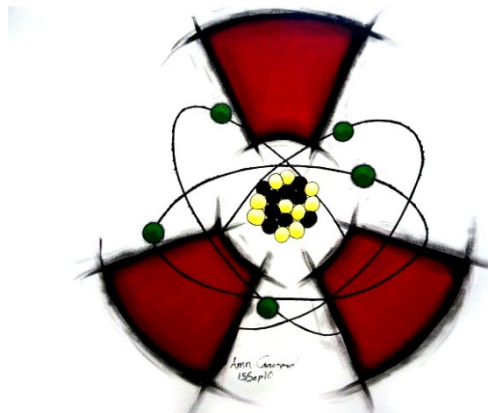


CDC 2W251B

Nuclear Weapons Journeyman

Volume 4. Reentry Vehicles and Systems



Air Force Career Development Academy

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Author: MSgt Joshua Brown
363d Training Squadron
Nuclear Weapons Technical Training School (AETC)
363 TRS/TRR
520 Missile Road (Stop 244)
Sheppard Air Force Base, Texas 76311-2261
DSN: 736-4120
E-mail address: joshua.brown.3@us.af.mil

Instructional Systems

Specialist: Patricia C. Christen

Editor: Patricia C. Christen

Air Force Career Development Academy (AFCD)
Air University (AETC)
Maxwell-Gunter Air Force Base, Alabama

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THIS FINAL VOLUME of Career Development Course (CDC) 2W251B, Nuclear Weapons Journeyman, covers reentry vehicles and systems. Unit 1 gives the summary and common inspections in regards to the reentry vehicles and further describes the two weapon systems associated to the Minuteman III weapon system. Unit 2 covers the Minuteman III reentry system. You'll also learn the characteristics of reentry systems subassemblies and learn about reentry systems inspection, testing, and maintenance.

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A glossary is included for your use.

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For Guard and Reserve personnel, this volume is valued at 12 hours and 3 points.

NOTE:

In this volume, the subject matter is divided into self-contained units. A unit menu begins each unit, identifying the lesson headings and numbers. After reading the unit menu page and unit introduction, study the section, answer the self-test questions, and compare your answers with those given at the end of the unit. Then complete the unit review exercises.

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Unit 1. Reentry Vehicles

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FOR OVER HALF A CENTURY, the intercontinental ballistic missile (ICBM) has provided “top cover” for our national security and continues to do so today. There is no doubt the ICBM plays a major factor in neutralizing any aggressive tendencies towards the United States (US) and its national interests. As a weapons maintenance technician, you have an important role in sustaining a viable, deployable nuclear force that has revolutionized national policy, military strategy, and most of all, an offensive deterrence. This unit provides a brief overview of the reentry vehicles (RV) and covers the specific procedures applicable to the W78/MK12A RV and W87/MK21 RV.

1-1. Reentry Vehicle Overview

The Minuteman III (fig. 1-1) is an ICBM with single reentry vehicles (SRV) for the MK12A, or safety enhanced reentry vehicles (SERV) for the MK21. The Minuteman III was originally designed to carry a maximum of three RVs (fig. 1-2), but because of the treaty mandates, they are currently configured to carry only one RV. In this section, we cover both types of RVs that are installed in the Minuteman III weapon system.

601. Reentry vehicles summaries

Each of the RVs contains unique characteristics and shares common traits. This lesson provides an overview of the systems summaries to enlighten you about the RVs within the Department of Defense (DOD) stockpile.

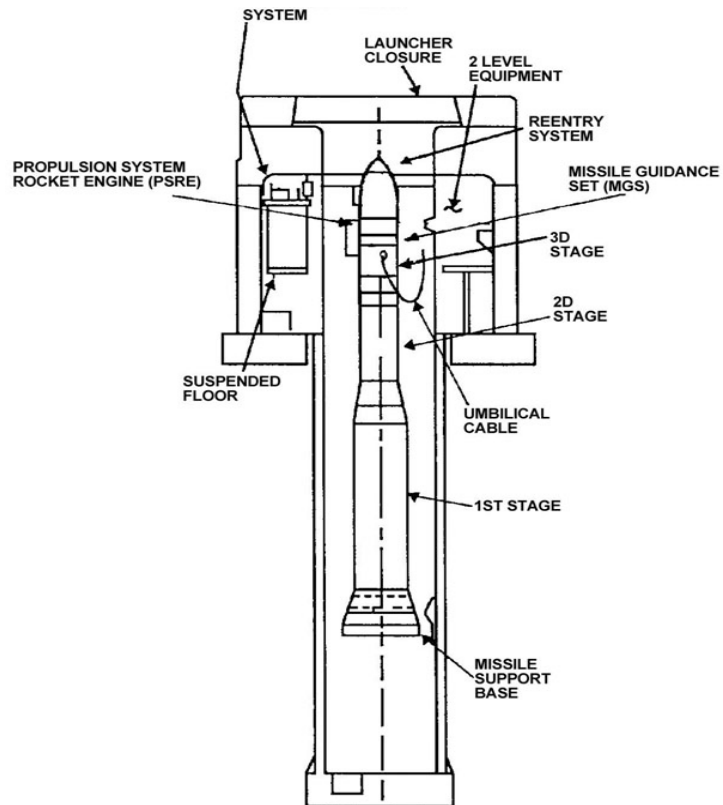


Figure 1-1. Minuteman III missile system.

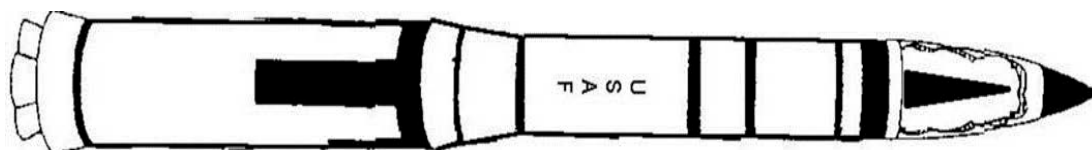


Figure 1-2. Minuteman III missile.

Reentry vehicles

The effectiveness of the Minuteman weapon system depends on a second strike capability. This means that the system must be able to perform its critical functions even after exposure to a hostile nuclear environment. The capability to withstand the effects of shock, vibration, air blast, acoustics, radiation, electromagnetic pulse (EMP), thermal radiation, and debris can only be achieved if the system retains its designed-in-hardness. To ensure the survival and retaliatory strike capability of the Minuteman weapon system, the substitutions, deviations, or changes are not allowed during the overhaul and maintenance of any item flagged with a hardness critical procedure (HCP) identified as ****HCP**** in TOs. The most important aspect of hardness preservation is making sure maintenance personnel perform all procedural steps exactly as given. Maintenance personnel should be thoroughly familiar with Technical Order (TO) 21M-LGM30G-2-31, *Weapon System Hardness Preservation and Installation Hardware*. This TO provides hardness awareness and preservation information for the weapon system and provides appropriate courses of action for resolving hardness critical maintenance issues and repair actions that are outside the scope of maintenance of other TOs. The RVs are designed to perform the following functions:

- Prevent premature detonation of the warhead (WH).
- Generate arming and fusing (A&F) signals to detonate the WH at a predetermined point.
- Survive the intense heat generated by reentry into the Earth's atmosphere.

Each RV is composed of several subsystems. Many of their functions are identical or very similar to the components of other nuclear weapons. However, there are some significant differences because an RV must exit and reenter the inner atmosphere. For example, there are additional components designed to transport the WH through a ballistic trajectory, to orient each RV at a specific angle to the Earth's surface, and to carry the RV safely through the reentry mode.

Because of the intense heat generated by reentry into the Earth's atmosphere, the RV is covered with an ablative heat shield. The ablative heat shield is bonded to the exterior of the RV and varies in thickness and materials from the nose to the rear of the RV. The materials may be plastic, ceramic, Teflon, phenolic, carbon, or a combination of these materials. RV overheating at reentry is prevented by the sloughing off or wasting away of the ablative material as it absorbs the heat. We define the term *sloughing* as an action of discarding or casting aside. As ablative material is cast off, heat energy is dissipated, and the RV does not become excessively hot. Naturally, some ablative material is sacrificed in this manner, but engineering and design techniques allow for this loss. There are two RVs within the US stockpile: MK12A RV and MK21 RV.

MK12A RV

The MK12A RV is a major assembly of the MK12A reentry system (RS). It is mounted on the RS payload support covered by the shroud assembly (fig. 1-3). The RV consists of three basic sections:

1. Forward section.
2. Mid section.
3. Aft section.

The three sections of the RV are connected by two threaded/breeched joints. The external surfaces of the RV are composed of carbon-phenolic ablative material with the exception of the central portion of

the aft section, which is protected with elastomeric material, and the nose-tip assembly of the RV is protected with carbon-carbon material.

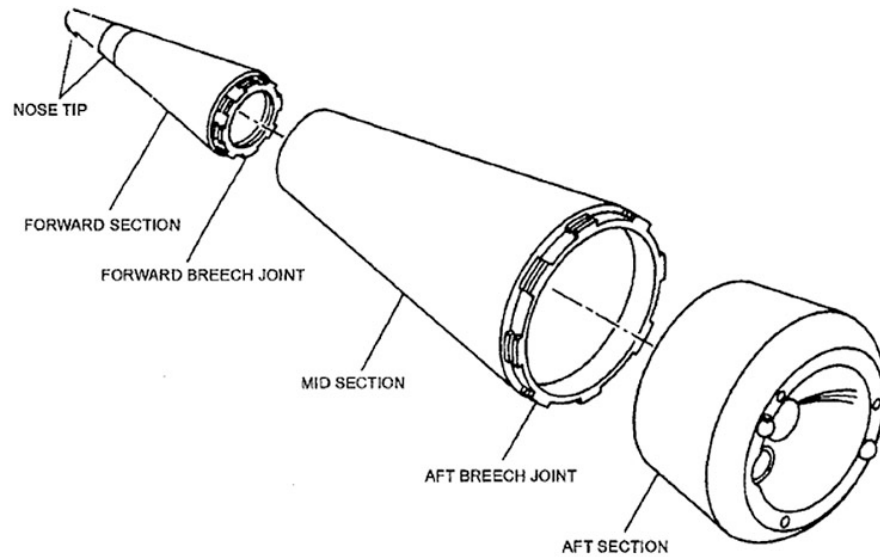


Figure 1-3. MK12A RV assemblies.

Forward section

This section consists of the nose-tip and forward section assembly, arming and fusing assembly (AFA), and high impulse transducer (HIT). The forward section assembly is a bonded assembly of an aluminum alloy machined forging and carbon-phenolic ablative material used to house the AFA, associated electrical harness, and HIT. The AFA is covered with a rubber cushion and fits snugly into the frustum behind the HIT. The assembly is held in place by a support ring, which is attached to the AFA and is keyed to prevent rotation of the assembly. Cable W1F is a part of the forward section and provides interconnection to the mid section.

Mid section

This section consists of a shield and structure assembly, an antenna array, and WH components. (**NOTE:** The Department of Energy (DOE) designation for this section is the *warhead*, which houses the W78 warhead; however, the term *mid section* is used in place of warhead in the DOD technical manuals. Therefore, in this career development course (CDC), we will use these two terms interchangeably.)

The MK12A RV has breech joint threads at the forward and aft ends for the attachment of the mid section to the forward section and aft section respectively. The machined forging of the mid section is covered with a carbon-phenolic ablative material. The mid section contains two through cables and four external cables that interconnect the mid section to the forward section. Cables W1B, W1C, W1D, and W1E are part of the mid section and provide interconnection between the mid section and forward section.

Aft section

This section consists of a shield and structure assembly, a hot gas system, collar assemblies, an in-flight disconnect (IFD) plug, cables W3A and CF2437, and a generator. The shield and structure assembly is made of a machined aluminum alloy frustum with an aft cover constructed from sheet aluminum, carbon-phenolic, and elastomeric shield material. Mounted on the aft section are three collar assemblies, an IFD jack, two hot-gas system nozzles, and an access cover. The collar assemblies are screwed into the longerons at 120-degree (°) intervals. The collar assemblies and support fittings provide the means for securing and releasing the RV to and from the payload support.

All electrical connections to internal circuits of the RV are connected through the IFD jack. The two hot-gas system nozzles are secured to the aft section 180° apart by mounting nuts. The nozzles provide a means of discharging the hot gas causing the RV to spin, stabilizing it in its correct reentry angle.

MK21 RV

The MK21 RV is an advanced ballistic RV containing the DOE provided payload. A carbon-phenolic heat shield, bonded to an aluminum substructure with Silastic adhesive, thermally and structurally protects the RV. A breech joint for assembly, disassembly, and repair of RV and components is located at the section interface. The RV consists of three major parts or sections: a forward section, body section, and rear cover (fig. 1-4).

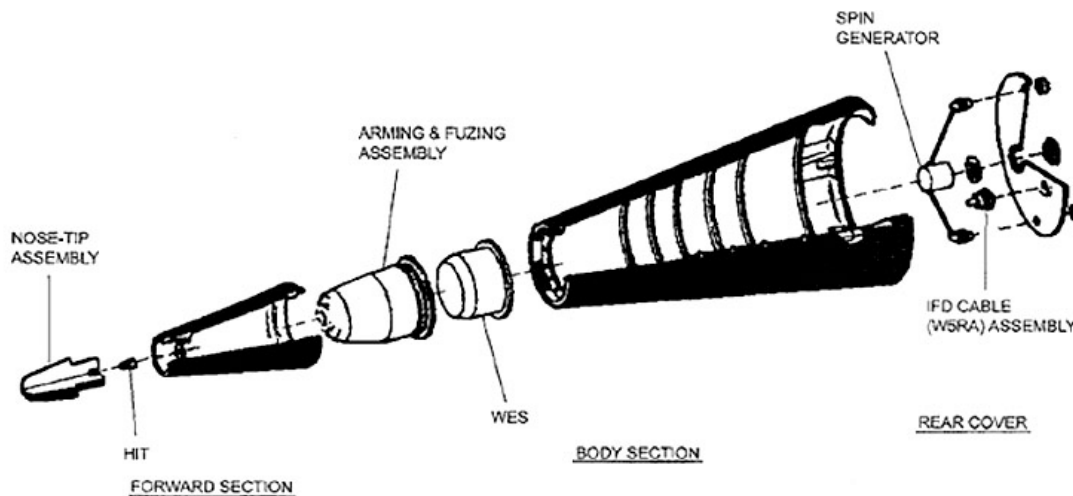


Figure 1-4. MK21 RV major subassemblies.

Forward section

This section is a hollow conical shell made of aluminum. In the forward position of this section is a detachable nose-tip assembly. A carbon-carbon material makes up the solid round tip of the nose with an aluminum collar bonded to the base for mating with the forward section. Six screws secure the nose-tip assembly to the forward section. The remainder of the section is designed to accommodate the AFA and a portion of the warhead electronics system (WES) that is structurally mounted to the body section, but protrudes into the forward section. A breech joint at the base of the forward section provides for secure attachment to the body section of the RV.

Body section

This section constitutes the largest section of the RV and is made of aluminum. There are S-band antennas mounted inside the RV body section, which are connected to the internal RV electronics by radio frequency (RF) cables. The antenna body is contained within an aluminum housing that provides the connection necessary to mate the RF cables. Diametrically opposite the RF connector is a tuning screw to permit adjustment of the antenna during electrical testing. The RF cables are manufactured from coaxial cable that is insulated and surrounded by tubular corrosion resistant steel that is preformed to an exact shape for internal routing. A breech joint is provided at the forward end of the body section for attachment to the RV forward section. Mounted inside the body section is a DOE-provided payload—the W87 and WES component. Located within the aft end of the body section are four antennas, each contained in an aluminum housing.

Rear cover

This section is an aluminum plate with an elastomeric heat shield material bonded to its exterior surfaces. It provides both rear access and closure to the RV. Mounted on the rear cover is the spin system, consisting of a spin gas generator and two delay initiators. An IFD cable assembly is also mounted on the rear cover and is used to carry electrical signals between the RS and internal electronics of the RV.

Emergency procedures

You may perform emergency procedures on either the RV mid section (or WH) following an incident/accident and before the explosive ordnance disposal (EOD) personnel arrive. You can locate specific procedures in the applicable –1 manual. Emergency procedures you must follow for a bare RV mid section (or WH) packaged in its respective shipping and storage container (H1224A for W78 or H1473 for W87) are as follows:

- Do *not* disassemble the WH.
- Do *not* apply electrical power to the WH.
- Do *not* connect or disconnect electrical cables.
- *Only* move the WH a limited distance provided the body section is intact with only minor exterior damage.

NOTE: When the weapon is connected to an external power source, such as an AFA, apply the procedures for a bare RV mid section (or WH); however, you must observe a mandatory wait period.

602. Common inspections

The two RVs have common inspections and handling procedures. It is important to stress that although the lessons are merged together, each of the specific procedures is contained within its respective technical manual: TO 11N–W78–1, *Assembly, Test, Maintenance, and Storage Procedures with Illustrated Parts Breakdown*; TO 11N–RV12A–2, *MK12A, MOD 3 Reentry Vehicle LGM30G (Munitions Facility)*; TO 11N–W87–1, *Assembly, Test, Maintenance, and Storage Procedures with Illustrated Parts Breakdown*; and TO 11N–RV21–2, *MK21 MOD 3 Reentry Vehicle P/N 125–51000–1 Textron Defense Systems*. (**NOTE:** Make sure you refer to the appropriate weapons manual before performing any procedures.) Below are typical inspections and handling operations identical to both RVs:

- Verification inspection.
- Receipt inspection.
- Preparation for storage and shipment.

Verification inspection

The verification inspection consists of visually inspecting the container contents to determine that the item is as described by the shipping document. The verification inspection is performed by removing the top half of the H1224A (or H1473), verifying the WH permanent marking serial number against the shipping document and electronic inspection record card (eIRC).

Receipt inspection

Once you've determined through the verification inspection process that you've received the correct WH, you must now perform a receipt inspection to determine the WH's condition. This involves visually inspecting all accessible and visible areas and evaluating all, if any, defects against established criteria according to the weapons manual. First, you must unpack the WH, or mid section, from its shipping and storage container and transfer it to the RV maintenance stand. In addition, you must inspect the shipping and storage container before repackaging the WH back into the container.

Preparing for storage and shipment

The last maintenance action we cover is preparation for shipment. First, inspect and repair the shipping and storage container, if needed, and make sure the WH is packaged correctly in the container, which will be covered later in this unit. Change the container markings reflecting the WH serial number and applicable alterations. Document the eIRC, package it in a mailing envelope, and mark the envelope with the appropriate classification. Place the envelope in a waterproof envelope and secure using filament-reinforced tape and 0.032-in. safety wire.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

601. Reentry vehicles summaries

1. How are “hardness critical procedures” identified in TOs?
2. What TO should maintenance personnel be familiar with that provides hardness awareness and preservation information?
3. What functions are RVs designed to do?
4. What materials may be used for the ablative heat shield?
5. What does the term “slough” mean?
6. How does slough work for the RV?
7. What are the three basic sections that makeup the MK12A RV?
8. How are the three sections of the MK12A RV connected?
9. What does the forward section of the MK12A consists of?
10. How does the DOE refer to the MK12A RV’s mid section?

11. What do the collar assemblies and support fittings of the MK12A RV's aft section provide?
12. What sections make up the MK21 RV?
13. How is the nose-tip assembly secured to the forward section of the MK21 RV?
14. What does the antenna body within the aluminum housing of the MK21 RV provide?
15. What emergency procedures must you follow for a bare RV mid section packaged in its respective shipping and storage container following a WH incident or accident and before the arrival of EOD personnel?

