DESIGN SPECIFICATIONS

Part Number: 924-501 **Date:** 9/22/2010
Revision: A
Product: Spare Tire Hoist **Author:** Jessica Casey

Fit & Function Overview

A vehicle spare tire carrier utilizing a winch for holding the tire against the vehicle underside, wherein the winch employs apparatus for preventing the cable sheave from being rotated in the improper direction for winding the tire supporting cable thereon. Winch stop means sensing the location of the cable relative to the sheave prevents winch rotation upon the cable being fully extended. Also, an embodiment of the tire carrier utilizes a cable guide and extension for remotely locating the winch from the location of tire support.

Design Objective:

Vendor will document performance and dimensions based on analysis of the supplied reference sample(s) and based on the included technical & material specifications given below. The vendor will submit the documentation for approval by Dorman Engineering Services. The vendor will produce the requested product based on the approved vendor documentation. The vendor will provide process information and material certification for their submitted product sample. Dorman Engineering Services will review and approve all vendor documentation prior to accepting a first article (FAI) sample(s) for inspection.

Patent Disclaimer:

Vendor is responsible for performing patent search to identify any relevant US patent that applies or potentially applies to the reference sample provided. A report of the research must be provided to Dorman Engineering Services at the time of the drawing submittal. The patent search report must include details of:

- Research procedure
- Patent numbers which were identified as being applicable or potentially applicable
- The design differences contained in the vendor design and how they eliminate any patent infringements.

In the event any conflicts and/or discrepancies exist in the information provided contact Dorman Products for clarification. Final approval concerning any conflicts and/or discrepancies is the decision of Dorman Products.

Reference Samples:

The following Approved Reference Sample is part of this specification: Original Equipment

Reference Documents:

Note: International equivalents to American standards such as SAE may be used with Dorman Products Engineering Services review and approval.

SAE J 1199: Mechanical and Material Requirements for Metric Externally Threaded Steel Fasteners
SAE J 403: Chemical Compositions of SAE Carbon Steels
SAE J 405: Chemical Compositions of SAE Wrought Stainless Steels
ASTM B 783-04: Standard Specification for Materials for Ferrous Powder Metallurgy (P/M) Structural Parts

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Materials and Finish Definition: As set forth by California State Proposition 65: The Safe Drinking Water and Toxic Enforcement Act of 1986; Material, Paint or other type of coatings are not to exceed <0.06% (600 **ppm**) **lead** by weight.

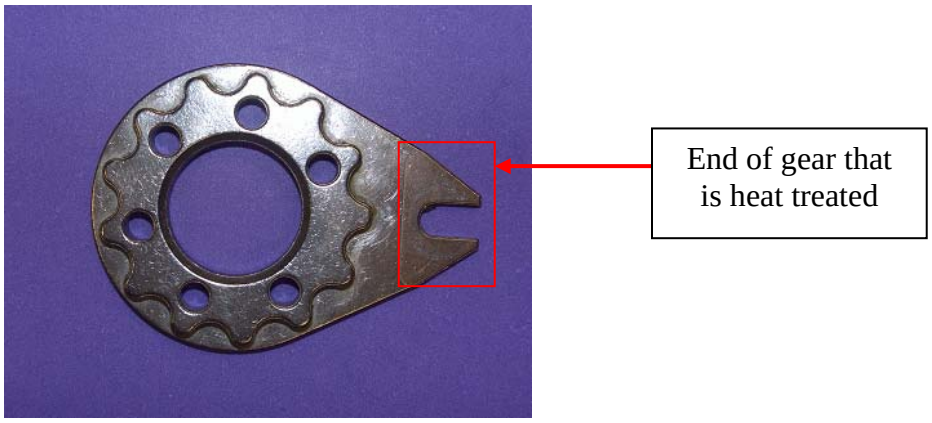
Metal

Housing, Cover, and Wheel Shoe:
Material: Low Carbon Steel
Grade: 1008-1010 per SAE J 403
Finish: Black Epoxy Coating
Hardness: HRB 85-90

