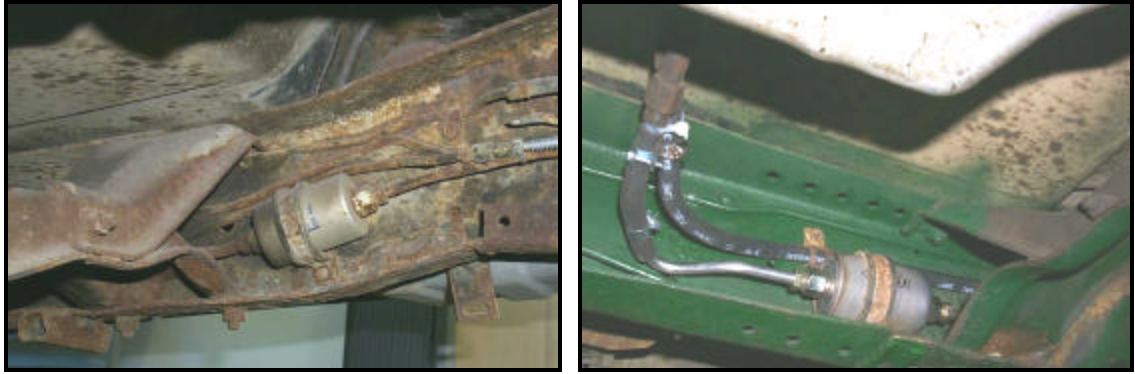


Figure 3: Relocation of the fuel filter.

3.2.2 For a non fuel injected system, replace the fuel lines with fuel line hose.

- 3.3 Route the fuel lines alongside the frame rail and then between the cab and the cab mount cross member (see Figure 4). Continue the lines approximately 16 inches past the cab mount cross member and loop the excess lines and tape to the under side of the box until the tank is installed.



Figure 4: Typical routing of the fuel lines.

- 3.4 Affix the fuel line hose along its length to the frame rail and cab mount cross member to ensure the hose is clear of the tank bracket mounting holes and is securely held in place.
- 3.5 Install the centre mounted tank as described in Section 4.
- 3.6 Connect the fuel lines to the tank sending unit. For fuel injected trucks ensure high pressure hose clamps are used.

4. INSTALLATION OF CENTRE MOUNTED TANK

- 4.1 If the box was not removed, remove the bed hold down bolt second from the front on the right side of the box. If the bolt is overly corroded it may be necessary to cut the bolt off. Replace the bolt with the 10 inch long bolt provided with the tank kit.
- 4.2 Install the sending unit into the tank. Note: the OEM sending unit from the original tank is not reused. A sending unit having a more positive attachment to the tank is used instead. Ensure that the sending units fuel strainer is orientation perpendicularly to the length of the tank so that it does not interfere with the fuel level float. Ensure the “O” ring is properly seated before tightening the clamping collar nuts. The installation of the sending unit is shown in Figure 5.

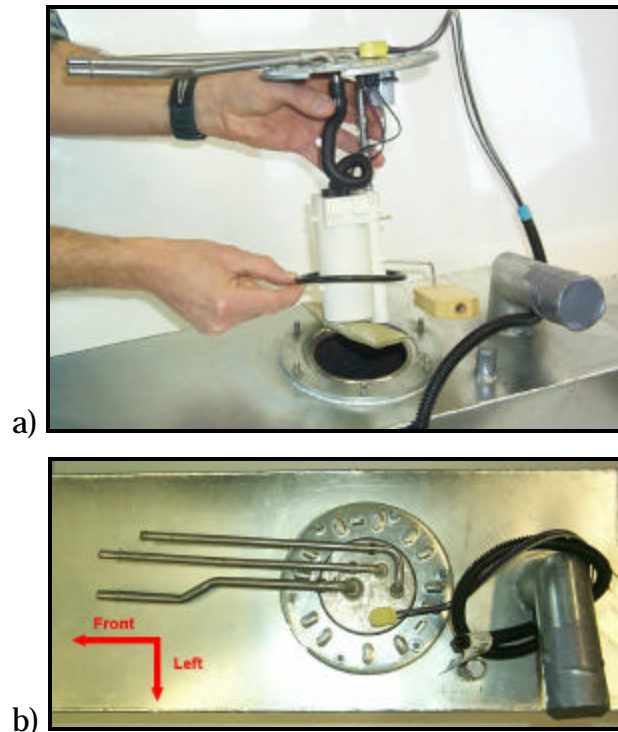


Figure 5: Installation of an after market sending unit.

