



# ALPHA™ DXM

## TRUCK MOUNTED ATTENUATOR

### PRODUCT MANUAL



**PN 120040**  
MAY 2023

# ALPHA™ DXM

The ALPHA™ DXM TMA has been tested pursuant to the AASHTO MASH 2016 standard

## Product Manual



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**WARNING:** The local highway authority, distributors, owners, contractors, lessors, and lessees are **RESPONSIBLE** for the assembly, maintenance, and repair of the ALPHA™ DXM system. Failure to fulfill these **RESPONSIBILITIES** with respect to the assembly, maintenance, and repair of the ALPHA™ DXM system 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 at (888) 323-6374 or visit [valtir.com](http://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 ALPHA™ DXM TMA 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.

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## Customer Service Contacts

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Valtir is committed to the highest level of customer service. Feedback regarding the ALPHA™ DXM TMA 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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The performance of the ALPHA™ DXM system is dependent upon the proper assembly, deployment and future system maintenance. These instructions must be read in their entirety and understood before assembling the ALPHA™ DXM TMA. These instructions are to be used only in conjunction with the assembly of an ALPHA™ DXM TMA 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. No person should be permitted to assist in the assembly, maintenance, or repair of this system that does not possess the unique knowledge described herein. 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 ALPHA™ DXM system may not perform as tested and accepted.



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.

## Safety Symbols

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This section describes safety symbols that may appear in the ALPHA™ DXM manual. Read the 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.

## Safety Rules for Assembly

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This manual must be kept in a location where it is readily available to persons who are skilled and experienced in the assembly, maintenance, or repair of the ALPHA™ DXM system. Additional copies of this manual are available from Valtir by calling (888) 323-6374 or visiting [valtir.com/contact](http://valtir.com/contact). Please contact Valtir if you have any questions concerning the information in this manual or about the ALPHA™ DXM TMA.



It is the responsibility of the installer to use proper safety precautions when operating power equipment and when moving heavy equipment or ALPHA™ DXM system components. Hand, eye, foot, and back protection is recommended.



Safety measures incorporating traffic control devices specified by the highway authority must be used to provide safety for personnel while the ALPHA™ DXM system is in use. The traffic control plan established by the highway authority should be adhered to when deploying the ALPHA™ DXM.



Do not assemble, maintain, or repair the ALPHA™ DXM system until you have read this manual thoroughly and completely understand it. Ensure that all warnings in this manual are followed. Please call Valtir if you do not understand these instructions.

## Limitations and Warnings

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Valtir contracts with accredited testing facilities to perform crash tests, evaluation of tests, and reporting of results for submission to FHWA for review.

The ALPHA™ DXM TMA was tested to meet the impact criteria, requirements, and guidelines of MASH 2016. These tests, specifically set forth by AASHTO, evaluate product performance by simulating those impacts outlined by MASH involving typical vehicles on our roadways, including lightweight cars (approx. 2420 lb. [1100kg]) and full size pickup trucks (approx. 5000 lb. [2270 kg]). A product can be tested to multiple Test Levels. The ALPHA™ DXM system is certified to the Test Level(s) as shown below:

### Test Level 2: 43 mph [70km/h]

**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 to the test matrix criteria of MASH 2016.**

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 ALPHA™ DXM system is intended to be assembled and maintained in accordance with specific State and Federal guidelines. Valtir offers a reflective delineator panel and has reflective tape for the ALPHA™ DXM TMA. However, the material is only intended to supplement delineation required by the US Department of Transportation's MUTCD or local jurisdiction. The appropriate highway authority approved engineer should be careful to properly select, assemble, and maintain the product. Careful evaluation of the host vehicle, vehicle population type, speed, traffic direction, and visibility are some of the elements that require evaluation in the

proper selection of a safety appurtenance by the appropriate specifying highway authority.

After an impact occurs, the product must be repaired to its original condition prior to placing back in service. When a safety product is impacted, it is mandatory that the highway authority inspect all the components for damage and repair and/or replace components as necessary. If the system is not repairable, a complete system replacement is required.

## System Overview

The ALPHA™ DXM system has been 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 it is impacted within the applicable MASH criteria. The system attaches to the rear of a truck and may be used in stationary applications (e.g. as a truck blocking a work zone) and mobile operations (e.g. striping, sweeping, plowing, etc.).

## Application Specifications

### Definitions:

A **BARRIER VEHICLE** is a truck on which an ALPHA™ DXM TMA is attached while positioned upstream (towards the direction that traffic is approaching) of a work zone.

A **SHADOW VEHICLE** is a truck on which an ALPHA™ DXM TMA is attached and is following behind a moving operation such as striping, spraying, etc.

The use of a TMA on the back of a truck is intended to:

- Gradually decelerate the impacting vehicle, if such vehicle impacts within MASH parameters.
- Protect the occupants of the impacting vehicle.
- Protect the barrier/shadow vehicle occupants.
- Reduce damage to the barrier/shadow vehicle.

## Controlling Skid Distance

The use of an ALPHA™ DXM system on the back of a truck will not:

- 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 lightweight shadow/barrier vehicles.
- Skid distance is reduced and is more consistent when heavier shadow/barrier vehicles are used.

### Roll-Ahead Distance for Shadow Vehicles

Weight of Shadow Vehicle (Moving)	Prevailing Speed mph [km/h]	Weight of Impacting Vehicle to be Contained*			
		4,500 lb [2,040 kg]	10,000 lb [4,536 kg]	15,000 lb [6,804 kg]	24,000 lb [10,886 kg]
10,000 lb [4,536 kg]	60-65 [96-105]	100' [30 m]	175' [53 m]	225' [69 m]	275' [84 m]
	50-55 [80-88]	100' [30 m]	150' [46 m]	175' [53 m]	200' [60 m]
	45 [72]	75' [23 m]	100' [30 m]	125' [38 m]	150' [46 m]
15,000 lb [6,804 kg]	60-65 [96-105]	75' [23 m]	150' [46 m]	175' [53 m]	225' [69 m]
	50-55 [80-88]	75' [23 m]	125' [38 m]	150' [46 m]	175' [53 m]
	45 [72]	50' [15 m]	100' [30 m]	100' [30 m]	100' [30 m]
24,000 lb [10,886 kg]	60-65 [96-105]	75' [23 m]	100' [30 m]	150' [46 m]	175' [53 m]
	50-55 [80-88]	50' [15 m]	75' [23 m]	100' [30 m]	150' [46 m]
	45 [72]	50' [15 m]	75' [23 m]	75' [23 m]	100' [30 m]

Note: Distances are appropriate for shadow vehicle speeds up to 15 mph [25 km/h].

## Roll-Ahead Distance for Barrier Vehicles

Weight of Barrier Vehicle (Stationary)	Prevailing Speed mph [km/h]	Weight of Impacting Vehicle to be Contained*			
		4,500 lb [2,040 kg]	10,000 lb [4,536 kg]	15,000 lb [6,804 kg]	24,000 lb [10,886 kg]
10,000 lb [4,536 kg]	60-65 [96-105]	50' [15 m]	100' [30 m]	150' [46 m]	200' [60 m]
	50-55 [80-88]	25' [8 m]	75' [23 m]	100' [30 m]	150' [46 m]
	45 [72]	25' [8 m]	50' [15 m]	75' [23 m]	100' [30 m]
15,000 lb [6,804 kg]	60-65 [96-105]	25' [8 m]	75' [23 m]	100' [30 m]	150' [46 m]
	50-55 [80-88]	25' [8 m]	50' [15 m]	75' [23 m]	100' [30 m]
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24,000 lb [10,886 kg]	60-65 [96-105]	25' [8 m]	50' [15 m]	75' [23 m]	100' [30 m]
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	45 [72]	25' [8 m]	25' [8 m]	25' [8 m]	50' [15 m]

### Shadow or Barrier Vehicle Recommended Weight

Required shadow/barrier vehicle weight: 12,200 lb [5,526 kg] to 26,500 lb [12,020 kg].

\* Weights of Typical Vehicles:

- Mid-size automobile - 2,250 lb [1,020 kg]
- Full-size automobile - 3,500 lb [1,500 kg]
- Loaded 3/4-ton pickup truck - 6,000 lb [2,750 kg]
- Loaded 1-ton cargo truck - 10,000 lb [4,500 kg]
- Loaded 4-yard dump truck - 24,000 lb [11,000 kg]

Source: "Use of Truck Mounted Attenuators in Work Zones" by T. Darcy Sullivan, P.E. and Jack B. Humphreys, P.E., University of Tennessee.

### Truck Preparation

The truck must be equipped with a rigid underride or socket hitches attached to the rear of the chassis. This mounting system must be capable of withstanding an impact load of 45,000 lb [200 kN] along the lower member.

Valtir offers kits for both socket hitches and rigid underrides, or mounts may be fabricated by the customer. Mounts vary depending on truck frame height. Contact Customer Service for assistance.

### Check for Interference

Before attempting to attach the socket receivers, check for interference problems.

Temporarily position underride socket receivers under truck frame as shown and check for interference problems. Interference problems with tail lights, springs, dump bodies (in up position), etc, need to be corrected before proceeding.

### Mount Installation

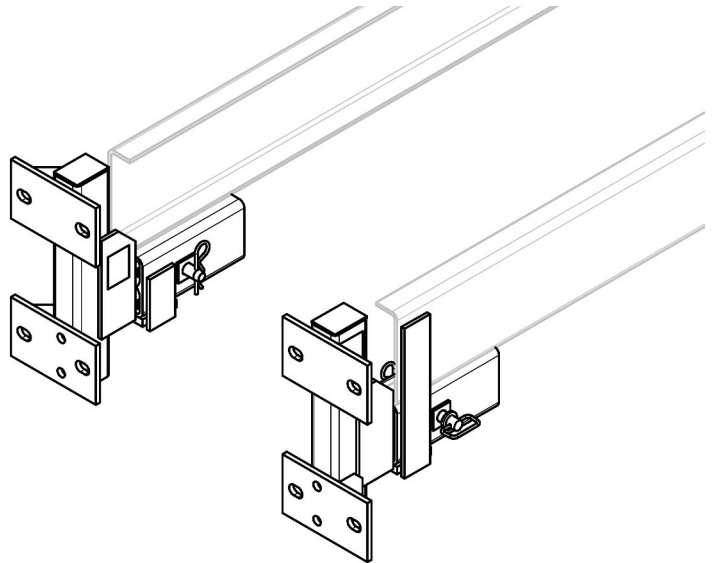
Park truck on a level surface. The truck should be as close to the final driving weight as possible. If ballast must be added to achieve the 12,200 lb [5,526 kg] minimum weight, add it at this time. The ballast must be properly anchored to the truck to keep it in place during an impact. Ideally an adequately sized truck that requires no ballast should be used. Follow the instructions included in the kit.



