

## Fluids and Combustion Facility Document

# FCF Rack Handling Procedures Book

*Approved by Dennis Rohn, FCF Chief Engineer, Systems Engineering Division, 7810*

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Cleveland, OH 44135**

<b>Glenn Research Center Document</b>	<b>Title:</b> FCF Rack Handling Procedures Book	
	<b>Document No.:</b> FCF-PO-BOOK-0001	<b>Rev.:</b> Initial Release

## **Signature Page**

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## Change Record – Master Document

Rev.	Effective Date	Description
Initial Release	01/04/02	Initial release of AD-01 and OM-01 through OM-09

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## Change Record Index – Procedures

<b>Proc. No.</b>	<b>Procedure Title</b>	<b>Rev.</b>	<b>Effective Date</b>	<b>Description</b>
AD-01	General Information	Initial Release	01/04/02	Initial Release
OM-01	Opening Rack Shipping Container Door	Initial Release	01/04/02	Initial Release
OM-02	Removing a Rack Handling Adapter From a Rack Shipping Container	Initial Release	01/04/02	Initial Release
OM-03	Placing a Rack Handling Adapter on a KSC Rack Handling Adapter Base	Initial Release	01/04/02	Initial Release
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OM-08	Handling Rack Handling Adapter and Rack Shipping Container Trunnions	Initial Release	01/04/02	Initial Release
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	<b>Procedure Title:</b> General Information	

## 1.0 Introduction

This is a book of procedures for proper handling of racks for the Fluids and Combustion Facility (FCF). This administrative procedure provides a summary of all reference information, such as documents, terms, and definitions.

## 2.0 References

### 2.1 Reference Documents

<b>Document Number</b>	<b>Document Title</b>
220G07455	Drawing Entitled: Upper Structure Assembly G1289
220G07475	Drawing Entitled: SSPF Base Assembly G1289
220G07505	Drawing Entitled: Shipping Container Structural Assembly G1094
FCF-PO-PROC-0001	FCF Requirements for Receiving Flight Racks
GRC-P4.7	Center Level Procedure for Corrective and Preventive Action
GGG-W-686E	Federal Specification Wrench, Torque, Unidirectional
OMI No.: R5005	Operation & Maintenance Instruction, Flight Rack Ground Support Operations – SSPF
S684-10101	Critical Item Development Specification For Rack Standard/Payload

### 2.2 Acronyms

<b>Acronym</b>	<b>Definition</b>
ESD	Electrostatic Discharge
FCF	Fluids and Combustion Facility
GRC	NASA Glenn Research Center
KSC	NASA Kennedy Space Center
OSAT	Office of Safety Assurance Technology
RHA	Rack Handling Adapter
RSC	Rack Shipping Container

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## 2.3 Definition of Terms

<b>Term</b>	<b>Definition</b>
Forklift	Forklift with a 2700 pound lifting capacity (minimum) with two 5 inch by 2 inch (minimum) tines configured for 100K Clean Room operations.
RHA	Hardware described in drawing 220G07455
RHA KSC Base	Hardware described in drawing 220G07475
RSC	Hardware described in drawing 220G07505
Technician	Individual, or individuals who obtain information and perform procedures provided in this procedure. If training, certification, or checkout is required for a particular operation, current documented evidence of relevant training, certification, and checkout shall be presented to the FCF Quality Assurance Designate or FCF Ground Systems Manager before beginning pertinent operation.

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	<b>Procedure Title:</b> Opening Rack Shipping Container Door	

## 1.0 Introduction

### 1.1 Objective

The first objective of this procedure is to provide step-by-step instructions as to how to open the Rack Shipping Container (RSC) door. The second objective of this procedure is to provide documented evidence that the RSC door was opened in accordance with Boeing procedures as provided in OMI No.: R5005 (Operation & Maintenance Instruction, Flight Rack Ground Support Operations – SSPF).

### 1.2 Special Requirements

1. NASA GRC Quality Assurance will monitor all operations as specified in this procedure and provide surveillance of the overall operations to insure adherence to the requirements of this procedure.
2. All deviations from this procedure shall be noted in a logbook. Deviations shall include changes to the steps as written, all unscheduled removals and all unscheduled reinstallations. Deviation steps shall be written in the same format as the procedure. Initials shall include FCF Structures Lead before implementation and Technician and OSAT's after completion. History item entry numbers shall be referenced at applicable paragraphs in procedure.
3. All non-conformance, failures and problems from this procedure shall be reported in accordance with the Problem Reporting and Corrective Action (PRACA) Form (NASA Form NASA-C-8192) per PAI 440, Problem Reporting, Analysis and Corrective Action System (PRACA).
4. All work areas shall be clean. All personnel working within five feet of the assemblies shall wear clean white lab coats and clean lint-free nylon or latex gloves and follow issued/posted instructions. Assemblies shall during lunch and off-shift periods, assemblies shall be covered with clean plastic sheets or placed back into their storage containers. The Clean Room shall be verified to be maintaining the environment required by Section 3.2.5.5 of S684-10101.
5. Use only properly calibrated tools as described in Section 6.3 of FCF-PO-PROC-0001.
6. Any discrepancies and/or problems related to removing the RHA from the RHA KSC Base shall be reported to the FCF Structures Lead and dispositioned as described in Section 7.1 of FCF-PO-PROC-0001. No corrective action shall be undertaken concerning opening the RSC door without express written (including e-mail and/or fax) direction from the FCF Structures Lead.

## 2.0 Key Procedure Information

### 2.1 Calibrated Equipment Requirement

Ohm Meter (Required Accuracy: +/- 0.05 Ohms)

### 2.2 Required Certifications

None

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### 3.0 Responsibilities

#### 3.1 Key Personnel Responsibilities

FCF Quality Assurance Designate: Verifies information recorded in this procedure is recorded correctly.

Technician: Obtains information recorded in procedure.

#### 3.2 Verification That Procedure has Been Read and Understood

Technician Signature/Date:

\_\_\_\_\_

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

### 4.0 Procedure to Open RSC Door

#### 4.1 Verify Door Clearance

Verify that there is sufficient clearance in front of and to the right of the Rack Shipping Container (RSC) so as to allow the RSC door to swing open 180 degrees. (The Door hinges are on the right-hand side of the RSC.)

Verify clearance for door: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

The RSC Door shall not be opened until all four conditions mentioned above are met.

Record room temperature: \_\_\_\_\_

Record room relative humidity: \_\_\_\_\_

Record room pressure: \_\_\_\_\_

Verify cleanliness of exposed sides of RSC: \_\_\_\_\_

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Technician Initials:

\_\_\_\_\_

FCF Quality Assurance Designate Initials:

\_\_\_\_\_

### 4.3 Verify Need for Ground Strap

If there are any electrical components or hardware in the Rack, attach Ground Strap to Ground. If not, proceed to Section 4.8.

Verify there are no electrical components or hardware in the Rack: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

### 4.4 Verify Ground Strap to Ground

Attach Ground Strap to Ground.

Verify attachment of ground strap: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

### 4.5 Check Free End to Ground Resistance

Measure resistance between free end of Ground Strap and Ground using a calibrated Ohm Meter. Record the resistance and the Impedance, as well as the Calibration Due Date and the GRC Property Tag Number of the Ohm Meter used for the measurements. The resistance shall be less than 1.0 Ohm. If the resistance is greater than 1.0 Ohms, a new ground shall be selected, and the resistance shall be measured again until a resistance less than 1.0 Ohm is found.

Record final resistance measurement for ground strap between free end and ground:

\_\_\_\_\_

Ohm Meter GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Ohm Meter: \_\_\_\_\_

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Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### 4.6 Verify Ground Strap Attachment to RSC

Attach the Ground Strap to the Rack Shipping Container (RSC) using the provided wing nut. The Ground Strap shall be attached in such a manner so as to not block access to the Door Latches or hinder the path of the door while it is being opened.

Verify attachment of ground strap: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### 4.7 Check Resistance Between RSC and Ground

Measure resistance between the RSC and Ground using a calibrated Ohm Meter. Record the resistance and the Impedance, as well as the Calibration Due Date and the GRC Property Tag Number of the Ohm Meter used for the measurements. The resistance shall be less than 1.0 Ohm. If the resistance is greater than 1.0 Ohms, The Ground Strap shall be disconnected from first the RSC and then the ground. Steps 1 through 4 of this procedure shall be repeated until the resistances measured in steps 2 and 4 are both less than 1.0 Ohm.

Record final resistance measurement for ground strap between RSC and ground:

\_\_\_\_\_

Ohm Meter GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Ohm Meter: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### 4.8 Verify Opening of Breather Valve Cover

Using a standard flathead screwdriver, open one of the two spring loaded hinged Breather Valve Covers by turning two quarter-turn fasteners.

Verify opening of one spring loaded hinged Breather Valve Cover: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

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#### 4.9 Verify Internal RSC Air Pressure

Gently depress the exposed Breather Valve until the pressure inside the RSC is the same as the exterior pressure. This process usually takes three to five seconds to occur.

Verify equalized internal/external pressure for RSC: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### 4.10 Verify Closure of Breather Valve Cover

Using a standard flathead screwdriver, close the opened Breather Valve Covers by fastening two quarter-turn fasteners.

Verify closing of the opened spring loaded hinged Breather Valve: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### 4.11 Check RSC Humidity History

Visually inspect the RSC Humidity Indicator. A white or light pink color for this Indicator is acceptable. An orange Indicator indicates the humidity inside the RSC has exceeded requirements. The color of the Humidity Indicator shall be recorded.

Color of Humidity Indicator (white, pink, or orange): \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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#### 4.12 Verify All 13 Door Latches are Unlatched

Unlatch the thirteen Door Latches around the RSC Door. There are three Latches on the top of the door, three Latches on both the left and right sides of the Door, and four Latches on the bottom of the Door. All Latches shall be stowed in their lower right stowed position.

Verify all 13 latches are opened and stowed: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

#### 4.13 Verify That Door Lock is Unlocked

If there is a lock in place, unlock the lock. The lock should be removed from the RSC and stored for later use.

Verify the lock has been removed and stored for later use: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

#### 4.14 Verify Door Hasp is Clear of Door for Door Opening

Open the hasp and verify that it is clear of door operation.

Verify the hasp is opened and clear of the door: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

#### 4.15 Verify One-Half Inch Gap Between Door and RSC

Pull on the right-hand handle (the handle nearest the Door hinges) until there is at least a 0.5-inch (12.7 mm) gap between the sealing edges on the right-hand side of the Door.

Verify an approximate 0.5-inch gap between sealing edges: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

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#### 4.16 Verify the Opening of RSC Door

Pulling on the left-hand handle (the handle opposite the Door hinges), open the RSC Door. Open the Door until the Door has rotated 180 degrees and is perpendicular with the right-hand side of the RSC. If binding occurs while attempting to open the RSC Door, close the Door using the left handle until there is no discernable opening between the sealing edges on the left-hand side of the Door. Pull again on the right-hand handle until there is at least a 0.5-inch (12.7 mm) gap between the sealing edges on the right-hand side of the Door. Then pull on the left-hand Door handle to open the Door. Repeat this process until the Door opens with no binding.

Verify the opening of the RSC Door (with no binding): \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### 4.17 Check RSC Temperature History

Visually inspect the RSC Temperature Indicator. A white color for this Indicator is acceptable. A red Indicator indicates the temperature inside the RSC has exceeded requirements. The color of the Temperature Indicator shall be recorded.

Color of Temperature Indicator (white, pink, or red): \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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#### 4.18 Check Acceleration History of RSC

Visually inspect the three Rack Handling Adapter (RHA) accelerometers. If a red magnet is visible in any of the three accelerometers, then it is indicated that the acceleration limits for the Rack have been exceeded. If all three accelerometers have their indicator set in the center position, then no acceleration limit for the rack has been indicated. The settings for all three accelerometers shall be recorded.

Record accelerometer setting (for accelerometer closest to the RHA forklift tubes):

\_\_\_\_\_

Record accelerometer setting (for accelerometer furthest from the RHA forklift tubes):

\_\_\_\_\_

Record accelerometer setting (for third accelerometer): \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

### 5.0 Verification of Procedure Implementation

#### 5.1 Verify Door Clearance

Verify procedure has been followed as indicated in this copy of the procedure and as noted in the rack logbook.

FCF Quality Assurance Designate Signature/Date: \_\_\_\_\_

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## Appendix A – Figures

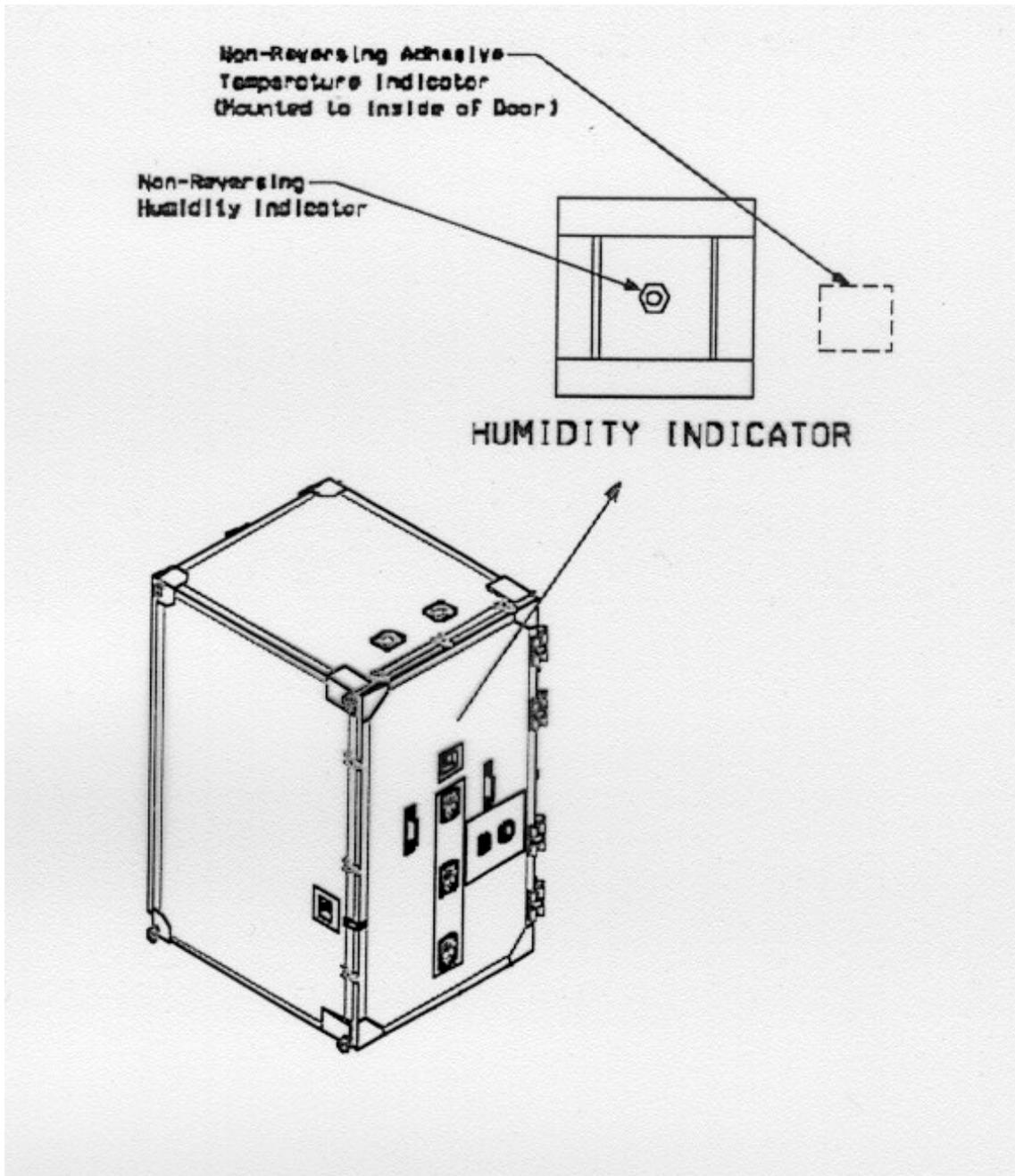


Figure A.1 - RSC With Door Closed

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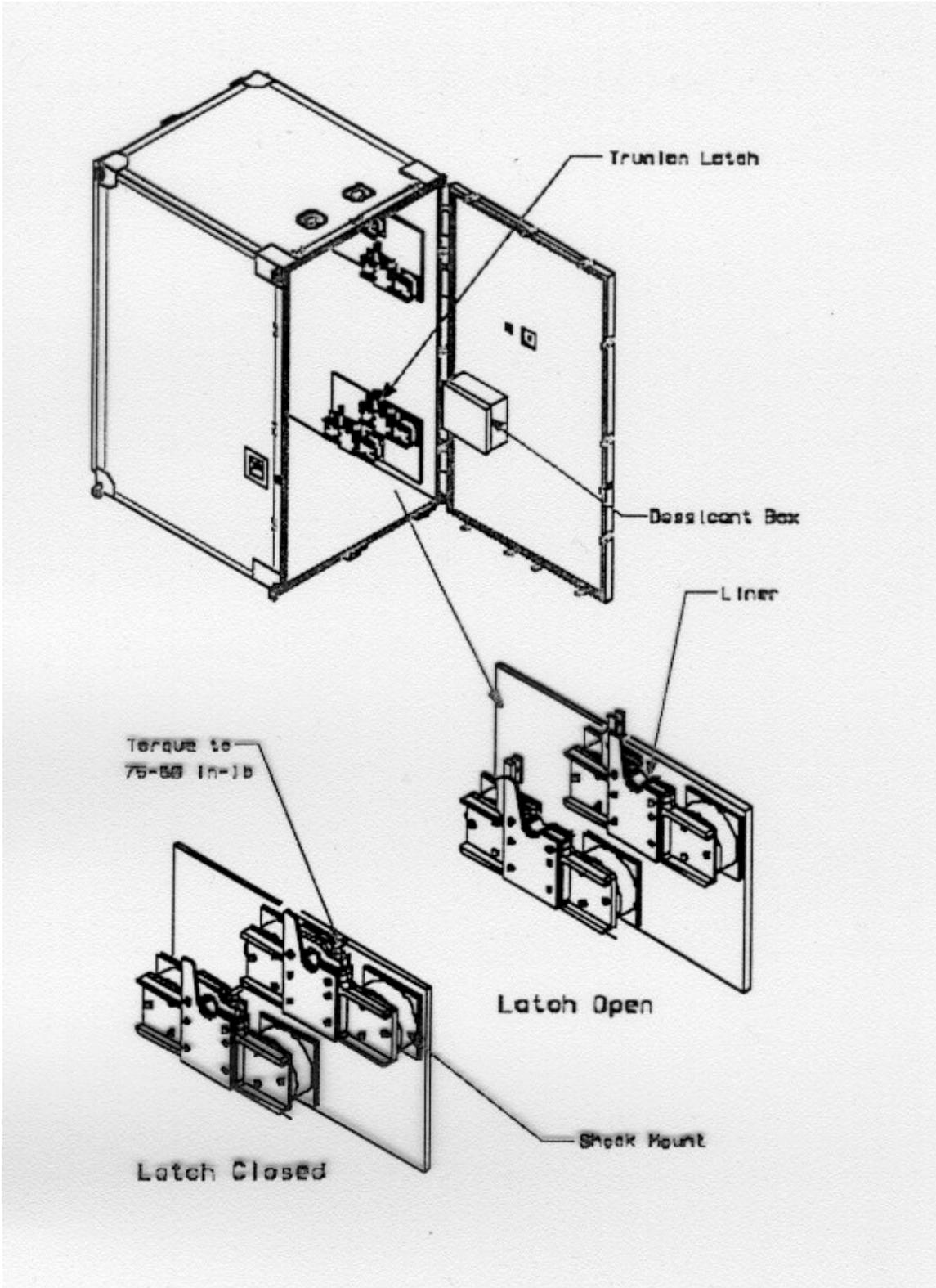


Figure A.2 - RSC With Door Opened

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## 1.0 Introduction

### 1.1 Objective

The first objective of this procedure is to provide step-by-step instructions as to how to remove the Rack Handling Adapter (RHA) from a Rack Shipping Container (RSC). The second objective of this procedure is to provide documented evidence that the RHA was removed from the RSC in accordance with Boeing procedures as provided in OMI No.: R5005 (Operation & Maintenance Instruction, Flight Rack Ground Support Operations - SSPF).

### 1.2 Special Requirements

1. A controlled area will be established.
2. Communication will be maintained between forklift operator and task leader at all times.
3. All lifting equipment must have current certification tags.
4. A load shall not be lifted/suspended over personnel except as specified in the NASA suspended load operations analysis/ approval document.
5. The task leader is responsible to keep the controlled area clear of nonessential personnel.
6. If a controlled area is violated during a forklift operation, all forklift operations shall be halted until the situation is corrected.
7. Attendance at a pre-task briefing is mandatory for all forklift/ops personnel.
8. All lifting equipment shall be visually inspected for certification, damage, and completeness.
9. All forklift equipment and lifting points on equipment to be hoisted will be visually inspected in its operating configuration on each day just prior to use for obvious degradation.
10. All forklift equipment and lifting points on equipment to be hoisted will be visually inspected in its operating configuration on each day just prior to use for obvious degradation.
11. Any person participating in an operation may call a stop to the operation if it is apparent that to continue would expose personnel or property to a dangerous or unacceptable risk.
12. Verify and/or accumulate the special tools, equipment and materials as specified.
13. Verify all members of the lift team are wearing appropriate personal protective equipment.
14. Pre-ops of the forklift have been completed prior to lift operation. The FCF Quality Assurance Designate verifies completion.
15. Verify a safety analysis has been performed prior to lift.

