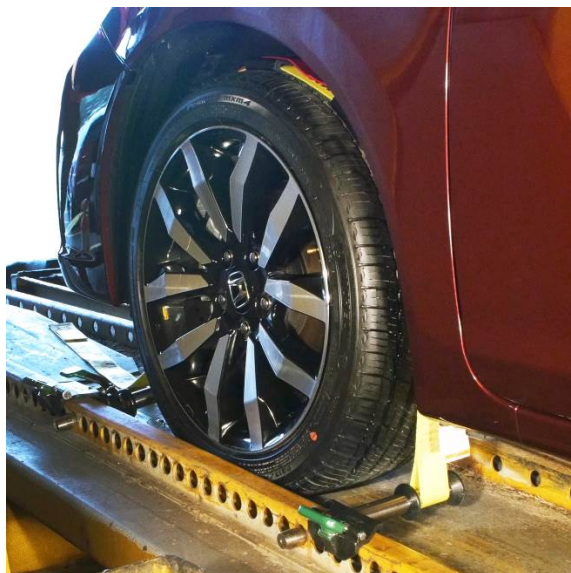




Trinity Low Profile Vehicle Restraint System Through Track Mandrel (TTM)

Pre-Trip, Installation, Removal, and Field Repair Manual



Revision 7 – May 19, 2016

Trinity Parts & Components, LLC
2525 N. Stemmons Freeway
Dallas, TX 75207
Phone: (800) 336-7305
Fax: (817) 378-2003

© 2016 Trinity Parts & Components, LLC

This document is property of Trinity Parts & Components, LLC, and should only be used in connection with Trinity Low Profile Vehicle Restraint Systems. Any modification, reproduction, or alteration without the express written permission of Trinity Parts & Components, LLC is strictly prohibited.

Table of Contents

Introduction	3
Cautions and Notices	4
Pre-Trip Inspection.....	6
Installation Instructions.....	8
Removal Instructions.....	13
Field Repairs	17
Replacing a Damaged Strap	17
Replacing Damaged or Missing Polymer Rings:	18
Replacing a Broken Torsion Spring.....	19
Replacing a Damaged or Worn Ratchet Release Lever:.....	19
Replacing a Track Retainer Lock Spring	20
Replacing a Damaged or Worn Track Retainer Lock and Clevis Pin	21
Replacing the End Cap.....	21
Replacing a Worn or Damaged Pin End Roller Assembly.....	22
Replacing a Bent Ratchet Mandrel:	23
Replacing a Bent Anchor Mandrel:.....	26
Assembly Procedures	28
Anchor Restraint and Strap Assembly Procedure	28
Apply Polymer Rings and Strap Assembly to Anchor Mandrel	28
Apply Lock Lever, Spring, and Clevis Pin to Retainer Casting	30
Assemble Anchor Mandrel and Retainer Casting	33
Ratchet Restraint Assembly Procedure.....	35
Apply Polymer Rings and Tire Guard to Ratchet Mandrel	35
Apply Lock Lever, Spring, and Clevis Pin, to Retainer Casting	36
Apply Release Lever, Torsion Spring, and Shoulder Bolt to Retainer Casting.....	38
Assemble Ratchet Mandrel, Retainer Casting, Ratchet, and End Cap.....	39
Parts Lists – Anchor and Ratchet Restraints	42
Anchor Restraint Parts List.....	42
Ratchet Restraint Parts List.....	42
Engineering Drawings.....	43
Ratchet Restraint Exploded (Drawing Number EXP_RATCHET)	43
Anchor Restraint Exploded (Drawing Number EXP_ANCHOR).....	44
Restraints & Strap Assembly (Drawing Number M-099-7083)	45
Service, Parts, and Rebuilding.....	46

Introduction

The Trinity Low Profile Vehicle Restraint System is engineered to restrain a passenger vehicle by two tires on the same side of the vehicle using one strap over each tire and two restraints per tire. The system is to be used only with Tri-level autoracks equipped with raised track according to AAR M-990-96.

The Vehicle Restraint System is not a chock. The system employs friction to limit the amount of movement the passenger vehicle will have during transportation on rail. Strap tension and placement are crucial for proper use.

The system must be “pre-tripped” correctly to prevent unnecessary additional time to install and correct installation.



One Vehicle Restraint System consists of three major subassemblies:

Ratchet Restraint –

Part Number M-099-7079

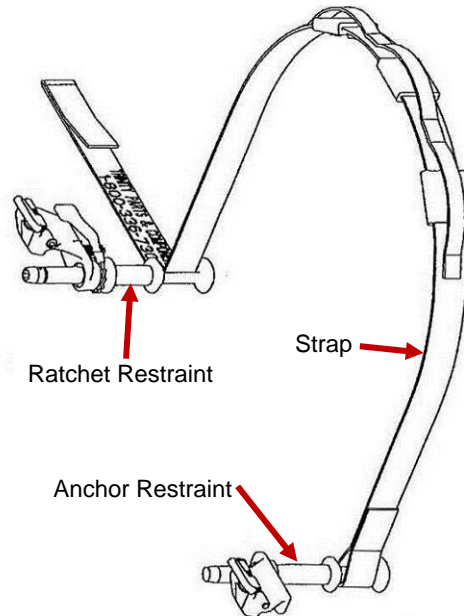
Anchor Restraint –

Part Number M-099-7082

Strap – Part Number 214-42717

Two Vehicle Restraint Systems are required for each passenger vehicle.

Refer to Drawing M-099-7083 found in the Engineering Drawings section of this manual.



Cautions and Notices

CAUTION

All loaders should wear hard hats, safety glasses, steel-toed shoes and protective gloves while handling straps and restraints.

CAUTION

The Trinity Vehicle Restraint System is only intended for use on Tri-level autoracks to secure passenger vehicles while being transported by rail.

CAUTION

Trinity Vehicle Restraints are only to be used in accordance with AAR Multi-level Manual instructions.

CAUTION

Do not climb onto autoracks while carrying restraint assemblies. Always keep one hand on side screens for balance while walking on deck.

CAUTION

Always be alert for potential slippery spots due to ice, water, or oils on the autorack deck surfaces.

CAUTION

Always remove all restraints and straps from the deck surfaces before vehicles are loaded or unloaded.

CAUTION

Never throw restraints off a rail car. Always hand them down to a person on the ground.

CAUTION

Remove all debris, ice, and snow from the autorack decks prior to use.
DO NOT use salt on decks or restraints.

CAUTION

While operating the restraints watch for finger pinch points. The hand operating the ratchet should be on the socket wrench handle; the other hand must be kept clear of the strap and ratchet.

CAUTION


Straps must be maintained free of wear or damage. Worn or damaged straps must be replaced before use. See the instructions in the Field Repairs section of this manual for information.

NOTICE

Always use Trinity service parts for rebuild, repair, or refurbishment of the restraint and strap assemblies. See the last page for contact information.

NOTE

The decal illustrated below provides a quick reference to the information provided in this manual. It appears in multiple locations on the Tri-Level autorack.



TRINITY
PARTS & COMPONENTS

“TTM” (Through Track Mandrel)
Low-Profile Vehicle Restraint System

2548 NE 28th Street
Fort Worth, Texas 76111
1-800-336-7305
Decal Part # 041-42987

Application Procedure

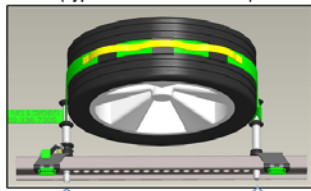
1. Remove Restraint System from Side Screen Hangers (or floor box) and place on deck along side wheel as shown in “Correct Orientation” diagram below.
2. Insert Mandrel of Anchor Restraint completely through both holes of the chock track (to right side of wheel) as shown. See **NOTE** for strap orientation.
3. Rotate the Retainer Plate down until the spring loaded Lock Lever snaps into adjacent chock track hole.
4. Pull strap taut over top of tire and insert cleats into tread keeping the strap centered on the tire. Remove any twists keeping the strap flat with printed text facing up.
5. Insert Mandrel of Ratchet Restraint completely through both holes of the chock track (to left side of wheel) as shown. See **NOTE** for strap orientation.
6. Rotate the Retainer Plate down until the spring loaded Lock Lever snaps into adjacent chock track hole.
7. Before tightening strap, allow enough slack in strap to provide a minimum of 1 to 2 complete windings of the strap around the mandrel. Using the 1/2” socket drive recess in end of mandrel, tighten strap CW using a ratchet wrench to 50 ft.-lbs. Min. of torque.

NOTE: The vertical strap orientation shown (below) reflects the maximum distance the Restraint should be positioned from the wheel. Position Restraint closer to the wheel to attain the minimum clearance of 2 inches between the strap and car body.

Removal Procedure

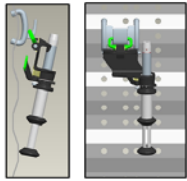
1. Depress Ratchet Release Lever.
2. Push Lock Lever Handle forward.
3. Rotate Retainer Plate up to clear track.
4. Push Ratchet Restraint forward out of track holes, then repeat steps 2 thru 4 for Anchor Restraint. Return System to Storage.

Correct Orientation
(Typical – All Wheel Locations)



Ratchet Restraint Anchor Restraint

Storage
(Side Screen Hangers)



Proper mounting shown above. Mount Restraints side by side with strap hanging between them.

Pre-Trip Inspection

CAUTION
Refer to the Cautions section at the beginning of this manual.

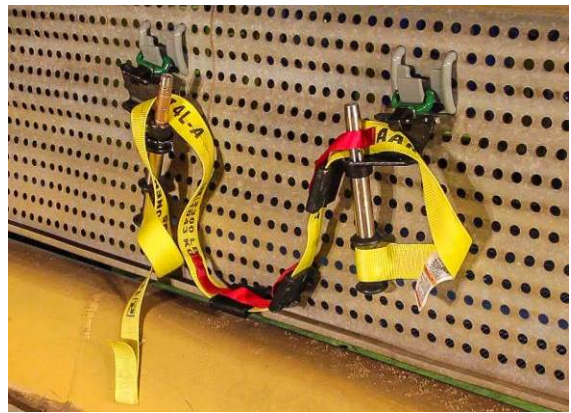
Two Vehicle Restraint Systems are required to control a vehicle. The systems are to be stored off the deck either in chock boxes or on provided hangers, if so equipped.

<p>Do not use salt on the decks of an auto rack equipped with this system. The Trinity Vehicle Restraint System has premium coatings to prevent corrosion, but ease of operation and Restraint life will be extended if salt or other known corrosive ice melt is not used. Refer to Multi-level manual for allowable ice and snow removal procedures.</p>	
<p>Restraints immobilized due to ice can be freed by inserting them into the chock track and latching the retainer body down. Then rotate the Restraint with a ½” square drive ratchet wrench in the clockwise direction [↻] (as seen by the operator) and the Restraint will be freed.</p>	

CAUTION
Do not hammer the end of the restraint assembly against a rack post. This will deform and damage the end of the restraint roller assembly and prevent proper operation.

<p>Inspect Vehicle Restraints for damage and replace if necessary according to AAR requirements. The Vehicle Restraint System does not require lubrication.</p>	
---	--

The straps should not be twisted or wrapped around the Restraints.
Untwist the strap so that the cleats will face towards the tire tread.



Unwind the strap so that the strap end will slide freely through the slot in the Ratchet Restraint.
Straps must be stored close to the side screen to prevent them catching on the vehicles' side mirrors.



Installation Instructions

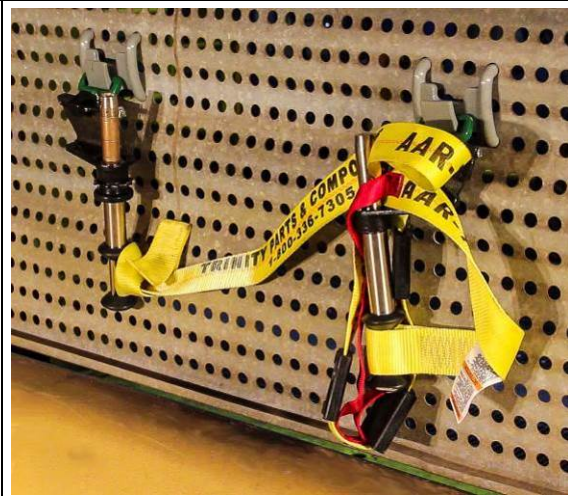
CAUTION

Refer to the Cautions section at the beginning of this manual.

Vehicle Restraint Systems shall be properly stored prior to loading. Refer to the Pre-Trip Inspection section of this manual.

Vehicle Restraints should never be driven over; damage to tires, the vehicle and the restraint may occur.

Vehicle Restraint Systems may be hung on side screen hangers or stored in existing chock boxes **if** the chock boxes have bottoms. Do not place Restraints in chock boxes without bottoms because they could slip out and fall between decks and out of the rail car.