602. Common inspections

1. What does the RV verification inspection consist of?
2. Once a verification inspection is completed, what do you perform?

1-2. W78/MK12A Reentry Vehicle Procedures

The W78 is the mid section of the MK12A RV and designed to be installed in the Minuteman III weapon system. In this section, we discuss the procedures unique to this weapon system.

603. W78/MK12A inspection and cleaning procedures

Now, we'll discuss the inspection and cleaning procedures applicable to the W78/MK12A RV. Acceptable defects or differences include identical components (manufactured at different times) that vary in surface appearance and minor manufacturing defects in surfaces such as the following:

- Minor surface irregularities.
- Discoloration from welding heat.
- Tooling marks.
- Molding impressions.

Inspecting MK12A RV components

TO 11N-RV12A-2, tables 4-1 through 4-5, contains all inspection criteria for the RV components. The following paragraphs list some major inspection points but are not all-inclusive. As a general requirement, you must clean as soon as practical the carbon-phenolic and carbon-carbon surfaces after they have been contaminated by foreign matter. Contacting the heat shield, nose-tip assembly,

and antenna windows with clean gloves or cleaned equipment does not constitute contamination. Refer to the weapons-specific TO for exact requirements.

Forward section components

In the forward section area, inspect the cable W1F for any rips, tears, or cuts in sleeving and make sure the potting compound does not contain voids that extend completely through to the wire or connector ends. Replace cable W1F if any of these are present. Re-mark cables that are illegible with permanent ink. Inspect the HIT cable for rips, tears, or cuts in sleeving using magnification. Reject the forward section if any of the damage exceeds the criteria, but if the damage does not exceed the criteria, have it repaired as authorized. Certain electrical connectors contain a gap in the ground fingers at the major keyway. This condition is an acceptable condition provided its width does not exceed that of two ground fingers. Inspect for the presence of safety wire and replace it if it's broken or missing. Inspect the carbon-carbon nose-tip assembly for nicks, pits, and scratches. Reject the nose-tip assembly if it contains chips. Inspect the nose-tip assembly carbon-phenolic collar for nicks and pits; reject it if more than two defects occur within 5.0 inches (in.) of each other. Inspect the AFA aft cover assembly for damage. Replace the forward section if the AFA aft cover assembly contains nicks, scratches, gouges, pits, chips, and dents that exceed 0.010 in. in depth. Using Type I Organic Finish, refinish the zinc chromate finish on the inside of the forward section if defects expose bare metal.

Mid section components

In the mid section area, inspect the electrical connectors for dust, dirt, or foreign matter and clean as necessary according to the instructions in TO 11N-35-51, *General Instructions Applicable to Nuclear Weapons*. If any connector pins are bent aside a pin diameter (or less), you must attempt a connection with the mating connector. If mating is difficult, replace the mid section or cables. If mating is accomplished, the mid section and cables are usable. Inspect the forward bulkhead for the presence of safety wire; reject the mid section if the safety wire is missing or damaged. Next, inspect the antenna window twice for cracks, fractures, or surface defects with measureable defects. First, inspect the window while it's *dry*; second, dampen a clean cloth with isopropyl alcohol and wipe the antenna window. Now inspect the antenna window again before it dries for the same defects. As alcohol dries, cracks appear as irregular dark lines in the antenna window. Inspect the antenna window for edge defects, and then inspect the antenna insulator carbon-phenolic surface for pits, nicks, gouges, and chips. Multiple defects with depths greater than 0.008 in. are causes to reject the mid section. You must report defects via unsatisfactory report channels. The report must contain defect dimensions, spacing between defects, and locations. Any internal voids or bubbles in the fused silica glass have been screened during production and, therefore, are acceptable.

Aft section components

Inspect carbon-phenolic surfaces, setscrews, limited life components (LLC), hot-gas generators, and connectors of the RV aft section. Also, inspect the IFD connector and elastomeric material on the rear of the aft section. Use table 4-4 and the 11N-W78-1 technical manual for specific inspection criteria.

MK12A cleaning and repairing procedures

After being contaminated by foreign matter, the carbon-phenolic and carbon-carbon surfaces of the RV must be cleaned as soon as practical. Remember that contacting the heat shield, nose-tip assembly, and antenna windows with clean gloves or cleaned equipment does not constitute contamination. Use the following procedures to clean and/or repair surfaces.

Forward section surfaces

To clean the carbon-carbon, nose-tip assembly, first remove the protective boot, dampen a clean cloth with isopropyl alcohol, and wipe the contaminated area. (**NOTE:** If you *cannot* remove discoloration or contamination, repeat cleaning using acetone instead of isopropyl alcohol.)

Forward, mid, and aft section

If you notice foreign matter on the carbon-phenolic material, you must clean it as soon as practical. First, dampen a clean cloth with isopropyl alcohol and wipe the contaminated area. (**NOTE:** If you *cannot* remove discoloration or contamination, repeat the process using acetone instead of isopropyl alcohol.) If foreign matter is still present, use aluminum oxide finishing paper 320-grit to lightly abrade the contaminated area and reclean using isopropyl alcohol. Remember, this step is used once per contaminated area during RV initial buildup, and, if required, only once during each recycle. The contaminated area is then considered acceptable.

The breech joint threads are cleaned with a clean cloth dampened with isopropyl alcohol, and the same applies to removing lubricant from thread-fraying surfaces. (**NOTE:** Do *not* allow solvent to run down the sides of the RV). Lubricate the breech joint thread afterwards by applying a solid film lubricant and allow five minutes for air-drying. (**NOTE:** Do *not* allow the lubricant to contaminate area “C” of the breech joint threads.)

Repair any burrs or deformation using a fine file to redress the damaged areas. Clean the area where the repair occurred with a clean cloth moistened with isopropyl alcohol. Then use a natural bristle varnish brush to apply Alodine 600 to damaged areas and allow it to remain on the surface for 15 to 30 seconds. Afterwards, rinse with clean water and allow it to air-dry for two hours before lubricating or mating breech joints.

Repair any corrosion found by abrading it with aluminum wool on the corroded area. Clean the abraded area with a clean cloth moistened with isopropyl alcohol. Next, use a natural bristle varnish brush to apply Alodine 600 to the abraded areas and allow it to remain on the surface for 15 to 30 seconds. Afterwards, rinse with clean water and allow it to air-dry for two hours before lubricating or mating breech joints. (**NOTE:** Do *not* allow water to run down the sides of the RV.)

Install/remove breech joint setscrews

To remove a breech joint setscrew, locate the setscrew decal on the aft section. Insert a $\frac{3}{32}$ -in. hex adapter into the breech joint setscrew port and into the setscrew. Rotate the setscrew clockwise until it clears the breech joint and remove the setscrew. To install a breech joint setscrew, insert the hex adapter through the breech joint setscrew port and into a breech joint setscrew. Rotate the setscrew counterclockwise until it bottoms in the insert, approximately $10\frac{1}{2}$ turns from the initial installation point, and then turn the setscrew one full turn clockwise to make sure it's not jammed in the retracted position. Use care to avoid excessive force when bottoming a setscrew in an insert because you could damage the equipment. Next, check the locking feature of the breech joint setscrew by turning the setscrew clockwise using the hex adapter and a torque wrench. If the setscrew moves with 2 inch-pounds (in-lb.) of applied torque, replace the setscrew. If the setscrew fails to move with 5 in-lb. of applied torque, take out the setscrew and remove some of the nylon-locking feature. Reinstall the setscrew and check the locking feature until it passes. Make sure the setscrew is clear of the breech joint. If it is not, rotate the setscrew counterclockwise until clear.

Install/remove threaded ring and protective cover

The protective cover and threaded ring may be removed as one assembly. We will cover installing each one independently. To prevent damaging components, always observe proper clearances when you remove or install the ring or protective cover. Lower the aft ring onto the mid section and slowly turn the aft ring onto the breech joint threads until seated. While holding the eyebolts in the aft ring, turn the ring as tight as possible with a steady pull. You are not allowed to snap the ring into place. Apply dry film lubricant to the taper and threads of the cap screws. Let dry for 30 minutes. Carefully position the protective cover over the aft ring, align the screw holes, and start the cap screws by hand. Torque the cap screws to 70 ± 10 in-lb. To remove the protective cover and threaded ring, reverse the process. Loosen and remove the cap screws and lift the protective cover straight up off the mid section. Using your hands or the H556 handle set, rotate the aft ring until it is free from the breech joint threads, and then remove the aft ring.

Replace locking screw inserts

If you have to replace a locking screw insert, you will request the insert and installation tool from the Ogden Air Logistics Complex (OO-ALC). When you install the removal tool, use extreme care so you will not damage the mid section carbon-phenolic surface. After installing the removal tool, slowly turn the removal bolt until you break the screw insert seal. Remove the insert and any bonding material, then lightly sand the area and wipe the area clean with acetone. Let the area air-dry for 15 minutes. Measure out the adhesives part A and B by weight and mix thoroughly. Apply adhesive to the insert and interior cavity, and then using the installation tool, slide the insert into place. Keep any excess adhesive from getting into the carbon-phenolic hole opening. Let the adhesive cure for seven days.

Replace decals

First, remove the old decal by breaking the seal at one corner of the decal and slowly remove the decal. Clean the area using a disposable wipe dampened with isopropyl alcohol, and then inspect the area from where you removed the decal. If the decal you are using to replace the old decal does not have an adhesive backing, apply a small amount of Scotchcal to the back of the decal and press the decal into place. Each decal has stringent placement requirements. Refer to TO 11N-RV12A-2 for proper placement.

Replace W1B/W1E cables

The RV's W1B and W1E cables are disconnected from the mid section only during fault isolation or when defective. You must follow the HCP when replacing these cables.

NOTE: Remember, all HCP steps must be performed exactly as given in the TO.

Install the aft ring (with eyebolts) onto the mid section aft end. Next, attach the beam sling to the hoist, position the beam sling over the mid section and attach the beam sling to eyebolts with quick-release pins. Raise the hoist until the beam sling cables have very little slack. Make sure the sling is attached to the aft ring, and then on the front of the mid section, loosen the jackscrew knobs, which secure the mid section to the RV assembly stand, and remove the quick-release pins to the safety retaining ring. Remove the safety retaining ring from the mid section. While keeping the connector face(s) parallel, disconnect the W1B and/or the W1E cable(s) from the mid section and install protective caps. To connect the cables, reverse the procedures. A special strap wrench may be used to disconnect or connect the W1B/W1E cables. If you use the wrench, do not overtighten the connectors because you may damage the connectors or equipment.

Removing/installing W3A cable and access cover

The procedures for removing and installing the W3A cable are HCP. Remember to follow the steps identified as HCP exactly as given. To remove and install the W3A cable, the RV aft section needs to be in the aft section adapter. Touch the metal structure of the aft section to discharge static electricity, disconnect the W3A cable from the gas generator, and install the shielding cap. Remove the cable clamps then reposition the aft section so you can hold the IFD connector in position while you loosen the locking ring. Remove the locking ring and W3A cable from the aft section, remove and discard the interface gasket, and remove the IFD installation tool.

To install the W3A cable, place the aft section in the horizontal position. Install the IFD installation tool on the W3A cable. Install a new gasket and cable until it engages the slots in the bracket and is seated against the connector hole. Install and torque the lock ring, remove the IFD installation tool, then position the aft section with the aft end facing down, and install and torque the cable clamps on the W3A cable. Make sure the vehicle installation stripe on the W3A cable is located in the correct position. Finally, touch the metal structure on the aft end, remove the shielding cap from the gas generator, and connect the W3A cable.

To replace the access cover, place the aft section with the aft end facing up. The access cover is located directly in the center of the aft section. Using a wrench and spin generator torquing adapter, remove the cover. To install the access cover, reverse the steps then torque the cover to 144 (± 36) in-lb.

604. W78/M12A handling procedures

In this lesson, we'll discuss the handling procedures involved with the MK12A RV and W78 WH. It is important to stress that although this lesson provides procedural steps in performing the operation, the governing procedures are contained in TO 11N-W78-1 and 11N-RV12A-2. Make sure you refer to the appropriate weapons manual before performing any procedures. The following are typical handling operations for the W78 WH/mid section:

- Unpack and package WH in H1224A.
- Transfer mid section to/from RV maintenance stand.
- Transfer WH in H1224A to/from lift vehicle.

W78 transfer and transport procedures

The following procedures pertain to the handling operations of the W78. (**NOTE:** Personnel must *not* use the carbon-phenolic or carbon-carbon surface as a guidance point *except* when directed by technical [tech] data.) If tech data directs contact with carbon-phenolic or carbon-carbon surfaces, personnel must wear clean gloves to prevent contamination. This prohibition does not apply to the elastomeric material located in the RV aft section.

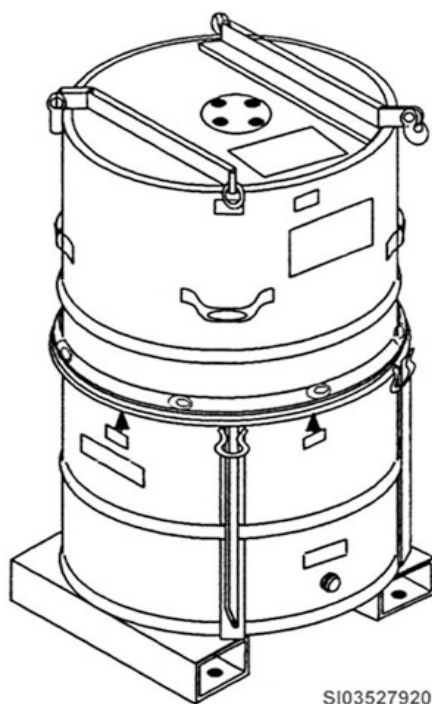
Unpack warhead from H1224A

Transfer the WH from the H1224A (fig. 1-5), the only authorized container for shipping and storing the W78, to the RV maintenance stand by performing the following steps:

1. Remove the top-half of the H1224A shipping and storage container.
2. Remove the WH from the H1224A by connecting the HLU-121/E beam-type sling according to the -1 procedure.

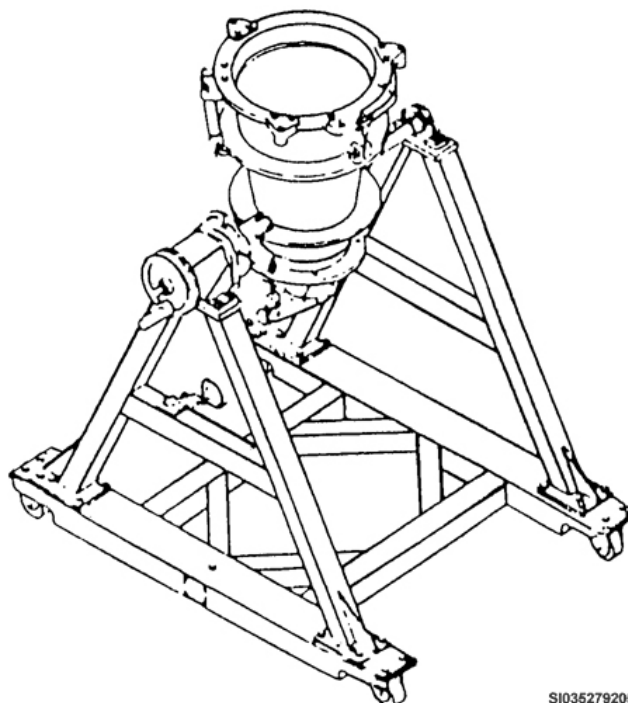
Transfer mid section to RV maintenance stand

Verify the RV maintenance stand (fig. 1-6) cradle is in the nose-down position and position the mid section over the cradle. Make sure the jackscrew hand knobs and friction release nuts are loose. Align the arrow alignment marks on the mid section with the bar alignment mark on aft end of the cradle. You can make final adjustments when you lower the mid section into the cradle until the forward end of the mid section protrudes from the forward end of the cradle. Seat the mid section into the cradle. Properly align the safety retaining ring and install it onto the mid section. Make sure that when you are aligning the safety retaining ring that you observe the $\frac{1}{4}$ -turn restriction when aligning jackscrew yokes. Once you install the safety retaining ring, create a friction load between the mid section and cradle by turning both jackscrew hand knobs simultaneously. Tighten the jackscrew friction release nuts and remove the sling.



SI035279203

Figure 1-5. H1224A shipping and storage container.



SI035279205

Figure 1-6. Mid section installation into RV maintenance stand.

Package mid section in H1224A

Before you pack the mid section into the H1224A shipping and storage container, first install the H1223B aft ring and protective cover on the mid section according to the weapons manual. Attach the HLU-121/E sling cables to the ears of the H1223B protective cover and secure with quick-release pins. Raise the hoist until the lifting cables have very little slack. Loosen the jackscrew knobs securing the mid section to the RV maintenance stand. Use two $\frac{3}{4}$ -in. wrenches at the same time and tighten the jackscrew friction release nuts until the mid section is freed from the cradle. Now, loosen the jackscrew friction release nuts. Then remove the quick-release pins securing the jackscrew yokes to the safety retaining ring and remove the safety ring from the mid section. Lift the mid section by hoist from the RV maintenance stand and package it into the H1224A container using procedures in the weapons manual.

Transfer warhead in H1224A to/from lift vehicle

Once the W78 WH is packed in the H1224A, the WH can be transported using a forklift. The forklift tines must be inserted into the forklift channels of the H1224A for transportation. Also, ensure a nuclear certified tie-down device (i.e., CGU-1/B cargo straps) is used to secure the H1224A to the forklift.

CAUTION: The strap could loosen from the tie-down point; therefore, do *not* use nylon tie-down strap if the safety latch is missing. Failing to comply could result in damage the equipment.

Install the nylon strap by attaching the fixed hook to the appropriate location to prevent damaging the container during the tightening process. You must repair any damage to the container; therefore, use care in determining the attachment points. Also make sure the adjusting mechanism has at least one-half wrap of strap on the take-up spool (measured after initial webbing-to-webbing contact) to ensure the strap cannot be pulled through. Once the strap is connected to two connection points (it can be connected to itself weaved through the forklift cage), use the ratcheting mechanism to tighten the strap securely. Leave the ratcheting lever in the closed position and secure the loose ends to a tightened portion or to another convenient fixture using suitable material. The H1224A is ready to be

transferred. Depending on the location and condition of the floor surfaces, wheeled pry bars and/or pallet jacks may be used in lieu of forklifts to maximize time.

MK12A transfer and transport procedures

The following are handling procedures for the MK12A RV. Alignment marks on the RV and support equipment are used to aid maintenance personnel. There are six alignment marks on the RV and four on the support equipment.