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16. If there are grounding requirements for the RSC rotation, the lift coordinator shall verify the grounding leads are attached properly and are able to travel with the load with no interference. ESD requirements will clearly stated.
17. NASA GRC Quality Assurance will monitor all operations as specified in this procedure and provide surveillance of the overall operations to insure adherence to the requirements of this procedure.
18. All deviations from this procedure shall be noted in a logbook. Deviations shall include changes to the steps as written, all unscheduled removals and all unscheduled reinstallations. Deviation steps shall be written in the same format as the procedure. Initials shall include FCF Structures Lead before implementation and Technician and OSAT's after completion. History item entry numbers shall be referenced at applicable paragraphs in procedure.
19. All non-conformance, failures and problems from this procedure shall be reported in accordance with the Problem Reporting and Corrective Action (PRACA) Form (NASA Form NASA-C-8192) per PAI 440, Problem Reporting, Analysis and Corrective Action System (PRACA)
20. All work areas shall be clean. All personnel working within five feet of the assemblies shall wear clean white lab coats and clean lint-free nylon or latex gloves and follow issued/posted instructions. Assemblies shall during lunch and off-shift periods, assemblies shall be covered with clean plastic sheets or placed back into their storage containers. The Clean Room shall be verified to be maintaining the environment required by Section 3.2.5.5 of S684-10101.
21. Use only properly calibrated tools as described in Section 6.3 of FCF-PO-PROC-0001.
22. Any discrepancies and/or problems related to removing the RHA from the RHA KSC Base shall be reported to the FCF Structures Lead and dispositioned as described in Section 7.1 of FCF-PO-PROC-0001. No corrective action shall be undertaken concerning opening the RSC door without express written (including e-mail and/or fax) direction from the FCF Structures Lead

### **1.3 Emergency Conditions**

In the event of building evacuation or electrical power outage, the forklift shall be shut off, and secured. If possible (personnel safety first), the lift coordinator shall ensure the area is roped off and marked with signs warning of the overhead load. Personnel in clean room attire shall exit the area immediately, without removing clean room attire. Resume this procedure after the emergency condition has been corrected.

## **2.0 Key Procedure Information**

### **2.1 Calibrated Equipment Requirement**

Ohm Meter (Required Accuracy: +/- 0.05 Ohms)

### **2.2 Required Certifications**

Forklift Operator

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### 3.0 Responsibilities

#### 3.1 Key Personnel Responsibilities

FCF Quality Assurance Designate: Verifies information recorded in this procedure is recorded correctly.

Forklift Operator: Operates The Forklift

Technician: Obtains information recorded in procedure

#### 3.2 Verification That Procedure has Been Read and Understood

Forklift Operator Signature/Date:

\_\_\_\_\_

Technician Signature/Date:

\_\_\_\_\_

Technician Signature/Date:

\_\_\_\_\_

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

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## 4.0 Procedure to Remove the RHA from the RSC

### 4.1 Ground Strap Procedure

1. If there are any electrical components or hardware in the Rack, attach Ground Strap to Ground. If not, proceed to Section 4.2.

Verify there are no electrical components or hardware in the Rack: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

2. Attach Ground Strap to Ground.
3. Measure resistance between free end of Ground Strap and Ground using a calibrated Ohm Meter. Record the resistance and the Impedance, as well as the Calibration Due Date and the GRC Property Tag Number of the Ohm Meter used for the measurements. The resistance shall be less than 1.0 Ohm. If the resistance is greater than 1.0 Ohms, a new ground shall be selected, and the resistance shall be measured again until a resistance less than 1.0 Ohm is found.

Record final resistance measurement for ground strap between free end the Ground Strap and ground:

\_\_\_\_\_

Record final impedance measurement for ground strap between free end of the Ground Strap and ground:

\_\_\_\_\_

Ohm Meter GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Ohm Meter: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Signature/Date: \_\_\_\_\_

4. Attach the Ground Strap to the Rack Handling Adapter (RHA) using the provided wing nut. The Ground Strap shall be attached so as to allow the removal of the RHA from RSC without the Ground Strap being required to be disconnected at either end.

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Verify that the Ground Strap is attached so as to allow the removal of the RHA from RSC without the Ground Strap being required to be disconnected at either end:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

5. Measure resistance between the RHA and Ground using a calibrated Ohm Meter. Record the resistance and the Impedance, as well as the Calibration Due Date and the GRC Property Tag Number of the Ohm Meter used for the measurements. The resistance shall be less than 1.0 Ohm. If the resistance is greater than 1.0 Ohms, The Ground Strap shall be disconnected from first the RHA and then the ground. Steps 1 through 4 of this procedure shall be repeated until the resistances measured in steps 2 and 4 are both less than 1.0 Ohm.

Record final resistance measurement for ground strap between RHA and ground:

\_\_\_\_\_

Record final impedance measurement for ground strap between RHA and ground:

\_\_\_\_\_

Ohm Meter GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Ohm Meter: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Signature/Date: \_\_\_\_\_

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- Disconnect the Ground Cable connecting the RHA to the RSC. First disconnect this Ground Cable from RHA Lower Left Side Gusset by removing the bolt, nut, and washer. Store this bolt, nut, and washer for future use. Install the end of the Ground Cable to the RSC Ground Cable Terminal. Secure the Ground Cable to the side of the RSC using a tie wrap or tape to ensure that the Ground Cable will not interfere with RHA removal.

Verify that Ground Strap which has been secured to the side of the RSC will not interfere RHA removal from the RSC:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

#### **4.2 Forklift Operations to Remove RHA from RSC**

- Have the Forklift Operator align the Forklift in line with the RSC approximately 24 inches (60 cm.) from the RSC Door opening. The Forklift shall be equipped with 72 inch Tines, marked at 49 inches and 51 inches from the leading points of those Tines.

Verify that both Forklift Tines are clearly marked at 49 and 51 inches from the leading points of the Tines:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

- Position one person on each side of the RSC Door opening to direct the movement of the Forklift.
- Have the Forklift Operator position the leading points of the Forklift Tines at the openings of the RHA Forklift Tubes at the top of the RHA. The Tines should be positioned so that they can enter the Forklift Tubes unhindered.
- Have the Forklift Operator to slowly (less than 5 mph or 8.1 kph) insert the Tines into the RHA Forklift Tubes so that the front edge of the Forklift Tubes rests between the 49-inch and 51-inch marks on the Tines.

Verify that the leading edge of the Forklift Tubes both rest between the 49 and 51 inch marks on their Tines:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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5. Open the Port, Top, Front Trunnion Retention Assembly Latch Assembly Caps located on the interior sides of the RSC.
  - a) While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
  - b) Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
  - c) Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
  - d) Remove the Trunnion from the Latch Cap Assembly.
  - e) Rotate the Latch Cap Assembly back to the closed position.
  - f) Rotate the T-Bolt so as to securely capture the Latch Cap.
  - g) Tighten the T-Bolt nut until the T-Bolt is snug.
  - h) Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify that the Port, Top, and Front Latch Assembly Caps have been rotated to a closed position and that the T-Bolt has been tightened until snug:

\_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

6. Open the Port, Upper, Rear Trunnion Retention Assembly Latch Assembly Caps located on the interior sides of the RSC.
  - a) While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
  - b) Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
  - c) Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
  - d) Remove the Trunnion from the Latch Cap Assembly.
  - e) Rotate the Latch Cap Assembly back to the closed position.
  - f) Rotate the T-Bolt so as to securely capture the Latch Cap.
  - g) Tighten the T-Bolt nut until the T-Bolt is snug.
  - h) Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

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Verify that the Port, Upper, and Rear Latch Assembly Caps have been rotated to a closed position and that the T-Bolt has been tightened until snug:

\_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

7. Open the Port, Lower, Rear Trunnion Retention Assembly Latch Assembly Caps located on the interior sides of the RSC.
  - a) While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
  - b) Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
  - c) Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
  - d) Remove the Trunnion from the Latch Cap Assembly.
  - e) Rotate the Latch Cap Assembly back to the closed position.
  - f) Rotate the T-Bolt so as to securely capture the Latch Cap.
  - g) Tighten the T-Bolt nut until the T-Bolt is snug.
  - h) Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify that the Port, Lower, and Rear Latch Assembly Caps have been rotated to a closed position and that the T-Bolt has been tightened until snug: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

8. Open the Port, Bottom, Front Trunnion Retention Assembly Latch Assembly Caps located on the interior sides of the RSC.
  - a) While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
  - b) Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
  - c) Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
  - d) Remove the Trunnion from the Latch Cap Assembly.

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- e) Rotate the Latch Cap Assembly back to the closed position.
- f) Rotate the T-Bolt so as to securely capture the Latch Cap.
- g) Tighten the T-Bolt nut until the T-Bolt is snug.
- h) Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify that the Port, Bottom, and Front Latch Assembly Caps have been rotated to a closed position and that the T-Bolt has been tightened until snug:

\_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

9. Open the Starboard, Top, Front Trunnion Retention Assembly Latch Assembly Caps located on the interior sides of the RSC.
  - a) While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
  - b) Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
  - c) Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
  - d) Remove the Trunnion from the Latch Cap Assembly.
  - e) Rotate the Latch Cap Assembly back to the closed position.
  - f) Rotate the T-Bolt so as to securely capture the Latch Cap.
  - g) Tighten the T-Bolt nut until the T-Bolt is snug.
  - h) Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify that the Starboard, Top, and Front Latch Assembly Caps have been rotated to a closed position and that the T-Bolt has been tightened until snug:

\_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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10. Open the Starboard, Upper, Rear Trunnion Retention Assembly Latch Assembly Caps located on the interior sides of the RSC.
- a) While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
  - b) Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
  - c) Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
  - d) Remove the Trunnion from the Latch Cap Assembly.
  - e) Rotate the Latch Cap Assembly back to the closed position.
  - f) Rotate the T-Bolt so as to securely capture the Latch Cap.
  - g) Tighten the T-Bolt nut until the T-Bolt is snug.
  - h) Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify that the Starboard, Upper, and Rear Latch Assembly Caps have been rotated to a closed position and that the T-Bolt has been tightened until snug:

\_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

11. Open the Starboard, Lower, Rear Trunnion Retention Assembly Latch Assembly Caps located on the interior sides of the RSC.
- a) While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
  - b) Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
  - c) Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
  - d) Remove the Trunnion from the Latch Cap Assembly.
  - e) Rotate the Latch Cap Assembly back to the closed position.
  - f) Rotate the T-Bolt so as to securely capture the Latch Cap.
  - g) Tighten the T-Bolt nut until the T-Bolt is snug.
  - h) Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify that the Starboard, Lower, and Rear Latch Assembly Caps have been rotated to a closed position and that the T-Bolt has been tightened until snug:

\_\_\_\_\_

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Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

12. Open the Starboard, Bottom, Front Trunnion Retention Assembly Latch Assembly Caps located on the interior sides of the RSC.
  - a) While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
  - b) Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
  - c) Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
  - d) Remove the Trunnion from the Latch Cap Assembly.
  - e) Rotate the Latch Cap Assembly back to the closed position.
  - f) Rotate the T-Bolt so as to securely capture the Latch Cap.
  - g) Tighten the T-Bolt nut until the T-Bolt is snug.
  - h) Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify that the Starboard, Bottom, and Front Latch Assembly Caps have been rotated to a closed position and that the T-Bolt has been tightened until snug:

\_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

1. Have the Forklift Operator slowly raise the RHA approximately three inches until the RHA Trunnions clear their respective Latch Assemblies. Make sure that the RHA is level before removing the RHA from the RSC via the forklift. This shall be done by using a level on one of the back vertical frames of the RHA facing out from the RSC.

Verify that RHA has been raised sufficiently so as to allow the removal of the Trunnions still attached to the RHA:

\_\_\_\_\_

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Verify that the RHA is level before removing the RHA from the RCS via the forklift: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

13. Have the Forklift Operator slowly remove the RHA from the RSC, moving at a rate that shall not exceed 5 mph (8.1 kph).

Verify that the Forklift was backed away from the RSC at a rate less than 8.1 kph (5.0 mph): \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 5.0 Verification of Procedure Implementation

### 5.1 Verification Procedure

Verify procedure has been followed as indicated in this copy of the procedure and as noted in the rack logbook.

FCF Quality Assurance Designate Signature/Date: \_\_\_\_\_

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## Appendix A – Figures

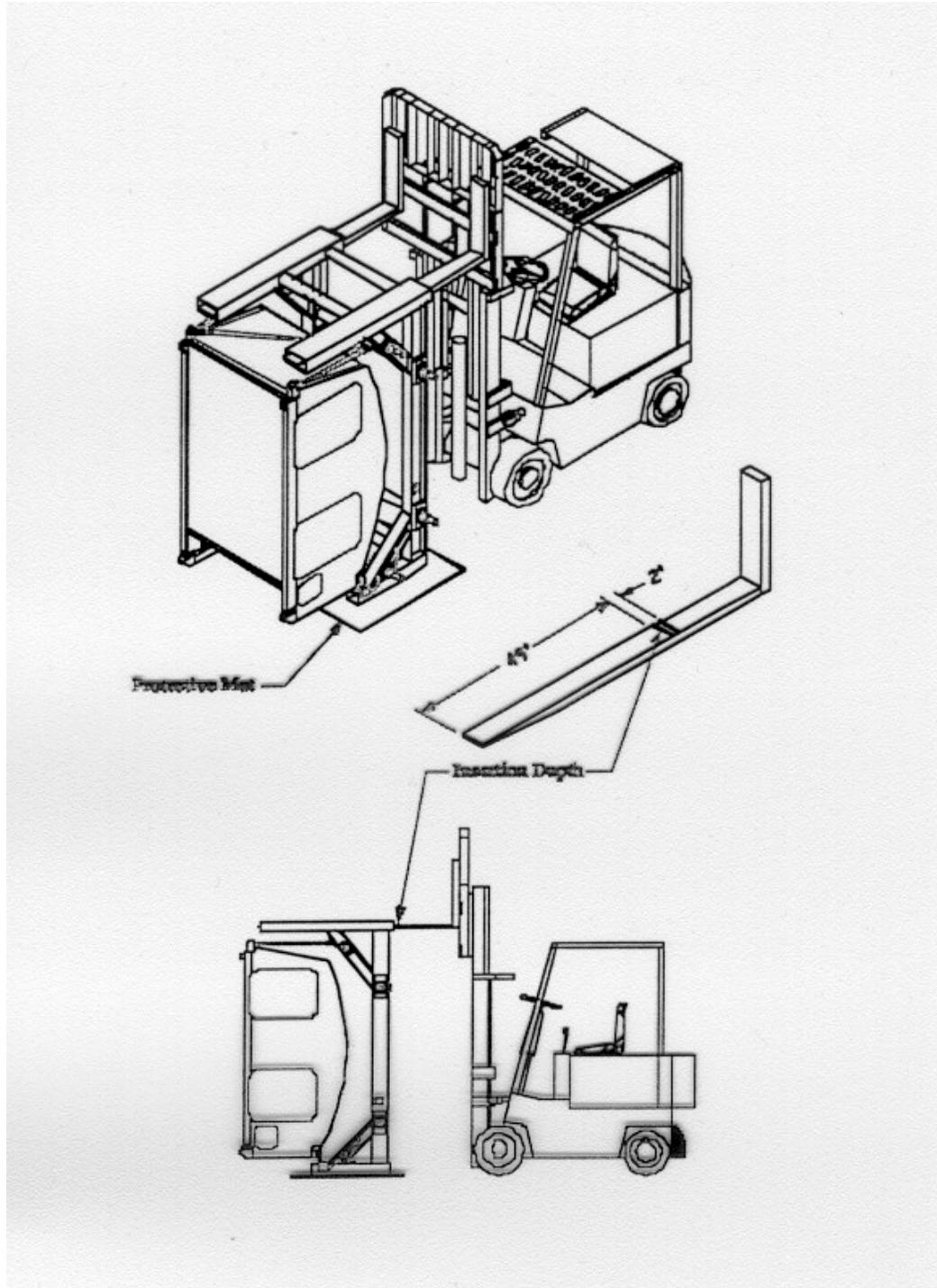


Figure A.1 - RHA Forklift Configuration and Tine Markings

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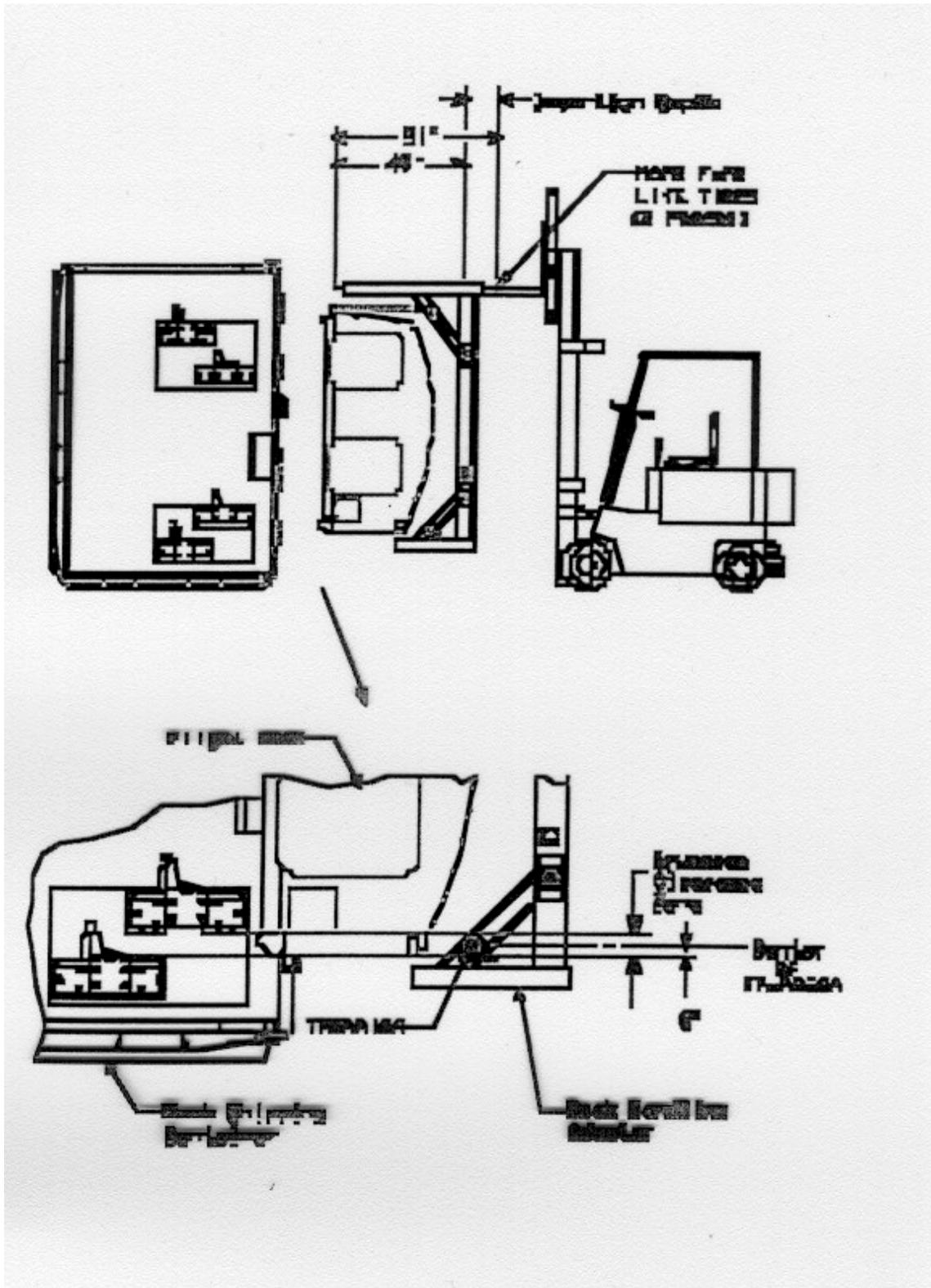


Figure A.2 - RHA (With Rack Shown) Installation/Removal With RSC

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## 1.0 Introduction

### 1.1 Objective

The first objective of this procedure is to provide step-by-step instructions as to how to attach the Rack Handling Adapter (RHA) to the KSC Base. The second objective of this procedure is to provide documented evidence that the RHA was attached to the KSC Base in accordance with Boeing procedures as provided in OMI No.: R5005 (Operation & Maintenance Instruction, Flight Rack Ground Support Operations - SSPF).

### 1.2 Special Requirements

1. A controlled area will be established.
2. Communication will be maintained between forklift operator and task leader at all times.
3. All lifting equipment must have current certification tags.
4. A load shall not be lifted/suspended over personnel except as specified in the NASA suspended load operations analysis/ approval document.
5. The task leader is responsible to keep the controlled area clear of nonessential personnel.
6. If a controlled area is violated during a forklift operation, all forklift operations shall be halted until the situation is corrected.
7. Attendance at a pre-task briefing is mandatory for all forklift/ops personnel.
8. All lifting equipment shall be visually inspected for certification, damage, and completeness.
9. All forklift equipment and lifting points on equipment to be hoisted will be visually inspected in its operating configuration on each day just prior to use for obvious degradation.
10. All forklift operators shall have a valid license in their possession while operating forklifts.
11. Any person participating in an operation may call a stop to the operation if it is apparent that to continue would expose personnel or property to a dangerous or unacceptable risk.
12. Verify and/or accumulate the special tools, equipment and materials as specified.
13. Verify all members of the lift team are wearing appropriate personal protective equipment.
14. Pre-ops of the forklift have been completed prior to lift operation. The FCF Quality Assurance Designate verifies completion.
15. Verify a safety analysis has been performed prior to lift.
16. If there are grounding requirements for the RSC rotation, the lift coordinator shall verify the grounding leads are attached properly and are able to travel with the load with no interference. ESD requirements will clearly stated.

