



GREGORY

HIGHWAY

TTMA-200

Trailer Truck Mounted Attenuator (MASH TL-3)



USER MANUAL

Gregory Industries, Inc.

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www.GregoryHighway.com

JANUARY 2021

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FOREWORD

Thank you for your purchase of the TTMA-200 Trailer Truck Mounted Attenuator (MASH) from Gregory Industries, Inc. (herein referred to as the TTMA-200). We are committed to providing our customers with highway safety products offering the best performance and value for your money, as well as the highest level of customer service.

The TTMA-200 is the latest addition to our highway safety products line. The TTMA-200 is an AASHTO MASH 2016 Test Level 3 (TL-3) crash cushion designed for use with a support truck in both stationary and moving work zones. The TTMA-200 is nearly identical to the predecessor TTMA-100 which was one of the most innovative TMA's in the market.

The TTMA-200 can be equipped to most vehicles 10,000 lbs. or heavier in your fleet within a matter of minutes. The TTMA-200 has successfully passed all required crash tests (3-50, 3-51, 3-52, 3-53, 3-54) set forth by AASHTO MASH 2016 and is eligible for use on the National Highway System by the Federal Highway Administration (CC-152). Versatility, reparability and ease of use are the keys to the TTMA-200. We believe you will find the TTMA-200 a great value for your short or long-term work zone solution.

This manual is a guide for operators through the operation and maintenance of the TTMA-200. Please read and understand the recommendations contained in this manual thoroughly before using the TTMA-200 and keep the manual available for future reference. If you have any questions or comments regarding the operation and/or maintenance of this product, please contact us:

Telephone: (866) 994-4929 - Monday to Friday, 8:00 a.m. to 5:00 p.m. EST.

Email: Technical Support: TTMATechnicalSupport@gregorycorp.com
Sales & Distribution: TTMASales@gregorycorp.com

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Online: For the most up to date version of our USER MANUAL visit our website
www.gregoryhighway.com

This manual has four sections:

- **TTMA Design and Major Components.** Detailed in this section is an overview of the TTMA-200 design and major components. Included are trailer and components, technical specifications, and wiring instructions.
- **Operational Guidelines.** Guidelines pertaining to the operation of the TTMA-200 are located in this section such as minimum support truck weight, support truck attachment structure, roll-ahead distances, connections, and other operational items.
- **Maintenance Guidelines:** This section offers suggested routine maintenance of the TTMA-200. How to keep the TTMA-200 in top operational condition.
- **Repair Guidelines.** Includes discussion of impacts by an errant vehicle and the associated repair and replacement of trailer parts.

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TTMA-200 DESIGN AND MAJOR COMPONENTS

