



# SS180<sup>®</sup> M

## TRUCK MOUNTED ATTENUATOR

### PRODUCT MANUAL



# SS180® M

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The SS180® M Truck Mounted Attenuator (“TMA”) has been tested pursuant to American Association of State Highway and Transportation Officials (“AASHTO”) Manual for Assessing Safety Hardware (“MASH”) specifications.



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Suite 525

Addison, Texas 75001



The local highway authority, distributors, owners, contractors, lessors, and lessees are **RESPONSIBLE** for the assembly, maintenance, and repair of the SS180® M. Failure to fulfill these **RESPONSIBILITIES** with respect to the assembly, maintenance, and repair of the SS180® M could result in serious injury or death.



These instructions are for standard assembly specified by the appropriate highway authority. In the event the specified system assembly, maintenance, or repair would require a deviation from standard assembly parameters, contact a Valtir representative.

**This manual must be available to the worker overseeing and/or assembling the product at all times. For additional copies, contact Valtir directly at (888) 323-6374 or visit [Valtir.com](https://www.valtir.com).**

The instructions contained in this manual supersede all previous information and manuals. All information, illustrations, and specifications in this manual are based on the latest SS180® M information available to Valtir at the time of printing. We reserve the right to make changes at any time. Please contact Valtir to confirm that you are referring to the most current instructions.

SS180® M is a registered trademark of Valtir, LLC.

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## Customer Service Contacts

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Valtir is committed to the highest level of customer service. Feedback regarding the SS180® M system, its assembly procedures, supporting documentation, and performance is always welcome. Additional information can be obtained from the contact information below:

**Valtir:**

**Telephone:**

(888) 323-6374 (USA)

+1 214 589 8140 (International)

**Internet:**

[valtir.com/contact](http://valtir.com/contact)

## Abbreviations

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AASHTO	American Association of State Highway and Transportation Officials
FHWA	Federal Highway Administration
MASH	Manual for Assessing Safety Hardware
MUTCD	Manual on Uniform Traffic Control Devices
PPE	Personal Protective Equipment

## Important Introductory Notes

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Proper assembly, deployment and future maintenance of the SS180® M are critical to achieve tested performance under accepted MASH criteria. Take the time to review this manual thoroughly before performing all necessary work. These instructions should be read in their entirety and understood before assembling the TMA. These instructions are to be used only in conjunction with the assembly of the SS180® M system and are for standard assemblies only as specified by the applicable highway authority.

In the event your system assembly requires or involves deviation from standard parameters or, during the assembly process a question arises, please contact Valtir customer service. These instructions are intended for an individual who is qualified to both read and accurately interpret them as written. They are intended for the individual who is experienced and skilled in the assembly of highway products which are specified and selected by the highway authority.

If additional information is required, please contact Valtir Customer Service. If there are deviations, alterations, or departures from the assembly protocol specified in this manual, the SS180® M may not perform as tested.



It is the responsibility of the installer to maintain a safe work area including the use of standard work zone safety equipment & PPE: gloves, safety-toe shoes, and eye / ear protection.



DO NOT use any component part that has not been specified and/or approved for this system during assembly or repair.



## System Overview

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The SS180® M system has shown to reduce the risk of injury to passengers of an errant vehicle and to the driver of the truck to which the system is attached when the system is impacted within the applicable MASH criteria. The system mounts on the rear of a truck and may be used in stationary applications

## Safety Symbols

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This section describes safety symbols that may appear in the SS180® M manual. Read this manual for complete safety, assembly, operating, maintenance, repair, and service information.



Indicates Danger or Warning. Failure to read and follow this warning could result in serious injury or death to the workers and/or bystanders.



Indicates Caution or High Importance. Failure to follow this warning can result in improper performance, failure of operation, to serious injury or death in the event of a vehicle impact with the system.



Indicates Notifications or Reference. These denote important items but will not cause system damage or serious injury.



Indicates importance of reading instructions. Failure to follow all steps can result in improper performance, system failure, and/or serious injury or death in the event of a vehicle impact with the system.

## Safety Rules for Assembly

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This manual must be kept in a location where it is readily available to persons who assemble, maintain, or repair the SS180® M. Additional copies of this manual are available from Valtir by calling (888) 323-6374 or contact us using [Valtir.com/Contact](http://Valtir.com/Contact). Please contact Valtir if you have any questions concerning the information in this manual.



It is the responsibility of the installer to use proper safety precautions when operating power equipment, mixing chemicals, and when moving heavy equipment or SS180® M components. The installer is responsible for proper use of hand, eye, foot, and back protection.



Safety measures incorporating appropriate traffic control devices specified by the highway authority must be used to protect all personnel while the TMA is in use. The traffic control plan established by the highway authority must always be observed when utilizing this product.

## Limitations and Warnings

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Valtir, in compliance with MASH “Recommended Procedures for the Safety Performance of Highway Safety Features”, contracts with FHWA approved testing facilities to perform crash tests, evaluation of tests, and submittal of results to the FHWA for review.

The SS180® M was tested to meet the impact criteria, requirements, and guidelines of MASH. These tests, specifically set forth by the FHWA, evaluate product performance by simulating those impacts outlined by MASH involving a typical range of vehicles on our roadways, from lightweight cars (approx. 2420 lb. [1100kg]) to full size pickup trucks (approx. 5000 lb. [2270 kg]) as specified by the FHWA. A product can be certified for multiple Test Levels. The SS180® M is certified to the Test Level as shown below:

### Test Level 3: 62 mph [100 kph]

**These FHWA directed tests are not intended to represent the performance of systems when impacted by every vehicle type or every impact condition existing on the roadway. This system is tested only to the test matrix criteria of MASH as approved by the FHWA.**

Valtir expressly disclaims any warranty or liability for injury or damage to persons or property resulting from any impact, collision or harmful contact with products, other vehicles, or nearby hazards or objects by any vehicle, object or person, whether or not the products were assembled in consultation with Valtir or by third parties.

The SS180® M is intended to be assembled, delineated, and maintained within specific state and federal guidelines. It is important for the highway authority specifying the use of a highway product to select the most appropriate product configuration for its site specifications. The customer should be careful to properly select, assemble, and maintain the product. Careful evaluation of the site lay out, vehicle population type; speed, traffic direction, and visibility are some of the elements that require evaluation in the selection of a highway product.

After an impact occurs, the debris from the impact should be removed from the area immediately and the product should be evaluated and restored to its original specified condition or replaced as soon as possible. All components and assemblies should be inspected and any parts that are damaged should be replaced with original Valtir replacement parts. Contact the Customer Service Department prior to repair if you have any questions (p. 1).



It is the responsibility of the installer to ensure that the SS180® M and delineation used meet all federal, state, specifying agency, and local specifications.



It is the responsibility of the installer to ensure that your assembly meets all appropriate Manual on Uniform Traffic Control Devices (MUTCD) and local standards.

# Know Your SS180® M System



For the safety of the operator, the operator shall stand at the rear of the truck, on the curb side, (Figure 2). When tilting the TMA, care shall be taken to stay clear of all moving parts.

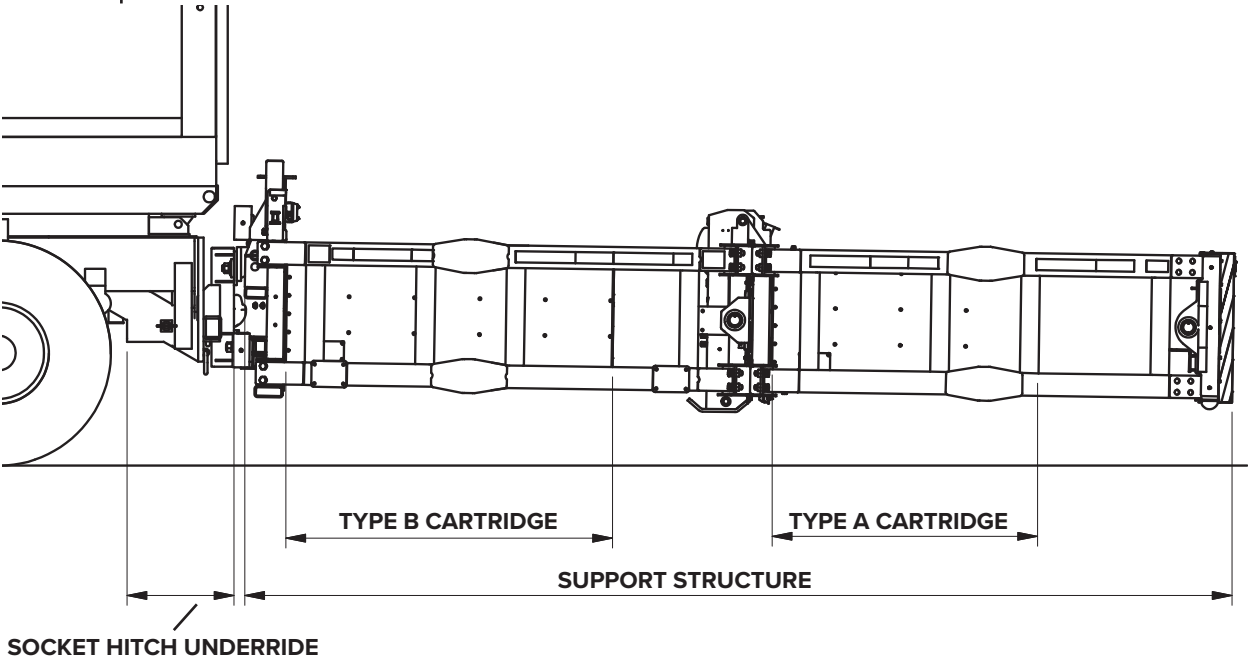


Figure 1

STAND HERE (FOR CONTROLS ON RIGHT SIDE OF TRUCK) CONTROLS LOCATED ON EITHER SIDE OF THE TRUCK

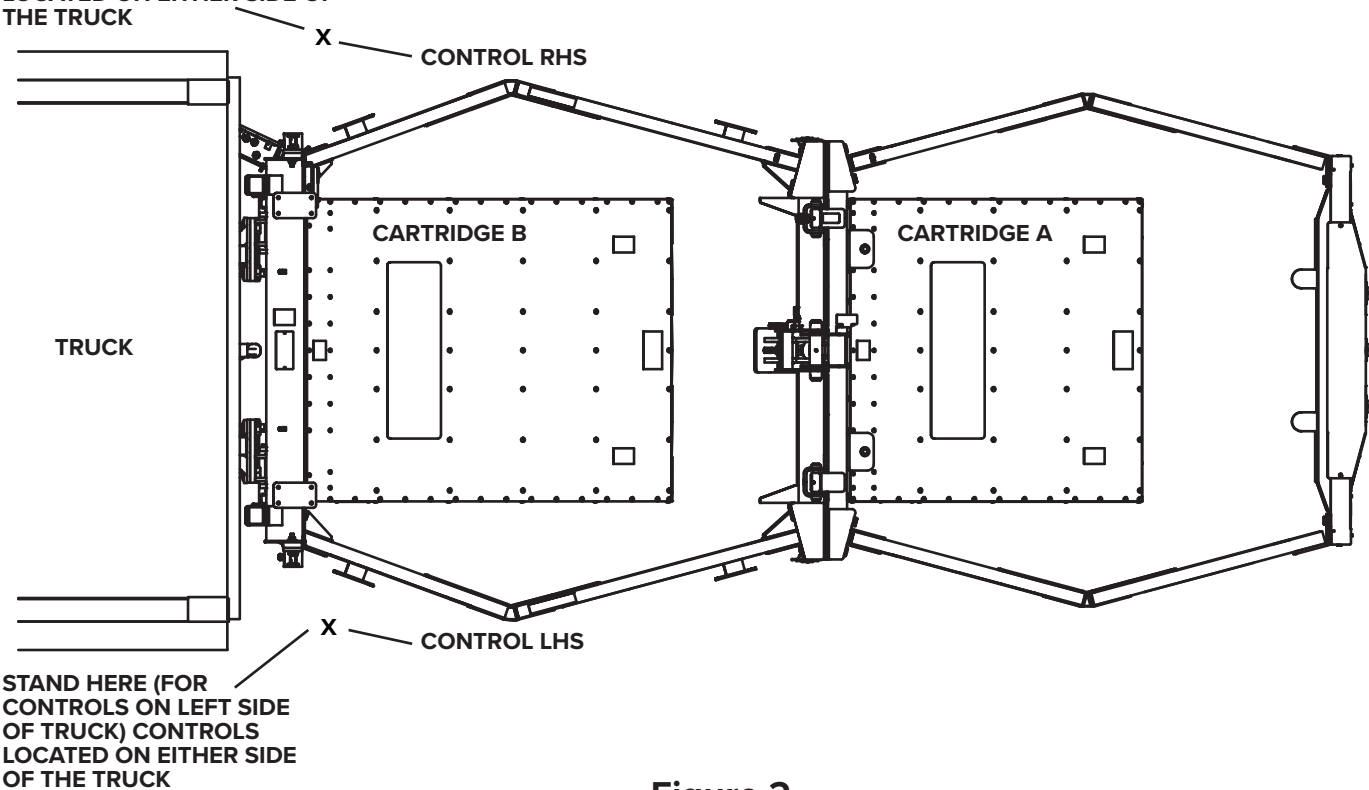
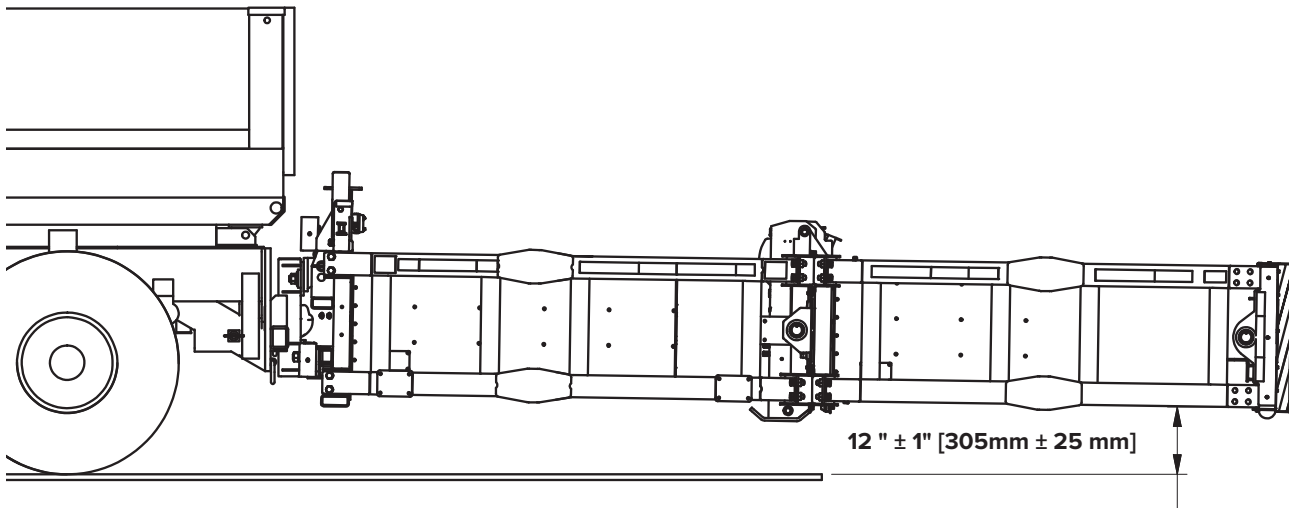


Figure 2

1. The SS180® M shall be rigidly fastened to the truck. In the horizontal position, the bottom of the TMA shall be 11" to 13" [280 to 330 mm] from the ground to the bottom of the Rear Impact Face (Figure 3).



