



U.S. Department
of Transportation

Pipeline and
Hazardous Materials
Safety Administration

East Building, PHH-23
1200 New Jersey Ave, SE
Washington, D.C. 20590

**COMPETENT AUTHORITY CERTIFICATION FOR A
TYPE B(U)
RADIOACTIVE MATERIALS PACKAGE DESIGN
CERTIFICATE USA/9357/B(U) , REVISION 8**

The Competent Authority of the United States certifies that the radioactive material package design described in this certificate satisfies the regulatory requirements for a Type B(U) package as prescribed in the regulations of the International Atomic Energy Agency¹ and the United States of America² The package design is approved for use within the United States for import and export shipments made in accordance with applicable international and domestic transport regulations.

1. Package Identification - SENTRY - Model Nos. SENTRY 110, SENTRY 330, and SENTRY 867.
2. Package Description and Authorized Radioactive Contents - as described in U.S. Nuclear Regulatory Commission Certificate of Compliance No. 9357, Revision 8 (attached).
3. General Conditions -
 - a. Each user of this certificate must have in his possession a copy of this certificate and all documents necessary to properly prepare the package for transportation. The user shall prepare the package for shipment in accordance with the documentation and applicable regulations.
 - b. Each user of this certificate, other than the original petitioner, shall register his identity in writing to the Office of Engineering and Research, (PHH-23), Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, Washington D.C. 20590-0001.

¹ "Regulations for the Safe Transport of Radioactive Material, 2018 Edition, No. SSR-6 (Rev. 1)" published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

² Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

CERTIFICATE USA/9357/B(U) , REVISION 8

c. This certificate does not relieve any consignor or carrier from compliance with any requirement of the Government of any country through or into which the package is to be transported.

d. Records of Management System activities required by Paragraph 306 of the IAEA regulations¹ shall be maintained and made available to the authorized officials for at least three years after the last shipment authorized by this certificate. Consignors in the United States exporting shipments under this certificate shall satisfy the applicable requirements of Subpart H of 10 CFR 71.

4. Special Conditions -

a. Aging Management protocols detailed in QSA Global In-Service Bulletin SB-27 dated January 2025 (attached) shall be followed.

5. Marking and Labeling - The package shall bear the marking USA/9357/B(U) in addition to other required markings and labeling.

6. Expiration Date - This certificate expires on May 31, 2031. Previous editions which have not reached their expiration date may continue to be used.

This certificate is issued in accordance with paragraph(s) 810 of the IAEA Regulations and Section 173.471 of Title 49 of the Code of Federal Regulations, in response to the April 23, 2025 petition by QSA Global, Inc., Burlington, MA, and in consideration of other information on file in this Office.

Certified By:



William Schoonover
Associate Administrator for Hazardous
Materials Safety

May 07, 2025
(DATE)

Revision 8 - Issued to endorse U.S. Nuclear Regulatory Commission Certificate of Compliance No. 9357, Revision 8 to the IAEA Regulations for the Safe Transport of Radioactive Material, 2018 Edition, No. SSR-6, Rev. 1, and to extend the expiration date.

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES**

1.	a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
	9357	8	71-9357	USA/9357/B(U)-96	1 OF	3

2. PREAMBLE

- a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, *Code of Federal Regulations*, Part 71, "Packaging and Transportation of Radioactive Material."
- b. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. THIS CERTIFICATE IS ISSUED ON THE BASIS OF A SAFETY ANALYSIS REPORT OF THE PACKAGE DESIGN OR APPLICATION

- | | |
|---|---|
| a. ISSUED TO (<i>Name and Address</i>)
QSA Global, Inc.
40 North Avenue
Burlington, MA 01803 | b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
QSA Global, Inc., consolidated application dated
January 2025. |
|---|---|

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

- (1) Model No.: SENTRY
- (2) Description

The Model No. SENTRY package includes the Model Nos. SENTRY 110, SENTRY 330, and SENTRY 867, as three variations of the same design. The external dimensions of all models in their standard transport configurations, i.e., with the handling rib and link plate assemblies, are identical and are approximately 19 inches (48 cm) wide, 19 inches (48 cm) tall, and 19 inches (48 cm) deep.

The primary components of the SENTRY packages include (i) a depleted uranium shield completely encased and supported in a cylindrically shaped, stainless steel, welded body, (ii) the rear plate lock and front plate assemblies, (iii) the handling rib and link plate, and (iv) the source assembly. The inner cavity of the welded body around the shield is filled with polyurethane foam. The Model Nos. SENTRY 110 and 330 packages can contain only one source wire assembly during transport, while two source wire assemblies can be loaded into the Model No. SENTRY 867 package. The radioactive contents are securely positioned by either a lock slide for the Model Nos. SENTRY 110 and 330 packages or locking pins for the Model No. SENTRY 867 package. All lock assemblies include a dust cover with a plunger lock to prevent rotation of the selector ring and further secure the source in the package during transport.

The optional rib/link assemblies provide lifting attachments and are bolted to the body weldment. The maximum weight, including the optional rib/link assemblies, is 780 pounds (354 kg) for the Model Nos. SENTRY 330 and 867 packages, and 605 pounds (274 kg) for the Model No. SENTRY 110 package.

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5.(a) Packaging (continued)

(3) Drawings

The package is constructed in accordance with QSA Global, Inc., Drawing No. R86000, Rev. U, sheets 1-11.

(b) Contents

(1) Type and form of material

Cobalt-60, as a sealed source, which meets the requirements of special form radioactive material.

All source wire assemblies consist of a special form capsule crimped onto the end of a flexible steel wire.

(2) Maximum quantity of material per package:

Co-60: 110 curies (4.07 TBq) for the Model No. SENTRY 110 package.

Co-60: 330 curies (12.2 TBq) for the Model Nos. SENTRY 330 and 867 packages.

(3) Maximum weight of contents:

0.09 pounds (40 grams) for the Model Nos. SENTRY 110 and 330 packages.

0.18 pounds (80 grams) for the Model No. SENTRY 867 package.

The maximum content weight includes the mass of radioactive material and the source capsule handling wire assembly for a shipment containing the maximum number of source wire assemblies that can be transported in a package, i.e., 1 source wire assembly for the Model Nos. SENTRY 110 and 330 packages, and 2 source wire assemblies for the Model No. SENTRY 867 package.

(4) Maximum decay heat: 5.5 watts

6. A cover over the source wire connector prevents access to the source assembly until a keyed lock is actuated and the cover removed. This cover stays in place during transport of the package.
7. The nameplate shall maintain its legibility and be fabricated of materials capable of resisting the fire test of 10 CFR Part 71.

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES**

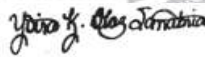
1.	a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
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8. In addition to the requirements of Subpart G of 10 CFR Part 71:
- (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Section 7 of the application;
 - (b) The package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application.
9. Supplemental shielding shall not exceed 5% of the maximum weight of the depleted uranium casting, with a thickness not to exceed 0.5 inch.
10. Revision No. 7 of this certificate may be used until March 31, 2026.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.
12. Expiration date: May 31, 2031.

REFERENCES

QSA Global Inc., consolidated application dated January 15, 2025.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Signed by Diaz-Sanabria, Yoira
on 04/21/25

Yoira Diaz-Sanabria, Chief
Storage and Transportation Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Date: April 21, 2025

Sentry Series Extended Inspection & Maintenance for IAEA SSR-6: 2018 Compliance

Purpose

This document provides information applicable to the inspection and maintenance of the Model Sentry 110, Sentry 330 and Sentry 867 (Sentry Series) transport packages to comply with IAEA SSR-6 (2018). In addition to ensuring the packages are in accordance with the operating instructions supplied with the transport package, per 10 CFR 71.87 and 71.89, specifically Sections 7 & 8 of the Model Sentry Series Safety Analysis Report, compliance with this bulletin is required for all packages shipped under a USDOT certificate, or other foreign Type B certification, endorsed to IAEA SSR-6 (2018).