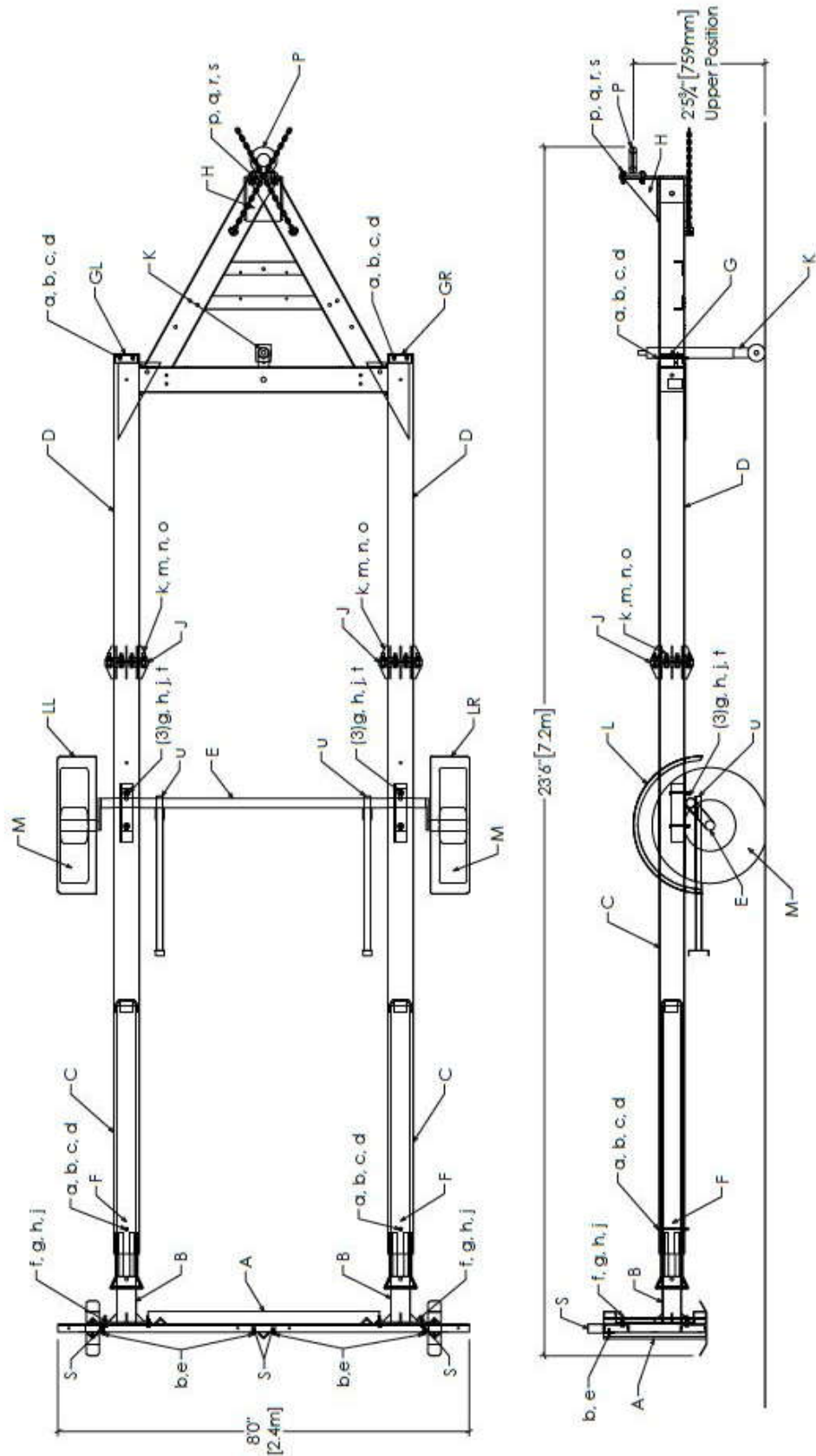


Figure 1. Schematic and Parts Layout of TTMA-200

TTMA-200 DESIGN AND MAJOR COMPONENTS

GENERAL

Trailer Components			
ITEM	PART #	QTY	DESCRIPTION
A	T-200A	1	Impact Head
B	T-200B	2	Bursting Mandrel
C	T-200C	2	First Stage Energy Absorber
D	T-200D	1	Trailer A-Frame
E	T-200P	1	MASH Axle Assembly
F	T-NHRC	2	Plastic Guide Plates w/Shear Bolt & hdw
G	T-200F/T-200G	2	End Caps (Driver/Passenger)
H	T-200H	1	Hitch Assembly/Lunette Ring
J	T-200J	8	Spacer
K	T-200K	1	Wheeled Jack Assembly
L	T-200EF-L/R	2	Fender (left/right)
M	T-200T	2	Spare Tire w/rim (205/75D15)
For a complete list of repair parts please refer to the index of this manual or contact your local distributor			

Table 1. Main Components of TTMA-200

Hardware Items (all hardware is Grade 5 Zinc Coated)			
ITEM	PART #	QTY	DESCRIPTION
a	-	6	5/16"-18 x 7" Grade 5 Hex Bolt
b	-	12	5/16" Flat Washer
c	-	6	5/16" Heavy Lock Washer
d	-	6	5/16"-18 Hex Nut
e	-	12	5/16" Tech Screws
f	-	8	1/2"-13 x 2" Hex Bolt
g	-	32	1/2" Flat Washer
h	-	16	1/2" Heavy Lock Washer
j	-	16	1/2"-13 Hex Nuts
k	-	16	9/16"-12 x 3" Hex Bolts
m	-	32	9/16" SAE Flat Washer
n	-	16	9/16" Heavy Lock Washer
o	-	16	9/16"-12 Hex Nuts
p	-	4	5/8"-11 x 2-1/2" Hex Bolts
q	-	4	5/8" USS Flat Washer
r	-	4	5/8" Heavy Lock Washer
s	-	4	5/8" Hex Nuts
t	-	4	1-3/8" (1-1/2" OD) Plastic Locking Plugs
u	-	2	Square Tubing Plug
v	-	4	1/2"-13 x 1-1/2" Hex Bolts
w	-	4	1/2"-13 x 4-1/2" Hex Bolts
x	-	4	5/8" SAE Flat Washers
Hardware items listed for reference only. Hardware items supplied with each repair part as needed.			

Table 2. Hardware Parts List

TTMA-200 Technical Specifications

Overall Dimensions

Length	23' - 6"
Width	8' - 0"
Height (to top of impact head)	39"
Height (to top of light bar)	43"
Ground Clearance (to bottom of impact head).....	13"

Capacity

Trailer Weight	1,835 lbs.
Approximate Tongue Weight (w/ Arrow Board Stand and Arrow Board)	300 lbs.
Minimum Support Truck Weight	10,000 lbs.
Maximum Support Truck Weight	Unlimited

Pintle Hook

Hitch	Lunette ring with no other structural attachment
Capacity Rating (Minimum)	8 tons
Mounting Height (3 positions).....	19.5" – 32.0"
Hitch Plate (Hitch Mounting Structure).....	100 klb (minimum)

Breakaway Axle

Rating	2,200 lbs.
Tire Size	205/75D15
Rim Size	15x5JJ
Cold Tire Inflation Pressure	50 psi

Lighting

Lighting	Integrated light bar
Lighting Standard	FMVSS 108

Arrow Board Frame

Arrow Board Frame	3" x 3" x 3/16" A500B
Manual Winch	

Construction

Frame	Open design
All energy absorbing components	6" x 6" x 3/16" A500 B
All structural members in impact system	Hot-dipped galvanized
Axle	Mid-mounted breakaway
Fender	Full-fender

Safety Performance

MASH 2016 required tests	AASHTO
Support truck weight – MASH 2016 Tests 3-50, 3-51, 3-52, 3-54	Unlimited
Support truck weight – MASH 2016 Test 3-53	10,000 lbs. (minimum)
Energy Absorbing System	Bursting Tube Technology
FHWA Letter of Eligibility.....	CC-152

Warranty

Warranty against defects in material and workmanship	One year
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Table 3. TTMA-200 Technical Specifications

WIRING INSTRUCTIONS

The TTMA-200 comes standard with a 7-pin Heavy Duty Truck Plug for connection to the tow vehicle. It is necessary to determine the plug on the tow vehicle so the correct plug can be adapted to the TTMA-200. The TTMA-200 can be adapted to fit an RV Plug as well as a 6-pin Heavy Duty Truck Plug. The shapes of the plug types are distinguishable as shown **Figure 2**. The RV plug uses blades and both truck plugs uses round pins.



