



LS-Pro[®] TMA

TRUCK MOUNTED ATTENUATOR

ASSEMBLY MANUAL

PN 115281

REVISION C FEBRUARY 2023

LS-Pro TMA

15601 Dallas Parkway
Suite 525
Addison, Texas 75001

This booklet is intended to supply useful data on the LS-Pro Truck Mounted Attenuator (TMA). Completely read and understand this entire manual prior to installing and/or operating the Valtir, Inc. TMA. Included in this manual are the following:

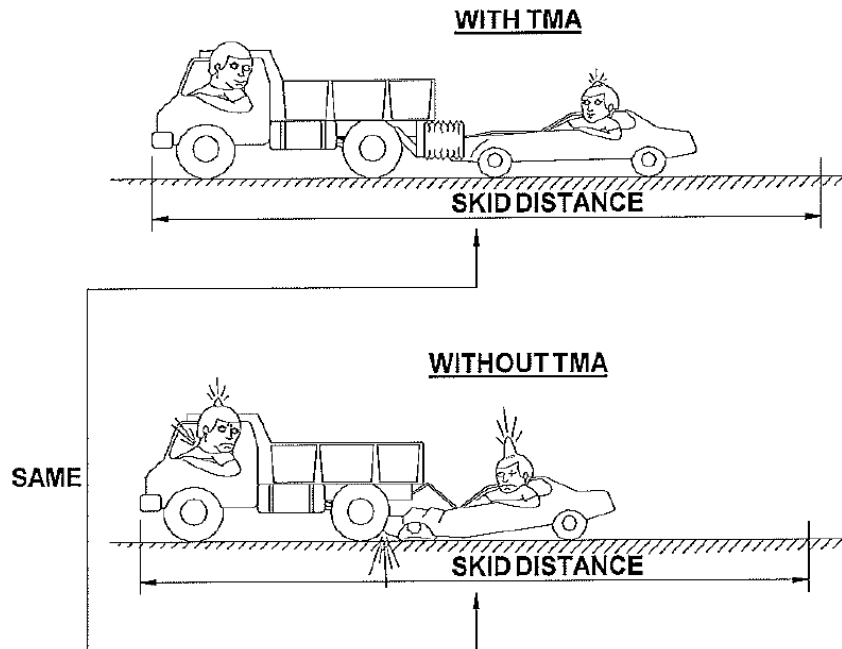
Safety Instructions.....	2
Installation Instructions, TMA 1000LC attachment.....	4
Attachment/Removal Instructions, TMA 1000LC Attachment.....	12
Installation Instructions, Receiver UnderrideAttachment.....	14
Attachment/Removal Instructions, Receiver UnderrideAttachment.....	17
Maintenance.....	19
Repair Instructions.....	20
Limitations and Warnings.....	22

If you need additional information or have any questions about the LS-Pro TMA, please call **Valtir Customer Service Department at 1-888-323 6374**.

Safety Instructions

- A. THE CARTRIDGE SHOULD BE RIGIDLY FASTENED TO THE TRUCK AND SHOULD BE 279 TO 330 mm [11" TO 13"] OFF THE GROUND AND LEVEL
- B. THE JACKS SHOULD NEVER BE EXTENDED WHILE THE UNIT IS ATTACHED TO THE TRUCK. (NOTE: THE REARMOST JACK WHEEL WILL PROJECT APPROXIMATELY 51mm [2"] BELOW CARTRIDGE WHEN RE-TRACTED). THE BACKUP JACKS SHOULD BE FULLY RETRACTED BEFORE ROTATING THE JACKS TO THE HORIZONTAL POSITION.
- C. MAKE SURE ALL 1" DIA PINS ARE IN POSITION AND RETAINING PINS ARE INSTALLED CORRECTLY.
- D. THE ALUMINUM CARTRIDGE IS SOFT ENOUGH TO SAFELY ABSORB A CRASH, YET STRONG ENOUGH TO SUPPORT ITS OWN WEIGHT. DO NOT DRAG THE CARTRIDGE OR PLACE HEAVY LOADS ON ITS TOP; DAMAGE MAY RESULT.
- E. TO PREVENT POSSIBLE SECONDARY IMPACTS WITH THE ERRANT VEHICLE, HEAVY OBJECTS OR BAL- LAST MUST BE PROPERLY ANCHORED TO THE TRUCK TO PREVENT SHIFTING DURING AN IMPACT ANCHOR STRAPS SHOULD BE CAPABLE OF RESISTING A 20 G ACCELERATION OF THE TRUCK.
- F. THE RESPONSIBLE AGENCY FOR THE TRUCK SHOULD INSPECT IT FOR ADEQUATE OPERATOR SAFETY EQUIPMENT (I.E., SEAT BELTS, HEAD-RESTS, ETC.).
- G. IT IS RECOMMENDED THAT THE LS-Pro TMA BE MOUNTED TO TRUCKS WEIGHING BETWEEN 2722 AND 6804 kg [6,000 AND 15,000 LBS.] FOR OPTIMUM IMPACT PERFORMANCE.
- H. MAKE SURE THAT UNIT PERFORMANCE OR SAFETY IS NOT IMPAIRED BY DAMAGE OR CORROSION.

FAILURE TO COMPLY WITH THESE INSTRUCTIONS CAN RESULT IN IMPROPER UNIT PERFORMANCE AND POSSIBLE PERSONAL INJURIES.



THE USE OF A TMA ON THE BACK OF A TRUCK:

DOES

- SAFELY STOP THE ERRANT MOTORIST*
- PROTECT THE SHADOW VEHICLE OCCUPANTS*
- REDUCE DAMAGE TO THE SHADOW VEHICLE*

DOESN'T

AFFECT THE SKID (ROLL AHEAD) DISTANCE OF AN IMPACTED TRUCK (**KEEP WORK CREWS CLEAR!**)

CONTROLLING SKID DISTANCE (ROLL AHEAD)

SKID DISTANCE IS SIGNIFICANTLY INCREASED AND IS LESS PREDICTABLE FOR LIGHT WEIGHT SHADOW VEHICLES

SKID DISTANCE IS REDUCED AND IS MORE CONSISTENT WHEN HEAVIER SHADOW VEHICLES ARE USED. RECOMMENDED TRUCK WEIGHT FOR LS-Pro ALPHA
CURB WEIGHT = 6804 kg [15,000 LBS.]

*DESIGN SPEED IMPACTS FOR LS-Pro SYSTEM:
820-2000 Kg. [1800-4400 LBS.] IMPACT VEHICLES, 50 KPH [30 MPH] IMPACT SPEED

Installation Instructions

(For LS-Pro TMA W/ TMA1000LC Attachment)

1. Check shipping list against actual parts to make sure all items were received. Review drawing package and familiarize yourself with the assembly and part numbers. Read the entire instructions before proceeding.
2. The LS-Pro has been designed to attach to truck with a vehicle weight between 2722 and 6804 kg [6000 and 15,000 lbs.] and with an outside frame to frame dimension of 864 mm [34"]. If a truck is selected with characteristics different then these values, then consult the Customer Service Department of Valtir, Inc., (888) 32-ENER-G before proceeding with the installation.
3. Assemble necessary tools:
 - A. Welding equipment (for 1/2" plate)
 - B. Cutting torch
 - C. Hammer
 - D. Framing square
 - E. Tape measure
 - F. 1/2" drive socket wrench
 - G. 1 1/2" drive sockets (9/16", 3/4", 1-1/8", 1-1/2")
 - H. Open end wrenches (3/8", 1/2", 9/16", 11/16", 3/4", 7/8", 1-1/8", 1-1/2")
 - I. 12" crescent wrench - 2
 - J. Vise grip welding clamps or C-clamps
 - K. Pliers for installing crimped connectors on 16 ga. wires
 - L. Marking implement (pencil, soap stone)
 - M. Forklift
 - N. Floor jack
 - O. Torque wrench
 - P. Surface grinder
 - Q. Drill motor
 - R. Drills (9/16", 7/8" and pilot drills)
4. Park truck on a level surface (use bubble level), The truck should be as close to the final driving weight as possible. If ballast must be added to achieve the 6000 lb [2722 kg] minimum weight, add it at this time. It must be properly anchored to the truck frame to keep it in place during an impact. Ideally an adequately sized truck that requires no ballast should be used.