Vehicles are to be positioned so that the sides of the tires are $\frac{1}{2}$ " to 2" from the chock track. The ideal vehicle position allows the Restraint Strap to extend vertically from the attachment point on the Restraint over the center line of the tire.



Free the Strap from the hanger.
Remove the Anchor Restraint from its storage hook (or chock box if so equipped) with one hand and the Ratchet Restraint with the other hand.



Carefully position the Restraint System on the rail car deck alongside the tire to be restrained.
Make sure that the Strap is not twisted or wrapped around the Ratchet Restraint. The Strap is to be free to move through the slot in the Ratchet Mandrel.



Pull out Strap slack so that the Ratchet Restraint can be easily installed.



Locate a track hole to insert the Vehicle Restraint's Mandrel end through on either side of the tire to be restrained.

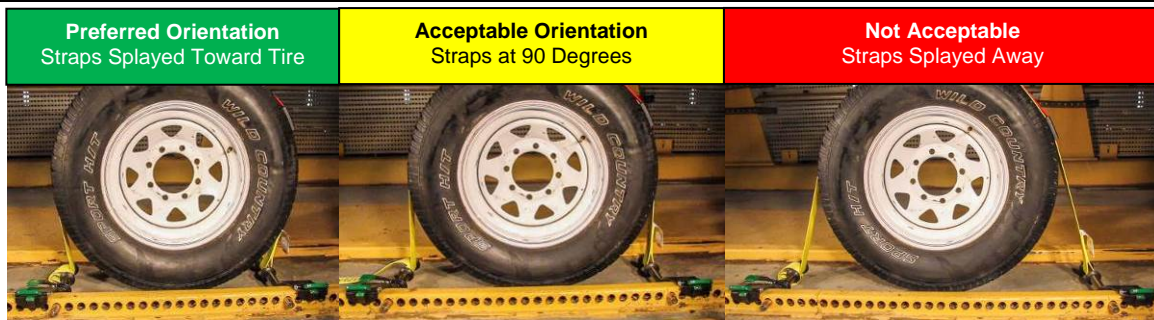
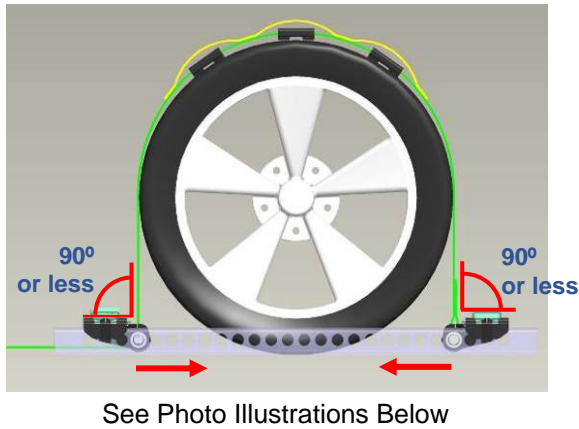
Note that a distance of 2" or more must be maintained between the Strap and the nearest point of contact to the vehicle's body or fender well when the Strap is placed in position over the tire.

Position the Retainer mandrels so that the straps will be splayed in towards the tire when tightened [see diagrams below]. Vehicle damage may occur if the straps are splayed out.



Ideally the Straps should be splayed towards the tire tread or at most installed perpendicular to the rail car deck.

The Strap must never be splayed outwards from the tire tread. It is acceptable if the Polymer Rings on the Restraint contact the tire tread when the Strap is fully tightened.



The Restraints are inserted into the traditional raised tri-level chock track holes by carefully placing them between the tire tread and the body of the vehicle, rotating the Retainer Body up to allow the Restraint end to be inserted into the track hole and all the way through two track holes in line.



Once the Restraint is inserted, rotate the Retainer Body down over the top of the track until the spring loaded latch is seated in the adjacent track hole.

Insert the Anchor Restraint first, then the Ratchet Restraint on the other side of the tire in the holes selected.



Place the Strap over the tire tread so that the Strap is not twisted and lays straight. The Strap's rubber cleats must engage the tire's tread; in the same tread. The Strap's preferred location is the centerline of the tire tread.

Do not locate the Strap at the rounded shoulder of the tire tread as this may result in the Strap working itself off the tire due to rail truck hunting motion.



Pull slack through the Ratchet Restraint slot taking up any Strap slack but leave enough Strap for one to three wrappings of the Mandrel when tightened.

Do not over wind the strap on to the mandrel.



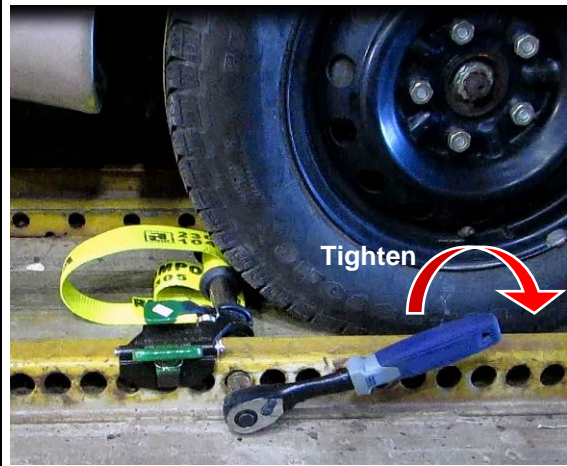
Make sure that the pawl has engaged the ratchet tooth fully.



Tighten the Strap using a ½" square drive hand ratchet wrench to a minimum of 50 Ft.-Lbs. while using your left hand to pull the tail of the strap to prevent it from being wrapped over the Polymer Rings.

The Strap tightens in the clockwise [⤵] direction as viewed from the end of the Mandrel.

A ½" square drive extension may be used to increase the wrench swing.



Excess Strap can be tucked under the Ratchet Restraint if necessary.



A correctly installed Restraint System will prevent vehicle damage and deliver a damage-free vehicle to a satisfied customer.



Removal Instructions

CAUTION

Refer to the Cautions section at the beginning of this manual.

To remove the Vehicle Restraint System from each automobile on the Auto Rack:

Inspect the Restraint System and vehicle for contact or damage prior to removing the Vehicle Restrain Systems.
Report any on-rail damage as normally done.



CAUTION

To prevent injury, make sure your fingers are not in the ratchet pawl mechanism or near the strap.

Depress the Ratchet Release Lever and pull up on the Strap until it has enough slack to slip over the tire. The Ratchet Release Lever may be operated with your foot or the palm of your hand.



If necessary, reposition the vehicle off the Polymer Rings on the Restraint if the vehicle has shifted during transportation in order to remove the Strap or Restraints.

CAUTION

If using a ratchet wrench to loosen a tightened restraint strap, do not leave the ratchet wrench in place when you press the Ratchet Release Lever. Personal injury may result when the wrench handle swings through to the deck floor.

If necessary use a ½” square drive ratchet wrench to loosen the Strap. To loosen the Strap turn the wrench in the counter clockwise direction [↺] (as viewed by the operator).

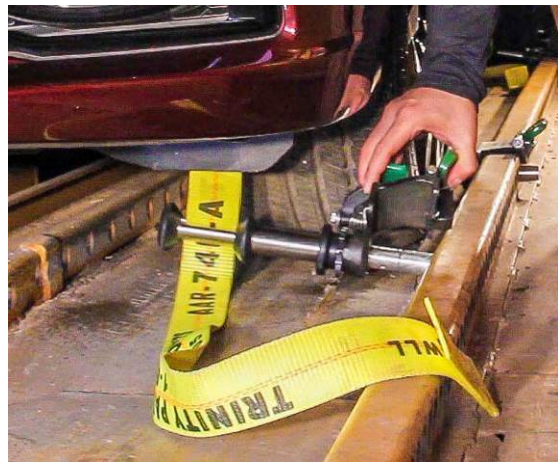
Do not leave the ratchet wrench in place while depressing the Ratchet Release Lever.



Once the Strap is off the tire tread, remove the Ratchet Restraint by lifting up on the spring loaded latch handle until it rotates the latch out of the track hole.



Continue with the same motion used to unlatch the Retainer Body from the track, rotate the Restraint upwards towards the tire tread and slide the Retainer Body out of the track hole until it is clear of the chock track.



Push the Retainer Body away from the track so that the Restraint is fully disengaged.



After the Ratchet Restraint has been removed release the Anchor Restraint by lifting up on its spring loaded latch handle until it rotates the latch out of the track hole.

Continue with the same motion to rotate the Anchor upwards towards the tire tread and slide the Retainer Body out of the track hole until it is clear of the chock track.

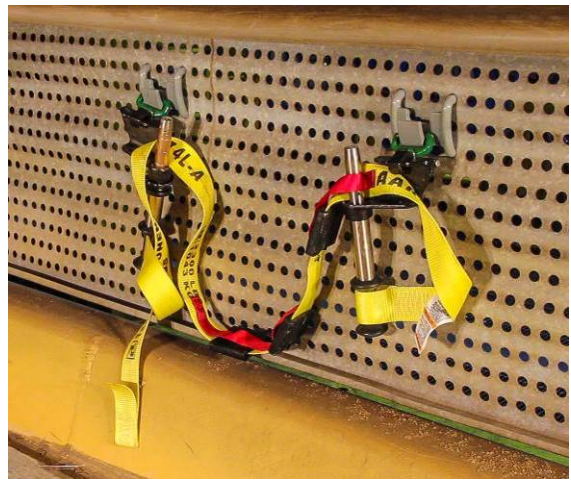
Push the Retainer Body away from the track so that the Anchor is fully disengaged.

Inspect the Vehicle Restraint System for damage and if necessary follow your local area procedures.

Place the Vehicle Restraint into its storage position by hanging it on the side screens with the hooks provided (or in chock boxes if so equipped).

Unwrap and untwist Strap from the Ratchet Mandrel, if necessary, so that it slides freely through the slot.

The Strap can dry out if hung back up and will not be on the deck posing a potential trip hazard.



Field Repairs

CAUTION
Refer to the Cautions section at the beginning of this manual.


CAUTION
Wear safety glasses and other personal protection equipment (PPE) as required by your employer when performing these procedures.

NOTE
Part numbers in parentheses () refer to Trinity service parts for replacement, repair, or refurbishment of the Restraint and Strap assemblies.

NOTE
If greater detail is necessary during reassembly refer to the Assembly Procedures sections in the back of this manual.

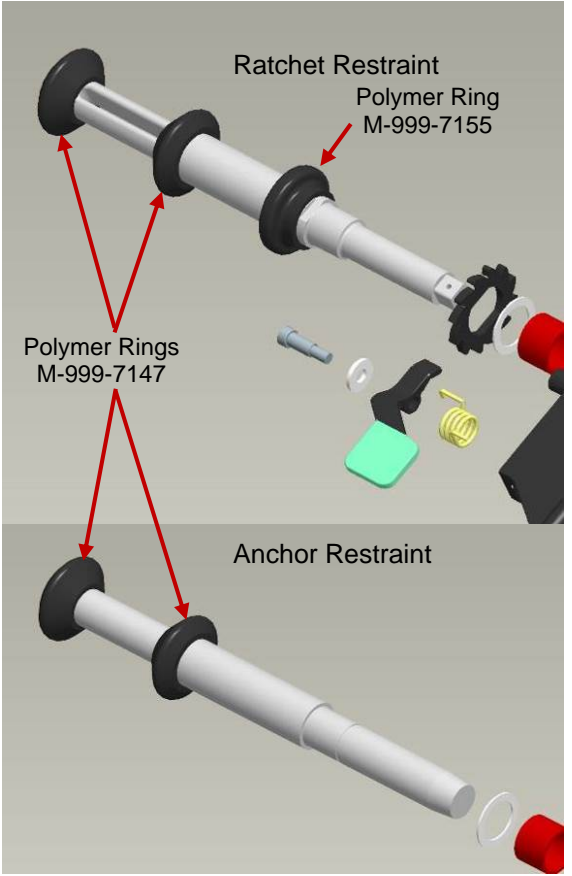
The Vehicle Restraint System can be easily rebuilt in the field.