The SS180® M can only absorb the energy of an impacting vehicle when in the unfolded position.



**Figure 3**

2. Jacks shall be used to support the SS180® M when it is detached from the truck. The Jacks must be stored while the TMA is attached to the truck.

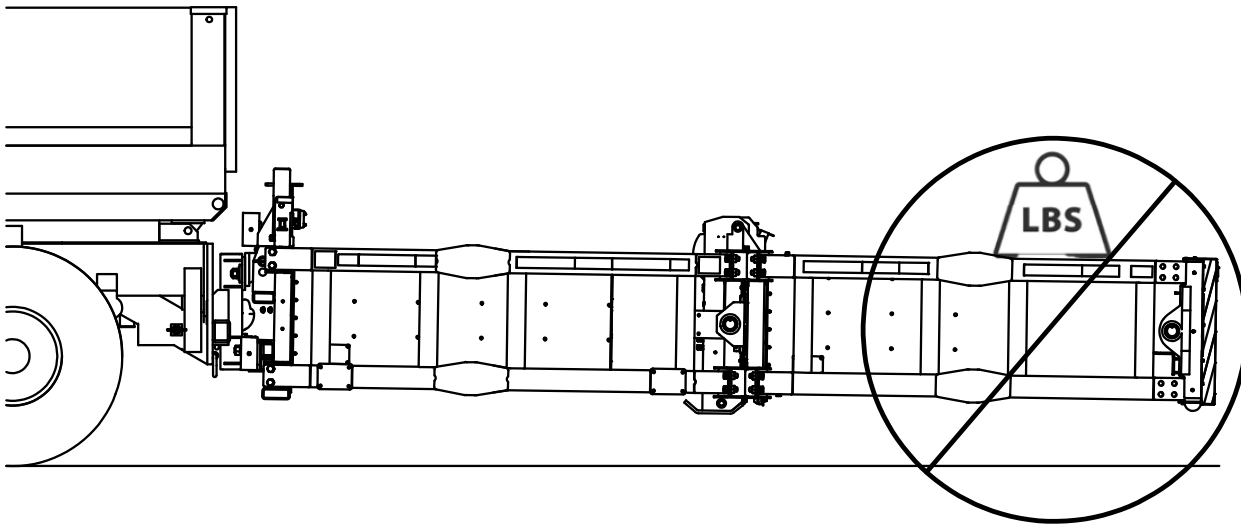


The SS180® M must be deployed in the unfolded position at **all times** while operating as either a **Barrier** or **Shadow Vehicle**.

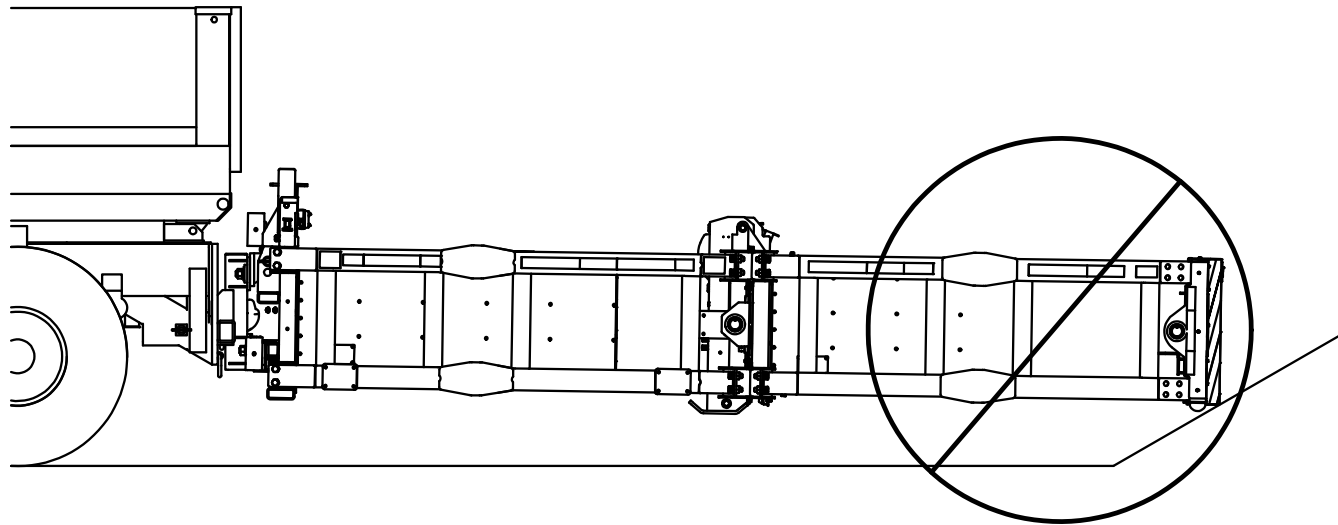
- The SS180® M can be in the “**unfolded**” position when traveling short distances at low speed (not greater than 30 mph).
- The SS180® M must be in the “**folded**” position when traveling long distances at a high speed (greater than 30 mph).



3. The SS180® M is intended to support its own weight and dissipate the kinetic energy of errant vehicles per MASH criteria. Do not drag the TMA or place anything on its top or damage will result. Do not sit, stand, or lean on any part of the TMA (Figures 4 & 5).



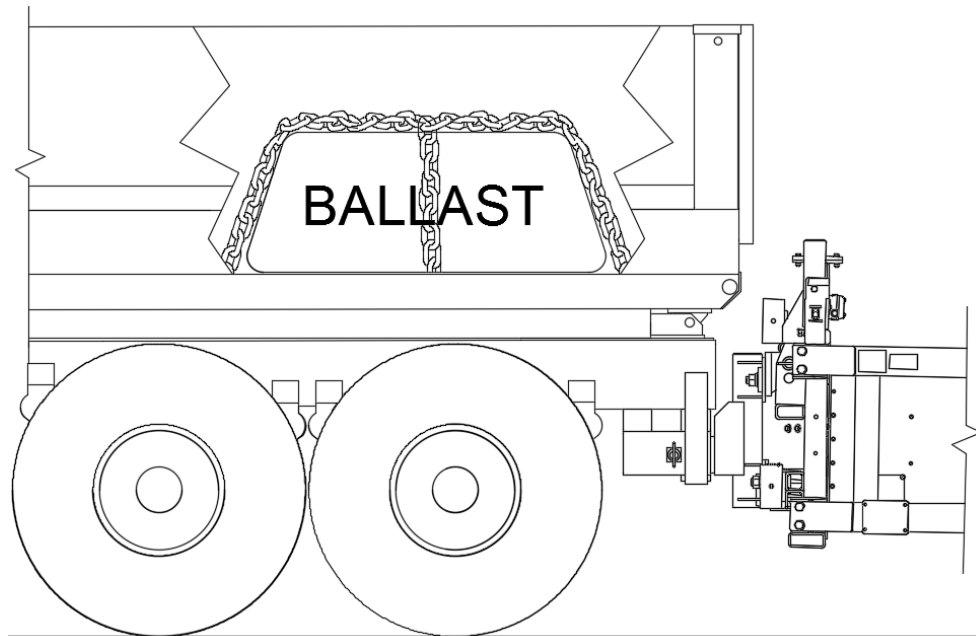
**Figure 4**



**Figure 5**

4. Before raising or lowering the TMA, the operator shall be fully trained in its proper operation. All operators are required to fully understand the contents of this manual prior to operating the system. The operator should never stand under the TMA while it is being raised or lowered.
5. Folding the TMA provides the best maneuverability and driving characteristics. The TMA shall be in its folded transport position while travelling between deployment locations. Refer to local agency policies as required for additional guidance. Unfold the system before entering a job site or beginning shadow vehicle operations. The support vehicle must be fully stopped before TMA folding and unfolding.
6. All persons shall stand clear before folding or unfolding the TMA. The system must be stopped in full folded position before allowing anyone directly behind the folded system.

7. Ballast and other heavy objects **MUST BE ADEQUATELY ANCHORED** to the truck to prevent shifting during an impact (Figure 6). The force exerted on the tie-down straps could be 20 times the weight of the ballast.



**Figure 6**

8. The agency responsible for the truck shall inspect it for adequate operator safety equipment (e.g., seat belts, head rests, etc.)
9. The SS180® M can only be mounted to trucks weighing 13,500 - 25,000 lbs. [6,120 - 11,340 kg].
10. Make sure that the performance and safety of the TMA is not impaired by damage or corrosion.



This TMA is intended to be used as an impact attenuator on the rear of trucks weighing 13,500 - 25,000 lbs. [6,120 - 11,340 kg]. The TMA must not be used for any other purpose.

11. Regular maintenance of the TMA is critical for proper operation. Refer to the maintenance section of this manual for additional information.
- a. Regular inspection of frame members, cartridges, and fasteners is necessary to ensure proper system performance.
  - b. Regular inspection of hydraulic hoses is critical. A broken or damaged hose will cause the system to operate uncontrollably.
  - c. Clean any hydraulic spills or leakage to prevent bodily injury, fire, etc.
12. The driver shall be cautious while making turns with the TMA in the unfolded position. The TMA extends beyond the end of the truck and will swing wide while turning.
13. This system is an impact attenuator and is therefore used in high risk areas. Stay clear of traffic whenever possible.

14. The Hydraulic Assembly was designed to fold and unfold the TMA. Any other use may be hazardous to people or equipment.
- Do not use the system to push a load.
  - Do not use the raised end of the system to support any load.
  - Do not use any part of the TMA for towing or hauling a load. This could cause the lift mechanism to malfunction and permanently damage the system.
  - Do not use the TMA as a ladder.



Do not leave the TMA raised, even slightly, when deployed.

**BARRIER VEHICLE** - A truck on which a TMA is mounted, while positioned upstream (towards the direction that traffic is approaching) of a work zone.

**SHADOW VEHICLE** - A truck on which a TMA is mounted, which is following behind a moving operation such as striping, spraying, etc.

**THE USE OF A TMA ON THE BACK OF A TRUCK, WHEN IMPACTED WITHIN THE APPLICABLE MASH CRITERIA, HAS BEEN SHOW TO:**

- Reduce the severity of the impact
- Help protect the occupants of the impacting vehicle
- Help protect the barrier or shadow vehicle occupants
- Help reduce damage to the barrier or shadow vehicle

**HAS NOT BEEN SHOWN TO:**

- Affect the skid (roll ahead) distance of an impacted truck

**CONTROLLING SKID DISTANCE (ROLL AHEAD):**

- Skid distance is significantly increased and is less predictable for lightweight shadow vehicles.
- Skid distance is reduced and is more consistent when heavier shadow vehicles are used.
- Required Truck + TMA weight: 15,500 lbs. [7,030 kg] up to 27,000 lbs. [12,250 kg]

# Assembly

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Read and understand all instructions before beginning assembly.

The weight of the vehicle shall be between 13,500 lbs. [6,120 kg] and 25,000 lbs. [11,340 kg] for tested performance.

The system must be attached to the truck by welding parts to the frame. Do not weld on the bottom flange of the truck frame forward of the rear leaf spring hangers to ensure structural integrity of frame. Use certified or professional welders to ensure durable attachment of the TMA system. Disconnect the truck battery before any welding on truck or TMA.

The truck frame must be suitable and accessible for mounting a TMA. If there are any questions regarding the suitability, contact the Customer Service Department for input as to your specific application.

## Shipping List

Check the shipping list against the actual parts.

## Recommended Tools

Check the shipping list against the actual parts.

- Welding equipment (for 1/2" plate) GMAW or SMAW
- Cutting torch
- Hammer
- Drift pin or alignment pin (12" long)
- Tape measure
- 1/2" drive socket wrench w/6" extension
- 1/2" drive sockets (9/16", 1-1/8", 1-1/2", 9/16" deep well)
- Open end wrenches –(9/16", 1-1/8", 1-1/2")
- 12" crescent wrenches – (2)
- Marking implement (pencil, soap stone)
- Drill for 13/16" diameter bit
- 13/16" diameter bit and pilot drill bit for same
- Center punch
- Torque wrench - 90 ft-lb [120 N-m]
- Hydraulic fluid (Dexron™ III fluid only) - Shipped with system
- Floor jack or Forklift
- Work gloves and other personal protection equipment as required
- Bubble level



The above list of tools is a general recommendation. Depending on specific site conditions and the complexity of the assembly specified by the appropriate highway authority, additional or fewer tools may be required. Decisions as to what tools are needed to perform the job are entirely the responsibility of the specifying highway authority and the authority's selected contractor performing the assembly of the system at the authority's specified assembly site.

## **Preparation**

### **1A. Assembly Must Be Performed On Level Surface**

The system's framework is very heavy.