5. The TMA cartridge is shipped assembled to the backup. The first step in the installation process is to remove this assembly from the crate and make it mobile. This is accomplished by carefully removing the crating material and then if the two optional jacks are ordered (P.N. 2724230-0000) attach them to the backup (see referenced drawing no. 35-22-36). Once the jacks have been attached, the unit can be made mobile as shown in Figure 1.

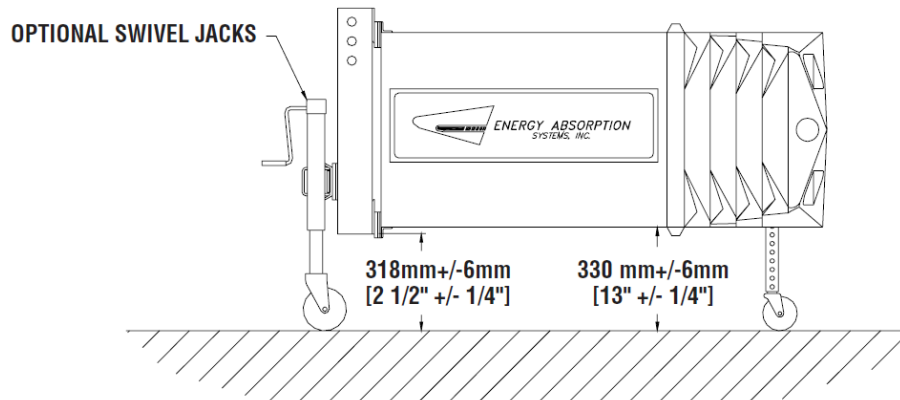


Figure 1

Elevate the jacks so the cartridge is 318mm +/- 6mm [12 1/2" +/- 1/4"] above the level surface at the backup end and 330 +/- 6mm [13" +/- 1/4"] at the rear end.

If the optional jacks have not been purchased, then a forklift, with extra long forks to prevent damage to the cartridge, can be used to achieve the required dimensions.

6. Cut a 13mm [1/2"] thick piece of steel plate to shape and weld it between the rear frame members, as shown in Figure 3. Each side of the plate should be welded to the frame member with a minimum 380mm [15"] long, 6mm [1/4"] weld.

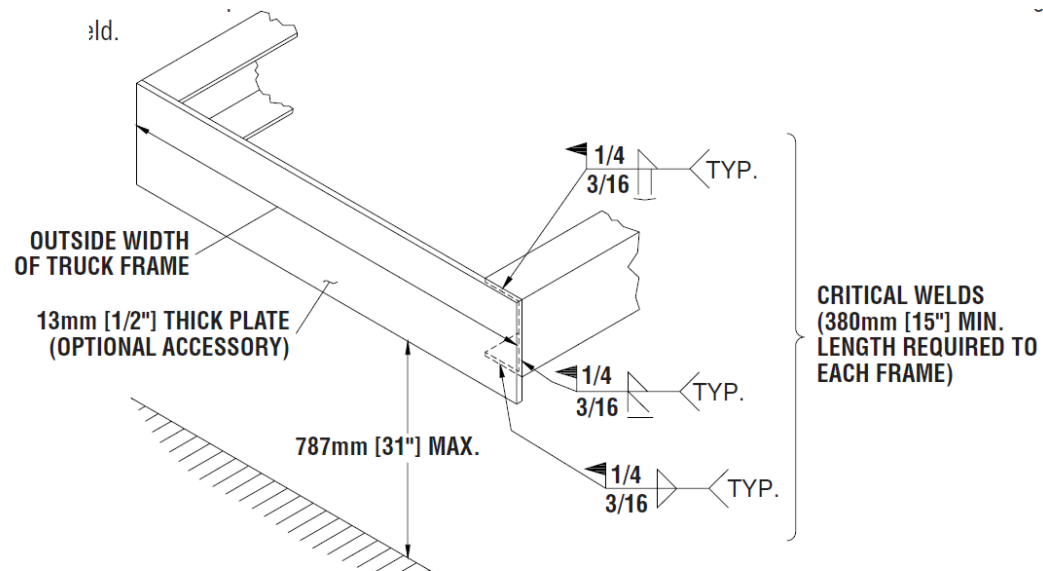


Figure 2

7. Attach the Backup Attachment brackets (P.N. 2725481-0000) to the upper two holes in the backup using the 1" dia. x 3" long hex head bolts, lock washers, and nuts provided; reference Figure 3. Torque the nuts to 250 ft-lbs. [338 Nm] (Note: If the truck has especially low frame, it may be desirable to attach the backup attachment brackets in one of the alternate positions shown in Figure 4.