Replacing a Damaged Strap

<p>Remove damaged Strap by aligning the flap at the end of the strap and sliding it through the slot on the Ratchet Mandrel. Before removing the Polymer Rings note the orientation of the rings for reinstallation later.</p> <p>Remove the Polymer Ring at the end of the Anchor Restraint using your hands. Slide looped end of the strap off the Mandrel.</p> <p>Acquire a new Strap (214-42717).</p> <p>Slide the looped end of the Strap onto the Anchor Restraint.</p>	
<p>Inspect the Anchor Restraint Polymer Ring. If it is damaged or worn acquire a new Ring (M-999-7147).</p>	

<p>If necessary, apply a small amount of liquid dish soap to the Anchor Restraint to help with lubrication.</p> <p>Carefully slide the Polymer Ring onto the Restraint until it is positioned on the outermost end.</p> <p>Use a rag to wipe any excess soap lubricant off the Anchor Restraint.</p>	
<p>Reinstall the Strap on the Ratchet Restraint by aligning the flap at the end of the Strap and sliding it through the slot on the Restraint. Pull out enough excess Strap to assure it will not pull loose.</p>	

Replacing Damaged or Missing Polymer Rings:

<p>The Polymer Rings can be removed or reapplied by hand. Cold polymer rings may be difficult to remove. Allow the Ratchet Restraint or the Anchor Restraint to rest in a warm area before removing the Rings. Store new Polymer Rings in a warm area away from direct sunlight.</p> <p>Before removing the Polymer Rings notice the orientation of the rings for reinstallation later.</p> <p>Two Polymer Rings (M-999-7147) are required for either the Ratchet Restraint or the Anchor Restraint.</p> <p>Note: On the Ratchet Restraint, a third Polymer Ring, closest to the ratchet, is a different part number (M-999-7155) and must not be confused with the two outer rings.</p> <p>If necessary, apply a small amount of liquid dish soap to the Restraint to help with lubrication.</p> <p>Carefully slide the central Polymer Ring onto the Restraint until it is positioned at the inside edge of where the Strap will rest.</p> <p>Position the second Ring on the outermost end of the Restraint. Use a rag to wipe any excess soap lubricant off the Restraint.</p>	 <p>Ratchet Restraint Polymer Ring M-999-7155</p> <p>Polymer Rings M-999-7147</p> <p>Anchor Restraint</p>
---	--

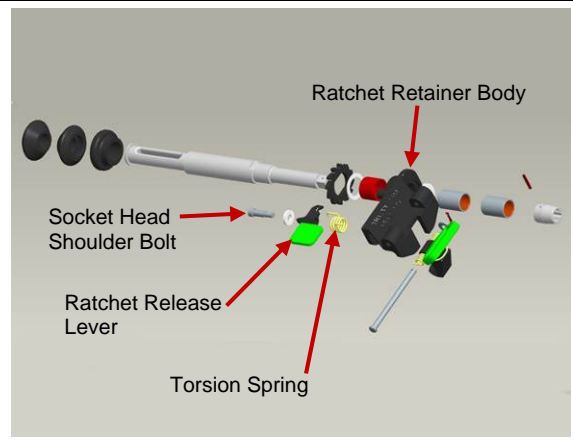
Replacing a Broken Torsion Spring

The Ratchet Release Lever can be disassembled from the Ratchet Retainer Body by removing the Socket Head Shoulder Bolt.

Remove the broken Torsion Spring and replace it with a new Spring. (M-289-7015)

Reassemble the Ratchet Release Lever (M-373-7003) to the Ratchet Retainer Body along with the Torsion Spring.

Reinstall the Shoulder Bolt and torque to 3 to 5 foot-pounds.



Replacing a Damaged or Worn Ratchet Release Lever:

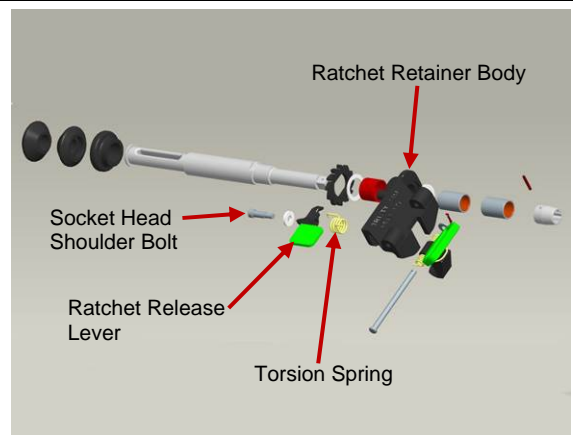
Disassemble the Ratchet Release Lever from the Ratchet Retainer body by removing the Socket Head Shoulder Bolt.

Remove the Torsion Spring.

Acquire a new Ratchet Release Lever (M-373-7003).

Reassemble the Ratchet Release Lever to the Ratchet Retainer body along with the Torsion Spring. Replace the Torsion Spring (M-289-7015) if necessary.

Reinstall the Shoulder Bolt and torque to 3 to 5 foot-pounds.



Replacing a Track Retainer Lock Spring

The Restraint Retainer Lock Spring is part of both the Ratchet Restraint and the Anchor Restraint.

The Lock Spring can be replaced by removing the Cotter Pin from the end of the Clevis Pin and disassembling the latch from the Anchor Retainer or Ratchet Retainer body.

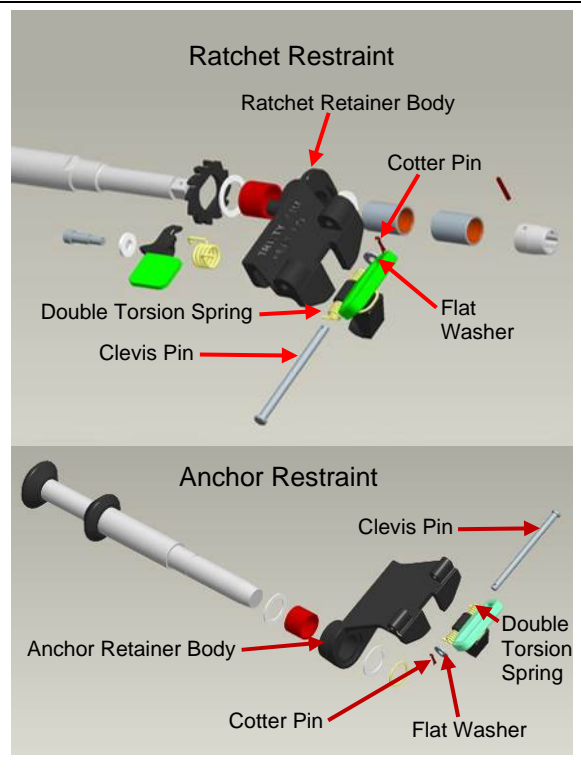
Replace the broken spring with a new Double Torsion Lock Spring (M-289-7016).

Reassemble by inserting the Clevis Pin (M-355-7018) part way through the Retainer Body (Ratchet: M-294-7037; or Anchor: M-294-7038).

Insert the Clevis Pin through the Spring and the rest of the way through the Retainer Body.

Apply the Flat Washer (063-77701).

Install a new Cotter Pin (063-42814) in the end of the Clevis Pin. Each leg must be bent a minimum of 40 degrees.



Replacing a Damaged or Worn Track Retainer Lock and Clevis Pin

The Retainer Lock and Clevis Pin can be replaced by removing the Cotter Pin from the end of the Clevis Pin and disassembling the Latch from the Retainer Body.

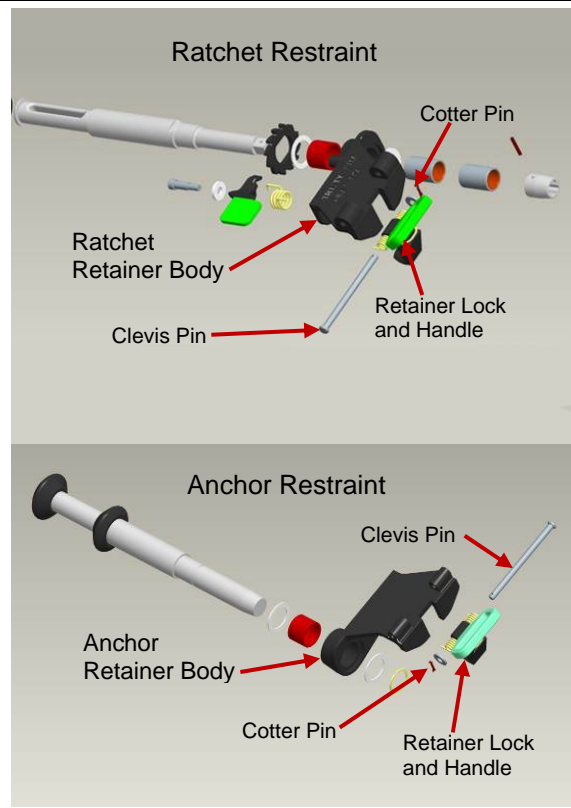
Acquire a new Retainer Lock with Handle (M-369-7004).

Reassemble by inserting a new Clevis Pin (M-355-7018) part way through the Retainer Body (Ratchet: M-294-7037; or Anchor: M-294-7038).

Insert the Clevis Pin through the Spring, the Lock Handle, and the rest of the way through the Retainer Body.

Apply the Flat Washer (063-77701).

Install a new Cotter Pin (063-42814). Each leg must be bent a minimum of 40 degrees.



Replacing the End Cap

Safety Glasses and other PPE prescribed by your local work rules are required.

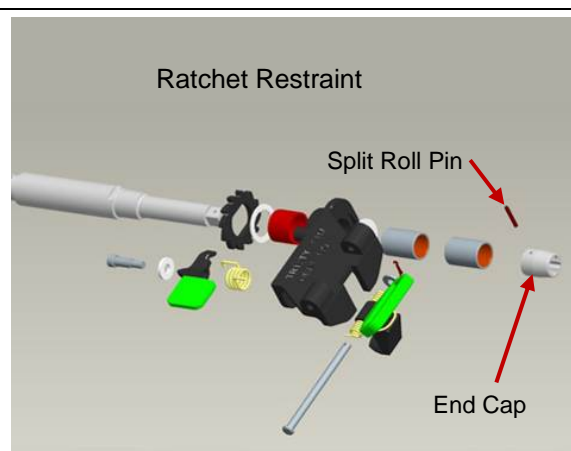
Use a hammer and a $\frac{1}{8}$ " punch to drive the $\frac{1}{8}$ " diameter Roll Pin out of the End Cap.

Pull the End Cap off the Mandrel end.

Acquire a new End Cap (M-999-7154).

Insert the End Cap into the protective Sleeve, mate the square on the end of the Ratchet Mandrel with the square inside the End Cap, and align the holes for the Roll Pin.

Acquire a new $\frac{1}{8}$ " diameter by $\frac{15}{16}$ " split Roll Pin (M-355-7016). Use a hammer to gently drive the Roll Pin into the hole until it is flush with the surface.

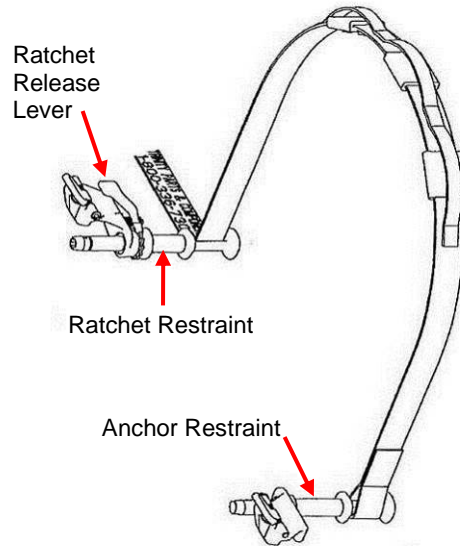


Replacing a Worn or Damaged Pin End Roller Assembly

The Ratchet Restraint releases its Strap tension by operating the Ratchet Release Lever. The Ratchet rotates counter clockwise [⤴] (as viewed by the operator) to relieve the Strap tension.

The Restraint has two steel Bearings lined with polymer that reduces the friction between the Restraint end and the track holes.

The steel Bearings can get deformed from over-speed impacts or mishandling which would prevent it's free rotation.



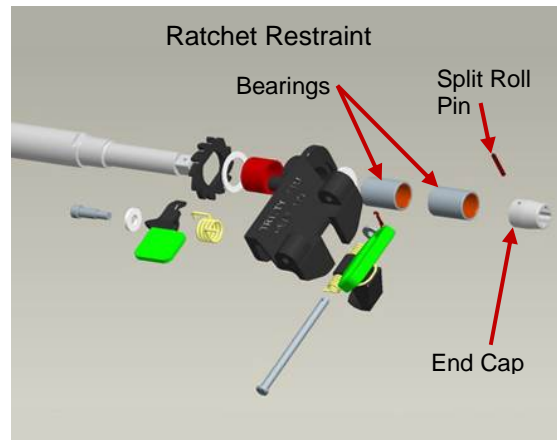
Procedure:

Safety Glasses and other PPE prescribed by your local work rules are required.

Use a hammer and a 1/8" punch to drive the 1/8" diameter Roll Pin out of the End Cap.

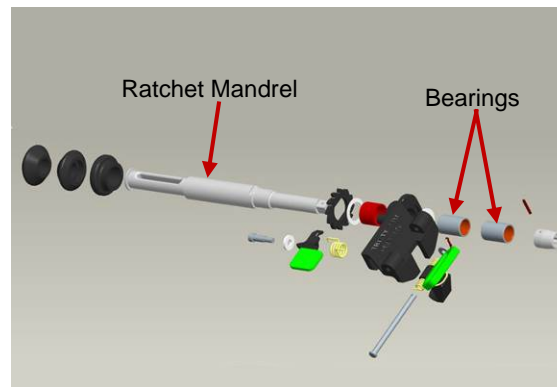
Pull the End Cap off the Mandrel end.