Figure 2. Photographs of RV and Heavy Duty Truck Plugs

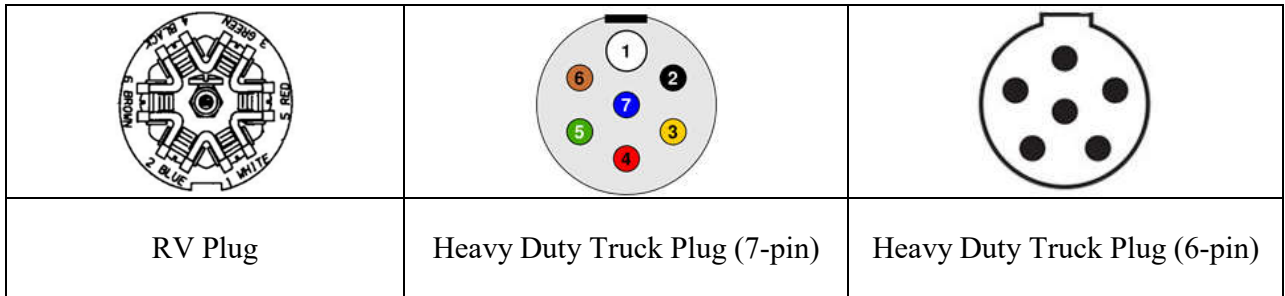


Figure 3. Standard Wiring Layouts of RV and Heavy Duty Truck Plugs

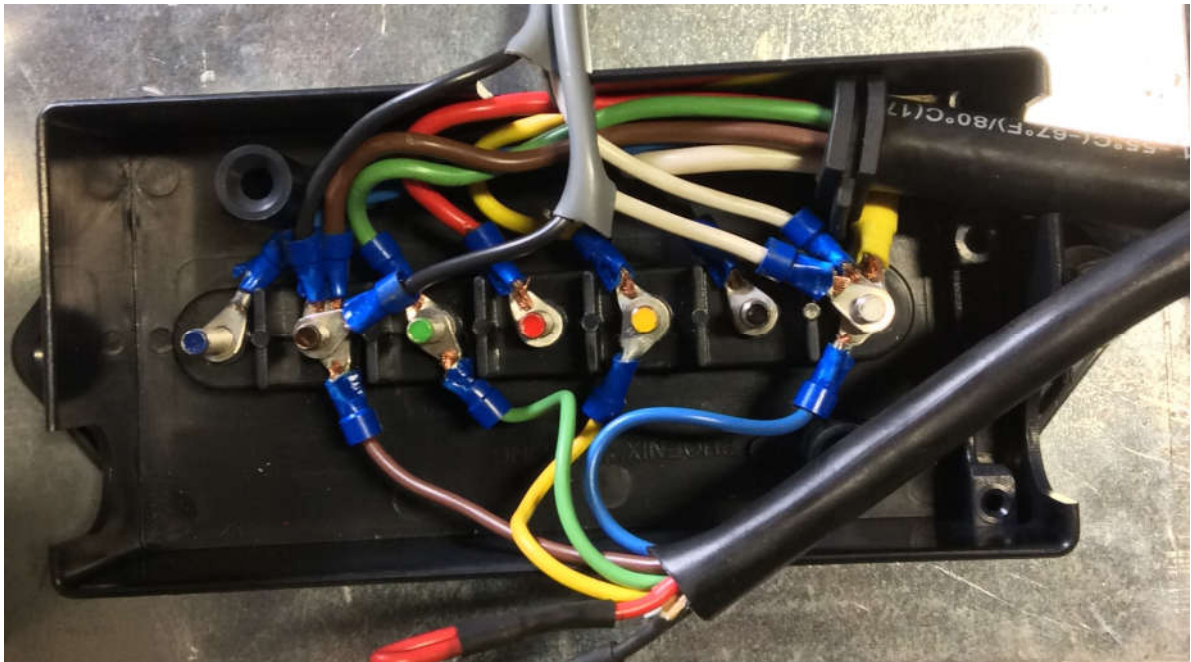


Figure 4. Wiring junction box TTMA-200

WIRING INSTRUCTIONS (Cont.)

RV Plugs with Separate Brake Wire			
Function	Trailer Wire Color	Plug Labels	
		Number	Color
Common Ground	White	1	White
Auxiliary	Black	2	Black
Left Turn	Yellow	3	Yellow
Brake Light	Red	4	Red
Right Turn	Green	5	Green
Tail/Marker Lights	Brown	6	Brown
12V Power Supply	Blue	7	Blue

Heavy Duty Truck Plugs			
Function	Trailer Wire Color	Plug Labels	
		Number	Color
Common Ground	White	1	White
Brake Light	Red	2	Blue
Tail/Marker Lights	Brown	3	Green
12V Power Supply	Blue	4	Black
Left Turn	Yellow	5	Red
Right Turn	Green	6	Brown
Auxiliary	Black	7	(center)

Table 4. Standard Wiring Layouts of RV and Heavy Duty Truck Plugs

NOTE: The above wiring patterns represent standard wiring for the tow vehicle. Wiring patterns may need modified if the tow vehicle does not use standard wiring. Please contact our technical services for assistance at TTMATechnicalSupport@gregorycorp.com

Figure 3 shows the different standard wiring layouts for the RV plug and the heavy-duty truck plugs.

Figure 4 shows the schematic of the wiring details of the TTMA-200. The TTMA-200 is fully wired at the time of delivery and this diagram is for reference purposes only. The only item that may require attention of the user is the wiring of the trailer plug for connection to the tow vehicle.