Rivets:
Material: Low Carbon Steel
Grade: 1020 per SAE J 403
Finish: Zinc Plated, Clear Chromate
Hardness: HRB 70-80

Cable Lock:
Material: Low Carbon Steel
Grade: 1008-1010 per SAE J 403
Finish: Phosphorization
Hardness: HRB 60-70

Cam and Gear:
Material: Sintered Powder Metal
Grade: FC-0208 per ASTM B 783-04
Hardness: HR30N 22-27, End of Gear is heat treated and oil quenched to HR30N 45-50



Sheave Wheel:
Material: Sintered Powder Metal
Grade: FC-0208 per ASTM B 783-04
Hardness: HR30N 22-27
Overmolding: White PA6+GF40

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Cam Backing Plate:
Material: Low Carbon Steel
Grade: 1008-1010 per SAE J 403
Finish: Zinc Plated, Clear Chromate
Hardness: HRC 45-50

Main Shaft:
Material: Medium Carbon Steel
Grade: 1035 per SAE J 403
Finish: Zinc Plated, Clear Chromate
Hardness: HRC 20-25

C-Clip and Spring:
Material: High Carbon Steel
Grade: 1070 per SAE J 403
Finish: Zinc Plated, Clear Chromate
Hardness: HRC 25-35

Shear Pin:
Material: Stainless Steel
Grade: 420 per SAE J 405
Finish: Passivated

Cable:
Material: Stainless Steel
Grade: 316 per SAE J 405
Finish: Passivated

Cable End Button:
Material: Zinc Die Cast
Grade: UNS Z35631 Zn-Al Alloy ZA-27

Nut:
Material: Medium Carbon Steel
Grade: 1035 per SAE J 403
Finish: Zinc Plated, Clear Chromate
Hardness: HRB 80-85

Bracket and Cable Tube:
Material: Low Carbon Steel
Grade: 1008-1010 per SAE J 403
Finish: Black Epoxy Coating

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Cable End and Spring Collar:
Material: Medium Carbon Steel
Grade: 1035 per SAE J 403
Finish: Zinc Plated, Clear Chromate
Hardness: HRB 80-85
Zinc plated components are to be plated per ASTM B633, minimum plating thickness 7.5um
Chromate using trivalent chromium, thickness range 0.3um to 0.5um ***(Hexavalent Chromium not permitted)***

Plastic

Cable Guide:
Material: PA6 + M40
Color: Black
Surface Finish: To match OE, No regrind allowed

Cable End Sleeve:
Material: PA6 + M40
Color: Black
Surface Finish: To match OE, No regrind allowed

Rubber

Cable Protector:
Material: Polyurethane
Color: Transparent
Durometer: Shore A 85-90

Grease

Material: Water resistant Lithium based grease with minimum drop temperature of 80°C

Exception to Sample:
- Alternative material use is acceptable, but only with the approval of Dorman Products Engineering Services.
- Alternative finishes are acceptable, but only with the approval of Dorman Products Engineering Services.

Dimensions and Measurements:

This section contains information regarding significant dimensions, characteristics, or measurements that that are required to manufacture this product.

- Part or Assembly Weight: 3.6 kg
- Unless otherwise specified, all part dimensions to match the supplied samples.
- Unless otherwise specified, dimensions specified in Bid Package are for reference only.
- Surface finishes to match supplied samples.
- Approximate length of entire cable (from end button to end stop): 38.5” (98 cm)
- Cable strand configuration is 7x19 (Individual wire diameter is 0.28mm) as shown below:

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Images of Product Sample:

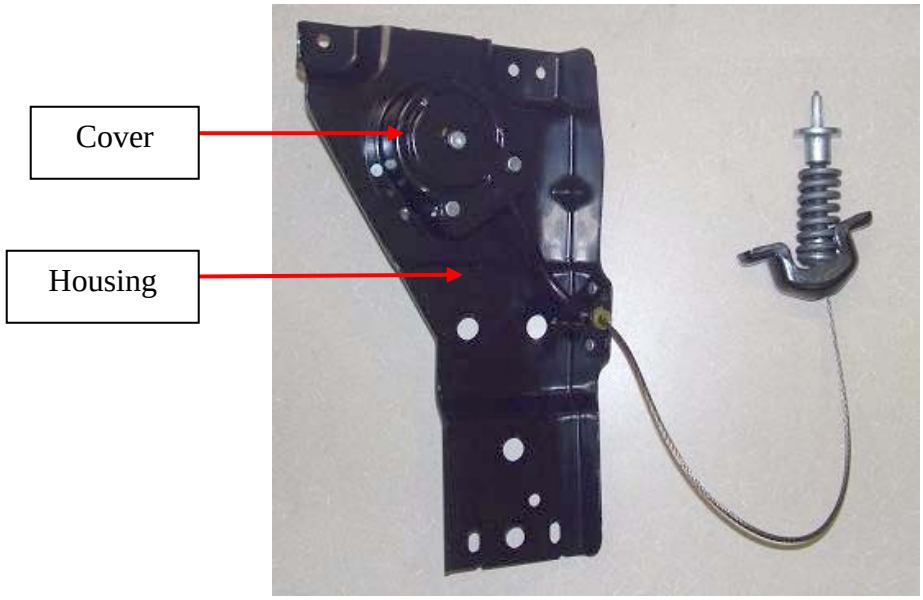

Figure 1: Assembly (Front View)

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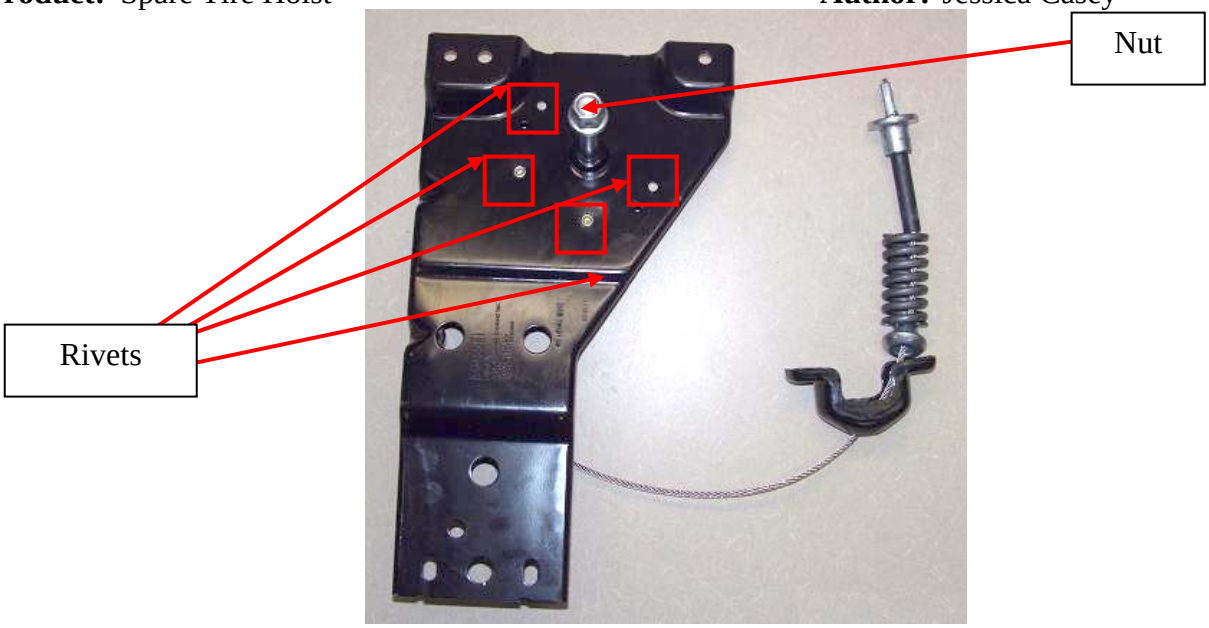