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

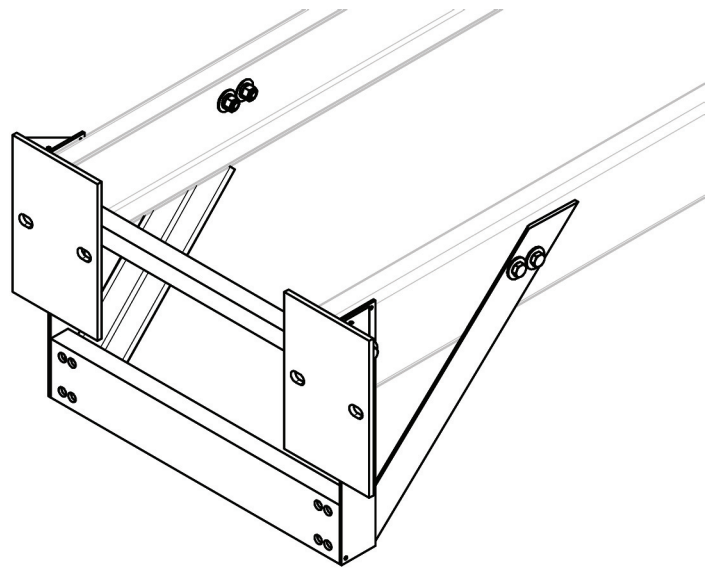
## Socket Hitch

A socket hitch allows easy and quick attachment and removal of the TMA. Only the sockets remain on the truck.



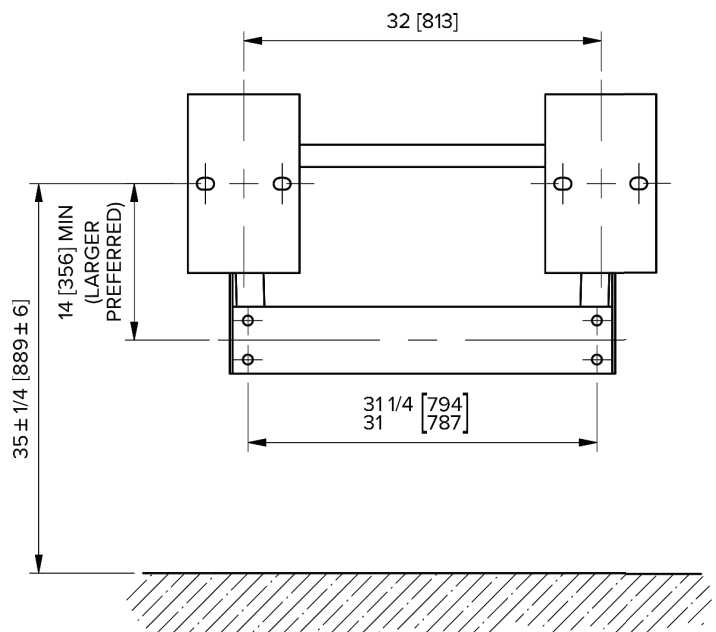
## Rigid Underride

A rigid underride is a semi-permanent method of attachment. The TMA may still be attached and removed using pins but the entire mount remains on the truck.



## Customer-Fabricated Mount

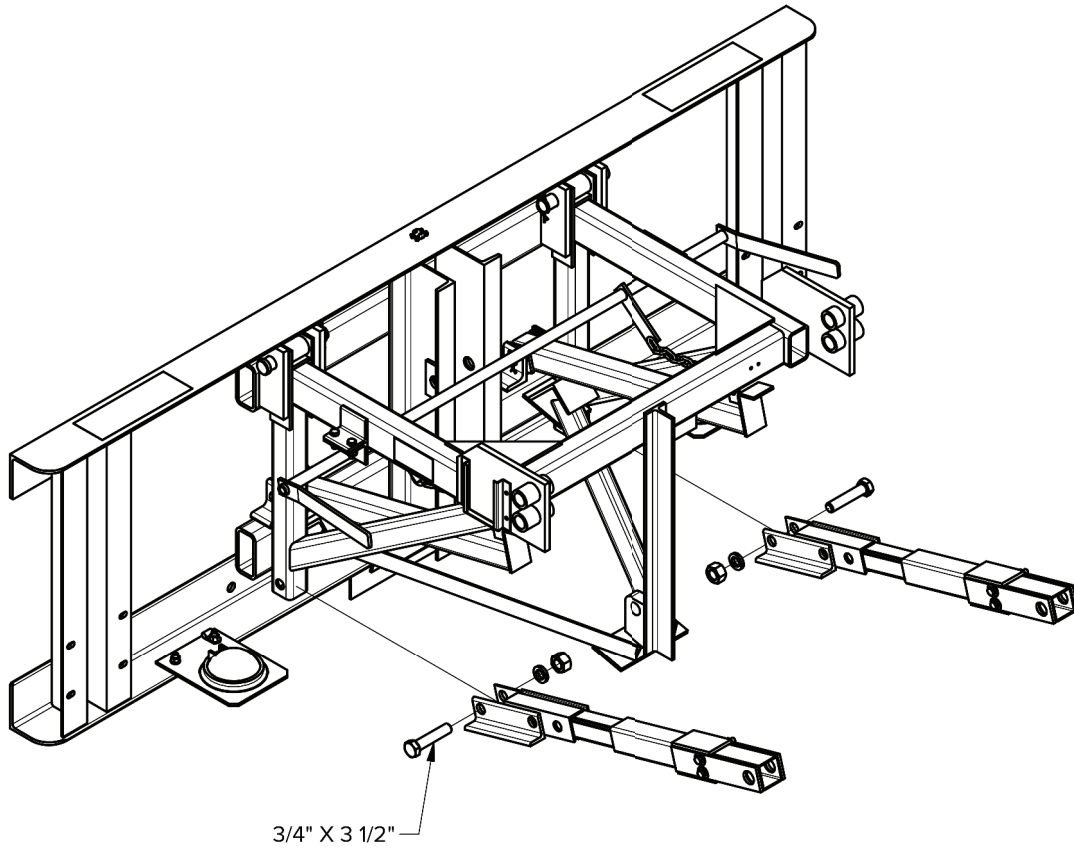
The customer may install their own mount following the dimensions shown provided it can withstand the impact load indicated.