Package Inspection & Maintenance Requirements

The Sentry Series packages must be maintained regularly by trained and qualified personnel to ensure the package complies with applicable Type B(U) or Type A approval requirements and the package maintains its integrity during transport.

The recommended inspection and maintenance requirements are based on the system's design, application, materials, anticipated work cycles, environmental factors of use under the normal and abnormal conditions of transport. A program of systematic maintenance will prolong the working life of the package in addition to ensuring safety during transport and use. Routine inspection of the package is required prior to each shipment. In addition, a complete annual servicing of the Sentry Series package designs is necessary to ensure the package's integrity.

Maintenance program administrators must recognize the need for maintenance intervals that are less than the required annual interval, especially in cases where the packages are used in severe environmental conditions. Maintenance program administrators must ensure the systems are completely serviced immediately after observed damage or after exposure to severe conditions. Extreme or severe conditions may include, but is not limited to, conditions where the package was:

- Immersed in water or mud.
- Subjected to high-concentrations of particulate such as fly ash, sand or foundry green-sand.
- Subjected to hot radiography conditions.
- Subjected to salt-water conditions, caustic or acidic materials.
- Subjected to accidental drops or falling objects.
- Whenever subjected to extreme environmental conditions.

The complete maintenance (performed once a year or after removal from long term storage – see Sections 4 and 5) involves a complete disassembly, cleaning, inspection, re-lubrication and operational tests of the major assemblies on the package.

Personnel performing the inspections and maintenance in this bulletin must be adequately trained and approved to perform these duties. Personnel approved and qualified under either a USNRC approved QA program or an ISO 9001 QA program to perform Type B container inspection and maintenance would meet the training requirements in this bulletin.

1. General Requirements

- a. The Model Sentry Series transport packages must be loaded and closed in accordance with procedures that, at a minimum, include the requirements in Sections 7 & 8 of the SAR and this bulletin. Shipment of Type B quantities of radioactive material are authorized for sources specified in Section 2. Maintenance and inspection of these packages is in accordance with the additional requirements specified in Section 3 through 5.

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NOTE: Package conformance after storage and prior to use for Type B shipments is ensured by proper inspection and maintenance. The materials used in the Sentry Series packages are not vulnerable to degradation due to irradiation over time, and there will typically be no chemical/galvanic material interactions between package materials during storage so long that the package is not exposed to hazardous chemicals and is stored under controlled environmental conditions¹.

For packages removed from storage and prior to shipment, the package components are inspected for any degradation due to non-use/storage. Any degradation identified will prevent the package use for shipment until correction by replacement, service and/or repair. (Reference: IAEA SSR-6 §503(e) & 613A).

- b. Results of package inspections and maintenance covered in this bulletin must be recorded and include, at a minimum,
- The date of inspection and maintenance.
 - Name and signature of the qualified individual performing the required inspections.
 - Problems found and maintenance or repairs performed.
 - Model number and serial number of the exposure device and transport container.
 - Associated equipment that was inspected and maintained.
 - Part numbers and associated lot numbers or serial numbers of replacement parts installed

If any defective/damaged components are identified on the package or source, they must be removed from transport use and identified with a status indicator (tag, label, or tape) to prevent inadvertent shipment or use. Defective or damaged components must be repaired or replaced before continued use of the Sentry Series package (or source assembly as applicable) in transport. Contact QSA Global, Inc. if additional guidance or assistance is needed to determine actions needed to deal with defective/damaged equipment.

2. Authorized Package Contents

The Sentry Series transport packages are designed for use with a special form source capsules as approved under a U.S. Department of Transportation special form certification². The approved isotopes and maximum package activity limits are shown in Table A. Details of encapsulation as well as chemical and physical form of the radioactive material will comply with specifications approved under U.S. Department of Transportation or other Competent Authority special form certifications.

¹ Storage of the Model Sentry Series packages must be in a temperature and humidity controlled area away from chemicals or other hazardous substances to prevent degradation of the package integrity while in storage.

² Special Form is defined in 10 CFR 71, 49 CFR 173, IAEA TS-R-1 and SSR-6.

Sentry Series Extended Inspection & Maintenance for IAEA SSR-6: 2018 Compliance

Table A: Isotopes Permitted in the Model Sentry Series

Model	Nuclide	Maximum Capacity	Maximum DU Weight	Maximum Package Weight
Sentry 110	Co-60	110 Ci	320 lbs (145 kg)	605 lbs (274.4 kg)
Sentry 330	Co-60	330 Ci	485 lbs (220 kg)	780 lbs (354 kg)
Sentry 867	Co-60	330 Ci	485 lbs (220 kg)	780 lbs (354 kg)

3. Packaging Maintenance and Inspection Prior to Shipment

- If the package has been in storage for 1 year or longer, inspection to the requirements in Section 4 or 5 (as applicable) must be completed in addition to the maintenance and inspection listed in this section.
- Ensure all markings are legible and the labels are securely attached to the package. If a source is loaded in the package, inspect the legibility and attachment of the source identification tag that describes the radioactive source contained in the package.
- Inspect the container for signs of significant degradation. Ensure all welds are intact, the container is free of heavy rust and cracks/damage to the steel housing which breaches the container. If there is any evidence of bent or cracked welds contact QSA Global, Inc. prior to shipping.
- Inspect the locking mechanism to ensure the protective covers are installed over the source assembly connector. Inspect the plunger lock to ensure the lock will engage when the plunger is depressed, and the key is removed. Grasp the entire locking mechanism with one hand and try to move the lock to determine that the screws have not loosened due to vibration. Unlock the plunger lock and confirm it releases the protective cover. Return the protective cover to the lock assembly and secure it to the package with the plunger lock.
- On the Sentry 110 and Sentry 330 packages, inspect the outlet port for damage and for smooth operation by operating the outlet port cover. Verify that the outlet port cover rotates smoothly and that the mechanism is not clogged with dirt, grease or sludge.
- Ensure all bolts and fasteners (hardware) required for assembly of the package and as specified on the drawings referenced on the Type B transport certificate are fit for use. Without removing the hardware by disassembly from the device, examine the visible external surfaces of the bolts/fasteners for any signs of damage including fatigue cracking.

Note: A visual examination of the bolt/fastener thread condition is performed after removal from the Sentry 110 and Sentry 330 exposure devices as part of the Annual maintenance inspections required for radiography devices under 10 CFR 34.31 or equivalent Agreement State regulations (see Section 4). This inspection is also included for the Sentry 867 as specified in Section 5 of this bulletin.

Sentry Series Extended Inspection & Maintenance for IAEA SSR-6: 2018 Compliance

The bolts/fasteners must be replaced if they are no longer fit for use (e.g., threads stripped, unable to fully thread, signs of cracking, etc.). For the Sentry 110 and Sentry 330 packages, ensure the front port is properly secured and seal wire(s) are properly installed on all Sentry Series packages (drawing R86080 Rev A). All replacement hardware must meet all applicable specifications listed on the drawings referenced on drawing R86000 Rev U.

- g. If the container fails any of the inspections in steps 3.a-f, remove the container from use until it can be brought into compliance with the Type B certificate.

4. Sentry 110 and Sentry 330 Packaging Annual Maintenance and Inspection

The Sentry 110 and Sentry 330 packages must receive inspection and maintenance at least once a year. The locking mechanisms and outlet port mechanism must be removed from the package and disassembled for proper cleaning, inspection and lubrication of components that are critical to safety. These procedures can only be performed on an empty package, which requires transfer of the radioactive source assembly into an approved storage container.