### **1B. Truck Ballast**

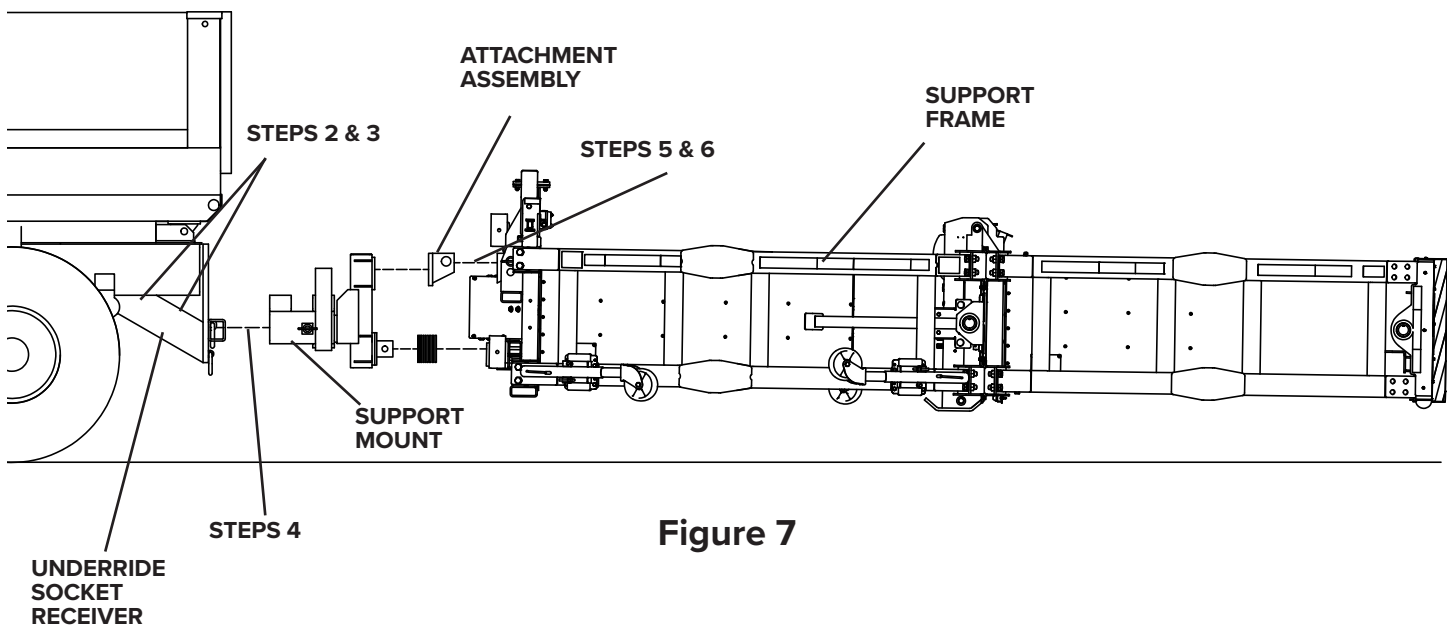
Use a bubble level to verify that the truck is parked on a level surface. The truck shall be as close to the final driving weight as possible. If ballast must be added to achieve the minimum weight, add it at this time. Ballast must be properly anchored to the truck to keep it in place during an impact. Ideally, an adequately sized truck, that requires no ballast, should be used. Because the 2,000 lbs. [910 kg] weight of the rearward protruding TMA is supported by the back of the shadow vehicle, care must be taken not to exceed the manufacturer's published maximum axle loads. To ensure that the driving characteristics of the vehicle are maintained, the manufacturer's recommended center-of-gravity zone shall be followed completely.

### **2. Interference Check**

Before attempting to assemble the Underride, check for interference concerns.

The TMA folds so the Impact Face is very close to the mounting location (p. 25, Figure 25). If you are not using a standard Socket Receiver Hitch Underride skip to Step 8.

Temporarily position the Underride Socket Receiver under truck frame as shown (p. 11, Figure 8) and check for interference concerns. Interference concerns with tail lights, springs, dump bodies (in the folded or unfolded positions), etc., shall be corrected before proceeding.



**Figure 7**



### 3. Underride Assembly

With the truck at its actual driving weight and parked on a level surface, measure the distance from the ground to the bottom of the truck frame. A distance of  $28 \pm 1$ " [ $711 \pm 25$  mm] is required. Spacer Tubes may be added to the bottom of the frame to achieve this height (p. 12, Figure 10).



The truck's springs may settle with the weight of the TMA, sometimes as much as 2" [50 mm]. Adjust the height to compensate for anticipated settling.

Measure from the back end of the frame forward to the rear-most leaf spring hanger. Look for any obstruction on the bottom of the frame that could interfere with the Socket Receiver. A minimum of 12" [305 mm] is required from the back end of the frame forward to the rear-most leaf spring hanger (refer to **Underride Assembly** provided in customer reference drawings).

Position the Socket Receiver at the rear end of the frame so that the 3" x 15-1/4" [76 x 387 mm] flat bar is along the outside of the frame member and the Socket Receiver Assembly is flush with the end of frame. If spacers are required, weld them to the Socket Receiver and lap the Spacer Splices (pieces of 3/8" x 2" x 4" [10 x 51 x 103 mm] flat bar) across the Socket Receiver and Spacer at the rear-most location (refer to **Impact Face Assembly** provided in customer reference drawings). The top of the Socket Receiver shall be  $28 \pm 1$ " [ $711 \pm 25$  mm] from the level ground for proper system height (p. 12, Figure 10).

Weld the Socket Receiver to the bottom of the truck frame with the 3" x 15-1/4" [76 x 387 mm] flat bar on the outer side of the frame (p. 12, Figure 10).

Note: **Prime and paint all welded areas.**



Welding must be performed by professional or certified welder.



The truck frame is high carbon steel. To avoid cracking, do not weld or apply excessive heat to the bottom flange forward of the rear-most leaf spring hangers.

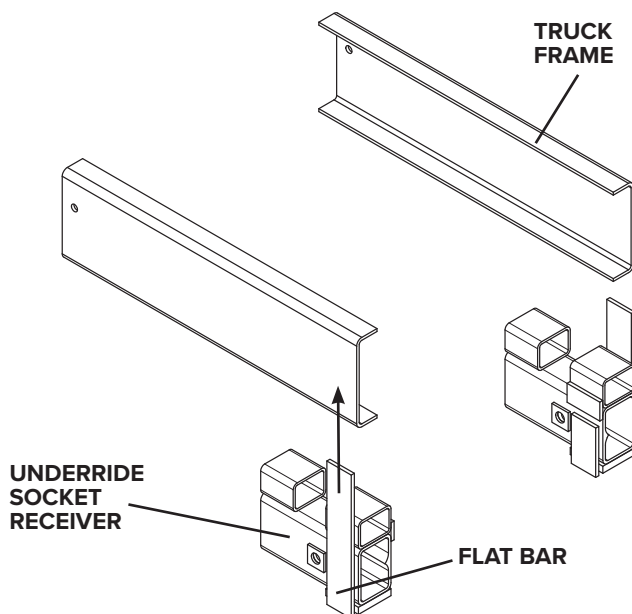


Figure 8

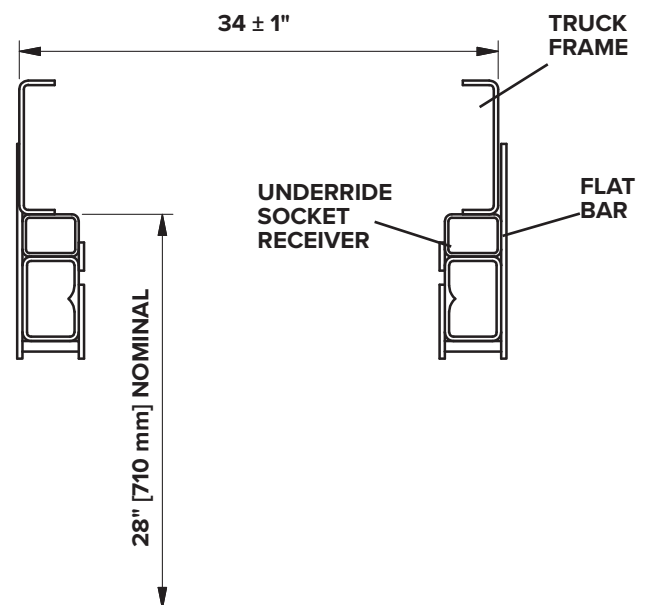
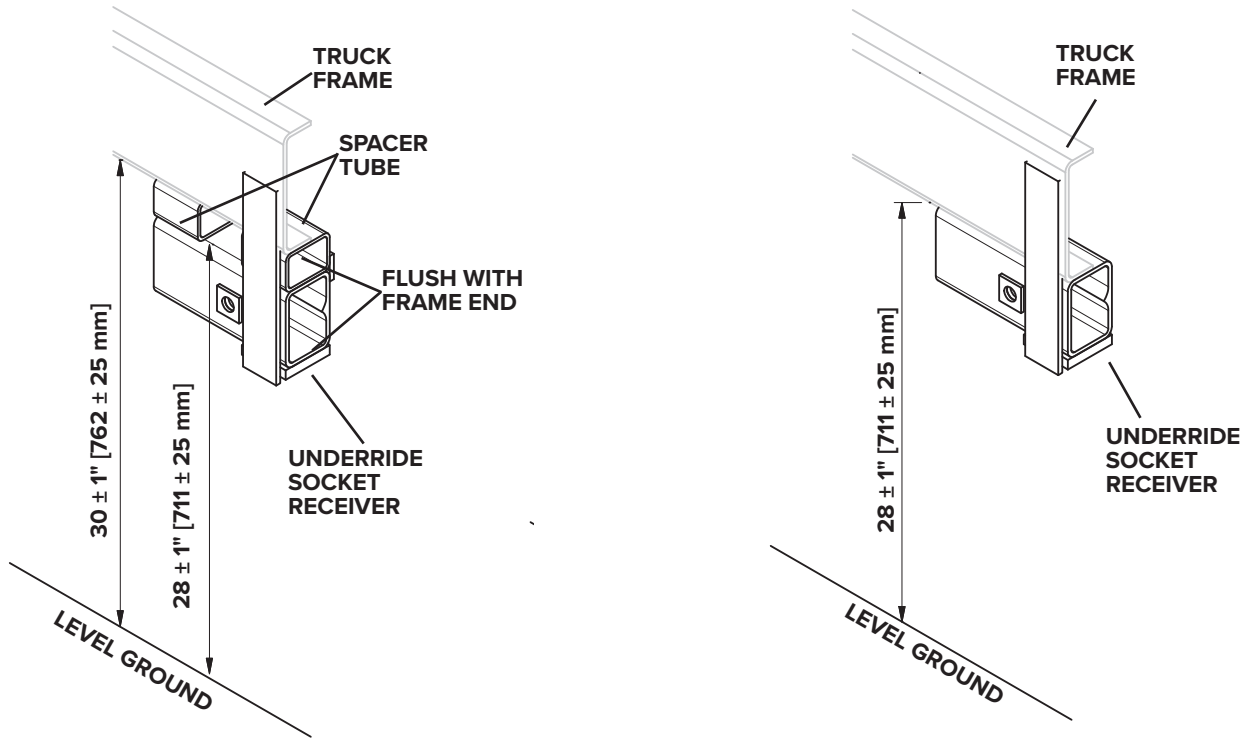


Figure 9



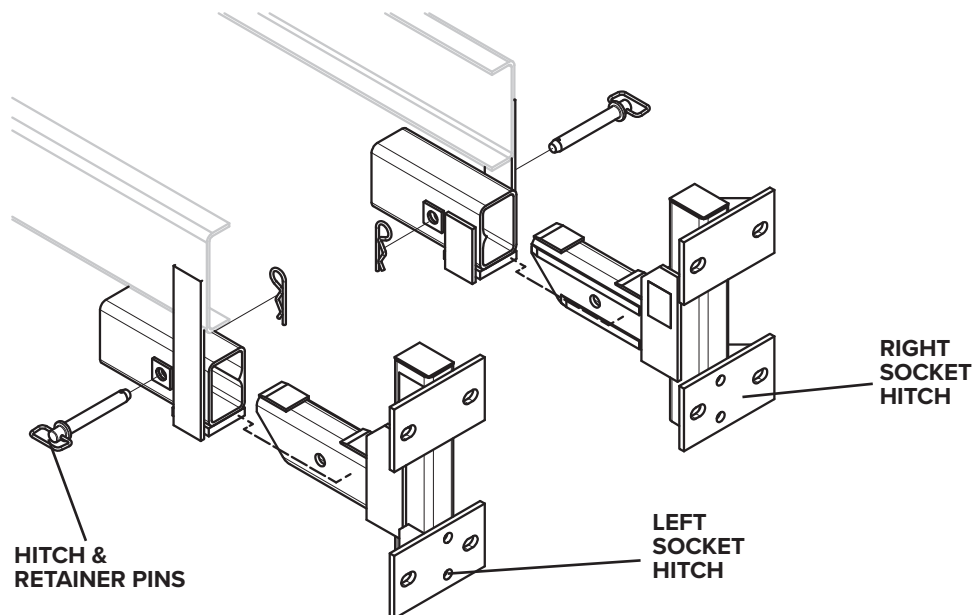
Left and right Underride Socket Receivers must be parallel and level with each other.



**Figure 10 - Socket Hitch  
Left Side Shown**

#### 4. Socket Hitch Assembly

Insert the Socket Hitches and pin them into place using the 1" x 6 3/4" Hitch Pins and Retainer Pins shipped with the system.



**Figure 11**

## 5. Mount the Support Brackets to Socket Receivers

Mount the Support Brackets to the Socket Hitches as shown in Figure 12. Shims are used to level the system. It is recommended that two (2) 1/4" Shims per side be used initially. This may be adjusted once the system is assembled.