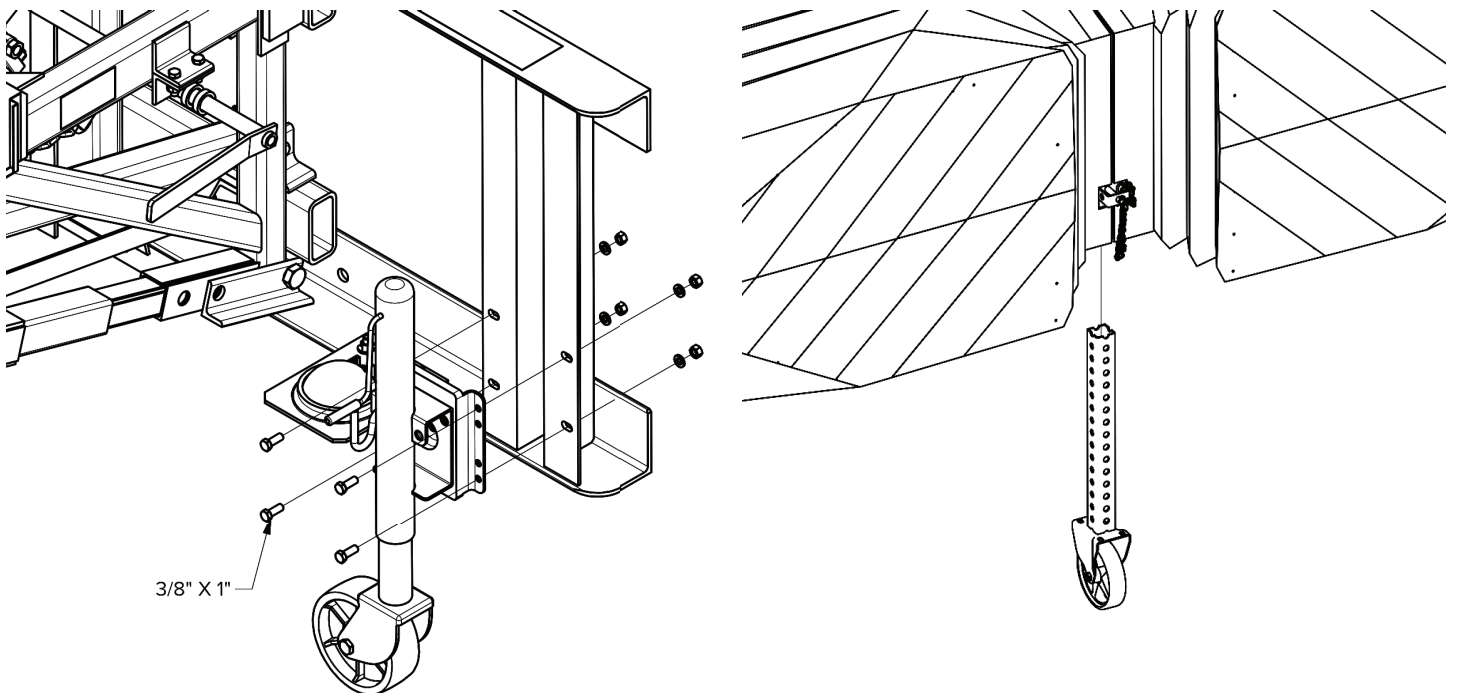


## System Installation

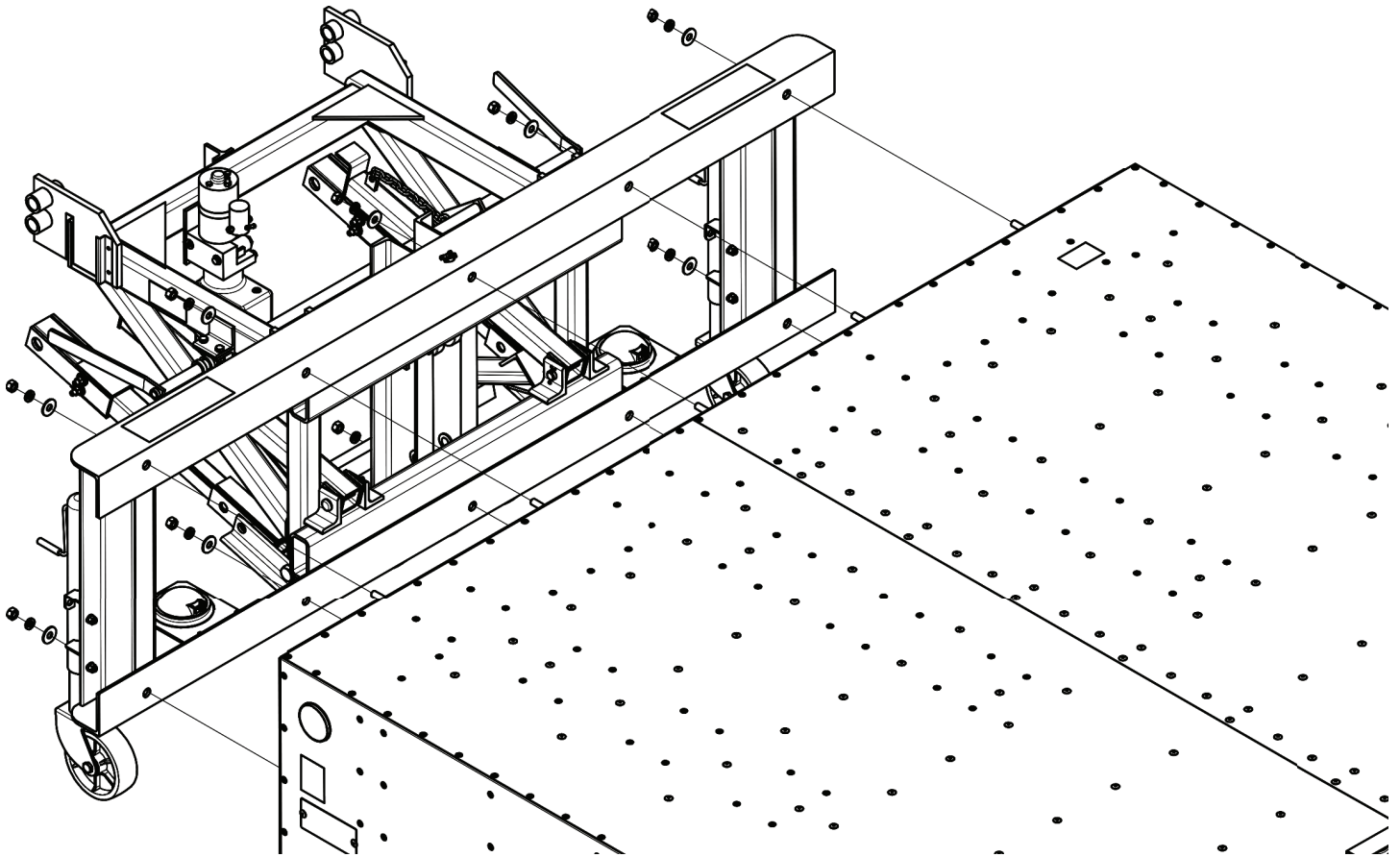
1. Attach the braces.



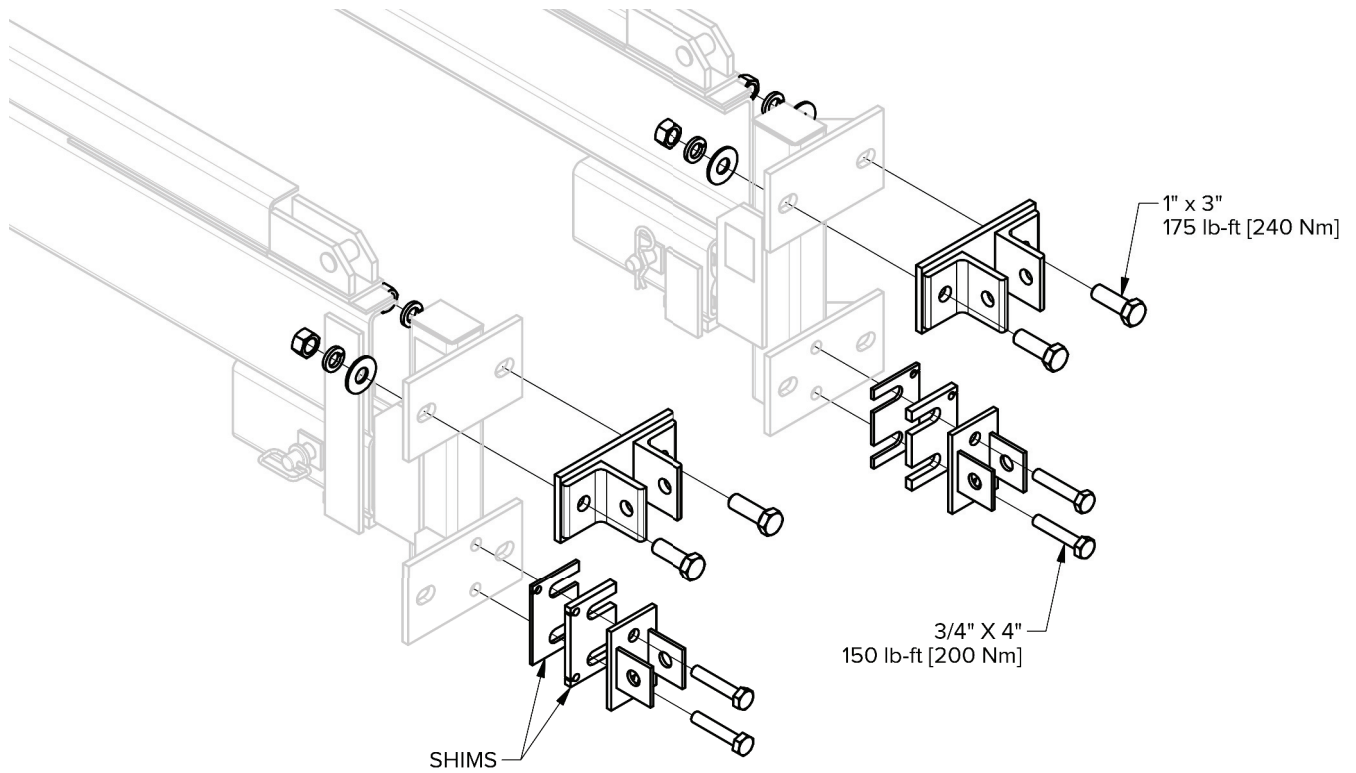
2. Install the two backup jacks and the cartridge jack.



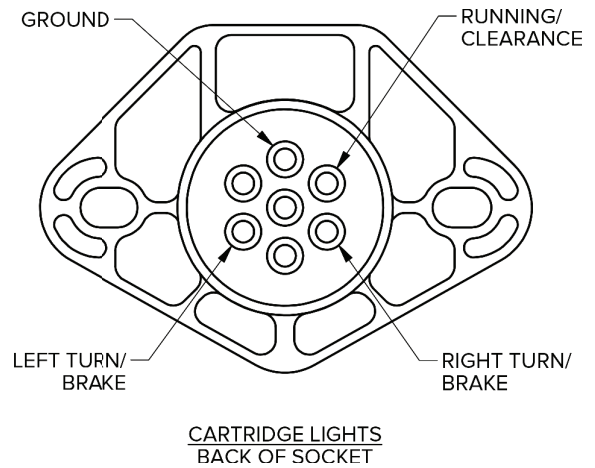
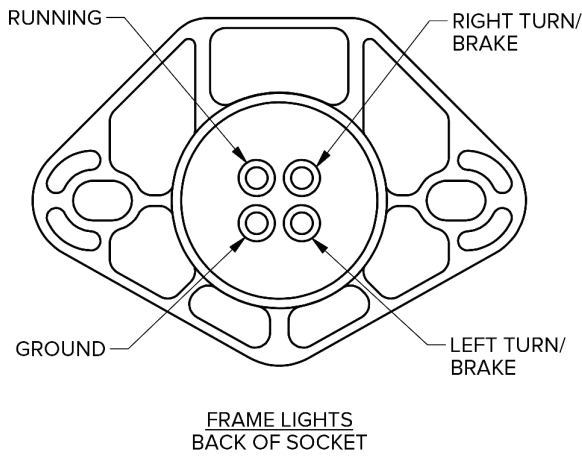
3. Attach the backup to the cartridge. Torque nuts to 90 lb-ft [122 Nm].



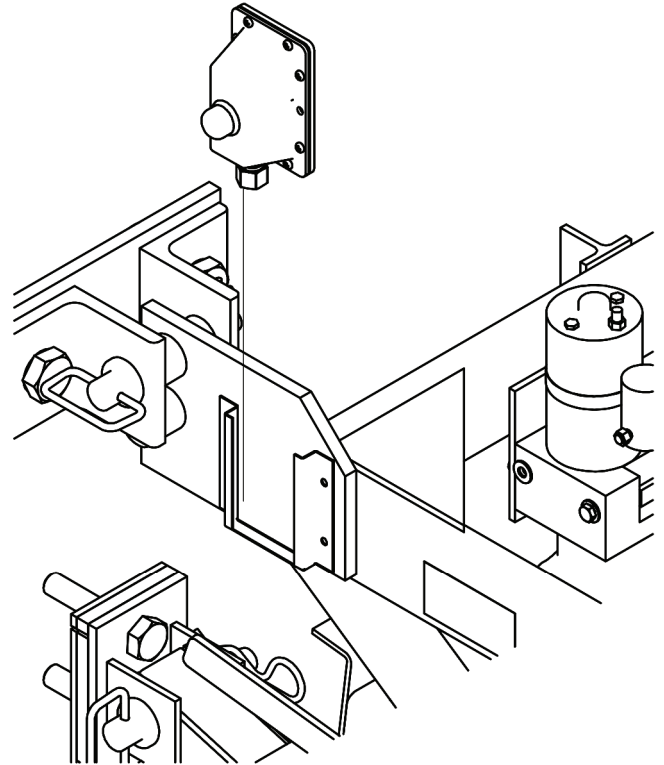
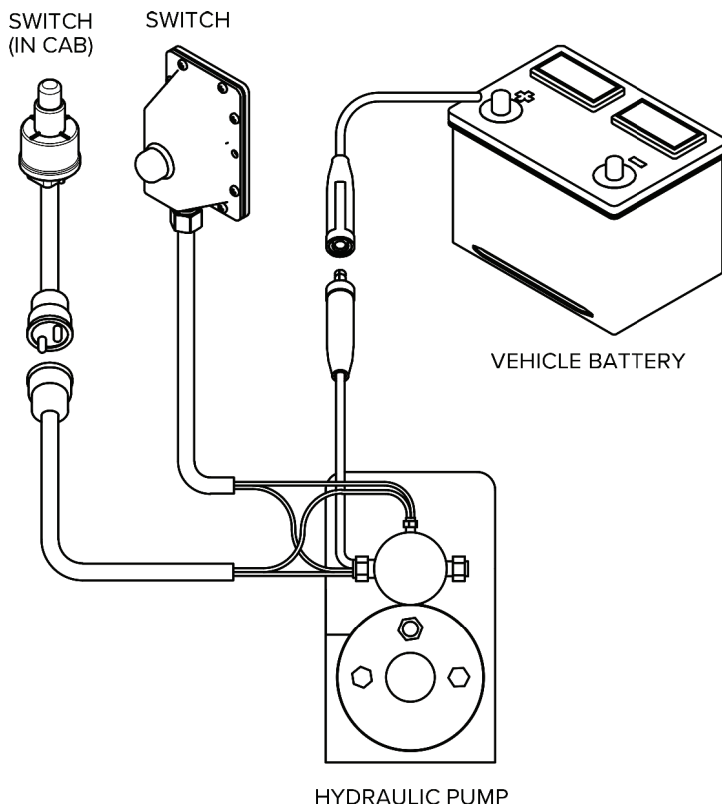
4. Fasten the mounting brackets to the socket hitches. Use the appropriate shims to achieve a level cartridge height of 12" ± 1" [305 mm ± 25 mm].