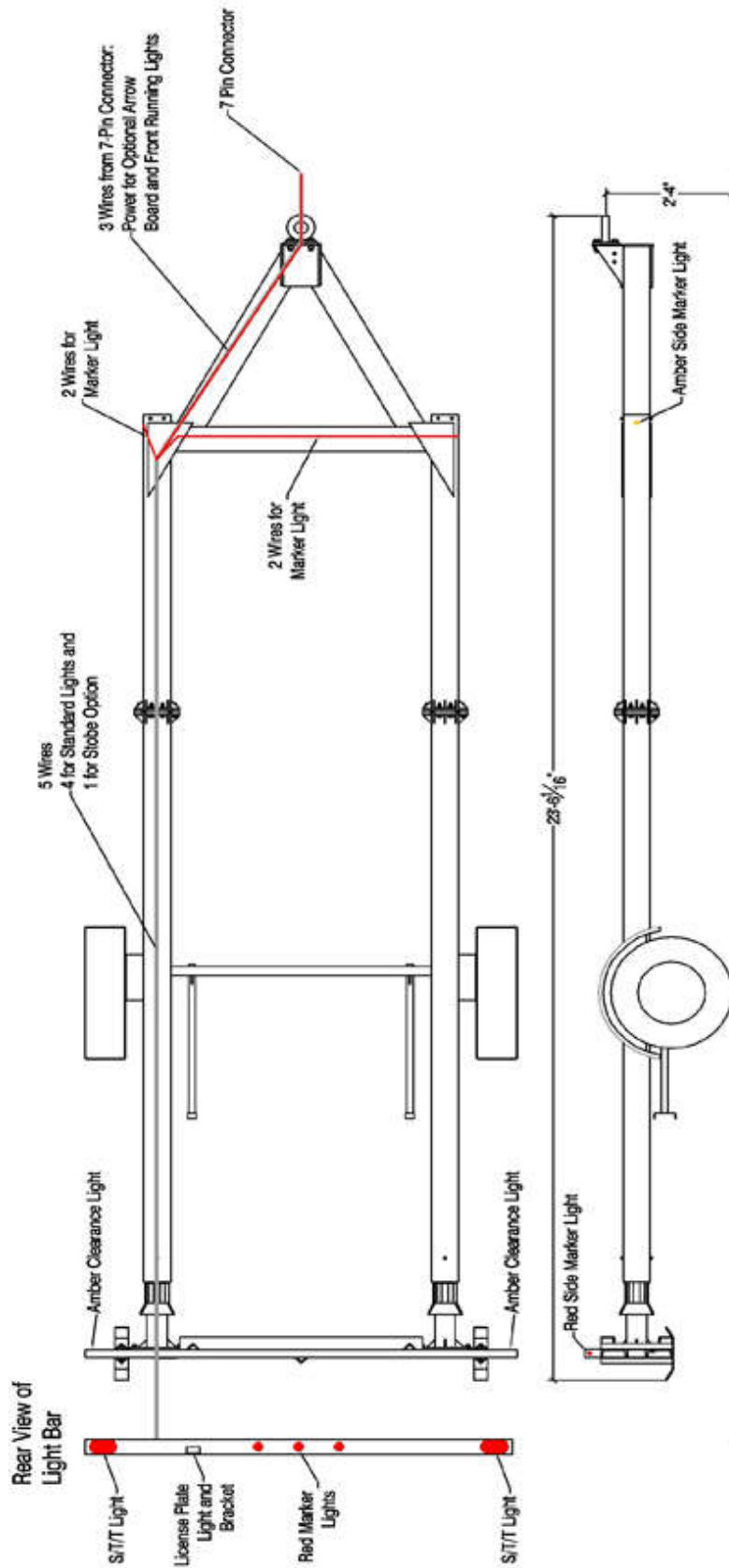


Figure 5. TTMA-200 Wiring and Light Layout

OPERATION GUIDELINES

INITIAL SETUP

The TTMA-200 should be delivered fully assembled. If there are problems with the delivered trailer, please contact Gregory Industries, Inc. immediately.

Three items will require your attention prior to utilizing the trailer:

- Check to make sure that there are no missing bolts and the bolts are tightened to the specific torque. The following are the recommended torques to the bolts according to the bolt size:

Bolt Size (in)	5/16"	1/2"	9/16"	5/8"
Torque (ft-lb)	15	60	85	115
Torque (N-m)	20	81	115	156

Table 5. Torque Detail for Fasteners

- Check to make sure the wiring of the trailer plug for connection to the tow vehicle is appropriate. As mentioned on **Page 8**, there are two distinctly different wire plugs that are not compatible, one is the RV plug and the other is the heavy-duty truck plug. Make sure that you have the correct type of plug and that the plug is wired properly. Also, check to confirm that the lights are functioning properly prior to putting the TTMA-200 into service.
- Check to make sure the Pintle hook is mounted properly. Due to the wide variations in the frame structures of different tow vehicles, there is not a single standard means of mounting the pintle hook assembly to the frame of the tow vehicle. **The major considerations in mounting of the pintle hook are the strength of the attachment and the mounting height.**

The Pintle hook assembly may be welded or bolted to the frame of the tow vehicle. Regardless of the method of mounting or attachment to the tow vehicle, it is critical to ensure that the strength of the attachment exceeds the rated capacity of the pintle hook with a wide margin of safety. **It is the obligation of the users to ensure that their particular pintle hook attachment system meets these strength requirements.** *Figure 6* below shows the mounting positions of the lunette ring.



Figure 6. Mounting Positions of Lunette Ring

MINIMUM AND MAXIMUM WEIGHT OF TOW VEHICLE

The minimum recommended weight for the tow vehicle is 10,000 lbs. gross vehicle weight (GVW) was established during AASHTO MASH 2016 Test 3-53. This test, as specified by AASHTO MASH 2016 did not use a vehicle blocked against forward movement. There is no specified maximum weight for the tow vehicle. TTMA-200 crash tests (3-50, 3-51, 3-52) specified under AASHTO MASH 2016 were conducted with the TTMA-200 attached to a tow vehicle that was blocked against any forward movement. By these standards, the TTMA-200 can be towed by a vehicle with an unlimited amount of weight.

TOW VEHICLE ROLL AHEAD DISTANCES

One of the major safety concerns is the roll-ahead distance of the shadow vehicle when impacted by an errant vehicle. When an errant vehicle impacts the tow vehicle with a TTMA-200 attached, it WILL roll forward. It is therefore important to allow sufficient space between the tow vehicle and the workers so the roll ahead of the tow vehicle would not pose any safety concern to the workers. **Table 6** and **Table 7** show the estimated roll-ahead distances for rolling and stationary tow vehicles, respectively, as a function of impact speed and weights of the support truck and impacting vehicle. The space between the support vehicle and the workers should exceed the estimated roll-ahead distance under the prevailing operating conditions. The following steps are provided to determine appropriate roll-ahead distance.

1. Assess the nature of the operation (i.e., moving or stationary operation). In a moving operation, the tow vehicle is moving at slow speed, such as 15 mph. In a stationary operation, the shadow vehicle is stopped with the parking brakes on. Use **Table 6** for stationary operations and **Table 7** for mobile operations.
2. Select the weight that best approximates the actual weight of the tow vehicle: 10,000, 15,000, 24,000, 40,000, 60,000 or 80,000 lb. Note the weight of the support truck should include the weights of items to be carried on the truck during the operation and the weight of the TTMA-200.
3. Select the range of prevailing speed of the traffic at the work zone: 45, 55 or 65 mph.
4. Select the weight of the impact vehicle to be contained: 10,000, 15,000, or 24,000 lb.
5. Select from the appropriate table the expected roll ahead distance

For example: If you are operating a tow vehicle with a gross weight of 15,000 lb as a stopped shadow vehicle in an area where the operating traffic speed is 45 mph, and there are few if any large trucks in the mix of traffic. Start with **Table 6**, select the appropriate values from above, and determine that the maximum roll-ahead distance would be 11 ft. This is the distance from the front of the tow vehicle to the work area that should be provided.

ATTACHMENT OF TTMA-200 TO TOW VEHICLE

The TTMA-200 is attached to the tow vehicle via a Pintle hook with a minimum capacity of 8 tons.

- Verify the retaining pin for the pintle hook is properly locked to avoid accidental release of the Pintle hook and lunette ring attachment of the TTMA-200
- Make sure the TTMA-200 lights are connected to the tow vehicle and are operating properly
- Ensure the safety chains properly secure the TTMA-200 to the tow vehicle.
- The mounting structure where the pintle hook attaches should be capable of sustaining 100 klpf (minimum) force at impact. Consult the hitch plate, vehicles manufacturer or engineer to ensure mount integrity.