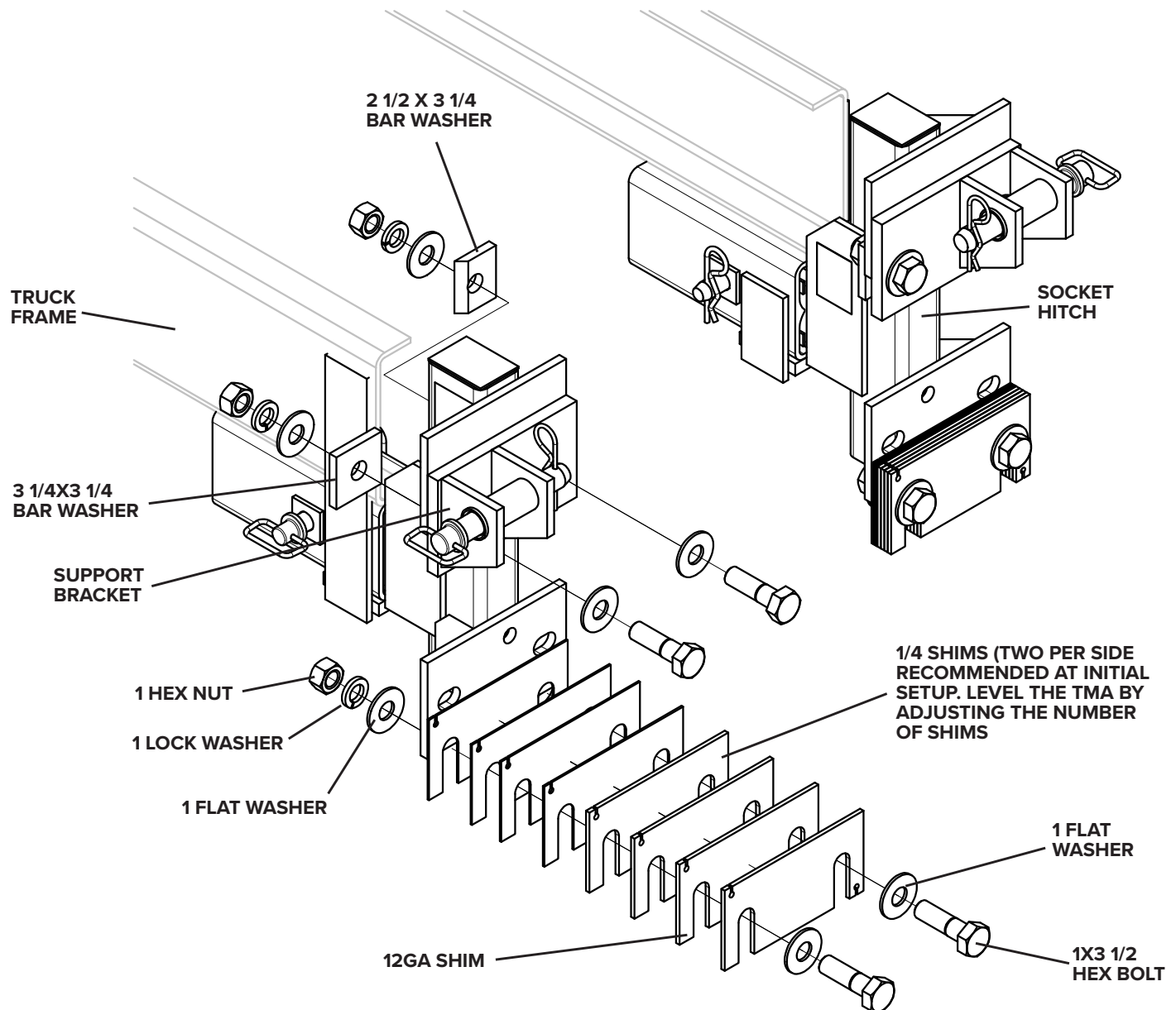
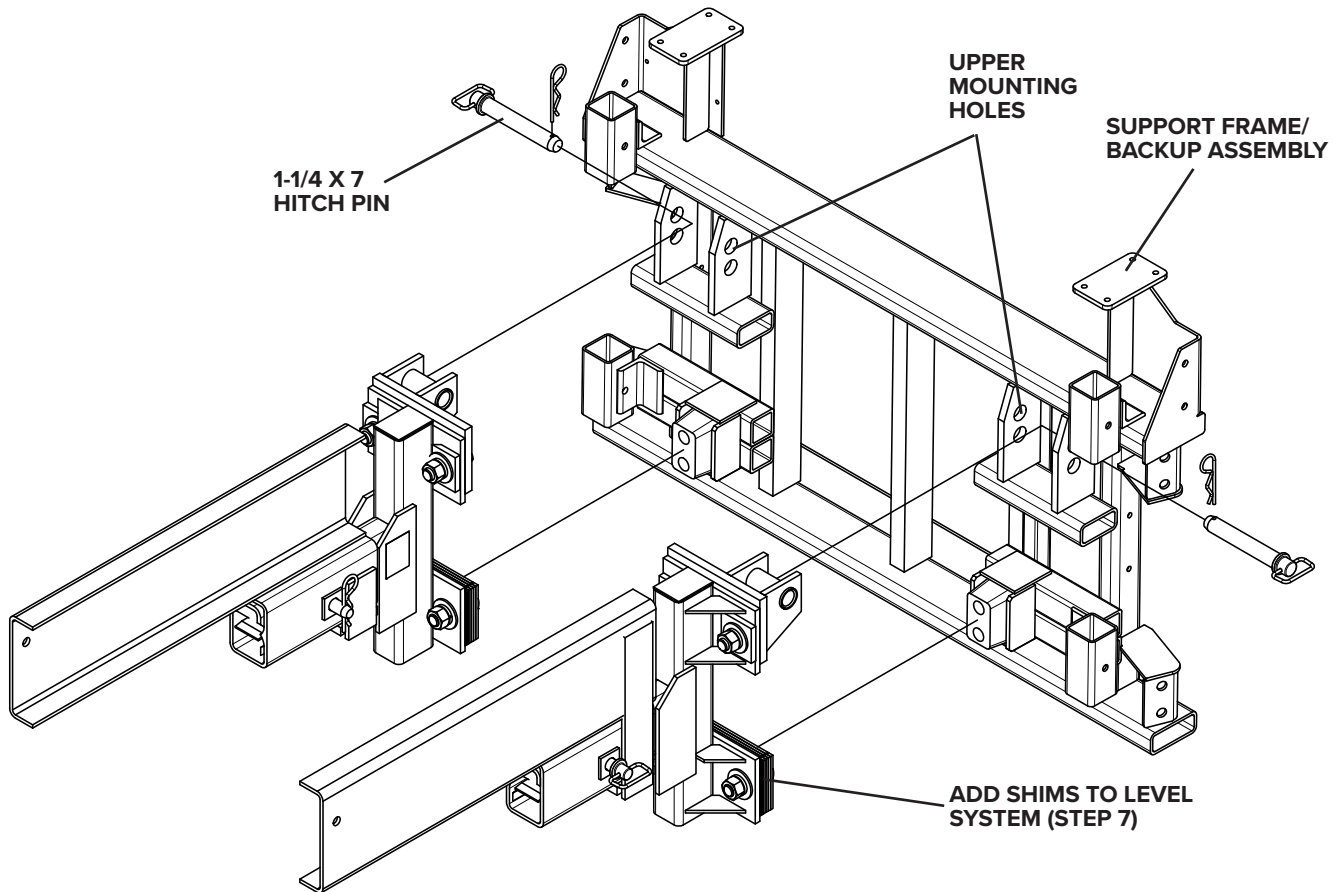


Figure 12

## 6. Attach the Support Frame / Backup to the Attachment Assembly

Move the system to the truck and pin the Support Frame/Backup Assembly to the Support Brackets (Figure 13). The system is to be assembled as a whole unit. Use forklift slings to support the system. Use the upper set of mounting holes for the attachment.



**Figure 13**

## 7. Adjust the Height of the System Frame

Verify that the system frame is  $12" \pm 1"$  [305 $\pm$ 25 mm] from the ground at the rear of the system. It may be necessary to add shims to the Socket Hitch in order to level the Frame (Figures 3 & 12).

## 8. Connect the Lights and Controls

Locate the female TMA Socket Connector in a convenient location on the truck so that lifting or lowering the TMA will not damage the electrical cable. Make sure that the electrical cord on the TMA can reach this location.

For support vehicles with combined tail and clearance lights, connect a jumper between pins 2 and 6 on the backside of the male TMA plug connector (VIEW A-A and Figure 14). Connect the 7-pin plug to the socket on the truck.

The truck battery must be of the proper voltage. The SS180® M is available in 12 and 24 volt versions. Be sure the system and truck are compatible. Use standard safety practices when attaching the battery cables. Attach positive terminal first when connecting and remove the negative cable first when disconnecting the battery. Do not run the battery cables around sharp corners, metal work, or in other areas that could pinch or cut the cables. Connect the battery cable to the buzzer system.



For over-current protection, the positive cable lead coming off the truck battery should be protected with a 70 amp fuse or circuit breaker within 18" of the truck battery.

The controls at the rear of the truck are mounted to both sides of the Support Frame. Securely fasten cable ties to secure any loose wiring to the SS180® M frame. Mount the cab switch box inside the cab within easy reach of the driver and plug in the cab switch box at the mating connector of the TMA.

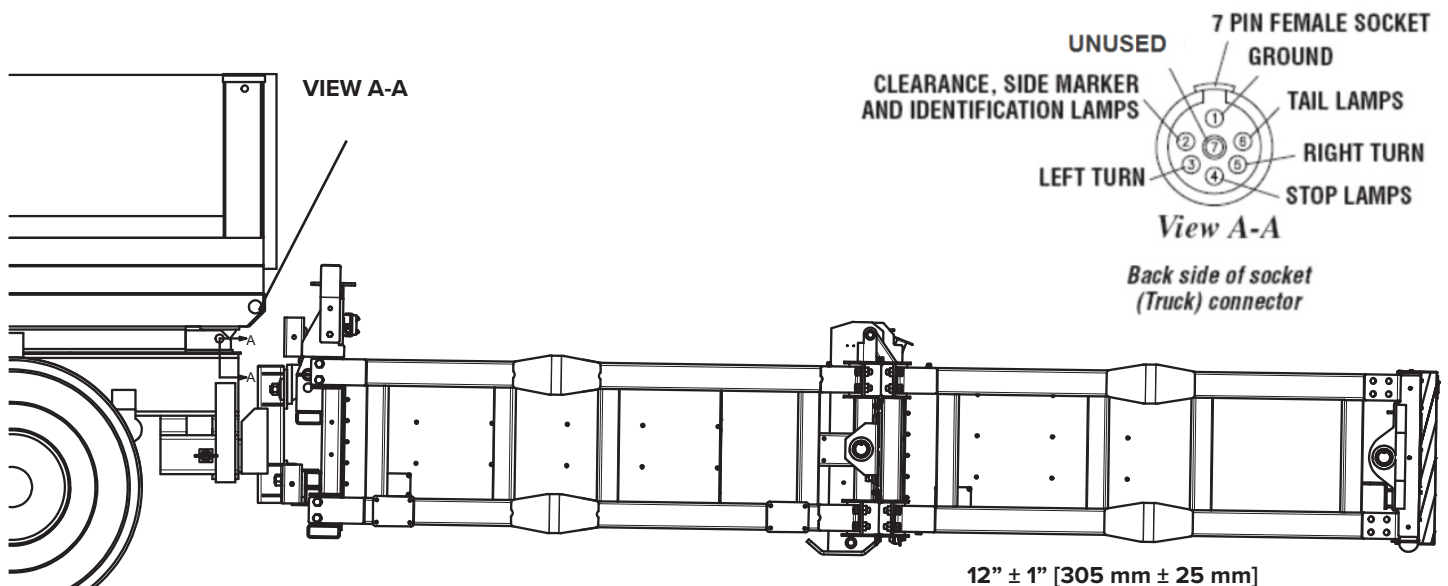


Figure 14



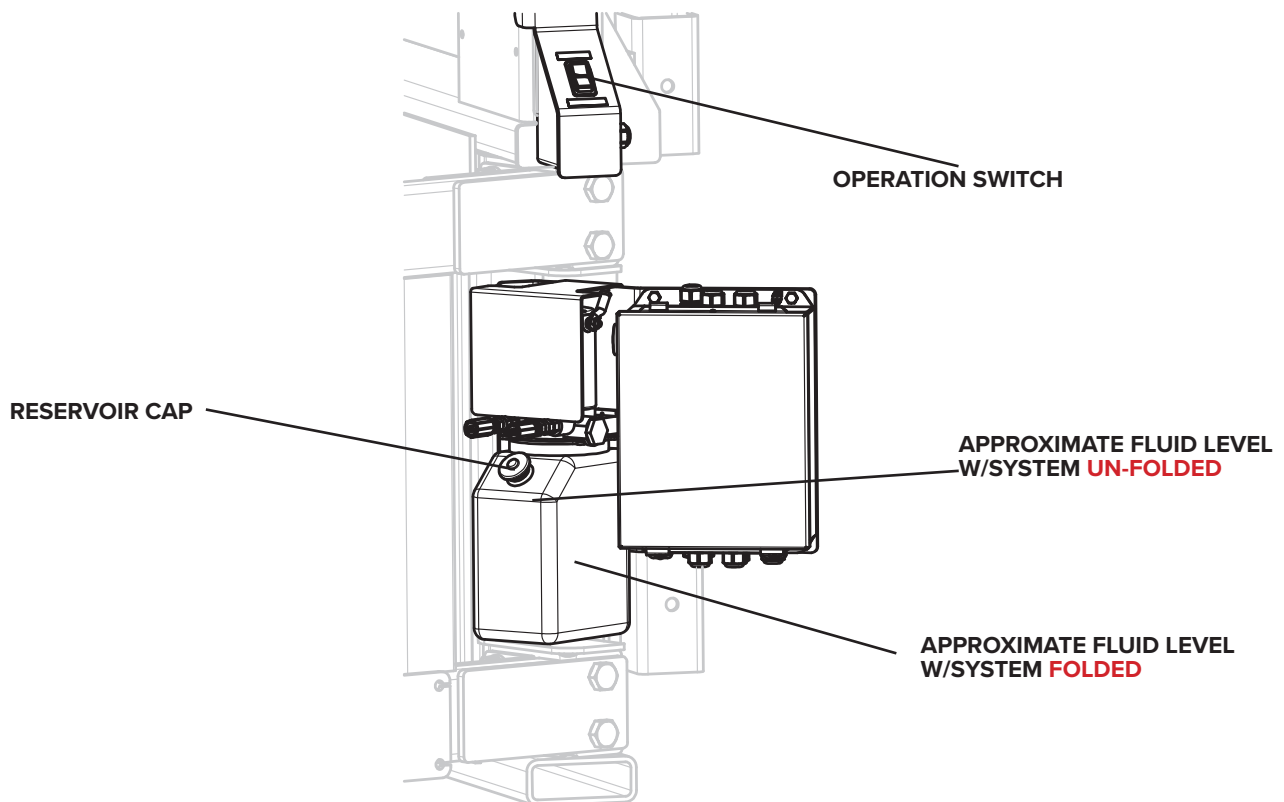
## 9. Check the Hydraulic System

The Hydraulic Assembly is pre-assembled and tested for operation and leaks before shipping. The pump is wired as shown on the Hydraulic Assembly drawing (refer to **Electrical Box, Hydraulic 1-4** provided in customer reference drawings). Before operating the system, check to see if the reservoir has adequate fluid. The fluid level of a folded system should be approximately half full. Add only Dexron™ III ATF fluid. Do not overfill or fluid may leak out when un-folded. Replace the cap in the fill port.

Read Operation Instructions (p. 19; Folding and Unfolding the System). To ensure all electrical and hydraulic lines will not be damaged, use the switch at the rear of the truck to fold and unfold the system twice. Cycling the SS180® M will purge excess air from hydraulic lines and confirm its operational status.



Cycle the system using the cab switches to test controller operation.



**Figure 15**

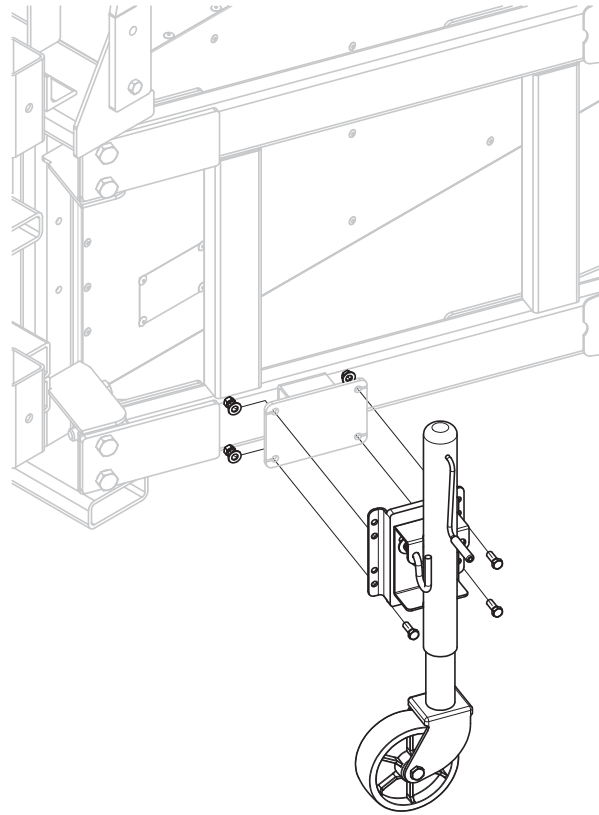
Note: Continuous operation may run down truck battery and/or damage pump.



