

Installation, Operations, and Maintenance Manual



U-MAD® Truck Mounted Attenuator



- *Low and High Speed Capacities*
- *Many Flexible Mounting Options*

U-MAD® Installation and Operations Manual

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Introduction

The U-MAD Truck Mounted Attenuator (TMA) offers outstanding performance, excellent life cycle costs and quick, simple refurbishment. The U-MAD TMA is available in various sizes for workzones with speed capacities from 45 mph to 62 mph (70 km/h to 100 km/h) to supply a wide range of protection for workers, motorists and equipment. The TMAs are designed to absorb collision energy during rear-end impacts, prevent impacting vehicles from underriding the truck and reducing expensive damage to equipment.

The system offers many flexible options in lifts, mounting systems, hydraulics, and controllers to make installation, use, and maintenance as simple and cost-effective as possible.

Applications for the U-MAD TMA include stationary and slow-moving operations such as striping, sweeping, marking, road plowing, and roadside maintenance operations such as repairing crash cushions, guardrails, and road surfaces.

Contact Information

If you need additional information, or have questions about the U-MAD TMA, please call the BSI Customer Service Department at (888) 800-3691 (U.S. toll free) or (707) 374-6800.

Address:
Barrier Systems Sales and Service
180 River Road
Rio Vista, CA 94571

www.BarrierSystemsInc.com
email: Info@barriersystemsinc.com

Safety Instructions

The TMA support structure and cartridge should be rigidly attached to the frame rails of the truck, **after the support vehicle has been properly equipped with ballast and counterweights (if needed) to meet its' fully designated weight (including amenities such as an arrow panel)**. The cartridge must be a minimum of 11" (280 mm) and a maximum of 13" (330 mm) from the ground and level when in the full-down position. The U-MAD TMA must be in the full-down position whenever the unit is "in service" as either a parked protection device or as a moving protective shadow vehicle.

- All personnel should stand clear of the TMA before a qualified operator raises or lowers it.
- Lock pins must be in place when the TMA is in the travel (up) position or when traveling more than 5 miles (8 km).
- When traveling less than 5 miles with the TMA in the up position without the pins inserted, the maximum speed should not exceed 25 mph (40 km/h).
- The maximum speed in the deployed (down) position should not exceed 25 mph (40 km/h).
- Caution must be observed when attaching or detaching the TMA cartridge. Never attempt to use the force of the hydraulic power mechanism to align the pins or bolts.
- Never stand, sit, or place any objects onto a lowered U-MAD TMA. The top of the TMA should never be used for a work surface.
- Safety warning labels have been provided for the cab of the truck and the area where the control box is being mounted on the outside of the truck. Always have a qualified operator that is familiar with all of the warning labels located throughout the lift and cushion areas.

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In the cab of truck, a safety label should be clearly visible by the driver at all times that states when using a 100k TMA : "TOTAL TRAVEL HEIGHT 12' 6" (3.8 meters), "AVOID ALL CURBS, MEDIANS, AND OFF ROAD AREAS WITHOUT ELEVATING CUSHION MINIMUM OF 15° ", and "WHEN CUSHION IS IN UP (travel) POSITION, LOCKING PINS MUST BE IN WITH COTTER PIN THROUGH END".

Required Installation Tools

Standard mechanics tools are required to install the U-MAD TMA. These tools include, but are not limited to:

1. Lifting device (standard fork lift with fork extensions)
2. Side cutters
3. Wire crimpers
4. 3 lb. + hammer
5. Drill (able to penetrate 3/8" steel)
6. Drill bits 7/8" with starter bits
7. 2 ea. 1 1/2" wrench or socket
8. 2 ea. 1 1/8" wrench or socket
9. Tape measure
10. 24" + carpenters level
11. Plumb bob and line

Note: In the event that welding is required, use only a certified welder.

Optional Installation Tools

These tools while not required have proven to aide in the ease of installation on the U-MAD TMA.

1. Large clamps (C-clamp, Bessie clamp, ect...)
2. Hand bar or crow bar
3. Electromagnetic drill
4. Multi-meter

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Installation Mounting Instructions

All welding, drilling, and/or bolt work should be accomplished and inspected by a qualified mechanic and a certified welder.

It is recommended that the U-MAD TMA be mounted to a truck weighing between 19,000 lbs. (8,618.4 kg) and 20,000 lbs. (9,072.0 kg) to achieve the proper NCHRP 350 impact performances.