Remove the damaged Bearings.



Acquire a pair of new Bearings (M-999-7157)

Insert the new Bearings over the Ratchet Mandrel.

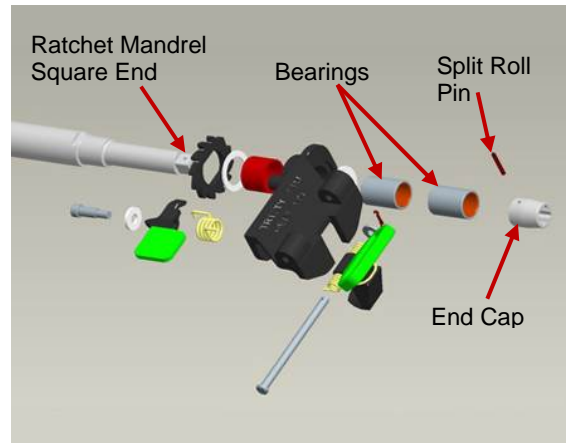


If the original End Cap is damaged acquire a new one (M-999-7154).

Insert the End Cap onto the Mandrel end, mate the square on the end of the Ratchet Mandrel with the square inside the End Cap, and align the holes for the Roll Pin.

Acquire a new $\frac{1}{8}$ " diameter by $\frac{15}{16}$ " Split Roll Pin (M-355-7016).

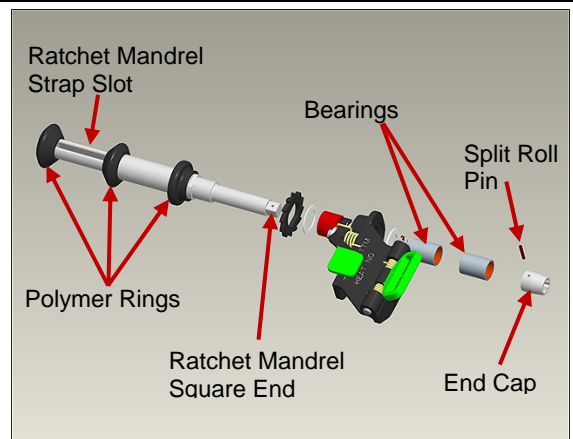
Use a hammer to gently drive the Roll Pin into the hole until it is flush with the surface.



Replacing a Bent Ratchet Mandrel:

Remove the Strap by aligning the flap at the end of the Strap and sliding it through the slot on the Ratchet Restraint. Place the Strap, still attached to the Anchor Restraint in a safe location.

Remove the three Polymer Rings on the Ratchet Restraint using your hands to slide the Rings off the end of the Mandrel. Cold polymer rings will be harder to remove. Allow the Ratchet Restraint to rest in a warm area before removing the Polymer Rings.

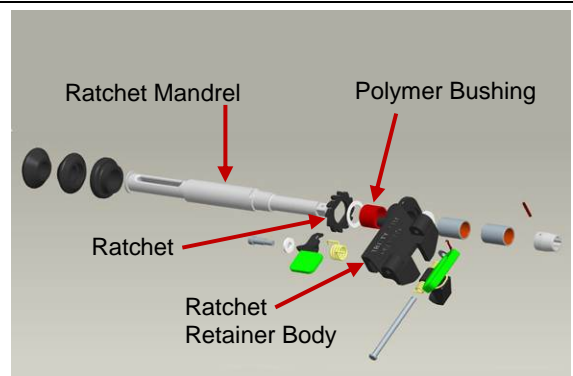


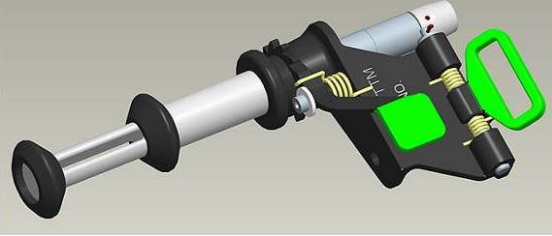
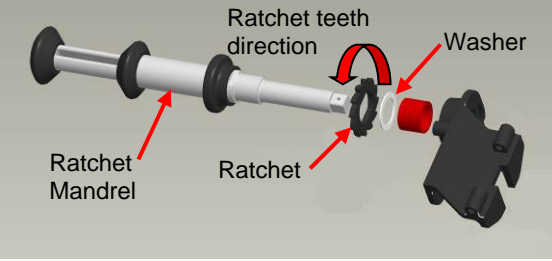
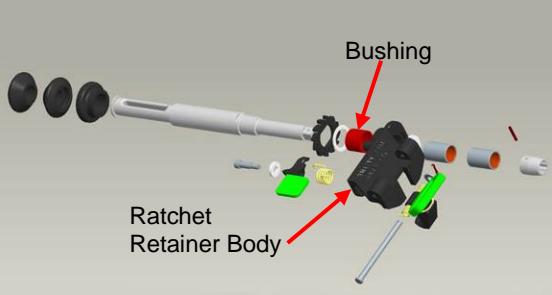
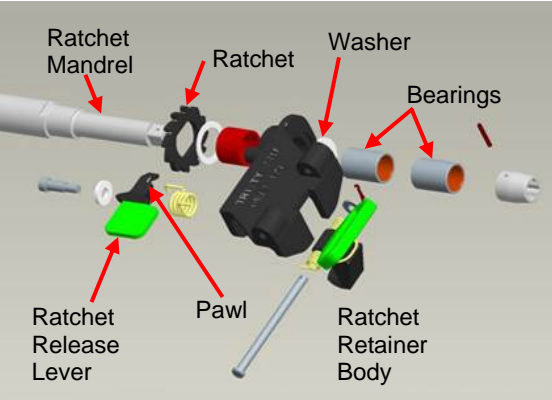
Use a hammer and a $\frac{1}{8}$ " punch to drive the $\frac{1}{8}$ " diameter Roll Pin out of the End Cap.

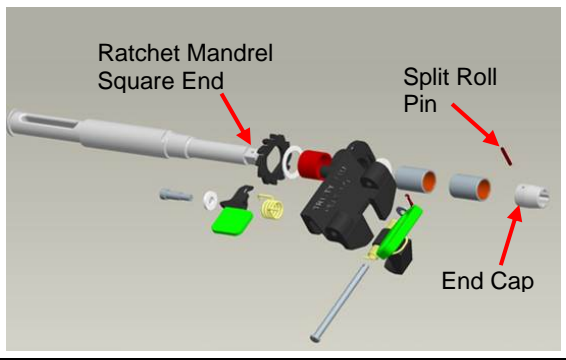
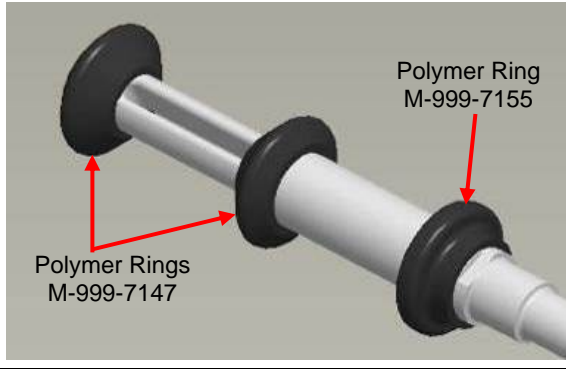
Pull the End Cap off the Mandrel end.
Remove the Sleeve and the Polymer Bushing

Slide the Ratchet Mandrel out of the Ratchet Retainer Body, Polymer Bushing, and Ratchet.

When replacing the Mandrel, always replace the Polymer Bushing (M-302-7013).

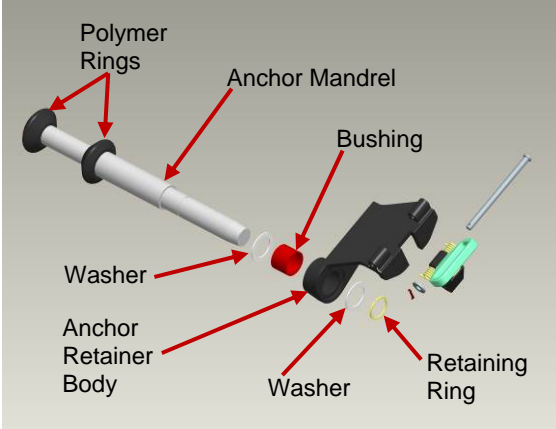
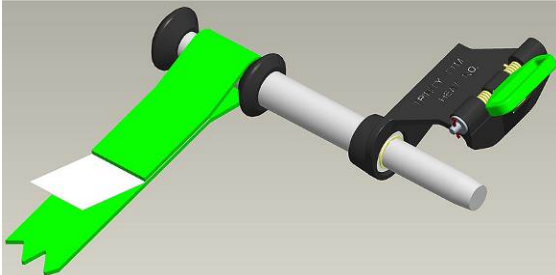


<p>Before starting reassembly obtain an existing assembled Ratchet Restraint for a visual aid.</p>	
<p>Begin the installation of the new Ratchet Mandrel (M-999-7146) by first placing the Ratchet (M-999-7144) on the Mandrel and sliding it to the shoulder on the Mandrel.</p> <p>Note: the Ratchet teeth direction must be oriented correctly to prevent counter clockwise rotation [⤵] (as viewed by the operator).</p> <p>Slide the Washer (F-118-7009) on the Mandrel until it contacts the Ratchet.</p>	
<p>Assure that the Ratchet Retainer Body has a new Polymer Bushing inserted in it.</p> <p>Always replace the Bushing (M-302-7013) with a new one when replacing the Mandrel.</p>	
<p>Slide the Ratchet Mandrel into the Retainer Body while depressing the Ratchet Release Lever and align the Ratchet with the Lever's pawl.</p> <p>Install the Washer (F-118-7011) on the Mandrel.</p> <p>If the original Bearings are worn or damaged acquire new ones (M-999-7157).</p> <p>Insert the Bearings over the Ratchet Mandrel.</p>	

<p>Acquire a new End Cap if the original is damaged. (M-999-7154)</p> <p>Mate the square inside the End Cap with the square inside the Ratchet Mandrel and align the holes for the Roll Pin.</p> <p>Acquire a new $\frac{1}{8}$" diameter x $\frac{15}{16}$" split Roll Pin (M-355-7016). Use a hammer to gently drive the Roll Pin into the hole until it is flush with the surface.</p>	
<p>Three Polymer Rings are required for the Ratchet Restraint. The innermost Ring, nearest the Ratchet, is part number (M-999-7155).</p> <p>The central Ring and the outer Ring are part number (M-999-7147)</p> <p>Apply a small amount of liquid dish soap to the Mandrel to help with lubrication.</p>	
<p>Carefully slide the innermost Ring (M-999-7155) onto the Mandrel until it is positioned at the hub on the Mandrel.</p> <p>Carefully slide the central Ring (M-999-7147) onto the Mandrel until it is positioned at the inside edge of the Strap slot.</p> <p>Position the outer Ring (M-999-7147) on the end of the Mandrel.</p> <p>Use a rag to wipe any excess soap lubricant off the Mandrel.</p>	
<p>Inspect the Strap for wear or damage. If it is not acceptable acquire a new Strap (214-42717).</p> <p>If it is necessary to replace the strap, use your hands to slide the outermost Polymer Ring off the end of the Anchor Restraint.</p> <p>Slide the old Strap loop off the Anchor Restraint and discard it appropriately.</p>	
<p>Slide the new Strap loop over the Anchor Restraint and center it between the Polymer Ring positions.</p> <p>Replace the outer Ring on the end of the Anchor Restraint.</p>	

<p>Reinstall the Strap on the Ratchet Restraint by aligning the flap at the end of the Strap and sliding it through the slot on the Ratchet Mandrel. Pull out enough excess Strap to assure it will not pull loose.</p>	
---	--

Replacing a Bent Anchor Mandrel:

<p>The Polymer Rings can be removed by hand. Cold polymer rings may be harder to remove. Allow the Anchor Restraint to rest in a warm area before removing the Polymer Rings. Store new Polymer Rings in a warm area away from direct sunlight. Notice the orientation of the Polymer Rings before removing them.</p> <p>Use your hands to slide the outermost Polymer Ring off the end of the Anchor Restraint (M-999-7147).</p> <p>Slide the Strap loop off the Restraint.</p> <p>Slide the inner Polymer Ring off the Anchor Mandrel.</p>	
<p>Remove the Retaining Ring by expanding the Ring and sliding it out of the groove on the Anchor Mandrel.</p> <p>Remove the outer Washer.</p> <p>Slide the Anchor Mandrel out of the Retainer Body.</p> <p>Remove the inner Washer.</p>	
<p>Install a new Polymer Bushing (M-302-7013) in the Retainer Body.</p> <p>Inspect the inner and outer Washers. If either is worn or damaged replace them with new washers. (F-118-7009).</p>	
<p>Acquire a new Anchor Mandrel (M-999-7151).</p> <p>Before starting reassembly obtain an existing assembled Anchor Restraint for a visual aid.</p>	

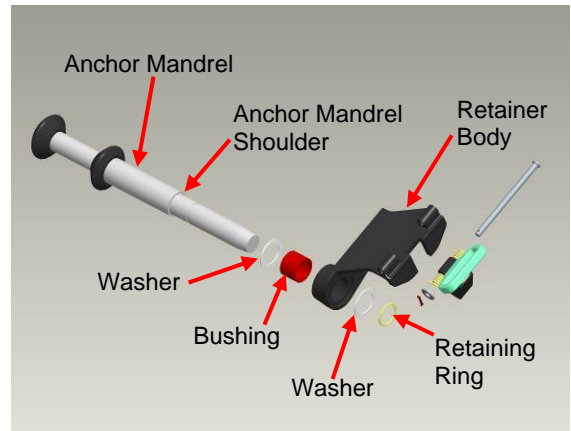
Place a Washer on the Anchor Mandrel and slide it to the shoulder on the Mandrel. Carefully slide the Anchor Mandrel into the Bushing in the Retainer Body until it contacts the Washer.