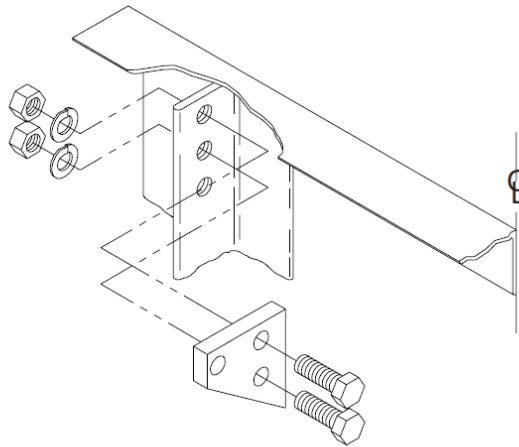


Figure 3

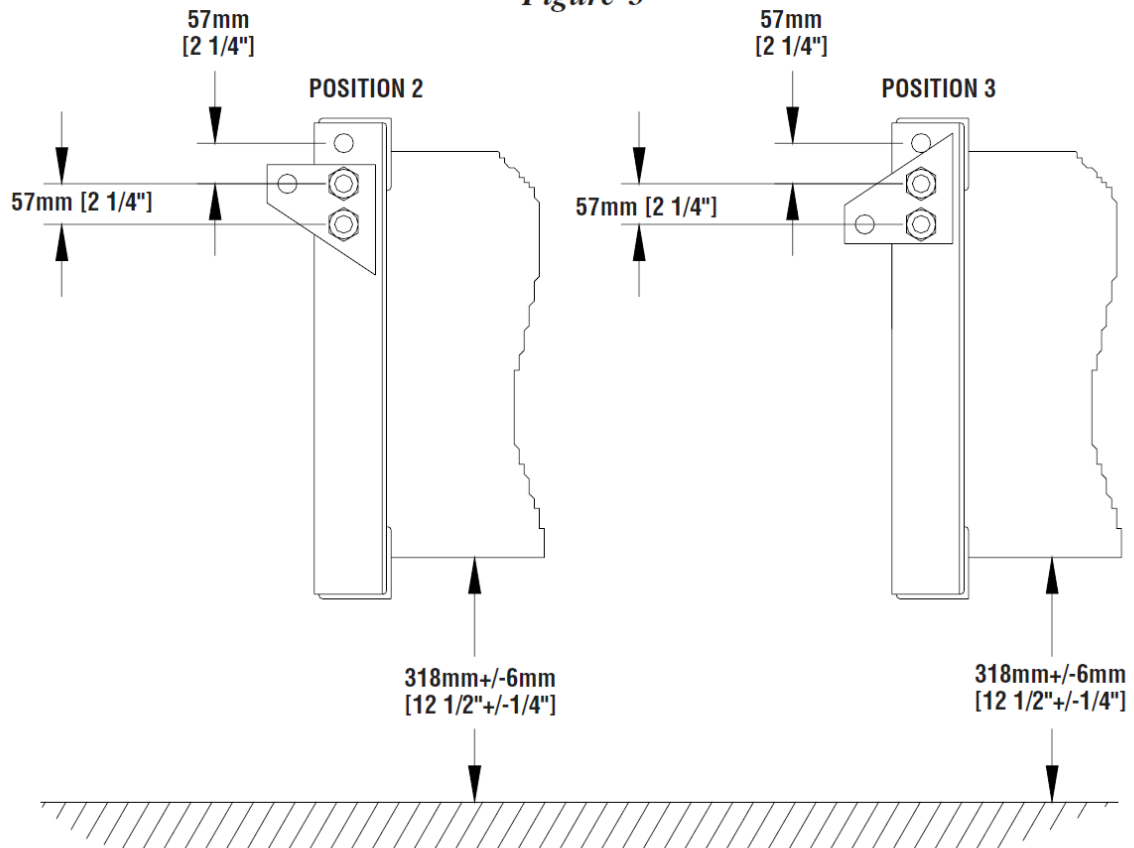


Figure 4

8. Attach the Upper Support Brackets to the backup with the (2) 25mm [1"] hitch pins (P.N. 2702161-0000). Move Cartridge, Backup & Upper Support Brackets to the 13mm [1/2"] plate. Making sure that the bottom of the cartridge is 311mm [12 1/4"] from level grade at the front & 318mm [12 1/2"] from level grade at the rear, clamp or spot weld Upper Support Brackets to the 13mm [1/2"] plate. Remove 25mm [1"] hitch pins & move Backup & Cartridge clear. Then attach the Upper Support Brackets (left P.N. 2725501-0000 and right P.N. 2725491-0000) to the 1/2" plate