5. Mount and wire the lighting connectors to the truck.

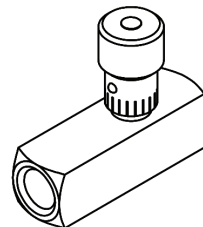


6. Install the round button inside the truck cab and apply the warning decal nearby. Slide the large button into the pocket on the passenger side of the TMA frame. Connect the positive power cable to the truck battery.

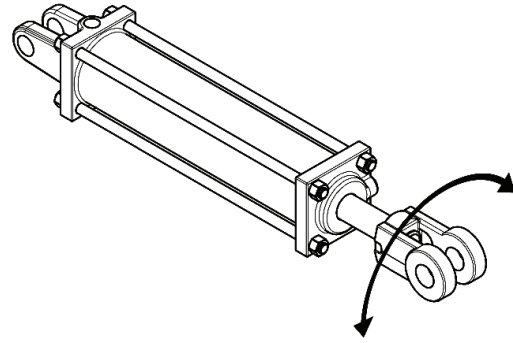


7. Fill the hydraulic pump reservoir with Dexron III fluid. Fill to 1/2" [13 mm] from the top. Replace the plug with the breather cap on the reservoir. Cycle the system up and down several times to remove air from the hydraulics.

8. If necessary, adjust the bleed-down rate using the flow control valve. The cartridge should fall from vertical to horizontal in 15-30 seconds.



9. Ensure the locking mechanism works properly and smoothly with the system in the raised position. If the system does not raise to the proper vertical position, the hydraulic cylinder may be adjusted by turning the clevis by one or two turns.



10. Check tightness of all fasteners, installations of attachment pins, and height and levelness of the cartridge before operation.

## Operation

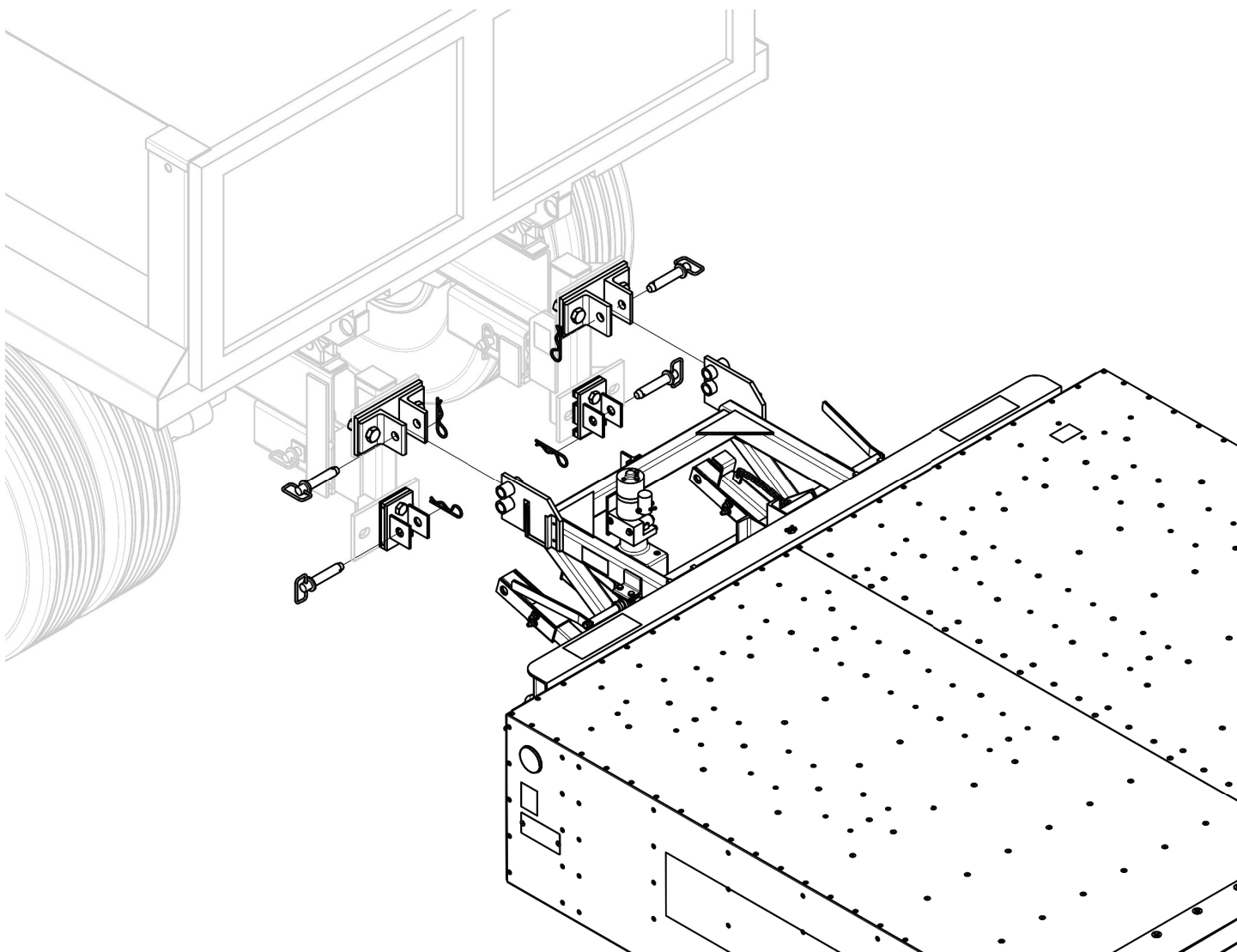
The ALPHA™ DXM TMA has been equipped with a hydraulic pump which can be used to tilt the energy absorbing cartridge from its horizontal position. The tilting feature may be used to prevent possible scraping of the rear end of the cartridge as the truck travels in and out of sloped driveways. The driver activates the “UP” button from inside the cab to momentarily tilt the cartridge up. Upon releasing the button, the cartridge will slowly bleed back down to its horizontal position.

The hydraulic system can also be used to tilt the cartridge to a full 90 degree vertical position where it will be automatically locked. This feature allows the TMA equipped truck to be easily driven and parked in congested areas. It should be remembered that for the ALPHA™ DXM TMA to function properly during a crash, the cartridge must be in the horizontal position. To lower the cartridge from the 90 degree vertical position, the driver must exit the cab and check behind the cartridge to ensure everything is clear before manually disengaging the locking braces.

### Attaching the TMA:

To attach the ALPHA™ DXM system to a truck:

1. Roll the system squarely toward the rear attachment points.
2. Insert the attachment pins and retaining pins in the TMA frame to the mount brackets.



3. Plug in the lighting connectors and verify all turn/stop/tail/clearance lights are working properly.
4. Secure the rear cartridge and backup jacks in their stowage positions.



Missing or damaged attachment pins or cotter pins must be replaced before putting the TMA into service. Ensure all cotter pins are installed correctly.

## TMA Removal

To remove the TMA from the rear of truck:

1. With the TMA in the horizontal position, lower the single rear jack to the ground.
2. Rotate the two backup jacks into position and extend them until the weight of the TMA is relieved from the attachment pins.
3. Remove the attachment pins. The struts should remain attached to the TMA backup.
4. Unplug all cables.



The jacks are designed to roll on smooth surfaces. Rolling the TMA over rough surfaces may result in damage to the jacks and/or TMA.

## Operating the 90° Tilt System

Raising the TMA:

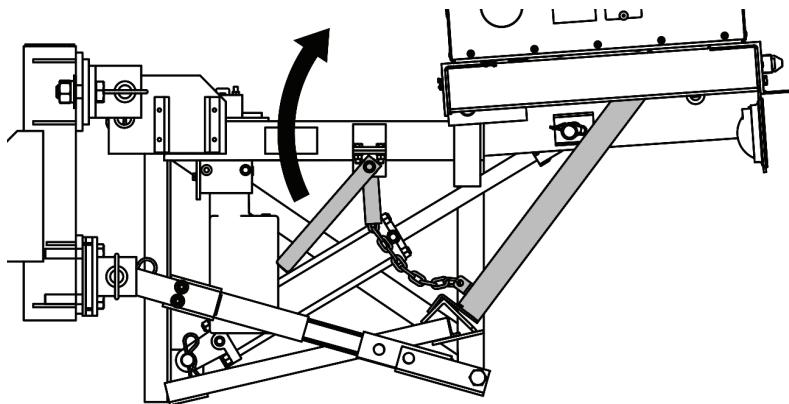
1. Make sure the top of the cartridge is clear of all objects before proceeding.
2. Activate the hydraulic system to raise the cartridge using the switch in the cab or the switch located on the side of the support frame.
3. The cartridge may be tilted a full 90 degrees where it will be locked in the up position, or it may be partially tilted to travel up sloped driveways, after which it will bleed back down to the horizontal position.
4. Be sure latching mechanism is secure before transporting TMA or allowing anyone behind an elevated cartridge (see below).