Figure 2: Assembly (Back View)

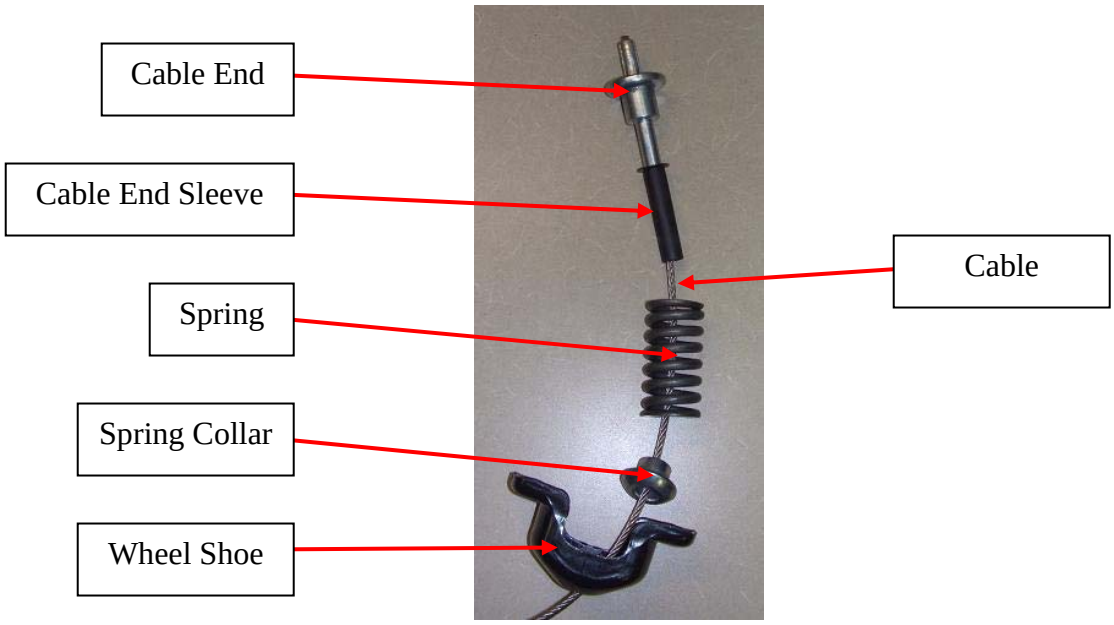

Figure 3: Close up of Wheel Shoe End of Cable (Exploded View)

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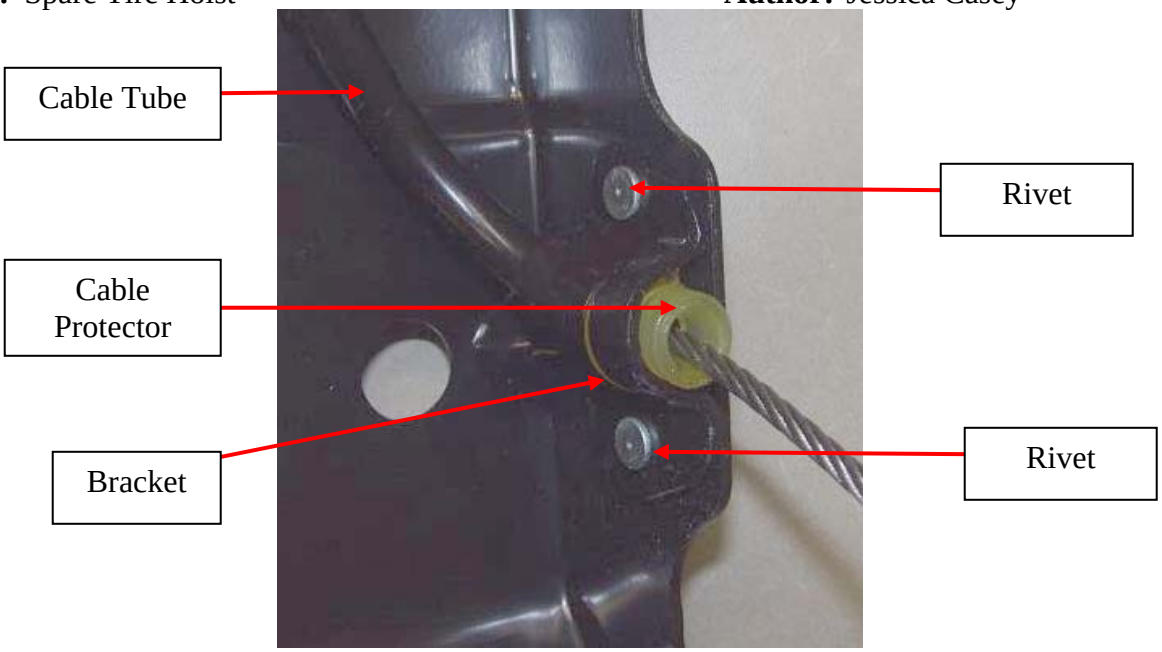