as shown in Figure 5 and on Sheet 2 of detail drawings. The decision to permanently weld or bolt the parts should be based on the expected future use of the truck and on possible interference with existing parts (i.e., dump in up position, salt spreader, etc.). If bolting is used, all eight (8) bolts must be installed into drilled holes and torqued to 108 Nm [80 ft.-lbs.]. If welding is used, it should be done by a qualified welder and should be completed as shown on sheet 2 of detail drawings.

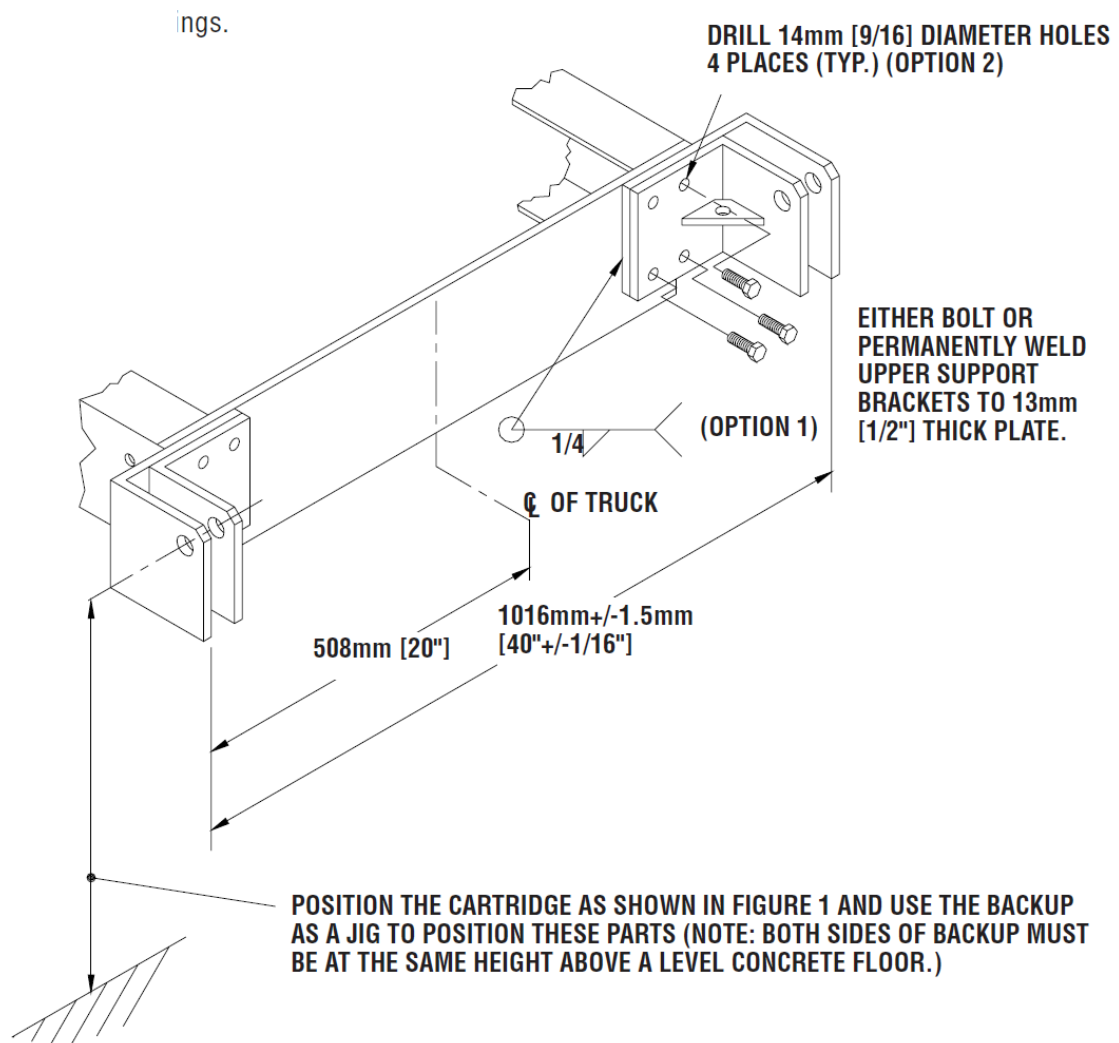
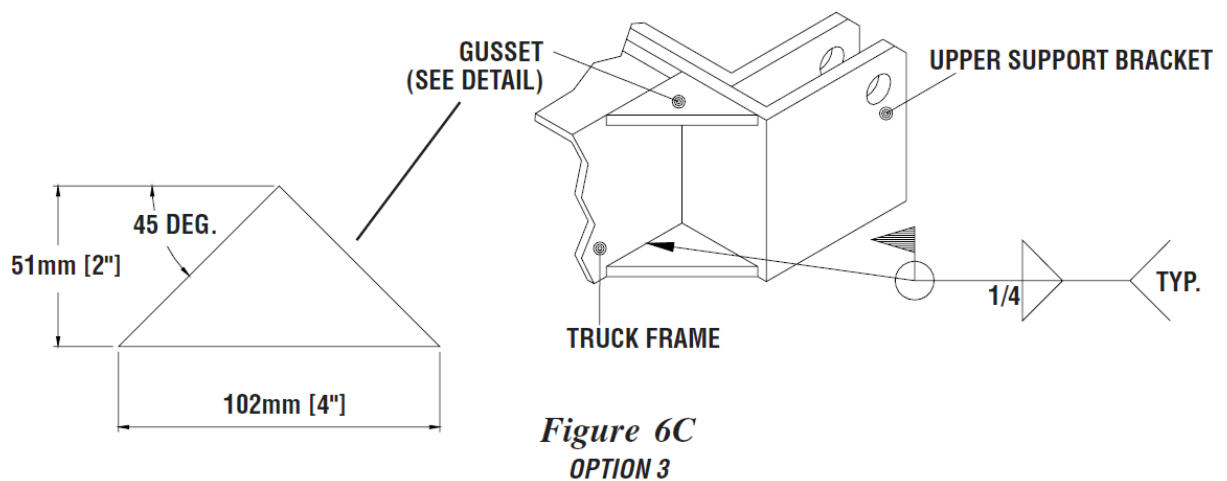
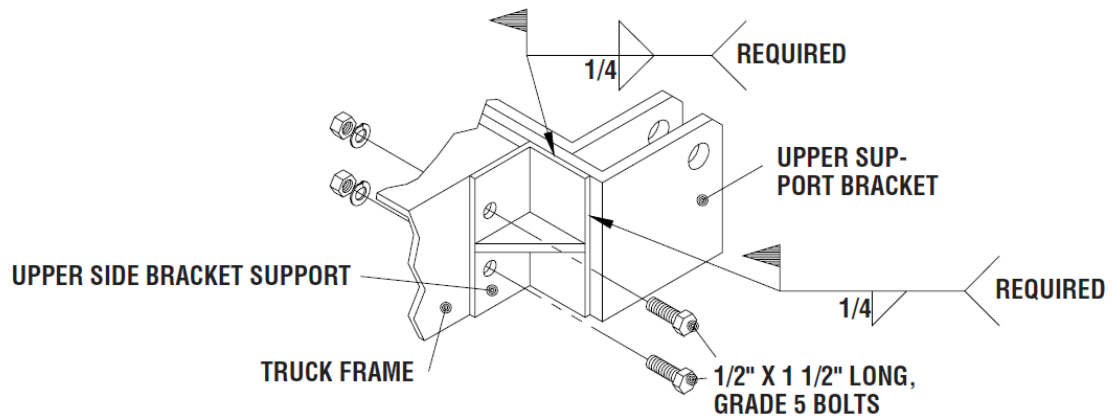
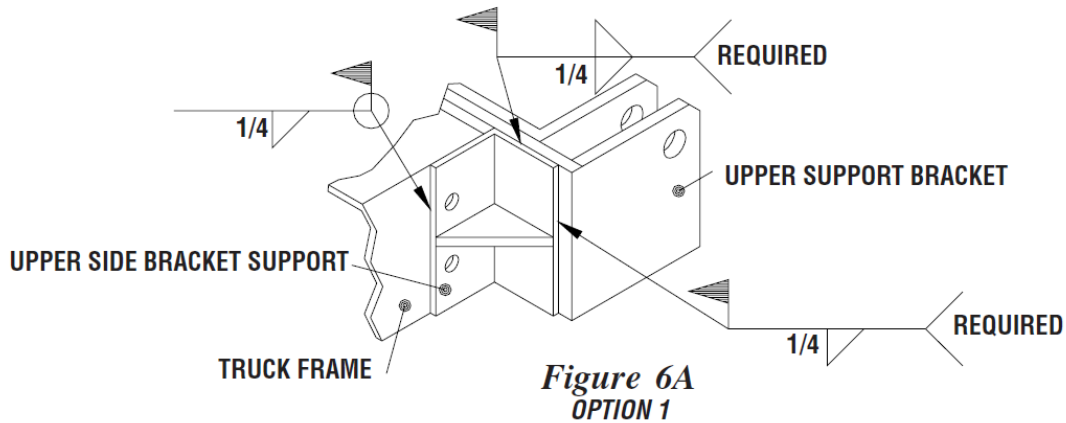