Ensure both positive and ground cables are connected directly from pump to battery. **DO NOT** rely on chassis or frame for proper grounding.

## 10. Store the Jacks

The Jacks are provided to facilitate the attachment and removal of a folded SS180® M from the truck. Retrieve Jacks set aside earlier and place them in a storage location (Figure 16).



**Figure 16**



Unbolt, remove, and store Jacks when the TMA is in service.

## 11. Verify the Position of the Hydraulic/Electrical Lines

Check the location of all the hydraulic and electrical lines to be sure they will not be damaged while folding and unfolding the system.

## 12. Final System Check

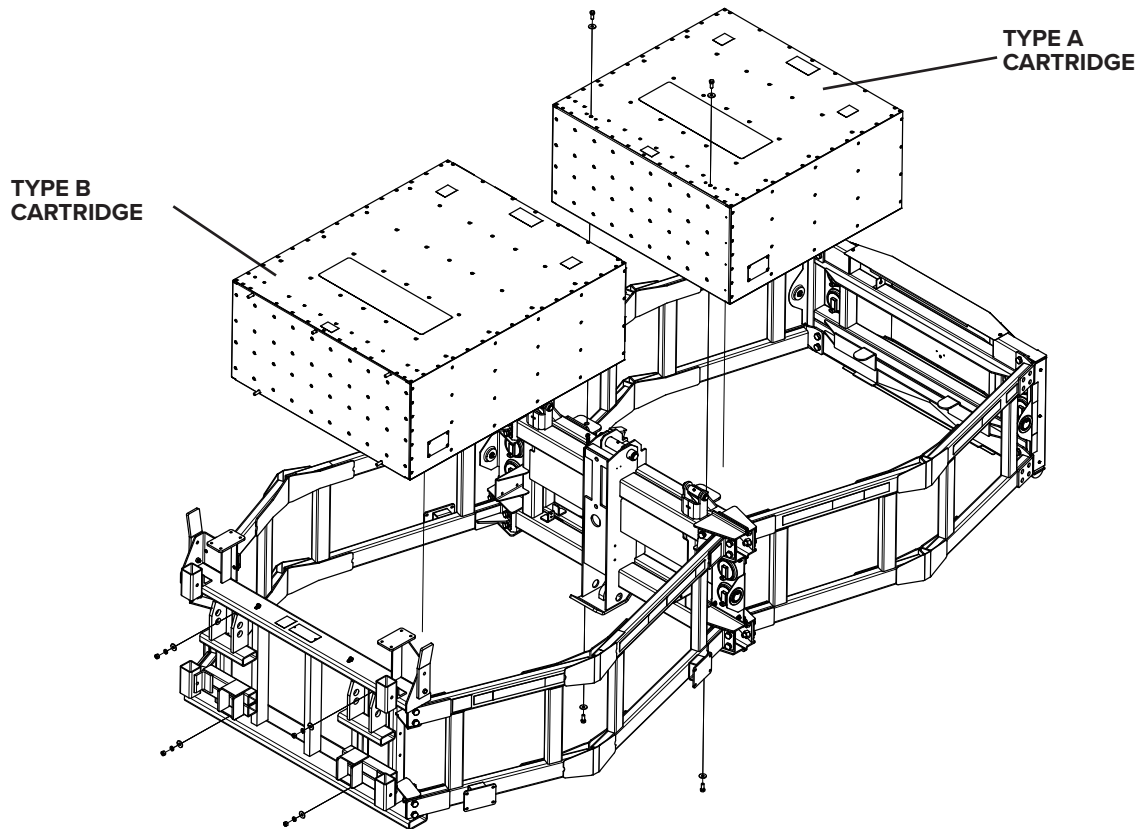
Double check the height and levelness of the system.

## 13. Ready to Use

The SS180® M system is now ready for use. To ensure proper and safe operation, all SS180® M users must be given operating and safety training from this manual and as specified by the owner and local regulations.

## Operation Instructions

Before operating the SS180® M, thoroughly read and understand all Operation Instructions and safety sections of this manual. Verify that the system is properly assembled and in working order. For proper impact performance, the TMA must be equipped with one SS180® M Type A Cartridge and one SS180® M Type B Cartridge, in their proper positions as shown below.



**Figure 17**

The SS180® M has been equipped with a Hydraulic Pump to fold / unfold the unit. The controls are located on both sides of the Support Frame. A set of controls may also be located in the truck cab.

While folding or unfolding the SS180® M from outside the cab, the operator must stand on the non-traffic side of the truck. Always stay clear of moving parts. Never stand underneath the TMA.

## Folding and Unfolding the System



Make sure the area above and behind the system is clear of all objects before proceeding. **Under no circumstances shall anyone be allowed behind the system when it is being folded or unfolded.** When operating from the cab, always be aware of objects behind and above the SS180® M.

Folding and unfolding the system: Truck hydraulics control the hydraulic system on the SS180® M. Use the truck hydraulic controls to fold or unfold the TMA. The SS180® M buzzer system will continue to sound until the TMA is fully folded or unfolded.

The system cannot serve its intended purpose when folded. The SS180® M must be unfolded during shadow or barrier vehicle operations. The truck with a folded SS180® M offers better driving performance. Driving with the system in the folded position is recommended during restricted city driving, driving to and from the work site, and when there is a period of extended high-speed travel between work sites. Be sure to unfold the system before entering a site. The support vehicle must be stopped each time the SS180® M is folded or unfolded.



The SS180® M hydraulic system is only to be operated while the truck is stopped. Jarring or severe bumping of the system while folding or unfolding will cause damage to the system and possible injury to the operator.

Note: The pump is not intended for continuous operation. The folding and unfolding operation has an automatic stop feature. Hold the rocker switch down until the pump motor stops at the fully folded or unfolded position.

# Maintenance

Before performing any maintenance on the SS180® M, thoroughly read and understand the Maintenance Section and the Safety Section of this manual.

## Routine Maintenance

Description	Interval
1. <u>Height</u> - The height of the system is important to its impact performance. Check regularly and adjust as necessary (Figure 18).	<b>As Required</b>

2. <u>Fasteners</u> - Check the tightness of the fasteners. Refer to the Drawing Package for all fastener locations. Check all bolts attaching the Cartridges to the support structure.	<b>Monthly</b>
3. <u>Lights</u> - Replace non-working lights.	<b>As Required</b>
4. <u>Lubrication</u> - Lubricate as described in the Lubrication Section (Maintenance Section - III).	<b>Varies - p.24</b>
5. <u>Hydraulic Ram</u> – Clean the Hydraulic Ram. Remove all residue or debris on or around the ram.	<b>Monthly</b>
6. <u>Hydraulic Hoses</u> – Check all Hydraulic Hoses for damage, leaks or cracks. Replace damaged or leaky hoses.	<b>Each use</b>
7. <u>Clean System</u> - Clean the system frame, Cartridges and Impact Face from dirt and salt. Always check lubrication after cleaning.	<b>Monthly &amp; each use when salt &amp;/or snow are present</b>

Figure 18

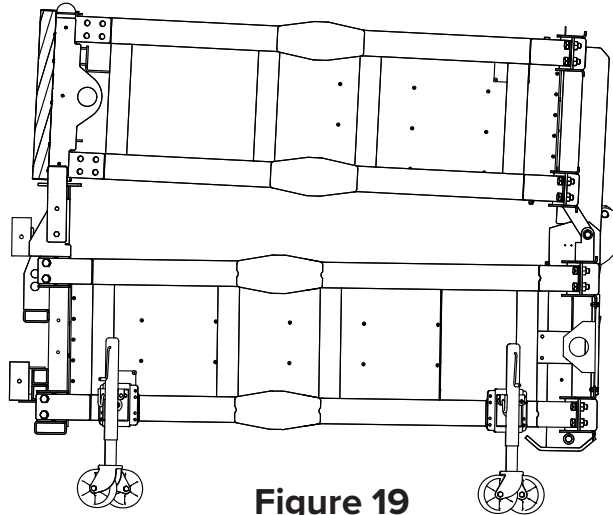


## **Detaching and Attaching the System**

### **1. Detaching the System from the Truck**

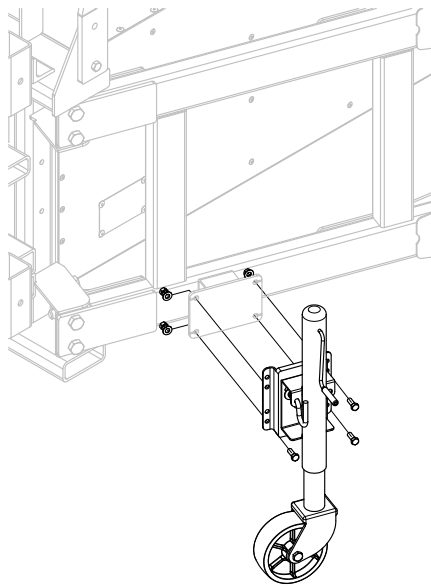
Ensure the TMA and the truck are on level ground

- a. System is in the folded position
- b. Attach Jacks as shown in Figure 19 & 20
- c. Crank the Jacks until the weight of the system is supported

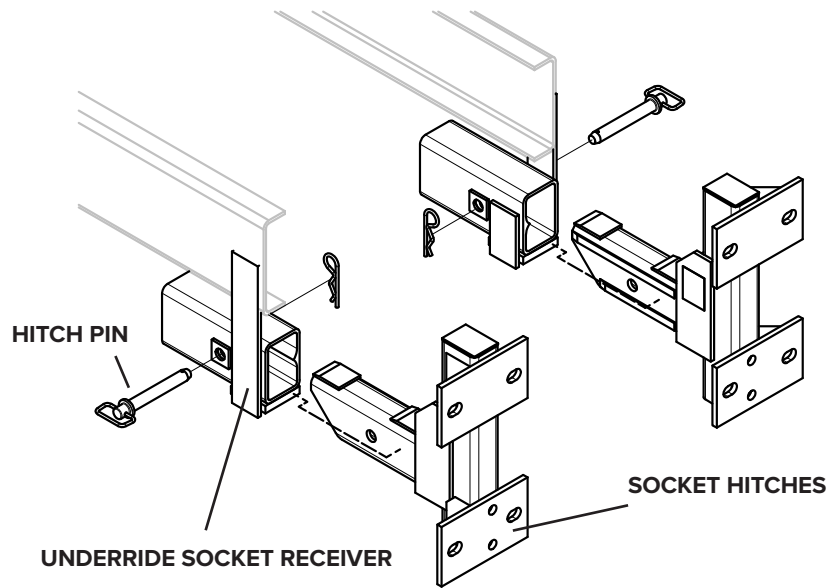


**Figure 19**

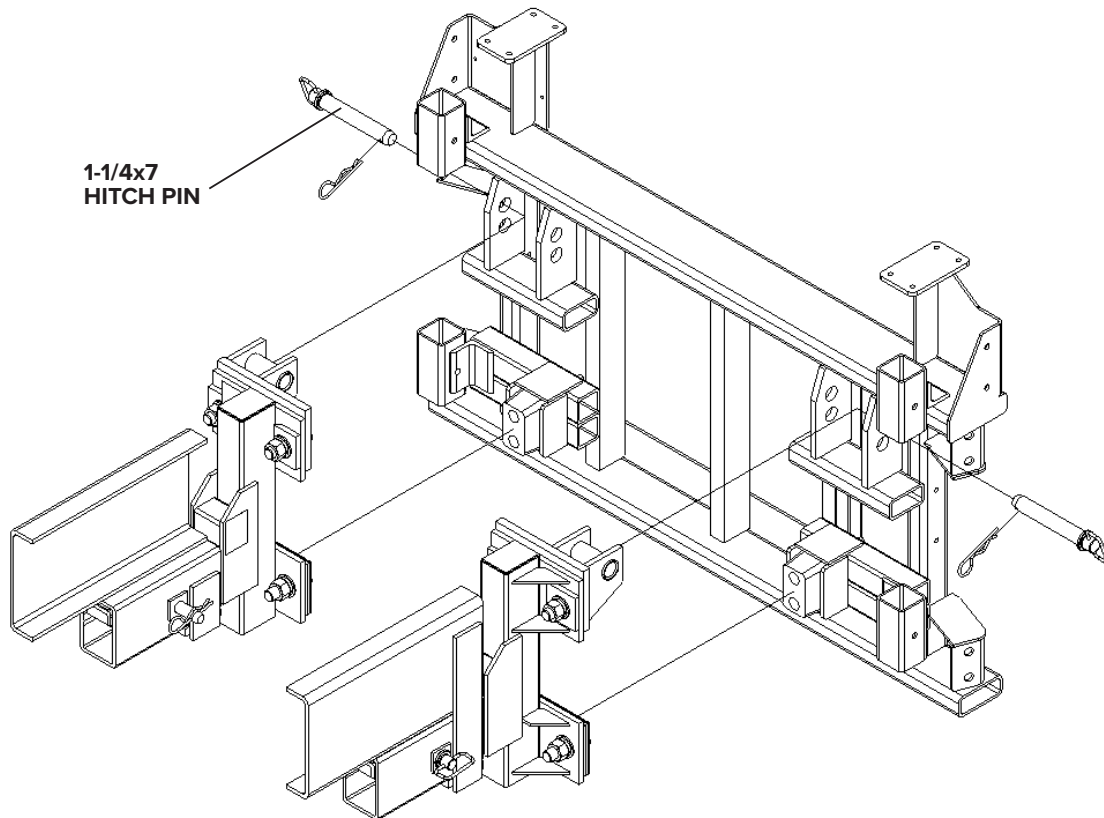
- d. Unplug the light harness and disconnect the positive and negative cables from the pump. Unplug the Cab Switch Box at the mating connector on the TMA.
- e. Remove the Socket Hitches from the Underride Socket Receivers by removing both 1 x 6 3/4" hitch pins and retainer pins (Figure 21). (If the alignment is off, making removal difficult, it may be necessary to adjust Jacks or temporarily disengage the TMA from the Socket Hitches. This can be done by removing the two (2) 1 1/4 x 7" Hitch Pins and Retainer Pins as shown in Figure 22.) Loosen the hardware to ease interference and then retighten.
- f. Roll the TMA away from the truck.