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17. NASA GRC Quality Assurance will monitor all operations as specified in this procedure and provide surveillance of the overall operations to insure adherence to the requirements of this procedure.
18. All deviations from this procedure shall be noted in a logbook. Deviations shall include changes to the steps as written, all unscheduled removals and all unscheduled reinstallations. Deviation steps shall be written in the same format as the procedure. Initials shall include FCF Structures Lead before implementation and Technician and OSAT's after completion. History item entry numbers shall be referenced at applicable paragraphs in procedure.
19. All non-conformance, failures and problems from this procedure shall be reported in accordance with the Problem Reporting and Corrective Action (PRACA) Form (NASA Form NASA-C-8192) per PAI 440, Problem Reporting, Analysis and Corrective Action System (PRACA)
20. All work areas shall be clean. All personnel working within five feet of the assemblies shall wear clean white lab coats and clean lint-free nylon or latex gloves and follow issued/posted instructions. Assemblies shall during lunch and off-shift periods, assemblies shall be covered with clean plastic sheets or placed back into their storage containers. The Clean Room shall be verified to be maintaining the environment required by Section 3.2.5.5 of S684-10101.
21. Use only properly calibrated tools as described in Section 6.3 of FCF-PO-PROC-0001.
22. Any discrepancies and/or problems related to removing the RHA from the RHA KSC Base shall be reported to the FCF Structures Lead and dispositioned as described in Section 7.1 of FCF-PO-PROC-0001. No corrective action shall be undertaken concerning opening the RSC door without express written (including e-mail and/or fax) direction from the FCF Structures Lead

### 1.3 Emergency Conditions

In the event of building evacuation or electrical power outage, the forklift shall be shut off, and secured. If possible (personnel safety first), the lift coordinator shall ensure the area is roped off and marked with signs warning of the overhead load. Personnel in clean room attire shall exit the area immediately, without removing clean room attire. Resume this procedure after the emergency condition has been corrected.

## 2.0 Key Procedure Information

### 2.1 Calibrated Equipment Requirement

Ohm Meter (Required Accuracy: +/- 0.05 Ohms)  
Torque Wrench (Required Accuracy: +/- 10 inch-pounds)  
Aeroshell V (or equivalent) Lubricant

### 2.2 Required Certifications

Forklift Operator

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### 3.0 Responsibilities

#### 3.1 Key Personnel Responsibilities

FCF Quality Assurance Designate: Verifies information recorded in this procedure is recorded correctly.

Forklift Operator: Operates The Forklift

Technician: Obtains information recorded in procedure

#### 3.2 Verification That Procedure has Been Read and Understood

Forklift Operator Signature/Date:

\_\_\_\_\_

Technician Signature/Date:

\_\_\_\_\_

Technician Signature/Date:

\_\_\_\_\_

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

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## 4.0 Procedure to Install RHA on the KSC RHA Base

### 4.1 Verify RHA Ground Strap is Properly Configured

1. If there are any electrical components or hardware in the Rack, attach Ground Strap to Ground. If not, proceed to Section 4.2.

Verify there are no electrical components or hardware in the Rack: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

2. Verify that the Ground Strap for the Rack Handling Adapter (RHA) is configured so as to not hinder the installation of the RHA on the KSC RHA Base.
3. Verify that severing the Ground for the RHA shall not be required so as to allow installation of the RHA on the RHA Base.

### 4.2 Prepare the RHA and KSC Base for Installation

1. Verify that the two lower Trunnions have been removed from the RHA before Proceeding. (If there is a Trunnion that needs to be removed from the RHA, consult the Procedure Removal From RHA Procedure in this document.)

Verify The Two Lower Trunnions Have Been Removed From The RHA: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

2. Place the RHA Base in a position to allow it to receive the RHA that shall allow the RHA grounding to be maintained throughout the RHA installation procedure and shall minimize RHA handling.
3. Remove the four hex-head bolts from the four nut plates on the KSC Base and retain for reinstallation.

Verify That Four Bolts Have Been Removed From The RHA Base: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

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### 4.3 Forklift Operations for Positioning RHA

1. Verify that the Forklift is using two 72 inch Tines marked at 49 and 51 inches from the leading point of the Tines. Then position the forklift so that the RHA will rest on both forklift tines between those 49 and 51-inch marks.

Verify That Both Forklift Tines Have Been Marked At 49 And 51 Inches: \_\_\_\_\_

Verify That The Forklift Has Been Positioned So That The RHA Will Rest On Both Tines Between The 49 And 51 Inch Marks: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

2. Have the Forklift Operator lift the RHA and position it over the RHA Base so as to have the open end of the RHA facing the swivel casters of the KSC RHA Base. The two Alignment Pins on the RHA Base shall be aligned with the corresponding holes in the bottom of the RHA.
3. Have the Forklift Operator slowly lower the RHA onto the RHA Base. The Forklift shall still support the RHA.

Verify The RHA Is Still Supported By The Forklift: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

### 4.4 Attaching RHA to KSC Base

1. Place the RHA Base Pins in their RHA holes. (Do not remove the Forklift.)

Verify RHA Base Pins Are In Their RHA Holes: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

2. The RHA and RHA Base shall be inspected to check for any damage or misalignment. Any identified damage or misalignment shall be recorded in the Rack logbook.

Verify No Damage Or Misalignment Found: \_\_\_\_\_

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Verify Damage/Misalignment Was Recorded In Rack Logbook: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

3. A small amount of Aeroshell V (or equivalent) lubricant shall be applied to each of the four bolt threads (for the bolts removed in step 3 of Section 4.2).
4. Install the two rear bolts through the four by four inch Tubes at the bottom of the RHA into the nut plates of the RHA Base. These two bolts should be tightened until they're snug using a 3/8-inch drive ratchet with a 3/4-inch standard socket.
5. Install the two remaining bolts. These two bolts should also be tightened until they're snug using a 3/8-inch drive ratchet with a 3/4-inch standard socket.
6. All four bolts shall be tightened to 587-690 inch-pounds above running torque using a 12-inch long torque wrench (with 3/8 inch drive) using a 3/4-inch standard socket. The actual applied torques shall be recorded.

Record actual torque applied to 1st bolt: \_\_\_\_\_ inch-pounds

Record actual torque applied to 2nd bolt: \_\_\_\_\_ inch-pounds

Record actual torque applied to 3rd bolt: \_\_\_\_\_ inch-pounds

Record actual torque applied to 4th bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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#### 4.5 Removing Forklift from RHA

1. Have the Forklift Operator lower the Tines so as to allow the RHA to rest solely on the RHA Base. Verify that there is nothing that will interfere with the Tines being pulled out from within the RHA Forklift Tubes.

Verify Forklift Tines Are Clear For Removal From RHA: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

2. Have the Forklift Operator pull the Forklift away from the RHA at no more than 5 mph (8.1 kph).

#### 4.6 Check RHA Accelerometer Indicators

1. Visually inspect the three Rack Handling Adapter accelerometers. The settings for all three accelerometers shall be recorded.

Indicator Reading For Upper Accelerometer: \_\_\_\_\_

Indicator Reading For Side Accelerometer: \_\_\_\_\_

Indicator Reading For Lower Accelerometer: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

2. These accelerometers shall be reset following the procedure for RHA Accelerometer Configuration

Upper Accelerometer Has Been Reset: \_\_\_\_\_

Upper Accelerometer Reset Not Required: \_\_\_\_\_

Side Accelerometer Has Been Reset: \_\_\_\_\_

Side Accelerometer Reset Not Required: \_\_\_\_\_

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Lower Accelerometer Has Been Reset: \_\_\_\_\_

Lower Accelerometer Reset Not Required: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 5.0 Verification of Procedure Implementation

### 5.1 Verification Procedure

Verify procedure has been followed as indicated in this copy of the procedure and as noted in the rack logbook.

FCF Quality Assurance Designate Signature/Date: \_\_\_\_\_

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## Appendix A – Figures

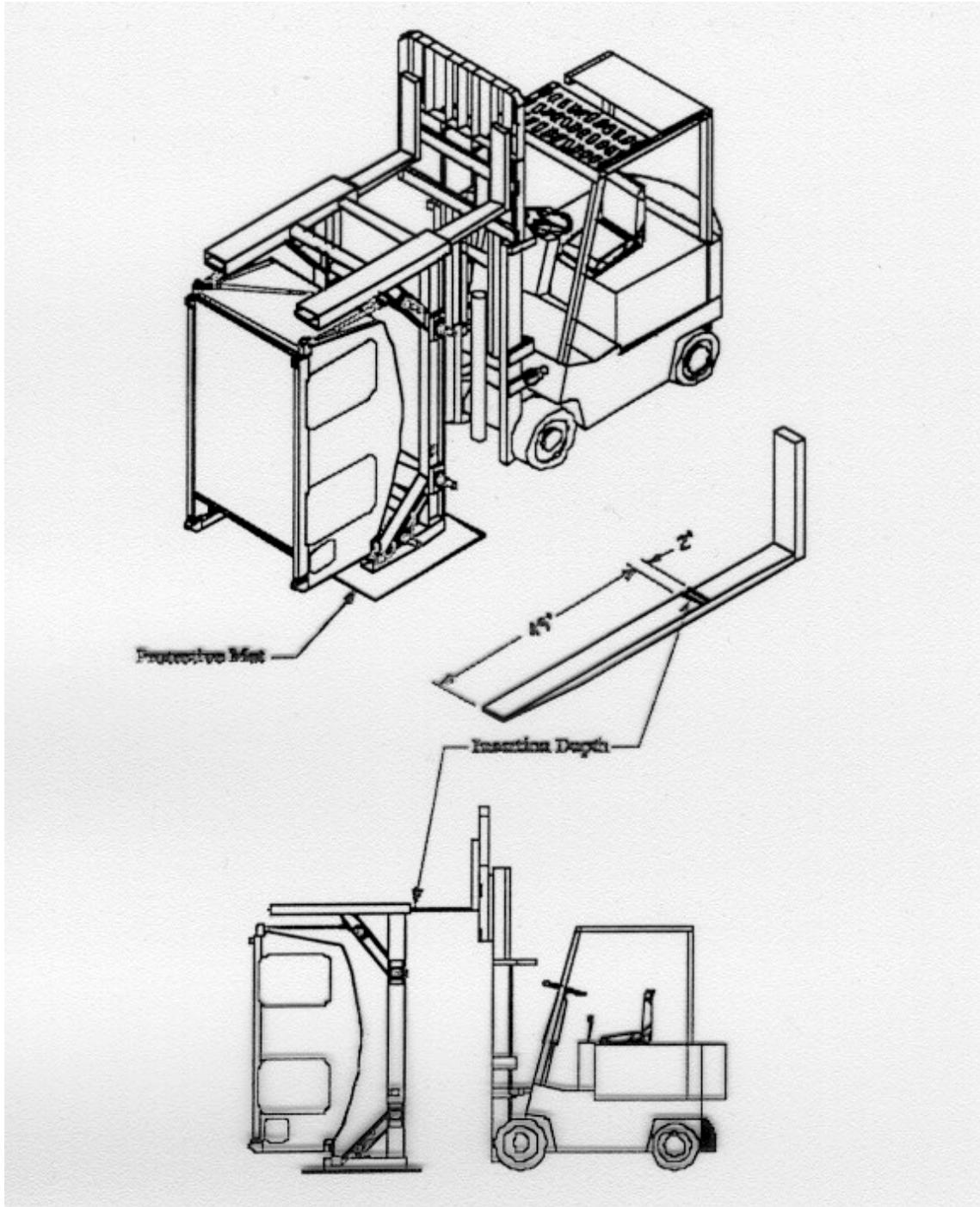


Figure A.1 - RHA Forklift Configuration and Tine Markings

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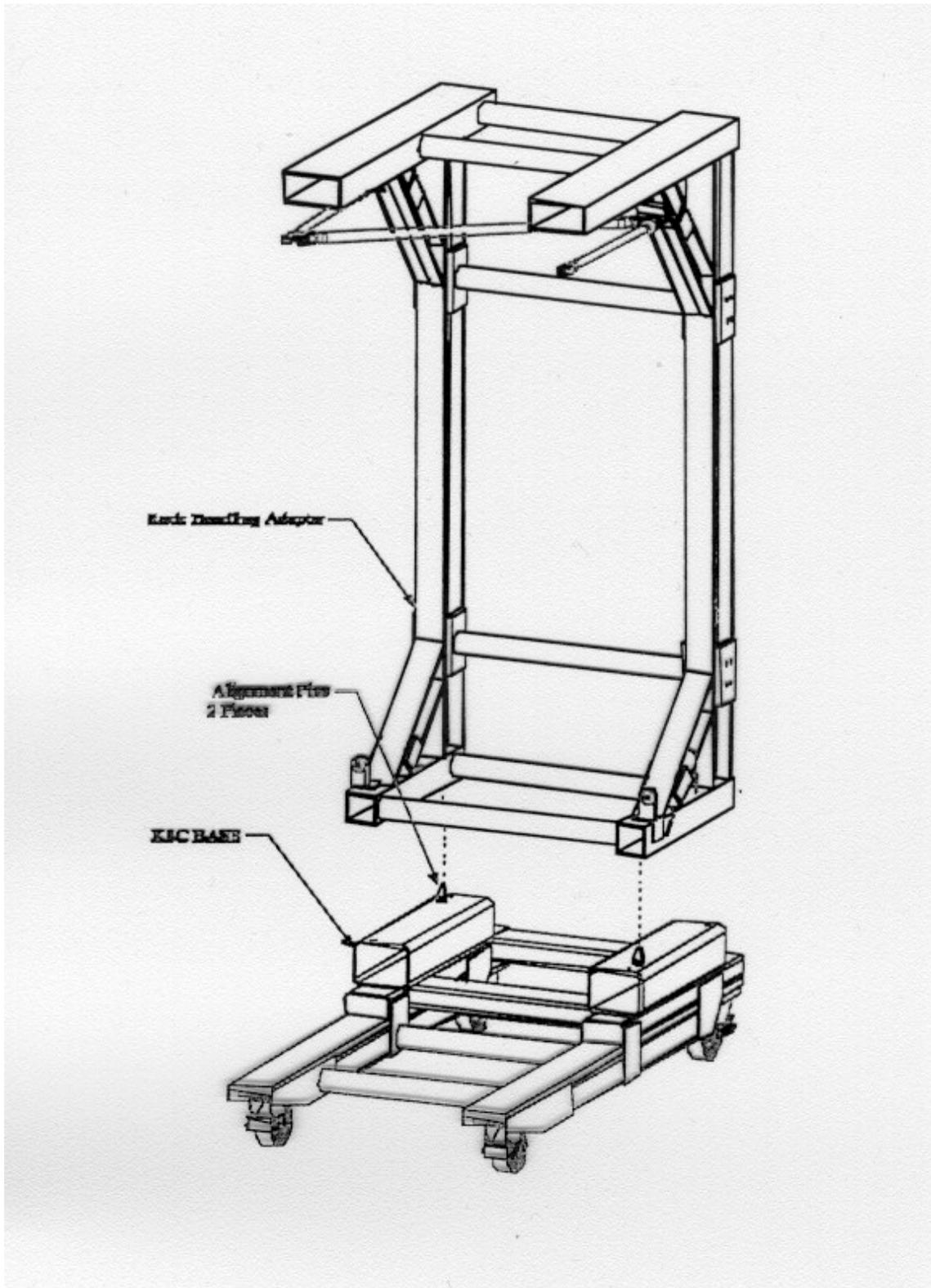


Figure A.2 - RHA Installation Onto Rack KSC Base

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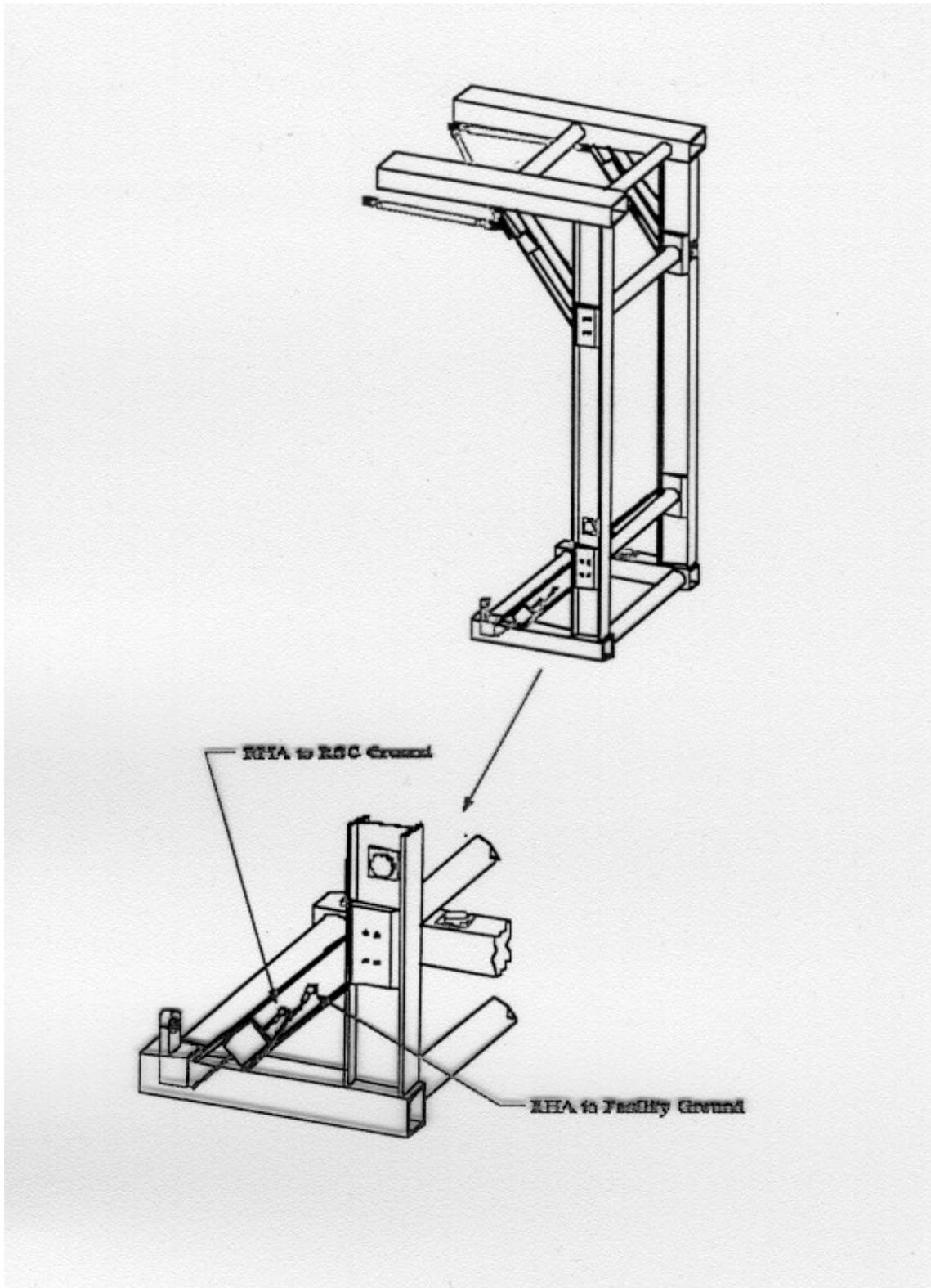


Figure A.3 - RHA Grounding Configuration

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## 1.0 Introduction

### 1.1 Objective

The first objective of this procedure is to provide step-by-step instructions as to how to remove the RHA from the RHA KSC Base. The second objective of this procedure is to provide documented evidence that the RHA was removed from the RHA KSC Base in accordance with Boeing procedures as provided in OMI No.: R5005 - Operation & Maintenance Instruction, Flight Rack Ground Support Operations - SSPF.

### 1.2 Special Requirements

1. A controlled area will be established.
2. Communication will be maintained between forklift operator and task leader at all times.
3. All lifting equipment must have current certification tags.
4. A load shall not be lifted/suspended over personnel except as specified in the NASA suspended load operations analysis/ approval document.
5. The task leader is responsible to keep the controlled area clear of nonessential personnel.
6. If a controlled area is violated during a forklift operation, all forklift operations shall be halted until the situation is corrected.
7. Attendance at a pre-task briefing is mandatory for all forklift/ops personnel.
8. All lifting equipment shall be visually inspected for certification, damage, and completeness.
9. All forklift equipment and lifting points on equipment to be hoisted will be visually inspected in its operating configuration on each day just prior to use for obvious degradation.
10. All forklift operators shall have a valid license in their possession while operating forklifts.
11. Any person participating in an operation may call a stop to the operation if it is apparent that to continue would expose personnel or property to a dangerous or unacceptable risk.
12. Verify and/or accumulate the special tools, equipment and materials as specified.
13. Verify all members of the lift team are wearing appropriate personal protective equipment.
14. Pre-ops of the forklift have been completed prior to lift operation. The FCF Quality Assurance Designate verifies completion.
15. Verify a safety analysis has been performed prior to lift.
16. If there are grounding requirements for the RSC rotation, the lift coordinator shall verify the grounding leads are attached properly and are able to travel with the load with no interference. ESD requirements will clearly stated

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17. NASA GRC Quality Assurance will monitor all operations as specified in this procedure and provide surveillance of the overall operations to insure adherence to the requirements of this procedure.
18. All deviations from this procedure shall be noted in a logbook. Deviations shall include changes to the steps as written, all unscheduled removals and all unscheduled reinstallations. Deviation steps shall be written in the same format as the procedure. Initials shall include FCF Structures Lead before implementation and Technician and OSAT's after completion. History item entry numbers shall be referenced at applicable paragraphs in procedure.
19. All non-conformance, failures and problems from this procedure shall be reported in accordance with the Problem Reporting and Corrective Action (PRACA) Form (NASA Form NASA-C-8192) per PAI 440, Problem Reporting, Analysis and Corrective Action System (PRACA).
20. All work areas shall be clean. All personnel working within five feet of the assemblies shall wear clean white lab coats and clean lint-free nylon or latex gloves and follow issued/posted instructions. Assemblies shall during lunch and off-shift periods, assemblies shall be covered with clean plastic sheets or placed back into their storage containers. The Clean Room shall be verified to be maintaining the environment required by Section 3.2.5.5 of S684-10101.
21. Use only properly calibrated tools as described in Section 6.3 of FCF-PO-PROC-0001.
22. Any discrepancies and/or problems related to removing the RHA from the RHA KSC Base shall be reported to the FCF Structures Lead and dispositioned as described in Section 7.1 of FCF-PO-PROC-0001. No corrective action shall be undertaken concerning opening the RSC door without express written (including e-mail and/or fax) direction from the FCF Structures Lead.