Figure 4: Close Up of Bracket and Tube Connection

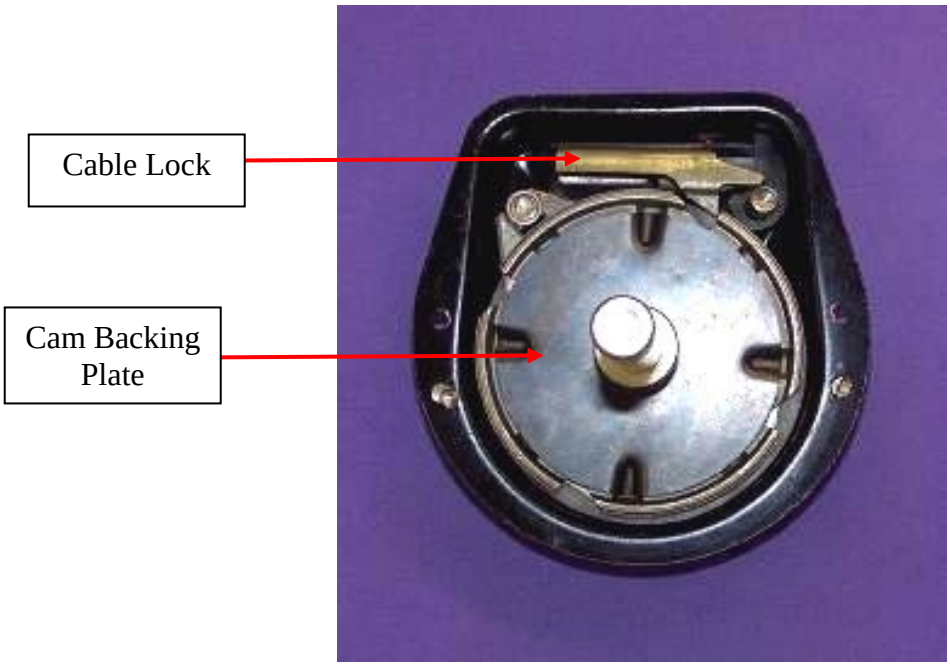

Figure 5: Cover and Inner Gear Assembly (Removed from Main Assembly)