Transfer RV to/from RV maintenance stand

Remove one self-sealing screw from the storage hole in each torque pin and retain the screws. Remove the RV hardpoint plugs and install one self-sealing screw in each plug and torque to 12 (+3, -2) in-lb. Attach the shackle to the hoist and attach the shackle to the forward section sling. Lift the forward section sling over the RV maintenance stand cradle and RV maintenance stand yoke. Lower the forward section sling and align the jackscrews with the support ring pins; insert quick-release pins. Remove three bolts and washers. Turn two torque pins until the tips of the pins are retracted below the rubber blocks. Loosen the jackscrew hand knobs. Using hoist and manual guidance, lift the RV maintenance stand cradle and the forward section sling clear of the RV maintenance stand. Position the forward sling and RV maintenance cradle over the RV and align the RV maintenance stand cradle alignment mark bar with the alignment mark bar on the aft end of the mid section. Slowly lower it onto the RV. With the weight off the maintenance stand cradle, look through the cutouts in each half of the forward section sling covers and carefully align the torque pins with the RV hardpoints. Manually tighten the torque pins until they are bottomed and the red bands are not visible. Back off either one of the torque pins one-quarter turn, then lock torque the pins in place by tightening the knurled jam nuts. Turn the jackscrew hand knobs until they are snug against the top of the RV maintenance stand cradle. Hand tighten the jackscrew release nuts. Loosen the tie-down assemblies, release the quick-release pins on the tie-down ring, and remove the four tie-down assemblies. Remove the tie-down ring by releasing the latch screw and slowly raise the RV clear of the pallet. Use manual guidance and position the RV adjacent to the RV maintenance stand and then guide the RV laterally into the RV maintenance stand yoke. Align the mounting bolt holes in the RV maintenance stand cradle with tapped holes in the RV maintenance stand yoke. While ensuring the shortest bolt is installed through the center hole of the RV maintenance stand cradle, install three bolts and flat washers securing the cradle to the yoke. Tighten the three bolts securely. Disconnect the shackles from the hoist.

Transfer RV to/from ball-lock installation stand

Place one support fitting (with the cutouts facing inward) on each standoff of the ball-lock installation stand (fig. 1-7). Loosely install three bolts and washers in each support fitting. When using after safety enhanced reentry vehicle (ASERV) procedures, make sure the support fittings are installed in the inner positions and only support fittings marked "MOD" are used. Attach the forward section sling shackle to the hoist, and then attach the shackle to the forward section sling. Remove the three bolts and washers securing the RV assembly stand cradle to the RV assembly stand. Lift the RV (in the RV assembly stand cradle) slightly, and then move the RV away from the RV assembly stand. Position the RV above the three support fittings with the matchmark on the RV aligned with the 180° matchmark on the ball-lock stand. Again, verify the proper position of the support fittings, then lower the RV until it is firmly seated on the support fittings. Finally, torque all the bolts and washers to 55 (± 10) in-lb.

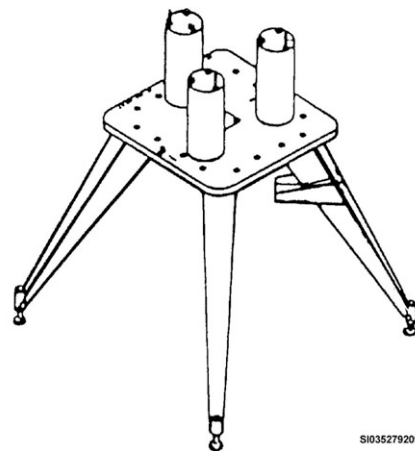


Figure 1-7. Ball-lock installation stand.

Transfer RV to/from RV storage stand

Attach the shackle to the hoist and the forward section sling. Remove the three bolts securing the RV assembly stand cradle to the RV assembly stand. Raise the RV approximately $\frac{1}{2}$ in., and then move the RV laterally so the cradle will clear the RV assembly stand. Position the RV over the RV storage stand and align the mark on the RV with the alignment bar mark on the RV pallet. Make sure you position the spherical inserts properly or you could damage the equipment. Lower the RV until it is on the spherical inserts and RV pallet supports. Place the tie-down ring around the RV, aligning the mark on the ring with the RV alignment mark, and finger tighten the tie-down ring latch screw hex nut. Secure the tie downs to the ring and pallet (yellow band mark on the tie-down assemblies in the forward position), and manually tighten the turnbuckles while keeping the tie-down ring parallel to the pallet. Loosen the RV from the assembly stand cradle and retract the torque pins until they are flush with the support ring. Hoist the RV cradle clear of the RV.

Transport RV on pallet using forklift

Prior to transporting the RV on a pallet, wrap all exposed surfaces of the RV with polyethylene sheet and tape it closed. If you have not already done so, secure the four RV storage stand tie-down assemblies to the tie-down ring with quick-release pins. While manually tightening the tie-down assembly turnbuckle, keep the tie-down ring parallel with the RV storage stand. Align the forklift tines with the slots of the storage stand and insert the tines. Secure the RV storage stand containing the RV to the forklift with the wire rope assemblies. Raise the tines and transport the storage stand and RV. When you are at the designated area, lower the tines until the storage stand is on the floor. Remove the wire rope assemblies securing the stand to the forklift, and carefully back the forklift away until the tines are clear.

Transfer RV on storage stand (pallet)

When transferring the RV on a storage stand, verify that the RV mating and handling sling lockpins are fully engaged with the red band *not* visible prior to installing the RV and handling sling on the RV. Using the overhead hoist, lift the RV clear of the stand. Position the RV over the RV pallet; orient the 0° mark on the RV 180° opposite the mark on the RV pallet. Lower the RV onto the pallet (fig. 1-8), install the tie-down ring, and secure the RV. Attach four turnbuckles (yellow band up) to the tie-down ring and pallet base. Manually tighten the turnbuckles while making sure the tie-down ring is parallel to the RV pallet. Fully retract the RV mating and handling sling lockpins (red band visible), then slowly hoist the mating and handling sling from the RV.

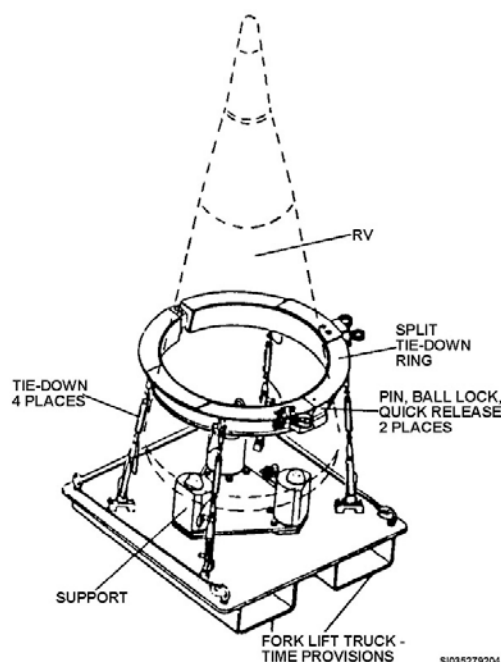


Figure 1-8. RV pallet installation.

Transfer forward section to/from shelf hand truck

To transfer the forward section to or from the shelf hand truck, loosen the yoke assembly knobs and remove the quick-release pins. Position the forward section sling spanner wrench on the support ring pins, tighten the retainer screws, and then back them off approximately $\frac{1}{2}$ turn. Attach the forward section sling spanner wrench to the hoist and carefully lift the forward section clear of the support stand. Lower the hoist so you can install the sling cover onto the support ring with the cap screws. (NOTE: This is a two-technician operation.) Once you install the cover, position the shelf hand truck under the forward section. Extend the two legs nearest the alignment mark and lock them in place. While lowering the forward section onto the shelf hand truck, position the alignment mark so it faces the shelf hand truck. Remove the hoist and spanner wrench and transport the forward section on the shelf hand truck to the maintenance area.

605. W78/MK12A maintenance procedures

Upon removal and until reinstalled or packaged, all RV components are placed on clean, padded surfaces to prevent inadvertent damage. This requirement does not apply to attaching hardware. We will discuss RV disassembly procedures, limited life component exchange (LLCE), and RV assembly procedures. Let's start with RV disassembly procedures.

RV disassembly procedures

The RS installation kit needs to be removed by first removing the cable W4A, removing the support fittings, and transferring the RV to the RV maintenance stand. Next, the forward section needs to be removed from the mid section by installing the aft section adapter.

Removing forward section

First, to remove the forward section, make sure that the bolts securing the RV maintenance stand cradle to the RV maintenance stand yoke are installed and tightened securely. Use the handwheel to rotate the RV to a nose-down position.

CAUTION: Avoid excessive force when bottoming setscrews in the insert because failing to comply may cause damage to the equipment.

Break the initial torque and back out the breech joint setscrews at least $3\frac{1}{2}$ turns, but no more than four. Loosen the three quick-release pin locknuts on the aft section adapter and withdraw the quick-release pin to the storage position in each pad. Manually align the bar matchmark on the radial housing with the bar mark on the aft section. Using a two-person lift, simultaneously align the three spherical inserts on the aft section adapter with the three aft section collar assemblies and lower the aft section adapter until it's seated. Insert a quick-release pin and hand tighten the three quick-release pin locknuts until the pins are firmly seated. While maintaining positive control of the hand knobs and retractable shafts, unthread the hand knob from each of the three retractable shafts in the aft section adapter. Slide each retractable shaft through the associated torque rod bracket. Screw the hand knob on each retractable shaft and hand tighten. Torque the three quick-release pin locknuts to 40 (± 10) in-lb. Remove the beam sling cables from the aft section adapter. Continue operations with repositioning the RV in the RV maintenance stand cradle, opening the forward breech joint, disconnecting the cables, and then transferring it to the shelf hand truck.

Removing aft section

First, open the aft breech joint by using the handwheel to rotate the aft and mid section assembly to the nose-down position. Attach the hoist to the HLU-121/E beam sling, and position it over the aft section. Attach the sling cables to the hoisting lugs. While maintaining positive control of the hand knobs and retractable shafts, unthread the hand knobs of retractable shafts securing the aft section adapter to the RV maintenance stand cradle. Thread the hand knobs on opposite ends of the retractable shafts in the aft section adapter. You should hand tighten hand knobs against the aft flange of the aft section adapter. Remove two bolts from the torque unit bracket. Place the breech joint torque unit on the aft flange and slide the torque pin that is located on the safety retaining ring of the aft section adapter into the breech joint torque unit uniball bearing. Position the breech joint torque unit over the attachment holes on the torque unit bracket and tighten securely with two bolts. Loosen the aft breech joint by applying counterclockwise torque. Remove two $\frac{3}{4}$ -in. head bolts securing the breech joint torque unit to the aft flange. Remove the torque unit, reinstall the two bolts, and restore the torque pin to the storage position. Rotate the aft section by hand until the arrow alignment marks are aligned, and then use the procedures in TO 11N-RV12A-2 to disconnect the aft section cables. Once complete, use the hoist to raise the aft section from the mid section until it is clear of components and attaching parts. Place the aft section on the designated location and remove the sling.

Limited life component exchange

LLCE is usually part of the RS recycle. Before you exchange any parts or LLCEs, unpack, inspect, and inventory all replacement parts. Once you do this, make sure the parts are the correct ones for replacement. Perform a verification inspection. You will inventory the new items by verifying the major component number, part number, serial number, and manufacture date. During your inventory, you will also inspect the exterior of the items for any damage that may have occurred during shipment. Besides replacing the LLC itself, you will also replace certain items of common hardware. These specified items are packaged in the Group X kit. You identify the particular kit you need for a specific weapon by part number. You must have this kit before you begin the LLCE. Unpack the kit and inventory the items, but keep all the items in their original container until you are ready to use them. Make sure all pertinent data is recorded or written down. You will need this information for all the paperwork you must complete. Unpack and package any components and perform LLCE procedures according to the -1 manual. If applicable, make sure you perform the proper tritium monitoring.

RV assembly procedures

During assembly, if it is necessary to clean components before you install them and when no specific procedures are provided, simply clean the components by wiping them with clean disposable wipes dampened with isopropyl alcohol. Allow the cleaned surface to air-dry until all visible traces of isopropyl alcohol have evaporated.

Installing the aft section

Install the aft section adapter on the aft section. Secure the adapter by inserting three quick-release pins into the collars of the aft section and then torquing the locknuts. If you were performing an initial build, you would install the hot-gas generator and initiator (already tested and inspected) now. Using an overhead hoist, position the aft section over the mid section and connect the remaining W3A pigtails to the mid section connectors (fig. 1–9). Before connecting to the LLC, ground yourself to the aft section and mid section to discharge any accumulated static electricity.

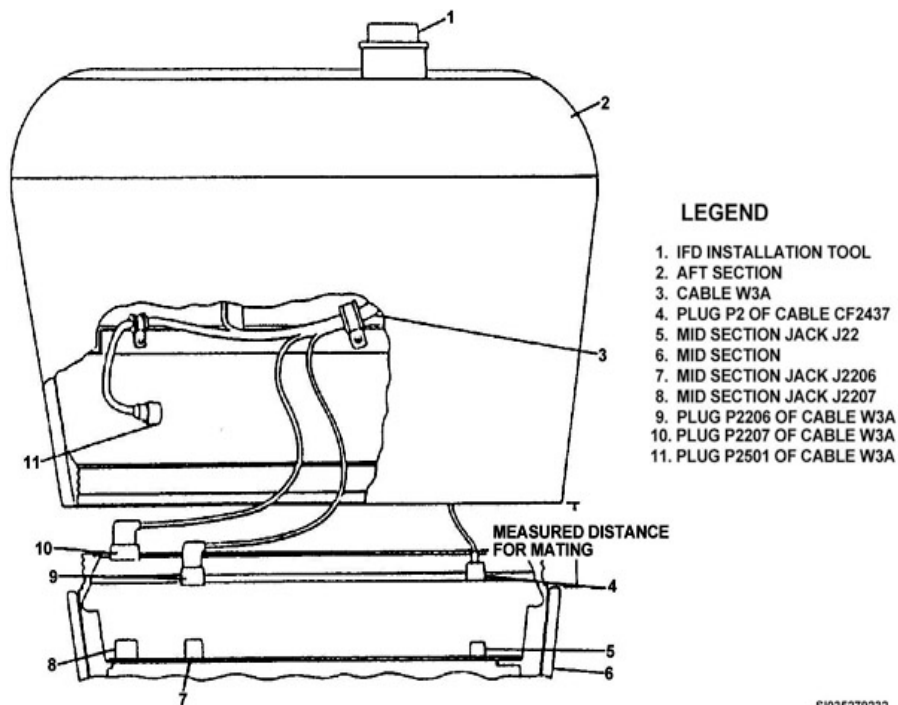


Figure 1–9. MK12A aft section cable routing.

While ensuring the alignment marks match, lower the aft section onto the mid section and engage the breech joint threads. Secure the torque unit to the RV cradle and the aft section adapter. Now torque the breech joint to 410 ± 15 in-lb. To check for proper fit, try to insert a 0.004-in. feeler gauge at 12 equally spaced locations around the aft breech joint. Check to see if you can insert the feeler gauge further than 0.5 in. at each location. The fit is acceptable if you *cannot* insert the gauge more than 0.5 in. in four consecutive locations. If the aft section fails the inspection, remove it and re-lubricate the breech joints.

Now, attach the aft section adapter to the RV cradle aft flange to hold the mid section in the cradle. Rotate the cradle to a nose-up position and remove the safety retaining ring. You are now ready to mate the forward section.

Installing the forward section

Transfer the forward section from the shelf hand truck using the facility hoist and shackle. Position the forward section over the mid section and connect all of the cables (fig. 1–10). Connect them in this order: W1E, W1B, W1F, W1D, and W1C.

CAUTION: You must connect the W1E and W1B cables *before* you connect the W1F cable. The W1F cable connects to the firing system. If you connect it earlier, you could injure yourself or damage the RV.

Additionally the W1D and W1C cables are identical and easily confused. To connect them correctly, double-check the cable identification labels.

While ensuring that the cables are properly routed, lower the forward section and engage the threads of the breech joint. Install the forward section spanner wrench and the breech joint torque adapter and torque the breech joint to 350 ± 10 in-lb. (fig. 1-11). Now check for proper fit using a 0.002-in. feeler gauge at 12 different locations. The fit is acceptable if you *cannot* insert the gauge more than 0.5 in. in four consecutive locations. Rotate the RV nose down and remove the aft section adapter. Torque the aft section and mid section setscrews and rotate the RV back to a nose-up position. The RV is now ready to transfer to a storage pallet/stand or to the ball-lock installation stand.

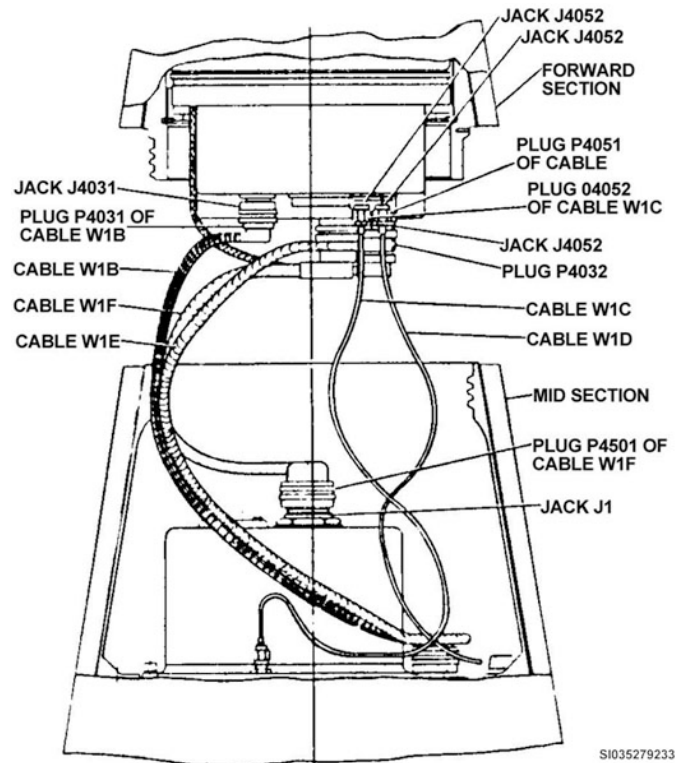


Figure 1-10. MK12A forward/mid section cable routing.

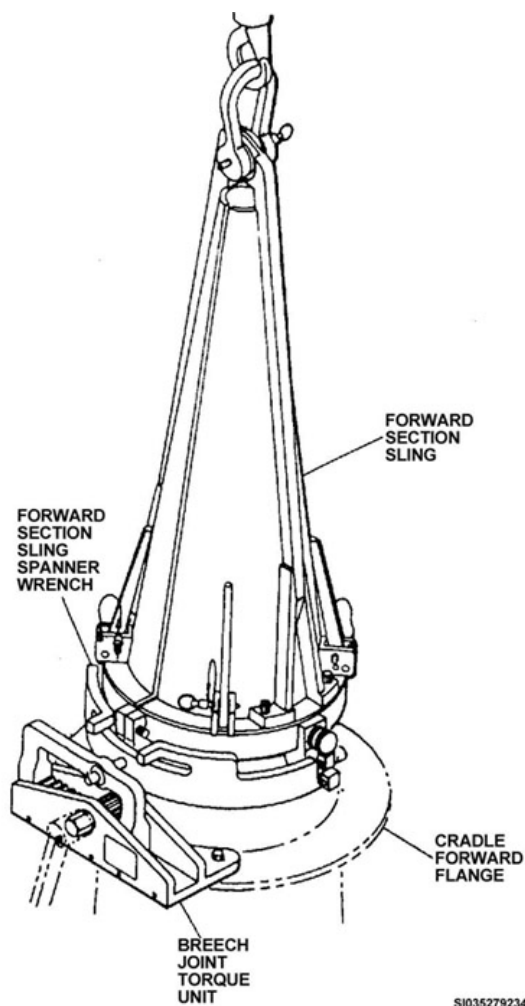


Figure 1-11. Forward section breech joint torquing.

In the rest of this lesson, we discuss how to install the RS installation kit components and the two chaff dispensers. These steps will prepare you for final RS assembly and transfer.

Installing the RS installation kit

There are several components in the RS installation kit: support fittings, zero-impulse bolts (ZIB), pressure cartridges, and the W4A cable.

Support fittings

Position the three support fittings on the ball-lock alignment maintenance stand (cutouts facing inward) and loosely install their bolts. Using the hoist connected to the RV sling, transfer the RV over the ball-lock installation stand. Verify the alignment marks (those on both the stand and RV) match and lower the RV on the support fittings. Seat it firmly on the RV collars and tighten the support fitting bolts.