Tow Vehicle Weight	Traffic Operating Speed	Impact Vehicle Weight			
		4500 lbs.	10000 lbs.	15000 lbs.	24000 lbs.
10000 lbs.	65 mph	38 ft.	103 ft.	152 ft.	216 ft.
	55 mph	27 ft.	74 ft.	109 ft.	155 ft.
	45 mph	18 ft.	50 ft.	73 ft.	104 ft.
15000 lbs.	65 mph	22 ft.	68 ft.	108 ft.	166 ft.
	55 mph	16 ft.	49 ft.	77 ft.	119 ft.
	45 mph	11 ft.	33 ft.	52 ft.	80 ft.
24000 lbs.	65 mph	11 ft.	38 ft.	65 ft.	111 ft.
	55 mph	8 ft.	27 ft.	47 ft.	80 ft.
	45 mph	6 ft.	18 ft.	32 ft.	54 ft.
40000 lbs.	65 mph	5 ft.	18 ft.	34 ft.	64 ft.
	55 mph	4 ft.	13 ft.	24 ft.	46 ft.
	45 mph	3 ft.	9 ft.	16 ft.	31 ft.
60000 lbs.	65 mph	3 ft.	10 ft.	19 ft.	38 ft.
	55 mph	2 ft.	7 ft.	13 ft.	27 ft.
	45 mph	2 ft.	5 ft.	9 ft.	18 ft.
80000 lbs.	65 mph	2 ft.	6 ft.	12 ft.	25 ft.
	55 mph	1 ft.	5 ft.	9 ft.	18 ft.
	45 mph	1 ft.	3 ft.	6 ft.	12 ft.

Table 6. Calculated Roll Ahead Distances for Stationary Operation

Tow Vehicle Weight	Traffic Operating Speed	Impact Vehicle Weight			
		4500 lbs.	10000 lbs.	15000 lbs.	24000 lbs.
10000 lbs.	65 mph	119 ft.	205 ft.	261 ft.	333 ft.
	55 mph	97 ft.	158 ft.	198 ft.	247 ft.
	45 mph	77 ft.	118 ft.	143 ft.	174 ft.
15000 lbs.	65 mph	93 ft.	161 ft.	211 ft.	278 ft.
	55 mph	78 ft.	127 ft.	162 ft.	209 ft.
	45 mph	65 ft.	97 ft.	120 ft.	150 ft.
24000 lbs.	65 mph	71 ft.	118 ft.	157 ft.	215 ft.
	55 mph	62 ft.	97 ft.	124 ft.	165 ft.
	45 mph	54 ft.	77 ft.	96 ft.	122 ft.
40000 lbs.	65 mph	56 ft.	86 ft.	112 ft.	155 ft.
	55 mph	50 ft.	73 ft.	92 ft.	123 ft.
	45 mph	45 ft.	61 ft.	74 ft.	95 ft.
60000 lbs.	65 mph	48 ft.	68 ft.	86 ft.	118 ft.
	55 mph	44 ft.	60 ft.	73 ft.	96 ft.
	45 mph	41 ft.	52 ft.	61 ft.	77 ft.
80000 lbs.	65 mph	44 ft.	59 ft.	73 ft.	97 ft.
	55 mph	41 ft.	53 ft.	63 ft.	81 ft.
	45 mph	39 ft.	47 ft.	54 ft.	67 ft.

Table 7. Calculated Roll Ahead Distances for Moving Operation (15 mph)

OPERATION OF TTMA-200

Operation of the TTMA-200 is similar to many other trailers. Special attention should be given to the following issues:

- The TTMA-200 when deployed the entire TTMA-200 should be horizontal to the ground with the impact head clearance to the ground at 13" +/- 1"
- The TTMA-200 device does not have brakes. All braking will be dependent on the tow vehicle. Thus, additional distance should be allowed for in braking and stopping of the tow vehicle.
- Do not use the TTMA-200 for hauling. Objects on the trailer create a potential projectile hazard for vehicles impacting the TTMA-200 and workers in the work zone.
- Attachment of the TTMA-200 results in wider turns. Drivers should be aware of this need for wider turning radius and adjust their driving accordingly.
- Attachment of any trailer TMA will result in different handling for the tow vehicle while backing up. Drivers should be aware of this difference in vehicle handling characteristics and adjust their driving accordingly.
- Tow vehicles should be equipped with headrests, lap belts and shoulder straps to provide proper crash protection for the driver. Operators should adjust their headrest to contact the center of the head and should wear seat belt and shoulder strap at all times.
- Do not attach any item to the trailer or hitch without explicit approval from the manufacturer. Contact Gregory Industries Technical Support for any question regarding attachments to the trailer E-Mail: TTMATechnicalSupport@gregorycorp.com - Phone: (330) 477-4800
- Verify that the retaining pin for the Pintle hook is properly locked to avoid accidental release of the Pintle hook and/or the lunette ring attachment of the TTMA-200.
- Make sure that the trailer lights are connected to the tow vehicle and operating properly.
- Ensure that the safety chains properly secure the TTMA-200 to the tow vehicle.

This manual does not cover the operation of optional equipment such as arrow boards, variable message signboards, and other approved hitch mounted equipment. Please see appropriate operating manuals accompanying those devices for instructions.

MAINTENANCE GUIDELINES

Proper maintenance of the TTMA-200 is critical to assure continued safe operation and long-term durability of the device. The outside of the TTMA-200 should be washed periodically, particularly during winter usage, to eliminate salt and other road contaminants. The inside of the frame should be washed annually. The end caps (Item G) can be removed to allow rinsing the inside of the frame. Care should be taken with the wiring for the side marker lights during this process. Note all critical parts of the TTMA-200 are hot-dip galvanized and require minimal maintenance. The following preventive maintenance schedule is recommended:

Item	Function Required	Each Use	Weekly	3 Months	1 Year
Lighting System	Test that all lights are operational	**			
Pintle Hook	Check capacity and verify the retaining pins properly inserted	**			
Safety Chains	Check they are properly attached	**			
Mandrel Restraining Bolts	Check the restraining bolts are not missing, bent, or broken and tightened to specified torque of 15 lbs.	**			
Lunette Ring	Check tightness of the 5/8" nuts / bolts to torque of 115 ft-lbs		**		
Tire Inflation	Ensure tires are inflated to 50 psi (Cold)		**		
Tire Condition	Inspect for cuts, wear, bulging, etc. <i>Table 9</i> provides guidance of routine wear issues.		**		
Wheels	Inspect for cracks, dents, distortion or other signs of wear			**	
Chevrons	Inspect retroreflective material & ensure it meets requirements for deployment		**		
Splice Bolts	Check the 9/16" splice bolts are not missing, bent, or broken and tightened to the specified torque of 85 ft-lbs.			**	
Wheel Nuts	Tighten to manufacturer specified torque values			**	
Breakaway Axle Bolts	Check the 1/2" breakaway axle bolts are not missing, bent, or broken and tightened to the specified torque of 60 ft-lbs.			**	
Wheel Bearings and Cups	Inspect for corrosion or wear. Clean and repack				**
Frame Welds	Check for cracks, call Gregory Industries for instruction if cracks are detected				**