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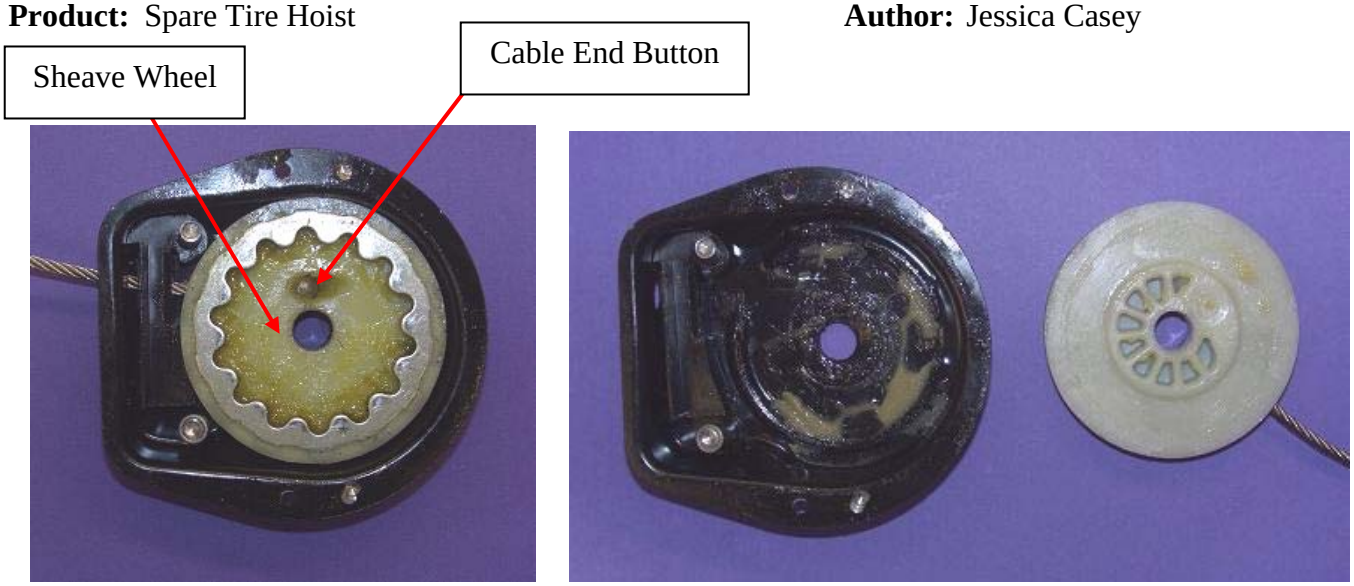
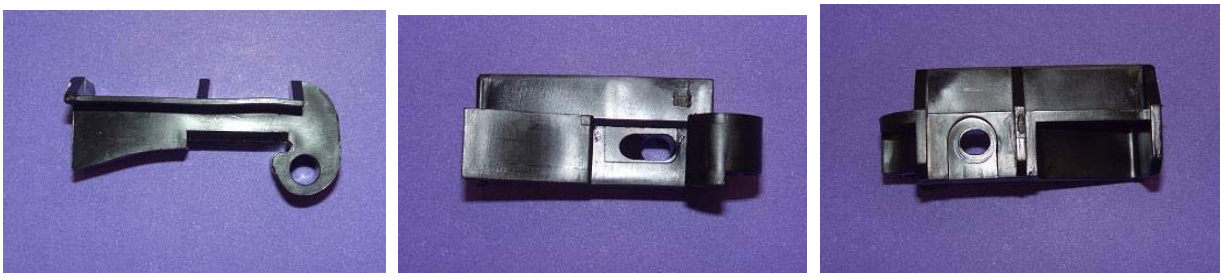


Figures 6 and 7: Grease on Inner Components



Figures 8, 9, and 10: Cable Guide Top, Front, and Back Views

Figures 11 and 12: Gear Front and Back Views

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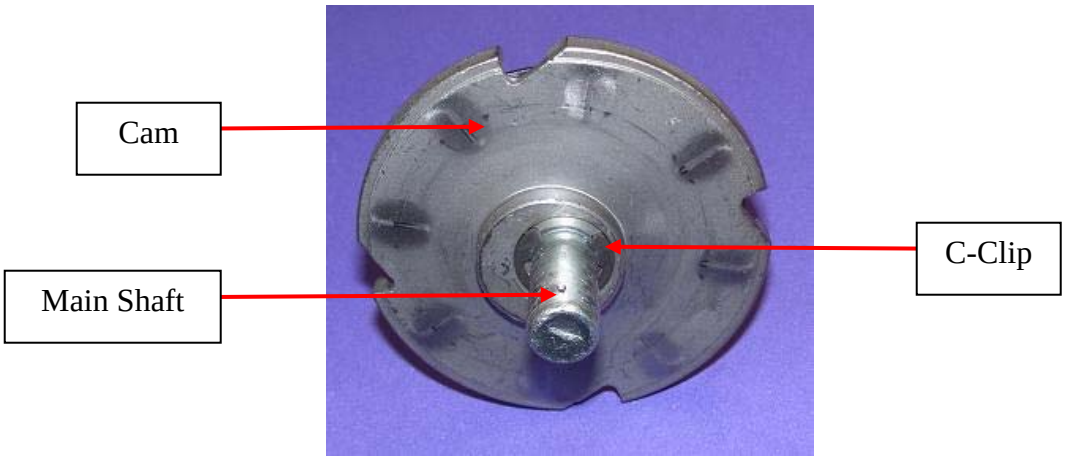