A leak test of a sealed source must be performed every 6 months or prior to its first use after removal from storage. Acceptable results of a radio-assay must indicate removable contamination is less than 185 Bq (0.005 μ Ci). If the source requires a leak test, perform the test and obtain the results prior to transferring the source from the package into a source changer.

Prior to this inspection, transfer the source from the package following the instructions in the package and source changer operations manuals. The annual inspection and maintenance must be performed by individuals specifically trained, qualified and authorized for this work.

- a. After unloading the package, perform a leak test of the package for removable depleted uranium contamination. This test is typically required annually for projection type radiography devices where the source projects out of the device during use. The purpose of the leak test is to detect the long-term wear through of the device's source tube that may consequently expose the DU shielding. A wipe-test wand that is both flexible and long enough to reach a bend radius or a wear point is required to perform a leak test. The wand enables direct contact with the DU where the device's source tube has worn through.

The analysis performed on the wipe test must be capable of detecting the presence of 0.005 μ Ci (185 Bq) of radioactive material on the test sample. If the test sample reveals 185 Bq (0.005 μ Ci) or more of removable DU contamination, the package must be removed from service until an evaluation of the wear on the 'S' tube has been made. Should the evaluation reveal that the source tube is worn through, the exposure device may not be used again.

DU shielded devices do not have to be tested for DU contamination while in storage and not in use. Before using or transferring a device that has been in storage for more than 12 months, the Sentry 110 and Sentry 330 exposure devices must be leak tested for DU contamination prior to use or transfer. Please contact QSA Global, Inc. for guidance in the disposition of worn through packages.

- b. Complete the inspections in Section 3.b through 3.g.

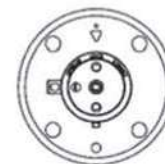
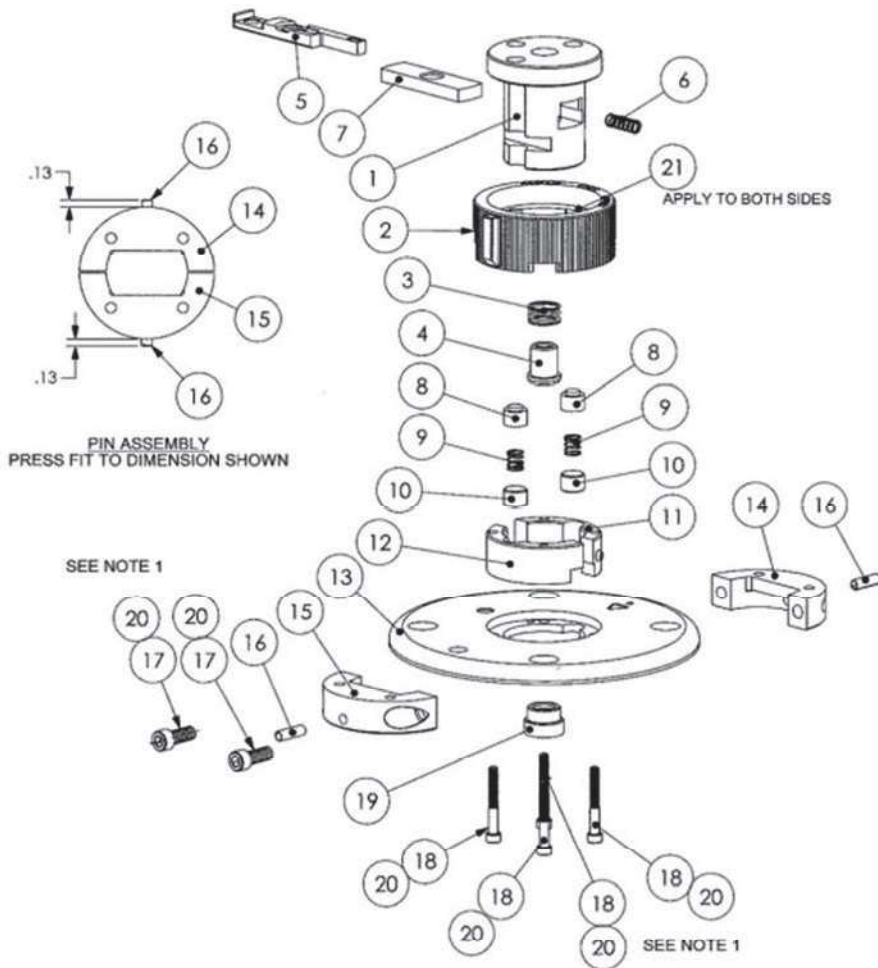
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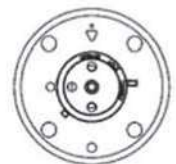
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- c. Clean the exterior of the package using a mild detergent solution to remove any dirt and grime. Visually inspect the package stainless steel body for weld failures (cracks, etc.) especially around the locking mechanism and outlet port attachment areas. If damage, such as deep dents and crevices, cracked welds, etc., is found on the package body, these repairs must be performed by QSA Global, Inc. at an approved service center. Ensure the handling rib assembly components are intact and not damaged.

d. Locking Mechanism (Rear Plate) Maintenance



LOCKED STATE
SEE NOTE 2



OPERATE STATE
SEE NOTE 2

21	GRE001	AR	GREASE, AIRCRAFT AND INSTRUMENT
20	GLU002	AR	THREAD LOCKER, REMOVABLE
19	88084-1	1	TUBE SEAL - SENTRY 110
18	SCR346	4	SCREW, #8-32 X 1-1/4 LG SHCS, STN STL
17	SCR347	2	SCREW, 1/4-20 X 5/8 LG SHCS, STN STL
16	PIN059	2	ROLL PIN
15	86088-2	1	LOCK COLLAR - SENTRY 110
14	86088-1	1	NUT COLLAR - SENTRY 110
13	86081-1	1	REAR PLATE
12	86086-12	1	INDEX SEGMENT
11	86086-10	1	INDEX STOP ASSEMBLY
10	80087	2	SPACER
9	SPR004	2	COMPRESSION SPRING
8	66001-6	2	ANTI-ROTATE LUGS
7	86083-1	1	BRIDGE
6	SPR006	1	COMPRESSION SPRING
5	88024	1	LOCK SLIDE
4	88025	1	SLEEVE
3	SPR005	1	COMPRESSION SPRING
2	86026	1	SELECTOR RING
1	86082	1	SELECTOR RING RETAINER
ITEM	PART NO	QTY	TITLE

Replacement Components Must be Obtained from QSA Global, Inc. to ensure compliance with package approvals.

NOTES:

1. APPLY GLU002 TO THREADS OF SCR346 & SCR347.
2. USE DEMO SOURCE WIRE TO CHECK LOCK FUNCTION.

Sentry 110 Locking Mechanism (Rear Plate) Assembly

Sentry Series Extended Inspection & Maintenance for IAEA SSR-6: 2018 Compliance



Replacement Components Must be Obtained from QSA Global, Inc. to ensure compliance with package approvals.

1. APPLY GLU002 TO THREADS OF SCR346 & SCR347.
2. USE DEMO SOURCE WIRE TO CHECK LOCK FUNCTION.

- 1) Remove the dust cover from the lock mechanism. Remove the four ½-13 x 1½ inch long hex head bolts and the one 5/16 x 1 ½ inch long security screw that retain the locking mechanism from the empty package. Remove the locking mechanism by rotating the rear plate 90 degrees in either direction.
- 2) Invert the locking mechanism with the back (serial number side) of the rear plate facing up.

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- 3) Remove the plastic seal and the fitting from the assembly (if still in the selector ring retainer).



- 4) Remove the two 1/4-20 x 5/8 inch long socket head screws and the four 8-32 x 1 1/4 inch long socket head screws attaching the lock collars to the selector ring retainer.



- 5) Ensure spring loaded parts are not lost when removed.
- 6) Slowly remove the lock and nut collars. **CAUTION:** Spring loaded spacers will pop up (place hand over center of the locking mechanism to catch the spacers).