### 1.3 Emergency Conditions

In the event of building evacuation or electrical power outage, the forklift shall be shut off and secured. If possible (personnel safety first), the lift coordinator shall ensure the area is roped off and marked with signs warning of the overhead load. Personnel in clean room attire shall exit the area immediately, without removing clean room attire. Resume this procedure after the emergency condition has been corrected.

## 2.0 Key Procedure Information

### 2.1 Calibrated Equipment Requirement

None

### 2.2 Required Certifications

Forklift Operator

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### 3.0 Responsibilities

#### 3.1 Key Personnel Responsibilities

FCF Quality Assurance Designate: Verifies information recorded in this procedure is recorded correctly

Forklift Operator: Operates The Forklift

Technician: Obtains information recorded in procedure

#### 3.2 Verification That Procedure has Been Read and Understood:

Forklift Operator Signature/Date:

\_\_\_\_\_

Technician Signature/Date:

\_\_\_\_\_

Technician Signature/Date:

\_\_\_\_\_

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

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## 4. Procedure to Remove the RHA From the KSC RHA Base

### 4.1 Inserting Forklift Tines Into RHA Forklift Tubes

1. Verify the Forklift has 72 inch Tines. Verify that these Tines are marked at 49 and 51 inches from the leading point of the Tines. (If there are no markings on the Forklift Tines, refer to Procedure For Removing RHA From RSC for Tine marking requirements. The Tines shall be marked as described in the Procedure For Removing RHA From RSC before proceeding with implementing this procedure.)

Verify That Both Trunnions Are Marked At 49 And 51 Inches

From The Leading Point Of Both Tines: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

2. Verify that the Ground Strap for the Rack Handling Adapter (RHA) is configured so as to not hinder the removal of the RHA from the KSC RHA Base. Also verify that severing the Ground for the RHA shall not be required so as to allow removal of the RHA from the RHA Base.

Verify Ground Strap Will Not Hinder RHA Removal From The

KSC RHA Base: \_\_\_\_

Technician Initials: \_\_\_\_\_

3. Have the Forklift Operator insert the Forklift Tines into the RHA Forklift Tubes from behind the Rack. The Forklift shall insert the Tines at a speed not to exceed 5 mph (8.1 kph) until the end of the Forklift Tube is aligned between the 49 and 51-inch marks on the Tines. Once the end of the Forklift Tube is between the 49 and 51-inch marks, the Forklift shall stop. The Forklift Operator shall then raise the Tines until they contact the Forklift Tubes. The Forklift shall not lift the RHA with the RHA Base attached.

Verify That Both Forklift Tines Are In Contact With The

Appropriate RHA Forklift Tubes Without Lifting The RHA: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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#### 4.2 Disconnecting RHA From KSC RHA Base

1. Using a 3/8-inch drive ratchet with a 3/4-inch socket, remove the two front bolts located in the four by four inch Tubes. The front bolts are the two bolts closest to the open face of the Rack and RHA. Retain the two bolts for reinstallation into the RHA Base.
2. Using a 3/8-inch drive ratchet with a 3/4-inch socket wrench, remove the two rear bolts located in the four by four inch Tubes. The rear bolts are the two bolts furthest from the open face of the Rack and RHA. Retain the two bolts for reinstallation into the RHA Base.

Verify The Removal And Safe Retention Of All Four Bolts: \_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### 4.3 Removing RHA From KSC RHA Base

1. Have the Forklift Operator gently lift the RHA off the RHA Base, avoiding any jerking of the RHA. The RHA shall be lifted so as to allow the RHA to clear the RHA Base Alignment Pins by two inches (50 mm).

Verify RHA Clearance Of KSC RHA Base: \_\_\_\_

Technician Initials: \_\_\_\_\_

2. Once the RHA is clear of the Pins, the Forklift Operator shall remove the RHA from the immediate area of the RHA KSC Base at a speed not to exceed 5 mph (8.1 kph). No sudden jerking of the RHA shall be done.

Verify Removal Of RHA From KSC RHA Base: \_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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- Install the four hex-head bolts and four nut plates (from step 4 of the Procedure To Install RHA On The KSC RHA Base) on the KSC RHA Base. Tighten these four bolts (with nut plates) snug using a 3/8-inch drive ratchet with a 3/4-inch socket wrench.

Verify Replacement Of Four Bolts With Nut Plates: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

- Reinstall the two lower Trunnions for the RHA following the Procedure To Install Trunnions Onto The RHA.

Verify Replacement Of Two Lower Trunnions: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 5. Verification of Procedure Implementation

### 5.1 Verify Procedure has Been Followed as Indicated in This Copy of the Procedure and as Noted in the Rack Logbook.

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

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## Appendix A – Figures

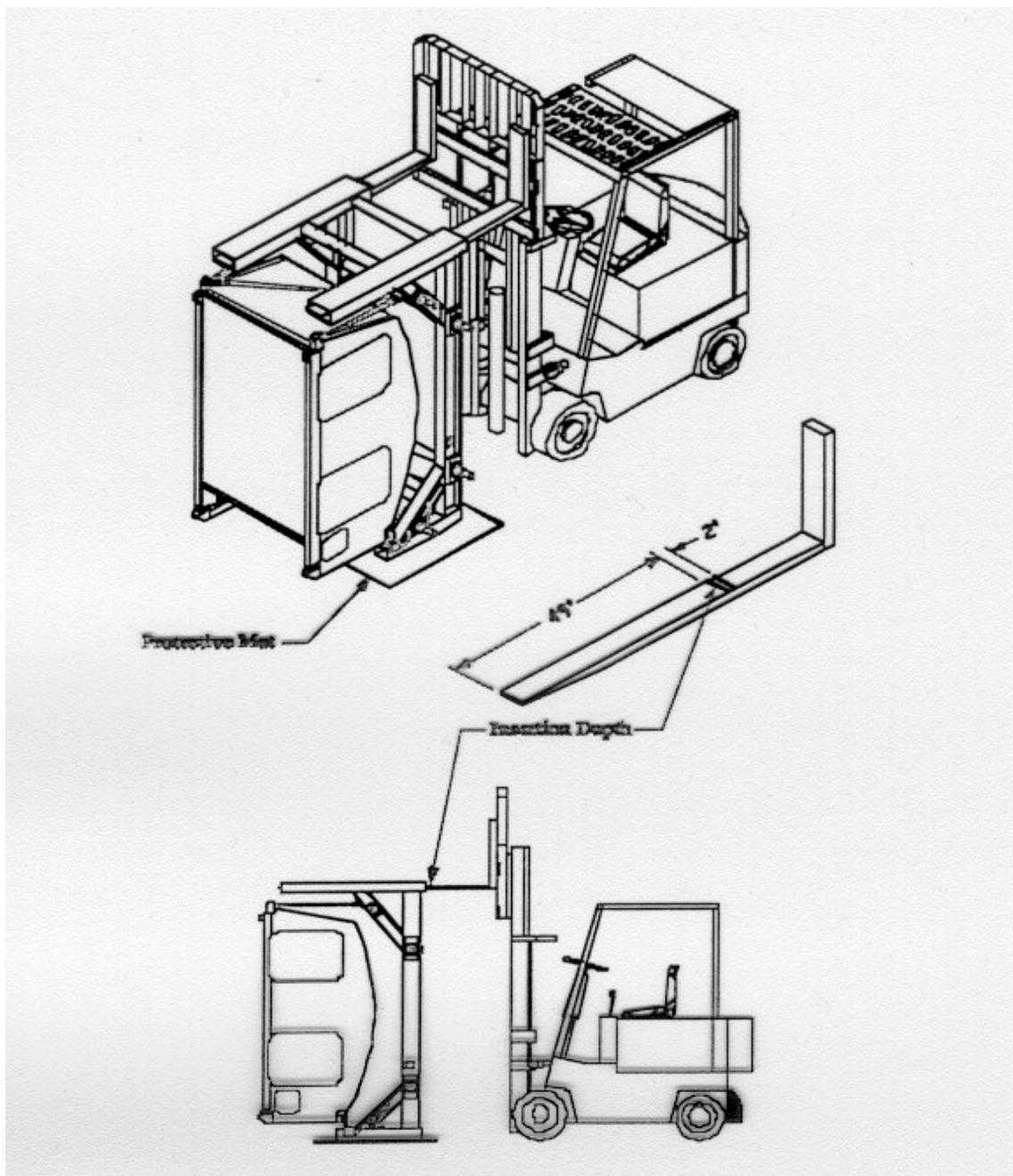


Figure A.1 - RHA Forklift Configuration and Tine Markings

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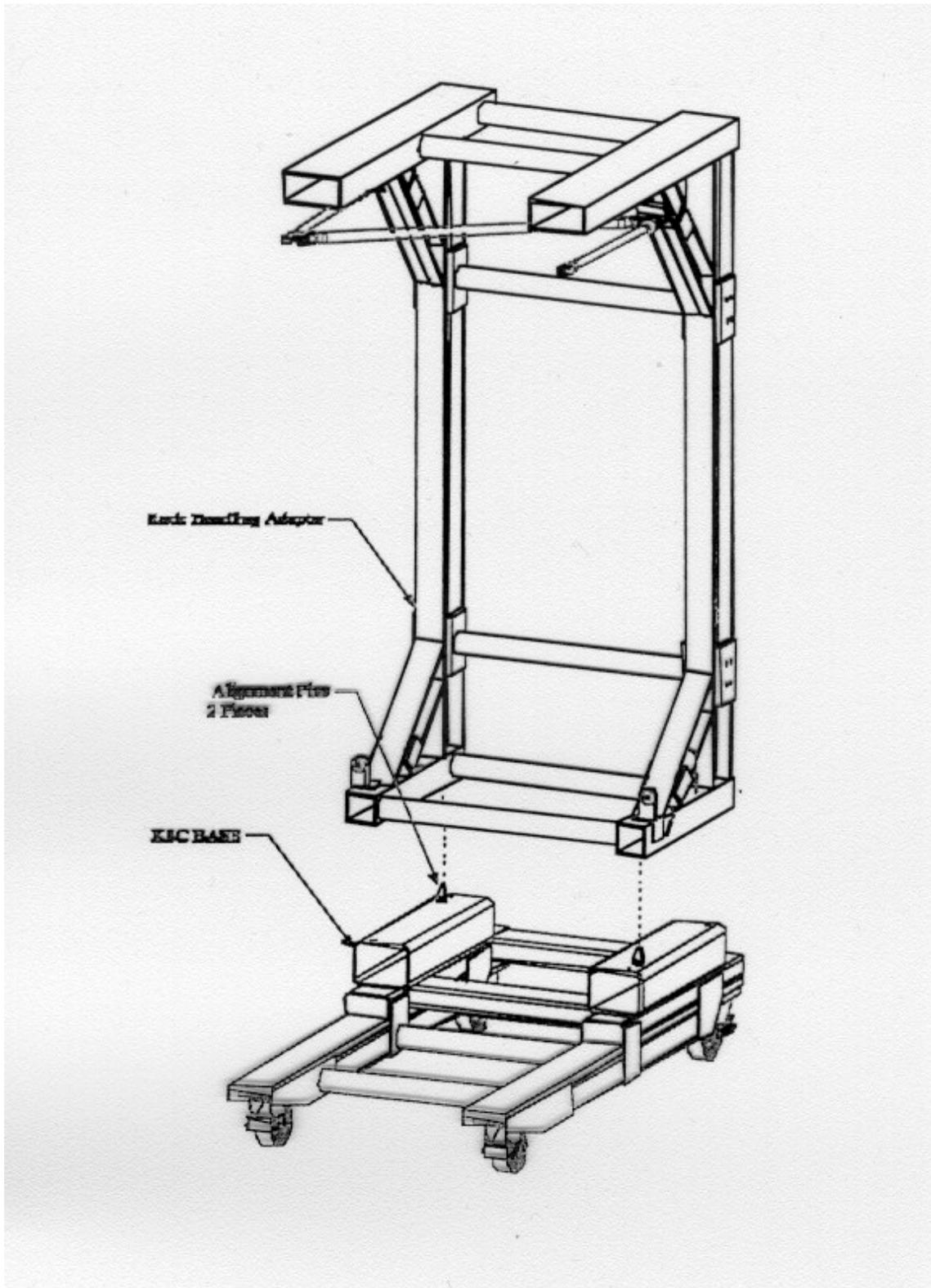


Figure A.2 - RHA Installation Onto Rack KSC Base

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	<b>Procedure Title:</b> Placing a Rack Handling Adapter into a Rack Shipping Container	

## 1.0 Introduction

### 1.1 Objective

The first objective of this procedure is to provide step-by-step instructions as to how to place a Rack Handling Adapter (RHA), holding a Flight Rack, into a Rack Shipping Container (RSC). The second objective of this procedure is to provide documented evidence that the RHA has been placed into a RSC in accordance with Boeing procedures as provided in OMI No.: R5005 (Operation & Maintenance Instruction, Flight Rack Ground Support Operations - SSPF).

### 1.2 Special Requirements

1. A controlled area will be established.
2. Communication will be maintained between forklift operator and task leader at all times.
3. All lifting equipment must have current certification tags.
4. A load shall not be lifted/suspended over personnel except as specified in the NASA suspended load operations analysis/ approval document.
5. The task leader is responsible to keep the controlled area clear of nonessential personnel.
6. If a controlled area is violated during a forklift operation, all forklift operations shall be halted until the situation is corrected.
7. Attendance at a pre-task briefing is mandatory for all forklift/ops personnel.
8. All lifting equipment shall be visually inspected for certification, damage, and completeness.
9. All forklift equipment and lifting points on equipment to be hoisted will be visually inspected in its operating configuration on each day just prior to use for obvious degradation.
10. All forklift operators shall have a valid license in their possession while operating forklifts.
11. Any person participating in an operation may call a stop to the operation if it is apparent that to continue would expose personnel or property to a dangerous or unacceptable risk.
12. Verify and/or accumulate the special tools, equipment and materials as specified.
13. Verify all members of the lift team are wearing appropriate personal protective equipment.
14. Pre-ops of the forklift have been completed prior to lift operation. The FCF Quality Assurance Designate verifies completion.
15. Verify a safety analysis has been performed prior to lift.
16. If there are grounding requirements for the RSC rotation, the lift coordinator shall verify the grounding leads are attached properly and are able to travel with the load with no interference. ESD requirements will clearly stated

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17. NASA GRC Quality Assurance will monitor all operations as specified in this procedure and provide surveillance of the overall operations to insure adherence to the requirements of this procedure.
18. All deviations from this procedure shall be noted in a logbook. Deviations shall include changes to the steps as written, all unscheduled removals and all unscheduled reinstallations. Deviation steps shall be written in the same format as the procedure. Initials shall include FCF Structures Lead before implementation and Technician and OSAT's after completion. History item entry numbers shall be referenced at applicable paragraphs in procedure.
19. All non-conformance, failures and problems from this procedure shall be reported in accordance with GRC-P4.7, Center Level Procedure for Corrective and Preventive Action. The log book shall be used to record the information for entry into the database at a later time.
20. All work areas shall be clean. All personnel working within five feet of the assemblies shall wear clean white lab coats and clean lint-free nylon or latex gloves and follow issued/posted instructions. During lunch and off-shift periods, assemblies shall be covered with clean plastic sheets or placed back into their storage containers. The Clean Room shall be verified to be maintaining the environment required by Section 3.2.5.5 of S684-10101.
21. Use only properly calibrated tools as described in Section 6.3 of FCF-PO-PROC-0001.
22. Any discrepancies and/or problems related to removing the RHA from the RHA KSC Base shall be reported to the FCF Structures Lead and dispositioned as described in Section 7.1 of FCF-PO-PROC-0001. No corrective action shall be undertaken concerning opening the RSC door without express written (including e-mail and/or fax) direction from the FCF Structures Lead.

### 1.3 Emergency Conditions

In the event of building evacuation or electrical power outage, the forklift shall be shut off, and secured. If possible (personnel safety first), the lift coordinator shall ensure the area is roped off and marked with signs warning of the overhead load. Personnel in clean room attire shall exit the area immediately, without removing clean room attire. Resume this procedure after the emergency condition has been corrected.

## 2.0 Key Procedure Information

### 2.1 Calibrated Equipment Requirement

Ohm Meter (Required Accuracy: +/- 0.05 Ohms)  
7/16-inch Torque Wrench (Required Accuracy: +/- 2 inch-pounds) (In accordance with Section 3.8.1 of GGG-W-686E)

### 2.2 Required Certifications

Forklift Operator

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### 3.0 Responsibilities

#### 3.1 Key Personnel Responsibilities

FCF Quality Assurance Designate: Verifies information recorded in this procedure is recorded correctly

Forklift Operator: Operates The Forklift

Technician: Obtains information recorded in procedure

#### 3.2 Verification That Procedure has Been Read and Understood:

Forklift Operator Signature/Date:

\_\_\_\_\_

Technician Signature/Date:

\_\_\_\_\_

Technician Signature/Date:

\_\_\_\_\_

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

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## 4.0 Procedure to Install the RHA Into the RSC

### 4.1 Attachment of Ground Strap from RHA to Ground

1. If there are any electrical components or hardware in the Rack, attach Ground Strap to Ground. If not, proceed to Section 4.2.

Verify there are no electrical components or hardware in the Rack: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

2. Measure resistance between free end of Ground Strap and Ground using a calibrated Ohm Meter. Record the resistance and the Impedance, as well as the Calibration Due Date and the GRC Property Tag Number of the Ohm Meter used for the measurements. The resistance shall be less than 1.0 Ohm. If the resistance is greater than 1.0 Ohms, a new ground shall be selected, and the resistance shall be measured again until a resistance less than 1.0 Ohm is found.

Record final resistance measurement for ground strap between free end and ground:

\_\_\_\_\_

Record final impedance measurement for ground strap between free end and ground:

\_\_\_\_\_

Ohm Meter GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Ohm Meter: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

3. Attach the Ground Strap to the Rack Handling Adapter (RHA) using the provided wing nut. The Ground Strap shall be attached so as to allow the installation of the RHA into the RSC without the Ground Strap being required to be disconnected at either end.
4. Measure resistance between the RHA and Ground using a calibrated Ohm Meter. Record the resistance and the Impedance, as well as the Calibration Due Date and the GRC Property Tag Number of the Ohm Meter used for the measurements. The resistance shall be less than 1.0 Ohm.

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#### **4.2 Verify RHA (Including Accelerometers) are Prepared for Installation Into RSC**

1. Verify that the RHA Base is not attached to the RHA before lifting the RHA with the Forklift.

Verify that RHA base is not attached to RHA: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

2. Verify the Forklift has 72 inch Tines. Verify that these Tines are marked at 49 and 51 inches from the leading point of the Tines. (If there are no markings on the Forklift Tines, refer to Procedure For Removing RHA From RSC for Tine marking requirements. The Tines shall be marked as described in the Procedure For Removing RHA From RSC before proceeding with implementing this procedure.)

Verify that both Trunnions are marked at 49 and 51 inches from the Leading Point of both Tines:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

3. Verify that eight Trunnions are properly installed on the RHA in accordance with the Trunnion Procedure. Remove any tape used during installation of the Trunnions onto the RHA.

Verify that all eight RHA Trunnions are properly installed on RHA: \_\_\_\_\_

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### 4.3 Verify RSC is Prepared for Installation of RHA Into RSC

1. Verify that all eight RSC Trunnion Retention Latch Assemblies are open sufficiently to accept RHA Trunnions.

Verify That All Eight RHA Trunnions are Sufficiently Open to Accept Trunnions: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

2. Verify the RSC Door has been opened 180 degrees.

Verify That The RSC Door has been opened to approximately 180 Degrees: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

3. Have the Forklift Operator position the RHA in line with the RSC Door approximately 24 inches (60 cm) from the entryway into the RSC. While keeping the RHA level, raise or lower the RHA so that the bottom surface of the RHA is 12 to 14 inches above the Clean Room Floor. Verify the RHA has been raised/lowered so as to allow the lower RHA Trunnions to pass between the two lower sets of Trunnion Latch Assemblies on each side of the RSC. Make sure that the RHA is level before removing the RHA from the RSC via the forklift. This shall be done by using a level on one of the back vertical frames of the RHA facing out from the RSC.

Verify That Lower RHA Trunnions can Pass the Two Lower Sets of RSC Latches: \_\_\_\_\_

Verify that the RHA is level before removing the RHA from the RCS via the forklift. \_\_\_\_\_

Technician Initials: \_\_\_\_\_

4. Verify that there are no obstructions to placing the RHA into the RSC.

Verify that there are no obstructions for placing RHA into RSC: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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#### 4.4 Procedure for Installation of RHA Into RSC

1. Have the Forklift Operator slowly move the RHA into the RSC. Verify that there is no contact made between the lower Trunnions and the two lower sets of Latch Assemblies as Trunnions pass by the Latch Assemblies.
2. Align all eight Trunnions so that they are over their Trunnion Latch Assemblies.

Verify that all eight RHA Trunnions are aligned over RSC Trunnion Latch Assemblies: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

3. Have the Forklift Operator gently lower the RHA until the RHA load is supported by the RSC Latch Assemblies. Do not remove the Forklift yet.