- 4.3 Install the fuel filler tube and the vent line on the tank.
- 4.4 Place the front and centre tank strap on the tank in the general location of the tank bracket.

4.5 Raise the tank and support it in position along the inside of the right side frame rail. The tank should fit evenly between the cab mount cross member and the next rearward frame cross member.

4.6 Connect the fuel line, return line and the vent line to the sending unit.

Note: An exploded view of the tank assembly showing the relative positioning of the tank and brackets can be found in Appendix B. For steps 4.7 to 4.10 refer to Appendix B for both part positioning and fastening specifications.

4.7 Bolt the centre tank bracket to the frame rail using the rearmost set of holes that was used in the installation of the OEM tank bracket (see Figure 6).

4.8 Position the tank catch plate at the front end of the tank and bolt the front tank bracket to the frame rail using the foremost holes that were used in the installation of the OEM front tank bracket (see Figure 6 and Figure 7).



Figure 6: Centre and front tank brackets bolted to the frame rail.



Figure 7: Front bracket and tank catch.

Note: Two versions of the front bracket exist. The first is a “T” shaped bracket that attaches to a frame cross rail. This is the same as the front bracket demonstrated in the video tape of the centre tank installation. The “T” shaped

bracket has been replaced with a bracket similar to the mid bracket as shown in Figure 6.

4.9 Install the rear fuel tank strap and bolt in place (see Figure 8).



Figure 8: Rear tank strap (shown here with the truck box removed).

4.10 Secure the front and centre tank straps to the front and centre tank brackets.

4.11 Reinstall the truck box if it was removed for the tank installation.

4.12 Install the filler neck to the fuel hatch on the left side of the truck and connect the filler hose and vent line (see Figure 9).



Figure 9: Filler and vent hoses connected to filler neck.

- 4.13 Reconnect the tank sending unit's electrical connections. This is accomplished by removing the connector that is on the vehicle harness and splicing the wires directly to the sending unit wires. The three wires from the sending unit are coded as follows: black for ground, purple for the fuel level and grey for the fuel pump on fuel injected vehicles.
- 4.14 Connect the filler neck grounding wire and the tank ground wire to chassis ground.
- 4.15 Check that all fuel line hose clamps and tank brackets are tight.
- 4.16 The final step in the centre tank installation is to install a fuel line shield. The shield is bolted to the frame rail opposite the transmission. Align the holes in the shield with those in the frame and then bolt in place (see Figure 10).

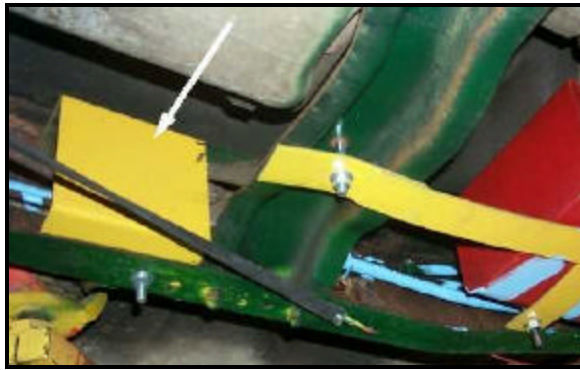


Figure 10: Fuel line cover. (Note: the old style front tank mounting bracket is shown in this photograph).

5. CONSIDERATIONS FOR TANK INSTALLATION

The centre mounted tank has been developed primarily around the General Motors two wheel drive, 1500 series pickup truck (model years 1985 to 1987) but it has also been installed in a four wheel drive version of the truck. A review of various models of the GM pickup truck was conducted to ascertain if the centre tank may be installed in other versions of the truck. This summarized in Table 1.

Table 1: Feasibility of installing the centre mounted tank in various models of the GM pickup truck

No	Truck Description	
1	Standard box, 2x2, 1500	Standard tank ^A . The centre tank was designed around this model of pickup. All the systems components can be installed without modification.
2	Standard box, 4x4, 1500	The standard tank is shortened at the front by 6 inches and increased in the rear by 1.5 inches. Additionally, a cut-out is provided to clear a stiffening gusset on the cab mount cross member.
3	Standard box, 2x2, 2500	The standard tank should fit.
4	Crew cab, 2x2, 2500	
5	Short box, 2x2, 1500	Neither the standard tank nor the modified tank of truck type 2 would fit in these shortened box pickup trucks. They are too long.
6	Short box, 4x4, 1500	
7	Short box, 2x2, 2500	
8	Short box, 4x4, 2500	
9	Step side short, 1500	
10	Dually 2 door	
11	Standard box, 4x4, 2500	The modified tank of truck type 2 is required.
12	Crew cab, 4x4, 2500	
13	Dually 4 door, 4x4,	
Note: A- The tank installed in this truck is considered the "standard" centre tank. Any alterations to the standard are noted in this table.		