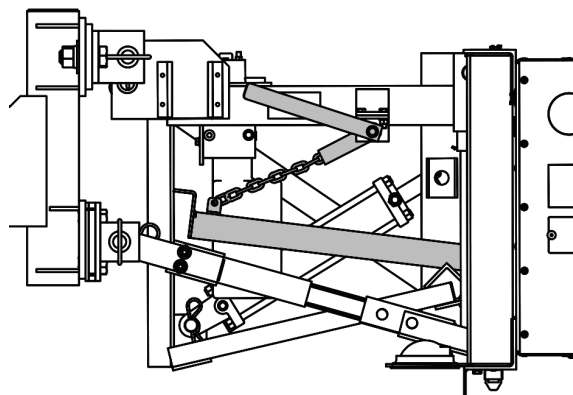
Under no circumstances should anyone be allowed behind an elevated cartridge when the latch is not fully seated in its locked position.

Lowering the TMA:

1. Activate the hydraulic system and keep the button depressed to remove pressure from the locking mechanism. With the button still depressed, lift and hold the handle to fully disengage the mechanism (see below). Release the button to lower the cartridge. This is to be accomplished from the rear corner of the truck so that the operator can ensure everyone is clear.
2. The cartridge should slowly descend over 15-30 seconds.



*Raise the system and lift the handle to disengage the locking mechanism*



*TMA system fully lowered*

## Troubleshooting

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### **Pump Motor Fails to Start:**

- Failed Motor Starter Solenoid: Replace if necessary.
- Electrical switch inoperative: Repair or replace.
- Open circuit/insufficient grounding: Check and correct.
- Motor inoperative: Repair or replace.

### **System is Inoperative**

- No oil/insufficient oil in system or pump losing prime: Fill system and check for leaks.
- Wrong oil in system (should be DEXRON® III or newer): Change oil.
- Clogged or dirty filter: Drain oil and replace filter or element.
- Oil line restricted: Line dirty or collapsed. Clean or replace oil line.
- Air leaks in pump suction line: Repair or replace as needed.
- Worn or dirty pump: Clean, repair or replace; check alignment; check for contaminated oil. Drain, flush, and refill system with approved oil.
- Badly worn components (valves, cylinders, etc.): Examine and test for internal or external leakage. Replace faulty components. Check for cause of wear.
- Leakage: Check all components, especially the relief valve, for proper settings.
- Excessive load.
- Broken or slipping pump drive: Repair or replace couplings, etc. Check for proper alignment or tension.
- Electrical ground fault.

### **System Operates Erratically**

- Air in system: Check suction side for leaks. Repair.
- Cold oil: Allow system to warm up.
- Damaged or dirty components: Clean or repair as needed.
- Restricted lines or filters: Clean and/or replace lines or elements as necessary.

### **System Operates Slowly**

- Oil viscosity too high; cold oil: Allow oil to warm up before operating or replace oil with proper specified oil.
- Low oil level: Check reservoir & add oil as necessary.
- Air in system: Check suction side for leaks – repair; cycle system several times to relieve air from system.
- Worn pump valves, cylinders, etc.: Replace or repair as necessary.
- Restriction in lines or filters: Clean or replace elements or lines.
- Improperly adjusted flow control valve: Replace or adjust as necessary.
- Oil leaks: Tighten fittings; replace seals or damaged lines.
- Low Voltage: Change or replace batteries or check the truck's charging system.

### **System Operates too Fast**

- Incorrectly adjusted flow control valve: Replace or adjust as necessary.

### **Oil in System Overheats**

- Incorrect, low or dirty oil: Add or change oil as necessary.
- Excessive component internal leakage: Repair or replace as necessary.
- Restriction in lines or filters: Clean or replace as needed.

- Insufficient heat radiation: Clean dirt and mud from reservoir and components.
- Malfunction component: Replace or repair.

### **Foaming of Oil**

- Incorrect, low or dirty oil: Replace or add oil as needed.
- Air leaks: Check suction lines & component seals for leaks.

### **Noisy Pump**

- Low oil level, incorrect or foamy oil: Replace or add oil as necessary.
- Suction line or inlet screen plugged: Clean or replace.
- Worn or damaged pump: Repair or replace.

### **Leaky Pump or Motor**

- Damaged or worn shaft seal: Replace. Check for misalignment.
- Loose or broken parts: Tighten or replace.
- Incorrectly adjusted relief valve.

### **Load Drops When System is Locked**

- Leaking cylinder seals or fittings: Replace worn parts.

### **Leaky Cylinder**

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



## Maintenance

Description	Each Use	1 Month	6 Months
Check for loose fasteners	1 month or 1,000 Miles		
Lubricate frame jacks			•
Replace hydraulic fluid	2 Years or 30,000 Miles		
Check hydraulic fluid level		•	
Clean hydraulic pump	As Required (Check Monthly)		
Clean hydraulic cylinder	As Required (Check Monthly)		
Clean cartridge and frame	As Required (Check Monthly)		
Check lamp operation		•	
Check cartridge height (horizontal)	•		
Lubricate all pivots and joints			•
Check lock operation	•		
Check all pins and retaining pins	•		
Check condition of jack wheels		•	
Check for damage or corrosion	•		

# Technical Specifications

## Weight (nominal)

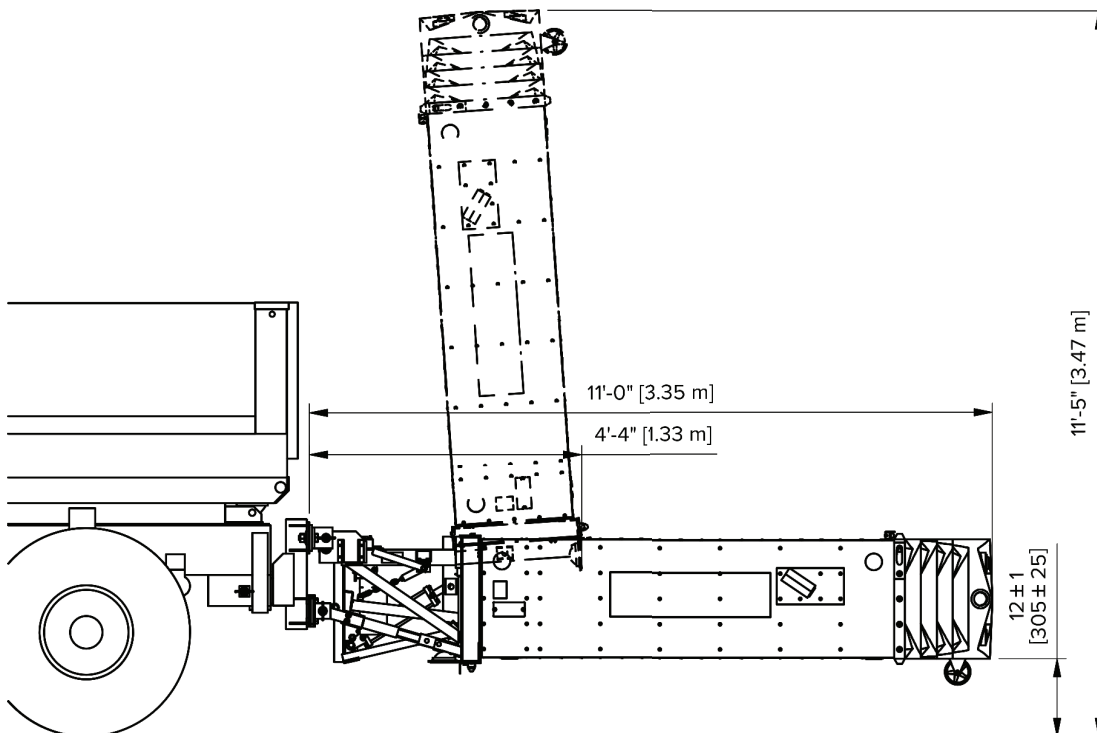
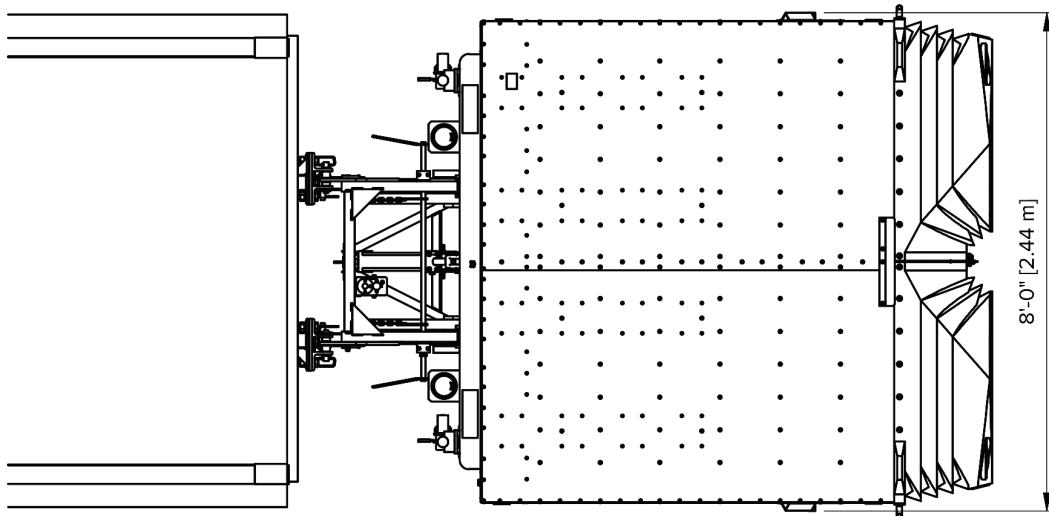
Total	1,160 lb [526 kg]
Cartridge Weight	390 lb [177 kg]

## Dimensions (nominal)

Width	8'-0" [2.44 m]
Length	11'-0" [3.35 m]
Height (horizontal)	2'-11" [0.89 m]
Height (vertical)	11'-5" [3.47 m]

## Fluids

Hydraulic Fluid	DEXRON® III (or newer)
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# Repair Instructions