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## 5.0 Procedure to Install the Trunnion Into the RSC

### 5.1 Port, Top, Front Trunnion Installation Into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number:

\_\_\_\_\_

Calibration Date for Torque Wrench:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

For Port, Top, Front Trunnion; Verify Secure Capture of Trunnion by Latch: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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## 5.2 Port, Upper, Rear Trunnion Installation Into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number:

\_\_\_\_\_

Calibration Date for Torque Wrench:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

For Port, Upper, Rear Trunnion; Verify Secure Capture of Trunnion by Latch: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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### 5.3 Port, Lower, Rear Trunnion Installation Into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number:

\_\_\_\_\_

Calibration Date for Torque Wrench:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

For Port, Lower, Rear Trunnion; Verify Secure Capture of Trunnion by Latch: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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#### 5.4 Port, Bottom, Front, Trunnion Installation Into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number:

\_\_\_\_\_

Calibration Date for Torque Wrench:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

For Port, Bottom, Front Trunnion; Verify Secure Capture of Trunnion by Latch: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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## 5.5 Starboard, Top, Front Trunnion Installation Into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number:

\_\_\_\_\_

Calibration Date for Torque Wrench:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

For Starboard, Top, Front Trunnion; Verify Secure Capture of Trunnion by Latch: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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## 5.6 Starboard, Upper, Rear, Trunnion Installation Into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number:

\_\_\_\_\_

Calibration Date for Torque Wrench:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

For Starboard, Upper, Rear Trunnion; Verify Secure Capture of Trunnion by Latch: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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## 5.7 Starboard, Lower, Rear Trunnion Installation Into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number:

\_\_\_\_\_

Calibration Date for Torque Wrench:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

For Starboard, Lower, Rear Trunnion; Verify Secure Capture of Trunnion by Latch: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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## 5.8 Starboard, Bottom, Front Trunnion Installation Into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number:

\_\_\_\_\_

Calibration Date for Torque Wrench:

\_\_\_\_\_

Technician Initials: \_\_\_\_\_

For Starboard, Bottom, Front Trunnion; Verify Secure Capture of Trunnion by Latch: \_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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## **6.0 Verification of Procedure Implementation**

### **5.1 Verify Procedure has Been Followed as Indicated in This Copy of the Procedure and as Noted in the Rack Logbook.**

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

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## Appendix A – Figures

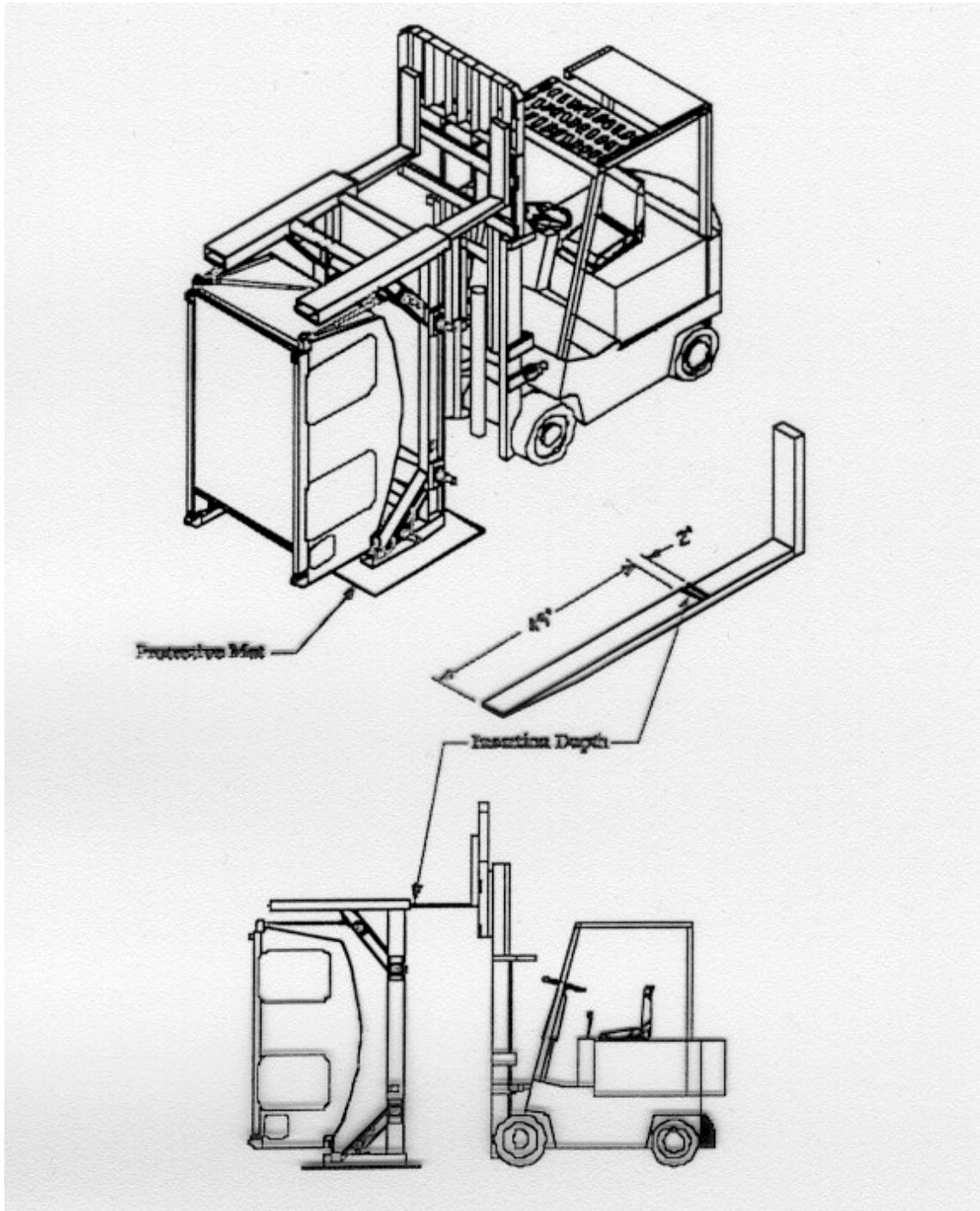


Figure A.1 - RHA Forklift Configuration and Tine Markings

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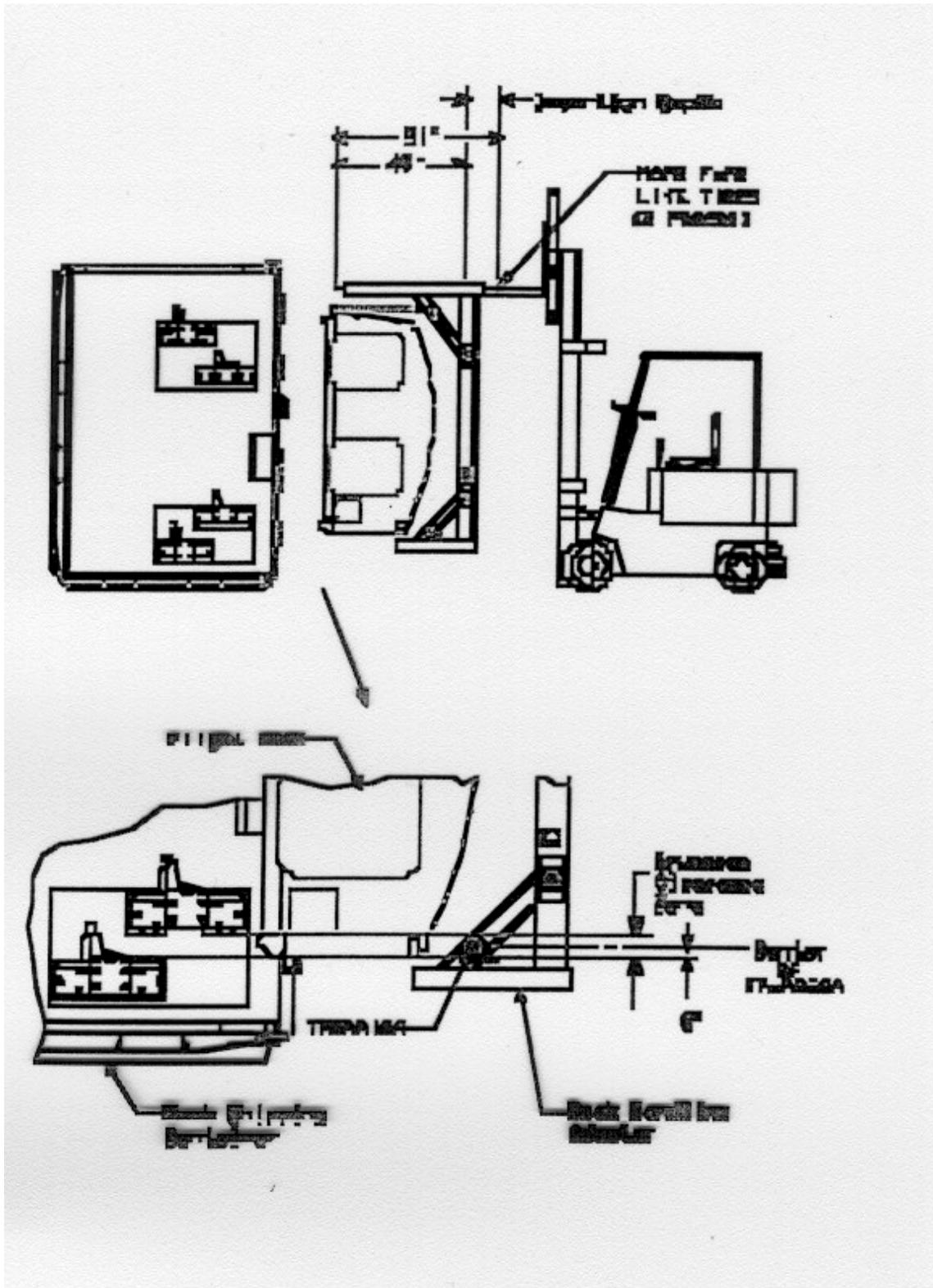


Figure A.2 - RHA (With Rack Shown) Installation/Removal With RSC

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	<b>Procedure Title:</b> Closing a Rack Shipping Container Door	

## 1.0 Introduction

### 1.1 Objective

The first objective of this procedure is to provide step-by-step instructions as to how to close the Rack Shipping Container (RSC) door. The second objective of this procedure is to provide documented evidence that the RSC door was closed in accordance with Boeing procedures as provided in OMI No.: R5005 (Operation & Maintenance Instruction, Flight Rack Ground Support Operations - SSPF).

### 1.2 Special Requirements

1. NASA GRC Quality Assurance will monitor all operations as specified in this procedure and provide surveillance of the overall operations to insure adherence to the requirements of this procedure.
2. All deviations from this procedure shall be noted in a logbook. Deviations shall include changes to the steps as written, all unscheduled removals and all unscheduled reinstallations. Deviation steps shall be written in the same format as the procedure. Initials shall include FCF Structures Lead before implementation and Technician and OSAT's after completion. History item entry numbers shall be referenced at applicable paragraphs in procedure.
3. All non-conformance, failures and problems from this procedure shall be reported in accordance with the Problem Reporting and Corrective Action (PRACA) Form (NASA Form NASA-C-8192) per PAI 440, Problem Reporting, Analysis and Corrective Action System (PRACA).
4. All work areas shall be clean. All personnel working within five feet of the assemblies shall wear clean white lab coats and clean lint-free nylon or latex gloves and follow issued/posted instructions. Assemblies shall during lunch and off-shift periods, assemblies shall be covered with clean plastic sheets or placed back into their storage containers. The Clean Room shall be verified to be maintaining the environment required by Section 3.2.5.5 of S684-10101.
5. Use only properly calibrated tools as described in Section 6.3 of FCF-PO-PROC-0001.
6. Any discrepancies and/or problems related to removing the RHA from the RHA KSC Base shall be reported to the FCF Structures Lead and dispositioned as described in Section 7.1 of FCF-PO-PROC-0001. No corrective action shall be undertaken concerning opening the RSC door without express written (including e-mail and/or fax) direction from the FCF Structures Lead.

## 2.0 Key Procedure Information

### 2.1 Calibrated Equipment Requirement

Ohm Meter (Required Accuracy: +/- 0.05 Ohms)

### 2.2 Required Certifications

None

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### 3.0 Responsibilities

#### 3.1 Key Personnel Responsibilities

FCF Quality Assurance Designate: Verifies information recorded in this procedure is recorded correctly

Technician: Obtains information recorded in procedure

#### 3.2 Verification That Procedure has Been Read and Understood

Technician Signature/Date:

\_\_\_\_\_

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

### 4.0 Procedure to Close RSC Door

#### 4.1 Attaching RSC Ground Strap to RHA

1. If there are any electrical components or hardware in the Rack, attach Ground Strap to Ground. If not, proceed to Section 4.2.

Verify there are no electrical components or hardware in the Rack: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

2. Measure resistance between free end of Ground Strap and the RSC structure using a calibrated Ohm Meter. Record the resistance and the Impedance, as well as the Calibration Due Date and the GRC Property Tag Number of the Ohm Meter used for the measurements. The resistance shall be less than 1.0 Ohm.

Record final resistance measurement for ground strap between free end

and RSC: \_\_\_\_\_

Ohm Meter GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Ohm Meter: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

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FCF Quality Assurance Designate Initials: \_\_\_\_\_

- Attach the Ground Strap to the Rack Handling Adapter (RHA) using the provided wing nut. The Ground Strap shall be attached so as to allow the RSC Door to close without the Ground Strap interference.

Verify attachment of ground strap: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

- Measure resistance between the RHA and Ground using a calibrated Ohm Meter. Record the resistance and the Impedance, as well as the Calibration Due Date and the GRC Property Tag Number of the Ohm Meter used for the measurements. The resistance shall be less than 1.0 Ohm.

Record final resistance measurement for ground strap between RHA and

ground: \_\_\_\_\_

Ohm Meter GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Ohm Meter: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 4.2 Reset or Replace Environmental Systems

- Reset the Accelerometer configuration as described in Section 4.1 of FCF Procedure for Resetting/Replacing Rack Environment Sensor Hardware.

Provide checkmark if replacement is not required: \_\_\_\_

Technician Signature/Date: \_\_\_\_\_

- Replace the Temperature Indicators as described in Section 4.2 of FCF Procedure for Resetting/Replacing Rack Environment Sensor Hardware.

Provide checkmark if replacement is not required: \_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

- Replace the Desiccant as described in Section 4.3 of FCF Procedure for Resetting/Replacing Rack Environment Sensor Hardware.

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Provide checkmark if replacement is not required: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

4. Replace the Humidity Indicators as described in Section 4.4 of FCF Procedure for Resetting/Replacing Rack Environment Sensor Hardware.

Provide checkmark if replacement is not required: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

5. Record any out of limit condition encountered while resetting the accelerometers or replacing the other hardware in Rack logbook.

Provide checkmark if replacement is not required: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

### 4.3 Close and Latch RSC Door

1. Push the RSC Door closed using the left Door handle until the RSC Door Seal engages. There will be a gap seen around the edge of the Door
2. Push the RSC Door sufficiently to position the Door so as to allow the Door Latches to catch.
3. Latch the center Latch on the left-hand side of the RSC Door.
4. Latch the center Latch on the right-hand side of the RSC Door.
5. Latch the remaining eleven Door Latches.
6. Close the Door Hasp.
7. Place the lock on the door and close the lock so that it cannot be opened without use of key or entering of the proper combination.

Verify all door latches are latched: \_\_\_\_\_

Verify all lock has been placed on door hasp, the lock is closed, and

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the RSC door is locked: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### **4.4 Remove Ground Strap from RSC**

Remove the Ground Strap from the RSC and retain for future use. Replace the wing nut on the RSC. Tighten the wing nut until it is snug.

Verify Ground Strap has been removed: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

### **5.0 Verification of Procedure Implementation**

#### **5.1 Verification Procedure**

Verify procedure has been followed as indicated in this copy of the procedure and as noted in the rack logbook.

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

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## Appendix A – Figures

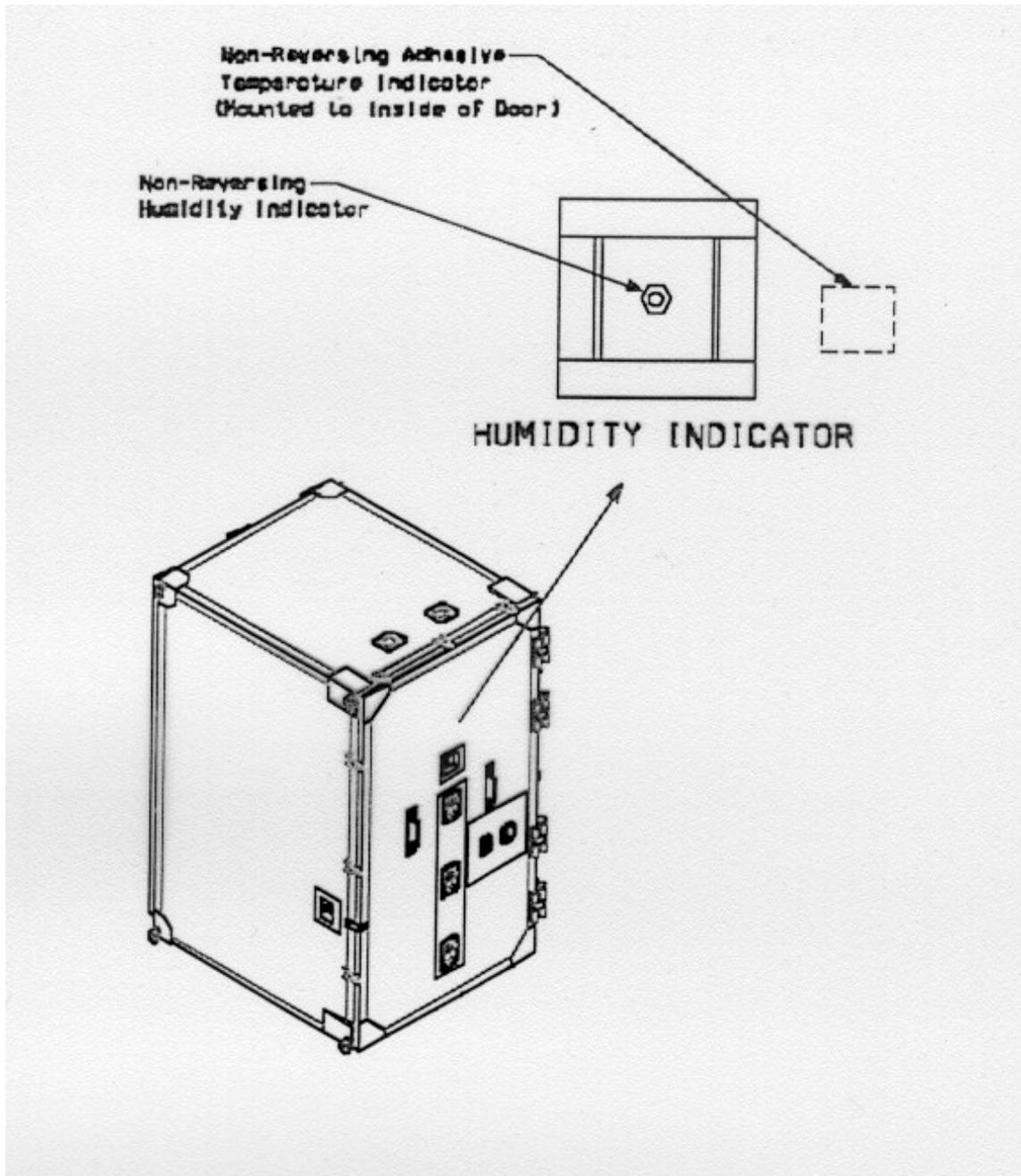


Figure A.1 - RSC With Door Closed

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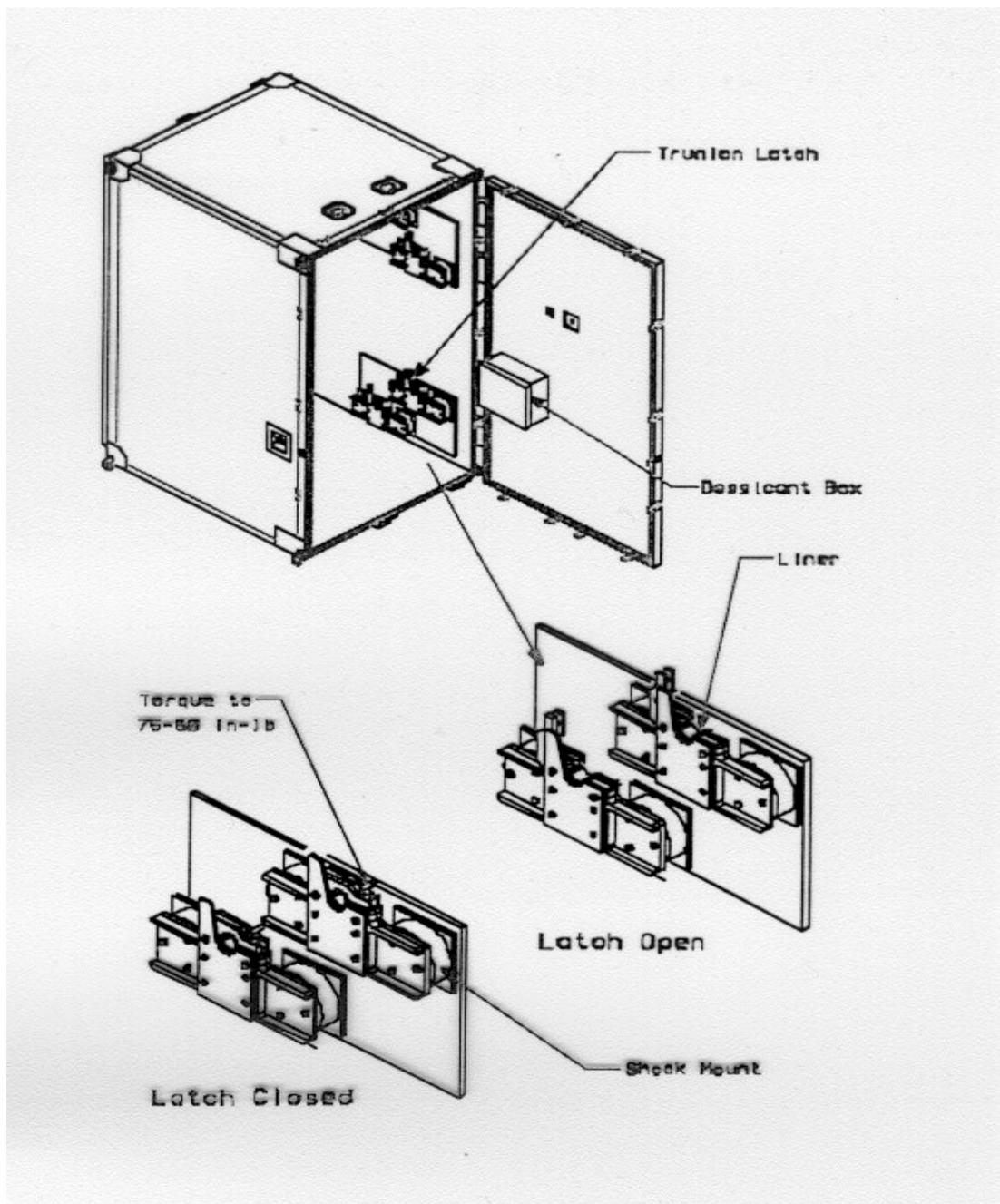


Figure A.2 - RSC With Door Opened

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	<b>Procedure Title:</b> Resetting/Replacing Sensor Devices for a Rack Shipping Container	

## 1.0 Introduction

### 1.1 Objective

The first objective of this procedure is to provide step-by-step instructions as to how to replace accelerometers, temperature indicators, desiccants, and humidity indicators. The second objective of this procedure is to provide documented evidence that the accelerometers, temperature indicators, desiccants, and humidity indicators were replaced in accordance with Boeing procedures as provided in OMI No.: R5005 (Operation & Maintenance Instruction, Flight Rack Ground Support Operations - SSPF).