Figure 5

9. After installing the Upper Support Brackets, install the Upper Side Support Brackets (P.N. 2725441-0000), as shown in Figures 6A-6C. Where these parts contact the Upper Support Brackets, they must be welded as shown. Again, the front part of these brackets can be either bolted or welded. (Note: If there is interference with the truck's rear leaf spring hangers; weld two 45 degree x 51mm [2"] wide gussets per side; top and bottom, in place of the side bracket.)



10. Move the cartridge and backup to the Upper Support Brackets and install the two Hitch Pins (P.N. 2702161-0000). Verify that the bottom of the cartridge is 311mm+/-6mm [12 1/4"+/-1/4"] off the ground at the front end and 318+/-6mm [12 1/2"+/-1/4"] off the ground at the back end (use plywood under the rear jack, if necessary). The reason for these dimensions is to compensate for settling of the unit after it has been attached to the truck with the jacks elevated to their travel positions.
11. Attach the Standard Struts (P.N. 3522560-0000) to the bottom backup tabs. Attach the Front Truck Frame Brackets (P.N. 2725451-0000) to the other end of the struts as shown in Figure 7.

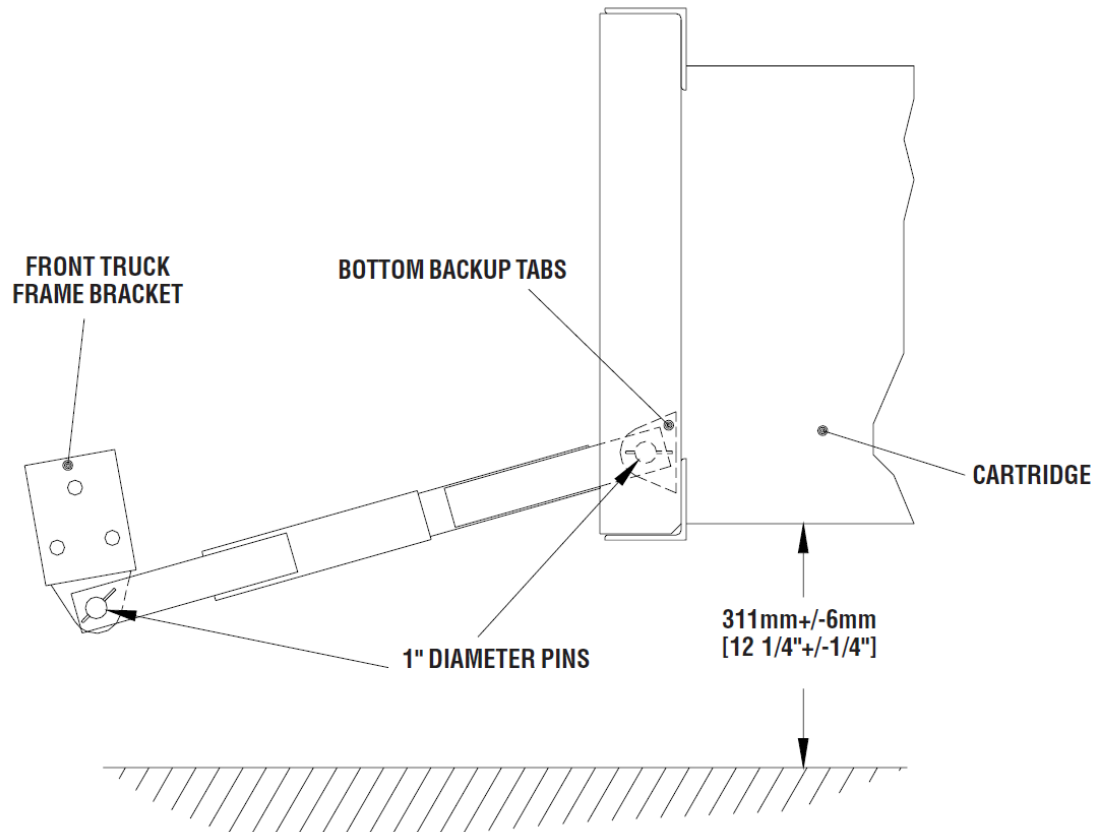


Figure 7

12. As shown in Figure 8, swing the Standard Struts up and position the Front Truck Brackets against the side of the truck frame. This part may be either bolted or welded to the truck frame. If bolting is used, all six (6) bolts must be installed into drilled holes and the bolts torqued to 270 Nm [200 ft.-lbs.]. (Before attempting the bolting method, make sure there is enough clearance between the side of the truck frame and the outboard leaf springs.) If welding is used, it should be done by a qualified welder and should be completed as shown on the detail drawings. Do NOT weld across the bottom of the truck frame. If there is interference between the Front Truck Frame Bracket and some existing part on the truck then the part can be installed as shown in Figure 9.

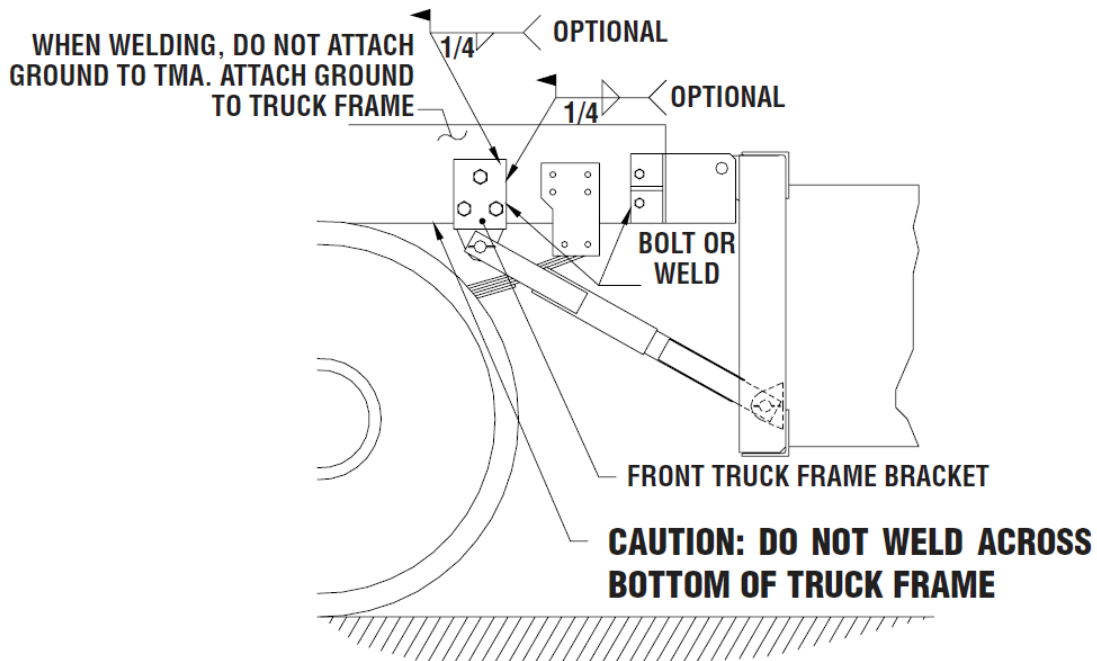


Figure 8

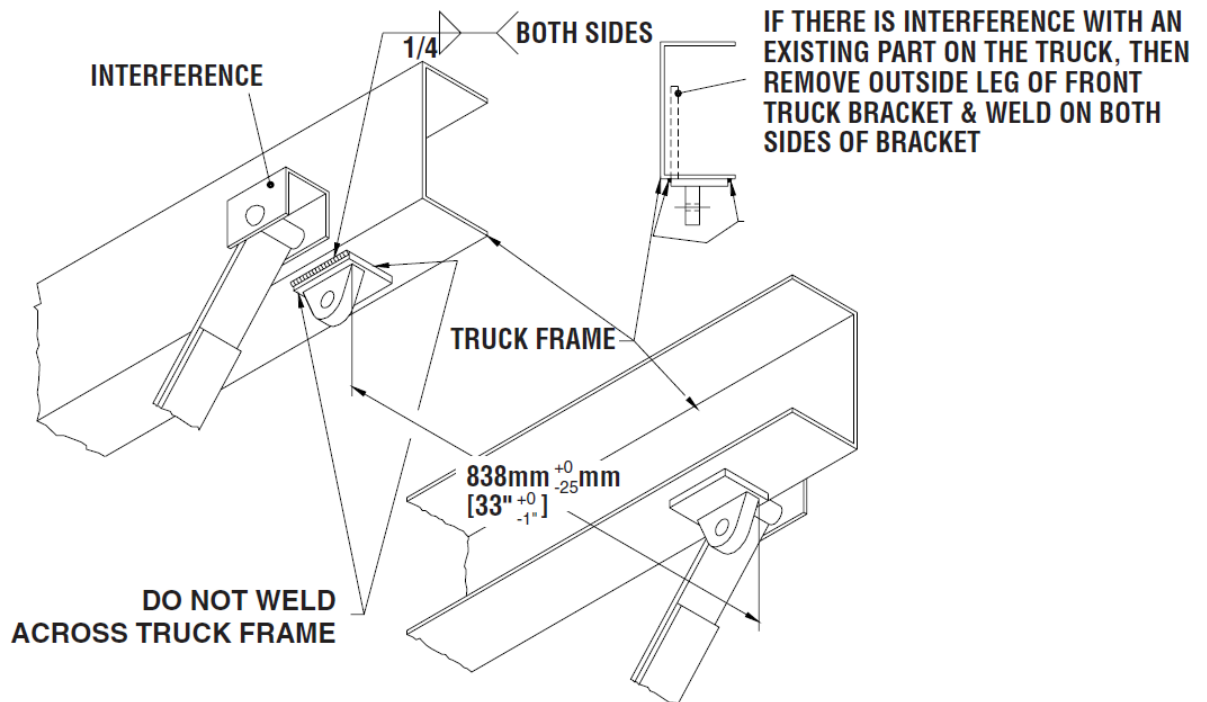


Figure 9

13. Detach the backup from the upper attach points and from the diagonal struts. Move the unit away from the rear end of the truck.
14. Install the 7 pin socket for the cartridge turn/stop/tail lights. (Use 14 gauge wire to connect the socket to the existing truck's wiring harness.)
15. Check the tightness of the cartridge-to-backup bolts (122Nm [90 ft.-lbs.]).
16. Reattach the backup to the Upper Support Brackets and to the diagonal struts. If equipped with jacks, elevate the jacks to their travel position. Final travel position of cartridge must be 305+/-25mm [12"+/-1"].
17. Plug in the light harness and verify that the turn/stop/tail lights are functioning properly.
18. Check the location of all electrical lines to make sure they will not be damaged.
19. Verify that all the fasteners are tight.
20. Users of the TMA should be trained as to it's proper use (see Suggested Attachment & Removal Instructions in the manual plus any additional guidelines established by the owner).
21. The TMA is now ready for use.

ATTACHMENT & REMOVAL INSTRUCTIONS (TMA 1000 LC ATTACHMENT)

(NOTE: LS-Pro TMA UNITS CANNOT BE RETROFITTED TO 90 DEGREE TILT UNITS.)