Figure 13: Main Shaft and Cam Assembly

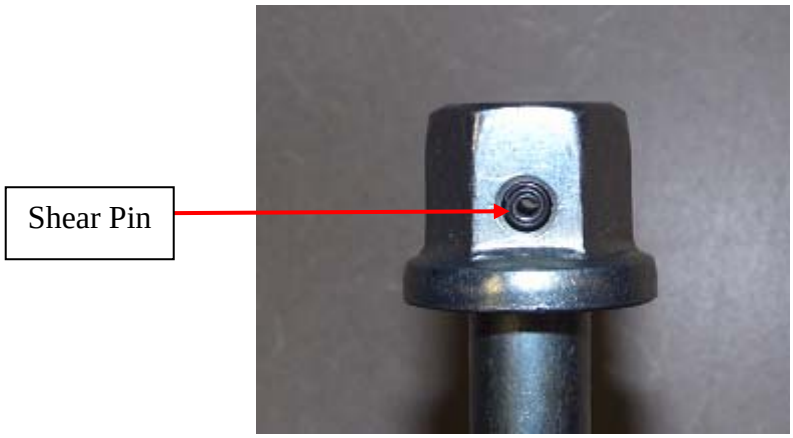

Figure 14: Shear Pin Holding On Nut

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Process & Performance Information:

This section contains information regarding significant performance requirements and / or manufacturing processes that are required to manufacture this product.

- Assembly to be tested in accordance with ASTM B117.
  Minimum corrosion resistance:
  96 hours: no white corrosion
  240 hours: no red corrosion of base metal
- Part must withstand exposure to -40 to 80 C without loss of performance or construction.
- Tube must be welded to the bracket before the bracket is riveted to the housing plate.

Critical Characteristics:

This section contains information significant to the proper function and durability of the product.

- Minimum pull off force of cable end from the cable is: 2100 lb (9300 N)
- Minimum pull off force of cable end (ball) from the cable is: 875 lb (3.9 kN)
- Minimum break strength of cable is: 2500 lb (11.1 kN)
- Minimum torque required to shear the shear pin which connects the nut to the shaft: 70 ft-lb (95 Nm)
- Spring rate constant of the spring: 85 N/mm
- Minimum shear strength of the shear pin: 5000 lb (22.2kN)
- Minimum push out force of the shear pin from the main shaft: 80 lb (350 N)
- Torque cam backing plate rotates at when cable is fully retracted: 35Nm