It is recommended that any additional permanent weight that will normally be on the vehicle should be added at this time (prior to TMA installation). If this step is neglected, the weight added after the TMA is installed may cause the TMA to be too close to the ground and out of specification.

STOP: If you are installing an optional mounting system, refer to the installation instructions included in your shipment. If the installation instructions are missing, contact your local distributor or a BSI customer service representative.

Step 1: Inspect the shipped materials

1.1 Inspect the U-MAD TMA at the time of receipt and note any shipping damages on the carrier truck driver's bill of lading. Have the notation initialed by the driver and subsequently report the damages to your BSI authorized Distributor.

1.2 Remove the parts list from the sealed package and assure that all of the parts listed are present. Report any missing parts to your Distributor immediately.

Step 2: Unpack the materials

2.1 Cautiously remove the protective shipping material from the TMA support structure.

2.2 Cautiously remove the protective shipping materials from the UMAD Cartridge.

2.3 The following items will be needed to mount the TMA support structure to the vehicle:

2.4 (10) each - 3" x 3/4" (76 mm x 19 mm), Grade 8 hex head bolts with washers and nuts.

2.5 (2) each - 4" x 36" C-channels (102 mm x 914 mm) or at a minimum, (2) each 3" x 3" x 36" x 1/4" angle iron (30 mm X 30 mm X 360 mm X 2.5 mm).

2.6 Electrical cable with a minimum diameter of 5/16" (0.80 cm) or 1/0 cable for power to the hydraulics.

2.7 (2) each - jack stands to support the rear of the TMA.

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Step 3: Install the TMA

3.1 Move the truck to a level working area

3.2 *Prepare the Frame Rails.*

Check for vertical plumb at rear of the truck frame rails with a tape measure or carpenter's level. It may be necessary to repair or modify the suspension to bring the frame rails to equal height. The rails should be the same length and extend beyond the bed of the truck approx. 8 to 12 in (200 mm – 300 mm). (Figure 1.).



Figure 1. Frame rails are equal Height and length.

3.3 *Connect the Frame Rail Ends.*

Connect the ends of the frame rails by welding (or bolting) a heavy steel plate or C-channel from end to end (if not already there). It is critical that this structure be heavy enough to adequately join the rail ends and maintain the spacing.



Figure 2. Connect the ends of the rails.

3.4 *Install the Support Structure.*

Using a forklift, fit the Support Structure over the outside of the frame rail assembly. (Figure 3)



Figure 3. Fit the support structure.

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3.5 *Adjust the Support Structure*

Adjust the position of the Support Structure so that it is level and the distance from the ground to the top of the support structure tubes is 23.5 in. (597 mm). Mark the attachment holes for drilling (Figure 4).

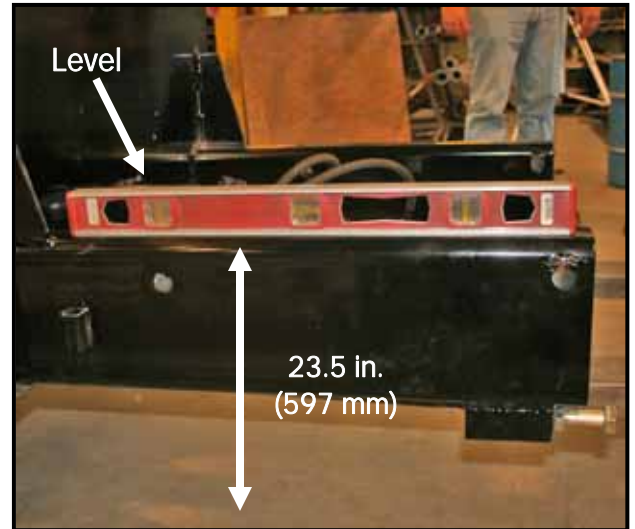


Figure 4. Adjust level and height of the Support Structure.

3.6 *Drill Holes*

After the Support Structure is level and at the correct height, mark and drill (4) 7/8 in. (222 mm) holes (Figure 5). Refer to drawing 1, notation A, in the Appendix .



Figure 5. Drill holes through the frame rails.

3.7 *Bolt Assembly*

Bolt the Support Structure assembly to the frame using (2 each per side) 3" x .75" (76 mm x 190 mm) grade 8 bolts, using washers, lock washes and nuts (Figure 6). Torque the bolts to 145 – 150 ft. lbs. (197 -203 Newton meters).

