



Solutions for SAFETY ON THE ROAD

U-MAD[®] Truck & Trailer Mounted Attenuator

CARTRIDGE REPAIR MANUAL



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00	09-09-09	Technical Department	--

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INTRODUCTION

This manual describes the protocol for repairs of the U-MAD[®] Truck Mounted Attenuator (TMA) cartridge. The purpose of the document is to provide guidance and Certified Repair centres on the methods for identification and performing necessary repairs of correctable damage to the U-MAD[®] cartridge.

Proper repair of the U-MAD[®] cartridge and attachment devices is critical to maintain the performance the performance of the system during vehicle impacts when in use.

Following any impact the TMA must go through a thorough inspection of the cartridge as well as the mounting structure.

Please Note: All repair work must be performed in accordance with the guidelines and specifications of SNOLINE spa in order to maintain acceptable crash cushion impact performance and to keep the manufacturer's warranty in effect. When working on a TMA in the upright position, make sure locking pins are installed.

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DAMAGE REPAIR CLASSIFICATION

Any U-MAD[®] TMA unit that becomes damaged in any way, may, depending on the type, location, and severity of the damages, be repaired by:

- The customer or distributor
- A certified repair centre
- Or deemed non-repairable

A U-MAD[®] TMA Repair Investigation Worksheet complete with appropriate photographs of the damaged TMA device, must be submitted to SNOLINE's Customer Service to request an evaluation and provide recommendations for repair procedures.

EN U-MAD[®] Cartridge Damage is classified into three general categories or levels. Any Level 1 Damage may be repaired by the Customer or distributor using SNOLINE Repair Kits. Level 2 Damage must be repaired by a Certified Repair Centre, if and when available. Level 3 Damage is non-repairable and will require a cartridge replacement. Details of the types of the damage that fall into each of these levels are described in the following sections.

During initial U-MAD[®] Cartridge damage assessment, location of the damage is critical to determine reparability of the damage. There are two keep-out zones, orange and red, as indicated in Figure 1.

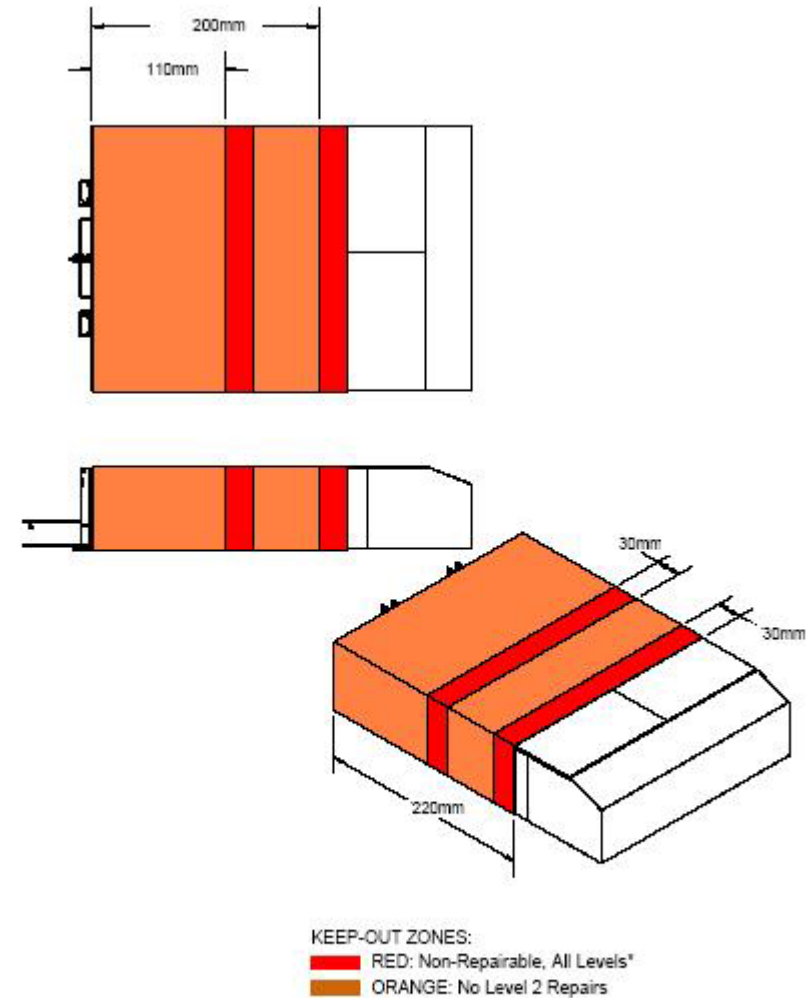


Figure 1 – Keep-Out Zones

The orange zone indicates a keep-out zone for Level 2. Only Level 1 can be repaired in the orange zone, it is non-repairable. Cosmetic damage as defined in Level 1 damage (in the next section), that falls into the red zone may be repaired. For any other non-cosmetic damage in the red zone, at any damage level, the unit is non-repairable and will require a cartridge replacement.