- 7) Disassemble the lock mechanism and separate the components including the selector ring, selector ring retainer, the two locking pins and springs.
- 8) Place the disassembled (non-plastic) locking mechanism components into a pan filled with fresh mineral spirits. Clean all metal parts using a brush to dislodge any dirt or grease. Remove cleaned parts from the solvent bath, dry and place on a clean surface. Inspect all parts for wear or damage. Replace worn/damaged parts³.

³ Replacement parts compliant for use under the Type B approval can be obtained from QSA Global, Inc. Use of unauthorized replacement parts may invalidate the device and/or Type B approval.

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- 9) Discard and replace the plastic tube seal. Discard all used locking mechanism springs and replace with new springs. All compression springs located within the selector ring mechanism must be replaced at 12-month intervals to ensure smooth and consistent operation of the mechanism.
- 10) Apply a light coating of lubrication to the locking pins using MIL-G-23827B (or C), MIL-PRF-23827C (or equivalent radiation resistant grease authorized by QSA Global, Inc.).
- 11) Begin reassembly by inverting the selector ring retainer with the flange end facing down. Insert the locking pins with new compression springs into the selector ring retainer and hold in place until the retainer with locking pins can be inserted into the selector ring to hold the pins in place. Then place the selector ring onto the selector ring retainer have the marking ("OPERATE, CONNECT and LOCK") facing down.
- 12) Insert the assembly into the rear plate with the serial number towards the back of the locking mechanism connection side. Secure the locking and nut collars onto the assembly by inserting the two 1/4-20 x 5/8 inch long socket head screws and the two 8-32 x 1 1/4 inch long socket head screws.
- 13) Test the spring actuation by sliding the lock slide over to release an inactive, demo source assembly. The spring should be fully compressed. This can be confirmed by looking through the viewing hold in the index ring. Push down on the demo source assembly to actuate the lock slide to loc the demo source assembly again. Repeat this test a few times while listening for the click when locking the demo source assembly. **(Note: If the click cannot be heard, then the spring is not assembled correctly and may be damaged. If this is the case, replace the spring with a new spring and try again.)**



- 14) Once the lock slide spring is successfully installed, place the inverted rear plate (serial number facing up) onto the index ring. **NOTE: Ensure the red dot on the rear plate is located on the same side as the green dot of the lock slide.**



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- 15) Drop in the anti-rotation lugs with holes facing up. Drop in the anti-rotation lug springs into the anti-rotation lugs, then place the spacers onto the springs.

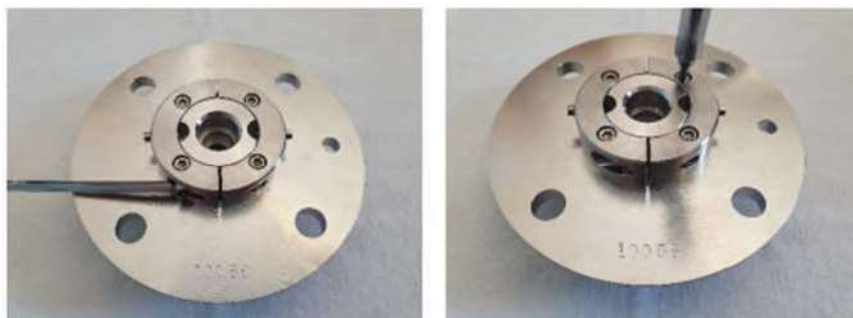


- 16) Install the lock and nut collars as shown in the pictures below:



- 17) Apply Vibratite™ 121 or Loctite™ 242 to all screws.

- 18) Install the two 1/4-20 socket head cap screws using a 3/16 inch allen wrench and lightly tighten while equalizing the gap between the lock collars. Ensure proper alignment of the selector ring retainer and freedom of movement of the lock slide when tightening the collar screws.



- 19) Flip the assembly over and insert the U-tool⁴ to depress the anti-rotation lugs. Ensure they depress and spring back freely. If not, then turn the lock collars slightly until they become free to spring.

⁴ This tool can be obtained from QSA Global, Inc. Reference part number SK1761.

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20) Once the lugs are checked, tighten the four 8-32 socket head cap screws and then retighten the two ¼-20 screws on the collars.

21) Locking Mechanism Functional Safety Check

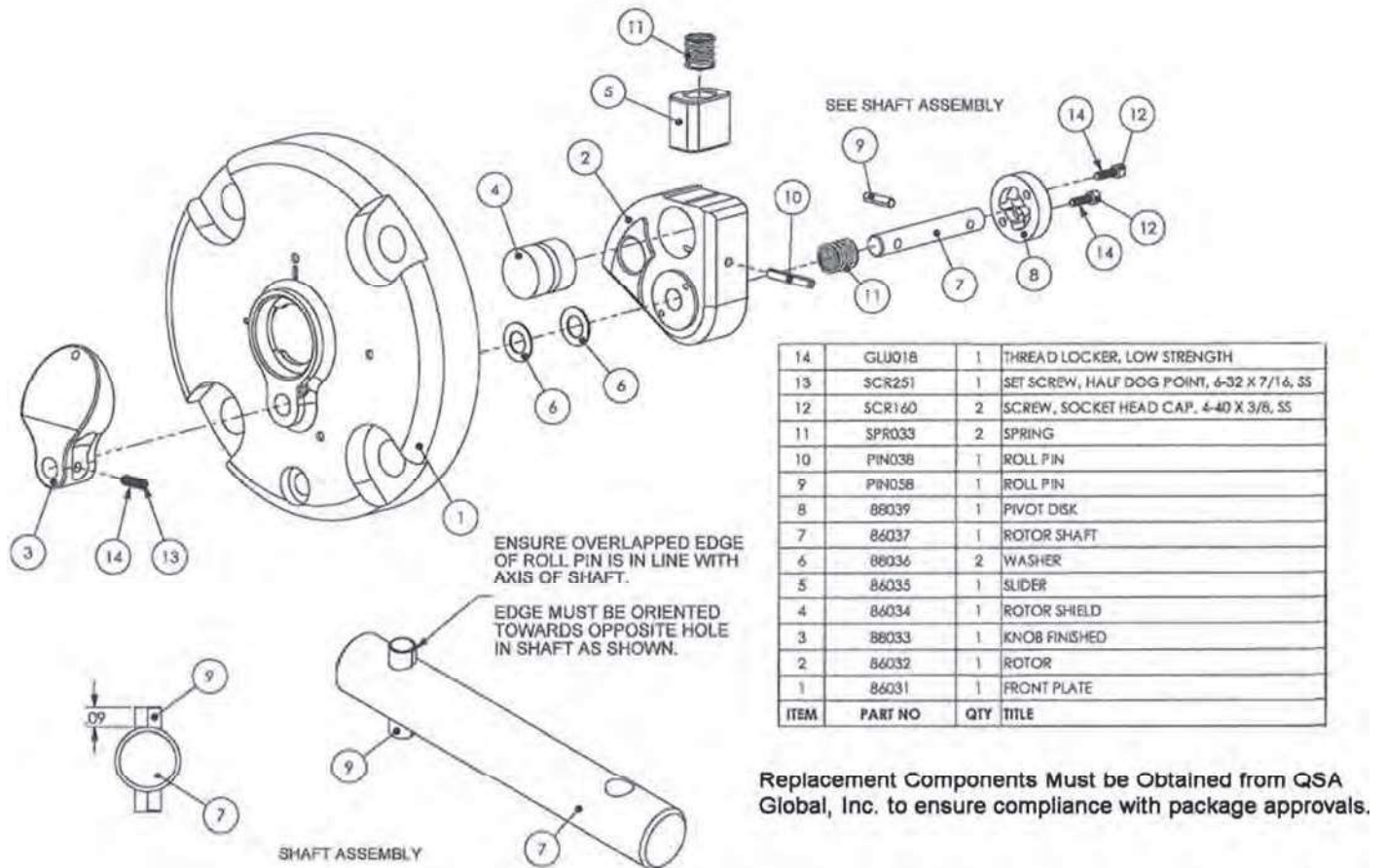
- i. Insert the U-tool into the top and bottom holes of the selector ring retained and rotate the selector ring toward the OPERATE position. Push the lock slide until the sleeve snaps into place.
- ii. While in the OPERATE position, wind out a short length of control cable and feed the control cable connector through the center port of the lock mechanism. Attach a demo source assembly or a test jumper connector to the control cable connector and retract it back into the lock mechanism.
- iii. Pull on the section of control cable and confirm that the lock slide automatically secures the connector. The lock slide must snap shut in a fast and smooth motion when triggered causing an audible “snap” or click sound. Check the success of the locking mechanism by attempting to both push and pull the demo source assembly out of the selector mechanism while in the EXPOSE, LOCK and CONNECT positions.
- iv. Rotate the selector ring back to the OPERATE position and push in the lock slide to ensure smooth operation and positive engagement. Attempt to push the lock slide towards the SECURED position to test for a positive engagement of the sleeve in the lock slide. If a smooth operation is not successful and/or the lock slide can be forced into the secured position by testing for positive engagement, disassemble and thoroughly re-inspect for faulty components.
- v. If the lock mechanism is disassembled, thoroughly inspect all components for rough edges or burrs, etc. which could cause jamming or irregular operation. Replace parts as necessary, re-lubricate and reassembly the lock mechanism assembly. Repeat the functional safety testing to verify smooth and safe operation of the selector mechanism.
- vi. Do not install the serviced lock mechanism (rear plate assembly) back onto the package at this point.