## Minor Damage

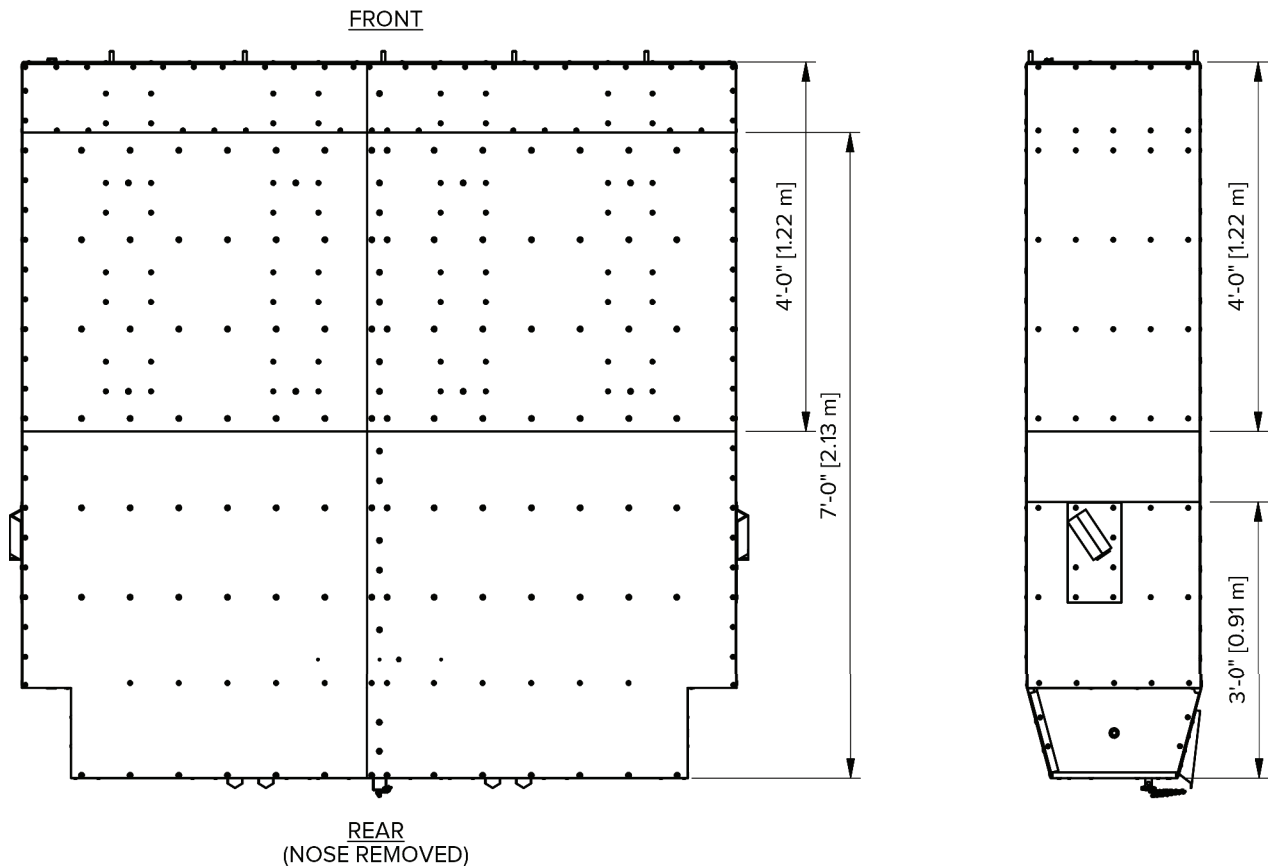
- Damage to the rear-most 7' [2.13 m] of the cartridge top and bottom skins or to the rear-most 3' [914 mm] of the side covers.
- An affected area smaller than 24" [610 mm] wide by 22 1/2" [571 mm] long by 6" [152 mm] deep may be repaired by applying aluminum reinforcement to cover the damaged area.
- Use .032" [0.8 mm] thick aluminum on top and bottom skins and .063" [1.6 mm] thick aluminum on side covers. Riveting is the recommended fastening method for attaching reinforcements.
- Damage to the front of the cartridge, because this is the area that supports the cantilevered weight of the system, cannot be repaired. If this area of the cartridge has not been crushed, extra rivets may be added as needed.

## Major Damage

- Damage to larger areas, or any crushed area in the front 12" [305 mm] of the cartridge is considered major. Damage to the front 4' [1.22 m] of the side covers or ripples along the length of any covers is also considered major. Such damage could significantly affect the total energy absorbing ability of the cartridge. Cartridge replacement is required as repairs for major damage are not recommended.



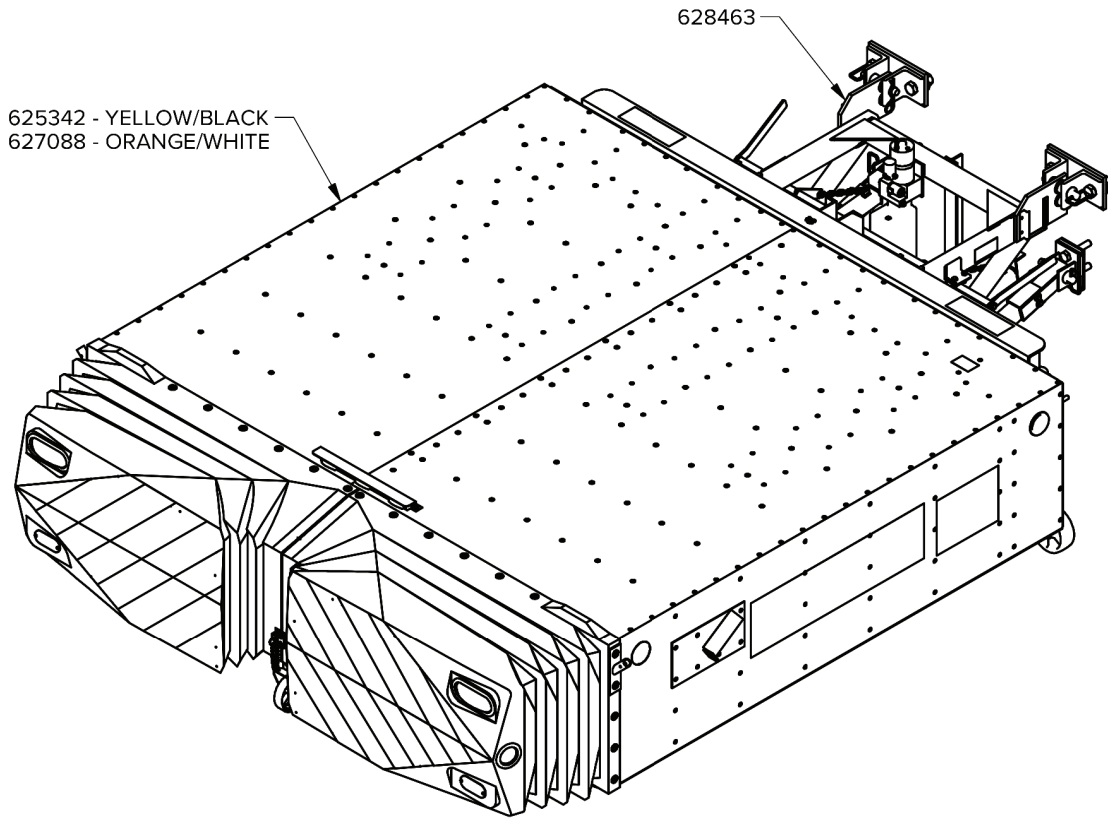
Customer Service personnel are available to assist in evaluating damaged TMA cartridges. Photos of the damaged area taken at different angles with measurements should be submitted for evaluation.