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LEVEL 1 DAMAGE

Damages to the U-MAD[®] under Level 1 are classified into 3 categories: cosmetic damage, denting and material separation/tearing. The red zone is a keep-out zone for this damage level for any non-cosmetic damage. Level 1 Damage repairs may be done by the Customer or Distributor using SNOLINE Repair Kits.

1. Cosmetic

- a. Paint – Scuff marks, paint transfer, cracking and hairline fractures in paint.
- b. Oxidation - Visible on bolts or on parts missing paint, cracking around site due to oxidation, pitting at oxidation site, missing material at oxidation site.
- c. Cosmetic damage - at the discretion of the customer, should be primed and repainted as needed.

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2. Denting

- a. Dents that have NO visible penetration into attenuator cavity with a maximum square dent size of 150mm x 150mm with a depth of 50mm is allowable for Level 1 repairs. Dent should be measured as follows:
 - i. Using a tape measure, measure and note the widest part of the dent, then also measure at 90 degrees to that measurement so that you have measured both the maximum length and maximum width of a rectangle that entirely surrounds the dent.

- ii. Place a straight edge or other rigid item across the dent in a manner to create a reference to the undented surface; measure the depth of the dent.

3. Material Separation and/or Tearing

- a. In the instance of the material separation at the joints or due to a tear, there should be no moisture intrusion.
- b. Separation at the joints of U-MAD[®] skin with a max allowable separation of 50mm in length and a cross-sectional separation width of 13mm.
- c. Tears in U-MAD[®] skin smaller than 80mm in length with a cross-sectional separation width of up to 13mm maximum.

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LEVEL 2 DAMAGE

Damages to the U-MAD[®] under Level 2 are classified into 2 categories: denting and material separation. The red zone and orange zone are keep-out zones for this damage level. Field repairs are not advised for Level 2 Damage. Repairs must be performed by a Certified Repair Center. Please contact SNOLINE's Customer Service for further information.

1. Denting

- a. Dents with a maximum square dent size larger than 150mm x 150mm with a depth no greater than 50mm is allowable for Level 2 repairs. Dents should be measured as follows:
 - i. Using a tape measure, measure and note the widest part of the dent, then also measure at 90 degrees to that measurement so that you have measured both the maximum length and maximum width of a rectangle that entirely surrounds the dent.
 - ii. Place a straight edge or other rigid item across the dent in a manner to create a reference to the undented surface; measure the depth of the dent.

2. Material Separation and/or Tearing

- a. Separation at the joints of U-MAD[®] skin larger than 50mm in length. Max cross-sectional width of 25mm.
- b. Tears in U-MAD[®] skin larger than 80mm in length with a cross-sectional separation width of up to 25mm maximum.

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- c. Crack growth at bolt holes or rivet points.
- d. Tears out at bolt holes or rivet points.

LEVEL 3 DAMAGE

Damages to the U-MAD[®] under Level 3 are non-reparable damages and require the unit to be replaced. These damages include:

1. **Any non-cosmetic damage in the red zone.**
2. **Damage in the orange that is not classified as Level 1 Damage.**
3. **Impact damage that exceeds the scope of Level 2 Damage.**
4. **Punctures to the outer skin that penetrates the moisture barrier**