### 1.2 Special Requirements

1. NASA GRC Quality Assurance will monitor all operations as specified in this procedure and provide surveillance of the overall operations to insure adherence to the requirements of this procedure.
2. All deviations from this procedure shall be noted in a logbook. Deviations shall include changes to the steps as written, all unscheduled removals and all unscheduled reinstallations. Deviation steps shall be written in the same format as the procedure. Initials shall include FCF Structures Lead before implementation and Technician and OSAT's after completion. History item entry numbers shall be referenced at applicable paragraphs in procedure.
3. All non-conformance, failures and problems from this procedure shall be reported in accordance with the Problem Reporting and Corrective Action (PRACA) Form (NASA Form NASA-C-8192) per PAI 440, Problem Reporting, Analysis and Corrective Action System (PRACA).
4. All work areas shall be clean. All personnel working within five feet of the assemblies shall wear clean white lab coats and clean lint-free nylon or latex gloves and follow issued/posted instructions. Assemblies shall during lunch and off-shift periods, assemblies shall be covered with clean plastic sheets or placed back into their storage containers. The Clean Room shall be verified to be maintaining the environment required by Section 3.2.5.5 of S684-10101.
5. Use only properly calibrated tools as described in Section 6.3 of FCF-PO-PROC-0001.
6. Any discrepancies and/or problems related to removing the RHA from the RHA KSC Base shall be reported to the FCF Structures Lead and dispositioned as described in Section 7.1 of FCF-PO-PROC-0001. No corrective action shall be undertaken concerning opening the RSC door without express written (including e-mail and/or fax) direction from the FCF Structures Lead.

## 2.0 Key Procedure Information

### 2.1 Calibrated Equipment Requirement

None

### 2.2 Required Certifications

None

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### 3.0 Responsibilities

#### 3.1 Key Personnel Responsibilities

FCF Quality Assurance Designate: Representative of OSAT who verifies information recorded in this procedure is recorded correctly

Technician: Obtains information recorded in procedure.

#### 3.2 Verification That Procedure has Been Read and Understood

Technician Signature/Date:

\_\_\_\_\_

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

### 4.0 Procedure to Reset/Replace Sensors

#### 4.1 Resetting the RHA Accelerometer Configuration

1. Place the MAG 2000 Key (P/N: MG2114) over the clear plastic cover and into the cover notches.
2. Gently press on the Key and carefully turn the Accelerometer cover counterclockwise (approximately three degrees) until the Key no longer turns.
3. Remove the Key and turn the accelerometer cover counterclockwise by hand until the tabs of the cover are aligned with the indicator notches on the base of the accelerometer.
4. Remove the clear plastic cover and retain this cover for reinstallation later.
5. Move the red magnet back to the center position.
6. Install the clear plastic cover that was removed as part of step 4. To install this cover, carefully align the notches for the plastic cover with the notches in the accelerometer base. Then rotate the cover clockwise until the cover clicks into its closed position.

Verify that the Indicator is in the center position and that the red magnet is not visible: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

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	<b>Procedure Title:</b> Resetting/Replacing Sensor Devices for a Rack Shipping Container	

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 4.2 Replacing the RSC Temperature Indicator

1. Remove the Temperature Indicator and scrap it.
2. Clean the area from which the Indicator was removed with isopropyl alcohol and a lint free cloth.
3. Install a new Temperature Indicator.
4. Verify that the new Temperature Indicator has a white color.

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 4.3 RSC Desiccant Replacement

(Note: Desiccants should be installed just before the RSC Door is to be closed.)

1. Open the Desiccant Basket by removing its five screws and washers. Retain these screws and washers for reinstallation.
2. Rotate the Desiccant to the open position.
3. Remove the Desiccants from the Basket and scrap them.

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

4. Install the 30 new Desiccants in the Desiccant Basket.
5. Rotate the Desiccant Basket to the closed position.
6. Reinstall the screws and washers removed in step #1. Tighten the screws until they are snug.

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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#### 4.4 Replacing the RSC Humidity Indicator

(Note: The Humidity Indicator should be installed just before the RSC Door is to be closed.)

1. Use a 1/2-inch external hex key wrench or socket to remove the insert for the Humidity Indicator Window Assembly from inside of the door and retain the insert for reinstallation.
2. Remove the Humidity Indicator and scrap it.
3. Install the New Humidity Indicator into the Window Assembly. Verify that the Indicator is facing so as to allow the Indicator Notations will be visible through the window of the Window Assembly.
4. Install the Window Assembly Insert in order to capture the Indicator. Tight the insert until it is snug.

Verify that the Humidity Indicator is white or light pink (not red): \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

### 5.0 Verification of Procedure Implementation

#### 5.1 Verification Procedure

Verify procedure has been followed as indicated in this copy of the procedure and as noted in the rack logbook.

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

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## Appendix A Figures

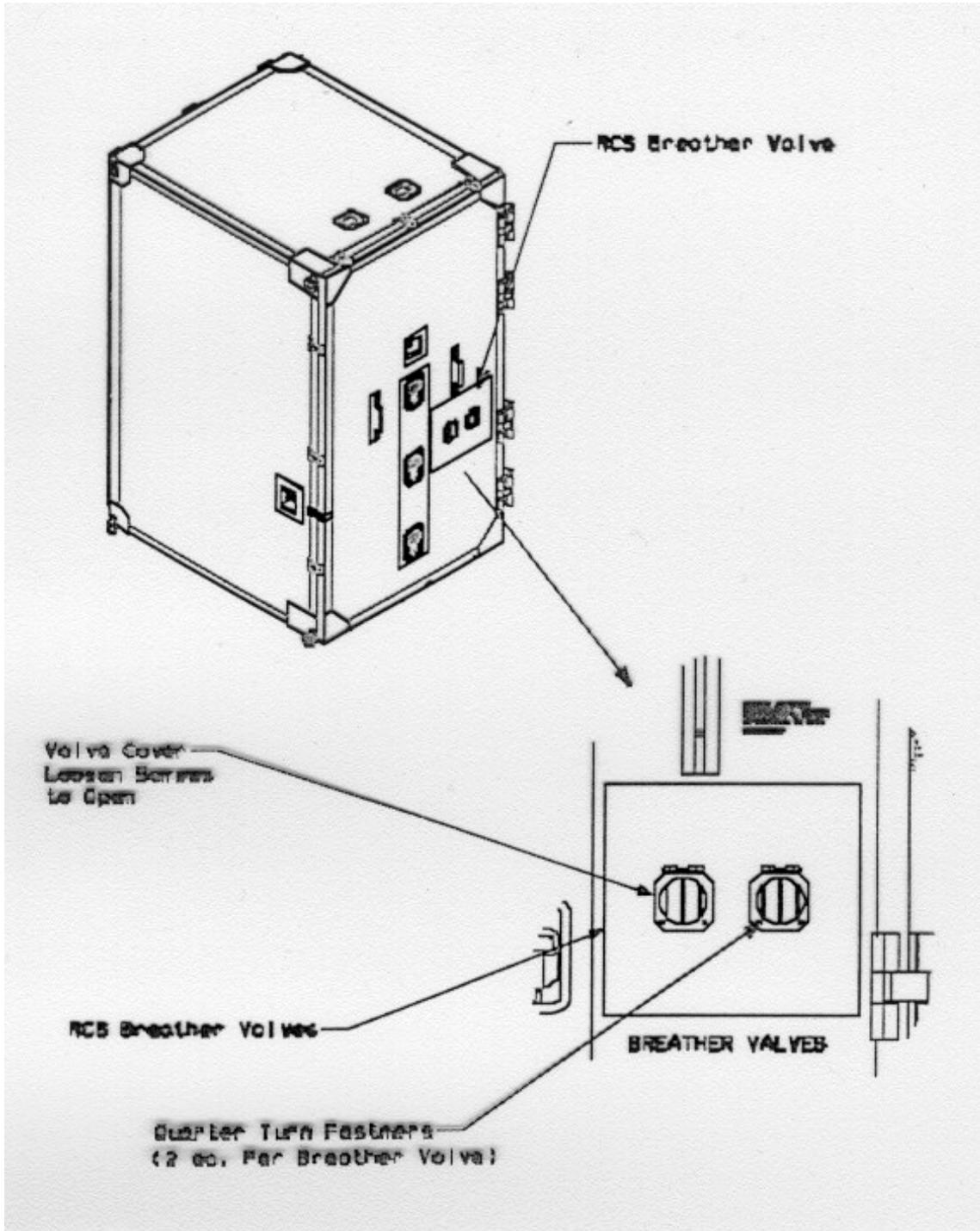


Figure A.1 - RSC Breather Valves

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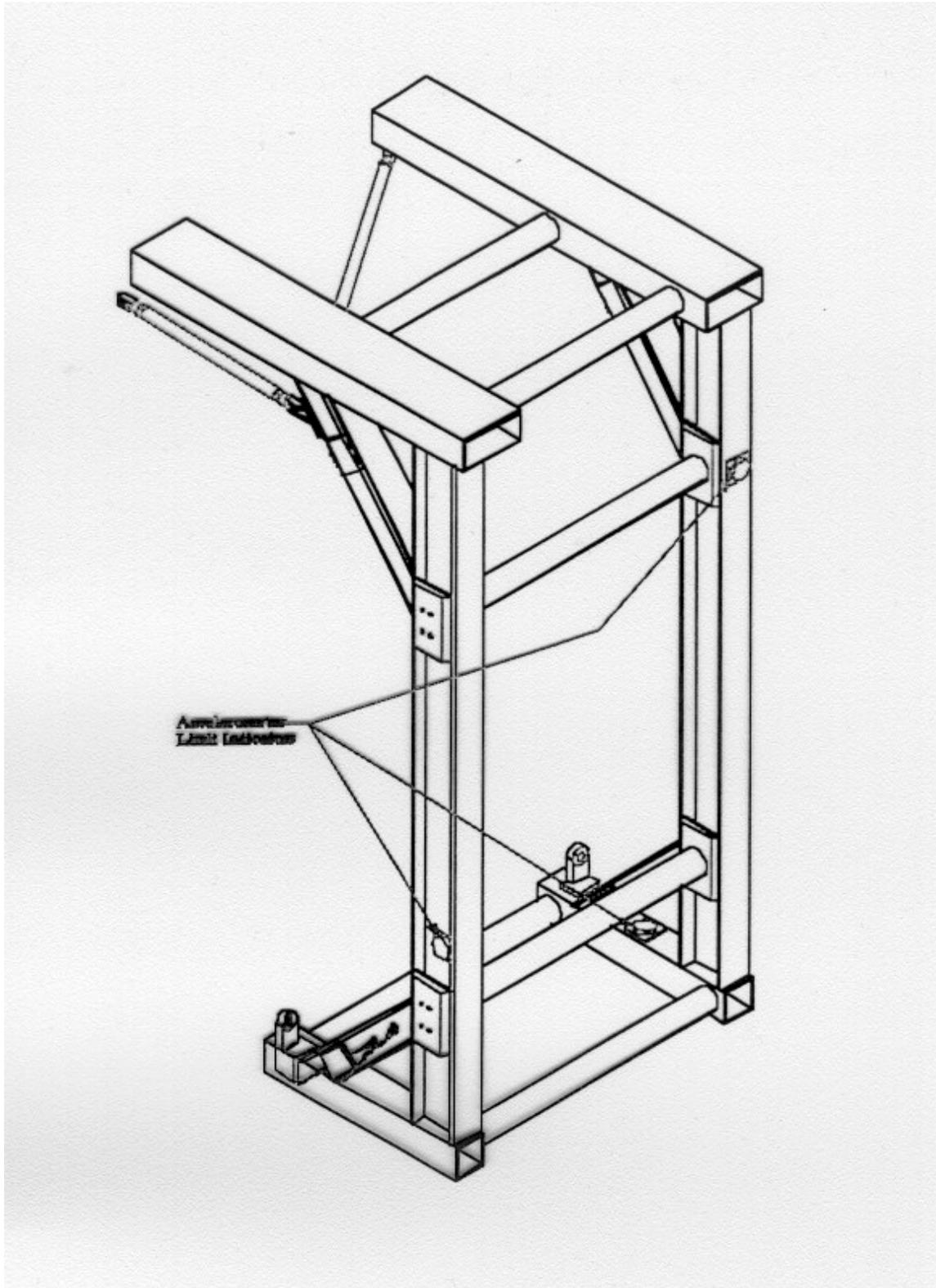


Figure A.2 - RSC Humidity Indicator

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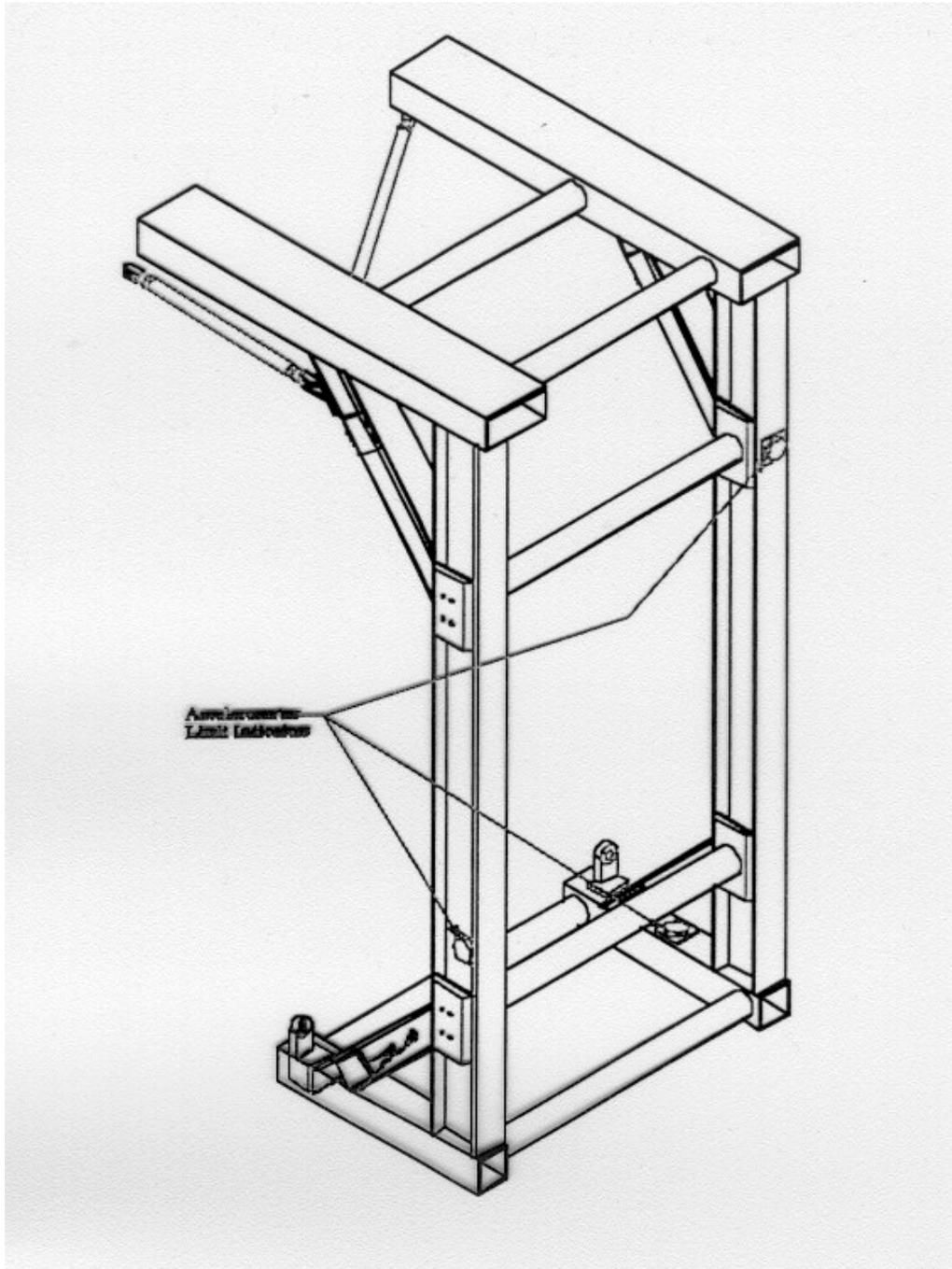


Figure A.3 Accelerometer Limit Indicator

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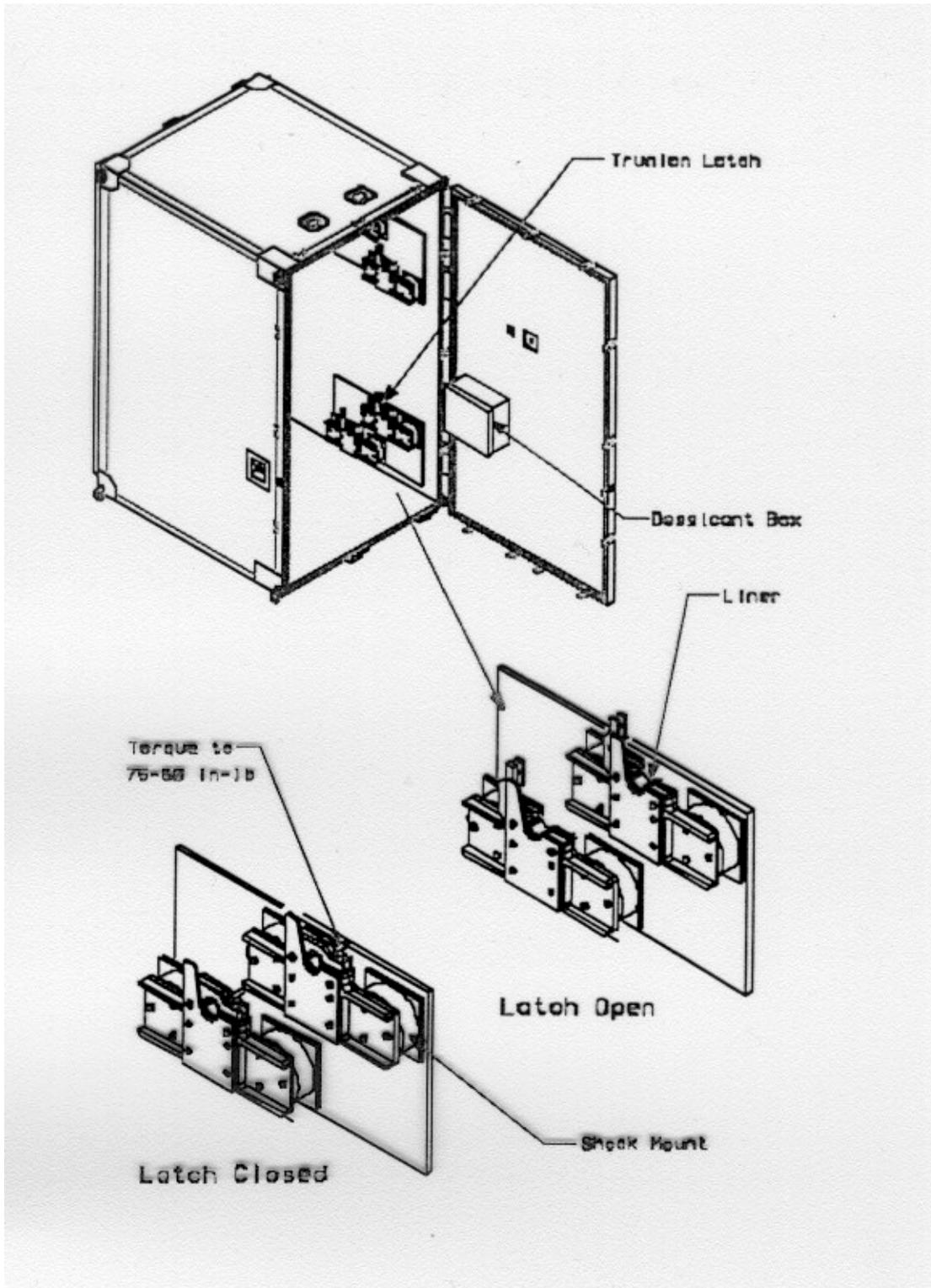


Figure A.4 RSC Trunnion Latch, Liner, Shock Mount, Dessicant Box, & Temperature Indicator