Place another Washer on the Anchor Mandrel and slide it to contact the Retainer Body.

Acquire a new Retaining Ring (M-279-7000).

Expand the Retaining Ring and seat it into the groove on the Anchor Mandrel. Assure the Ring is firmly in position.

Check to be certain that the Anchor Mandrel is firmly installed yet able to rotate in the Retainer Body.



Two Polymer Rings (M-999-7147) are required for the Anchor Restraint.

Apply a small amount of liquid dish soap to the Restraint to help with lubrication.

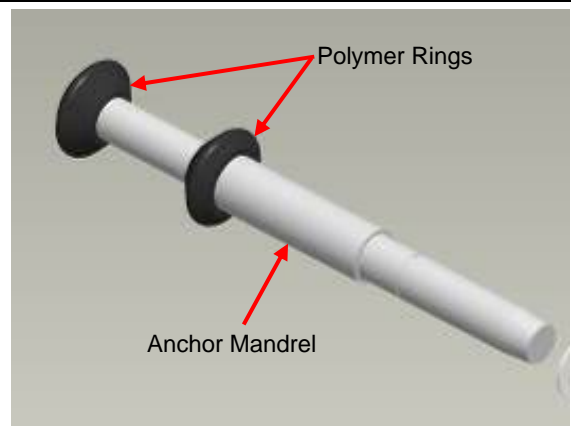
Carefully slide the inner Polymer Ring onto the Mandrel until it is positioned at the inside edge of where the Strap will rest.

Inspect the Strap for wear or damage. If it is not acceptable acquire a new Strap (214-42717).

Slide the Strap loop over the Anchor Restraint and center it between the Polymer Ring positions.

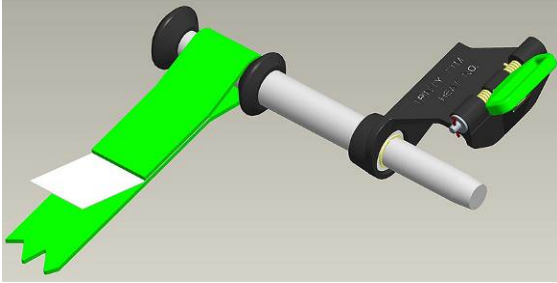
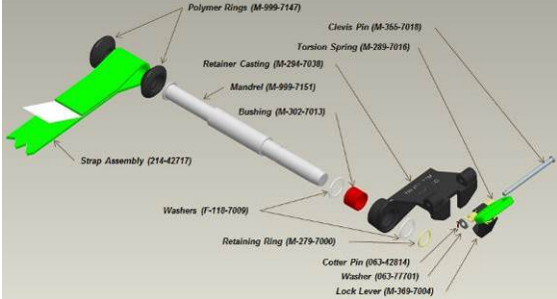
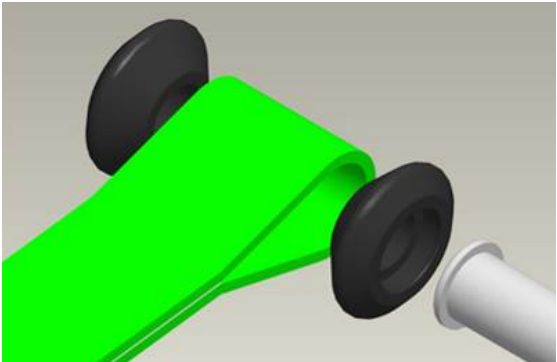
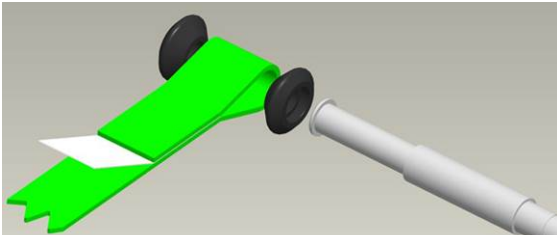
Place the outer Ring on the end of the Restraint.

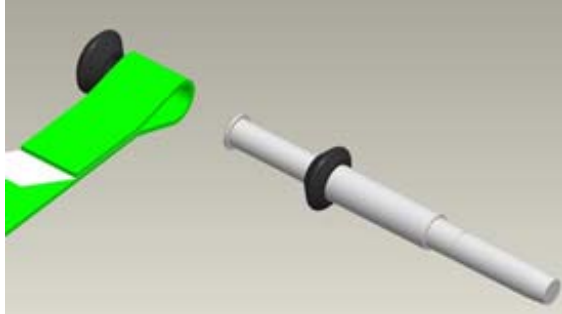
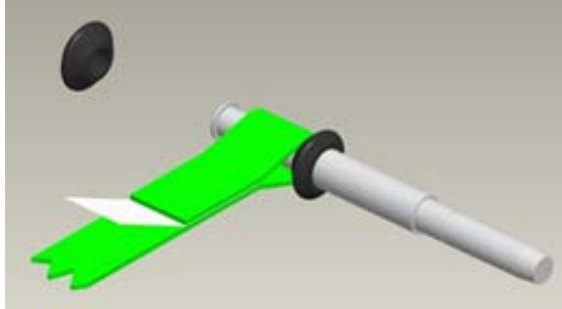
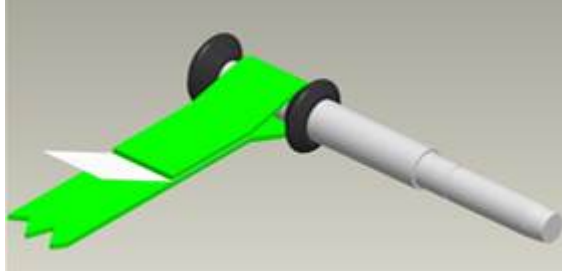
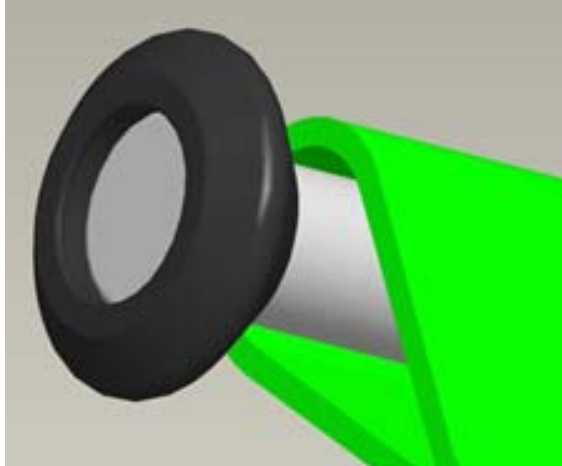
Use a rag to wipe any excess soap lubricant off the Restraint.

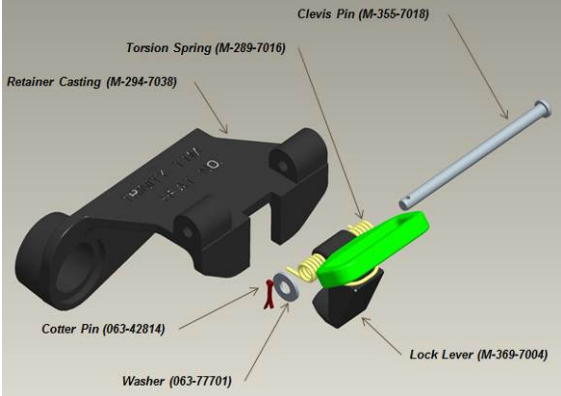
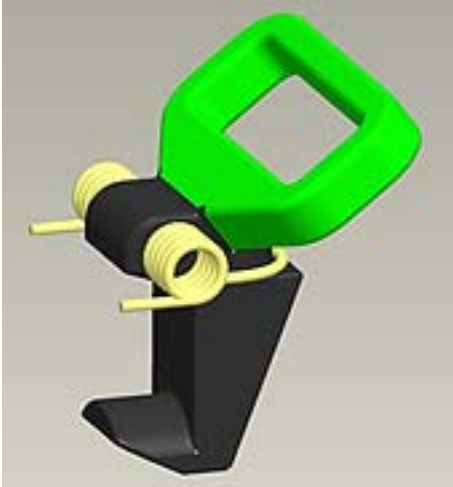



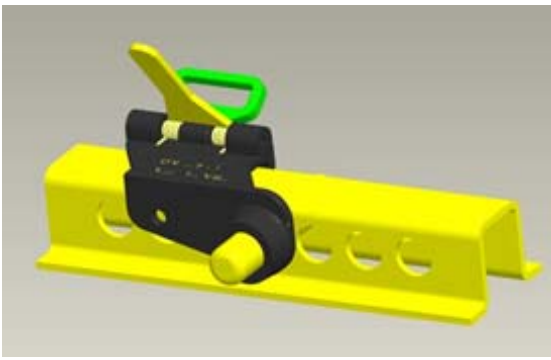
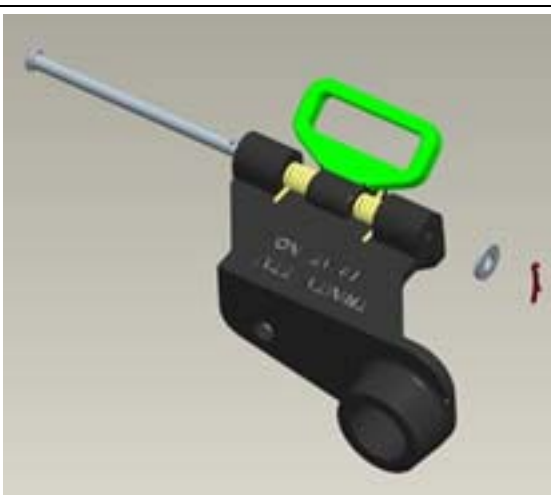
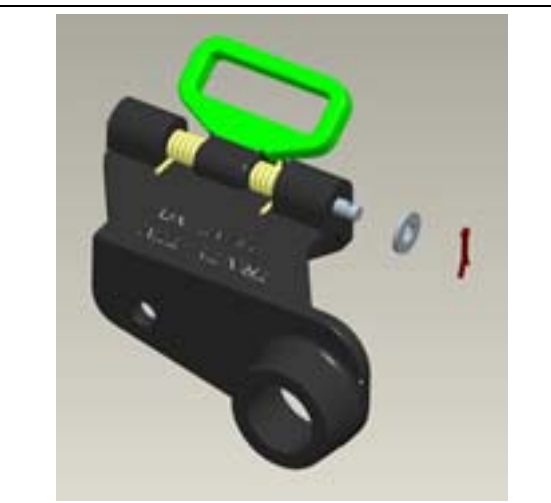
Assembly Procedures

Anchor Restraint and Strap Assembly Procedure

	
<p>Apply Polymer Rings and Strap Assembly to Anchor Mandrel</p>	
<p>Note Orientation of Polymer Rings</p>	
<p>Note Orientation of Strap Assembly: White tag and lettering must be facing up when strap is positioned to the left side of Mandrel as shown.</p>	

<p>Slide the first polymer Ring onto the Mandrel and press it against the Mandrel shoulder</p>	
<p>Slide the Strap onto the Mandrel so that the Strap label is facing up.</p>	
<p>Slide the second polymer Ring onto the Mandrel and be certain that it is seated against the Mandrel outer shoulder</p>	
<p>When the end Polymer Ring is applied correctly, the Ring will over-hang the end of the Mandrel as shown.</p>	