**Figure 20**



**Figure 21**



**Figure 22**

## 2. Attaching the System from the Truck

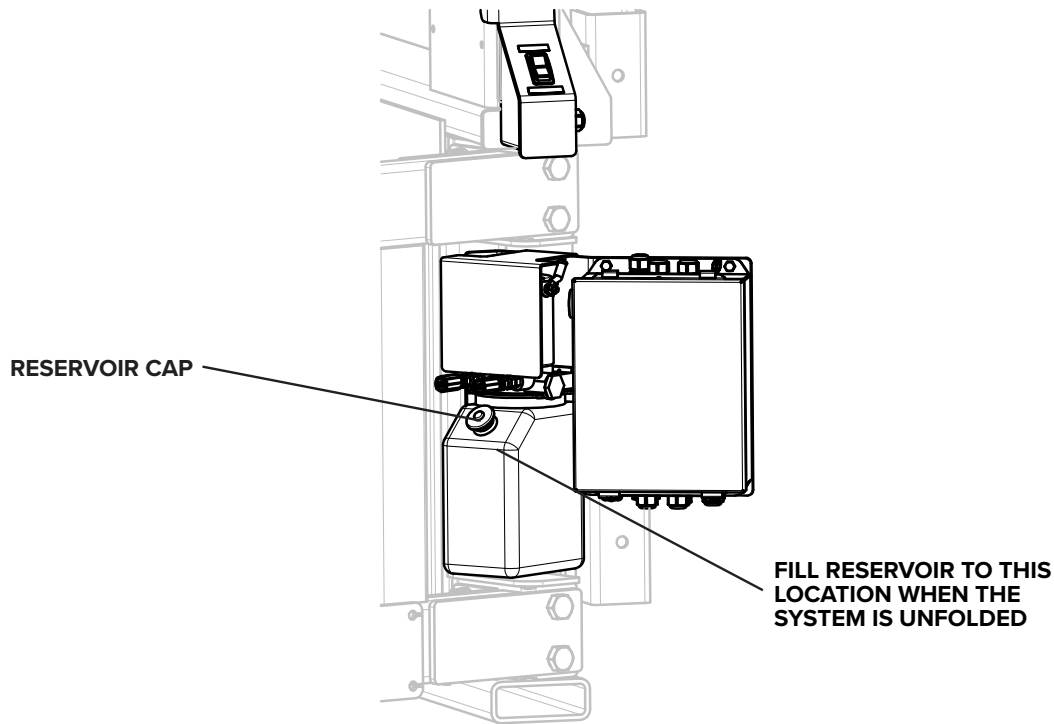
- a. Roll the TMA to the truck.
- b. Insert the Socket Hitches into the Underride Socket Receivers and pin them into place using 1 x 6-3/4" pin and retainer pin (Figure 21). If alignment is off, making the assembly difficult, it may be necessary to adjust Jacks or temporarily uncouple the Socket Hitches from the TMA. Ensure the retainer pins are inserted correctly and cannot fall out.
- c. Plug in the light harness and connect the positive and negative cables to the pump. Plug in the Cab Switch Box to the mating connector on the TMA.
- d. Retract the Jacks completely and remove them from the TMA.
- e. Store Jacks for future maintenance or repair.
- f. Check hydraulic/electrical system for proper operation.
- g. F. Verify system is 11"-13" [280-330 mm] above level ground at Rear Impact Face.

## **Lubrication**

When handling hydraulic fluid, use appropriate measures to prevent spillage. Clean any spillage immediately.

### **Add Hydraulic Fluid**

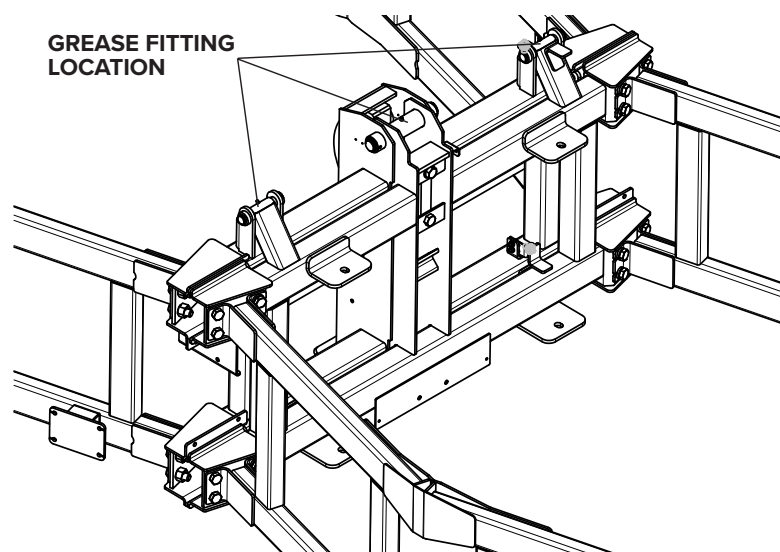
Add hydraulic fluid as required and check the fluid level monthly. The reservoir is full when the fluid level is filled to the location indicated below when the system is unfolded. Use only Dexron™ III ATF Hydraulic fluid.



**Figure 23**

### **Grease Pivot Points**

Figure 24 shows three (3) pivot locations equipped with grease fittings that require periodic lubrication. To prevent excessive noise and/or wear grease the locations shown below as required.



**Figure 24**

Technical Specifications

1. Weight

	lbs.	kg
Type A Cartridge	130	59
Type B Cartridge	196	89
Frame Components	1635	742
Jacks	72	32
Total	2033	922

2. Dimensions

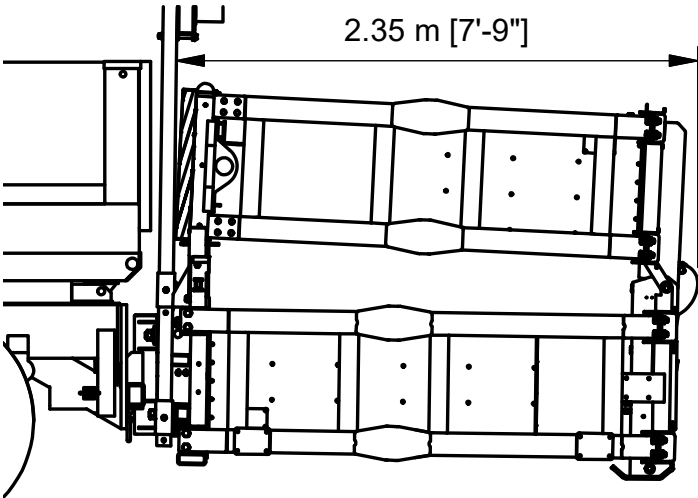


Figure 25

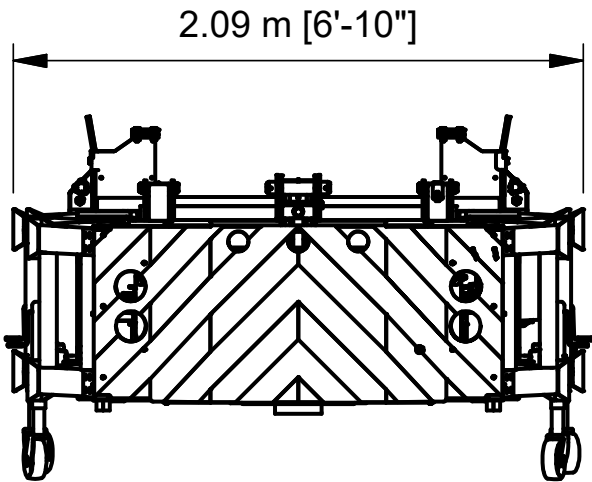


Figure 26

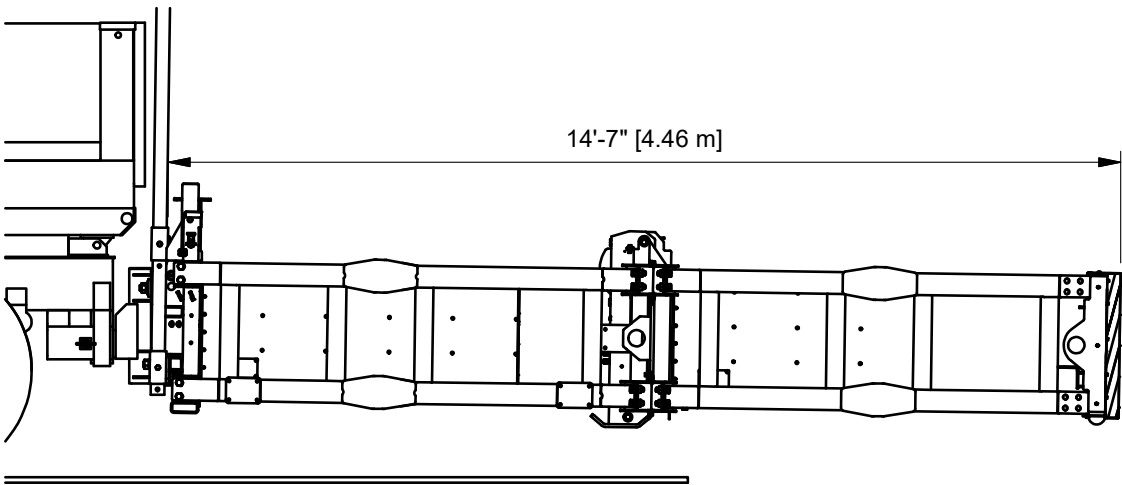


Figure 27

3. Replacement Parts

Refer to the drawing package for replacement part numbers and descriptions. Contact customer service for replacement parts (p. 1).

4. Operating Rates

The system **folds and unfolds** in approximately 35 to 40 seconds



# Repair Instructions

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## Post Impact



Only the correct parts manufactured specifically for this product by Valtir may be used to repair a damaged system. Failure to comply may result in damage to the system and/or an untested effect on the impacting vehicle, to and including injury or death.

### 1. Inspect The Frame For Bent Parts

Replace all frame members that have been damaged. Do not attempt to weld or straighten parts. Replace the arms in pairs. Refer to the system drawings for the part numbers and descriptions of the parts.

### 2. Replace Frame Arm Mounting Bolts

Replace all Frame Arm Mounting bolts. Refer to the system drawings for the part numbers and descriptions of the parts. All frame attaching bolts are 3/4"-10 G5, Zinc plated cap screws with 3/4"-10 G5, Zinc plated nuts. Split lock washers are placed under the head of the cap screws on all fasteners interior to the arm attachment of the FWD section and attachment of the mid-frame in the REAR section. All outer fasteners are tightened to 120-130 ft-lbs. [163-176 Nm]. The interior fasteners are torqued to 55-60 ft-lbs. [75 81 Nm]. All fasteners must have thread locker (Red Loctite® 262 recommended) applied to the threads prior to assembly (refer to **Support Frame Assembly** provided in customer reference drawings).

### 3. Remove Cartridges

Remove the crushed Cartridges.



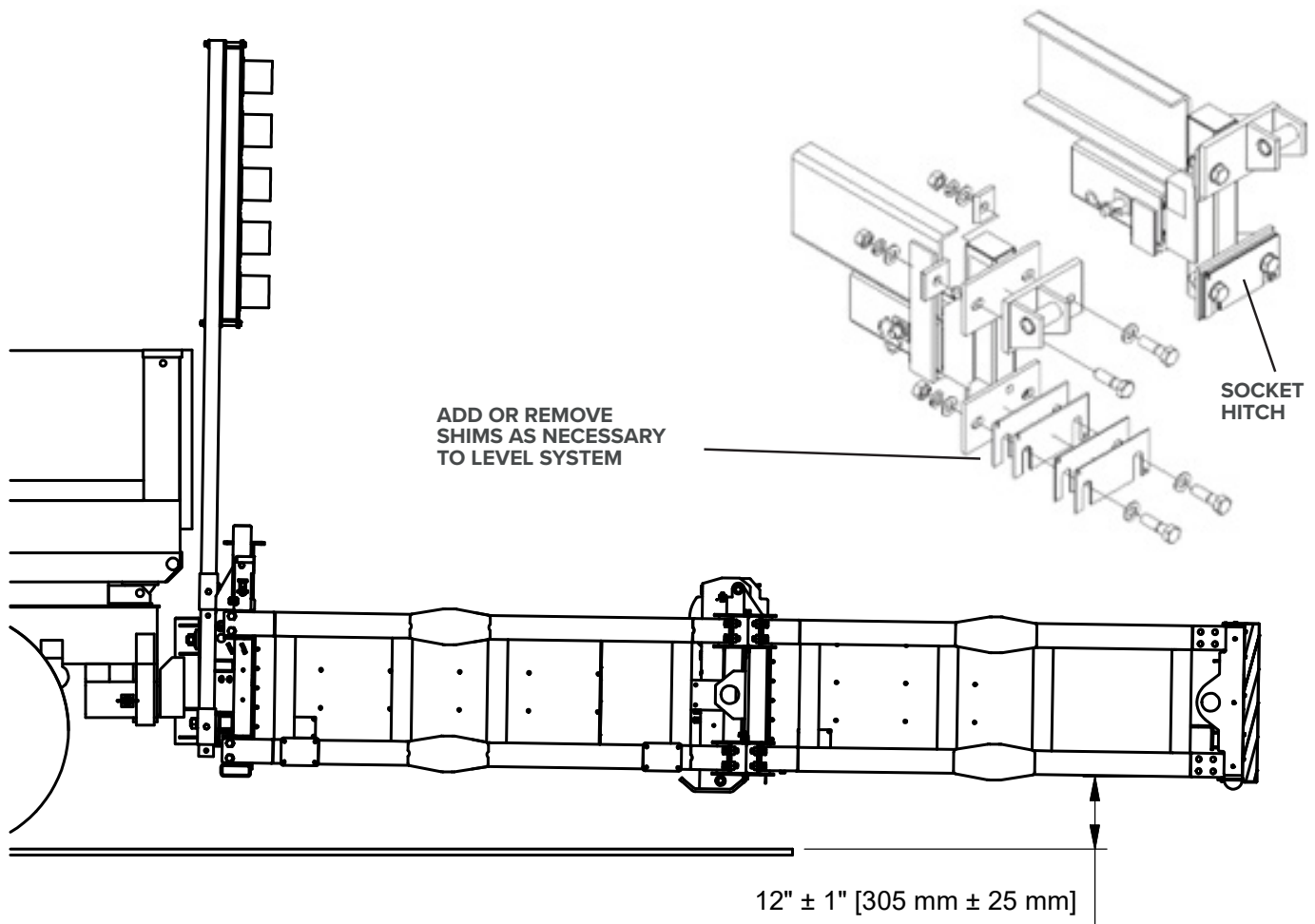
Do not attempt to repair damaged Cartridges. To ensure full impact capacity, the cartridges must be replaced even if slightly crushed.

### 4. Assemble Cartridges (p. 17, Figure 16)

Using a forklift and sling, place the Type B Cartridge in position and secure it using the flat washers, lock washers and nuts provided. Torque the nuts to  $90 \pm 5$  ft-lb [120±7 N-m]. Insert the Type A Cartridge between the mid-frame flanges and anchor it to the assembly with 1/2-13 G5 hex cap screws and 1/2" flat washers. Use medium threadlocker on the bolt threads (Blue Loctite® 242 recommended). Torque bolts to  $65 \pm 5$  ft-lb [88±7 N-m] (refer to **Cartridge A** and **Cartridge B** provided in customer reference drawings).