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e. Outlet Port (Front Plate) Maintenance



Outlet Mechanism (Front Plate) Assembly

- 1) Remove the four 1/2-13 x 1 1/2 inch long hex head bolts and the one 5/16 x 1 1/2 inch long security screw that retain the outlet port (front plate) from the empty package.
- 2) Disassemble the front plate (outlet port mechanism) by first removing the set screw from the outlet port cover (knob). Discard the used set screw.
- 3) Unscrew the two socket head cap screws from the pivot disk.
- 4) Remove and discard the two compression springs from the outlet port mechanism.
- 5) Clean all parts in mineral spirits using a brush to dislodge all dust and dirt. Dry all components thoroughly. Do not lubricate. Leave all components until dried completely.
- 6) Inspect the bronze rotor shaft with spring roll-pin attached to ensure the shaft is not damaged, bent or worn, and the spring roll-pin is not cracked, broken or loose in the bronze rotor shaft. Replace the rotor shaft with spring roll-pin attached if necessary.

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- 7) Inspect the brass slider and rotor surfaces for wear and burrs. Verify the tungsten port shield is not loose within the rotor. If the port shield is loose or the slider/surfaces are worn/damaged, replace the items.
- 8) Inspect the entire outlet port for wear and burrs, especially in areas where the source guide tube bayonet fitting engages. If damage is observed, contact QSA Global, Inc. for assistance in obtaining replacement parts.
- 9) Install new compression springs and reassemble the outlet port mechanism. Apply Vibratite™ 121 or Loctite™ 242 to the threads of a new set screw.
- 10) Install the set screw into the outlet port cover and through the bronze shaft.

11) Outlet Port Functional Safety Check

- i. After reassembly of the front plate, perform the following safety function tests using a bayonet source guide tube fitting.
- ii. Pull the outlet port cover and rotate clockwise 90 degrees. Movement should be smooth and limited to a clockwise 90 degree turn.
- iii. Insert a bayonet fitting into the outlet port and rotate 90 degrees in a counter-clockwise direction. Insertion and rotation of the bayonet fitting should be smooth and without snags.
- iv. Rotate the outlet port cover from a 3 o'clock position to a 4 o'clock position. This operation moves the rotor from the port shield position to a pass through section of the rotor.
- v. Reverse the operation to disengage the bayonet fitting.
- vi. Repeat the function test three times at a minimum to ensure smooth operation.

f. Post Maintenance Reassembly

- 1) Apply anti-seize thread lubricant⁵ to the end threads of the eight ½-13 x 1½ inch long hex head bolts and the two 5/16 x 1½ inch long security screws used to attach the locking mechanism (rear plate) and outlet port (front plate) to the package.
- 2) Insert and rotate the locking mechanism 90 degrees in either direction to align the mounting holes to the package port. NOTE: the Sentry 330 requires a spacer plate behind the rear plate while the Sentry 110 does not.
- 3) Secure the locking mechanism assembly to the package by installing the four ½-13 x 1½ inch long bolts using a calibrated torque wrench. Torque the bolts in an opposing cross pattern to 70 ± 6 foot/lbs. Install the security screw and torque to 110 ± 5 in/lbs.

⁵ Approved lubricant includes Permatex™ part numbers 81343 (133AR), 80078 (133K), 80208 (767) or 09175; Bostik™ part numbers NSS-160, NSSBT-8, NSSBT-16, NSS-42B or NSS-4258; Loctite™ part number LB 8150; or Molykote™ part numbers P-37 or P-1900 anti-seize thread lubricants.

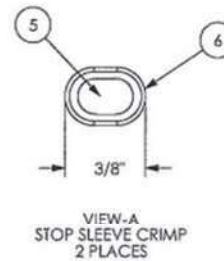
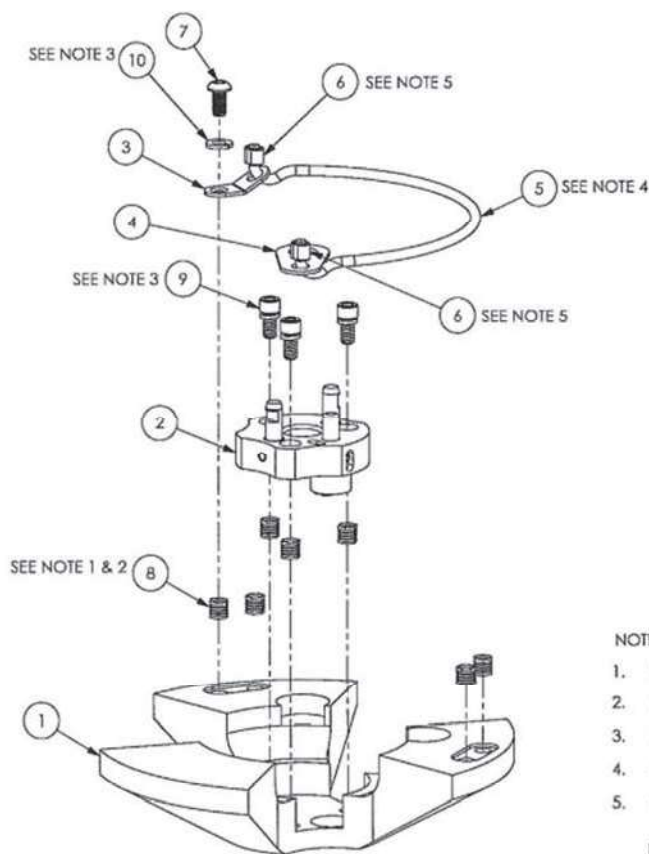
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- 4) Align and attach the outlet port assembly to the package by installing the four ½-13 x 1½ inch long bolts using a calibrated torque wrench. Torque the bolts in an opposing cross pattern to 70 ± 6 foot/lbs. Install the security screw and torque to 110 ± 5 in/lbs.

g. Lock and Dust Cover Assembly Maintenance



10	WSH028	1	LOCKWASHER
9	SCR332	3	SOCKET HEAD CAP SCREW WITH WASHER
8	SCR323	7	THREADED INSERT
7	SCR311	1	SOCKET BUTTON HEAD CAP SCREW
6	86025-4	2	STOP SLEEVE
5	CRBLO08	1	CABLE
4	86025-3	1	LARGE LINK
3	86025-2	1	SMALL LINK
2	86023	1	LOCK COVER ASSEMBLY
1	86025-1	1	TREFOIL DUST COVER
ITEM	PART NO	QTY	TITLE

NOTES:

1. PRESS THREADED INSERTS INTO DUST COVER.
2. ENSURE THREADED INSERT IS FLUSH WITH MOUNTING FACE.
3. DO NOT APPLY THREAD LOCKER TO SCREW THREADS.
4. CABLE LENGTH TO BE 12 +/-0.50 INCHES BEFORE CRIMPING.
5. CRIMP STOP SLEEVES TO CABLE ENDS BY FLATTENING IN VICE TO DIMENSION SHOWN IN VIEW-A.