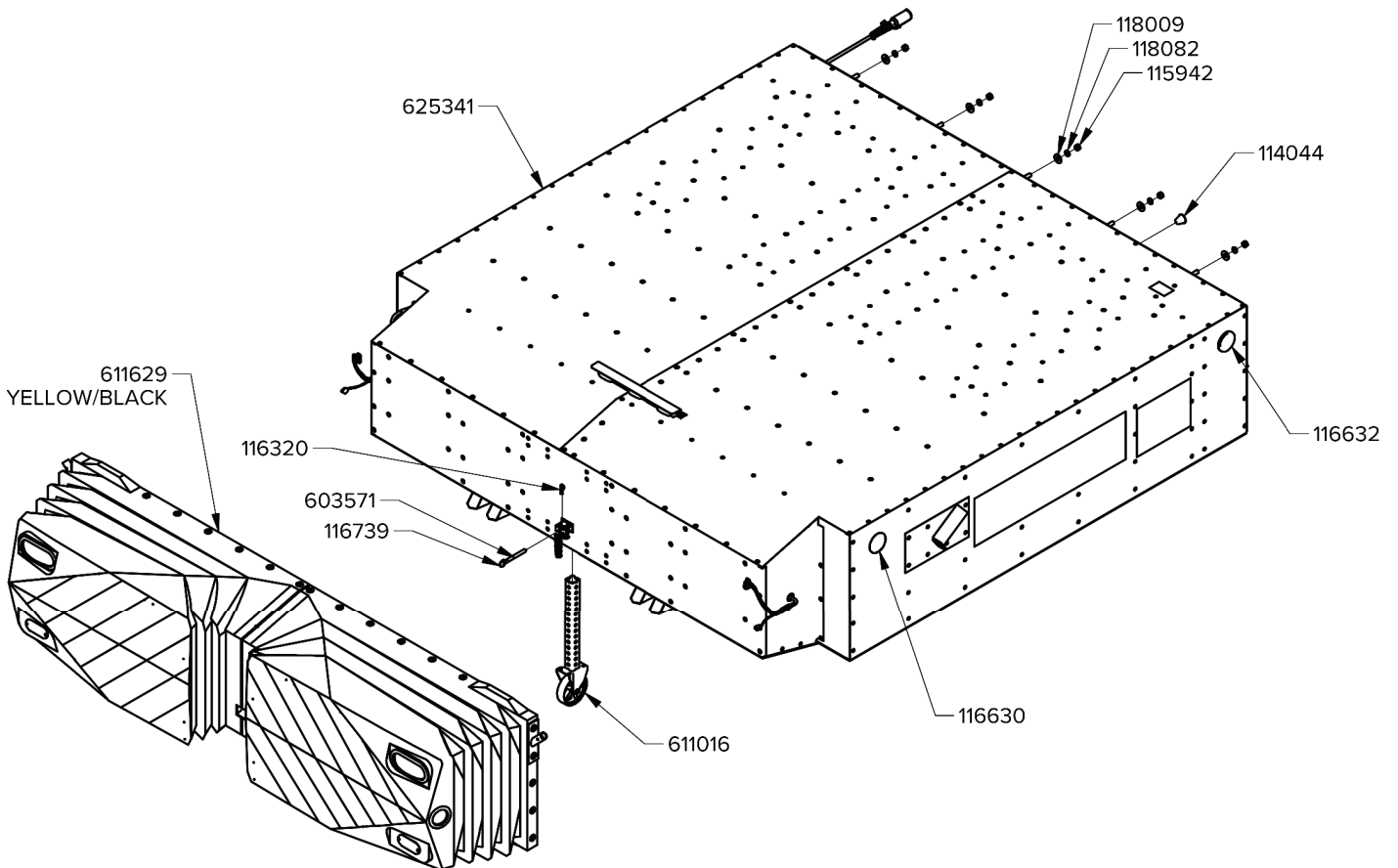


# Parts List

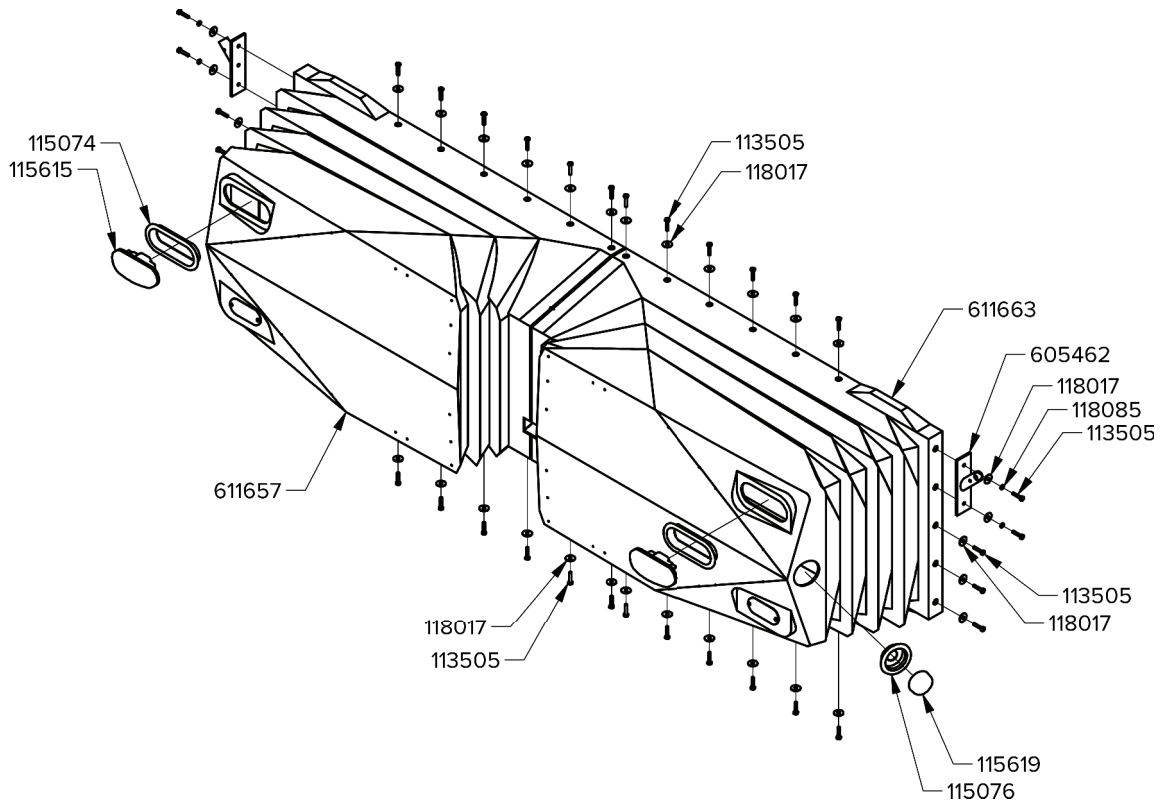
## System Assembly



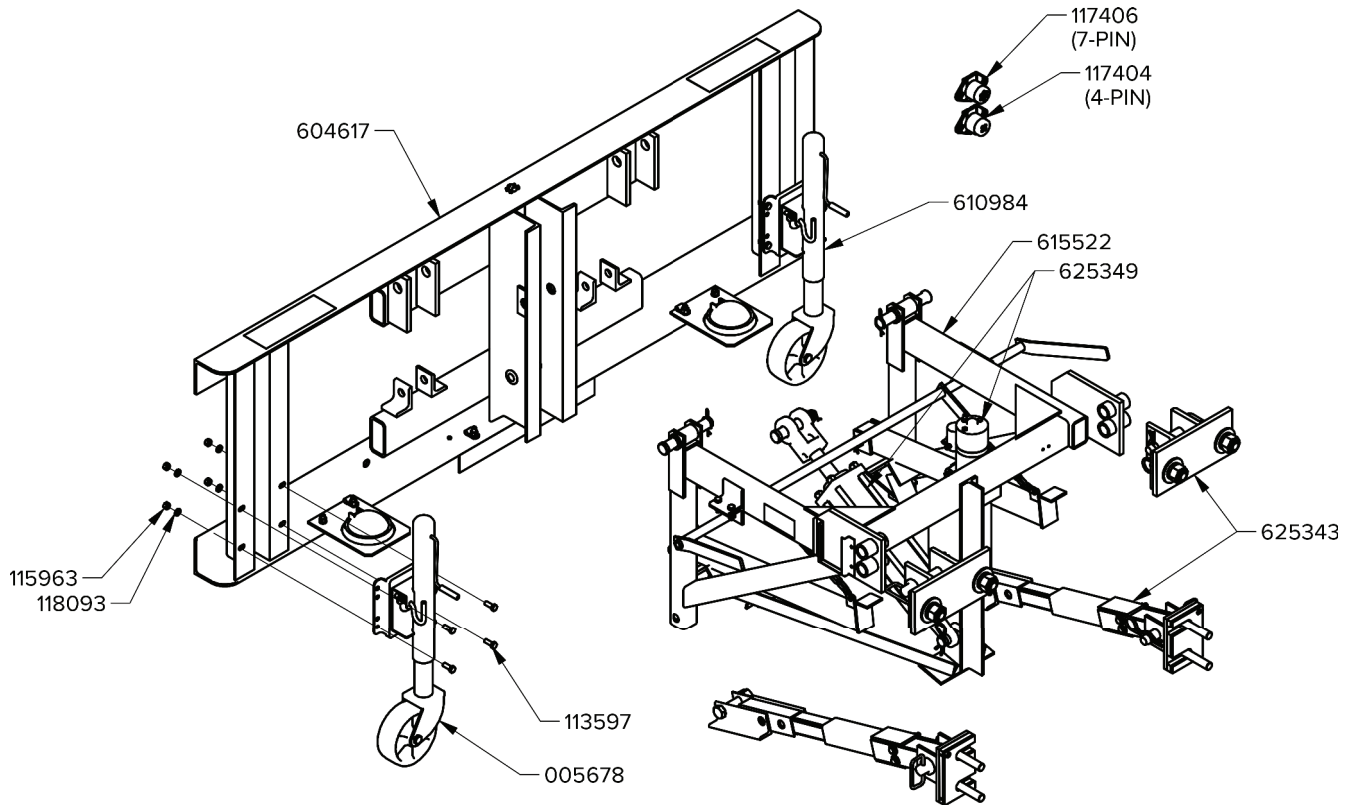
## Cartridge - 625342



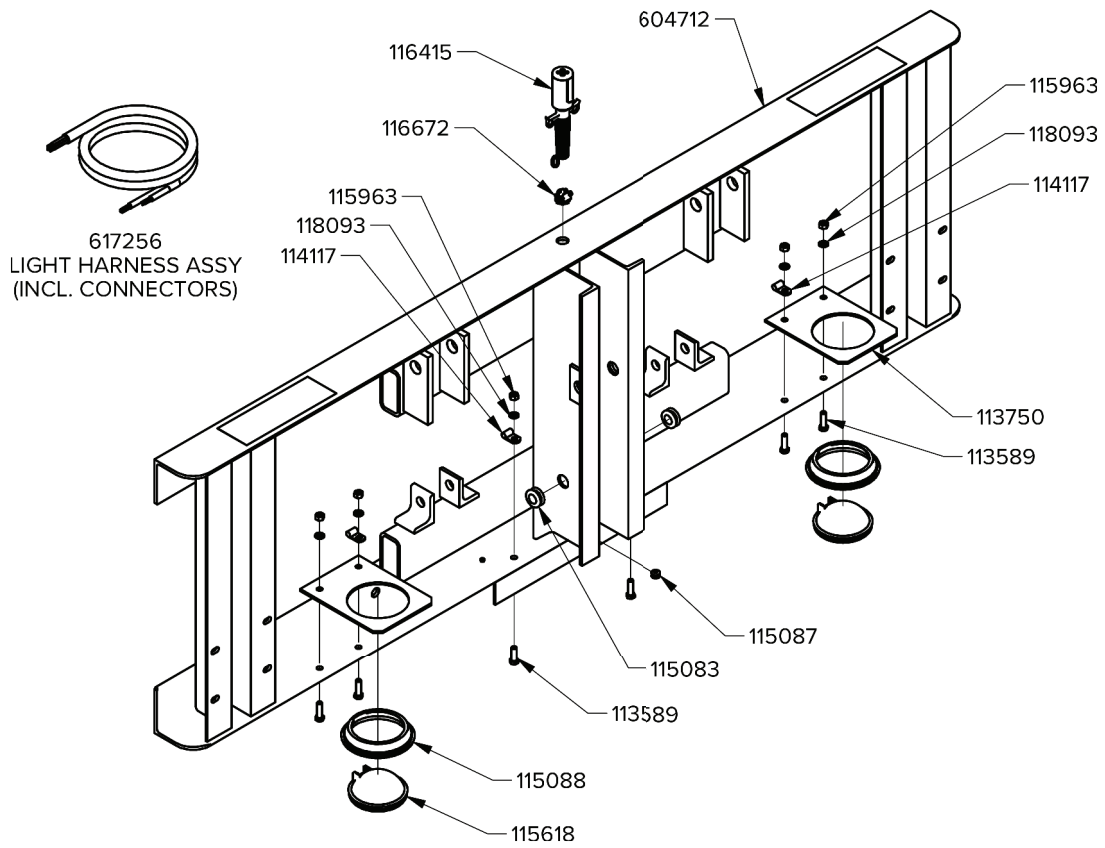
## Nose - 611629



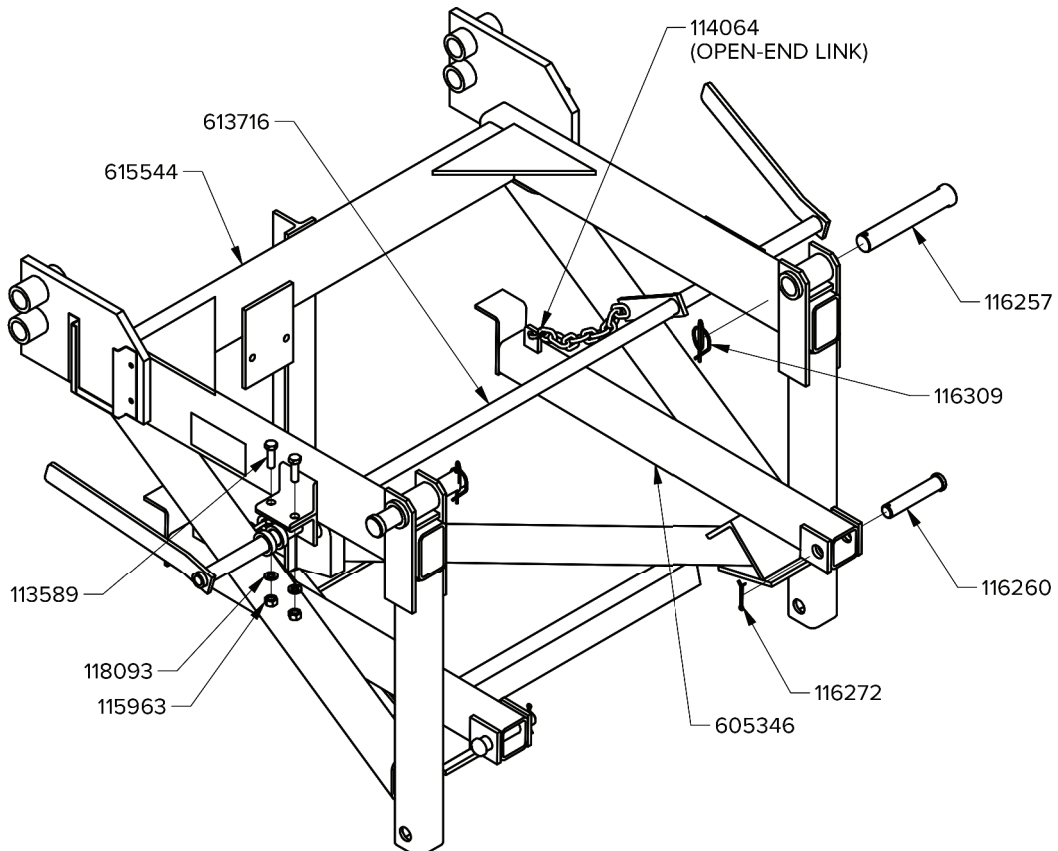