ZIBs

As you perform each step for a ZIB, you must repeat it for the other two ZIBs. Position the ZIB inside the support fitting. Insert the retraction tool into a cartridge port (curved tip down) and close the handles to retract the ball-lock piston. Insert the ZIB through the support fitting into the RV collar. Release the handles, remove the tool, and finger tighten the ZIB nut. Thread the restraining tool into the right cartridge port and rotate the assembly to the right until the restraining tool handle touches the edge of the support-fitting cutout.

Using the spanner wrench and a torque wrench, torque the ZIB nut in increasing increments of 100 ± 10 in-lb., 200 ± 10 in-lb., and 300 ± 10 in-lb. Using a dial-indicating torque wrench and the spanner wrench, back the ZIB nut off to 130 ± 10 in-lb. Finally, retorque the ZIB nut to 185 ± 10 in-lb. This procedure is a little elaborate, but is necessary to ensure the bolt is seated properly and the collar or bolt is not defective.

Pressure cartridges

Verify the cartridges have been inspected and tested. Before handling the pressure cartridge, remember to discharge static electricity. Install two cartridges in each ZIB assembly and finger tighten. After you install all the pressure cartridges, remove the shielding caps, torque, and reinstall the shielding caps. The final step is safety wiring the pressure cartridges to the ZIBs using 0.020-in. safety wire (fig. 1-12).

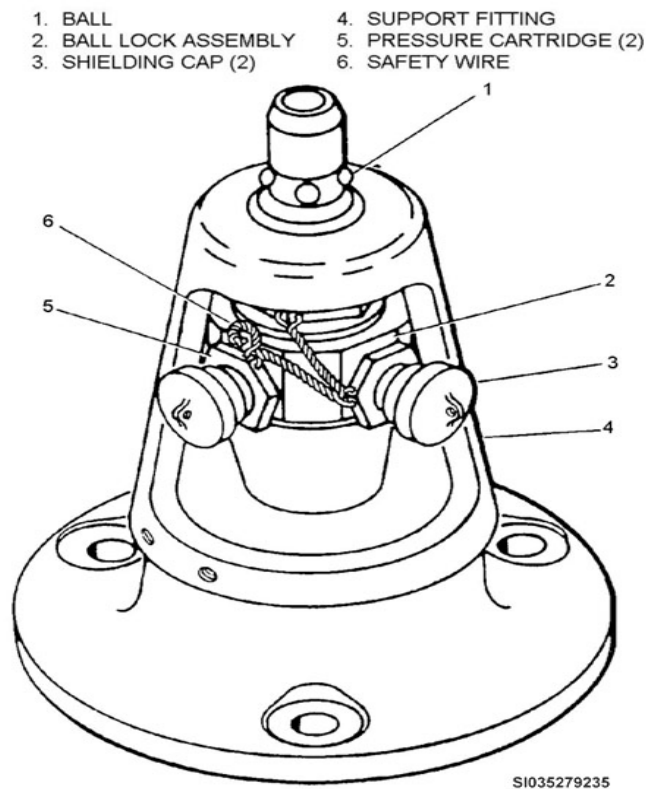


Figure 1-12. ZIB pressure cartridge installation and safety wire.

W4A cable

The RV's position on the payload support bulkhead determines the specific installation procedures for the W4A cable. Before connecting the RS installation kit W4A cable to the RV, verify the shielding caps are installed on the other end of the W4A cable. Turn the ARM/MATE nut (fig. 1-13) completely to the ARM position, and then turn the nut back $\frac{1}{4}$ turn and remove the protective cap. Momentarily touch the stand to discharge static electricity and remove the shielding cap on the RV connector. Mate the connectors, rotate the nut to the MATE position, and torque to 72 ± 10 in-lb. Measure the gap between the actuator and the nut to ensure the connection is made properly. The gap must be more than 0.2 in.

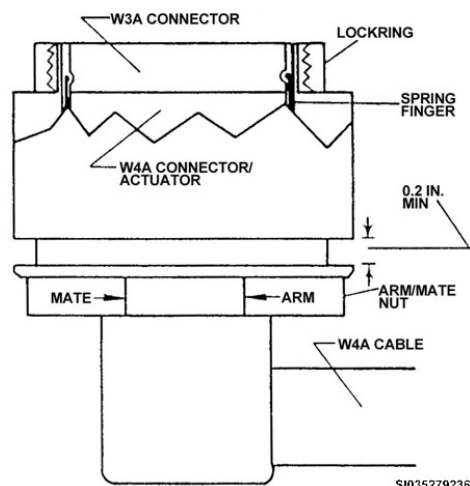


Figure 1-13. RV IFD connector.

606. W78/MK12A electrical checkouts

Fault isolation equipment cannot be used on a RV involved in an accident or incident. When a fault occurs during checkout and the technician is directed to a fault isolation table or procedure that contains a new cabling diagram, the technician should only make the connections shown on the fault isolation diagram. If the new cabling diagram results in cables left disconnected from the test set or aerospace vehicle equipment (AVE), this is permissible.

Test forward section for stray voltage

Use the explosive set circuitry test set (ESCTS) to check the forward AFA batteries for stray voltage by first performing a self-test on the ESCTS. Upon successful completion, perform a hazardous current check on the W3510 cable using cable ID 2FFFFFFF0. Perform the stray voltage test just before mating the forward section to the mid section. If a malfunction occurs during this test, reject and replace the forward section. Touch the metal structure on the forward section to discharge static electricity. Connect the test cable to the forward section and run the test steps. After successful completion of the test, turn off the ESCTS, touch the metal structure on the forward section to discharge static electricity, disconnect the test cable, and install the shorting plug on forward section.

Forward section using reentry system test set checkout

Use the reentry system test set (RSTS) to check out the forward section by first performing a self-check of the RSTS by attaching cables according to the figure identified in TO 11N-RV12A-2. Turn the test set on, and run the self-check. Tables provide procedural steps and what indications you receive on the test set. Certain steps during this test verify the ability of the test set to recognize faults. To perform checkout on the forward section, install it in the forward section support stand before performing the test. After the self-check is completed, attach the test cables to the forward section and run the test. If a malfunction occurs during the test, perform a self-check of the forward section continuity and isolation test circuits. If the self-check passes, refer to the fault indication table for fault isolation procedures. You will also run a self-check and checkout of the forward pressure test circuits and of the forward section functional test circuits. Make sure you follow the proper procedures when you perform the test.

Forward section using capacitance meter checkout

The capacitance meter is used to check the forward section circuitry for capacitance and isolation. Before each day's use, perform a self-check of the capacitance meter and cables. Set the power switch to on, select your range, and zero adjust the display. To record final readings, connect your cables and record the capacitance reading; disconnect the shunt cap and again record the reading. Subtract your

second reading from the first to see if you are in acceptable limits. Now connect the cable to the forward section and record the reading, and then subtract the second reading from the self-test that you recorded earlier. The difference should be within the stated tolerances in TO 11N-RV12A-2. If the reading is an out-of-tolerance indication, reject and replace the forward section.

Mid section W1 and W2 series cables checkout

If not already completed, perform a self-test on the ESCTS. Connect the cables, adapter, and shunt cap. Perform a bridgewire resistance checkout of the cables and adapter. If a malfunction occurs during the next test procedure, remove and test the W1B by itself. If the test fails, replace the W1B cable. If the W1B passes, test the W2B separately. If the W2B cable fails, reinstall the W1B cable and reject the mid section. Connect the cables and shunt cap and run the test making sure all required pin pairs have been tested. Remove the shunt cap and continue with the test. Once completed, turn off the ESCTS and disconnect the cable. Remember to keep the connector interface surfaces parallel during connection and disconnection of the cable.

The test procedures are similar for the W1E and W2E cables. Connect the cables, adapter, and shunt cap. Perform a bridgewire resistance checkout of the cables and adapter. If a malfunction occurs during the next test procedure, remove and test the W1E by itself. If the test fails, replace the W1E cable. If the W1E passes, test the W2E separately. If the W2E cable fails, reinstall the W1E cable and reject the mid section. Connect the cables but *not* the shunt cap (it will be connected in a later step) and run the test making sure all required pin pairs have been tested. Install the shunt cap and continue with the test. Once completed, disconnect the cable, keep the connector interface surfaces parallel during connection and disconnection, then turn off the ESCTS.

W3A cable checkout

Connect the cables to the RSTS with the exception of P3 of the W4145 and W4149 cables. Turn the ARM/MATE nut on P3 of the W4145 cable until the connector pins are flush with the top of the locking spring window. Connect P3 of the cables together, turn the ARM/MATE nut in MATE direction, and then torque the ARM/MATE nut on P3 of the W4145 to 72 (± 10) in-lb. Run the self-check, connecting and disconnecting cables as required. Next, touch the metal structure on the aft section, disconnect the cable from the gas generator, and install the shielding cap. Connect the test cables to W3A; torque P3 of the W4145 cable to J2300 on the W3A cable to 72 (± 10) in-lb. Run checkout, connecting and disconnecting cables as required. After the test is complete, turn off the test set, disconnect the test cables, touch the metal structure in the aft, remove the shielding cap from the gas generator, and reconnect the cable.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

603. W78/MK12A inspection and cleaning procedures

1. Where do you find the inspection criteria for the MK12A RV components?
2. What conditions warrant the replacement of the forward section cable W1F?
3. When inspecting the forward section, what is the *rejectable* criterion for gaps in the ground fingers at the major keyways?

4. How is the finish of the RV repaired if exposed bare metal is found inside the forward section?
5. When inspecting the RV mid section, you find a bent connector pin. When can you attempt to mate the bent connector to another connector?
6. What should you do upon discovering a missing safety wire in the RV mid section?
7. How soon must the carbon-phenolic surfaces be cleaned after being contaminated by foreign matter?
8. If you *cannot* clean contamination from the RV forward, mid, or aft section using isopropyl alcohol the first time, what should you do next?
9. What do you use to lubricate the RV breech joint threads?
10. What procedures do you perform when corrosion is present in the RV mid section?
11. Provide the procedures to remove the RV breech joint setscrews.
12. When installing or removing the threaded ring or protective cover on the MK12A RV, you are *not* allowed to do what?
13. What instance would require disconnection of the RV W1B/W1E cables?
14. To remove the W3A cable, where does the RV aft section need to be?
15. To install the W3A cable, in which position do you place the RV aft section?

604. W78/MK12A handling procedures

1. If tech data directs contact with carbon-phenolic or carbon-carbon surfaces, how can technicians avoid contaminating surfaces?
2. What handling equipment is connected and used to remove W78 during unpackaging from H1224A?
3. During initial mid section transfer to the RV maintenance stand, in which position do you place the cradle?
4. What is the turn restriction you must observe when aligning the safety retaining ring and jackscrew yokes?
5. What should you install on the mid section before packaging it into the H1224A shipping and storage container?
6. What must you use to secure the H1224A shipping and storage container to the forklift prior to transporting?
7. After the CGU-1/B nylon strap is connected to two connection points, in what position is the ratcheting lever?
8. For handling purposes, how many alignment marks are on the RV?
9. How is the RV maintenance stand cradle aligned with the RV maintenance stand yoke?
10. What special procedures are performed when using the ASERV during the RV transfer to the ball-lock installation stand?
11. What is used to wrap the RV prior to transporting it on a pallet?

12. When you transfer the RV on a storage stand, prior to installing the RV mating and handling sling on the RV, what should you verify?
13. Once the forward section sling spanner wrench is positioned on the support ring pins, what is the next step you perform to transfer the forward section to or from the shelf hand truck?
14. While lowering the forward section onto the shelf hand truck, how is its alignment mark positioned?

605. W78/MK12A maintenance procedures

1. What should you avoid when bottoming setscrews in the insert when removing the RV forward section?
2. When removing the RV forward section, once you slide the retractable shaft through the associated torque rod bracket, you torque the three quick-release pin locknuts to how many inch-pounds?
3. Which position is the aft and mid section rotated to prior to removing the aft section?
4. What does the Group X kit contain?
5. During RV assembly, what can you use to clean components if specific procedures are not provided?
6. How is the aft section adapter secured on the aft section?
7. After installing and torquing the aft section, how do you check for proper fit?
8. Why must you connect the W1E and W1B cables before you connect the W1F cable?
9. After installing and torquing the forward section, how do you check for proper fit?

10. List the components in the RS installation kit.
11. When installing the ZIBs, how do you retract the ball-lock piston?
12. Explain the torqueing procedures for the ZIBs.
13. Why do we elaborate torque sequence to torque the ZIBs?
14. What must you do before handling pressure cartridges?
15. What is the *final* step of pressure cartridge installation?
16. After the W4A cable is mated to the RV, how do you verify proper connection?

606. W78/MK12A electrical checkouts

1. What device do you use to check the forward section AFA batteries for stray voltage?
2. What should you do if a malfunction occurs during the stray voltage test?
3. What procedures do you perform upon successfully completing the stray voltage test?
4. What test set do you use to perform the checkout of the forward section?
5. What does the capacitance meter check?

6. During the forward section checkout, how do you record final readings using a capacitance meter?
7. In what position are the connector interface when connecting or disconnecting W1 or W2 series cables?
8. What is the next step you perform if a malfunction occurs during checkout of the mid section W1E and W2E cables?
9. On P3 of the W4145 cable, what is the torque on the ARM/MATE nut?

1-3. W87/MK21 Reentry Vehicle Procedures

The W87 is the body section of the MK21 RV and is designed to be installed in the Minuteman III weapon system. In this section, we discuss the procedures unique to this weapon system.

607. W87/MK21 inspecting reentry vehicle components

Inspecting, repairing, and testing are the very foundation of our maintenance process; don't underestimate the importance of performing these procedures. Be thorough and take your time. Poor techniques will yield an unreliable or unsafe weapon. In this lesson, we discuss some basic concepts for inspecting RV components.

As with every weapons maintenance task, you must first inspect the weapon and all of the components needed for assembly before starting the task. Visually inspect the body section and components for the following defects:

1. Forward breech joint for any burrs, corrosion, and insufficient lubricant.
2. Internal forward edge for delaminations and/or chips that result in the bond line plus damaged area being greater than 0.10 in. Reject the weapon if this condition exists.
3. Heat shield plugs (separate package) for defects exceeding allowable dimensions. If any burrs exist on the heat shield plugs, rework them according to the applicable technical manual procedures.
4. Heat shield plugholes on the body section for damage to the threads (fig. 1-14). If less than two full normal threads remain, reject the weapon. For other types of damage, perform a check of thread function by installing heat shield plugs. If plugs seat properly, no action is required. If plugs do not seat properly, reject the weapon.

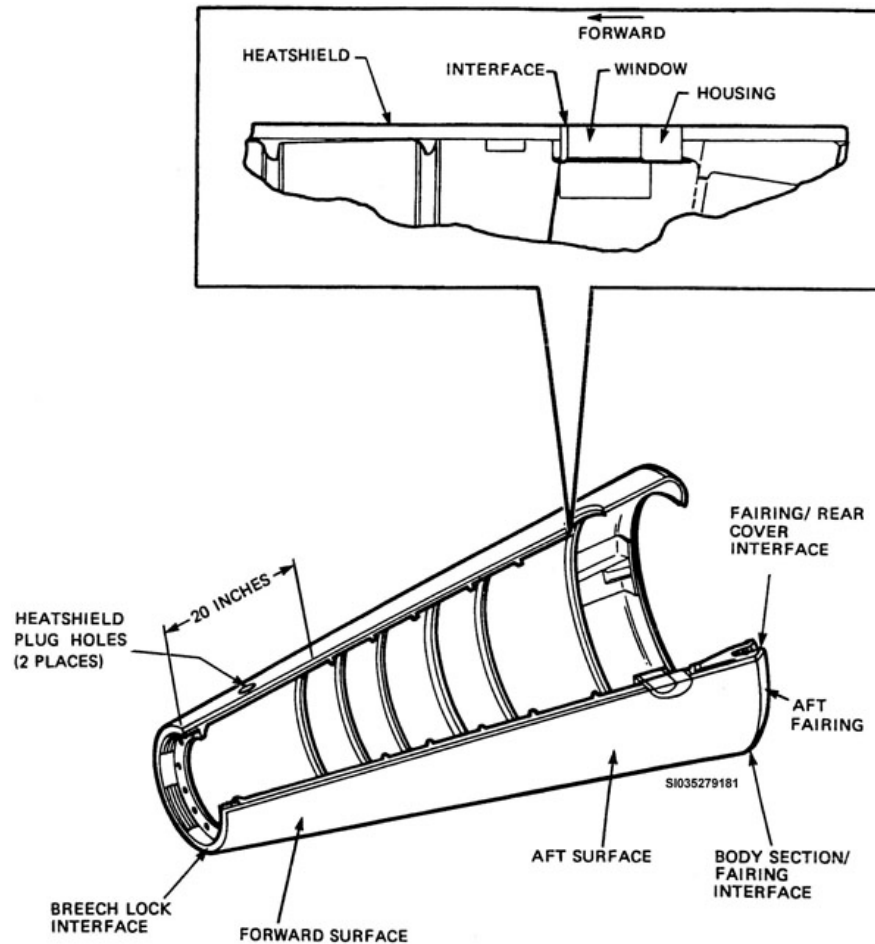


Figure 1-14. Body section heat shield inspection.

5. Body section painted marking (alignment mark) for width to ensure it is not less than 0.430 ± 0.020 in.
6. Tie-down assembly cavities for any accumulation of dust, dirt, oil, grease, corrosion, or other contamination. Reject the RV if there are any burrs on the body section threads or any damage that affects function.
7. Blind rivet nuts for damage or looseness. Reject the weapon if any have damage or are loose.
8. Interior of the aft section for exposed metal. If you find exposed surfaces, repair them according to applicable technical manual.
9. Radio frequency subsystem (RFSS) cables, which are located in the interior of the aft section, for scratches, gouges, crushed sections, or other notch-type defects. Defects exceeding 0.010 in. in depth, 0.90 in. in length, or length of any defect extending 90° around the cable circumference are causes for rejection.
10. Power splitters and antenna assemblies for damaged or missing safety wire. Reject the weapon if you note this condition.
11. Nose-tip assembly for any accumulation of dust, dirt, oil, grease, and other contaminants. Verify there are not any defects to the nose-tip assembly, the insert, or aft edge. Inspect the forward section for any accumulation of dust, dirt, oil, grease, and other contaminants. Verify there are not any delaminations and/or chips to the internal aft edge, defects to the ablative material, damage to the breech joints, or exposed metal on the interior surface. Inspect the heat shield plugs and heat shield plugholes for damage.

12. You must also inspect the interface hardware for the following:
 - HIT body—damage to threads, burrs, chips, and corrosion.
 - HIT cable sleeving—rips, tears, or cuts.
 - HIT plug P7—connector pins bent greater than the pin diameter.
 - HIT—dust, dirt, and grease.
 - Snubber—tears and missing material.
13. Visually inspect the AFA for surface dust/dirt, dents or deformation, scratches, nicks, gouges, and bubbles or blisters to the protective coating. Make sure the snubber is not loose, missing, or damaged, which could affect function. Inspect the RF connectors and electrical connectors according to applicable technical manuals.
14. Inspect the W5A/W5RA cable for contamination, damage, and illegible markings. Inspect cable connectors for contamination and damage. Inspect cable-shielding boot for cuts and gouges. Inspect retractor assembly and guide-pin assembly for damage preventing proper function.
15. Visually inspect the rear cover for general cleanliness. Inspect the elastomeric surface for gouges, cuts, scuffs, nicks, and scratches. Inspect the spin system dents, bends, structural damage, and the presence of the igniter plug.
16. The delay initiators are explosive components; inspect them according to TO 11A15-1-167-1, *Storage and Maintenance Procedures, Explosive Assemblies LGM-30*.
17. Perform the inspection for the tie-down assemblies on a workbench and according to TO 16W21-4-2, *MK12/12A/21 Mod 3 Penetration Aids, Deployment Module, and Shroud Assembly, Munitions Facility*.