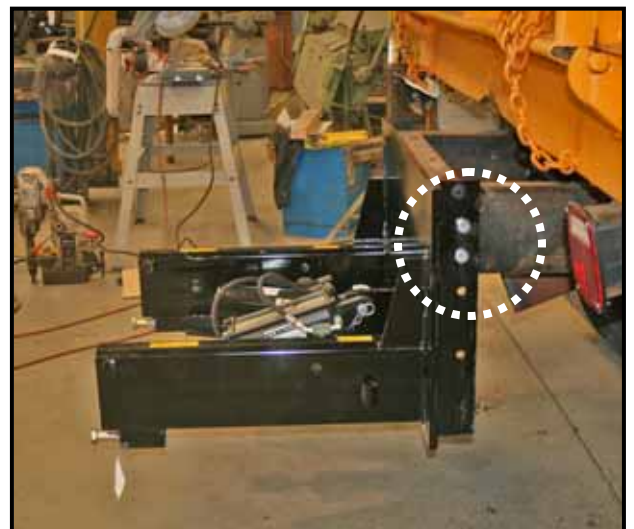


Figure 6. Bolt the support structure.

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3.8 Install Side Channel Braces

Position the Channel Braces on the truck frame insuring that the channels extend out even with, or past the rear of the support vehicle at a 45 degree angle to the lower section of the lift system as noted in drawing 1, notation B in Appendix (Figure 7).



Figure 7. Install side Channel Braces.

3.8 Bolt the Channel Braces

Bolt the Channel Braces to the truck frame insuring that the channels extend out even with or past the rear of the support vehicle at a 45 degree angle to the lower section of the lift system (Figure 8). Refer to drawing 1, notation B, in the Appendix. Torque the bolts to 145 – 150 ft. lbs. (197 -203 Newton meters)

Note: The support truck should already be loaded to its final adjusted weight prior to mounting the U-MAD TMA.



Figure 8. Bolt the side Channel Braces.

3.9 Route Control Wires

It is recommended that wiring be fed to the rear of the truck to accept the 7 round, or 4 flat, plug supplied to connect the vehicles lights to the U-MAD TMA to run the taillights, travel lights, 3 light bars and any accessories.

3.11 Route Power Source

A secondary electrical power source (+) will need to be provided to the electrical/hydraulic lifting pump (minimum cable diameter of 5/16" (8.0 mm) or 1/0 cable).

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Note: If installing a cab and/or outside control box please refer to section C of the Appendix.

3.12 Pick up the TMA

Using a standard duty forklift with fork extensions, carefully transfer the TMA to the back of the truck to for installation.



Figure 9. Transport the TMA.

3.13 Attach TMA to Support Structure

Attach the U-MAD cartridge to the Support Structure using the (2) 1" x 6" (25.4 mm x 152 mm) bolts and nuts provided. (Figure 10 – 11) Refer to drawing 1, notation D in the Appendix.



Figure 10. Bolt the TMA to the Support Bracket.

3.14 Fill hydraulic oil

Fill the hydraulic pump reservoir with AW45 clear, non foaming hydraulic fluid.



Figure 11. Fully attached TMA.

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3.15 Attach Cylinder

Attach lift cylinder to the cartridge using the 1" pin (2.54 cm) provided (Figure 12).



Figure 12. Install the lift cylinder.

3.16 Connect Plug

Connect the quick disconnect 4 flat or 7 round plug from the truck to the 4 flat or 7 round plug from the cartridge and test the lighting (Figure 13).



Figure 13. Plug in the quick disconnect.

3.17 Connect Power

Connect the power cable to the motor (Figure 14). Be sure that the power source is not energized before making this connection.



Figure 14. Attached to Support Structure.

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3.18 Using the adjusters, level the entire U-Mad TMA cartridge to between 11" (279 mm) and 13" (330 mm) off of a level ground surface (Figure 15 – 16).



Figure 15. Adjust the level of the cartridge.