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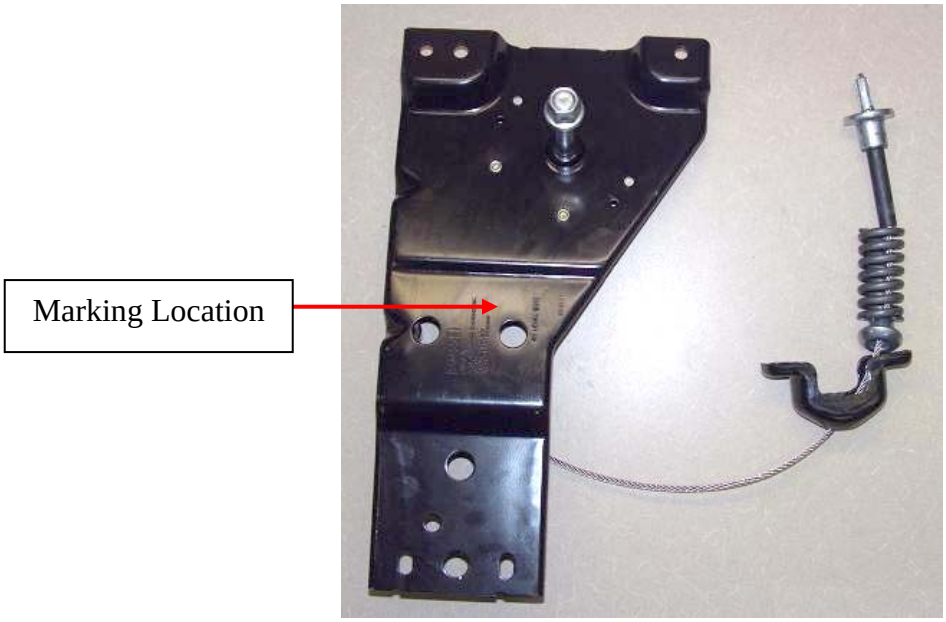
Marking and Identification:

- Unless otherwise specified, part is to be marked in accordance to *Dorman Products Inc. Marking Requirements.*
- Unless otherwise specified; part numbers, logos, recycling marks, date codes or other marking found on the approved product samples are not to be copied.
- Part to be marked with the Dorman Wings Logo, Country of Origin, date code, vendor code and part number on locations shown below.



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Ozone Depleting Chemicals (ODC) Compliance:

- The following Ozone Depleting Chemicals are not to be used in the cleaning or manufacturing of printed circuit boards or products with soldering:

Common Name	Chemical Nomenclature
CFC-11	Trichlorofluoromethane
CFC-12	Dichlorodifluoromethane
CFC-113	Trichlorotrifluoroethane
CFC-114	1,2 dichloro 1,1,2,2 tetrafluoroethane
CFC-115	Chloropentafluoroethane
Halon 1211	Bromochlorodifluoromethane
Halon 1301	Bromotrifluoromethane
Halon 2402	Dibromotetrafluoroethane
Carbon tetrachloride	Tetrachloromethane
Methyl chloroform	1,1,1 trichloroethane
CFC 13	CF3C1
CFC 111	C2FC15
CFC 112	C2F2C14
CFC 211	C3FC17
CFC 212	C3F2C16
CFC 213	C3F3C15
CFC 214	C3F4C14
CFC 215	C3F5C13
CFC 216	C3F6C12
CFC 217	C3F7C1

- Certification letter is required and is to describe in detail, the new alternative product or the replacement technology used instead of the ODC process. The description is to include the type of equipment involved, the month and year the new technology was placed in service, and the name and address of the firm from whom the new technology was purchased.
    - Additional requirements of the Supplier Letter:
        - Be from the supplier on the supplier's company letterhead, which includes the address and phone number of the foreign manufacturer.
        - Addressed to Dorman Products Inc.
        - Signed by an officer or an authorized representative of the company.

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Restriction of Hazardous Substances Directive (RoHS) Compliance:

- All solder and components used in the manufacturing of printed circuit boards are to be RoHS compliant.
- The RoHS controlled materials are to be within the allowable amount listed below.

Material	Allowable Amount
Lead (Pb)	0.1% by weight at raw homogeneous materials level
Cadmium (Cd)	< 0.01% by weight at raw homogeneous materials level
Mercury (Hg)	100 ppm or less; Not intentionally added
Hexavalent chromium (Hex-Cr)	< 0.01% by weight at raw homogeneous materials level
Polybrominated biphenyls (PBB – fire retardant)	0.1% by weight at raw homogeneous materials
Polybrominated diphenyl ethers (PBDE – fire retardant)	0.1% by weight at raw homogeneous materials

- Certification letter is required showing RoHS compliant components.