608. W87/MK21 handling procedures

In this lesson, we discuss the handling procedures involved with the body section, or the W87. It is important to stress that although this lesson provides procedural steps in performing the operations, the governing procedures are contained in TO 11N-W87-1 and 11N-RV21-2. Make sure you refer to the appropriate weapons manual before performing any procedures. The H1473 shipping and storage container is an authorized container for shipping and storing the W87, while the H1639 is used exclusively for storage only. The following are typical handling operations for the W87:

- Unpacking the WH from the H1473/H1639.
- Transferring the WH to/from the RV assembly stand.
- Packing the WH into the H1473/H1639.

Unpacking the warhead from the H1473/H1639

First, inspect the humidity indicator, which is located on the H1473 (fig. 1-15), for excessive humidity. (**NOTE:** Excess moisture will cause the middle spot of the humidity indicator to change color from white to orange or brown.) Next, inspect the H1473 for dents, punctures, and structural damage. Ensure the RV maintenance stand is in the nose-up position and grounded.

Then, attach the H1276 sling to the H1473 container handles. Loosen the swing bolts clear of container lid and remove the lid. Place it on a clean, padded surface. Ground the H1477 to a caster assembly of the H1473 and attach the H1276 to the hoist and to the H1477 top support.

Next, remove the H1477 top support by removing the four attaching bolts and hoisting it clear of the weapon. Remove the H1524 sleeve. Remove the eight screws and washers that secure the WES cap and remove the WES cap. Cover the fuse support shield with a polyethylene plastic sheet. Remove the H1475 RV forward adapter using the H1519 forward torque adapter and install the H1518 maintenance adapter. Finally, torque the H1518 to 30 foot-pounds (ft-lb.).

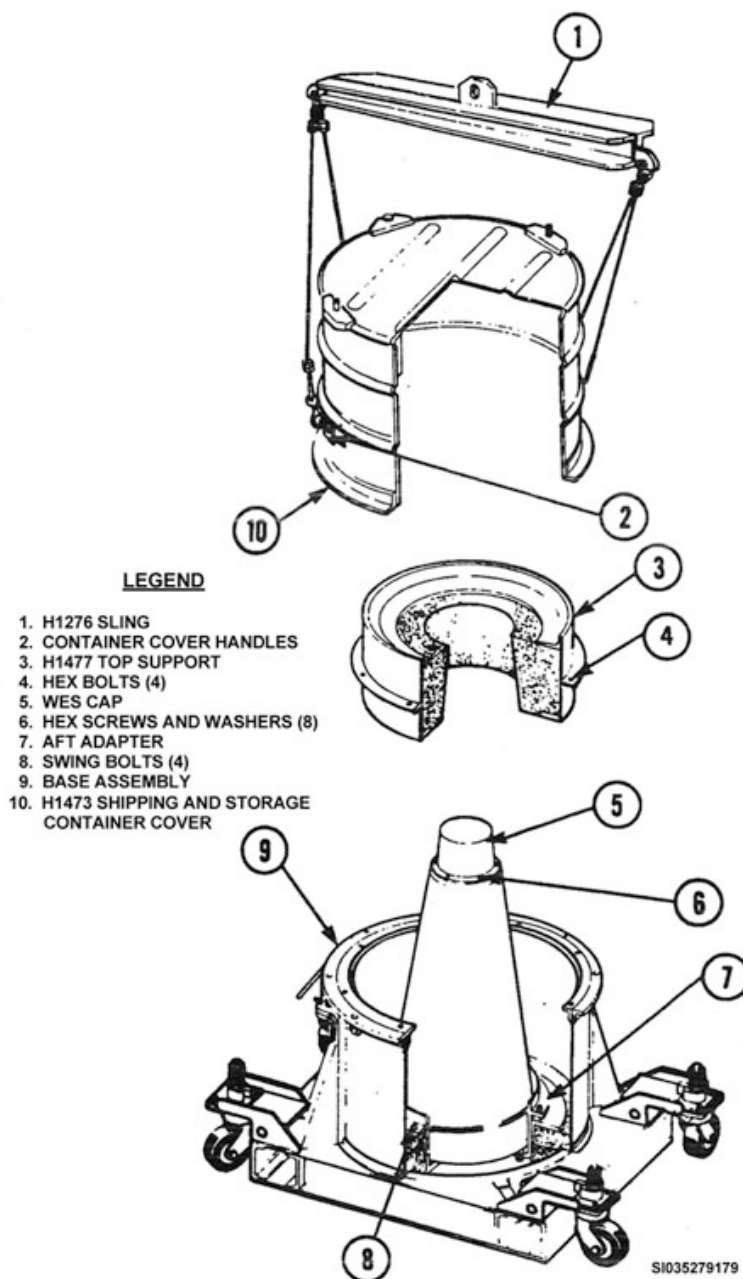


Figure 1-15. Unpacking WH from the H1473.

Transferring the warhead to/from the RV assembly stand

Transfer the WH from H1473 to the RV maintenance stand using the following steps. Verify the RV mating and handling sling lockpins are fully retracted (red band is visible) before you install the sling. Lower the sling to permit attachment to the H1518. Push lockpins into the H1518 lift points and verify they are fully engaged (red band is *not* visible). Loosen and lower the swings bolts of the H1476 aft adapter. Raise the body section clear of the H1473.

Position the body section into the maintenance stand cradle and align the body section with the maintenance stand index mark (fig. 1-16). Carefully raise the body section to install the mating and handling sling supports. Be careful not to raise the RV maintenance stand off the facility floor. Install the heat shield protector and sling supports.

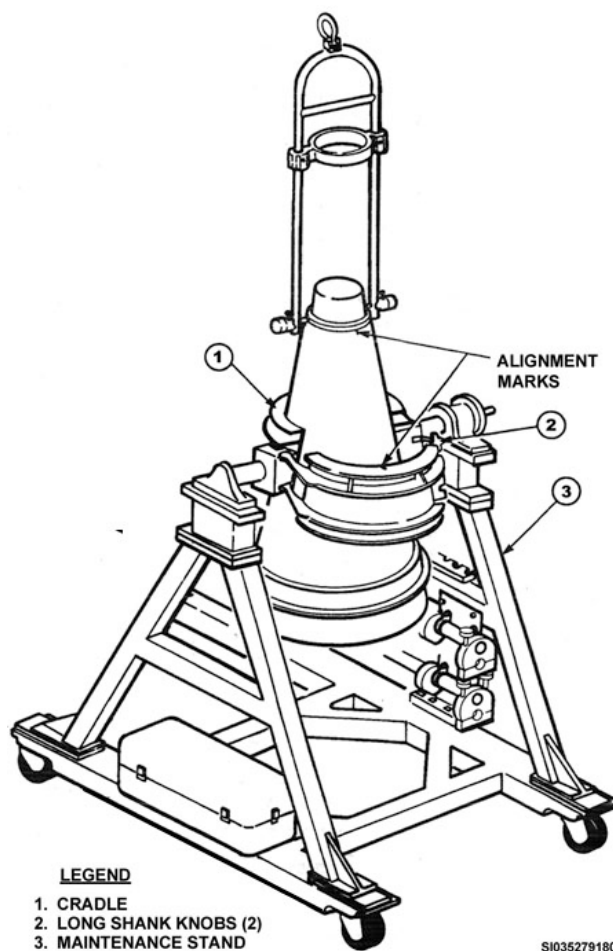


Figure 1-16. Body section installation into RV maintenance stand.

Rotate the body section from a nose-up position to the horizontal position. Support the aft adapter while removing the bolts that secure the aft adapter to the body section; remove the aft adapter. Inspect the applicable aft portions of the RV according to the table in TO 11N-W87-1. Install the collar assembly into the tie-down cavity, then, using the spanner wrench, tighten and torque the collar assembly to 50 (± 10) ft-lb. Make sure the quick-release pins on the lifting adapter are stowed and locknuts are backed off. Align the body section lifting adapter with the 0° mark on the body section, secure with quick-release pins, and hand tighten the quick-release pin lock nuts. Torque the locknuts to 40 (± 10) in-lb.

Install tie rods between the maintenance stand cradle and the body section lifting adapter. Disconnect the mating and handling sling supports from the RV maintenance stand cradle and the RV mating and handling sling. Disengage the RV sling lockpins by pulling up on the spring plunger, pulling the lockpin back (red band visible), and removing the RV mating and handling sling. Verify that the rods are tight and rotate the RV from a horizontal position to a nose-up position.

Packing the warhead into the H1473/H1639

Make sure the body section is in a nose-up position when packaging it back into the H1473.

WARNING: Contact with the exterior surface of the fuse support/shield could result in small amounts of beryllium contamination to skin. Personnel must wear protective gloves and use a locally fabricated cover of polyethylene plastic sheeting or a suitable substitute. This sleeve/cover must remain in place when personnel reinstall the WES cap.

Now, attach the RV mating and handling sling to the hoist and lower it to permit attachment to the H1518 maintenance adapter. Verify the lockpins are fully retracted (red band visible), and engage into the H1518. Verify the lockpins are fully engaged (red band is *not* visible) and the spring plunger's drop-down lockpin is in position. Place the mating and handling sling supports into the access holes in the RV maintenance stand cradle and attach it to the RV mating and handling sling to secure the body section into the stand. Adjust the feet on the sling supports and secure the knurled lockknobs. Remove the hoist and rotate the body section to the horizontal position. Remove the four tie rods and manually hold the body section adapter in place and remove the three quick-release pin nuts. Place the quick-release pins in their storage position and remove the body section adapter. Use a spanner wrench to remove the three collar assemblies. Install three screw thread inserts in the tie-down cavities and torque to 650 ± 50 in-lb. Use the procedures in TO 11N-W87-1 to install the H1476A. Once complete, remove the slack in the hoist cables, and remove the sling supports from the cradle and sling. Remove the RV heat shield protector. Open the RV maintenance stand cradle by loosening two long shank knobs and install a quick-release pin to hold the cradle open. Using the hoist, position the body section over the H1473 or H1639 and lower it into position. Remove all equipment and continue the procedures in TO 11N-W87-1 to complete.

609. W87/MK21 maintenance procedures

It may not always be feasible or convenient to follow procedures in the sequence provided in the TO. For instance, maintenance may require disassembly for access to only one component for replacement or reassembly although the TO provides a more extensive sequence. Except for electrical test procedures, the following rules apply:

- The using organization may change the sequence for procedures to facilitate operations if no required test are omitted, no inspection tests are invalidated, no HCP requirements are bypassed, and no safety features are violated.
- Sequence of actual test procedures must not change, but does not apply to test preparation.

RV disassembly procedures

The first step in disassembly is removing the RS installation kit by disconnecting the W4A cable. The RV must be installed on the ball-lock installation stand before removing the W4A cable. Once you remove the W4A cable, you need to remove the support fittings by cutting and removing the safety wire between the pressure cartridges and separation nuts. Touch the support fittings or ball-lock installation stand to discharge static electricity. Remove the shielding caps, and then remove the pressure cartridges from the ball-lock assembly. Make sure the shielding caps are installed on the connector end and that plastic shipping caps are installed on the threaded end of the pressure cartridges. Install the ball-lock restraining tool in the left pressure cartridge port. Using a separation nut wrench and breaker bar (if necessary), release the preload on the separation nut and run it down threads of the ZIB. Push up the ZIB using a ball-lock restraining tool (if required) until the nut contacts the support fitting (usually an audible snap is heard) to loosen the ZIB from the collar assembly. Remove the ball-lock restraining tool and insert a ball-lock retraction tool into the cartridge port. Close the handles of the ball-lock retraction tool to force the ball-lock piston down to release the balls. Remove the ball-lock assembly from the support fitting and repeat for each support fitting.

Removing rear cover

With the RV transferred to the RV maintenance stand in a horizontal position, don wrist straps and attach wrist straps to a bare metal surface on the RV maintenance stand. Remove 30 torque setscrews and washers from the rear cover. Remove the IFD connector nut from the IFD connector. Using two technicians, one person supports the rear cover while the second disconnects the cables. Once disconnected, make sure the shielding caps are installed and then attach the traveling facility ground to the lip of the IFD hole on the rear cover. The technician holding the rear cover must detach the ground from the RV maintenance stand and reattach it to the rear cover facility ground. The other

technician can detach and remove the wrist strap completely. Next, the W5RA IFD cable assembly can be removed and the delay initiators can be removed from the spin generators.

Removing forward section

First, align the 0° marks on the body section lifting adapter and body section. Hold it in place and secure it with quick-release pins. Hand tighten three quick-release pin locknuts until firmly seated. Install four tie rods and torque locknuts to 40 ± 10 in-lb. Disconnect the mating and handling sling support from the RV maintenance stand cradle, and disengage the lockpins by pulling up and back. Before you remove the RV mating and handling sling, verify the lockpins are fully retracted with the red band visible and then remove. Remove the RV heat shield protector from the forward section and place a nose strap over in its place. Secure the strap ends in two clamps on the maintenance stand cradle. Rotate the RV to nose down and make sure the tie rods are still secured. Remove two heat shield plugs and two locking setscrews. Verify the torque adapter lockpins are fully retracted (red stripe visible) or damage to the forward section may result. Verify the thread protector is installed in each heat shield plughole, and then attach the forward section torque adapter arm assembly. Make certain the gearbox lockscrew is loose to allow torque adapter installation. Ensure lockpins are fully engaged and spring plungers drop down, locking the pins in place. Make sure the torque adapter is approximately level (adjust knurled nut on pivot shaft as necessary). Ensure the clevis shaft is fully extended from the face of the gearbox. Now use the RV maintenance handwheels to adjust the RV orientation until the quick-release pin can be inserted through the clevis shaft and torque adapter arm. Use the forward section torque adapter to loosen the forward from the body section. Disengage the torque adapter lockpins and remove. Tighten the gearbox lockscrew on the stand, verify the tie rods are hand tight, and rotate the body section from nose down to nose up. Remove the nose strap, install the RV heat shield protector, and verify the thread protector is installed in each heat plughole. Attach the RV mating and handling sling to the hoist, center it over the RV, and lower and engage the lockpins into the forward section lift points. Rotate the RV forward section until the index mark on the forward section aligns with the S mark on the body section. Lift the forward section high enough to permit disconnecting of the HIT cable. Remove the safety wire, disconnect the HIT, and install protective caps on the AFA and HIT cable. The forward section is now ready to be transferred to the forward section maintenance stand.

RV assembly procedures

Use the following procedures to assemble the RV. When handling cable assemblies, avoid pulling, tugging, twisting, or bending cables to a radius of less than three times the cable diameter. Contacting the heat shield, nose-tip assembly, and antenna windows with clean gloves or cleaned equipment does not constitute contamination.

Installing HIT

When installing the HIT, make sure the HIT cable rotates during installation. First, remove the protective cap. Using your fingers, install the HIT into the nose-tip assembly and tighten until seated. Torque the HIT to 160 ± 10 in-lb. Install the protective cap and snubber.

Installing/removing nose-tip assembly on forward section

Remember, the nose-tip assembly is sensitive to contamination; perform the following procedures using care not to expose the nose-tip assembly to dirt, oil, grease, or other foreign matter. Remove the two quick-release pins from the nose-tip assembly and rotate the nose-tip assembly cover tabs into the grooves of the nose-tip assembly maintenance stand. Move the nose-tip assembly to the forward section maintenance stand and secure it by fastening the nose-tip assembly strap. Align the nose-tip assembly and forward section fasten holes to install the six hi-torque screws, 12 spring washers, and six flat screws into the forward/forward section and torque to 25 ± 5 in-lb.

Installing AFA

Attach the lifting assembly to the AFA and remove the AFA from the mounting plate. Make certain you turn the cleats on the AFA mating base fixture 90° before you install it over the body section. Use extreme caution not to contact the fuse support shield and place the fixture over the body section. Align the alignment marks on the fixture and the RV maintenance stand. Secure the fixture to the maintenance stand hand tight. Using a straight edge across the WES flange, turn the adjusting nut until the post shoulder is level with the straight edge. You should also ensure the journal block and yoke are in position 2. Install the AFA to the mating post and seat. Lower the lifting assembly to position number 1. Remove the quick-release pin from the journal block and loosen the clamping knobs on the yoke. Simultaneously slide and rotate the yoke to position 1.

Next don a wrist strap and cover the WES with a disposable wipe. Connect the P6 connector. Install the captive head screws and torque to 4.25 in-lb. Loosen the clamping knobs and remove the quick-release pin, then slide and rotate the yoke to position 2.

Lower the AFA to position 3 (fig. 1-17), connect the J11 and J12 RFSS cables, and torque to 8 in-lb. Using .020 safety wire, safety wire J11 and J12 to each other. Using the three alignment pins, lower the AFA to the fuse support shield, and remove the lifting assembly from the post.

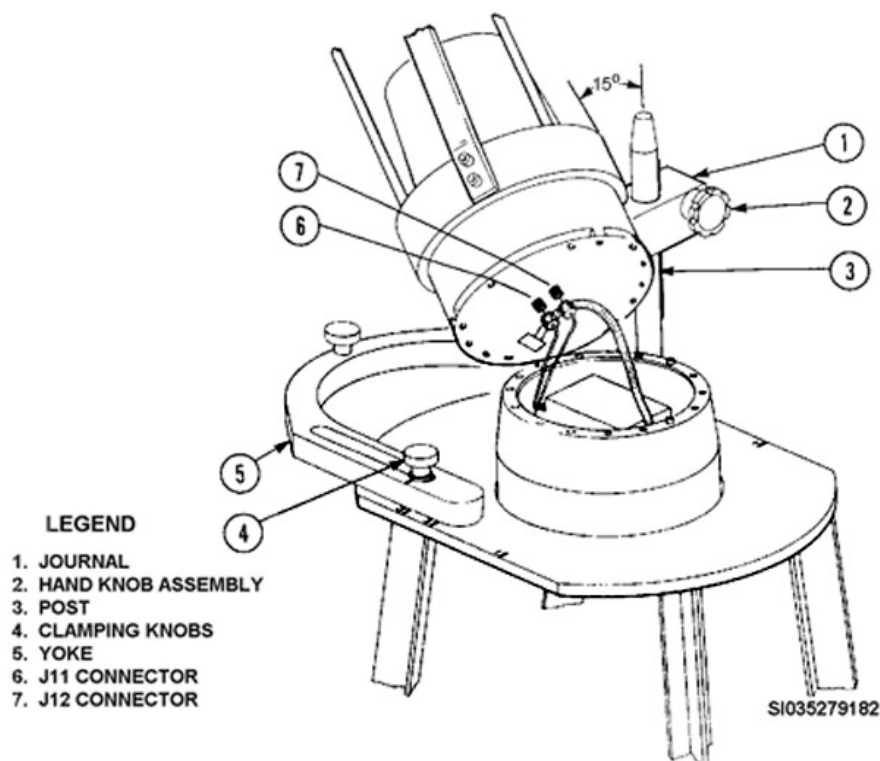


Figure 1-17. AFA mating.

Install the trim ballast bracket and align the 0° mark with the 0° of the body section. Lubricate the 16 mounting screws with dry film lubricant. Install the screws, torque to 22 ± 1 in-lb., and remove the mating base fixture.