Replacement Components Must be Obtained from QSA Global, Inc. to ensure compliance with package approvals.

Sentry 110 & Sentry 330 Dust Cover Assembly

- 1) Remove the dust cover assembly from the package by removing the socket button-head cap screw.
- 2) Inspect the dust cover for damage. Remove the lock cover assembly from the dust cover by removing the three socket cap screws with washers. Verify the notched cover pins are not bent, excessively work or have rotated from their fixed position. Replace the coiled spring pins that retain the notched cover pins if they are rusted, broken or cracked.
- 3) Remove the plunger lock assembly from the lock cover assembly by removal of the socket head cap screw. Thoroughly clean the plunger lock and its extension in mineral spirits. Clean the bore of the lock cover using mineral spirits. Use compressed air to thoroughly dry the plunger lock internally. Inspect the plunger lock for excessive wear on the outer bore and excessive looseness of the key tumbler. Replace the entire plunger lock and extension if the key tumbler is loose or if the plunger lock is loose when inserted into the lock cover.

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- 4) Clean and inspect the lock cover for damage. Confirm the notched cover pins do not have wear in the notched area and are not loose.
- 5) Lubricate the key tumbler of the lock with a few drops of light oil, such as 3-in-1™ oil. Insert and remove the key several times and actuate the tumblers to work the light oil into the tumblers. Apply a light coating of lubrication to the plunger lock barrel and inside surfaces of the lock cover assembly using MIL-G-23827B (or C), MIL-PRF-23827C, or equivalent radiation resistant grease authorized by QSA Global, Inc. Insert the plunger lock into the lock cover and align the screw hole for assembly. Apply thread locker Loctite™ 222 to the socket head cap screw, install and tighten.
- 6) Clean and inspect the dust cover assembly. Replace any components that are worn or damaged. Install the lock cover assembly in the dust cover assembly. Secure the lock cover assembly to the dust cover by installing and tightening the three socket head cap screws and washers.
- 7) Attach the serviced dust cover assembly to the package with the socket head cap screw. Reattach the dust cover assembly to the package and ensure the cable will allow attachment to the lock mechanism and storage bracket above the lock mechanism. Replace the dust cover cable if it is frayed or broken.
- 8) Check the plunger lock for proper function by using the key to engage and unlock. Engage the dust cover assembly to the lock mechanism to ensure smooth operation and proper function.

h. Post Maintenance Functional Safety Check of the Entire Package

- 1) Operationally test for proper function of the entire system by using the serviced package, a source guide tube with a bayonet fitting, a set of remote controls and an inactive, demo source wire assembly.
- 2) Attachment of the bayonet source guide tube to the outlet port must be smooth and without resistance. Rotate the outlet port mechanism to enable exposure of the demo source assembly.
- 3) Connect the remote controls to the demo source assembly connector and package locking mechanism.
- 4) Push the lock slide into the expose position and crack the remote control cable into the exposure mode.
- 5) While cranking the demo source assembly from the package, carefully feel for resistance or snags.
- 6) During retraction of the demo source assembly back into the package, carefully feel for resistance or snags during movement.
- 7) Conclude the test by verifying the lock slide automatically secures the demo source assembly. Action of the lock slide should be smooth with an audible 'snap' during automatic securing. After automatic securing, attempt to expose the demo source assembly from the package without releasing the lock slide to confirm a positive capture of the source. Repeat this testing several times.

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- 8) If resistance, snags or sluggish movement of the lock slide is noted during this testing, remove the outlet port and locking mechanism plates to determine the cause. Repeat all safety function tests if any additional servicing is required.
 - 9) After performing the full servicing of the package, If the package is operating normally, the demo source assembly can be removed from the package and an active source assembly loaded into the package.
- i. Maintain records of this inspection and maintenance per Section 1.b of this bulletin.

5. Sentry 867 Packaging Annual Maintenance and Inspection

The Sentry 867 package must receive inspection and maintenance at least once a year. The two locking mechanisms must be removed from the package and disassembled for proper cleaning, inspection and lubrication of components that are critical to safety. These procedures can only be performed on an empty package, which requires transfer of any radioactive source assembly into an approved alternate container.

A leak test of a sealed source must be performed every 6 months or prior to its first use after removal from storage. Acceptable results of a radio-assay must indicate removable contamination is less than 185 Bq (0.005 μ Ci). If the source requires a leak test, perform the test and obtain the results prior to transferring the source from the package into a source changer.

Prior to this inspection, transfer the source from the package following the instructions in the package and source changer operations manuals. The annual inspection and maintenance must be performed by individuals specifically trained, qualified and authorized for this work.

- a. After unloading the package, perform a leak test of the package source tubes for removable depleted uranium contamination. The purpose of the leak test is to detect the long-term wear through of the package source tubes that may consequently expose the DU shielding. A wipe-test wand that is both flexible and long enough to reach a bend radius or a wear point is required to perform a leak test. The wand enables direct contact with the DU where the device's source tube has worn through.

The analysis performed on the wipe test must be capable of detecting the presence of 0.005 μ Ci (185 Bq) of radioactive material on the test sample. If the test sample reveals 185 Bq (0.005 μ Ci) or more of removable DU contamination, the package must be removed from service until an evaluation of the wear on the source tube(s) has been made. Should the evaluation reveal that one or both of the source tubes are worn through, the package may not be used again.

Before using or transferring a package that has been in storage for more than 12 months, the Sentry 867 must be leak tested for DU contamination prior to use or transfer. Please contact QSA Global, Inc. for guidance in the disposition of worn through packages.

- b. Complete the inspections in Section 3.b through 3.g.