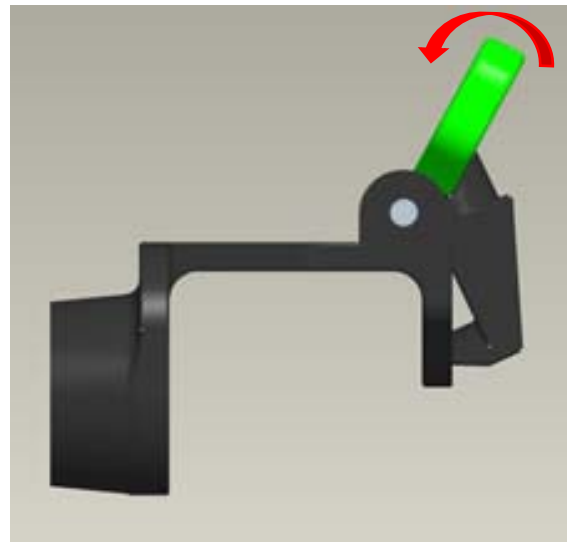
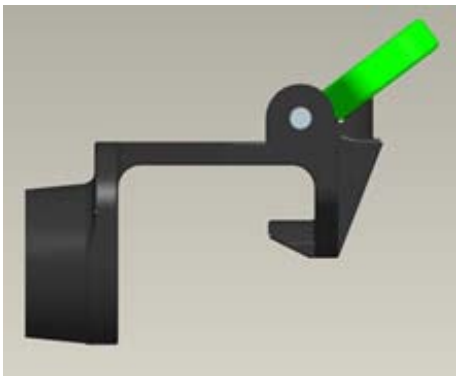
<p>Apply Lock Lever, Spring, and Clevis Pin to Retainer Casting</p>	
<p>Apply Torsion Spring to Lock Lever as shown.</p>	
<p>Align torsion spring and lock lever on Anchor body.</p>	

<p>Apply Spring / Lever assembly onto Retainer Casting as shown using a fixture comprised of a mounting track and pry fork.</p>	
<p>Insert Clevis Pin into the protruding end of the Retainer Casting as shown – do not exert excessive force when inserting the pin.</p>	
<p>Apply flat washer on clevis pin and insert cotter pin through hole in clevis pin shaft.</p>	

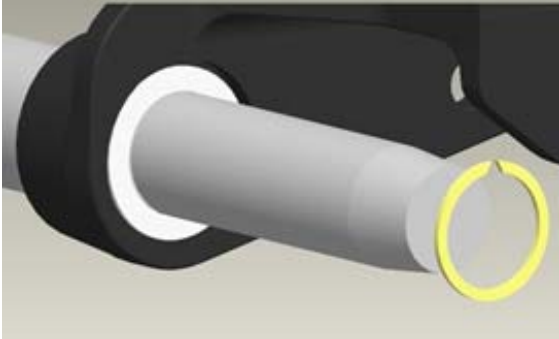
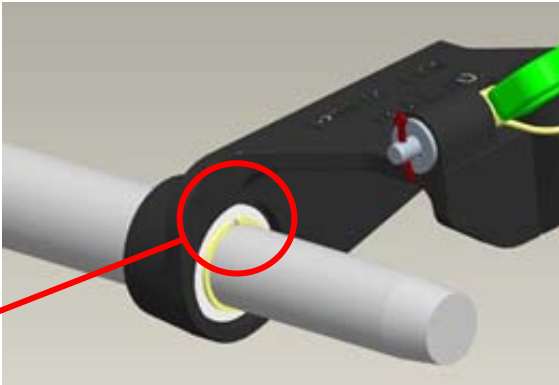
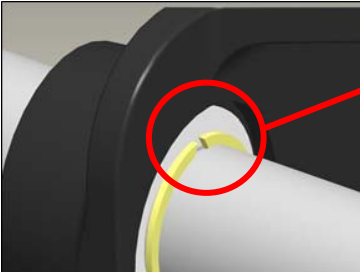
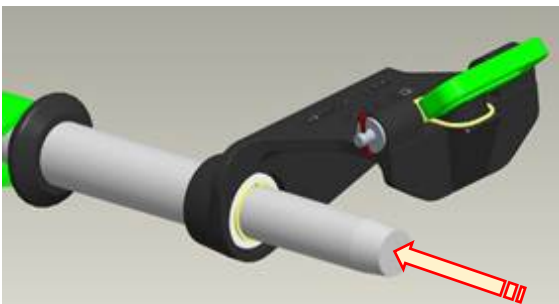
Bend the cotter pin arms back at least 40 degrees.



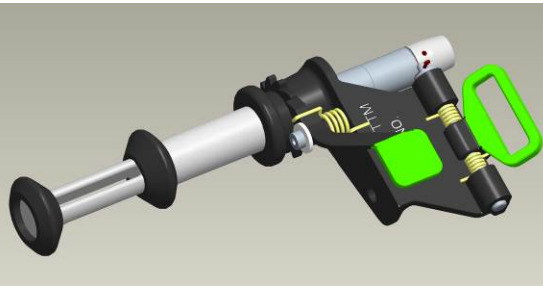
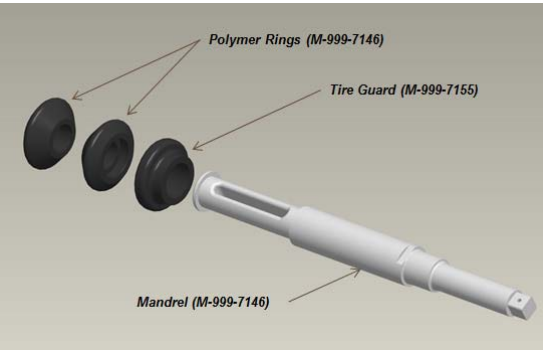
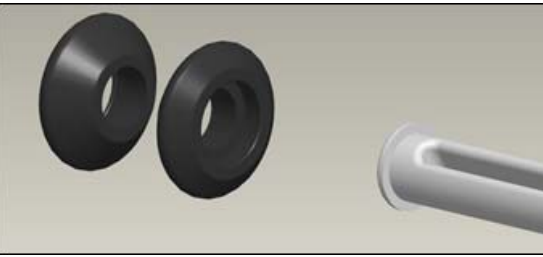

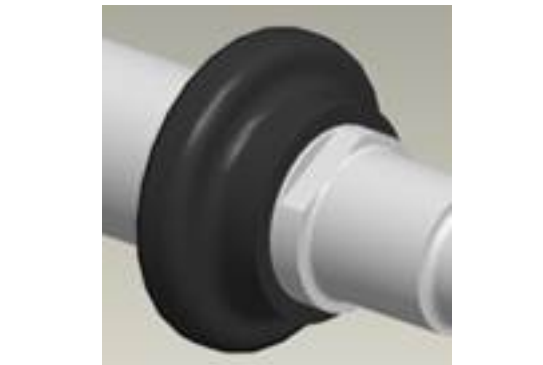
Rotate the Lock Lever Handle to verify that the lock tab clears the inside of the Retainer Casting as shown. The built-in cam is designed to stop rotation once tab clears (approximately 25 degrees).



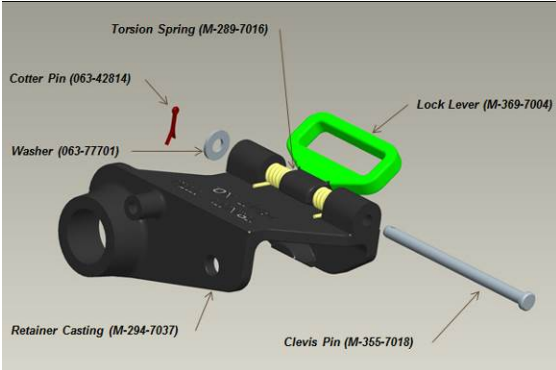




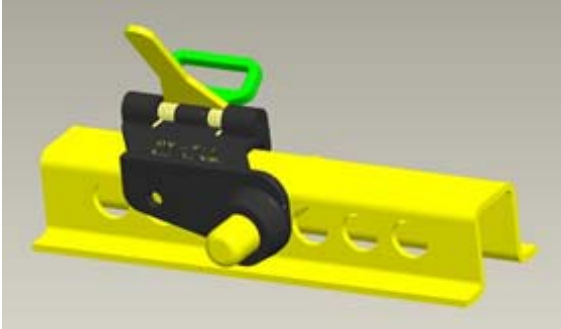


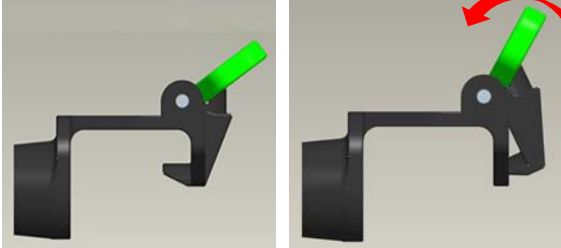
<p>Assemble Anchor Mandrel and Retainer Casting</p>	
<p>Apply first stainless steel Washer to Mandrel.</p>	
<p>Insert composite Bushing into Retainer Casting. Bushing is saturated with mineral oil to aid with insertion.</p>	
<p>Insert Retainer with Bushing onto Mandrel.</p>	

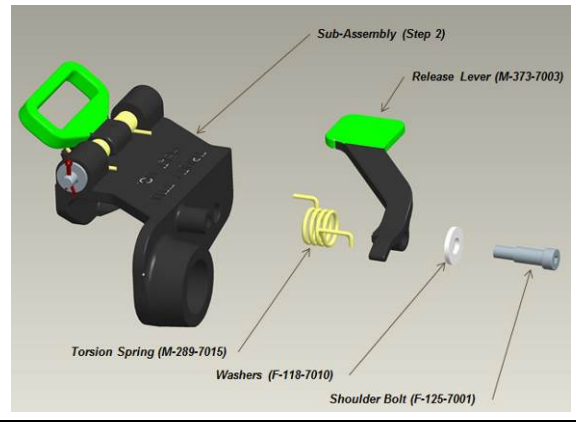

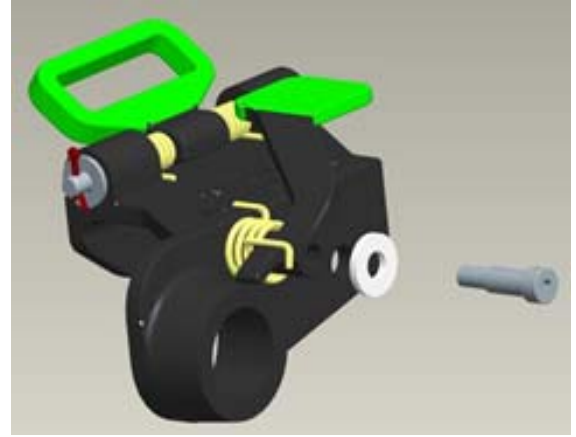
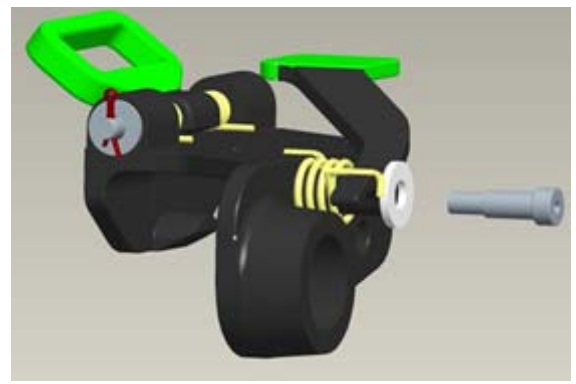
<p>Apply second stainless steel Washer.</p>	
<p>Apply Retaining Ring. Make certain that Retaining Ring is seated completely in ring groove.</p> <p>Note! To help keep the Retaining Ring square and aid in proper seating use a $1\frac{5}{16}$" to 1" I.D. plastic tube to push the Retaining Ring onto the Mandrel.</p>	 
<p>While holding the Retainer Body casting, use a rubber mallet to tap on the end of mandrel to verify that the Retaining Ring is seated completely in ring groove.</p>	 <p>Impacting End of Mandrel</p>

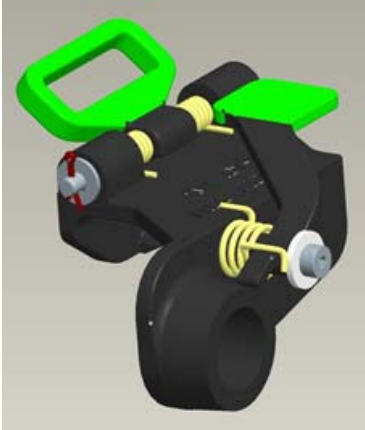
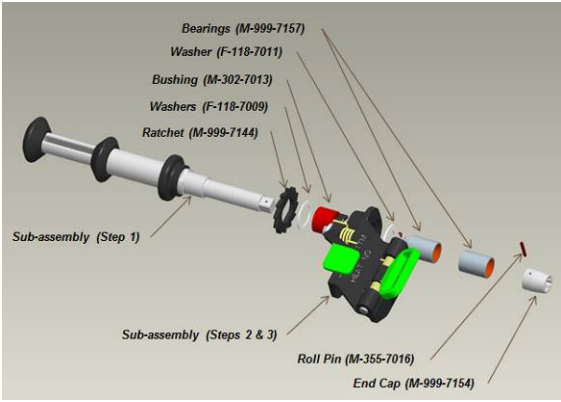
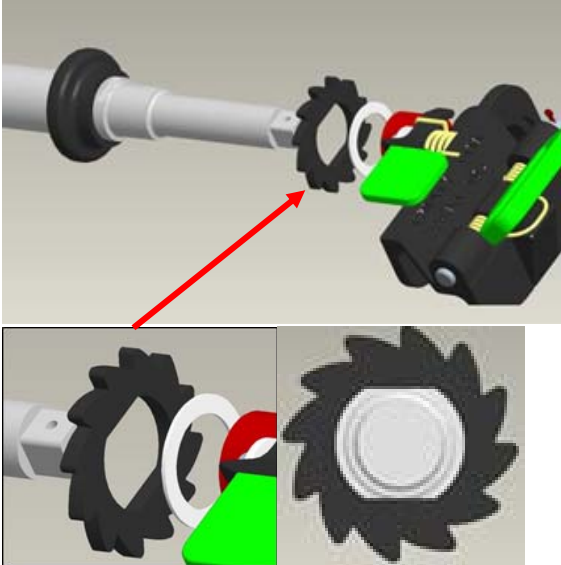
Ratchet Restraint Assembly Procedure