Torque Chart				
Bolt Size (in)	5/16"	1/2"	9/16"	5/8"
Torque (ft-lb)	15	60	85	115
Torque (N-m)	20	81	115	156

TABLE 8. Recommended Maintenance Schedule

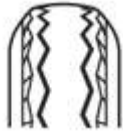





Tire Wear Diagnostic Chart			
Wear Pattern		Cause	Action
	Center Wear	Over Inflation	Adjust pressure to particular load per tire catalog
	Edge Wear	Under Inflation	Adjust pressure to particular load per tire catalog
	Side Wear	Loss of camber or overloading	Make sure load does not exceed axle rating. Alignment may be needed
	Even Wear	Proper wear of tire	Replace Tires
	Cupping	Out of balance	Check bearing adjustment and balance tires
	Flat Spots	Wheel lockup & tire skidding	Avoid sudden stops when possible and adjust brakes

TABLE 9. Tire Wear Diagnostic Chart

REPAIR GUIDELINES

For impacts requiring repair and replacement of parts on the TTMA-200, Gregory Industries, Inc. offers different parts packages depending on the extent of damage sustained by the unit. Parts packages are available through Gregory Industries, Inc. or a TTMA-200 distributor in your area.

DAMAGE ASSESSMENT AND REPAIR PARTS PACKAGES

Inspect the TTMA-200 to assess the extent of the damage and the necessary repairs. Due to the simple design of the TTMA-200, damages to the trailers are usually very evident. **The TTMA-200 should always be thoroughly inspected to assure everything is in proper working order prior to returning into service.**

The extent of damage to the trailer will vary greatly, depending on the nature and severity of the impact. It would not be possible to cover all situations that could potentially be encountered in real-world crashes. Thus, the instructions are presented in general terms for the following levels of damage to the trailer.

- **Nuisance Impact** – No apparent damage to TTMA-200 (5 mph impact)
- **Level 1 Impact** - Energy absorbing tubes (Part C) bursted, but axle assembly (Part E) not detached.
- **Level 2 Impact** - Energy absorbing tubes (Part C) bursted and axle assembly (Part E) detached, but the bursting does not reach the trailer A-frame (Part D).
- **Level 3 Impact** - Bursting reaches trailer A-frame (Part D).

Nuisance Impact - No Apparent Damage to Trailer

- Inspect shear bolts (Part a) holding mandrels (Part B) in place with the energy absorbing tubes (Part C). If the shear bolts are bent or broken, replace the bolts.
- Inspect trailer lighting system for damage. If the lighting system sustains only minor damage, such as a broken lens or light bulb, repair the damaged items, which may be purchased from automotive supplies stores. Make sure that all the lights are working properly prior to returning the trailer to service.
- The following replacement parts are typically required for repair with this severity of damage sustained by the trailer. **T-NHRC** (Shear Bolt, Nut, Washers and Plastic Guide Plates) per side.
- The user may conduct replacement of the shear bolts and plastic guide plates for the mandrels and repair of the lights in the field without involving the distributor or manufacturer.

Level 1 Impact – Energy absorbing tubes (Part C) bursted and axle assembly (Part E) not detached.

- Replace energy absorbing tubes (Part C) and shear bolts (Parts a, b, c, d).
 - **T-200C** (includes all hardware)
- Inspect trailer lights for damage. If the lighting system sustains only minor damage, such as a broken lens or light bulb, repair the damaged items, which may be purchased from automotive supplies stores. Make sure all the lights are working properly prior to returning the TTMA-200 to service. If the lighting system is severely damaged and no longer functional, replace the entire lighting system.

REPAIR GUIDELINES (Cont.)

- **T-LIGHTBAR-12V** (includes mounting hardware)
- Inspect impact head (Part A) and mandrels (Parts B) for damage. For this severity of impact, it is unusual for either the impact head or the mandrels to be damaged to the extent they are no longer usable and need replaced. Check to make sure that the impact head and mandrels are not severely bent and are properly aligned with the energy absorbing tubes. Replace as needed.
 - **T-200A** (includes mounting hardware)
 - **T-200B** (includes all hardware)
- Inspect lunette ring and pintle hook for damage. For this severity of impact, it is unusual for either the lunette ring or the pintle hook to be damaged to the extent they are no longer usable or need to be replaced. Check to make sure that the lunette ring and the pintle hook are not severely bent and can be hooked up properly.
 - **T-200H** (includes mounting hardware)



Figure 7



Figure 8

Level 2 Impact - Axle Assembly Detached, but No Damage to Trailer A-Frame.

- Replace energy-absorbing tubes (Part C) and shear bolts (Parts a, b, c, d, g and h).
 - **T-200C** (includes all hardware)
- Inspect the breakaway axle assembly (Part E) for damage. Replace axle if visibly bent. If the axle is not damaged, but the push rods are bent, straighten out the push rods. Make sure that the push rods are attached to the axle properly. If the axle is not damaged, but the fenders are severely bent, replace only the fenders.
 - **T-200P** (includes mounting hardware)
 - **T-200EF** – (includes mounting hardware, specify left, right or both fenders)
- Inspect trailer lights for damage. If the lighting system sustains only minor damage, such as a broken lens or light bulb, repair the damaged items, which may be purchased from automotive supplies stores. Make sure all the lights are working properly prior to returning the trailer to service. If the lighting system is severely damaged and no longer functional, replace the entire lighting system.

REPAIR GUIDELINES (Cont.)

- **T-LIGHTBAR-12V** (includes mounting hardware)
- Inspect impact head (Part A) and mandrels (Parts B) for damage. Check to make sure that the impact head and mandrels are not severely bent and are properly aligned with the energy absorbing tubes.
 - **T-200A** (includes mounting hardware)
 - **T-200B** (includes all hardware)
- Inspect lunette ring and Pintle hook for damage. For this severity of impact, it is unusual for either the lunette ring or the pintle hook to be damaged to the extent that they are no longer usable and needs to be replaced. Check to make sure that the lunette ring and the pintle hook are not severely bent and can be hooked up properly.
 - **T-200H** (includes mounting hardware)

Level 3 Impact - Bursting Reaches Trailer A-Frame

For this high severity of impact, it is not advisable to repair the trailer. It is recommended the user consider purchasing a new TTMA-200. The cost for the replacement parts would approach the price of a new trailer. Extensive assembly will be required, which may pose some problems for someone not familiar with the details of the trailer.