I. Attaching TMA to Truck:

To attach the LS-Pro TMA to the truck:

- A. Roll the unit squarely toward the rear attachment points.*
- B. Install the two 1" diameter attachment pins and retaining pins which connect the backup to the truck brackets, making sure they are properly installed**.
- C. Attach the upper arms of the diagonal struts to their attachment brackets. Make sure the 1" diameter pins are properly installed**.

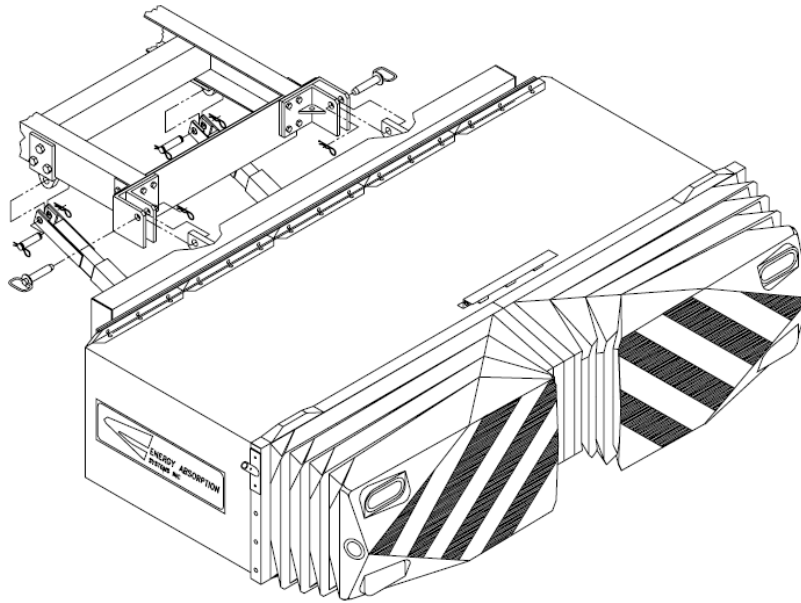


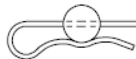
Figure 10

- D. Plug in the light harnesses and verify that the turn/stop/tail lights are working properly.
- E. If equipped with jacks, swing the rear cartridge jack and two optional backup jacks into their storage positions.
- F. Verify that the electrical harnesses are clear of moving parts.
- G. Verify that all fasteners are tight and that the cartridge is 12" +/- 1" off the level ground at all points.

*For units not equipped with optional backup jacks, use a forklift with long fork extensions to prevent damage to the cartridge.

**CAUTION: Missing or damaged pins or retaining pins should be replaced before putting the unit into service.

Retainer pins should be installed as shown:



ATTACHMENT & REMOVAL INSTRUCTIONS (CONTINUED)

II. TMA Removal:

To remove the TMA from the rear of the truck:

- A. Lower the rear jack* to the "down" position.
- B. Swing the two backup jacks* into position and extend them until the weight of the unit is off the 1" diameter attachment pins.
- C. Remove the two backup attachment pins and the two upper attachment pins in the diagonal struts. (The struts should remain attached to the backup.) Make sure the struts are properly supported. Return the pins & retainer pins to their positions in the unit so they won't be lost.
- D. Unplug the light harness.
- E. Roll the unit away from the truck. Note: The jacks have been designed to roll over smooth surfaces. Rolling the unit over rough surfaces may result in damage jacks and/or cartridge.

*For units not equipped with optional backup jacks, use a forklift with long fork extensions to prevent damage to the cartridge.

Installation Instructions

(With Receiver Underride Attachment)

1. Check shipping list against actual parts to make sure all items were received. Review drawing package and familiarize yourself with the assembly and part numbers. Read the entire instructions before proceeding.
2. The LS-Pro TMA has been designed to attach to truck with a vehicle weight between 2722 and 6804 kg [6000 and 15,000 lbs.] and with an outside frame to frame dimension of 864 mm [34"]. If a truck is selected with characteristics different than these values, then consult the Customer Service Department of Valtir, Inc., (888) 32-ENER-G before proceeding with the installation.
3. Assemble necessary tools:
 - A. Welding equipment (for 13mm [1/2"] plate)
 - B. Cutting torch
 - C. Hammer
 - D. Framing square
 - E. Tape measure
 - F. 1/2" drive socket wrench
 - G. 1/2" drive sockets (9/16", 3/4", 1-1/8", 1-1/2")
 - H. Open end wrenches (3/8", 1/2", 9/16", 11/16", 3/4", 7/8", 1-1/8", 1-1/2")
 - I. min. 300mm [12"] crescent wrench - 2
 - J. Vise grip welding clamps or C-clamps
 - K. Pliers for installing crimped connectors on 16 ga. wires
 - L. Marking implement (pencil, soap stone)
 - M. Forklift
 - N. Floor jack
 - O. Torque wrench
 - P. Surface grinder
 - Q. Drill motor
 - R. Drills (9/16", 7/8" and pilot drills)
4. Park truck on a level surface (use bubble level). The truck should be as close to the final driving weight as possible. If ballast must be added to achieve the 2722 kg [6000 lb] minimum weight, add it at this time. It must be properly anchored to the truck frame to keep it in place during an impact. Ideally an adequately sized truck that requires no ballast should be used.

5. The TMA cartridge is shipped assembled to the backup. The first step in the installation process is to remove this assembly from the crate and make it mobile. This is accomplished by carefully removing the crating material and then if the two optional jacks are ordered (P.N. 2724230-0000) attach them to the backup (see referenced drawing no. 35-22-36). Once the jacks have been attached, the unit can be made mobile as shown in Figure 11.

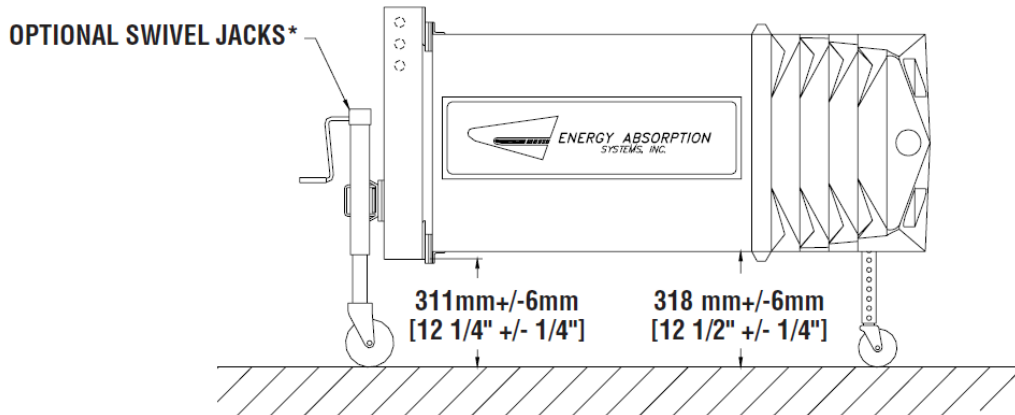


Figure 11

Elevate the jacks so the cartridge is 311 mm +/- 6mm [12 1/4" +/- 1/4"] above the level surface at the backup end and 318 mm +/- 6mm [12 1/2" +/- 1/4"] at the rear end.*

*If the optional jacks have not been purchased, then a forklift, with extra long forks to prevent damage to the cartridge, can be used to achieve the required dimensions.