Installing the forward section

Hoist the forward section from the maintenance stand and over the body section. Remove the protective caps from the HIT cable and J7 of the AFA. Remove the AFA plastic cover and carefully lower the forward section to allow connection of the HIT (fig. 1-18). Connect the HIT cable to J7 on the AFA, torque to 8 ± 1 in-lb., and safety wire.

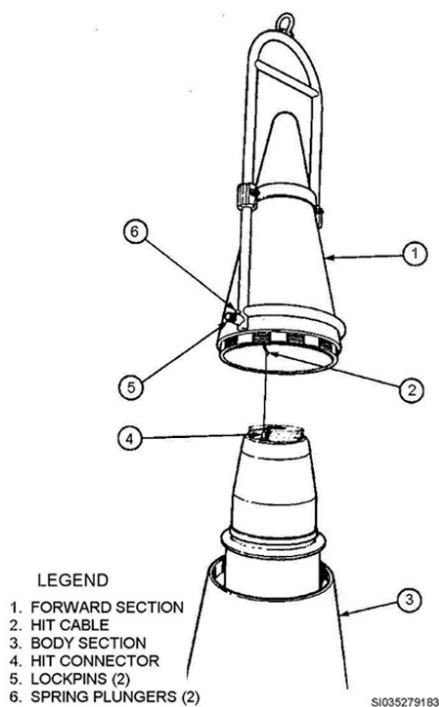


Figure 1-18. Forward section connection.

Slowly lower the forward section onto the body section. Align the mark on the aft end of the forward section with the “S” mark on the forward face of the body section. Once the forward section seats, rotate it by hand (clockwise) to engage the breech joint threads and remove the handling sling.

Install the nose strap and rotate the body section to the nose-down position. Attach the forward section torque adapter (fig. 1-19) to the forward section and the maintenance stand.

Torque the forward section to 235 ± 10 in-lb., and make sure the 0° marks on the forward and body sections align. Torque the two body section setscrews to 3.5 ± 0.5 in-lb., and remove the handling equipment.

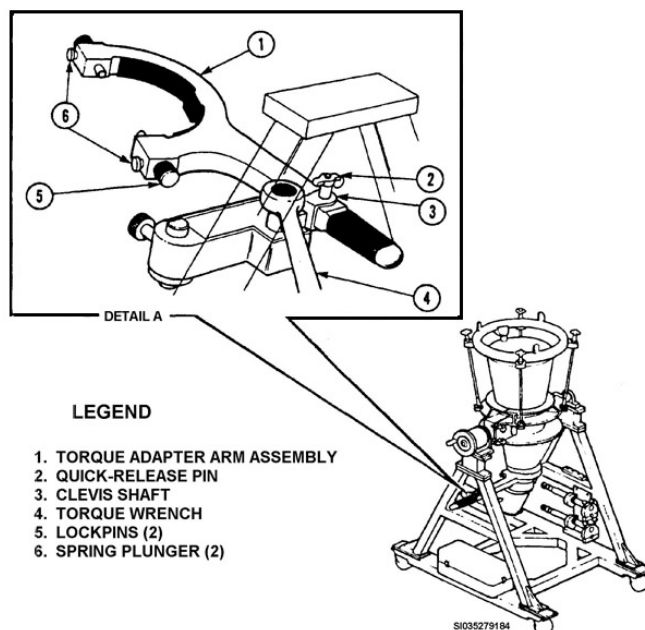


Figure 1-19. Forward section torquing.

Installing W5RA cable, delay initiators, and the rear cover

Verify the maintenance stand is grounded and the body section is in the horizontal position. Put on a wrist strap and connect the W5RA cable to J19 of the WH. Install clamps and attaching hardware to secure the cable. Remove the ground strap from the rear cover and verify the radio frequency interface (RFI) cap is on J22 of the W5RA IFD cable. One technician positions the rear cover close to the body section. A second technician installs the W5RA IFD connector (with gasket installed) through the IFD opening and installs the IFD connector nut hand tight (fig. 1-20). Next, connect the delay initiators and install the 30 torque setscrews that secure the rear cover and torque them to 22 ± 2 in-lb. Finally, using the IFD connector spanner wrench, torque the IFD connector nut to 144 ± 6 in-lb. Perform a checkout of the RV with the RV TESTER per applicable technical manuals.

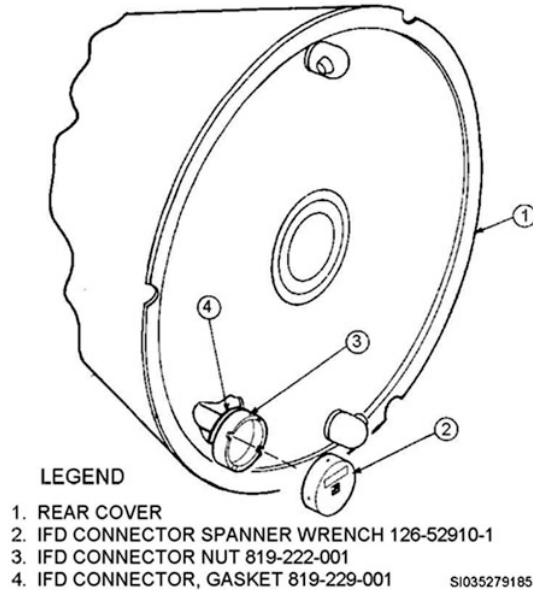


Figure 1-20. Installing rear cover.

Installing the W4A cable

The MK21 must use cable W4A with part number 23033409G2. The cable can be visually identified by two blue bands located approximately 6 in. from connectors P2550/2552. Using the incorrect cable will cause the MK21 not to function properly.

Attach the tie-down ring from the RV pallet and install it on the RV so the alignment mark closest to the cable bracket aligns with the 180° mark on the ball-lock stand. Manually support the W4A and hot wire to prevent minimum flexing of the P5111 cable. Extend the W4A cable across the aft end of the RV so P2300 can mate with J22.

Turn the ARM/MATE nut on the W4A cable fully to the ARM direction then back off one-fourth turn. Make sure to touch the support fitting or ball-lock stand to discharge static electricity or you may initiate a spin generator or cause damage to equipment.

With shielding caps installed on P2550 and P2552, align the connector keyways and connect the W4A cable to J22. Turn the arming nut in the mate direction and torque it to $72 (\pm 10)$ in-lb. Use a thickness gauge and make sure the gap between the arming nut and the actuator is more than .020 in. Fasten the W4A cable to the tie-down ring.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

607. W87/MK21 inspecting reentry vehicle components

1. The forward breech joint is inspected for what?
2. What criteria of the heat shield plugholes would be reasons to reject the body section?
3. The body section's painted marking (alignment mark) width should be what size?
4. What should you do upon finding a loose blind rivet nut?
5. Which components do you inspect for missing or damaged safety wire?
6. What are you checking for when you inspect the P7 HIT plug connector pin?
7. What are you looking for when you inspect the AFA protective coating?
8. When inspecting the W5A/W5RA cable, you inspect the cable-shielding boot for what type of damage?
9. What TO do you use when you inspect the delay initiators?

608. W87/MK21 handling procedures

1. How does the humidity indicator show excess humidity on the H1473?
2. What do you cover the fuse support shield with when unpacking the WH from the H1473?
3. What is the H1518 torqued to when removing the H1475 RV forward adapter?

4. How do you verify the RV mating and handling sling lockpins are fully engaged in the H1518 maintenance adapter?
5. What is the torque of the collar assemblies when tightened on the tie-down cavity?
6. What should you verify before rotating the RV from horizontal to nose-up position?
7. You must make sure the body section is in which position when packing it back into H1473?
8. During removal of the body section, you attach the RV mating and handling sling attached to what equipment?

609. W87/MK21 maintenance procedures

1. When the sequence of procedures provided in the TO are not feasible or convenient to follow, what rules must using organizations follow to change the sequence?
2. When disassembling the RV, prior to removing the shielding caps, where must you touch to discharge static electricity?
3. When disassembling the RV, where do you install the ball-lock restraining tool on the pressure cartridge?
4. When disassembling the RV, what is usually an indication that the separation nut has contacted the support fitting?
5. When disassembling the RV, what is the first step you perform before removing the rear cover?
6. When disassembling the RV, what are the two technician's duties when removing the rear cover?
7. When removing the RV rear cover, where does the technician holding the rear cover reattach the ground from the RV maintenance stand once cables are disconnected?

8. When removing the RV forward section, what is placed on the forward section once the heat shield is removed?
9. During forward section removal, before you lift it from the body section, how far do you rotate it?
10. When assembling the RV, what do you use to *initially* seat the HIT into the nose-tip assembly?
11. During RV assembly, when you attach the lifting assembly to the AFA, with what do you lubricate the 16 mounting screws securing the AFA?
12. During RV assembly, to what WH connector do you connect the W5RA cable?
13. What cable must you install on the MK21 RV during assembly?
14. When installing the W4A cable during RV assembly, what measurement do you take after torqueing the arming nut?

Answers to Self-Test Questions

601

1. ****HCP****.
2. TO 21M-LGM30G-2-31.
3. Prevent premature detonation of the WH; generate A&F signals to detonate the WH at a predetermined point; and survive the intense heat generated by reentry into the Earth's atmosphere.
4. Plastics, ceramics, Teflon, phenolics, or carbons, or combinations of these materials.
5. An action of discarding or casting aside.
6. As ablative material is cast off, heat energy is dissipated, and the RV does not become excessively hot.
7. Forward section, mid section, and aft section.
8. By two threaded/breeched joints.
9. The nose-tip and forward section assembly, AFA, and HIT.
10. WH.
11. The means for securing and releasing the RV to and from the payload support.
12. Forward section, body section, and rear cover.
13. Secured by six screws.

14. The connection necessary to mate the RF cables.
15. Do *not* disassemble the WH; do *not* apply electrical power to the WH, do *not* connect or disconnect electrical cables; and *only* move the WH a limited distance provided the body section is intact with only minor exterior damage.

602

1. Visually inspecting the container contents to determine that the items are as described by the shipping document.
2. A receipt inspection.

603

1. In TO 11N-RV12A-2 tables 4-1 through 4-5.
2. Any rips, tears, or cuts in sleeving and if potting compounds contain voids that extend completely through to the wire or connector ends.
3. The width exceeds two ground fingers.
4. Using Type 1 Organic Finish.
5. Only if the connector pin is bent aside a pin diameter (or less).
6. Reject the mid section.
7. As soon as practical.
8. Repeat the cleaning process but use acetone instead of isopropyl alcohol. If foreign matter is still present, use aluminum oxide finishing paper 320-grit to lightly abrade the contaminated area and reclean using isopropyl alcohol.
9. A solid film lubricant.
10. Abrade the corroded with an aluminum wool area and then clean with clean cloth moistened with isopropyl alcohol. Next, use a natural bristle brush to apply Alodine 600 to the abraded area and allow it to remain on the surface for 15 to 30 seconds before rinsing with clean water. Air-dry for two hours before lubricating or mating breech joints.
11. Locate the setscrew decal on the aft section. Insert a $\frac{3}{32}$ in. hex adapter into the breech joint setscrew port and into the setscrew. Rotate the setscrew clockwise until it clears the breech joint and remove the setscrews.
12. Snap the ring in place.
13. Only during fault isolation or when defective.
14. In the aft section adapter.
15. Horizontal position.

604

1. By wearing clean glove.
2. HLU-121/E beam-type sling.
3. Nose-down.
4. The $\frac{1}{4}$ -turn restriction.
5. H1223B aft ring and protective cover.
6. Nuclear certified tie-down device (i.e., CGU-1/B cargo straps).
7. Closed.
8. Six.
9. Align mounting bolt holes in the cradle with the tapped holes in the yoke.
10. Support fittings are installed in the inner positions and only support fittings marked "MOD" are used.
11. Polyethylene sheet.
12. The lockpins are fully engaged with the red band *not* visible.
13. Tighten the retainer screws, and then back them off approximately $\frac{1}{2}$ turn.
14. Facing the shelf hand truck.

605

1. Excessive force.
2. 40 (± 10) in-lb.
3. Nose-down.
4. Contains replacement items of common hardware.
5. Clean disposable wipes dampened with isopropyl alcohol.
6. By inserting three quick-release pins into the collars of the aft section and then torquing the locknuts.
7. Insert a 0.004 feeler gauge at 12 equally spaced locations around the aft breech joint. Check to see if you can insert the feeler gauge further than 0.5 in. at each location. The fit is acceptable if you cannot insert the gauge more than 0.5 in. in four consecutive locations.
8. Because the W1F cable connects to the firing system. If you connect it earlier, you could injure yourself or damage the RV.
9. Use a 0.002-in. feeler gauge at 12 different locations; the fit is acceptable if you cannot insert more than 0.5 in. in four consecutive locations.
10. Support fittings, ZIBs, pressure cartridges, and the W4A cable.
11. By inserting the retraction tool into a cartridge port (curved tip down) and closing the handles to retract the ball-lock piston.
12. Use the spanner wrench and a torque wrench to torque the ZIB nut in increasing increments of 100 ± 10 in-lb., 200 ± 10 in-lb., and 300 ± 10 in-lb. Use a dial-indicating torque wrench and the spanner wrench to back the ZIB nut off to 130 ± 10 in-lb. Retorque the ZIB nut to 185 ± 10 in-lb.
13. To ensure the bolt is seated properly and the collar or bolt is not defective.
14. Discharge static electricity.
15. Safety-wiring the pressure cartridges to the ZIBs using 0.020-in. safety wire.
16. By measuring the gap between the actuator and the ARM/MATE nut; it must be more than 0.2 in.

606

1. ESCTS.
2. Reject and replace the forward section.
3. Turn off ESCTS, touch the metal structure on the forward section to discharge static electricity, disconnect the test cable, and install the shorting plug on forward section.
4. RSTS.
5. Capacitance and isolation.
6. Connect cables and record the capacitance readings, disconnect the shunt cap and again record the readings. Subtract the second reading from the first to see if in the acceptable limits. Now connect cable to forward section and record the readings, then subtract the second reading from the self-test that was recorded earlier.
7. Parallel.
8. Remove and test the W1E by itself.
9. 72 ± 10 in-lb.

607

1. Burrs, corrosion, and insufficient lubrication.
2. If it contains less than two full normal threads remaining and if the plugs do not seat properly.
3. Not less than 0.430 ± 0.020 in.
4. Reject the weapon.
5. Power splitters and antenna assemblies.
6. Bent pins greater than pin diameter.
7. Bubbles or blisters.
8. Cuts or gouges.
9. TO 11A15-1-167-1.

608

1. The middle spot changes color from white to orange or brown.
2. A polyethylene plastic sheet.
3. 30 ft-lb.
4. Make sure the red band is *not* visible.
5. 50 ± 10 in-lb.
6. Tie rods are tight.
7. Nose-up.
8. H1518 maintenance adapter.

609

1. The using organization must make sure the change in sequence do *not* omit any required tests, invalidate any inspection tests, bypass any HCP requirements, or violate any safety features.
2. The support fittings or ball-lock installation stand.
3. Left pressure cartridge port.
4. Audible snap is heard.
5. Don wrist strap and attach wrist strap to a bare metal surface on the RV maintenance stand.
6. One person supports the rear cover and other disconnects the cables.
7. Rear cover facility ground.
8. Nose strap.
9. Until the index mark on the forward section aligns with the S mark on body section.
10. Your fingers.
11. Dry film lubricant.
12. J19.
13. The W4A cable with part number 23033409G2.
14. Measure the gap between the arming nut and actuator to make sure it is more than 0.20 in.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

1. (601) The reentry vehicle (RV) is designed to perform all of the following functions *except*
 - a. deploy penetration aids.
 - b. generate arming and fuzing (A&F) signals.
 - c. survive reentry into the Earth's atmosphere.
 - d. prevent premature detonation of the warhead (WH).
2. (601) What design of the reentry vehicle (RV) overcomes the intense heat generated by reentry?
 - a. Spin system.
 - b. Ablative material covering.
 - c. Missile guidance system.
 - d. High-impulse transducer.
3. (601) A material the reentry vehicle (RV) heat shield is made of is
 - a. titanium.
 - b. aluminum.
 - c. polyethylene.
 - d. carbon.
4. (601) The reentry vehicle (RV) overheating at reentry is prevented by the "sloughing" off. What does "sloughing" mean?
 - a. Layering of material.
 - b. Hardening by heat.
 - c. Casting aside.
 - d. Building up.
5. (601) Which section of the MK12A reentry vehicle (RV) houses the high impulse transducer (HIT)?
 - a. Forward.
 - b. Body.
 - c. Rear.
 - d. Mid.
6. (601) Which reentry vehicle's (RV) section houses the W78 warhead (WH)?
 - a. MK21 aft section.
 - b. MK12A mid section.
 - c. MK21 body section.
 - d. MK12A forward section.
7. (601) Which component is part of the MK12A reentry vehicle's (RV) aft section?
 - a. WF1 cable.
 - b. High-impulse transducer (HIT).
 - c. In-flight disconnect (IFD) plug.
 - d. Arming and fuzing (A&F) assembly.

8. (601) The MK21 reentry vehicle (RV) is divided into how many *major* parts or sections?
 - a. 2.
 - b. 3.
 - c. 5.
 - d. 6.
9. (602) Which inspection, if any, is performed after a verification inspection on a reentry vehicle (RV) is completed?
 - a. Receipt.
 - b. Final receipt.
 - c. Interim verification.
 - d. No further operation is required.
10. (602) What size safety wire is used to secure the electronic inspection record card (eIRC) packaged in a waterproof envelope to the reentry vehicle's (RV) shipping and storage container (i.e., H1224A or H1473)?
 - a. 0.020 inch.
 - b. 0.030 inch.
 - c. 0.032 inch.
 - d. 0.044 inch.
11. (603) After you inspect the high impulse transducer (HIT) cable in the MK12A reentry vehicle (RV) forward section, you find a broken safety wire. What should you do next?
 - a. Reject forward section.
 - b. Replace safety wire.
 - c. Submit dull sword report.
 - d. Accept as is.
12. (603) What should your next step be when you find a broken safety wire in the MK12A reentry vehicle's (RV) mid section during inspection?
 - a. Reject the mid section.
 - b. Replace safety wire.
 - c. Submit dull sword report.
 - d. Accept as is.
13. (603) How many times during a recycle can you lightly sand a contaminated area of the reentry vehicle (RV) carbon-phenolic material?
 - a. Once.
 - b. Twice.
 - c. As many times as required to clean the contaminated area.
 - d. No more than three as long as you clean with isopropyl alcohol between sanding.
14. (603) If a replacement breech joint setscrew fails to move with 5-inch pounds (in-lb.) of applied torque, what action do you take?
 - a. Remove some of the nylon-locking feature.
 - b. Replace the entire component.
 - c. Remove locking screw insert.
 - d. Replace setscrew.
15. (603) When you perform hardness critical procedures (HCP), identified as ****HCP**** in the technical order (TO), you must
 - a. make substitution of any hardware.
 - b. perform steps exactly as given.
 - c. perform electrical steps in any sequence.
 - d. complete steps in any sequence as long as you do them all.