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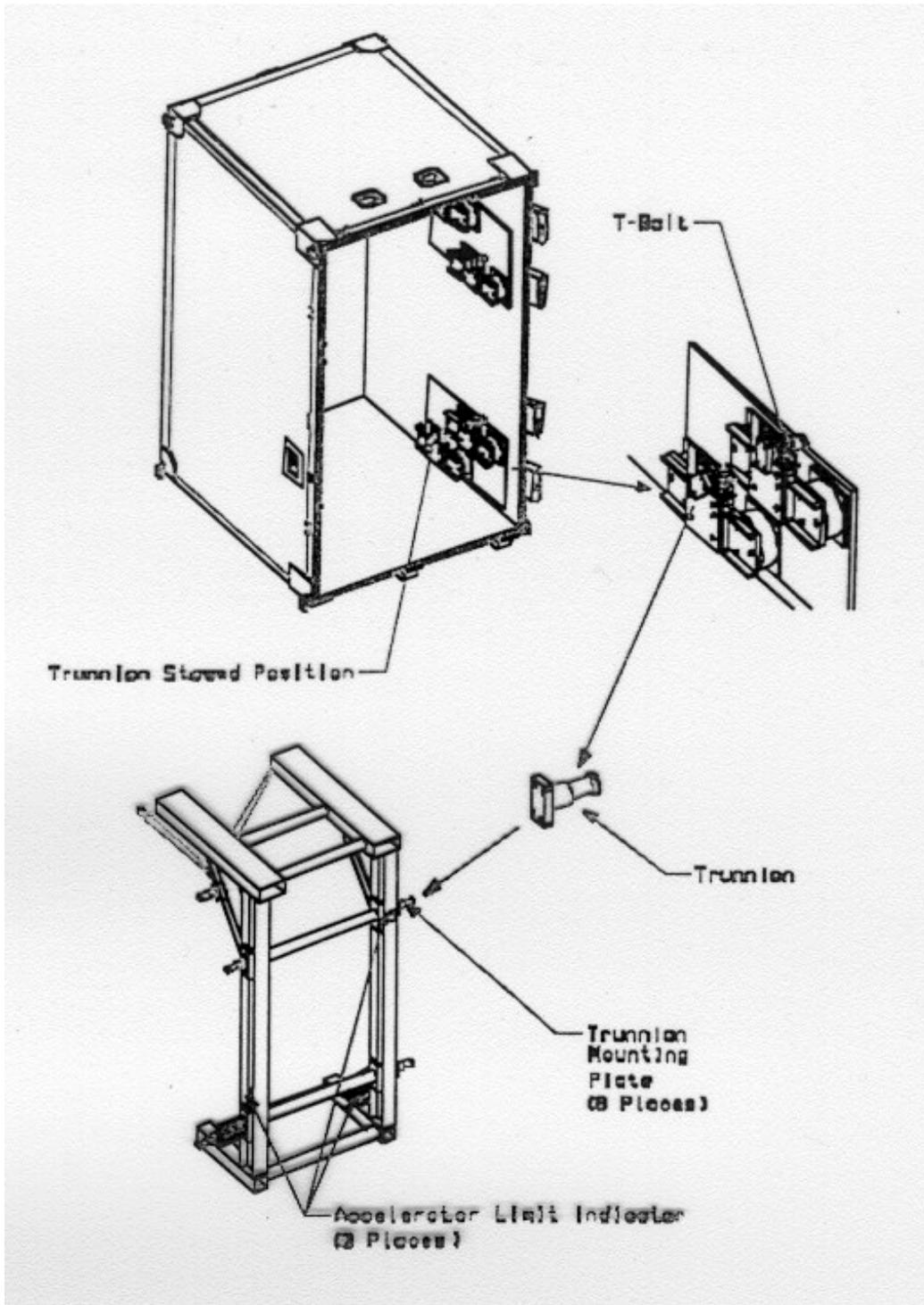


Figure A.5 RHA Trunnion Installation And Accelerator Limit Indicators

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## 1.0 Introduction

### 1.1 Objective

The first objective of this procedure is to provide step-by-step instructions as to how to install and remove Trunnions from both the Rack Handling Adapter (RHA) and Rack Shipping Container (RSC). The second objective of this procedure is to provide documented evidence that the Trunnions were installed or removed from either the RHA or RSC in accordance with Boeing procedures as provided in OMI No.: R5005 (Operation & Maintenance Instruction, Flight Rack Ground Support Operations - SSPF).

### 1.2 Special Requirements

1. NASA GRC Quality Assurance will monitor all operations as specified in this procedure and provide surveillance of the overall operations to insure adherence to the requirements of this procedure.
2. All deviations from this procedure shall be noted in a logbook. Deviations shall include changes to the steps as written, all unscheduled removals and all unscheduled reinstallations. Deviation steps shall be written in the same format as the procedure. Initials shall include FCF Structures Lead before implementation and Technician and OSAT's after completion. History item entry numbers shall be referenced at applicable paragraphs in procedure.
3. All non-conformance, failures and problems from this procedure shall be reported in accordance with the Problem Reporting and Corrective Action (PRACA) Form (NASA Form NASA-C-8192) per PAI 440, Problem Reporting, Analysis and Corrective Action System (PRACA).
4. All work areas shall be clean. All personnel working within five feet of the assemblies shall wear clean white lab coats and clean lint-free nylon or latex gloves and follow issued/posted instructions. Assemblies shall during lunch and off-shift periods, assemblies shall be covered with clean plastic sheets or placed back into their storage containers. The Clean Room shall be verified to be maintaining the environment required by Section 3.2.5.5 of S684-10101.
5. Use only properly calibrated tools as described in Section 6.3 of FCF-PO-PROC-0001.
6. Any discrepancies and/or problems related to removing the RHA from the RHA KSC Base shall be reported to the FCF Structures Lead and dispositioned as described in Section 7.1 of FCF-PO-PROC-0001. No corrective action shall be undertaken concerning opening the RSC door without express written (including e-mail and/or fax) direction from the FCF Structures Lead.

## 2.0 Key Procedure Information

### 2.1 Calibrated Equipment Requirement

7/16-inch Torque Wrench (Required Accuracy: +/- 2 inch-pounds) (In accordance with Section 3.8.1 of GGG-W-686E)

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## 2.2 Required Certifications

None

## 3.0 Responsibilities

### 3.1 Key Personnel Responsibilities

FCF Quality Assurance Designate: Verifies information recorded in this procedure is recorded correctly

Technician: Obtains information recorded in procedure.

### 3.2 Verification That Procedure has Been Read and Understood

Technician Signature/Date:

\_\_\_\_\_

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

## 4.0 Procedure to Remove Trunnion from RHA

### 4.1 Port, Top, Front Trunnion Removal from the RHA

1. Support the Trunnion from falling once the bolts are removed.
2. Remove the four bolts, nuts, and washers from the Trunnion and remove the Trunnion from the RHA.
3. Replace all four bolts, washers, and nuts on the Trunnion. Tighten the bolts until they are snug.
4. Store Trunnion in safe, clean location until it is to be reinstalled.

Verify Trunnion (With All 4 Bolts, Washers, And Nuts) Are Safely Stored: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

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#### **4.2 Port, Upper, Rear Trunnion Removal from the RHA**

1. Support the Trunnion from falling once the bolts are removed.
2. Remove the four bolts, nuts, and washers from the Trunnion and remove the Trunnion from the RHA.
3. Replace all four bolts, washers, and nuts on the Trunnion. Tighten the bolts until they are snug.
4. Store Trunnion in safe, clean location until it is to be reinstalled.

Verify Trunnion (With All 4 Bolts, Washers, And Nuts) Are Safely Stored: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

#### **4.3 Port, Lower, Rear Trunnion Removal from the RHA**

1. Support the Trunnion from falling once the bolts are removed.
2. Remove the four bolts, nuts, and washers from the Trunnion and remove the Trunnion from the RHA.
3. Replace all four bolts, washers, and nuts on the Trunnion. Tighten the bolts until they are snug.
4. Store Trunnion in safe, clean location until it is to be reinstalled.

Verify Trunnion (With All 4 Bolts, Washers, And Nuts) Are Safely Stored: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

#### **4.4 Port, Bottom, Front Trunnion Removal from the RHA**

1. Support the Trunnion from falling once the bolts are removed.
2. Remove the four bolts, nuts, and washers from the Trunnion and remove the Trunnion from the RHA.
3. Replace all four bolts, washers, and nuts on the Trunnion. Tighten the bolts until they are snug.

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4. Store Trunnion in safe, clean location until it is to be reinstalled.

Verify Trunnion (With All 4 Bolts, Washers, And Nuts) Are Safely Stored: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

#### **4.5 Starboard, Top, Front Trunnion Removal from the RHA**

1. Support the Trunnion from falling once the bolts are removed.
2. Remove the four bolts, nuts, and washers from the Trunnion and remove the Trunnion from the RHA.
3. Replace all four bolts, washers, and nuts on the Trunnion. Tighten the bolts until they are snug.
4. Store Trunnion in safe, clean location until it is to be reinstalled.

Verify Trunnion (With All 4 Bolts, Washers, And Nuts) Are Safely Stored: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

#### **4.6 Starboard, Upper, Rear Trunnion Removal from the RHA**

1. Support the Trunnion from falling once the bolts are removed.
2. Remove the four bolts, nuts, and washers from the Trunnion and remove the Trunnion from the RHA.
3. Replace all four bolts, washers, and nuts on the Trunnion. Tighten the bolts until they are snug.
4. Store Trunnion in safe, clean location until it is to be reinstalled.

Verify Trunnion (With All 4 Bolts, Washers, And Nuts) Are Safely Stored: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

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#### **4.7 Starboard, Lower, Rear Trunnion Removal from the RHA**

1. Support the Trunnion from falling once the bolts are removed.
2. Remove the four bolts, nuts, and washers from the Trunnion and remove the Trunnion from the RHA.
3. Replace all four bolts, washers, and nuts on the Trunnion. Tighten the bolts until they are snug.
4. Store Trunnion in safe, clean location until it is to be reinstalled.

Verify Trunnion (With All 4 Bolts, Washers, And Nuts) Are Safely Stored: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

#### **4.8 Starboard, Bottom, Front Trunnion Removal from the RHA**

1. Support the Trunnion from falling once the bolts are removed.
2. Remove the four bolts, nuts, and washers from the Trunnion and remove the Trunnion from the RHA.
3. Replace all four bolts, washers, and nuts on the Trunnion. Tighten the bolts until they are snug.
4. Store Trunnion in safe, clean location until it is to be reinstalled.

Verify Trunnion (With All 4 Bolts, Washers, And Nuts) Are Safely Stored: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

### **5.0 Procedure to Install Trunnion onto RHA**

#### **5.1 Port, Top, Front Trunnion Installation onto the RHA**

(Note: All eight Trunnions are interchangeable between all eight RHA Mounting Pads.)

1. Inspect the Trunnion Mounting Pads for cleanliness and damage.
2. Remove the four nuts from the Trunnion using a 7/16-inch wrench and a 9/16-inch socket. Retain these nuts for reinstallation.

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3. Apply tape to the Trunnion as necessary to protect the Trunnion from damage due to installation.
4. Install the Trunnion by inserting the four mounting bolts for the Trunnion into the mounting holes of the RHA mounting pad. Install the four nuts (from step #2) and torque with fingers until finger tight.
5. Using a 7/16-inch wrench and a 9/16-inch socket, tighten the bolts to 240-285 inch-pound torque (above the running torque). Record the applied torque as well as the NASA property number for the torque wrench used during assembly and the date the torque wrench was last calibrated.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 5.2 Port, Upper, Rear Trunnion Installation onto the RHA

(Note: All eight Trunnions are interchangeable between all eight RHA Mounting Pads.)

1. Inspect the Trunnion Mounting Pads for cleanliness and damage.
2. Remove the four nuts from the Trunnion using a 7/16-inch wrench and a 9/16-inch socket. Retain these nuts for reinstallation.
3. Apply tape to the Trunnion as necessary to protect the Trunnion from damage due to installation.
4. Install the Trunnion by inserting the four mounting bolts for the Trunnion into the mounting holes of the RHA mounting pad. Install the four nuts (from step #2) and torque with fingers until finger tight.
5. Using a 7/16-inch wrench and a 9/16-inch socket, tighten the bolts to 240-285 inch-pound torque (above the running torque). Record the applied torque as well as the NASA property number for the torque wrench used during assembly and the date the torque wrench was last calibrated.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

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Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

### 5.3 Port, Lower, Rear Trunnion Installation onto the RHA

(Note: All eight Trunnions are interchangeable between all eight RHA Mounting Pads.)

1. Inspect the Trunnion Mounting Pads for cleanliness and damage.
2. Remove the four nuts from the Trunnion using a 7/16-inch wrench and a 9/16-inch socket. Retain these nuts for reinstallation.
3. Apply tape to the Trunnion as necessary to protect the Trunnion from damage due to installation.
4. Install the Trunnion by inserting the four mounting bolts for the Trunnion into the mounting holes of the RHA mounting pad. Install the four nuts (from step #2) and torque with fingers until finger tight.
5. Using a 7/16-inch wrench and a 9/16-inch socket, tighten the bolts to 240-285 inch-pound torque (above the running torque). Record the applied torque as well as the NASA property number for the torque wrench used during assembly and the date the torque wrench was last calibrated.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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#### 5.4 Port, Bottom, Front Trunnion Installation onto the RHA

(Note: All eight Trunnions are interchangeable between all eight RHA Mounting Pads.)

1. Inspect the Trunnion Mounting Pads for cleanliness and damage.
2. Remove the four nuts from the Trunnion using a 7/16-inch wrench and a 9/16-inch socket. Retain these nuts for reinstallation.
3. Apply tape to the Trunnion as necessary to protect the Trunnion from damage due to installation.
4. Install the Trunnion by inserting the four mounting bolts for the Trunnion into the mounting holes of the RHA mounting pad. Install the four nuts (from step #2) and torque with fingers until finger tight.
5. Using a 7/16-inch wrench and a 9/16-inch socket, tighten the bolts to 240-285 inch-pound torque (above the running torque). Record the applied torque as well as the NASA property number for the torque wrench used during assembly and the date the torque wrench was last calibrated.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### 5.5 Starboard, Top, Front Trunnion Installation onto the RHA

(Note: All eight Trunnions are interchangeable between all eight RHA Mounting Pads.)

1. Inspect the Trunnion Mounting Pads for cleanliness and damage.
2. Remove the four nuts from the Trunnion using a 7/16-inch wrench and a 9/16-inch socket. Retain these nuts for reinstallation.
3. Apply tape to the Trunnion as necessary to protect the Trunnion from damage due to installation.
4. Install the Trunnion by inserting the four mounting bolts for the Trunnion into the mounting holes of the RHA mounting pad. Install the four nuts (from step #2) and torque with fingers until finger tight.

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- Using a 7/16-inch wrench and a 9/16-inch socket, tighten the bolts to 240-285 inch-pound torque (above the running torque). Record the applied torque as well as the NASA property number for the torque wrench used during assembly and the date the torque wrench was last calibrated.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 5.6 Starboard, Upper, Rear Trunnion Installation onto the RHA

(Note: All eight Trunnions are interchangeable between all eight RHA Mounting Pads.)

- Inspect the Trunnion Mounting Pads for cleanliness and damage.
- Remove the four nuts from the Trunnion using a 7/16-inch wrench and a 9/16-inch socket. Retain these nuts for reinstallation.
- Apply tape to the Trunnion as necessary to protect the Trunnion from damage due to installation.
- Install the Trunnion by inserting the four mounting bolts for the Trunnion into the mounting holes of the RHA mounting pad. Install the four nuts (from step #2) and torque with fingers until finger tight.
- Using a 7/16-inch wrench and a 9/16-inch socket, tighten the bolts to 240-285 inch-pound torque (above the running torque). Record the applied torque as well as the NASA property number for the torque wrench used during assembly and the date the torque wrench was last calibrated.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

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Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

### 5.7 Starboard, Lower, Rear Trunnion Installation onto the RHA

(Note: All eight Trunnions are interchangeable between all eight RHA Mounting Pads.)

1. Inspect the Trunnion Mounting Pads for cleanliness and damage.
2. Remove the four nuts from the Trunnion using a 7/16-inch wrench and a 9/16-inch socket. Retain these nuts for reinstallation.
3. Apply tape to the Trunnion as necessary to protect the Trunnion from damage due to installation.
4. Install the Trunnion by inserting the four mounting bolts for the Trunnion into the mounting holes of the RHA mounting pad. Install the four nuts (from step #2) and torque with fingers until finger tight.
5. Using a 7/16-inch wrench and a 9/16-inch socket, tighten the bolts to 240-285 inch-pound torque (above the running torque). Record the applied torque as well as the NASA property number for the torque wrench used during assembly and the date the torque wrench was last calibrated.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

### 5.8 Starboard, Bottom, Front Trunnion Installation onto the RHA

(Note: All eight Trunnions are interchangeable between all eight RHA Mounting Pads.)

1. Inspect the Trunnion Mounting Pads for cleanliness and damage.
2. Remove the four nuts from the Trunnion using a 7/16-inch wrench and a 9/16-inch socket. Retain these nuts for reinstallation.

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3. Apply tape to the Trunnion as necessary to protect the Trunnion from damage due to installation.
4. Install the Trunnion by inserting the four mounting bolts for the Trunnion into the mounting holes of the RHA mounting pad. Install the four nuts (from step #2) and torque with fingers until finger tight.
5. Using a 7/16-inch wrench and a 9/16-inch socket, tighten the bolts to 240-285 inch-pound torque (above the running torque). Record the applied torque as well as the NASA property number for the torque wrench used during assembly and the date the torque wrench was last calibrated.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 6.0 Procedure to Remove Trunnion from RSC

### 6.1 Port, Top, Front Trunnion Removal from the RSC

1. While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
4. Remove the Trunnion from the Latch Cap Assembly.
5. Rotate the Latch Cap Assembly back to the closed position.
6. Rotate the T-Bolt so as to securely capture the Latch Cap.
7. Tighten the T-Bolt nut until the T-Bolt is snug.
8. Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

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Verify Latch Cap Has Been Rotated To A Closed Position And That The T-Bolt Has Been  
Tightened Until Snug: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

## 6.2 Port, Upper, Rear Trunnion Removal from the RSC

1. While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
4. Remove the Trunnion from the Latch Cap Assembly.
5. Rotate the Latch Cap Assembly back to the closed position.
6. Rotate the T-Bolt so as to securely capture the Latch Cap.
7. Tighten the T-Bolt nut until the T-Bolt is snug.
8. Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify Latch Cap Has Been Rotated To A Closed Position And That The T-Bolt Has Been  
Tightened Until Snug: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

## 6.3 Port, Top, Front Trunnion Removal from the RSC

1. While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.

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3. Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
4. Remove the Trunnion from the Latch Cap Assembly
5. Rotate the Latch Cap Assembly back to the closed position.
6. Rotate the T-Bolt so as to securely capture the Latch Cap.
7. Tighten the T-Bolt nut until the T-Bolt is snug.
8. Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify Latch Cap Has Been Rotated To A Closed Position And That The T-Bolt Has Been

Tightened Until Snug: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

#### **6.4 Port, Bottom, Front Trunnion Removal from the RSC**

1. While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
4. Remove the Trunnion from the Latch Cap Assembly.
5. Rotate the Latch Cap Assembly back to the closed position.
6. Rotate the T-Bolt so as to securely capture the Latch Cap.
7. Tighten the T-Bolt nut until the T-Bolt is snug.
8. Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify Latch Cap Has Been Rotated To A Closed Position And That The T-Bolt Has Been

Tightened Until Snug: \_\_\_\_\_

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Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

### **6.5 Starboard, Top, Front Trunnion Removal from the RSC**

1. While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
4. Remove the Trunnion from the Latch Cap Assembly.
5. Rotate the Latch Cap Assembly back to the closed position.
6. Rotate the T-Bolt so as to securely capture the Latch Cap.
7. Tighten the T-Bolt nut until the T-Bolt is snug.
8. Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify Latch Cap Has Been Rotated To A Closed Position And That The T-Bolt Has Been

Tightened Until Snug: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

### **6.6 Starboard, Upper, Rear Trunnion Removal from the RSC**

1. While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
4. Remove the Trunnion from the Latch Cap Assembly.

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5. Rotate the Latch Cap Assembly back to the closed position.
6. Rotate the T-Bolt so as to securely capture the Latch Cap.
7. Tighten the T-Bolt nut until the T-Bolt is snug.
8. Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify Latch Cap Has Been Rotated To A Closed Position And That The T-Bolt Has Been Tightened Until Snug: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

### **6.7 Starboard, Lower, Rear Trunnion Removal from the RSC**

1. While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
4. Remove the Trunnion from the Latch Cap Assembly.
5. Rotate the Latch Cap Assembly back to the closed position.
6. Rotate the T-Bolt so as to securely capture the Latch Cap.
7. Tighten the T-Bolt nut until the T-Bolt is snug.
8. Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify Latch Cap Has Been Rotated To A Closed Position And That The T-Bolt Has Been Tightened Until Snug: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

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## 6.8 Starboard, Bottom, Front Trunnion Removal from the RSC

1. While supporting the Trunnion to prevent it from falling, loosen the nut on the Trunnion Retention Latch Assembly T-Bolt using a 3/4-inch, deep well, socket.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Latch the Latch Cap Assembly in the full open position so as not to obstruct the removal of the Trunnion.
4. Remove the Trunnion from the Latch Cap Assembly.
5. Rotate the Latch Cap Assembly back to the closed position.
6. Rotate the T-Bolt so as to securely capture the Latch Cap.
7. Tighten the T-Bolt nut until the T-Bolt is snug.
8. Retain the Trunnion for future use.

Verify Trunnion Safely Stored: \_\_\_\_\_

Verify Latch Cap Has Been Rotated To A Closed Position And That The T-Bolt Has Been

Tightened Until Snug: \_\_\_\_\_

Place Checkmark Here If Not Perform: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 7.0 Procedure to Install Trunnion into RSC

### 7.1 Port, Top, Front Trunnion Installation into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.

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3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 7.2 Port, Upper, Rear Trunnion Installation into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.

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6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

### **7.3 Port, Lower, Rear Trunnion Installation into the RSC**

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

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Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### **7.4 Port, Bottom, Front Trunnion Installation into the RSC**

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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## 7.5 Starboard, Top, Front Trunnion Installation into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 7.6 Starboard, Upper, Rear Trunnion Installation into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.

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4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 7.7 Starboard, Lower, Rear Trunnion Installation into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.