6. Attach the Backup Attachment brackets (P.N. 2725481-0000) to the upper two holes in the backup using the 1" dia. x 3" long hex head bolts, lock washers, and nuts provided; reference Figure 12. Torque the nuts to 338 Nm [250 ft-lbs.] (Note: if the truck has especially low frame, it may be desirable to attach the backup attachment brackets in one of the alternate positions shown in Figure 13.

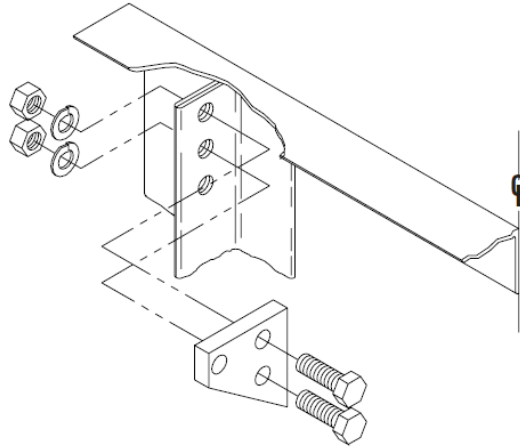


Figure 12

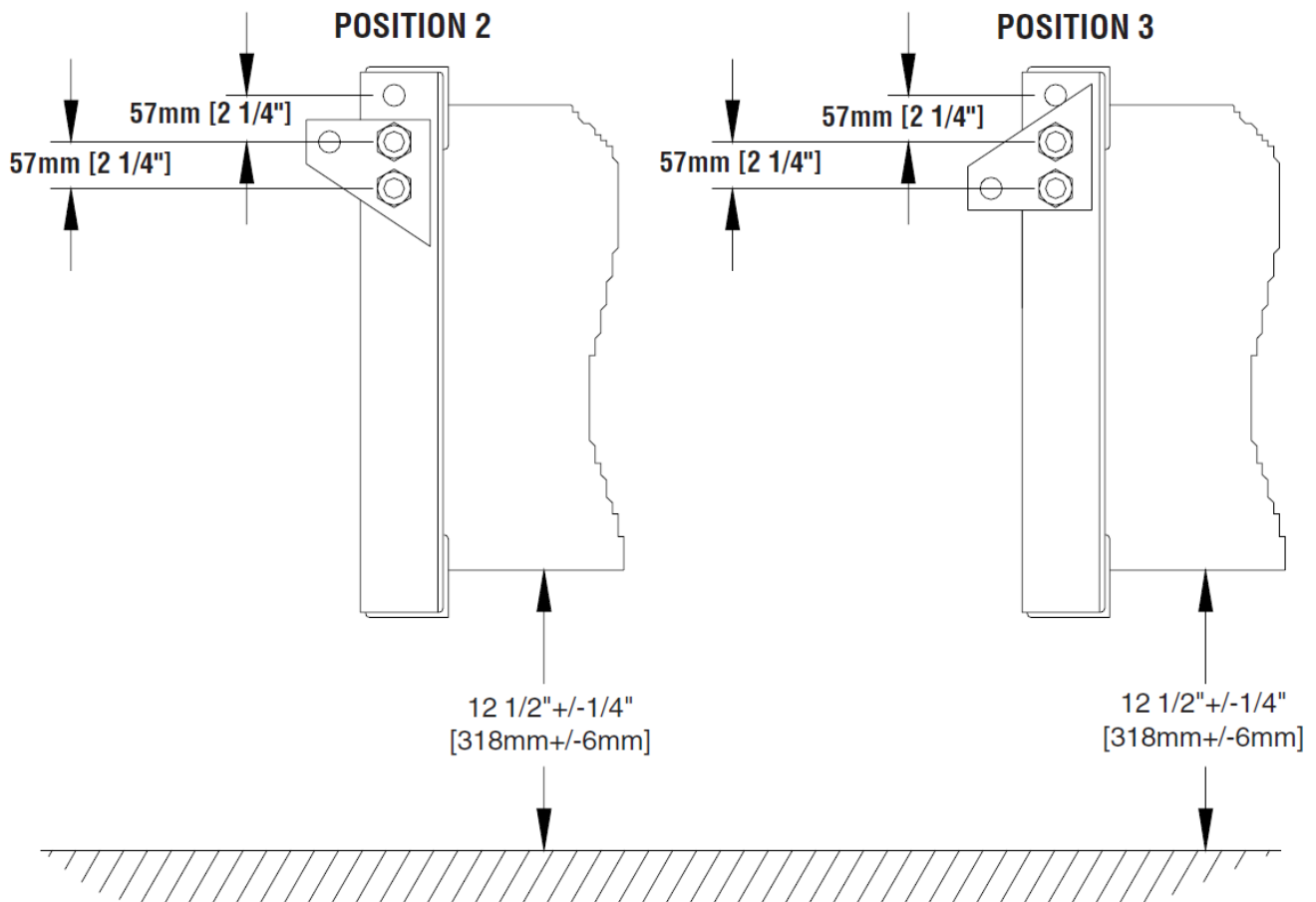


Figure 13

7. Refer to Dwg # 35-24-42 & Instruction Sheet #2750531-0000 for installation of Receiver Underride Assembly.

Attachment and Removal Instructions

(Receiver Underride Attachment)

Note: LS-Pro TMA Systems cannot be retrofitted to 90 degree tilt Systems.

I. Attaching TMA to Truck:

To attach the LS-Pro TMA to the truck:

- A. Roll the unit squarely toward the rear attachment points.*
- B. Install attachment assembly to the Receiver Underride. Refer to Dwg. #35-24-62. Do not install shims (items 7 & 8) at this time.
- C. Install the two 1" diameter attachment pins and retaining pins which connect the backup to the upper support brackets and to the chains on the 8" standoffs, making sure they are properly installed. (See Figure 14) **

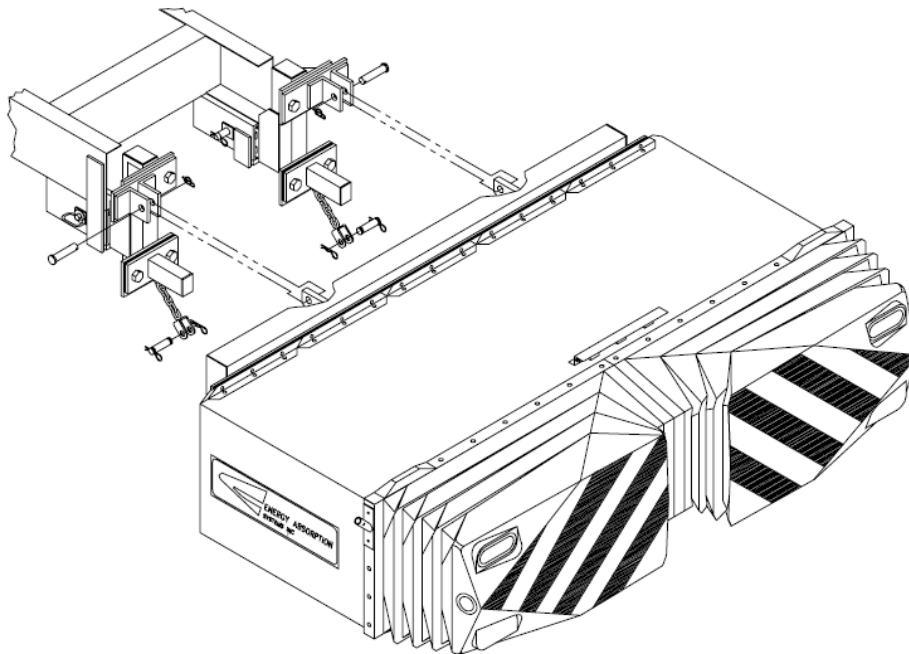


Figure 14

- D. Plug in the light harnesses and verify that the turn/stop/tail lights are working properly.
- E. If equipped with jacks, swing the rear cartridge jack and two optional backup jacks into their storage positions.
- F. Verify that the electrical harnesses are clear of moving parts.
- G. Verify that all fasteners are tight and that the cartridge is 12" +/- 1" off the level ground at all points.