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Operating Instructions: Raising and Lowering the TMA

Raising the U-MAD TMA:

1. Caution . . . stand clear of all moving parts while unit is moving.
2. Move the momentary three-way switch to the "Raise" position.
3. When the unit makes contact with the support structure tubes, install the two (2) 3/4" (19 mm) safety locking pins from the storage tubes (see drawing 1, notation E) into the full lockup position tubes and install cotter pins through safety locking pins (see drawing 1, notation F in Appendix)

Lower the U-MAD TMA:

1. Remove the two (2), 3/4" (19 mm) safety locking pins from the lock up tubes and place in the storage tubes on the sides of the support structure (see drawing 1, notation E and F in Appendix)

2. Caution . . . stand clear of all moving parts while unit is moving.
3. Move the momentary three-way switch to the "Lower" position.
4. When the U-MAD TMA approaches the full-down position, toggle the switch on/off quickly to make sure the unit rests properly against the support structure arms and adjusters.

IMPORTANT NOTE:

It is recommended that the U-MAD TMA be placed into the full down position when the unit is being used as a shadow vehicle for a moving operation or a parked protection device. The cartridge is not intended to be driven extensive miles at highway speeds in the full-down position and 25 mph is the maximum recommended speed when unlocked and in the down position.

If the need arises to move the unit through a highway median with steep up and down grades or to navigate through steep driveways or turn in or turn outs. It is recommended that the U-MAD TMA be elevated at least 15° while the obstacle is being circumvented.

General maintenance and Adjustments	Interval
1. Check tightness of bolts, fasteners and locking pins	Weekly
2. Oil swivel jack pivot points	Monthly
3. Check hydraulic pump fluid	Weekly
4. Change hydraulic pump fluid (AW46 Clear Hydraulic)	Quarterly
5. Add hydraulic fluid (non-foaming clear hydraulic oil)	As Needed
6. Grease hinge point between cartridge and support structure	Quarterly
7. Clean exterior of hydraulic pump	As Needed
8. Check and clean hydraulic ram	Weekly
9. Clean working parts of support structure (dirt, salt, oil, etc.)	As Needed
10. Check U-MAD TMA for level and height of cartridge from ground	Weekly
11. Check all friction points for lubrication	Weekly
12. Check hydraulic system and clean	Weekly

Table 1. Maintenance Schedule.

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IMPORTANT NOTE: DO NOT POWER WASH OR USE HARMFUL CHEMICALS ON CARTRIDGE OR SUPPORT STRUCTURE. EXCESSIVE PRESSURE OR CHEMICALS COULD CAUSE PAINT TO PEEL OR WEAR PREMATURELY.

MINOR ADJUSTMENTS

NOTE:

The U-MAD electric/hydraulic system provides power to raise and lower the TMA to the full up and deployed (down) positions. The needle control valve has been set at the factory to provide for a slow safe lowering time, you may experience greater speeds deploying the cushion until air is extracted from the cylinder; this is a factor that cannot be controlled because the hydraulic system is shipped to the end user dry. This speed should be checked before putting the unit into service and periodically from then on during the life of the U-MAD TMA.

NOTE:

It may sometimes become necessary to adjust the in-line hydraulic oil needle control valve to speed up or slow down the decent of the TMA cartridge. To increase speed: loosen control screw jam nut and turn the control screw _ turn counter clockwise ---continue making _ turn adjustments until desired speed is achieved. Re-tighten the control screw jam nut. To decrease speed: reverse above direction (i.e. clockwise).

The initial factory setting is a 1 full counter clockwise turn from a slightly seated position. Temperature when set was 75 degrees Fahrenheit and rising.

CAUTION . . . if the jam nut was loosened to adjust, it must be re-tightened before normal usage is instituted.

After on site testing of the full-up, full-down operation of the TMA, smooth operation of the lock-up pins should be checked. The pins were checked and adjusted at the factory but to avoid any field problems, it is advised that they be rechecked.

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Repair Policy / Limited Warranty

LIMITED WARRANTY

Barrier Systems, Inc. (BSI) has tested the impact performance of its barriers and crash cushion systems, and other highway safety hardware under controlled conditions, however, BSI does not represent nor warrant that the results of those controlled conditions would necessarily avoid injury to persons or property. BSI EXPRESSLY DISCLAIMS ANY WARRANTY OR LIABILITY FOR CLAIMS ARISING BY REASONS OF DEATH OR PERSONAL INJURY OR DAMAGE TO PROPERTY RESULTING FROM ANY IMPACT, COLLISION OR HARMFUL CONTACT WITH THE PRODUCTS OR NEARBY HAZARDS OR OBJECTS BY ANY VEHICLE, OBJECTS OR PERSONS.

BSI warrants that any product or component part manufactured by BSI will be free from defects in material or workmanship. BSI will replace free of cost any Product or component part manufactured by BSI that contains such a defect.

THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES NOT EXPRESSLY SET FORTH HEREIN, WHETHER EXPRESS OR IMPLIED BY OPERATION OF LAW OR OTHERWISE, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

BSI'S LIABILITY UNDER THIS WARRANTY IS EXPRESSLY LIMITED TO REPLACEMENT FREE OF COST (IN THE FORM AND UNDER THE TERMS ORIGINALLY SHIPPED), OR TO REPAIR OR TO MANUFACTURE BY BSI, PRODUCTS OR PARTS NOT COMPLYING

WITH BSI SPECIFICATIONS, OR, AT BSI'S ELECTION, TO THE REPAYMENT OF AN AMOUNT EQUAL TO THE PURCHASE PRICE OF SUCH PRODUCTS OR PARTS, WHETHER SUCH CLAIMS ARE FOR BREACH OF WARRANTY OR NEGLIGENCE. BSI SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL LOSSES, DAMAGES OR EXPENSES OF ANY KIND, INCLUDING, WITHOUT LIMITATION, ANY SUCH LOSSES, DAMAGES OR EXPENSES ARISING DIRECTLY OR INDIRECTLY FROM THE SALE, HANDLING OR USE OF THE PRODUCTS FROM ANY OTHER CAUSE RELATING THERETO, OR FROM PERSONAL INJURY OR LOSS OF PROFIT.

Any claim by the Buyer with reference to Products sold hereunder for any cause shall be deemed waived by the Buyer unless BSI is notified in writing, in the case of defects apparent on visual inspection, within ninety (90) days from the delivery date, or, in the case of defects not apparent on visual inspection, within twelve (12) months from the said delivery date. Products claimed to be defective may be returned prepaid to BSI's plant for inspection in accordance with return shipping instructions that BSI shall furnish to the Buyer forthwith upon receipt of the Buyer's notice of claim. If the claim is established, BSI will reimburse that Buyer for all carriage costs incurred hereunder.

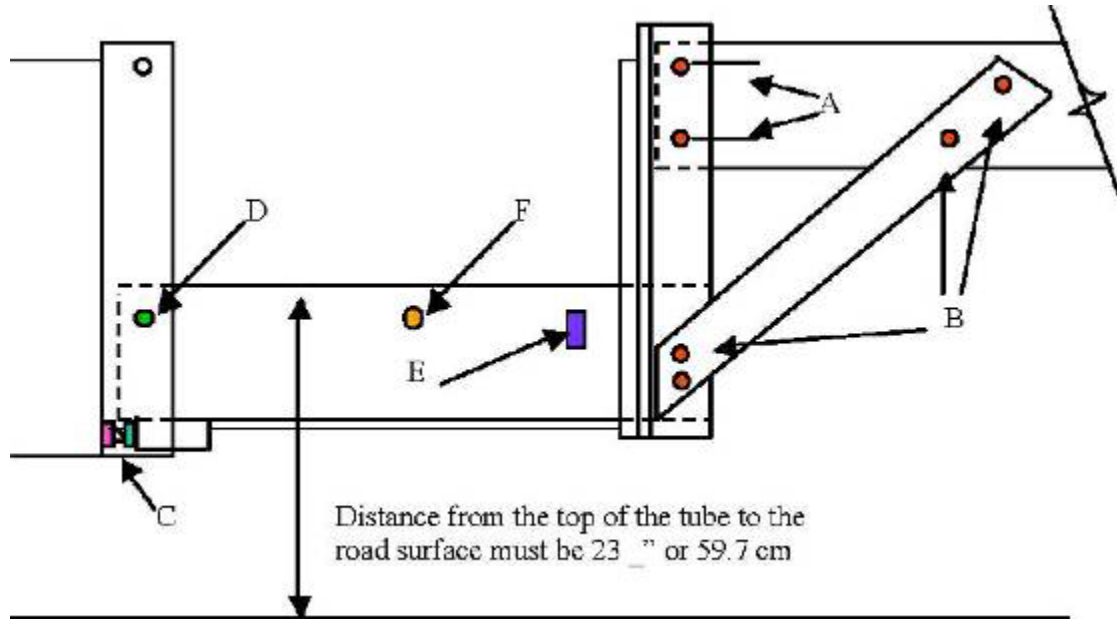
The forgoing warranty benefits shall not apply to (i) any Products that have been subject to improper storage, accident, misuse or unauthorized alterations, or that have not been installed, operated and maintained in accordance with approved procedures and (ii) any components manufactured by the Buyer.