## Backup & Support Frame Assembly - 628463



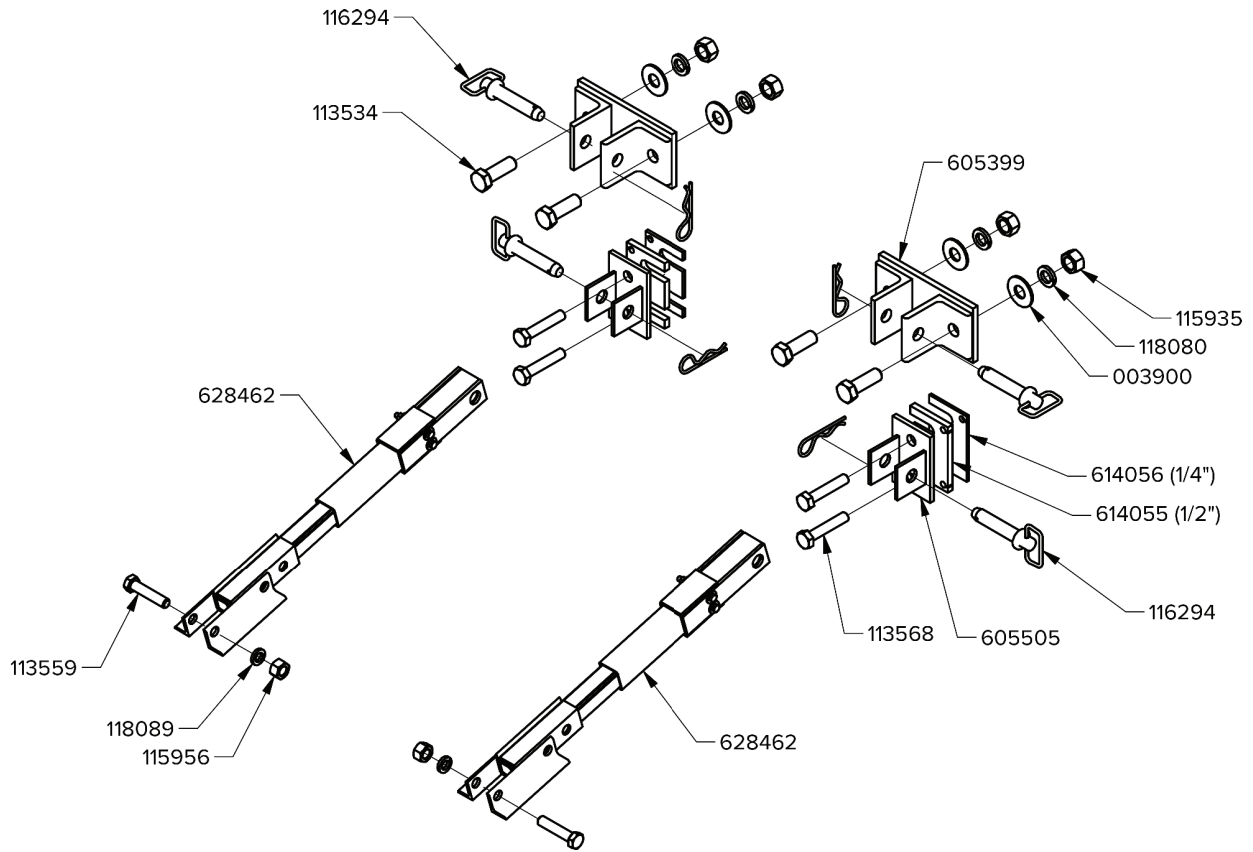
## Backup - 604617



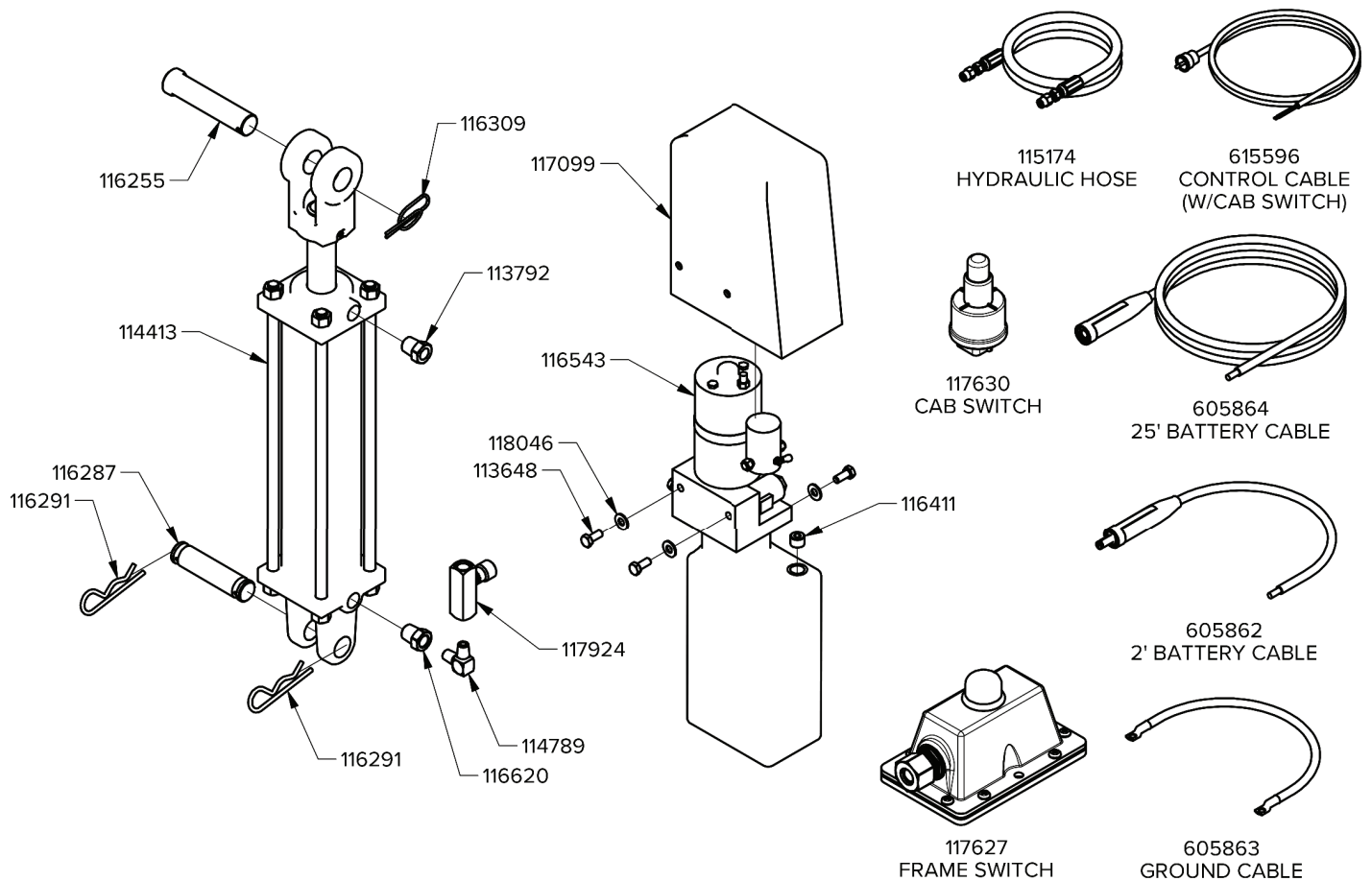
## Support Frame - 615522



## Strut Assemblies - 625343



## Hydraulic/Electrical - 625349











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