16. (604) What is the *only* authorized shipping and storage container for shipping the W78 warhead (WH)?
 - a. H1639.
 - b. H1473.
 - c. H1224A.
 - d. H1388B.
17. (604) When installing the W78 warhead (mid section) in the reentry vehicle (RV) maintenance stand, you know it is positioned correctly when the
 - a. bar alignment mark on the aft section aligns with the arrow alignment mark on the front of the cradle.
 - b. bar alignment mark on the mid section aligns with the arrow alignment mark on the aft end of the cradle.
 - c. arrow alignment mark on the aft section aligns with the bar alignment mark on the front of the cradle.
 - d. arrow alignment mark on the mid section aligns with the bar alignment mark on the aft end of the cradle.
18. (604) When installing the warhead (WH) in the MK12A reentry vehicle (RV) maintenance stand, you create a friction load between the mid section and the cradle by
 - a. turning either tape fully clockwise.
 - b. installing six socket head screws and washers.
 - c. installing eight high-torque Allen wrench bolts.
 - d. turning both jackscrew hand knobs simultaneously.
19. (604) What part of the reentry vehicle (RV) hoisting adapter do you use for lifting and transferring the MK12A RV?
 - a. Spanner wrench.
 - b. Upper support ring.
 - c. Lower support ring.
 - d. Forward section sling.
20. (605) After you assemble two MK12A reentry vehicle (RV) sections, the breech joint is acceptable if you *cannot* insert the feeler gauge more than 0.5 inches in how many consecutive locations?
 - a. 4.
 - b. 5.
 - c. 9.
 - d. 10.
21. (605) Which component is *not* a part of the reentry system (RS) installation kit?
 - a. Spline adapter.
 - b. Support fitting.
 - c. Zero-impulse bolt.
 - d. Pressure cartridge.
22. (605) Which stand supports the MK12A reentry vehicle (RV) during installation and removal of the reentry system (RS) installation kit?
 - a. Forward section support.
 - b. Ball-lock installation.
 - c. RV maintenance.
 - d. RS maintenance.

23. (605) The elaborate torque procedure for the zero impulse bolts (ZIB) serves several necessary purposes. Which option is *not* one of them?
- a. To ensure the bolt is not defective.
 - b. To ensure the collar is not defective.
 - c. To ensure the bolt is seated properly.
 - d. To ensure the mating frustum is in the correct angle.
24. (606) During an electrical checkout, what should a technician do when cables are left disconnected from a test set because of a new cabling diagram?
- a. Submit an Air Force Technical Order (AFTO) Form 22, Technical Manual (TM) Change Recommendation and Reply, to update technical order.
 - b. Submit a quality deficiency report.
 - c. Continue the test; it is permissible.
 - d. Reject the component.
25. (606) What should you do if a malfunction occurs during a stray voltage test of the forward section?
- a. Reassemble system without forward section and attach a Department of Defense Form (DD Form) 1577-2, Unserviceable (Reparable) Tag – Materiel.
 - b. Remove and reinstall forward section, then retest until it passes.
 - c. Reject and replace the forward section.
 - d. Submit a maintenance assistance request.
26. (606) During the checkout of cable W3A, how is the ARM/MATE nut tightened on the P3 of W4145 cable?
- a. Finger tightened only.
 - b. Tighten securely only.
 - c. Torqued to 72 ± 10 inch-ounces.
 - d. Torqued to 72 ± 10 inch-pounds.
27. (607) What is the rejection criterion for the W87 body section when you inspect the internal forward edge for delamination and/or chips that affect the bond line?
- a. Damaged area greater than 0.10 inch.
 - b. Damaged area smaller than 0.09 inch.
 - c. Feeler gauge inserted into more than two consecutive locations.
 - d. Feeler gauge inserted into more than four consecutive locations.
28. (607) When inspecting the W87 body section, what is a reason to reject the heat shield plugholes?
- a. Less than one full normal thread remains.
 - b. Less than two full normal threads remain.
 - c. Thread check function results in plugs seating properly.
 - d. Threads were not cleaned within specified time limit after being contaminated.
29. (607) When inspecting the W87 body section, which option is a reason to reject the radio frequency subsystem (RFSS) cables located in the interior of the W87 aft section?
- a. A defect measuring 0.020 inch in depth.
 - b. A defect measuring 0.5 inches in length.
 - c. The cable identification number is illegible.
 - d. The length of defect extends 45 degrees around cable circumference.

30. (608) What is the only *authorized* shipping and storage container for shipping the W87 warhead (WH)?
- H1473.
 - H1673.
 - H1224A.
 - H1388B.
31. (608) The humidity indicator plug on the H1473 shipping and storage container indicates excessive moisture inside the container by turning
- bright yellow.
 - slight pink.
 - orange.
 - red.
32. (608) What do you use to cover the fuse support shield once you remove the warhead electrical system (WES) cap?
- Cork sheet.
 - Wool felt sheet.
 - Disposable cloth.
 - Polyethylene plastic sheet.
33. (608) What equipment attaches to the facility hoist and the MK21 reentry vehicle (RV) forward section for handling operations?
- H1473A support.
 - MHU-210/E stand.
 - TLU-433/A adapter.
 - RV mating and handling sling.
34. (608) What do you install to hold the reentry vehicle (RV) maintenance stand cradle in the open position before you place a RV in the stand?
- Two long shank knobs.
 - Quick-release pin.
 - Threaded fastener.
 - Mounting bolt.
35. (609) During reentry vehicle (RV) disassembly, where must you install the MK21 RV before you remove cable W4A?
- RV pallet.
 - RV maintenance stand.
 - Arming and fuzing stand.
 - Ball-lock installation stand.
36. (609) Once the ball-lock restraining tool is removed during reentry vehicle (RV) disassembly, what is inserted into the cartridge port?
- In-flight disconnect connector installation tool.
 - Separation nut wrench.
 - Ball-lock retraction tool.
 - Protective cap.
37. (609) When disassembling the reentry vehicle (RV), before you lift the forward section from the body section, you must rotate it until
- it clears the body section.
 - you hear a click.
 - the index mark on it aligns with the S mark on body section.
 - the index mark on it aligns with the arrow on body section.

38. (609) When assembling the MK21 reentry vehicle (RV), what *must* you turn 90 degrees on the arming and fuzing assembly (AFA) mating base fixture before you install the fixture on the body section?
- Cleats.
 - Teeth.
 - Tines.
 - Tapes.
39. (609) How do you verify alignment when torqueing the forward section on the MK21 reentry vehicle (RV) during assembly?
- Make sure the “S” mark on the forward and body sections align.
 - Make sure the zero degree (0°) marks on the forward and body sections align.
 - Use the alignment fixture to make sure the sections are properly seated.
 - Use a feeler gauge to measure the gap around the breech joint threads.
40. (609) During MK21 reentry vehicle (RV) assembly, what secures the rear cover of the RV to the body section?
- Four quick-release pins.
 - Four mounting bolts.
 - 30 torque setscrews.
 - 16 torque setscrews.
41. (609) You locate the W4A cable to install on the MK21 reentry vehicle (RV) during assembly by identifying the
- part number on the blue band.
 - red band visible on the lock pins.
 - red band located approximately 6 inches from the connectors P2550/2552.
 - two blue bands located approximately 6 inches from connectors P2550/2552.

Unit 2. Reentry Systems Overview and the MK21

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THE UNITED STATES nuclear arsenal is made up of various deliverable systems which we've already covered in unit one. The gravity bombs are delivered by dual capable aircraft and long-range bombers, and the air-launched cruise missiles are delivered by long-range bombers. Finally, the ICBMs are self-sustained weapon systems independent of a delivery system capable of a long-range attack. They are continuously on alert, cost-effective, and launched from stationary silos. They can strike their intended targets within 30 minutes of launch.

In this unit, we introduce you to the RS portion of the ICBM weapon system and give you a brief overview of this system. We also cover inspections procedures for the RS and handling operations pertinent to the RS.

2-1. Reentry Systems Inspections and Maintenance

You'll find it easy to inspect the RS after you have a general understanding of what it is. This brief introduction covers some basic component information and then transitions into the inspection requirements of that particular component.

610. Inspecting reentry systems components

The RS consists of the RS payload, a deployment module (DM), and a shroud assembly (fig. 2-1).

NOTE: The MK12A RS may have a penetration aids assembly.)

RS components description

The RS is mounted on a guided missile that is propelled out of the Earth's inner atmosphere only to reenter the inner atmosphere at a predetermined point and detonates on the desired target. It transports and protects the WHs. The RS transports the RV on top of one missile. The RS has a DM that supports the RVs. The RVs are covered or enclosed by a shroud. The shroud protects the

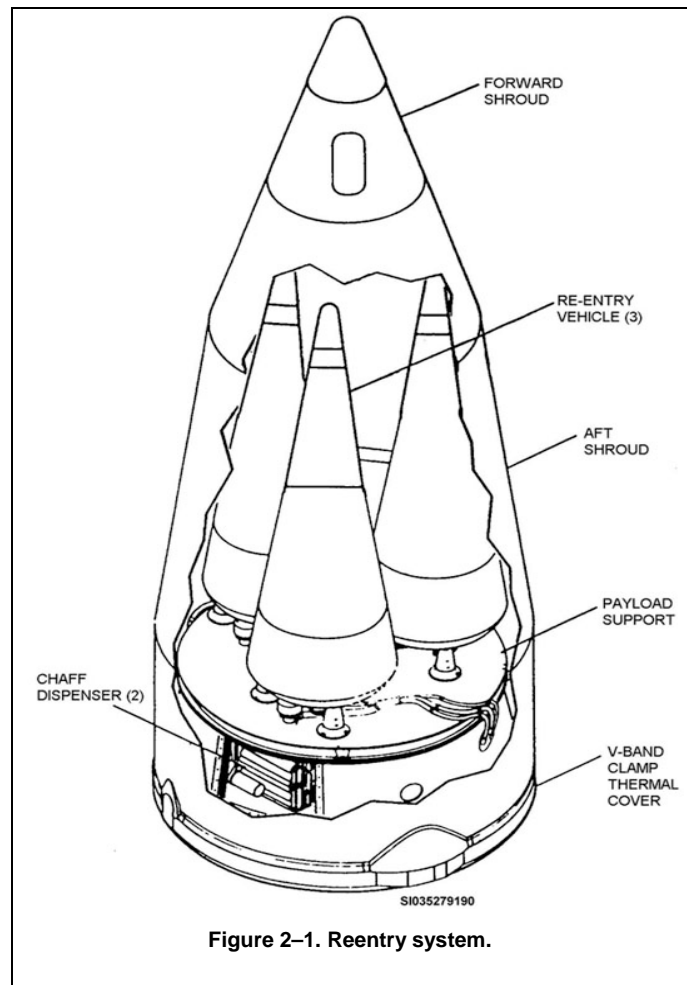


Figure 2-1. Reentry system.

WHs during initial launch until the RS reaches the outer atmosphere. Once the RS reaches the outer atmosphere, the shroud is *jettisoned* or *casted off* (fig. 2-2), and the RVs are individually released to descend to their targets.

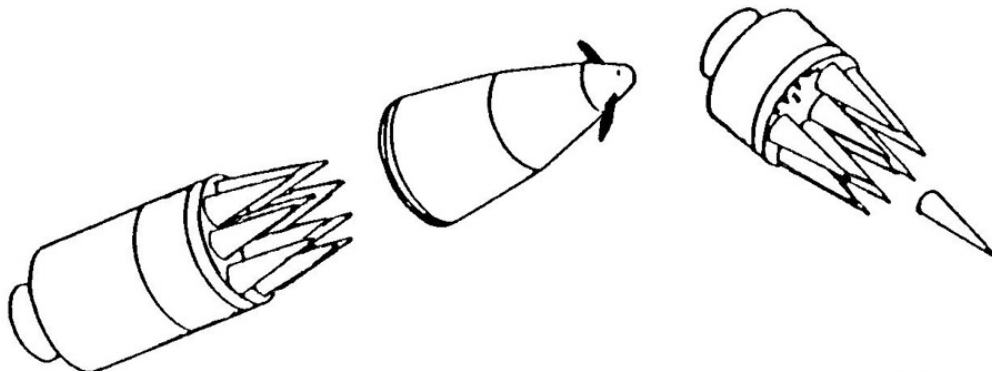


Figure 2-2. RS shroud jettison and RV release.

RS payload

The RS payload is basically the RV, whether it's the MK12A RV or MK21 RV. Depending on the type of RV used, the RV is mounted on the DM.

Deployment module

The DM is the mounting platform for the RS payload, or RVs. It consists of the payload support, which includes a frustum, a bulkhead, and the RS installation kit. Within the payload support frustum are the RS downstage interface connectors, arm & disarm (A&D) device, electronic command signals (ECS) programmer, and component and cable installation kit. For the MK12A, the chaff dispenser installation kits may also be installed.

Payload support frustum

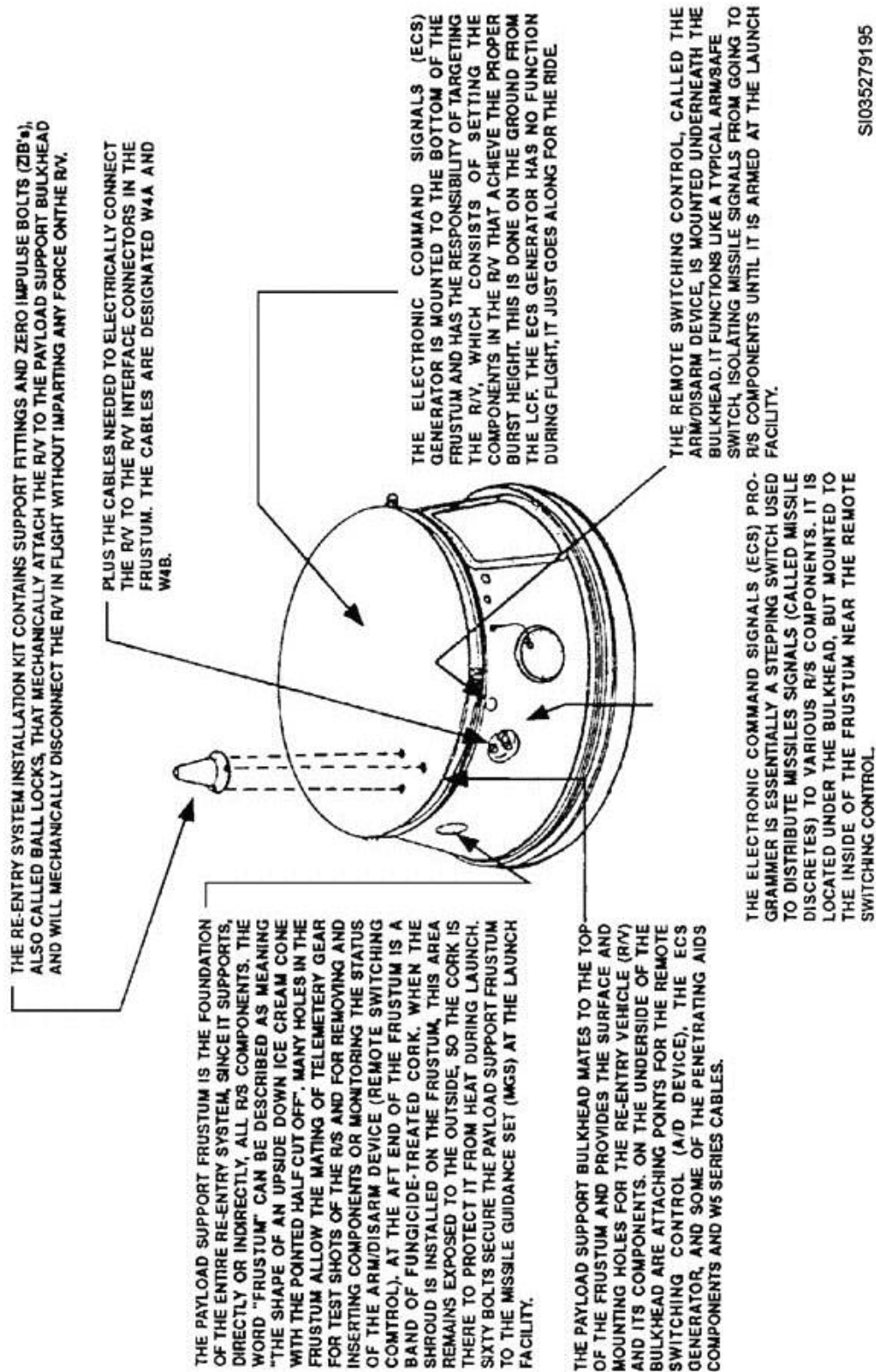
The payload support frustum is constructed of aluminum alloy and has rolled ring forgings secured to the forward and aft ends. Frustum covers are secured to chaff deployment apertures, which extend from the forward to aft rings on opposite sides of the payload support frustum to provide a means for deployment of chaff. Three closure pans containing cable connectors are secured to the payload support frustum. Another closure is removed when mating and demating the downstage interface connectors. Other holes and closures provide access for inspecting and safing the A&D device and mating the shroud IFD connectors.

Payload support bulkhead

The payload support bulkhead is a circular aluminum platform, which mounts to the forward end of the payload support frustum. Inserts in the platform provide mounting provisions for all RS configurations. Hole locations in the bulkhead are numbered for reference during installation of components, cabling, and hardware.

RS installation kit

The RS installation kit provides the mounting and support fitting for securing the RV to the payload support. The harnessing contained in the RS installation kit provides electrical interconnection between the RV and frustum-mounted connectors. The location of these components and a brief description appear in figure 2-3. Figure 2-4 provides a cutaway view so you can see several internal components.



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Figure 2-3. DM and components.

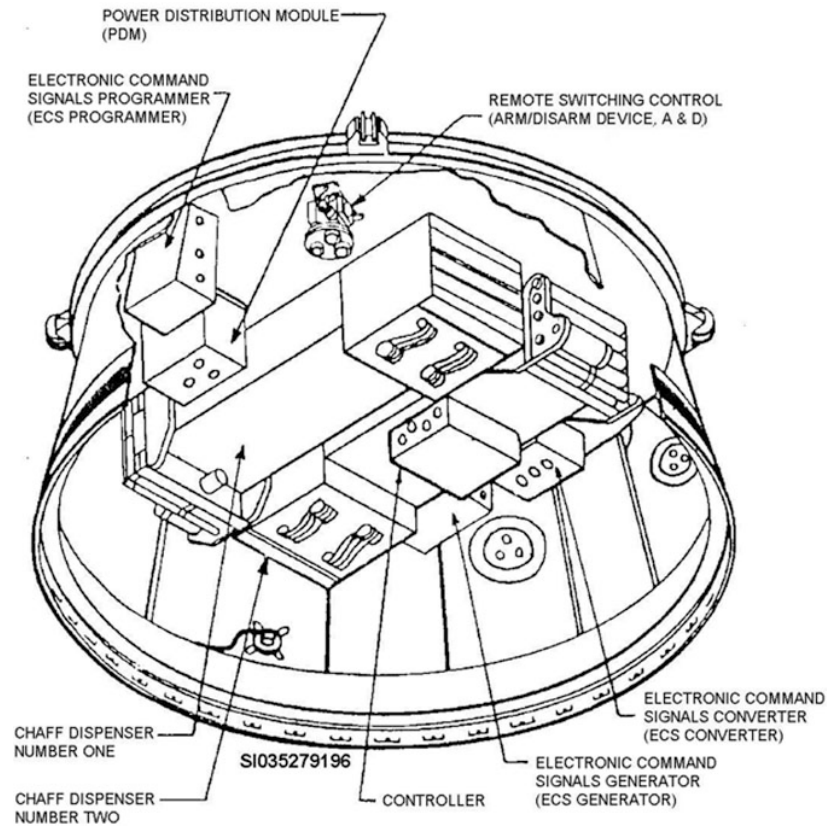


Figure 2-4. DM (cutaway view).