Arrow Board Frame

The TTMA-200 can be equipped with heavy gauge steel arrow board framework for use with a variety of 4' x 8' arrow board panels or variable message boards.

The arrow board framework for the TTMA-200 was used with each successful test during the AASHTO MASH 2016 testing.

NOTE: In the event an Arrow Board and Arrow Board Frame is not used on the TTMA a pair of ballast plates must be used in their absence. The ballast plates provide the necessary tongue weight required for the TTMA-200. Contact the manufacturer or distributor for pricing of ballast plates.

NOTE: Arrow Board/Arrow Board Frame should be moved to the travel position any time the TTMA-200 is being pulled over normal mobile work zone operating speeds. This will extend the life of the arrow-board stand connections.

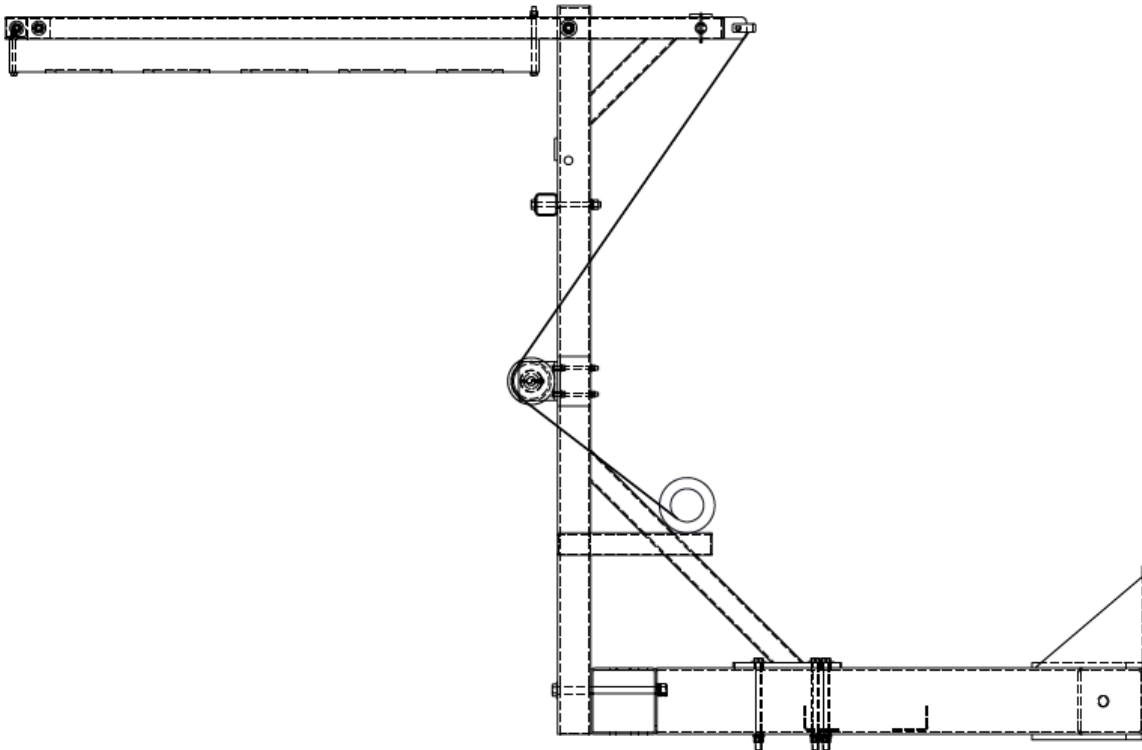


Figure 9. Arrow Board Frame (travel position)