CARTRIDGE REPAIR MATRIX

Damage Level	Damage Type	Description	Repair Method	Keep-out Zone	
1	Cosmetic:	Paint	Scuff marks, paint transfer, cracking and hairline fractures in paint	Sand, prime and paint	None
		Oxidation	Visible on bolts or parts missing paint, cracking around the site due to oxidation, pitting at oxidation site, missing material at oxidation site.		
	Hardware	Cracked/broken reflectors	Replace	-----	
	Denting	Denting without penetration into attenuator cavity. Max square dent size of 150mm	Use panel repair or corner repair kit. Flatten area with mallet, prepare surface, drill, tape, rivet and caulk. Allow (min.) material overlap from edge of dent. See Repair Procedures for detailed instructions. Note: in the instance of the material separation or tearing, there should be no moisture intrusion.	Red	
	Tearing	Tears in sheetmetal smaller than 80mm in length with a cross-sectional separation width of up to 13mm max.			
Material Separation	Separation at the joints of sheetmetal casing with max allowable separation of 50mm in length and a cross-sectional separation width of 13mm.				
2	Denting	Dents larger than 150mmx150mm. Max depth of 50mm.	Must be repaired by Certified Repair Center. Contact SNOLINE's Customer Service.	Orange	
	Tearing	Tears in sheetmetal larger than 80mm in length. Max cross-sectional separation width of 25mm.			
	Material Separation	Tears-outs and/or crack growth at bolt holes or rivet points.			
3	Denting	Damage in Orange Zone that exceeds the scope Level 1 Damage.	Non-reparable	Red, orange	
	Tearing or Material Separation				
	Impact	ANY Damage Exceeding the scope of Level 2 Damage.			
	Punctures or Missing Material	Punctures to sheetmetal casing that penetrates the moisture barrier			

REPAIR KITS

For Level 1 damage repair, Panel Repair and Corner Repair Kits are available. These kits contain the materials and instructions to make Level 1 repairs.

Required with each repair kit is also Patching Kit that contains paint, adhesive and caulking that is required to perform the repairs. The kits are required to be used as is, do not cut the material to size. There is also an optional Hardware kit that contains necessary tools that will help perform the repairs.

- **Panel Repair Kit**
- **Corner Repair Kit**
- **Patching Repair Kit**
- **Hardware Repair Kit**

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REPAIR PROCEDURES

LEVEL 1 REPAIR PROCEDURES

1. Flatten damaged area and prepare surface

- a. Use rubber mallet to straighten and flatten damaged area until it is flush to the U-MAD[®] skin, with no portions protruding beyond its profile.
- b. Locate any localized cracks in the U-MAD[®] skin where repairs are to be made. The end of the crack should be located, drilled and reamed into smooth circular shape. This prevents the crack from propagating.

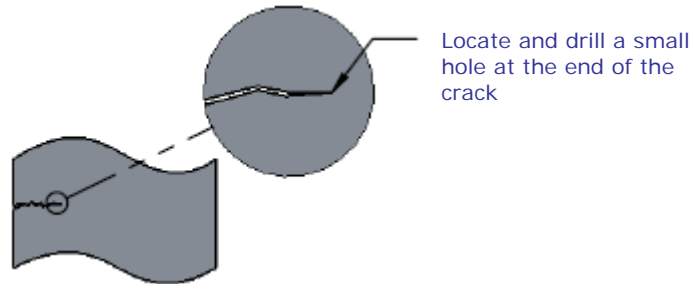


Figure 2: Example of a crack in a Material

Please Note: When Drilling do not penetrate the aluminium skin beyond 13mm past the surface; drilling further will risk damage to internal components and compromise the structural integrity of the U-MAD[®]. When working on a TMA in the upright position, make sure locking pins are installed.

- c. Center the damaged area across a 300mmx300mm square section and mark/outline this area to be prepped for patching. If repairing a corner or edge, the patched area shall be 230mmx300mm at one side and 100mmx300mm on the other (Figure 3).

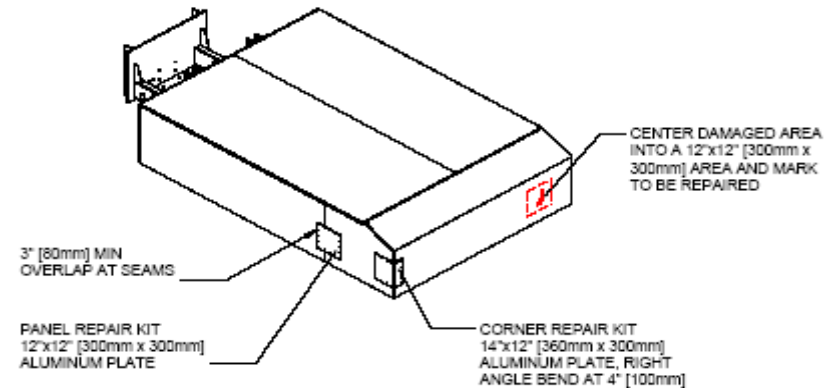


Figure 3 – Repair Kits Application

- d. Use the sandpaper provided to sand away the paint away the paint until underlying aluminium is exposed. Wipe away any debris from the sanded area with clean cloth.
- e. Apply caulking to any gaps, tears, or cracks and wipe away any excess.