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Appendix

A. Drawings

U-MAD mounting utilizing the optional Support Structure bolted to truck frame. Shows one (1) of two (2) adjustable bolts (C) used to final adjust the height of the crash cushion.



Drawing 1. Support Structure .

B. Wiring Schematic

COLOR CODED WIRING LIGHT INSTRUCTIONS
While the wiring for the U-MAD TMA was done by the factory wire up of the light harness, tail lights, revolving/strobe light(s), and travel lights require an understanding of the color coding at each end of the wires for the end user. All work should be accomplished and inspected by a qualified mechanic with knowledge of electrical systems.

1. The wiring harness from the cartridge has been pre-installed for ease in color match coding. However, to match the opposite side plug you will need to unscrew the faceplate on the receiver and read the color scheme embossed on the electrical plug. The following colors need to be matched to your truck wiring based on the colors you have available from the truck. With the limited numbers of color schemes offered by suppliers each area of wiring must be followed specifically so that the correct results can be achieved.

2. Wiring to Plug:

- White = White (Ground)
- Green = Green (Right Turn Signal/Stop Light)
- Black = Brown (Running/Marker Lights)
- Orange = Yellow (Left Turn Signal/Stop Light)
- Blue = Blue (Accessories/Strobe, Etc.)
- Red = NOT USED

3. Tail Lights:

- White = Accessories/Strobe, Etc
- Green = Turn Signals/Stop Lights
- Black = Running/Marker Lights

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Travel Lights:

White = Ground

Red = Turn Signals/Stop Lights

Black = Running/Marker Lights

1.9 Connect the Cab control cable green wire 3/16" (4.8 mm) eye terminal to the terminal screw on the solenoid of the Hydraulic pump.

1.10 Secure all loose wires, connections, and etc. to prevent damage and snagging.

C. Cab Control Mounting Instructions

1. CAB CONTROL BOX (WITH LOCK OFF)

INSTALLATION MOUNTING INSTRUCTIONS

1.1 Install the Cab Control Box in the cab at a safe and visible location within reach of the driver.

1.2 Provide adequate clearance for the Cab control cable and for the mounting of the Cab Control Box.

1.3 Connect a ground wire from the Cab Control Box to a metal part of the cab (the indicator light will not operate without proper grounding).

1.4 Attach the Cab control cable securely to the cab and frame. Use grommets when passing through the cab walls and frame holes, which lead to the Hydraulic pump from the cab.

1.5 Connect the white wire with the in-line fuse from the Cab control cable to the power side of the solenoid on the Hydraulic pump.

1.6 Connect the red wire with the 3/8" (9.5 mm) tongue ring from the Hydraulic Line Lock Control Valve to the ground connection on the opposite side of the Hydraulic pump.

1.7 Connect the red wire with the covered female spade from the Hydraulic Line Lock Control Valve to the red Cab control cable wire.

1.8 Connect the Cab control cable black wire to the relief valve on the side of the Hydraulic Pump.

2. CAB CONTROL BOX

INSTALLATION MOUNTING INSTRUCTIONS

2.1 Install the Cab Control Box in the cab at a safe and visible location within reach of the driver.

2.2 Provide adequate clearance for the Cab control cable and for the mounting of the Cab Control Box

2.3 Attach the Cab control cable securely to the cab and frame. Use grommets when passing through the cab walls and frame holes, which lead to the Hydraulic pump from the cab.

2.4 Connect the white wire from the Cab control cable to the power side of the solenoid on the Hydraulic pump.

2.5 Connect the Cab control cable black wire to the relief valve on the side of the Hydraulic Pump.

2.6 Connect the Cab control cable green wire 3/16" (4.8 mm) eye terminal to the terminal screw on the solenoid of the Hydraulic pump.

2.7 Secure all loose wires, connections, and etc. to prevent damage and snagging.

3. OUTSIDE CONTROL BOX

INSTALLATION MOUNTING INSTRUCTIONS

3.1 Connect the white wire from the outside control box electrical cable to the power side of the solenoid on the hydraulic pump.

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3.2 Connect the outside control box electrical cable black wire to the relief valve on the side of the hydraulic pump.

3.3 Connect the outside control box electrical cable green wire 3/16" eye terminal to the terminal screw on the solenoid of the hydraulic pump.

3.4 Secure all loose wires, connections, and etc. to prevent damage and snagging.