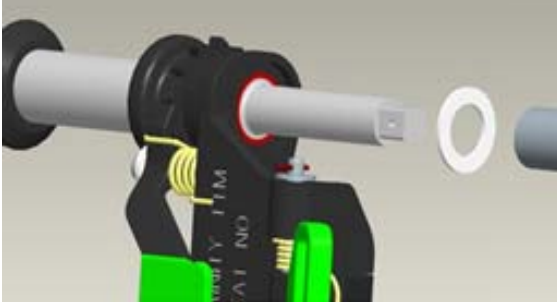
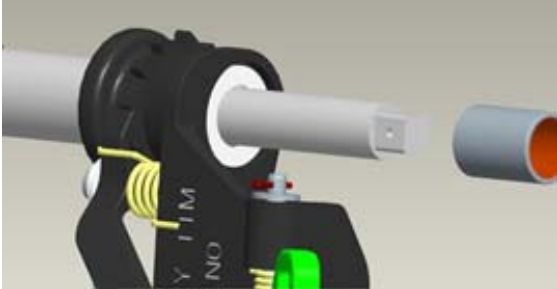
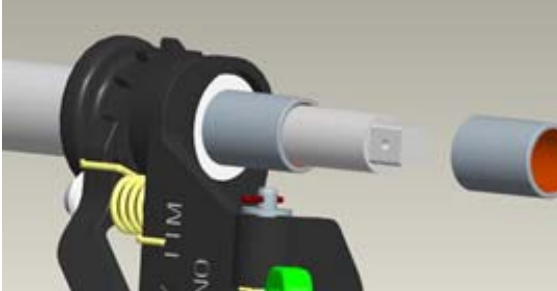
	
<p>Apply Polymer Rings and Tire Guard to Ratchet Mandrel</p>	
<p>Note orientation of Polymer Rings</p>	
<p>Dip Polymer Rings in soapy water to ease application.</p>	
<p>Tire Guard must not extend beyond edge.</p>	

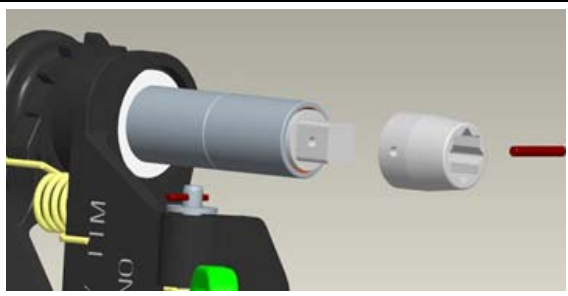
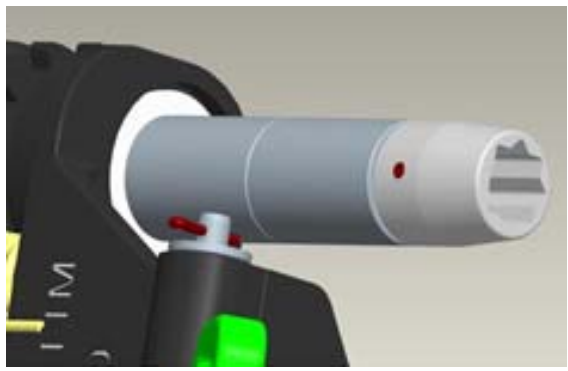
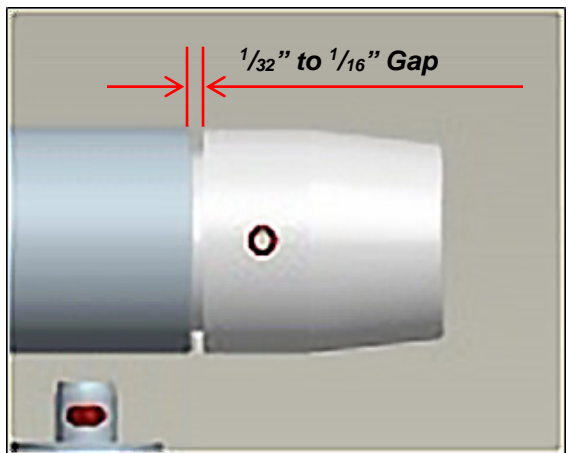
<p>When the end Polymer Ring is applied correctly, the Ring will over-hang the end of the Mandrel as shown.</p> 	
<p>Apply Lock Lever, Spring, and Clevis Pin, to Retainer Casting</p>	
<p>Apply Torsion Spring to Lock Lever as shown.</p>	
<p>Apply Spring / Lever assembly onto Retainer Casting as shown</p>	

<p>Apply Spring / Lever assembly onto Retainer Casting as shown using a fixture comprised of a mounting track and pry fork.</p>	
<p>Insert Clevis Pin into the protruding end of the Retainer Casting as shown – do not exert excessive force when inserting the pin.</p>	
<p>Apply Washer to end of Clevis Pin and insert Cotter Pin through hole in end of Clevis Pin. Bend Cotter Pin legs back at least 40 degrees.</p>	
<p>Rotate Lock Lever Handle to verify that the lock tab clears the inside of the Retainer Casting as shown. A built in cam is designed to stop rotation once tab clears (Approximately 25 degrees).</p>	

<p>Apply Release Lever, Torsion Spring, and Shoulder Bolt to Retainer Casting</p>	
<p>Apply Torsion Spring to Retainer Casting lug as shown.</p>	
<p>Apply Washer to Shoulder Bolt Partially screw the Shoulder Bolt into tapped hole in lug.</p>	
<p>Rotate lever as shown. Screw Shoulder Bolt into tapped hole in lug and tighten to 3 to 5 Ft-Lbs. with Allen Wrench. Make sure bolt shoulder seats against casting lug.</p>	

<p>Note: Lever will be under slight rotational load during final tightening of Shoulder Bolt. Make sure spring wire is not sandwiched between Lug face and Lever.</p>	
<p>Assemble Ratchet Mandrel, Retainer Casting, Ratchet, and End Cap</p> <p>Assemble Ratchet Mandrel sub-assembly Retainer Casting sub-assembly Ratchet Bushing Washers End Cap and Roll Pin.</p>	
<p>Apply Ratchet on the Mandrel and align the flat segment of the Ratchet with the flat recess on the Mandrel.</p> <p>Note Ratchet tooth orientation.</p>	

<p>Apply stainless steel Washer F-118-7009 on to Mandrel.</p>	
<p>Insert composite Bushing into Retainer Casting. Bushing is saturated with mineral oil to aid with insertion.</p>	
<p>Insert Retainer Casting (with inserted Bushing) onto Mandrel.</p> <p>Note: Ratchet Release Lever will have to be rotated from its rest position to clear Ratchet. Release Lever will engage Ratchet teeth when assembly is fully engaged.</p>	
<p>Apply Washer (F-118-7011).</p>	
<p>Apply Journal Bearings (2 pieces)</p>	

<p>Insert End Cap onto square lug on the end of the Mandrel, making sure that roll pin holes are aligned.</p>	
<p>Insert Roll Pin into holes and use a hammer to drive the pins into place. When properly inserted, both ends of the Pin should be flush with the surface of the End Cap.</p>	
<p>When properly assembled, there should be a $\frac{1}{32}$" to $\frac{1}{16}$" gap between Bearing and End Cap. Note: If tight, make sure Tire Guard is properly positioned allowing Ratchet to fully engage flat recess on Mandrel.</p>	

Parts Lists – Anchor and Ratchet Restraints

Anchor Restraint Parts List

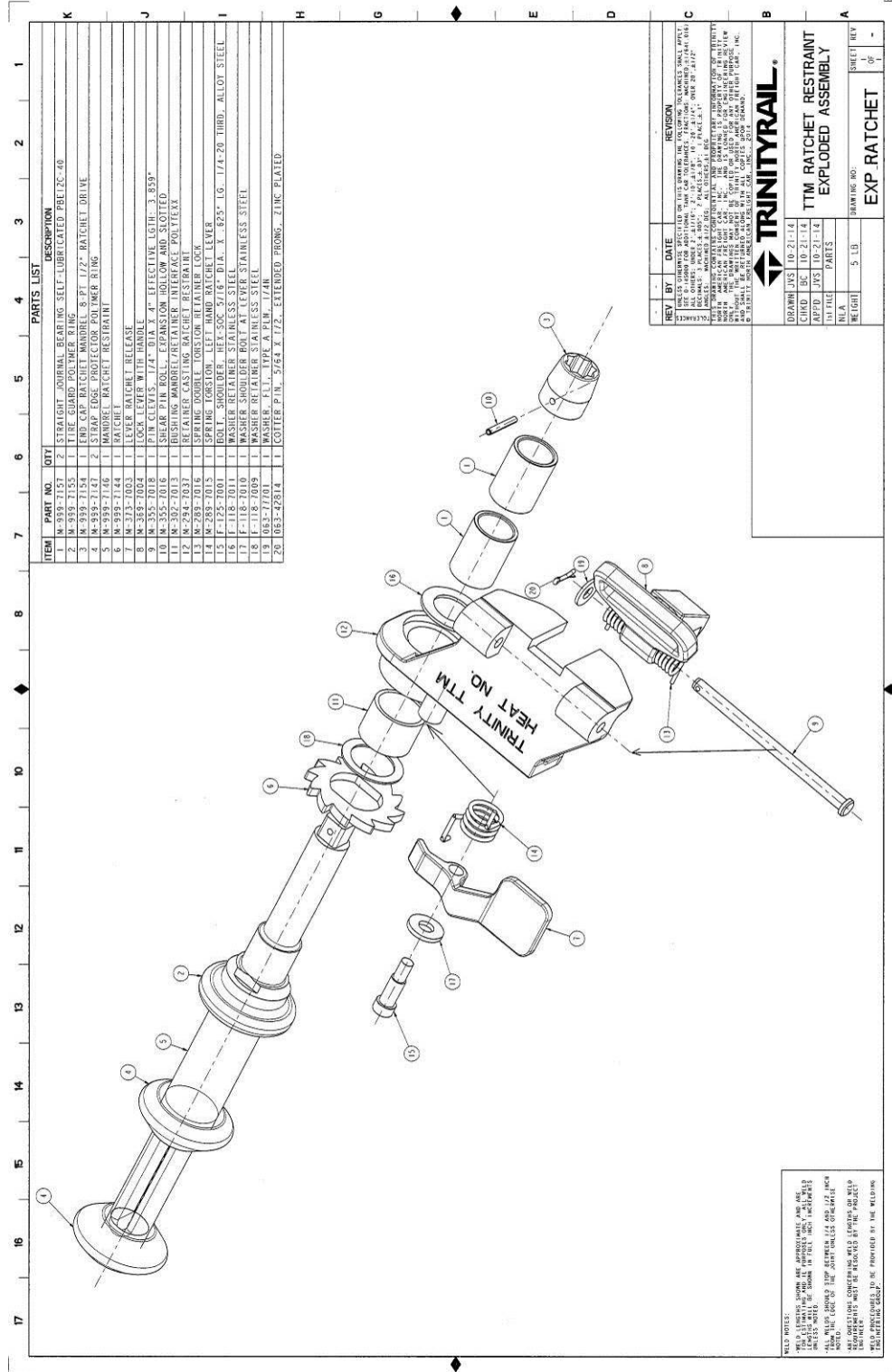
Item	Part Number	Qty	Description
1	M-999-7151	1	Mandrel, Anchor
2	M-999-7147	2	Strap Edge Protector Polymer Ring
3	M-369-7004	1	Lock Retainer, Chock Track with Handle
4	M-355-7018	1	Pin Clevis, 1/4" Diameter x 4" Effective Length: 3.859"
5	M-302-7013	1	Bushing Mandrel / Retainer Interface Polytexx
6	M-294-7038	1	Retainer Body Anchor
7	M-289-7016	1	Spring Double Torsion Retainer Lock
8	M-279-7000	1	Retaining Ring Constant Section-FSE Series Stainless Steel
9	F-118-7009	2	Washer Retainer Stainless Steel
10	063-77701	1	Washer, Flat, Type A Pln, 1/4N
11	063-42814	1	Cotter Pin, 5/64 x 1/2, Extended Prong, Zinc Plated