The centre tank is installed on the passenger side of the truck in the empty space between the frame rail and the drive shaft. This area is available for use on ½ ton, ¾ ton and 1 ton trucks which were originally equipped with a single exhaust that is routed on the left side of the truck. However, diesel trucks were equipped with a dual exhaust which occupies the space required by the centre tank system. Additionally, a review of the various models, indicated that some after market dual exhaust system may occupy the space required on the ½ ton, ¾ ton and 1 ton trucks. If the centre tank is to be installed in these trucks, the exhaust system must be relocated.

APPENDIX A : Parts List

The major components of the centre mounted tank system are shown in Figure 11 with a complete parts list provided in the subsequent table.



Figure 11: Centre mounted tank system components (note: parts may not be exactly as shown).

Table 2: Parts list for the developmental centre mounted tank system.

Item Number	Part Number	Part Name	Quantity
1	078-030B	Gas Tank	1
1	25028949	Sending Unit	1
2	25163463	Fuel Pump 4.3 L (fuel injected)	1
3	25163464	Fuel Pump 5.7 L (fuel injected)	1
4	10135426	Seal and Clamp	1
5		M6x1 zinc plate nut	6
6		6mm zinc plated washer	6
7		SAE30R7 rubber hose: 5/16" dia.	19" long
8	078-037	5/16" dia. Fuel Pipe (carbureted)	1.10" long
9	078-036	Filter coupler (carbureted)	
10	078-002B	Middle Bracket	1
11	078-007	Rear Bracket Support -02	1
12	078-009	Rear Bracket Support -04	1
13	078-006C	Rear Bracket Strap	1
14	FT-9	3/8" -16 x 1-1/2" Bolt	6
15	Grade 5	1/2"-13 X 10" long Bolt	1
16	155-225	1/2 X 13 Nut	1
17	656-005	1/2" Washer	1
18	663-085	1/2" Lock Washer	1
19	078-003	Middle Bracket Strap	1
20	078-013	Front Bracket Strap	1
21	078-022B	Front Bracket	1
22	078-021B	Forward Catch Plate	1
23	326-359	3/8"-16 x 3-1/2" Bolt	8
24	155-028	3/8"-16 Nut	16
25	656-004	3/8" Washer	16
26	663-084	3/8" Lock Washer	16
27	078-010	Fuel Line Shield	1
28	14027472	Retaining Washer	1
29	14071921	Filler Neck	1
30	22591476	Filler Cap	1
31	DAY76175	Filler Hose 1.75" X 48"	1
32	1-1/2X1COPCRLG	Filler Hose Adapter 1.75" to 1.25"	1