****For units not equipped with optional backup jacks, use a forklift with long fork extensions to prevent damage to the cartridge.***

****CAUTION: Missing or damaged pins or retaining pins should be replaced before putting the System into service. Retainer pins should be installed as shown:**



II. TMA Removal:

To remove the TMA from the rear of the truck:

- A. Lower the rear jack* to the "down" position.
- B. Swing the two backup jacks* into position and extend them until the weight of the unit is off the 1" diameter attachment pins.
- C. Remove the two upper support bracket attachment pins and the two standoff attachment pins. Return the pins & retainer pins to their positions in the backup so they won't be lost.
- D. Unplug the light harness.
- E. Roll the unit away from the truck. Note: The jacks have been designed to roll over smooth surfaces. Rolling the unit over rough surfaces may result in damage jacks and/or cartridge.

****For units not equipped with optional backup jacks, use a forklift with long fork extensions to prevent damage to the cartridge.***

Maintenance

Before performing any Maintenance on the LS-Pro TMA, thoroughly read and understand the Maintenance Section and the Safety Section of this manual.

Description

1. Height and Levelness - The height and levelness of the system is important to its impact performance. Check regularly and adjust as necessary: See Figure 15

A/R*

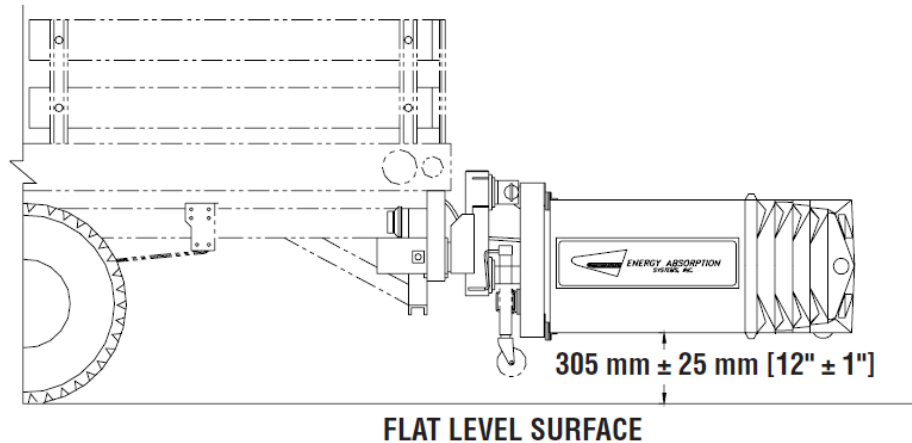


Figure 15

2. Fasteners - Check the tightness of the fasteners monthly. See the drawings for the locations of the fasteners. Be sure to check bolts attaching the cartridges to the support structure. Lock washers should be fully compressed. 1 month or 1000 Mi.
3. Jacks - Check the condition of the wheels on the jacks monthly or as required. 1 month
4. Light Bulbs - Replace the light bulbs. A/R*
5. Pins - Check all pins. Prior to each use, check all pins to make sure they are held in position by a retaining pin as required. Each use
6. Lubrication - Regrease all friction points (moving steel parts.)
7. Clean System - Clean the frame assembly, cartridges and support structure and impact face from dirt and salt as required. Check monthly. The system can be cleaned with mild soap solution. Always check lubrication after cleaning. 6 months
1 month
8. Jacks (Optional) - Oil jacks as shown in figure 16. 6 months

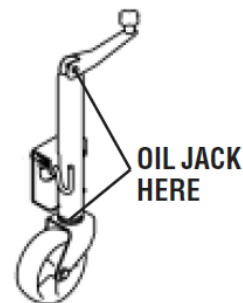


Figure 16

9. Roll pins - If equipped, check condition of roll pins in diagonal struts.

A/R*

*A/R = as required

Repair Instructions

The following REPAIR INSTRUCTIONS are given by first presenting a problem and then giving a possible solution

I. Lights will not work

- A. Replace affected light bulb(s).
- B. Check wire for damage.
- C. Using a volt/ohm meter trouble shoot and locate the problem.

II. Unit is not level

- A. Check for cause of problem
 - 1. Temporary extra load in truck.
 - 2. Support frame improperly installed.
 - 3. Weakening truck springs.
- B. For TMA 1000 LC Attachment:

If problems above can not be corrected, a new diagonal strut must be fabricated that will position the cartridge 305mm+/-25mm [12"+/-1"] above the ground at all points.
- C. For Receiver Underride Attachment:

If problems above can not be corrected shims may be added or removed from behind 203mm [8"] standoffs as required to level the unit.

III. 2001 MD A/B Section has been damaged

- A. The "A" section is a resilient plastic nose that normally recovers its shape after nuisance hits. However, if either the left or right side is damaged, it must be replaced in the following manner:
 - 1. Remove the bolts and washers attaching the nose to section "B".
 - 2. Disconnect the light plugs from the lights.
 - 3. Connect the light plugs to the lights in the new nose.
 - 4. Re-attach the nose to section "B" using the bolts and washers previously removed.
 - 5. Lights & grommets, if undamaged, may be salvaged.

- B. For nuisance impacts in which the "B" section is damaged in any way, it should be replaced using the following procedure:
1. Remove nose sections and unplug the lights following the steps outlined in "A" above.
 2. If TMA is attached to the truck, disconnect the electrical plug from the truck.
 3. Remove all ten nuts connecting "B" Section to backup frame.
 4. Remove all bolts connecting "B" & interface.
 5. Replace "B" section by aligning holes and re-attaching the bolts, washers and nuts removed in step 4, above.
 6. Reinstall the plastic disk on the cable approx. 41" from the electrical plug making sure the disk is tightly sandwiched between the 2 washers. Snap the disk back into the rubber grommet on the cartridge.
 7. Re-attach cartridge to frame using 10 flat washers, lockwashers and nuts from Step 3 above.
 8. Re-install nose sections or replace them if they are damaged, being sure to connect the light plugs into the lights before installing bolts and washers.

Limitations and Warnings

The LS-Pro TMA (Truck Mounted Attenuator) has been tested and evaluated per the recommendations of the National Cooperative Highway Research Program (NCHRP) report 350. *The LS-Pro TMA as currently designed, is capable of decelerating and stopping light and heavy weight vehicles (820 & 2000 Kg [1800 & 4400 lbs.) when the rear of the cartridge is impacted head-on at 50 KPH [30 MPH].

To achieve acceptable impact performance, the LS-Pro TMA must be mounted to a truck with a 2722 to 6804 Kg [6000 to 15,000 lbs.] vehicle weight. The TMA cartridge must be level and the bottom of the cartridge must be 305mm +/- 25 mm [12" +/- 1" above the ground.

Impacts that exceed the design capabilities described in this manual (vehicle weight, speed and impact angle) may not result in acceptable crash performance as described in NCHRP 350 relative to structural adequacy, occupant risk and vehicle trajectory factors.

* Copy may be obtained from:

Transportation Research Board
National Research Council
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Notes



For more complete information on Valtir products and services, visit us on the web at www.valtir.com. Materials and specifications are subject to change without notice. Please contact Valtir to confirm that you are referring to the most current instructions.

WWW.VALTIR.COM
1.888.323.6374