Ratchet Restraint Parts List

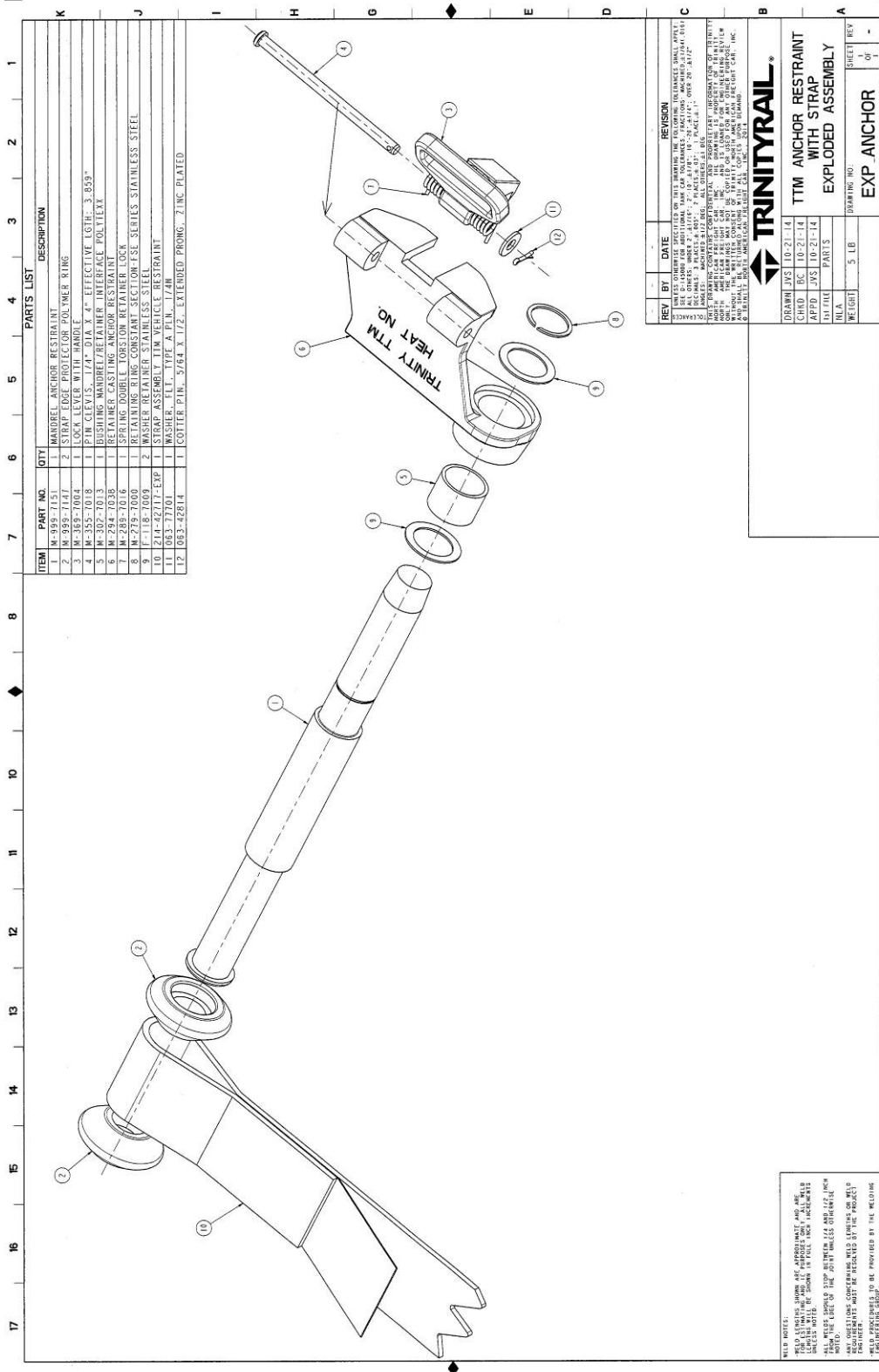
Item	Part Number	Qty	Description
1	M-999-7157	2	Straight Journal Bearing Self-Lubricated PBE 12C-40
2	M-999-7155	1	Tire Guard Polymer Ring
3	M-999-7154	1	End Cap Ratchet Mandrel 8-Pt 1/2" Ratchet Drive
4	M-999-7147	2	Strap Edge Protector Polymer Ring
5	M-999-7146	1	Mandrel Ratchet Restraint
6	M-999-7144	1	Ratchet Mandrel
7	M-373-7003	1	Lever Ratchet Release
8	M-369-7004	1	Lock Lever With Handle
9	M-355-7018	1	Pin Clevis, 1/4" Diameter X 4" (Effective Length: 3.859")
10	M-355-7016	1	Shear Pin Roll, Expansion Hollow and Slotted
11	M-302-7013	1	Bushing Mandrel / Retainer Interface Polytexx
12	M-294-7037	1	Retainer Casting Ratchet Restraint
13	M-289-7016	1	Spring Double Torsion Retainer Lock
14	M-289-7015	1	Spring Torsion, Left Hand Ratchet Lever
15	F-125-7001	1	Bolt, Shoulder, Hex-Soc 5/16" Dia. X .625" Lg. 1/4-20 Thread, Alloy Steel
16	F-118-7011	1	Washer Retainer Stainless Steel
17	F-118-7010	1	Washer Shoulder Bolt at Lever Stainless Steel
18	F-118-7009	1	Washer Retainer Stainless Steel
19	063-77701	1	Washer, Flt, Type A Pln, 1/4N
20	063-42814	1	Cotter Pin, 5/64 x 1/2, Extended Prong, Zinc Plated

Engineering Drawings

Ratchet Restraint Exploded (Drawing Number EXP_RATCHET)



Anchor Restraint Exploded (Drawing Number EXP_ANCHOR)



ITEM	PART NO.	QTY	DESCRIPTION
1	M-998-7151	1	MANDREL ANCHOR RESTRAINT
2	M-998-7147	2	STRAP EDGE PROTECTOR POLYMER RING
3	M-998-7008	1	LOCK LEVER WITH HANDLE
4	M-998-7008	1	LOCK LEVER WITH HANDLE
5	M-302-7013	1	BUSHING MANDREL/RETAINER INTERFACE POLYUREA
6	M-294-7038	1	RETAINER CASTING ANCHOR RESTRAINT
7	M-298-7016	1	SPRING DOUBLE TORSION RETAINER LOCK
8	M-273-7000	2	RETAINING RING CONSTANT SECTION-FSL SERIES STAINLESS STEEL
9	M-273-7000	2	RETAINING RING CONSTANT SECTION-FSL SERIES STAINLESS STEEL
10	10-214-82717-EXP	1	STRAP ASSEMBLY TTM VEHICLE RESTRAINT
11	063-77701	1	WASHER, FLI, TYPE A P.I.N. 1/4IN
12	063-42814	1	COTTER P.I.N., 5/64 X 1/2, EXTENDED PRONG, ZINC PLATED

REV	BY	DATE	REVISION

THIS DRAWING IS THE PROPERTY OF TRINITY. IT IS TO BE USED FOR THE MANUFACTURE OF THE PARTS AND COMPONENTS SHOWN HEREON. IT IS TO BE KEPT IN THE ORIGINAL FORM AND NOT REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM. THE USER OF THIS DRAWING SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PATENT RIGHTS AND CLEARANCES. THE USER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PATENT RIGHTS AND CLEARANCES. THE USER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PATENT RIGHTS AND CLEARANCES.

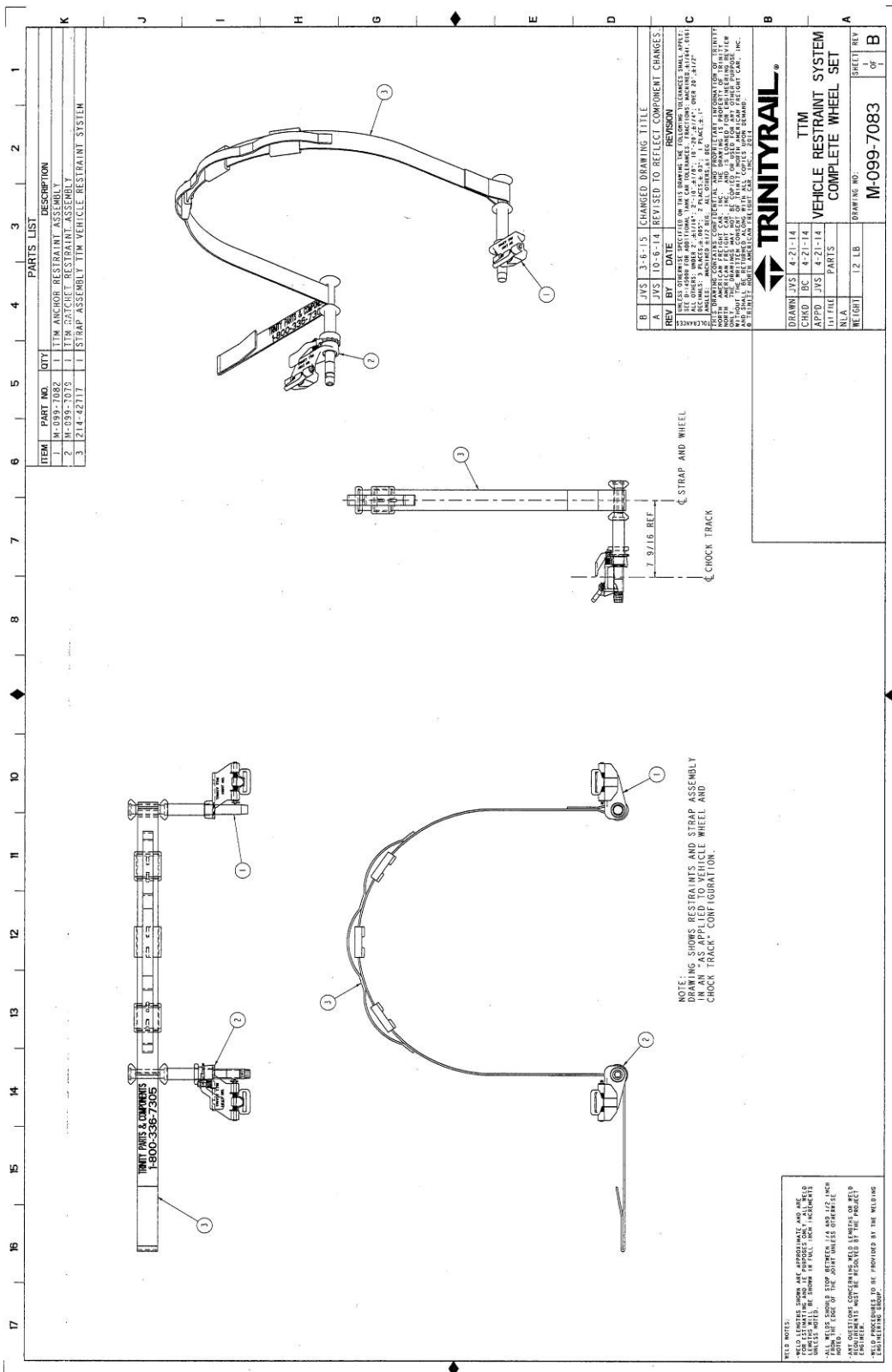
DESIGN	JVS	10-21-14
CHECKED	JVS	10-21-14
APP'D	JVS	10-21-14
DATE	JVS	10-21-14
REV		
NO.		
WEIGHT	5 LB	



TTM ANCHOR RESTRAINT WITH STRAP EXPLODED ASSEMBLY
 EXP_ANCHOR
 SHEET REV 01

ALL DIMENSIONS ARE APPROXIMATE AND ARE FOR INFORMATION ONLY. DIMENSIONS WILL BE SHOWN IN FULL INCHES UNLESS OTHERWISE NOTED. ALL DIMENSIONS SHOULD BE WITHIN 1/32 AND 1/16 INCH UNLESS OTHERWISE NOTED. DIMENSIONS WILL BE SHOWN IN FULL INCHES UNLESS OTHERWISE NOTED. DIMENSIONS WILL BE SHOWN IN FULL INCHES UNLESS OTHERWISE NOTED. DIMENSIONS WILL BE SHOWN IN FULL INCHES UNLESS OTHERWISE NOTED.

Restraints & Strap Assembly (Drawing Number M-099-7083)





Service, Parts, and Rebuilding

Trinity Parts & Components, LLC
2548 N. E. 28th Street
Fort Worth, TX 76111

Call (800) 336-7305 for Replacement Parts and
Rebuild Shipping instructions.
www.trinityparts.com