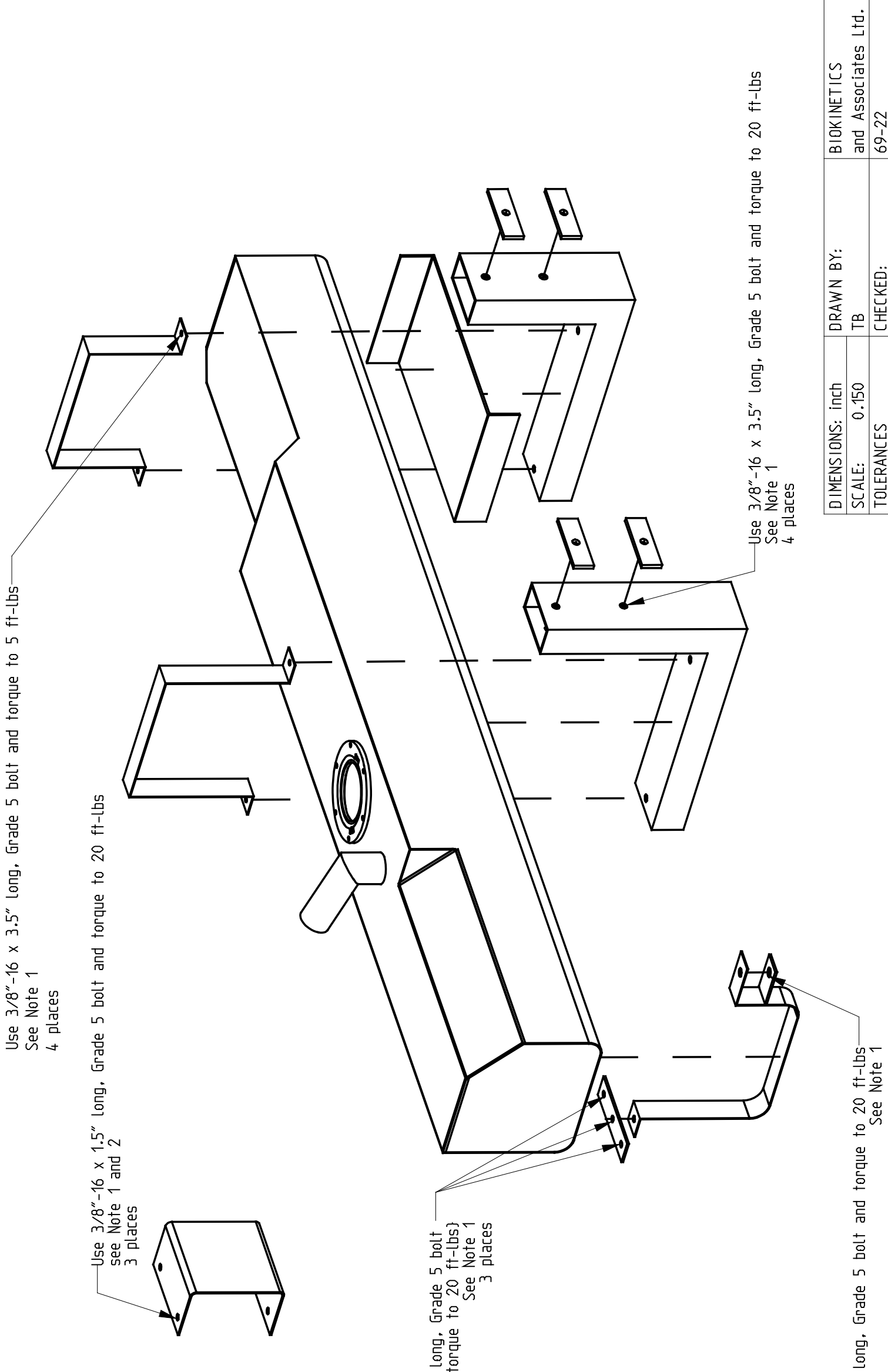
(The parts list is continued on the next page.)

(Parts list continued.)

Item Number	Part Number	Part Name	Quantity
33	DAY71288	1-1/4" Moulded Hose	1
34	REG93037	5/8" Vent Hose	4.5'
35	TYPE M COP	1/2" copper tubing	4"
36	14036751	Vent Hose	1
37	BRQ62006	70 mm Clamp	2
38	BRQ62008	44 mm Clamp	2
39	TRIDHAS20	32 mm Clamp	4
40	508-824	Self Taping Sheet Metal Screws	7
41	DAY80062	5/16" Fuel hose	7'
42	DAY80063	3/8" Fuel hose	7'
43	DAY80058	1/4" Fuel hose	7'
44	BRQ3504	1/4" Clamp	2
45	BRQ3506	3/8" Clamp	4
46	078-040	Distribution Plate	4
47	078-041	Assembly (exploded)	-

APPENDIX B : Exploded view of tank and brackets.

REV.	DESCRIPTION	DATE	APP.
A	FIRST RELEASE	2003/4/21	



DIMENSIONS: inch	DRAWN BY:	BIOKINETICS
SCALE: 0.150	TB	and Associates Ltd.
TOLERANCES	CHECKED:	69-22
DEC. .X± 0.1	DATE:	ASRI
DEC. .XX± 0.01	2003-04-22	ASSEM_TANK_AND_BRACKETS
DEC. .XXX±0.001	QTY 1	ASSEM
ANGLES° 0.5	MATERIAL:	FINISH
	n/a	n/a
	DO NOT SCALE DRAWING	DRAWING NO.
		078-041

- Notes:
- Please reference Table 2 of report #R01-21, titled "Installation of a Centre Mounted Fuel Tank in the GM 1500 Series Pickup Truck," for specifications of washers, lock washers and nuts.
 - Only three bolts are required for the installation of this part, the fourth hole is required for different engine sizes.