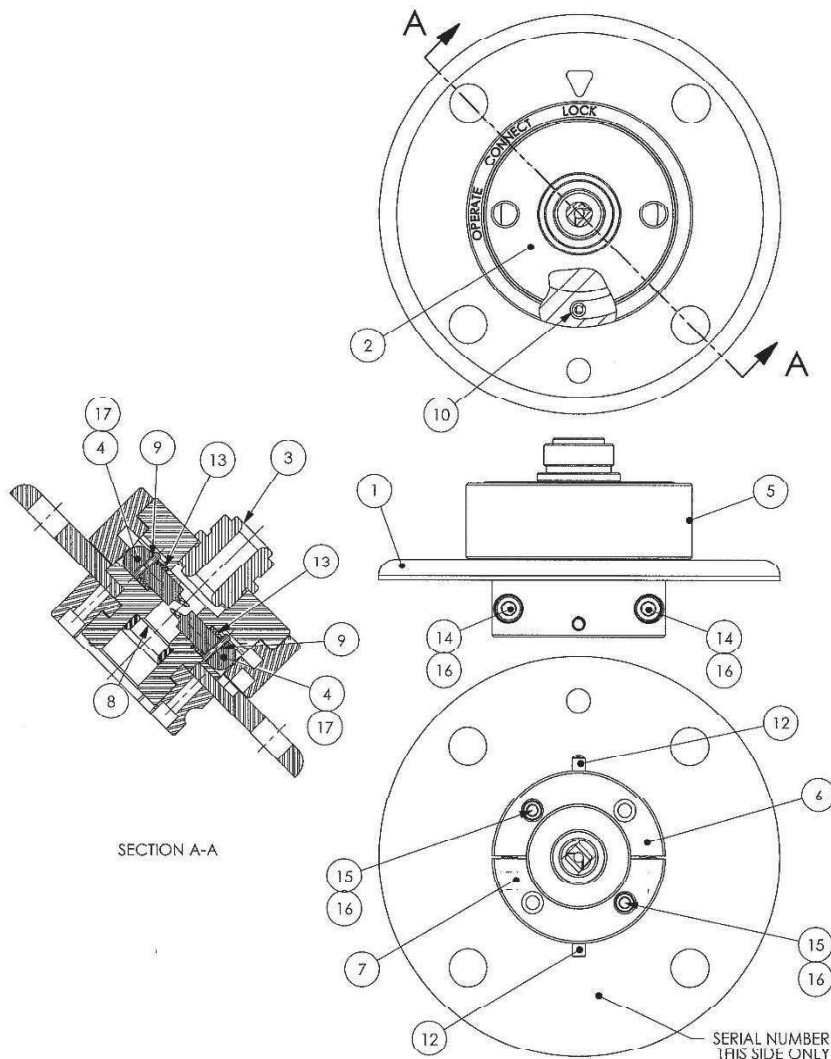
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- c. Clean the exterior of the package using a mild detergent solution to remove any dirt and grime. Visually inspect the package stainless steel body for weld failures (cracks, etc.) especially around the locking mechanism and outlet port attachment areas. If damage, such as deep dents and crevices, cracked welds, etc., is found on the package body, these repairs must be performed by QSA Global, Inc. at an approved service center. Ensure the handling rib assembly components are intact and not damaged.

d. Locking Mechanism Maintenance



17	GRE001	AR	GREASE, AIRCRAFT AND INSTRUMENT
16	GLU002	AR	THREAD LOCKER, REMOVABLE
15	SCR346	2	SCREW, #8-32 X 1-1/4 LG SHCS, STN STL
14	SCR347	2	SCREW, 1/4-20 X 5/8 LG SHCS, STN STL
13	SPR024	2	COMPRESSION SPRING
12	PIN059	2	ROLL PIN
11	PIN056	2	SPRING PIN
10	PIN055	1	SPRING PIN
9	PIN017	2	SPRING PIN
8	86784	1	TUBE SEAL - CHANGER
7	86089-1	1	NUT COLLAR - SENTRY 330
6	86089-2	1	LOCK COLLAR - SENTRY 330
5	86726	1	SELECTOR RING
4	86724	2	LOCKING PIN
3	86721-2	1	FILLING
2	86782	1	SELECTOR RING RETAINER
1	86781	1	REAR PLATE
ITEM	PART NO	QTY	TITLE

Sentry 867 Locking Mechanism Assembly

- 1) Remove the dust cover from a lock mechanism. Remove the four 1/2-13 x 1 1/2 inch long hex head bolts and the one 5/16 x 1 1/2 inch long security screw that retain the locking mechanism plate from the empty package. Remove the locking mechanism and spacer plate by rotating the rear plate 90 degrees in either direction.

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- 2) Remove the fitting from the assembly and inspect the fitting for damage including damage to the fitting threads (e.g., stripped threads, galling, etc.). Replace any damaged fittings that cannot be repaired.
- 3) Invert the locking mechanism with the back (serial number side) of the rear plate facing up.
- 4) Remove the plastic seal.
- 5) Remove the two ¼-20 x 5/8 inch long socket head screws and the two 8-32 x 1¼ inch long socket head screws attaching the lock collars to the selector ring retainer.
- 6) Ensure spring loaded parts are not lost when removed.
- 7) Slowly remove the lock collars and remove the locking mechanism parts from the rear plate.
CAUTION: Spring loaded parts may pop up (place hand over the center of the locking mechanism to catch any spring loaded parts).
- 8) Separate the remaining locking mechanism parts (e.g., locking pin assemblies, springs, selector ring, selector ring retainer). Note: Spring and roll pins need not be removed unless they show signs of wear or damage.
- 9) Place the disassembled (non-plastic) locking mechanism components into a pan filled with fresh mineral spirits. Clean all metal parts using a brush to dislodge any dirt or grease. Remove cleaned parts from the solvent bath, dry and place on a clean surface. Inspect all parts for wear or damage. Replace worn/damaged parts⁶.
- 10) Discard and replace the plastic tube seal. Discard all used locking pin springs and replace with new springs. Springs must be replaced at 12-month intervals to ensure smooth and consistent operation of the mechanism.
- 11) Inspect all removed hardware and inspect for signs of damage (e.g., stripped threads, galling, fatigue cracking, etc.). If any damage is noted, replace the damaged parts.
- 12) Inspect the threads on the selector ring retainer for signs of damage (e.g., stripped threads, galling, etc.). If damage is noted and not repairable, replace the selector ring retainer.
- 13) Apply a light coating of lubrication to the locking pins surfaces that will be inserted into the selector ring retainer using MIL-G-23827B (or C), MIL-PRF-23827C (or equivalent radiation resistant grease authorized by QSA Global, Inc.).
- 14) Begin reassembly by inverting the selector ring retainer with the flange end facing down. Insert the spring loaded locking pins into the selector ring retainer and hold them in place while inserting the selector ring over the parts to hold the pins. The selector ring marking ("OPERATE, CONNECT and LOCK") should be facing towards the front of the selector ring retainer. Orient the "T" cutout in the selector ring retainer to be in line with the half moon feature of the selector ring. This will set the lock position.
- 15) Place the inverted rear plate (serial number facing up) over the back end of the selector ring retainer assembly.

⁶ Replacement parts compliant for use under the Type B approval can be obtained from QSA Global, Inc. Use of unauthorized replacement parts may invalidate the device and/or Type B approval.

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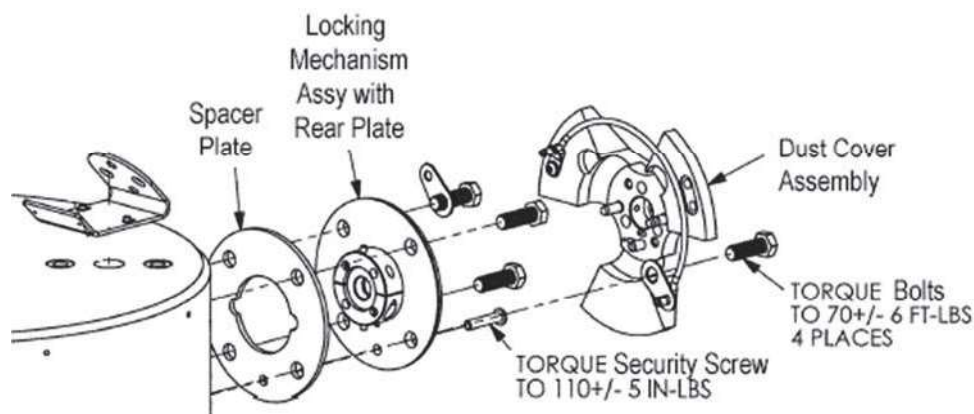
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- 16) Apply Vibratite™ 121 or Loctite™ 242 to the ¼-20 and 8-32 screws. Install the lock and nut collars around the base of the selector ring retainer securing the rear plate to the assembly using the two ¼-20 x 5/8 inch long socket head screws and the two 8-32 x 1¼ inch long socket head screws. Ensure proper alignment of the selector ring retainer when tightening the screws.