2. Layout and Prepare Aluminium Patch

- a. Place aluminium sheet over sanded area to determine placement of rivets. Mark for a drilling. Please note: A minimum of (equally spaced) rivets along each 300mm length should be used.

Rivet holes should be placed no less than 20mm from the edge of the aluminium sheet.

- b. Scuff the unpainted side of the aluminium sheet and apply butyl tape around the inner perimeter of the sheet. Apply a second application approx. 25mm in from the perimeter (Figure 4)

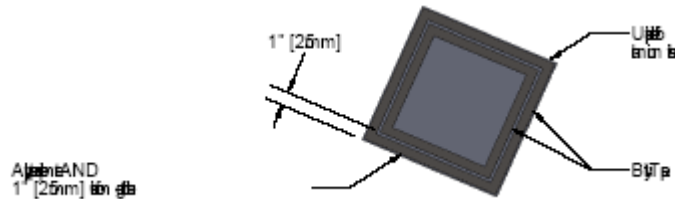


Figure 4 - Butyl Tape Applied to Aluminum Sheet

- c. Repeat the procedure for the procedure for the area on the U-MAD[®] skin surface that the aluminium sheet will be applied to.

3. Attach the Aluminum Sheet.

- a. Press aluminium sheet into prepared surface. Hold secure.
- b. Using a 7mm size drill bit, drill rivet holes into aluminium sheet as needed. When drilling, do not penetrate the U-MAD[®] skin beyond 13mm past the surface; drilling further will risk damage to internal components and compromise the structural integrity of the U-MAD[®].

- c. Caulk each rivet hole and fasten aluminium sheet to U-MAD[®] with rivets supplied in the Repair Kit.
- d. Apply caulking around the perimeter of the sheet and allow time for drying.
- e. Apply touch up paint as needed.

4. Allow 24 hours or longer for paint, adhesive, and caulking to cure.

LEVEL 2 REPAIR PROCEDURES

Available for a Certified Repair Center. Please contact SNOLINE Customer Service for further information.

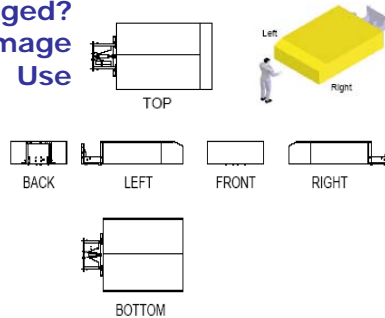


U-MAD[®] TMA REPAIR INVESTIGATION WORKSHEET

The purpose of this form is to request a damage assessment from SNOLINE, and obtain authorization for repairs of the U-MAD[®] truck mounted attenuating device. Please complete the form and send it to the address provided at the end of this document.

1. **Name of the Cartridge Owner:**.....
2. **Serial Number of the Cartridge:**.....
3. **Manufactured Date of the Cartridge (dd/mm/yy):**.....
4. **Date of damage (dd/mm/yy):**.....
5. **Does the damage show any cracking, tearing, or material separation on the aluminium skin of the cartridge?**
 Yes No
6. **Please indicate the approximate dimensions of the damaged area: (max. dimension length, width and depth)**
.....X.....X..... CM IN.

7. **Where is the cartridge damaged?**
Please mark location(s) of damage on the illustration to the right. Use all views necessary to show the damage to the cartridge.



8. **What caused the damage to the cartridge? Please describe how the cartridge was damaged.**
.....
.....

9. **Following Engineering Review—If damage is deemed repairable, please provide the following information where the Repair Kit and Repair Instruction should be sent**

Name.....**Phone Nr.:**.....
Shipping Address:.....
.....

11. **Has the cartridge been repaired in the past?** Yes No
If yes, when and by who?.....

Please include with this completed form, photos, of the damaged U-MAD[®], showing all sides.
Send to Customer Service using mail or e-mail.

The information held in this manual are based on information in our possession. Snoline SpA won't assume any responsibility for irregular use outside the official data supplied.

All the data held in this manual are exclusively owned by Snoline SpA. They can not be used, abused and/or released without a previous written agreement by Snoline SpA

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