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8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 7.8 Starboard, Bottom, Front Trunnion Installation into the RSC

(Note: All eight Trunnions are interchangeable between all eight RSC Mounting Pads.)

1. Loosen the T-Bolt nut, but do not remove the nut.
2. Rotate the T-Bolt so as to not obstruct the rotation of the Latch Cap Assembly.
3. Rotate the Latch Cap Assembly to a full open position so as not to obstruct the installation of the Trunnion.
4. Inspect the Trunnion mounting pad, the Trunnion, and the fastener hardware for damage and cleanliness.
5. While supporting the Trunnion to prevent it from falling, place the Trunnion onto the Latch Cap Assembly Seat.
6. Rotate the Latch Cap Assembly back to the closed position over the Trunnion.
7. Rotate the T-Bolt so as to securely capture the Latch Cap.
8. Using a torque wrench, tighten the T-Bolt nut to 75-80 inch-pounds torque. Record the applied torque and NASA Property Number for the torque wrench.

Place Checkmark Here If Not Perform: \_\_\_\_\_

Record actual torque applied to bolt: \_\_\_\_\_ inch-pounds

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Torque Wrench GRC Property Tag Number: \_\_\_\_\_

Calibration Date for Torque Wrench: \_\_\_\_\_

Technician Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

## 8.0 Verification of Procedure Implementation

### 8.1 Verification Procedure

Verify procedure has been followed as indicated in this copy of the procedure and as noted in the rack logbook.

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_

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## Appendix A Figures

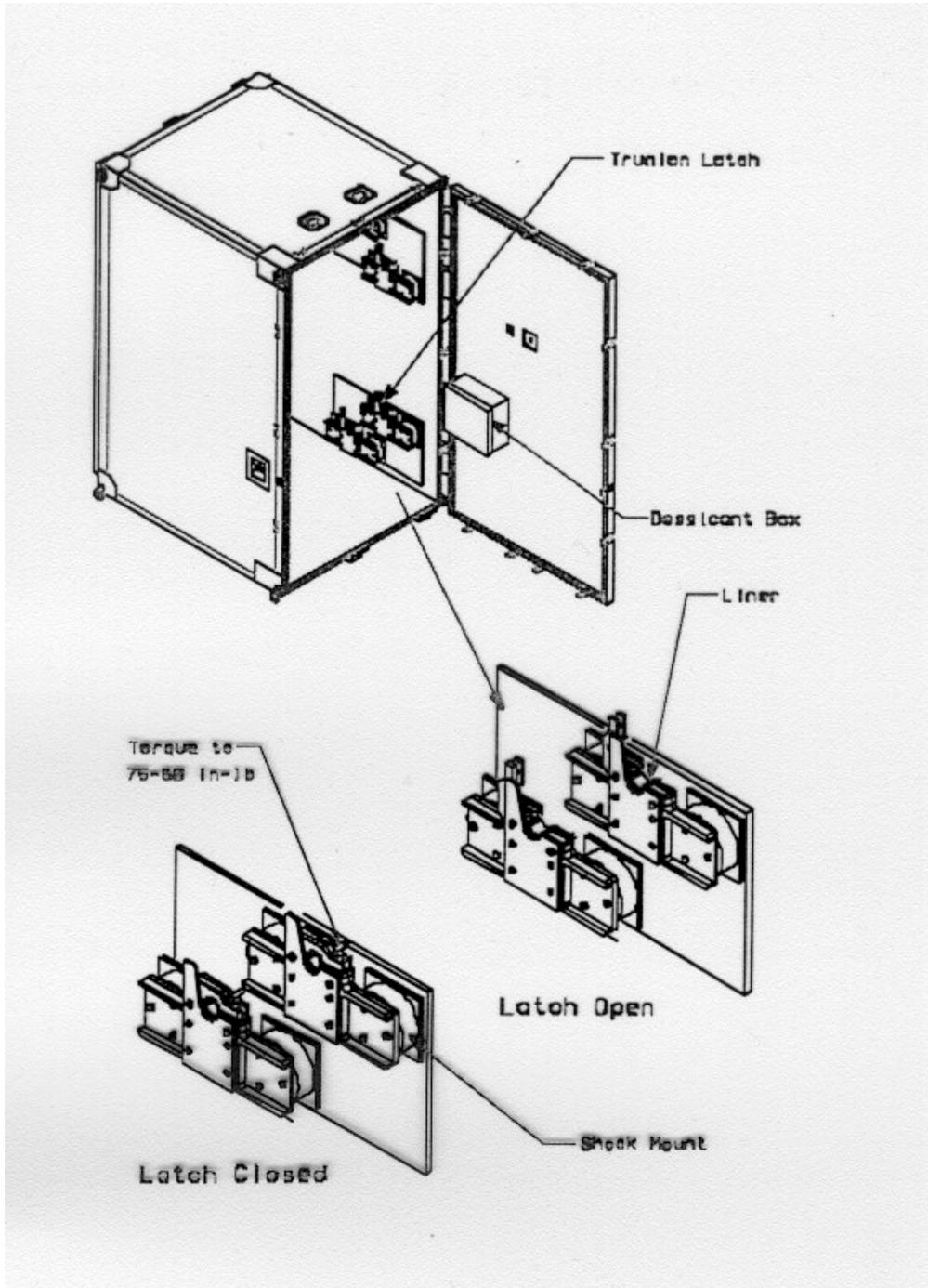


Figure A.1 - RSC Trunnion Latch, Liner, Shock Mount, and Dessicant

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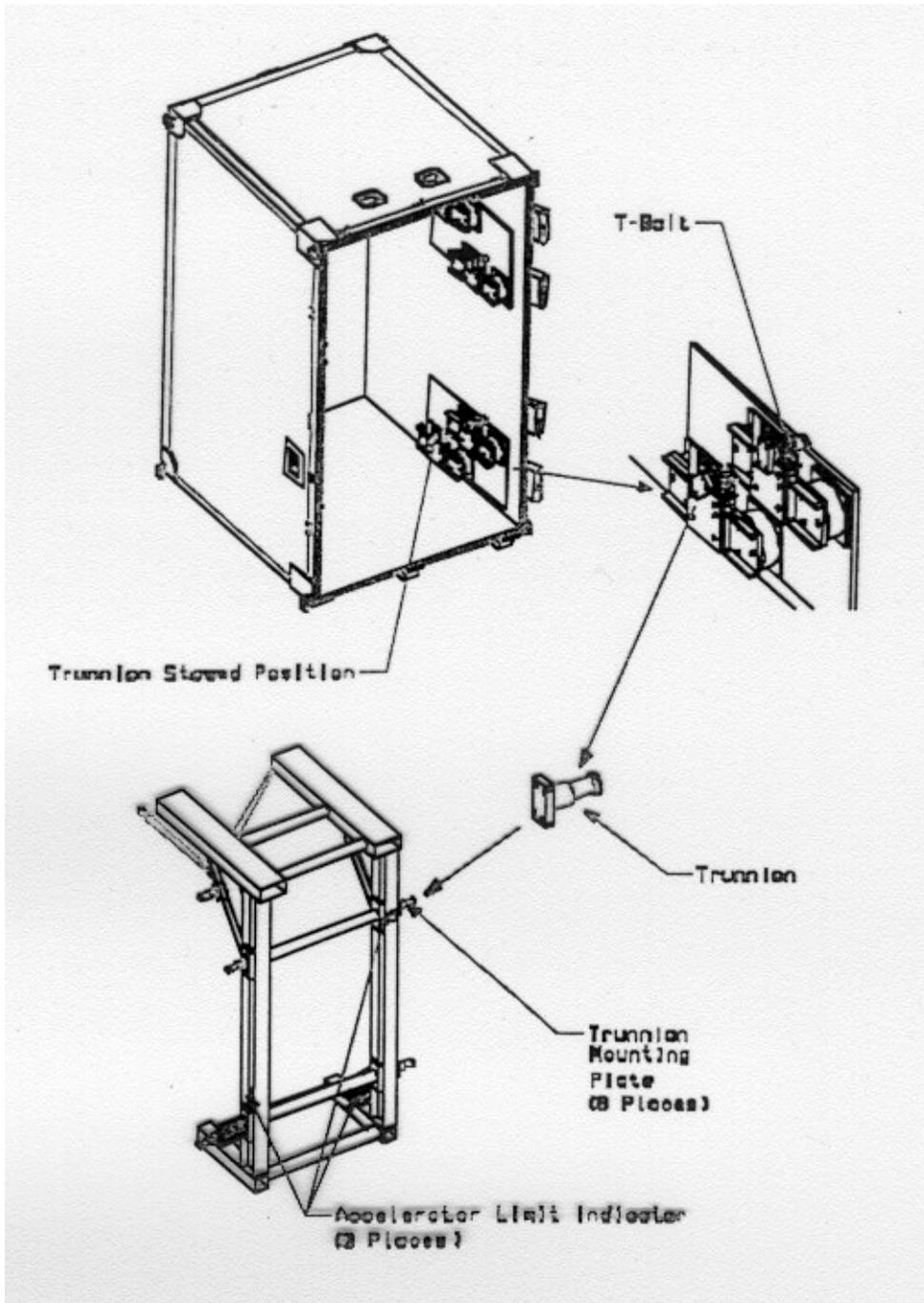


Figure A.2 - RHA Trunnion Installation and Accelerator Limit Indicators

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## 1.0 Introduction

### 1.1 Objective

The first objective of this procedure is to provide step-by-step instructions as to how to rotate the Rack Shipping Container (RSC) from a horizontal to a vertical orientation. The second objective of this procedure is to provide documented evidence that the RSC was rotated in accordance with Boeing procedures as provided in MDA-01, International Space Station Rack Shipping Container Operation & Maintenance Plan.

### 1.2 Special Requirements

1. A controlled area will be established.
2. Communication will be maintained between crane controller and task leader at all times.
3. All lifting equipment must have current certification tags.
4. A load shall not be lifted/suspended over personnel except as specified in the NASA suspended load operations analysis/ approval document.
5. The task leader is responsible to keep the controlled area clear of nonessential personnel.
6. If a controlled area is violated during a hoisting operation, the crane lifting operations shall be halted until the situation is corrected.
7. Attendance at a pre-task briefing is mandatory for all crane/ops personnel.
8. All lifting equipment shall be visually inspected for certification, damage, and completeness.
9. All hoisting equipment and lifting eyes/attach points on equipment to be hoisted will be visually inspected in its operating configuration on each day just prior to use for obvious degradation.
10. All crane operators shall have a valid license in their possession while operating cranes.
11. Any person participating in an operation may call a stop to the operation if it is apparent that to continue would expose personnel or property to a dangerous or unacceptable risk.
12. Verify and/or accumulate the special tools, equipment and materials as specified.
13. Verify all members of the lift team are wearing appropriate personal protective equipment.
14. Pre-ops of the crane have been completed prior to lift operation. The FCF Quality Assurance Designate or lift Safety Monitor verifies completion.
15. Verify a safety analysis has been performed prior to lift.
16. If there are grounding requirements for the RSC rotation, the lift coordinator shall verify the grounding leads are attached properly and are able to travel with the load with no interference. ESD requirements will clearly stated.

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17. NASA GRC Quality Assurance will monitor all operations as specified in this procedure and provide surveillance of the overall operations to insure adherence to the requirements of this procedure.
18. All deviations from this procedure shall be noted in a logbook. Deviations shall include changes to the steps as written, all unscheduled removals and all unscheduled reinstallations. Deviation steps shall be written in the same format as the procedure. Initials shall include FCF Structures Lead before implementation and Technician and OSAT's after completion. History item entry numbers shall be referenced at applicable paragraphs in procedure.
19. All non-conformance, failures and problems from this procedure shall be reported in accordance with the Problem Reporting and Corrective Action (PRACA) Form (NASA Form NASA-C-8192) per PAI 440, Problem Reporting, Analysis and Corrective Action System (PRACA)
20. All work areas shall be clean. All personnel working within five feet of the assemblies shall wear clean white lab coats and clean lint-free nylon or latex gloves and follow issued/posted instructions. Assemblies shall during lunch and off-shift periods, assemblies shall be covered with clean plastic sheets or placed back into their storage containers. The Clean Room shall be verified to be maintaining the environment required by Section 3.2.5.5 of S684-10101.
21. Use only properly calibrated tools as described in Section 6.3 of FCF-PO-PROC-0001.
22. Any discrepancies and/or problems related to removing the RHA from the RHA KSC Base shall be reported to the FCF Structures Lead and dispositioned as described in Section 7.1 of FCF-PO-PROC-0001. No corrective action shall be undertaken concerning opening the RSC door without express written (including e-mail and/or fax) direction from the FCF Structures Lead

### **1.3 Emergency Conditions**

In the event of building evacuation or electrical power outage, the forklift shall be shut off, and secured. If possible (personnel safety first), the lift coordinator shall ensure the area is roped off and marked with signs warning of the overhead load. Personnel in clean room attire shall exit the area immediately, without removing clean room attire. Resume this procedure after the emergency condition has been corrected.

## **2.0 Key Procedure Information**

### **2.1 Calibrated Equipment Requirement**

Hoist straps – Rated to 3000 Pounds)  
Tag lines – Rated to 3000 Pounds

### **2.2 Required Certifications**

Crane Operator for Crane in Building 333, Room 100W

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### 3.0 Responsibilities

#### 3.1 Key Personnel Responsibilities

Crane Operator: Operates crane

Flagman: Prevents any unauthorized personnel from entering the controlled area during the lift. remains in direct communication with the crane operator while the crane is in use.

FCF Project Representative: Representative of the FCF Project witnessing the lift.

FCF Quality Assurance Designate: Verifies information recorded in this procedure is recorded correctly.

FCF Structures Lead: Contacted if problem occurs during RSC rotation

Lift Coordinator: Coordinates lift, leads lift team through lift procedure

Lift Rigger: Assures rigging requirements are followed

Safety Monitor: No other responsibility than to monitor the lifting operation for compliance with the written procedure developed for that lift.

Technician (4 Total): Handle tag lines

#### 3.2 Verification That Procedure has been Read and Understood

Crane Operator:

Name (Printed): \_\_\_\_\_

Signature/Date: \_\_\_\_\_

Flagman:

Name (Printed): \_\_\_\_\_

Signature/Date: \_\_\_\_\_

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FCF Project Representative:

Name (Printed): \_\_\_\_\_

Signature/Date: \_\_\_\_\_

FCF Quality Assurance Designate:

Name (Printed): \_\_\_\_\_

Signature/Date: \_\_\_\_\_

Lift Coordinator:

Name (Printed): \_\_\_\_\_

Signature/Date: \_\_\_\_\_

Lift Rigger:

Name (Printed): \_\_\_\_\_

Signature/Date: \_\_\_\_\_

Safety Monitor:

Name (Printed): \_\_\_\_\_

Signature/Date: \_\_\_\_\_

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Technician #1:

Name (Printed): \_\_\_\_\_

Signature/Date: \_\_\_\_\_

Technician #2:

Name (Printed): \_\_\_\_\_

Signature/Date: \_\_\_\_\_

Technician #3:

Name (Printed): \_\_\_\_\_

Signature/Date: \_\_\_\_\_

Technician #4:

Name (Printed): \_\_\_\_\_

Signature/Date: \_\_\_\_\_

## **4.0 Procedure to Rotate RSC from a Horizontal to a Vertical Orientation**

### **4.1 Preliminary Checklist Items**

Test-item unique procedure provided?  Yes  No

FCF Quality Assurance Representative Required?  Yes  No

Safety Representative Required?  Yes  No

Safety Analysis Completed?  Yes  No

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Load Analysis (is one required?)  Yes  No

Stability analysis (is one required?)  Yes  No

Grounding Straps in place?  Yes  No

Other Special requirements?  Yes  No

If there are other Special Requirements, describe them below (or in Rack Logbook).

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

**4.2 Establish a lift safety exclusion zone defined by barriers or roped off areas. prevent unauthorized personnel from entering the zone.**

Verify The Establishment Of A Lift Safety Exclusion Zone: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

**4.3 Verify all members of the lift team are wearing appropriate personal protective equipment.**

Verify All Members Of Lift Team Are Wearing Appropriate Equipment: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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#### 4.4 Attaching RHA to KSC Base

Conduct pre-task briefing and assign jobs to personnel. Verify that lift operators and coordinators have valid crane certifications.

Verify Completion Of Pre-Task Briefing: \_\_\_\_\_

Verify Lift Operators And Coordinators Have Valid Crane Certifications: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### 4.5 Lift coordinator shall list all the lifting equipment needed for this job.

Item	P/N	Capacity/Length	Cert. Due Date
Crane			
Lifting Slings			
Shackles			
Load Cells			
Nylon Straps			
Hoist Rings			
Turnbuckles			
Tag Lines			

#### 4.6 Perform Engineering/Safety Walk Down of the Area

Verify Walk Down Was Performed: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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**4.7 Perform the daily Checkout (pre-ops) of the crane and/or hydraset (if not previously accomplished) and sign logbook.**

Verify Checkout Was Performed And That Rack Logbook Was Sign: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

**4.8 Visually inspect all lifting equipment for certifications and damages and completeness.**

Verify All Lifting Equipment Is Undamaged And Complete: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

**4.9 Issue verbal warning that hazardous crane operations are ready to begin. remove all unauthorized personnel from the lift zone.**

Verify Verbal Warning Was Given: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

**4.10 Preparing for RSC Rotation.**

Verify that all 13 latches on the RSC Door are latched

Verified all 13 RSC Latches are latched: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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**4.11 Position the RSC to prevent side loading of the overhead crane during RSC rotation.**

Verified location of RSC to prevent side loading of RSC during RSC rotation: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

**4.12 Establish a control area around the RSC so as to prevent the possibility of the RSC falling on any personnel.**

Verify The Establishment Of A Control Area: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

**4.13 Attaching Straps and Tag Lines to the RSC**

1. Position the crane over the RSC in a position so as to prevent the possibility of side loading of the crane.

Verified location of crane over RSC to prevent side loading of RSC during RSC rotation: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

2. Attach a hoist strap to each of the two lift rings that will be above the RSC door once the RSC has been rotated into a vertical orientation. Both of these lift rings will be labeled both "HOIST HORIZ" and HOIST VERTICAL". Attach the other ends of these straps to the crane hook. Both hoist straps shall be rated for 3000 pounds.

Verified hoist straps are rated to at least 3000 pounds: \_\_\_\_\_

For first hoist strap, record tag identification number: \_\_\_\_\_

For first hoist strap, record date for next scheduled rated load test: \_\_\_\_\_

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For second hoist strap, record tag identification number: \_\_\_\_\_

For second hoist strap, record date for next scheduled rated load test: \_\_\_\_\_

Verified hoist straps are securely attached to crane hook: \_\_\_\_\_

Verified hoist straps are attached to RSC lift rings above RSC doors: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

3. Attach four tag lines to the four RSC horizontal tie-down rings that are located near the horizontal orientation skids. Two of these tie-down rings will both be labeled "TIE-DOWN HORIZ" and "TIE-DOWN VERTICAL" while the other two tie-down rings will both be labeled "TIE-DOWN HORIZ" and "HOIST VERTICAL".

Verified hoist straps are rated to at least 3000 pounds: \_\_\_\_\_

For first tag line, record tag identification number: \_\_\_\_\_

For first tag line, record date for next scheduled rated load test: \_\_\_\_\_

For second tag line, record tag identification number: \_\_\_\_\_

For second tag line, record date for next scheduled rated load test: \_\_\_\_\_

For third tag line, record tag identification number: \_\_\_\_\_

For third tag line, record date for next scheduled rated load test: \_\_\_\_\_

For fourth tag line, record tag identification number: \_\_\_\_\_

For fourth tag line, record date for next scheduled rated load test: \_\_\_\_\_

Verified tag lines are attached to RSC horizontal tie-down rings: \_\_\_\_\_

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Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

#### 4.14 Attaching Straps and Tag Lines to the RSC

1. Position one technician with each tag line. Position the technicians with the tag lines attached to the tie-down rings labeled "TIE-DOWN HORIZ" and "HOIST VERTICAL" so as to be facing the RSC door once the RSC has been rotated. The purpose of these two technicians is to assist the crane with the rotation of the RSC. Position the other two technicians on the opposite side of the RSC so as to assist with preventing the sliding of the RSC during its rotation. All four technicians shall be positioned so as to not allow their tag lines to make contact with any portion of the RSC besides the tie-down rings. The technicians shall also be positioned so as to prevent the tag lines from interfering in any way with the operation of the crane.
2. Have the crane start lifting the RSC while translating the crane so as to keep the hoist straps as vertical as possible. At no time is the RSC to move faster than 5 Mph. Can the speeds on the crane be monitored?
3. Have the technicians with the top tag lines assist with the rotation of the RSC by pulling on the tag lines so as to assist the crane in rotating the RSC.
4. Unless there is a problem, rotation of the RSC will continue until the RSC is resting on the RSC's vertical skids.

Verify the RSC did not move sideways during RSC rotation: \_\_\_\_\_

Verify the RSC did not move faster than 5 Mph. during RSC rotation: \_\_\_\_\_

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

5. If there is a problem, the FCF Quality Assurance Designate shall direct the crane operator to set the RSC back down on the RSC's horizontal skids, with the assistance of the technicians handling the tag lines. The FCF Structures Lead shall be contacted. No further attempts shall be made to rotate the RSC without the permission of the FCF Structures Lead.

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

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#### 4.15 Securing the RSC After Rotation

1. Remove tension from hoisting straps. Then remove hoisting straps from crane hook.
2. Remove hoist straps and shackles from the RSC hoist rings.
3. Remove tag lines from the RSC.
4. Reopen RSC rotation control area.
5. Place hoist straps, tag lines, and shackles into bonded storage for later use.

Lift Coordinator Initials: \_\_\_\_\_

FCF Quality Assurance Designate Initials: \_\_\_\_\_

### 5.0 Verification of Procedure Implementation

#### 5.1 Verification Procedure

Verify procedure has been followed as indicated in this copy of the procedure and as noted in the rack logbook.

FCF Quality Assurance Designate Signature/Date:

\_\_\_\_\_