17) Locking Mechanism Functional Safety Check

- i. Insert the U-tool into the left and right holes of the selector ring retainer and rotate the selector ring toward the OPERATE position.
 - ii. While in the OPERATE position, wind out a short length of control cable and feed the control cable connector through the center port of the lock mechanism. Attach a demo source assembly or a test jumper connector to the control cable connector and retract it back into the lock mechanism.
 - iii. Pull on the section of control cable and pull the demo source assembly through the selector mechanism until it stops.
 - iv. Rotate the selector ring back to the LOCK position and push on the cable/demo source assembly to try to move the source in or out of its locked position. If the source assembly is not successfully secured in the lock assembly, disassemble and thoroughly re-inspect the locking assembly for faulty components.
 - v. If the lock mechanism is disassembled, thoroughly inspect all components for rough edges or burrs, etc. which could cause jamming or irregular operation. Replace parts as necessary, re-lubricate and reassemble the lock mechanism assembly. Repeat the functional safety testing to verify smooth and safe operation of the selector mechanism.
 - vi. Do not install the serviced lock mechanism (rear plate assembly) back onto the package at this point
- 18) Repeat steps 5.d.1) through 17) for the second locking mechanism assembly on the Model 867 package.

e. Post Maintenance Reassembly



867 Locking Assembly Attachment Details

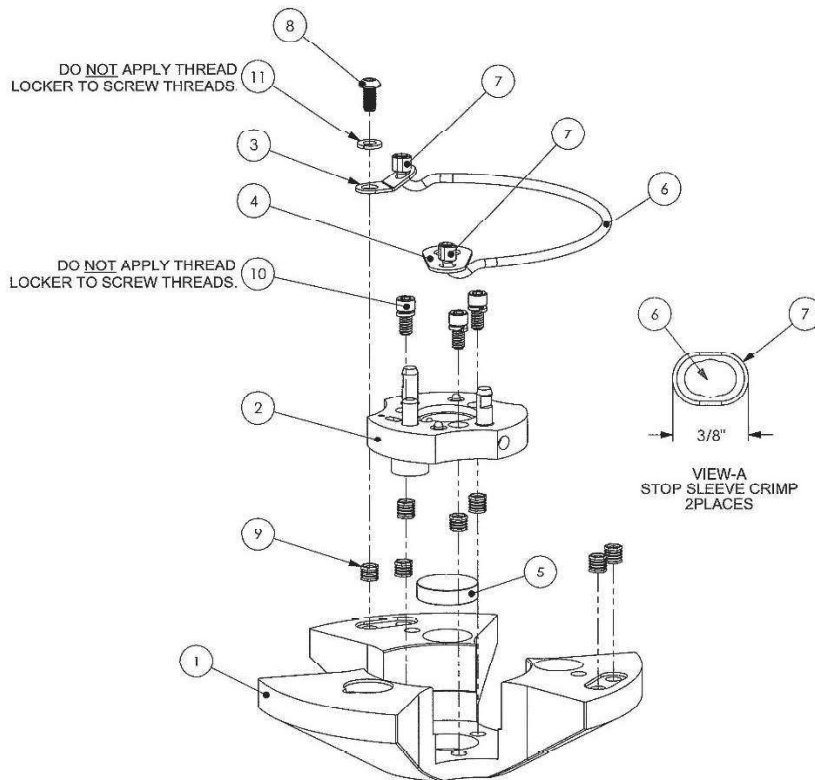
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- 1) Apply anti-seize thread lubricant⁷ to the end threads of the eight ½-13 x 1½ inch long hex head bolts and the two 5/16 x 1½ inch long security screws used to attach the locking mechanisms to the package.
- 2) For each assembly, insert and rotate the locking mechanism 90 degrees in either direction to align the mounting holes to the package port. Align the spacer plate behind the locking mechanism assembly also aligning the mounting holes to the package port.
- 3) Secure each locking mechanism assembly and spacer plate to one side of the package by installing the four ½-13 x 1½ inch long bolts using a calibrated torque wrench. Torque the bolts in an opposing cross pattern to 70 ± 6 foot/lbs. Install the security screw and torque to 110 ± 5 in/lbs.

f. Lock and Dust Cover Assembly Maintenance



11	WSH028	1	1/4 LOCKWASHER
10	SCR332	3	SOCKET HEAD CAP SCREW WITH WASHER
9	SCR323	7	THREADED INSERT
8	SCR311	1	SOCKET BUTTON HEAD CAP SCREW
7	86025-4	2	STOP SLEEVE
6	CBL008	AR	CABLE
5	86725-4	1	PORT SHIELD
4	86025-3	1	LARGE LINK
3	66025-2	1	SMALL LINK
2	86723	1	LOCK COVER ASSEMBLY - CHANGER
1	86725-6	1	DUST COVER - CHANGER
ITEM	PART NO	QTY	TITLE

867 Dust Cover Assembly

- 1) Perform the following steps for both dust cover assemblies used on the Model 867 package.

⁷ Approved lubricant includes Permatex™ part numbers 81343 (133AR), 80078 (133K), 80208 (767) or 09175; Bostik™ part numbers NSS-160, NSSBT-8, NSSBT-16, NSS-42B or NSS-4258; Loctite™ part number LB 8150; or Molykote™ part numbers P-37 or P-1900 anti-seize thread lubricants.

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- 2) Remove the dust cover assembly from the package by removing the socket button-head cap screw and ¼ inch lockwasher.
 - 3) Inspect the dust cover for damage. Remove the lock cover assembly from the dust cover by removing the three socket cap screws with washers.
 - 4) Clean and inspect the lock cover assembly for damage. Confirm the notched cover pins do not have wear in the notched area, are not bent, excessively worn or have rotated from their fixed position.
 - 5) Remove the plunger lock rework from the lock cover assembly by removal of the socket head cap screw. Thoroughly clean the plunger lock and its extension in mineral spirits. Clean the bore of the lock cover using mineral spirits. Use compressed air to thoroughly dry the plunger lock internally. Inspect the plunger lock for excessive wear on the outer bore and excessive looseness of the key tumbler. Replace the entire plunger lock and extension if the key tumbler is loose or if the plunger lock is loose when inserted into the lock cover assembly.
 - 6) Clean and inspect the condition of all removed hardware. Ensure they are undamaged and show no signs of stripped threads, cracking, galling, etc. Replace any worn or damaged hardware.
 - 7) Lubricate the key tumbler of the lock with a few drops of light oil, such as 3-in-1™ oil. Insert and remove the key several times and actuate the tumblers to work the light oil into the tumblers. Apply a light coating of lubrication to the plunger lock barrel and inside surfaces of the lock cover assembly using MIL-G-23827B (or C), MIL-PRF-23827C, or equivalent radiation resistant grease authorized by QSA Global, Inc. Insert the plunger lock into the lock cover and align the screw hole for assembly. Apply thread locker Loctite™ 222 to the socket head cap screw, install and tighten.
 - 8) Install the lock cover assembly in the dust cover assembly. Secure the lock cover assembly to the dust cover by installing and tightening the three socket head cap screws and washers. DO NOT apply thread locker to these screws.
 - 9) Reattach the serviced dust cover assembly to the package with the socket head cap screw and washer. When reattaching, ensure the cable will allow attachment to the lock mechanism and storage bracket above the lock mechanism. Replace the dust cover cable if it is frayed or broken.
 - 10) Check the plunger lock for proper function by using the key to engage and unlock. Engage the dust cover assembly to the lock mechanism to ensure smooth operation and proper function.
- g. After performing the full servicing of the package, If the package is operating normally, the demo source assembly can be removed from the package and active source assembly(ies) loaded into the package.
- h. Maintain records of this inspection and maintenance per Section 1.b of this bulletin.



U.S. Department of
Transportation

Pipeline and
Hazardous Materials
Safety Administration

East Building, PHH-23
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