## 5. Adjust the Height and Levelness of the System Frame

Verify that the System Frame is  $12'' \pm 1''$  [ $305 \pm 25$  mm] from the ground at the front and rear of the system. It may be necessary to add shims to the Socket Hitches in order to adjust the levelness of the Cartridge (Figure 28).



**Figure 28**

## 6. Verify Position of Hydraulic / Electrical Lines

Check the location of all the hydraulic and electrical lines to make sure they will not be damaged during the folding and unfolding of the system.

## 7. Check System Lights for Proper Operation

Verify that all the turn / stop / tail / lights are working properly and replace all non-working light assemblies.

There are two light circuits on the TMA. Verify both circuits are operational.

Raise the system to folded position and verify secondary lights are working.

With the system unfolded, lights on the Impact Face and Mid Frame will be on.

With the system folded, the lights on the Mid Frame will be on and the lights on the Impact Face will be off.

## 8. Final check

Each fastener is in place and properly tightened

## 9. Ready to Use

The system is now ready for service.

# Troubleshooting Guide

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## **Safety Notes** – See Troubleshooting Decision Trees on page 37.

1. Always wear eye protection when working on or around machinery or power tools, and while working with hydraulics.
2. Do not attempt to control a hydraulic leak with your hand. High-pressure hydraulic fluid can puncture the skin and cause severe injury or death. Use extreme caution when working on hydraulic systems.

In general, consult Valtir Customer Service if problems with operating or repairing the TMA arise (p. 1). This guide is meant to be an aid for performing minor repairs, not a detailed repair manual.

**Note:** For any problems not listed here, contact Valtir Customer Service.

## **Test Equipment**

The following is a recommended list of the test equipment required to troubleshoot DC powered hydraulic systems.

### **1. Gauge**

A 5000 psi [34.5 MPa] pressure gauge, preferably glycerin filled, is a valuable and relatively inexpensive tool for checking fluid pressure in the various sections of the circuit.

### **2. DC Test Light**

A test light is a light bulb with one lead wired to an alligator clip and the other lead connected to a metal probe. It is used to check for the presence of a voltage in the electrical circuit. With the alligator clip grounded, the light glows when the probe comes into contact with a hot electrical component.

### **3. Continuity Light**

A continuity light is like a test light but contains its own battery. It is used for testing electrical circuits when the components are not connected to a power source.

### **4. Volt Meter**

A DC voltmeter can be used to troubleshoot voltage problems. Two common uses are: 1) Ground one probe while using the other to probe hot leads in search of the available voltage at the point where the second probe is connected. 2) Measure a voltage drop in a wire or component by connecting one probe to one end and the remaining probe to the other end of the item in question.

### **5. Ohmmeter**

**Note:** All tests conducted with an ohmmeter must be done with the power source disconnected from the system.

An ohm meter is used to measure resistance and is useful when working with solenoid coils. On some coils the wire resistance is large enough that a DC test light might not illuminate, falsely indicating an open circuit (infinite resistance). A successful coil test, however, shall always show some non-infinite value of resistance.

### **6. Assorted Hoses, Pressure Fittings**

These can be used to connect and/or isolate certain parts of a hydraulic circuit for diagnosing hydraulic problems.

If you suspect problems, do not operate the system. Diagnose and repair, or contact Valtir Customer Service Department for input as to your specific application.

## Hydraulic Fluid

### 1. Purpose

The main purpose of hydraulic fluid is to transfer power from the truck hydraulic pump to the actuators. Secondary tasks include reducing metal on metal friction and preventing the formation of rust and sludge. These traits are achieved when the oil has a good lubricity (slipperiness), and with additives that inhibit oxidation and the entrainment of air and water in the oil, respectively. The viscosity (thickness) of the oil **must be appropriate for the operating temperature to minimize unwanted leakage and to lubricate the close fitting parts in the system.**

Additionally, the oil must be compatible with the seals used in the system. Finally, the oil must be able to pour or flow at the lowest expected operating temperature so that it can enter the reservoir and truck hydraulic pump for use. For all of these reasons, automatic transmission fluid (ATF, Dexron TM III) has been found to be the best readily available fluid for the job in most climate conditions.

### 2. Selecting Fluids for Applications Outside ATF'S Temperature Range

When looking for fluids that can be used in place of ATF or for applications where the operating temperature is outside the range of ATF, the following specs should be discussed with your local oil distributor:

- a. Fluid must be compatible with Buna-N sealing compounds.
- b. The pour point of fluid used must be below the lowest anticipated temperature.
- c. Fluid should contain Rust or Oxidation inhibitors as well as other detergent type inhibitors.
- d. Fluid viscosity (SUS) must have an operating range between 80 and 375, with the ideal viscosity near 200 SUS.
- e. The viscosity index should be as high as possible. As an example, ATF has the following specs listed for most oil manufacturers:

[1] Viscosity	(SUS)
99° F [37 ° C]	185 to 205
210° F [99 ° C]	45 to 55
Pour Point	-47 ° F [-44° C] to -35 ° F [-37° C]
Viscosity Index	145 to 165

## **Hydraulic System Check**

### **Finding & Solving Problems**



Contact Valtir Customer Service Department for advice on repair or replacement of TMA parts. All replacement components must be approved for use or provided by Valtir.

Hydraulic system failures can occur in several ways: A gradual or sudden loss of pressure or flow, a loss of power at the truck hydraulic pump, or other difficulties. Any of the system's components could be the cause. Start with the appropriate checklist below.



Do not use Teflon™ tape on hydraulic fittings as it can easily jam valves and cause failures in the hydraulic system.

#### **1. Motor Does Not Start**

- Improper ground. Check ground conditions.
- Improper or low voltage supply. Check voltage supply from truck battery and at pump.
- Electrical system inoperative: Verify that cable from battery is correctly attached.
- Failed motor solenoid: Replace, taking note of correct wire locations for reassembly.

#### **2. Rough or Erratic Performance**

- Insufficient or no oil in system, pump losing prime: Fill system, check for leaks.
- Ground fault: Check for loose wire leads, verify that pump is securely mounted to TMA frame and that the truck lighting plug is correctly attached. Ensure ground wire from pump is directly routed to the truck battery.
- Wrong oil in system (should be ATF Dexron TM III): Change Oil.
- Clogged or dirty cylinder check valve: Remove load on the cylinder, disassemble cylinder check valve and clean (See section on Cylinder Check Valves).
- Oil line is restricted, dirty, or collapsed: Clean or replace oil line.
- Dirty pump: Clean exterior and check for contaminated oil. If necessary, drain, flush, and refill system with ATF Dexron TM III.
- Worn components (valves, cylinder, etc.): Check for cause of wear. Replace worn parts with correct components.
- Leakage: Check all components, verify tightness of fittings, and inspect hoses for wear while system is idle. Replace damaged hoses or fittings.
- Excessive loading (especially any features not originally installed by Valtir): Remove excessive load.

#### **3. Operates Slowly or With Cavitation**

- Low voltage: Verify voltages with DC voltmeter and check truck charging system.
- Oil viscosity too high or cold oil: Allow oil to warm up before operating or replace with lower viscosity oil as necessary.
- Air in system: Check for leaks and tighten as necessary. Cycle the system several times to relieve air from system.
- Oil leaks: Tighten fittings, replace seals or damaged lines.
- Worn components (valves, cylinder, etc.): Check for cause of wear. Replace worn parts with correct components.

- Restriction in lines or cylinder check valves: Remove load on the cylinder, clean lines or valves, and replace hoses if necessary.

#### **4. Operates Too Fast**

- Internal fixed flow controls reversed: Contact Valtir

#### **5. Pump Overheats**

- Low voltage at pump: Check battery and wiring
- Incorrect, low volume, or dirty oil: Add or change oil as necessary
- Excessive internal leakage (pump): Replace the pump (contact Valtir).
- Restriction in lines or cylinder check valves: Remove load on the cylinder, clean lines or valves, and replace hoses if necessary.
- Insufficient heat radiation: Clean dirt and mud from reservoir and components.

#### **6. Noisy Pump**

- Low voltage at pump: Check battery and wiring
- Incorrect, low volume, or dirty oil: Add or change oil as necessary
- Excessive internal leakage (pump): Replace the pump (contact Valtir).

#### **7. Load Drops When Locked**

- Leaking cylinder seals or fittings: Remove load on the cylinder, inspect for damaged hoses or fittings, tighten fittings or replace hoses if necessary.
- Faulty counterbalance valve: Remove load on the cylinder. Clean or replace the appropriate counterbalance valve components.

#### **8. Leaky Cylinder**

- Seals worn or damaged: Replace the cylinder.
- Rod damaged: Replace the cylinder.

### **Pressure Relief Valve**

#### **1. Purpose**

- A. Limit the maximum pressure in the hydraulic system to a safe level.
- B. Keep the motor amperage (and battery drain) at a minimum when the cylinder dead heads (reaches full stroke).

#### **3. Adjusting Relief Valve (pump)**

**Note:** In general, do not adjust the relief valve. It is set to the correct operating pressure at the factory.

- A. Symptoms of incorrect pressure relief adjustment.
  - 1) Relief pressure too low.
    - a. Battery current draw is excessive
    - b. Motor RPM is slow
  - 2) Relief pressure too high.
    - a. Motor RPM is fast
    - b. System will not fold (cylinder will not extend).
    - c. Excessive turbulence in reservoir.



Contact the Valtir Customer Service Department for all replacement parts or components.



Do not exceed pressure rating for hydraulic system components. The system pressure of the SS180® M is factory set to 2400 psi [MPa 16.5].

## Counterbalance Valve

### 1. Purpose

The counterbalance valve allows free flow of hydraulic oil into and out of the cylinder but blocks the flow when there is no truck hydraulic pump pressure. The counterbalance valve locks the system when the truck pump is not running.



When the system is stopped at an intermediate angle, there will be pressure on the oil in the hoses between the counterbalance valve and cylinder. This pressure is supporting the load of the folding bay. **ALWAYS** make sure the TMA is completely folded or unfolded before loosening a hose fitting or servicing any check valve. This will minimize the chance of injury from an uncontrolled falling load or spray of high-pressure oil. Never stand underneath the TMA when performing any service or component check.

### 2. Repairing Counterbalance Valve

#### A. Symptoms

If the TMA exhibits a slow drifting of the folding bay when the truck hydraulic pump is not running, one of the following may be true:

1. The counterbalance valve has become blocked by foreign debris in the oil (hydraulic) line.
2. The piston ring seal inside the cylinder has been compromised.

#### B. Repair procedure

##### 1. Blocked Cartridge

- a. Ensure the system is completely folded or unfolded.
- b. Remove the Cartridge from the valve body, being cautious of oil spray from residual pressure in the system.
- c. Clean the Cartridge using compressed air, making sure to direct the air away from anyone's face. Avoid breathing the oil mist that this process may create.
- d. Reinsert the Cartridge as they were before disassembly.

##### 2. Piston ring seal

- a. Refer to the following section on the Hydraulic Cylinder.



If the counterbalance valve has failed in some other way, do not attempt to repair it. Replace it with a new valve by contacting Valtir Customer Service Department (p. 1).



## Hydraulic Cylinder



Never allow anyone underneath the moving portion of the SS180® M. Block out all loads and disconnect electrical contact prior to performing any service on hydraulic equipment.

### 1. Troubleshooting

If you suspect problems with the hydraulic cylinder on the TMA, you may need to remove the cylinder from the TMA for repair or replacement. The cylinder can only be removed when the TMA is completely folded. Double check all electrical contacts between the TMA and support vehicle have been disconnected prior to performing any work on the hydraulic system.

A cracked, bent, or leaky cylinder may need repair but will almost always be replaced to ensure reliable performance.

### 2. Cylinder Replacement

- A. Completely fold the TMA.
- B. Unplug all electrical connections between the TMA and the support vehicle.
- C. See Hydraulic Cylinder Assembly drawing on page 47. Loosen (but do not disconnect) the “Follower Link Pivot” and the “Push Link Pivot” where they are bolted to the “Weldment, Front Intermediate Frame” and the “Weldment, Rear Intermediate Frame”, respectively.
- D. At the top end of the cylinder rod, loosen the set screw and push out the short 1” diameter pin, making note of the alignment and location of all linkage components for later reassembly.
- E. Disconnect the hoses leading into the cylinder at two convenient locations and place temporary caps on hoses and cylinder ports to prevent spillage or contamination.
- F. At the bottom end of the Cylinder body, remove the Cotter Pin from the Clevis Pin and push out the long 1” diameter pin, making note of the alignment and location of all components for later reassembly.
- G. The cylinder should now be free. Reinstall a new cylinder in the reverse order of these removal steps, making sure to properly align and (where necessary) tighten all components. Use blue thread locker (medium strength) on all fasteners.

**Note:** See the section on Hydraulic System Priming (p. 34). You will likely need to prime the system if you are installing a new or “dry” cylinder.

### 3. Cylinder Replacement

Replace any faulty or damaged cylinder with a new cylinder.

## Hydraulic System Priming

SS180® M hydraulic system priming will only be necessary after changing the oil or if you have recently repaired a leak.

### Priming Process

Systems that have been disassembled for repair require priming for proper performance. The hydraulic system is said to be primed when all hoses and the cylinder are full of oil and the air has been expelled. The reservoir will be full of oil (oil just visible at the filler port) when the TMA is FOLDED. Prime the pump as follows:

- A. Detach the long hoses where they connect to the cylinder. Note which hoses connect to the top and bottom of the cylinder.
- B. Jog and pump by briefly depressing the “UNFOLD” button until clean oil flows from two of the hoses.
- C. Repeat this process for the other two hoses by briefly depressing the “FOLD” button.
- D. Replace and retighten all four hoses.



Do not completely fold or unfold the TMA until it has been jogged a few times to work out any air in the system. Add oil at the filler port any time that the pump begins to cavitate.

- E. Jog the system a few times by depressing “FOLD” or “UNFOLD” depending on the current position of the TMA.



Remove all rings, watches, jewelry, etc. prior to doing any electrical work!

### Check for These Problems When a System Fails to Prime

- Correct pump mounting, with the motor on top and reservoir at the bottom. Every SS180® M has vertically mounted pumps. Mounting the pump in some other orientation will prevent the suction line from picking up oil and cause cavitation.

**Note:** Vertical mount pumps have a label stating such designation.

- A solid plug in the reservoir filler port instead of a vent plug (See Reservoir section).

### Reservoir



Do not use a solid plug or fill cap without a filter/breather element, or damage will be caused to the pump and/or reservoir.

1. Use Recommended Fluid:

Fill reservoir with Dexron™ III only (See Hydraulic Fluid section).

2. Proper Filling:

- A. With the TMA FOLDED (cylinder fully retracted), fill the reservoir so that oil can just be seen in the filler port.
- B. Operate the unit several times starting with short cylinder strokes (in the folded position only), increasing the length of each successive stroke.
- C. Recheck oil level often and add as necessary to keep the pump from picking up air.
- D. Reinstall the filter/breather plug provided.