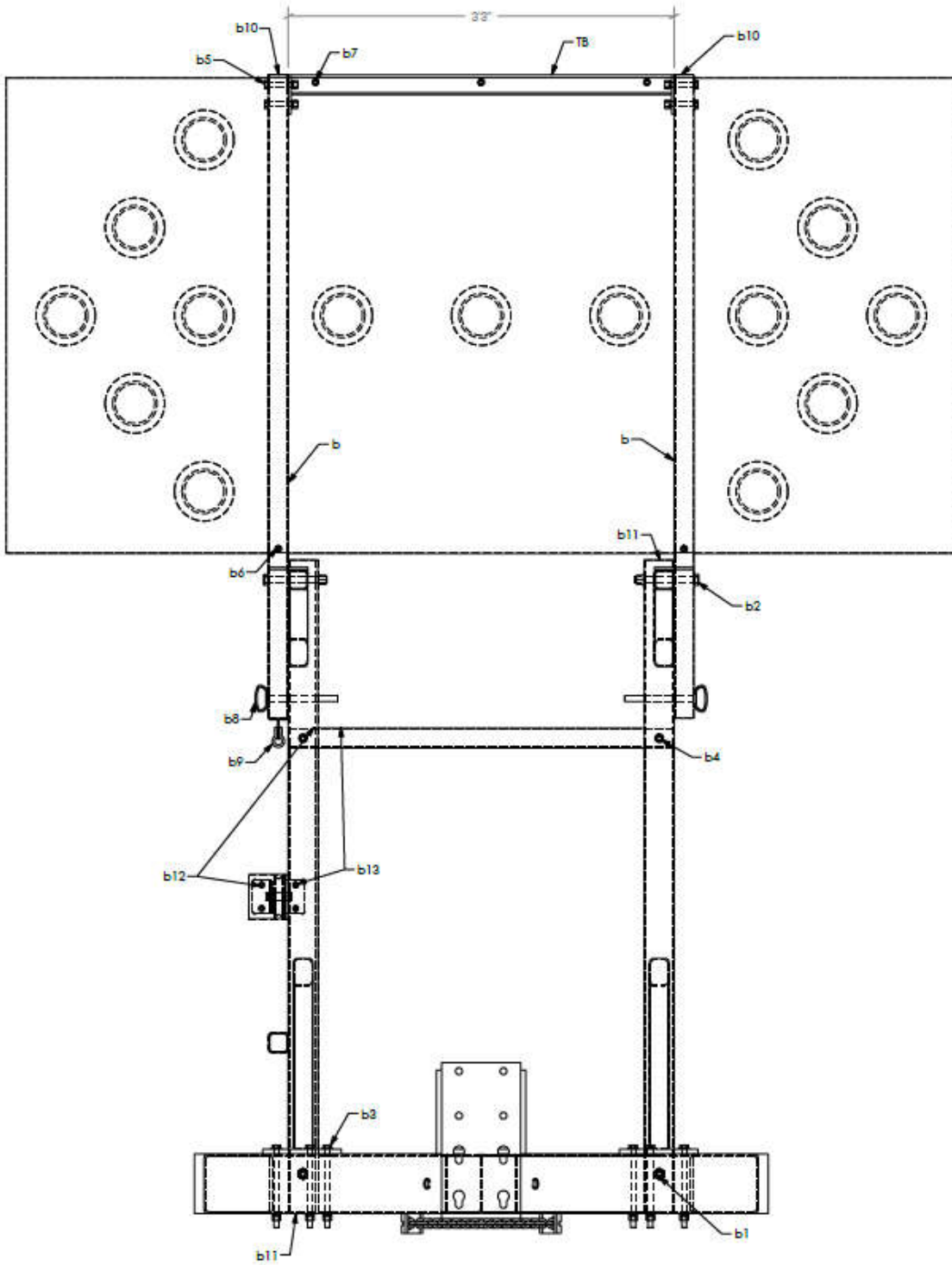


Figure 10. Arrow Board Frame (deployed position)

Replacement Parts and Components of TTMA-200

Replacement Parts	Description	Weight (lbs.)
T-200A	Impact Head & Hardware	240.00
T-200B	Mandrel w/ Hardware (ea.)	120.00
T-200C	Bursting Tube w/ Hardware (ea.)	127.00
T-200D	Trailer A-Frame	505.00
T-200E	Fender Bracket Light (specify driver or passenger side)	1.00
T-200EF-L/T-200EF-R	Fender (Left or Right)	23.50
T-200F	End Cap (Passenger)	1.75
T-200G	End Cap (Driver)	1.75
T-200H	Lunette Ring & Hardware	22.00
T-200J	Spacer (package of 8)	2.00
T-200K	Wheeled Jack Assembly	15.00
T-200K-WHEEL	Jack Assembly (Wheel Only)	1.00
T-200L	Safety Chains w/Hooks GR 70 (2 chains) – Standard Length	10.00
T-200LX	Safety Chains w/Hooks GR 70 (2 chains) – Extended Length	11.00
T-200M	16” Hitch Extension	63.00
T-NHRC	Shear Bolt, Nut, Washer & (2) Plastic Guide Plates	1.00
T-200P	MASH Axle and 5 Lug Hub Assembly (only)	90.50
T-200R	Battery Tray – Replacement/Upgrade	9.00
T-200S	Spare Tire Mount w/ Hardware	20.00
T-200T	Spare Tire w/ Rim (205/75D15)	37.50
T-200U	Radial Tire (205/75D15) – Upgrade	37.50
T-200X	T-Pin & Clip for Arrow Board Stand	1.00
T-200Y	Wiring Harness (Each) - From Lightbar to Junction Box	9.00
T-200Z	Reflective Tape for Bursting Tubes (2 per)	1.00
CHEVRONS	Various Chevron Patterns (CALL)	8.00
T-200-LIGHTBAR	12 Volt Light Bar (includes hardware and brackets)	8.50
T-200-LIGHTBAR-BRACKETS	MASH Mounting Brackets SS (Package of 4) with hardware	1.00
TM-ABF	Arrow Board Frame MASH	194.00
TM-WINCH	Manual Winch for TM-ABF MASH	9.00

Table 10. Repair and Replacement Parts

Table 10 provides a list of parts and part numbers. Please refer to these part numbers and legends for ordering spare or repair parts. Note this is not a complete parts list. Please inquire with the manufacturer, distributor, or reseller of the TTMA-200 for a complete parts list and pricing.

TECHNICAL ASSISTANCE

If you have any questions regarding inspection and assessment of damage to the trailer or required repair parts, please contact your distributor or Gregory Industries, Inc. by telephone at

Telephone: (866) 994-4929 - Monday to Friday, 8:00 a.m. to 5:00 p.m. Eastern Standard Time.

Fax: (330) 477-0626

Email: TTMATechnicalSupport@gregorycorp.com

TTMASales@gregorycorp.com

Web Site: www.GregoryHighway.com

Mail: Gregory Industries, Inc.
4100 13th Street SW
Canton, Ohio 44710

In order for Technical assistance to better provide assessment of the TTMA-200 or required repair parts, it is requested photographs be sent via email of the damaged TTMA-200 showing the overall damages, VIN tag and damages to the specific areas or parts in question.

Limitations and Warnings

The TTMA-200 Trailer Truck Mounted Attenuator has been tested and evaluated per the recommendations of the [American Association of State Highway and Transportation Officials \(AASHTO\) Manual for Assessing Safety Hardware \(MASH\) 2016](#).

The TTMA-200 Trailer Truck Mounted Attenuator is a Test Level 3 (TL-3) tested device capable of decelerating and stopping lightweight vehicles (2,425 lbs.) [1100 kg] and heavyweight vehicles (5004 lbs.) [2270 kg] in accordance with the criteria of MASH Tests 3-50, 3-51, 3-52, 3-53, 3-54 (62.14 mph/100 km/hr). FHWA Letter of Eligibility CC-152.

Impacts that exceed the design capabilities described in this manual (vehicle weight, speed, impact angle) may not result in acceptable crash performance as described in AASHTO MASH 2016, relative to structural adequacy, occupant risk and vehicle trajectory factors.

One Year Limited Warranty

Gregory Industries, Inc. warrants the purchaser against any defects in materials and workmanship of the Trailer Truck Mounted Attenuator (TTMA-200). Should the TTMA-200 prove to be defective in material and workmanship during the period of this warranty, Gregory Industries, Inc. will repair and/or replace the defective product free of charge. The period of the warranty shall commence on the date the purchaser puts the unit into service and shall remain in effect for a period of ONE YEAR.

This warranty does not cover any failure of the TTMA-200 caused by misuse, abuse or material alteration of the TTMA-200, or any negligence in connection with the installation, service, or use of this product. For proper installation, maintenance, or use of this product refer to the User's Manual, and the maintenance/service checklist.



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