### 3. Reservoir Problems

- A. Clear oil flowing out of the filler port usually means the reservoir was completely filled before the cylinder was fully collapsed (TMA unfolded).
- B. Foamy oil flowing out of the filler port points to one of the following:
  - 1) Air present in the system; the response is usually spongy or the cylinder may move with a jerking motion.
- C. Water in the oil:

Water can enter the reservoir through the filler port if the unit is left outdoors or washed with a high-pressure washer. Protect the unit, whenever possible, and change the oil if you suspect contamination. In cold weather the water could freeze, preventing the pump from working until the ice melts.



Remove all rings, watches, jewelry, etc. prior to doing any electrical work!

### **Electrical Problems**

#### 1. Low Voltage

Operating DC (direct current) power units efficiently requires proper voltage.



Any attempt to operate below the minimum required voltage could cause system failure.

- A. Signs that point to low voltage are:
  - 1) Motor won't run because solenoid won't shift.
  - 2) Motor running at reduced speed.
- B. Minimum voltage requirements:
  - 1) Between the motor stud and ground: 9.0 volts at maximum load.
- C. Minimum voltage requirements:
  - 1) Improper ground. Check grounds.
  - 2) Battery capacity too small.
  - 3) Cable ends not electrically secure to battery cable.
  - 4) Battery cable size too small for load and length of run. Copper #4 automotive is the recommended minimum size battery cable. Larger copper battery cable (#2, #1, #0, or #00) may be required for cable lengths over 25 feet to keep performance from deteriorating.
  - 5) The pump ground is established through the battery ground cable. Clean any dirt or rust from cable to achieve proper ground.
  - 6) Burnt contacts on motor solenoid.
- D. Check for low voltage as follows (requires a voltmeter):
  - 1) On alternator equipped vehicles, verify that the battery voltage is approximately 13.5 volts with no electrical accessories operating and the engine running.
  - 2) Operate the TMA while an assistant uses the voltmeter to probe each connection, cable end, and cable from the battery all the way back to the motor stud. Note the voltage losses. Make necessary repairs. Increase the voltage above the minimum as required.



Check ground connections and remove any paint, rust, or dirt that maybe acting as insulators.

## 2. DC Motors

Before concluding that the hydraulic pump is malfunctioning:

- 1) Verify that all connections are secure and that the problem does not lie somewhere else.
- 2) Check ground.
- 3) Check brushes for wear, and replace if necessary.



A motor that does not turn in freezing weather may indicate frozen water in hydraulic system.

If it has been verified that the pump is defective; contact Valtir Customer Service Department for input as to your specific application (p. 3).

## 3. Electrical Switches

- A. If you suspect that the switch is defective, use one of these three methods to test the operation of the switch:
  - 1) First check grounds.
  - 2) Use continuity light to test the switch (p.37).
  - 3) Use a circuit test light to test the switch (p.37).
- B. Motor solenoid switches:

The solenoid switches found on the hydraulic pump are four post style solenoid. They shall be constructed and wired such that:

- 1) The large posts with the connecting bar must be attached to the cable from the battery.
- 2) The same post is the shared hot lead and provides power to the control circuit.
- 3) The remaining large posts attach to the motor wires.
- 4) The small post on each solenoid connects to the control circuit on the side and the other small post connects to the ground. This circuit activates both the solenoid and the pump when energized.

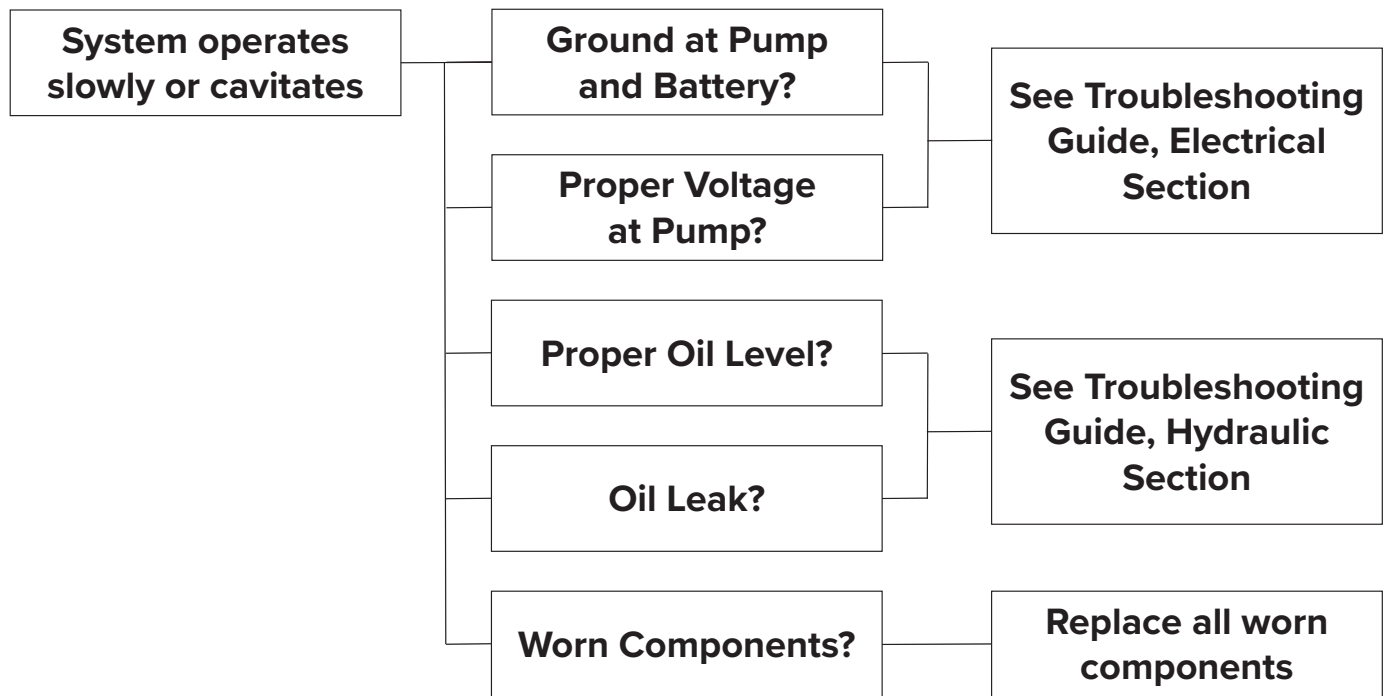
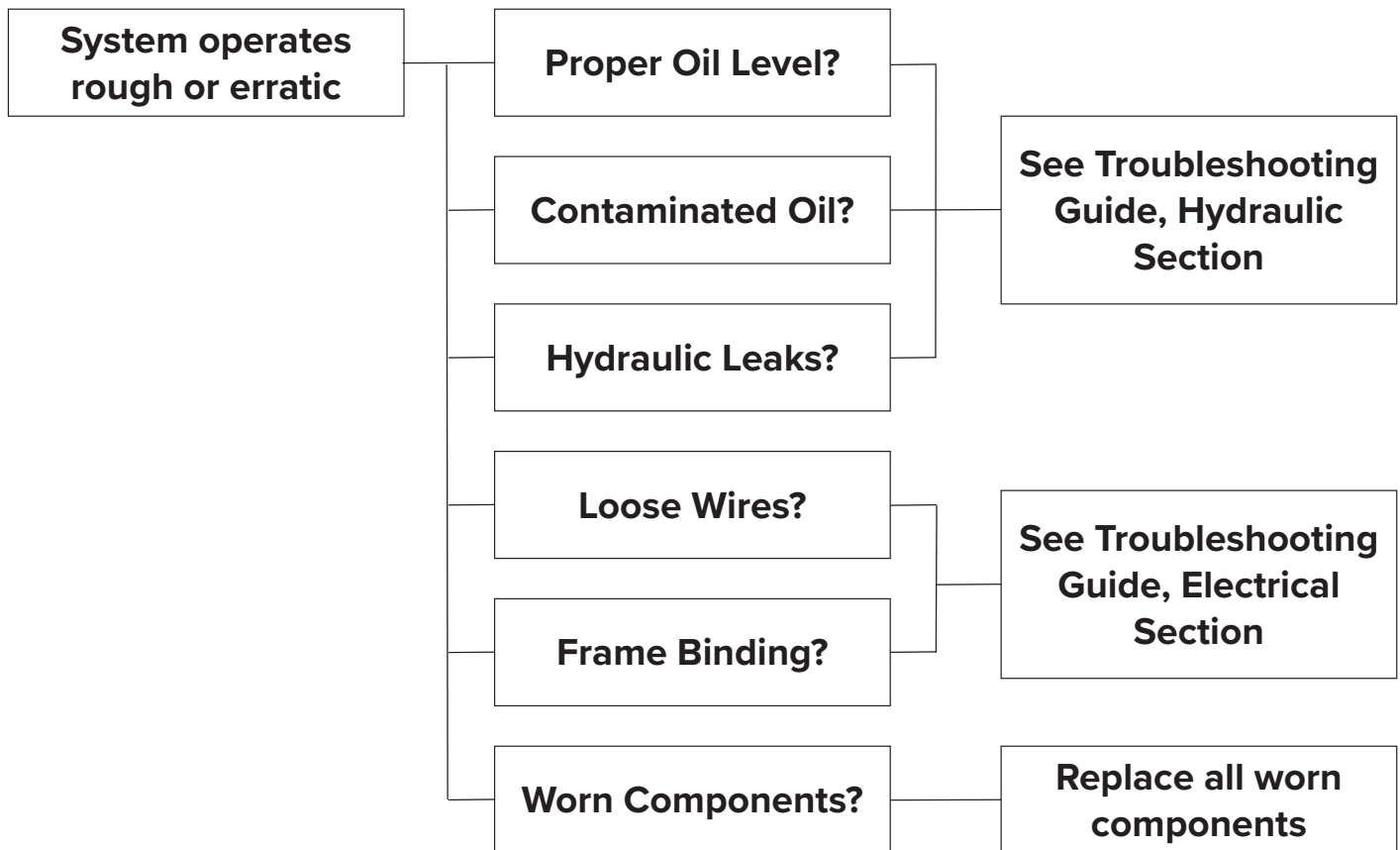
## 4. Electrical Polarity

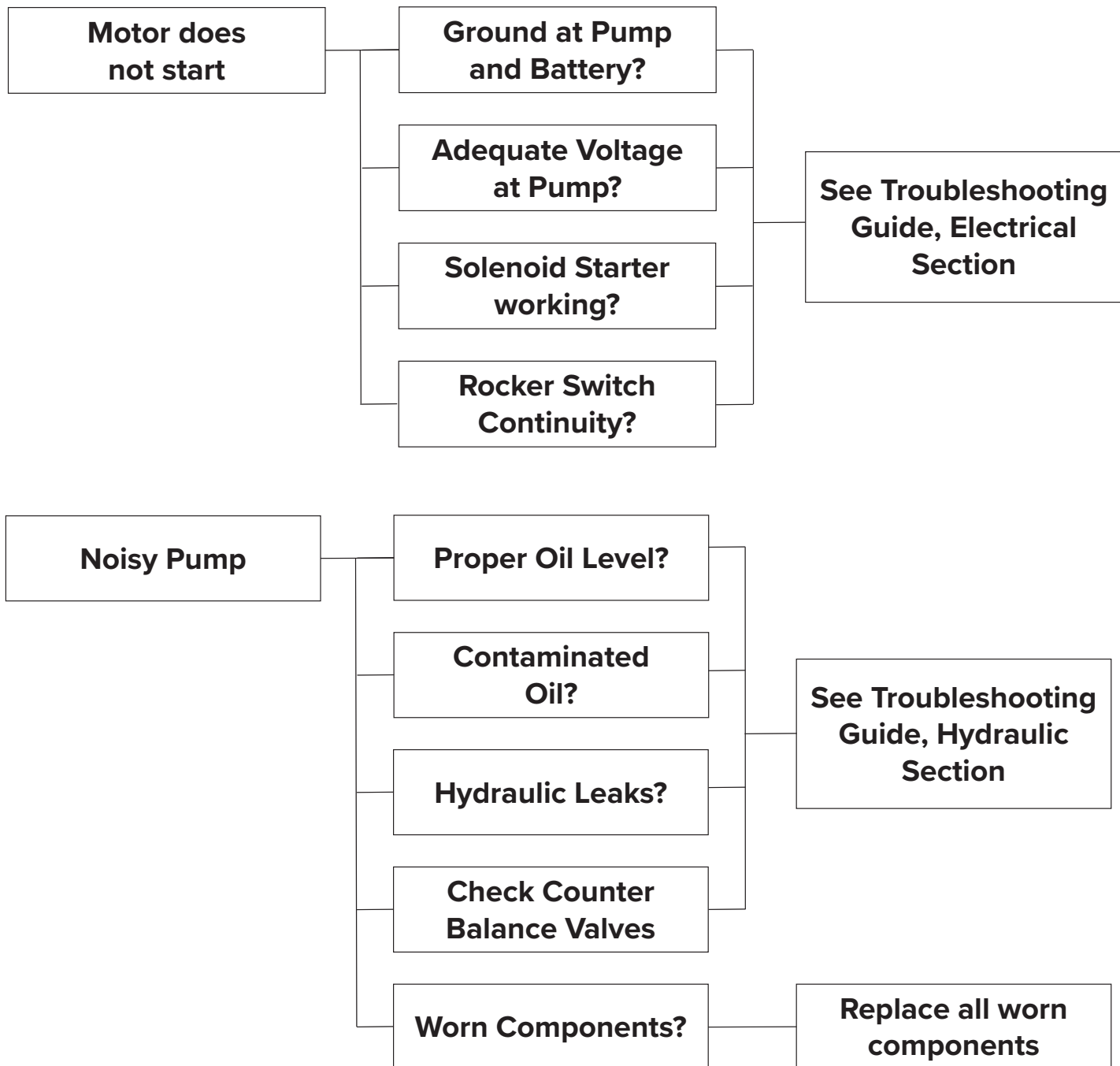
The pump motor and all controls have a negative ground.

## 5. Electrical Shorts or Open Circuits

- A. Shorts occur when wires with power come in contact with a ground. A short will cause a fuse to blow or a wire to burn. Look for pinched or cut wires.
- B. An open circuit is simply a break which prohibits current flow. Look for pinched or cut wires.

## Troubleshooting Decision Trees





# Inspection Log

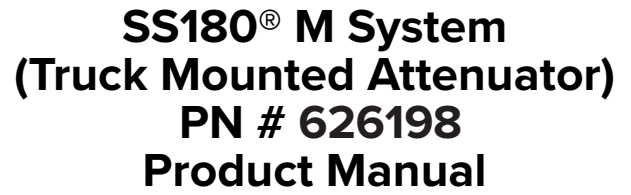
Location: \_\_\_\_\_

System Serial Number: \_\_\_\_\_

Date	Inspector	Condition	Maintenance Actions



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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