Shroud assembly

As you look at an assembled RS, the shroud assembly is the only component you see. It is a titanium structure that provides environmental protection for the RS payload support, associated components, and cabling during powered flight. The assembly consists of a forward shroud and an aft shroud (fig. 2-5), which are joined by 12 fasteners.

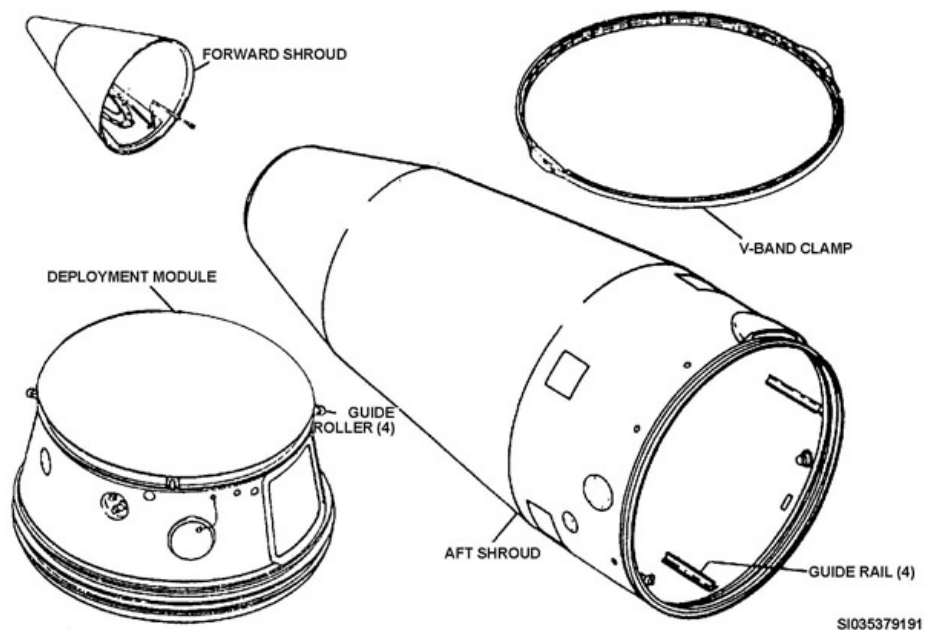


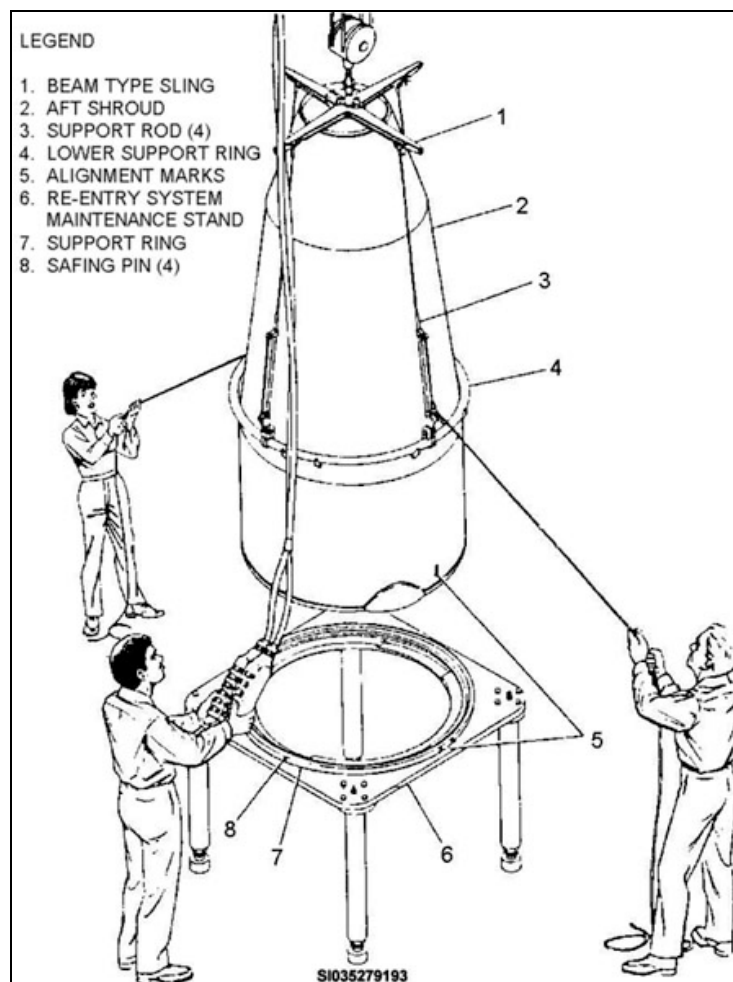
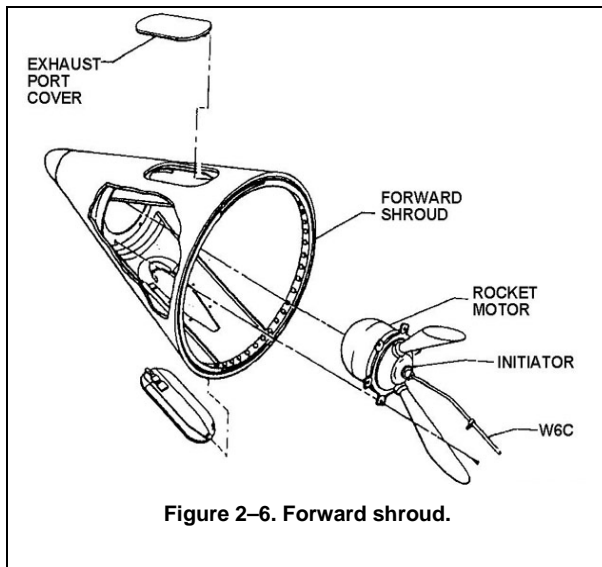
Figure 2-5. Shroud assembly and deployment module.

Forward shroud

The forward shroud (fig. 2-6) is a conical titanium assembly with a rounded nose cap. Dual exhaust vents in the forward shroud provide ventilation of exhaust from the rocket motor. Environmental protection is provided in the forward shroud in the form of shielding for the rocket nozzles, initiator, rocket motor, seal, collar assemblies, and cover assemblies.

Aft shroud

The aft shroud (fig. 2-7) is composed of three titanium sections welded together, two of which are conical, and the third (aft) portion cylindrical. Four lift points, located 90° apart around the aft shroud, provide a means for handling the shroud assembly. A V-band (fig. 2-8) secures the shroud assembly to the frustum of the payload support.



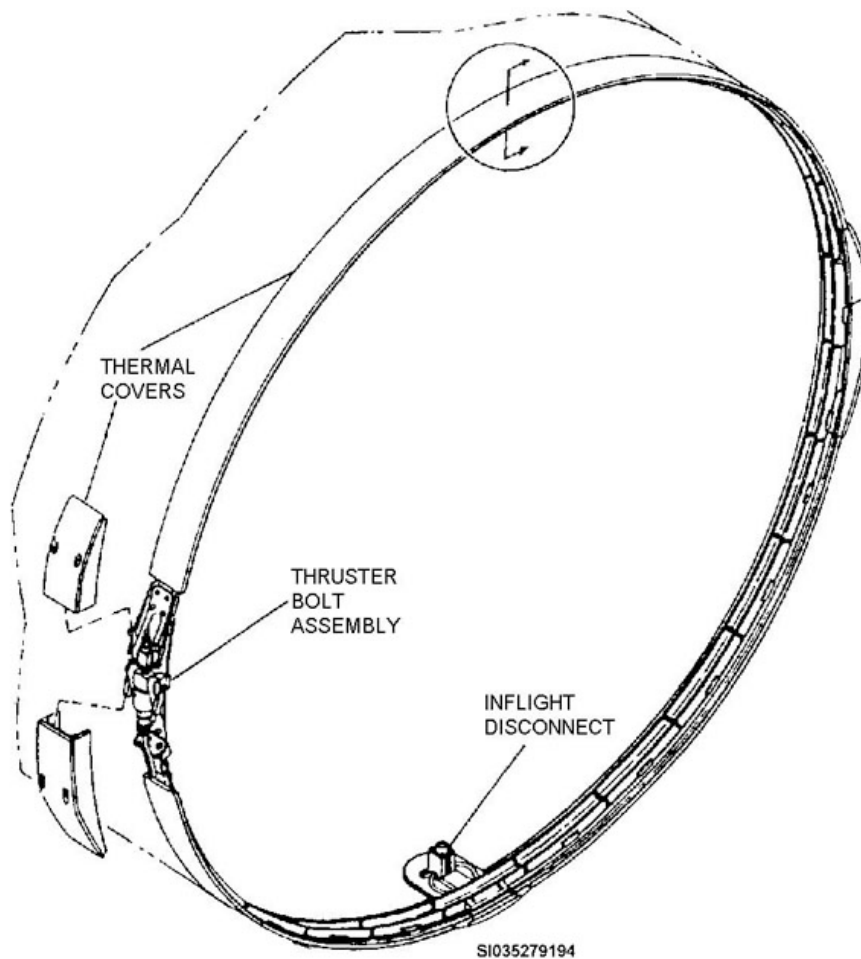
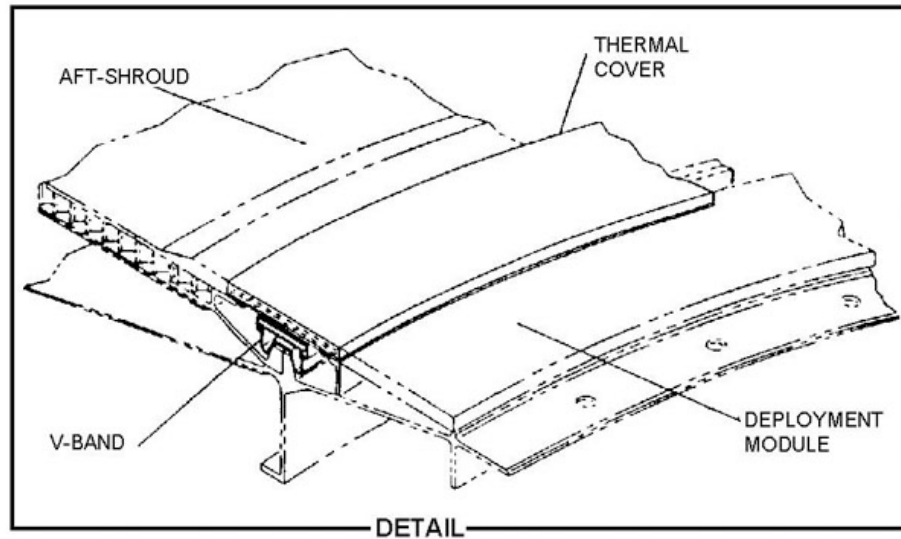


Figure 2-8. V-band assembly.

Penetration aids

Penetration aids are used with the MK12A and consist of the chaff subsystem, which includes the chaff dispensers (fig. 2-9), and a chaff dispenser installation kit. The concept is to eject metallic particles to confuse radar monitoring. This confusion increases the probability of impact.

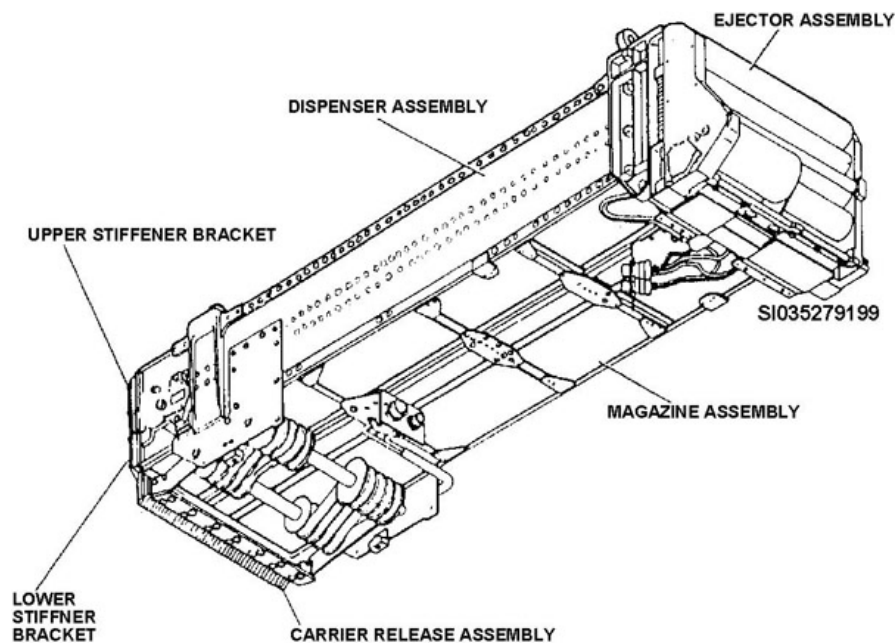


Figure 2-9. Chaff dispenser.

Chaff subsystem

The chaff subsystem consists of two chaff dispensers mounted on the rear face of the payload support bulkhead, each containing a chaff payload. Each dispenser is an electromechanical device, which stores the chaff and dispenses it in the required deployment pattern.

Chaff dispenser installation kit

The chaff installation kit consists of a power distribution module (PDM), ECS converter, dispenser mounting brackets, dispenser controller module, closure installation kit, and associated cabling.

Inspection, repair, and replacement procedures

Since we are familiar with the different components that make up the RS, we start the inspection of each of the RS components, and then move on to the repair and replace procedures for some of the components. When an abnormal condition is noted and pertinent procedures do not specifically relate to the noted irregularity, we must stop work and obtain technical qualified guidance before continuing the operation.

RS payload

Inspect the RS payload, or RV, according to the weapons-specific manual and its RV counterpart manual. The RS payload was covered in lessons 603 and 607.

Forward shroud

Verify the shielding cap is on the interface connector P2593. Inspect the titanium surface for defects. If you have a scratch that exceeds .01 in. in depth, reject the shroud. Inspect the W6C cable, nozzle shield, and initiator shield for missing or damaged decals. One decal is located on the inside surface of the forward shroud at the 315° position. This alignment mark helps you orientate the rocket motor to the correct position when installing it. If you have to replace a decal, use a utility knife and pry off the damaged decal taking care not to damage the titanium surface. Use isopropyl alcohol to clean the area, position the appropriate decal in place, and apply uniform pressure. Avoid air bubbles and wrinkles.

You may be required to replace damaged or defective parts such as the forward shield, nozzle shield, or initiator shield. Steps for replacing these components are in the TO 16W21-4-2. Some shrouds

have a series of numbers and/or letters engraved, stamped, or stenciled on the surface. They may be at different locations on the shroud and were used to track lot numbers during manufacturing. These markings are not cause for rejection. You can locate specific inspection criteria in TO 16W21-4-2.

Aft shroud

Inspect the steel rivets for corrosion. If corrosion is found, remove it according to TO 11N-35-51. If a repairable defect is found during inspection of the titanium surface, repair procedures are identical to those used for the forward shroud. If any cracks or pits are found or a dent exceeds the prescribed depth, reject the aft shroud. Clean the surface of any foreign material. On the inside of the aft shroud, you'll inspect the thermal panels for defects. If there are any cracks, tears, or corrosion in the foil, replace the panel. Try to remove markings from the thermal panels with isopropyl alcohol. If the marking cannot be removed, replace the panel. Torque loose panels. If a thermal panel is still loose after torqueing, it is still considered acceptable. Inspect the W6B cable. Replace the cable if the braided wire is parting from the backshell or if the wire braid has a completely severed strand. Inspect for missing or damaged decals and replace as necessary.

Payload support components

Inspect the cork of the payload support heat shield for nicks, cuts, gouges, or scratches. Damage to the cork can be repaired using the procedures in the applicable TO. After making repairs to the cork, apply p-nitrophenol to the repaired area. You apply three coats of p-nitrophenol with a 20-minute dry time between coats. When applying p-nitrophenol, you put on surgical gloves, goggles, and an impervious apron. When applying p-nitrophenol, you need to be in a well-ventilated area. Inspect the cables, components, helicoil inserts, rollers, roller brackets, nut retainer and element, closures, and alodine-coated surfaces. Check for cleanliness. The surface must be free from dirt, dust, and moisture of any kind. You can clean the bulkhead with a soft cloth and soap and water then wipe dry. Isopropyl alcohol can be used in place of the soap and water.

Some of the components of the payload support may need replacement: frustum cover, ECS generator, ECS programmer, A&D device, or W5 series cables. Frustum covers are removed for repair and replacement or when you reconfigure the reentry system. Repairing the alodine-coated surfaces may also be required. It is *vital* that you follow the steps according to the applicable TO when repairing alodine-coated surfaces; otherwise, you may impair the functional capability of radiation and EMP shielding. When a broken bolt or screw needs to be replaced, follow procedures in TO 11N-35-51. If the bolt or screw is broken in a helicoil insert or nut plate, replace the insert or nut plate.

RS installation kit components

Inspect the RS installation kit for support fitting assemblies and associated hardware and the W4A and W4B cables. For each RV, the installation kit contains three support fittings: one W4A cable, one W4B cable, and the associated hardware. Refer to table 3-2 of TO 16W21-4-2 for inspection criteria.

You may be required to replace the spring retainer from a support fitting. Remove the two fastener pins, washers, and nuts securing the defective spring retainer from the inside of the support fitting. Position a new spring retainer on the inside of the support fitting, align the holes, and insert the fastener pins through the support fitting. On the outside of the retainer, attach the washers and nuts. Torque the nuts to 27 (+2, -3) in-lb. Repair procedures for the W4A, W4B, W5G, W6B, and W6C cables are found in TO 16W21-4-2. Cable repair must be limited to two repairs in the same area. If a third repair is necessary, remove all counter-wrapped repair tape, use table 3-2 as a guide, and check for damage criteria. Repair or replace the cable as required. If the cable can be repaired, use aluminum foil/glass cloth tape, and with a minimum use of tension, counter wrap the damaged area overlapping the wraps by $\frac{3}{8}$ in., and overlap the damaged area by 1 in.

V-Band clamp components

Place the V-band on a padded surface. Inspect the V-band for damage, such as nicks, cuts, gouges, or scratches, which result in removing cork from the surface of the V-band clamp. Refer to TO 16W21-4-2 for damage criteria and corrective actions. Inspect the W6A cable, components, and thruster bolt threads. When inspecting the W6A cable, if you find damage to the sleeving, which also involves damage to the wire insulation underneath, reject the W6A cable. Inspect the V-band clamp thermal cover assembly wire rope for broken strands.

If any damage is found, replace the thermal cover assembly. Inspect the slipper and spacer assemblies to make sure no spacers have been removed. If a spacer is loose or separated from the slipper, re-bond the spacer to the slipper. To replace the V-band thermal cover assembly jam nut, remove the lockwire, jam nut, and hex end fitting. Install the new hardware and torque the hex end fitting to 3.5 (± 1.5) in-lb.

Chaff dispenser

When inspecting the chaff dispenser rollers, you need to wear goggles to prevent injury from releasing the chaff carrier accidentally. Manually rotate the rollers to verify binding or slippage does not occur. While using a flashlight, inspect between the rollers and magazine for released carriers. Inspect the face of the magazine for missing or released carriers by placing your thumb on the solenoid located under the motor assembly and advancing the roller head by depressing and releasing the solenoid. Inspect both upper and lower pairs for missing carriers. Inspect each index position making sure all carriers have been examined. After you inspect the index head, reset the head to the initial position by grasping the crossbar, releasing the no-back lever, and pulling down on the crossbar until the index head bottoms. Inspect the chaff dispenser installation kit to make sure all items are included.

611. Reentry systems disassembly

This lesson contains RS disassembly procedures assuming the RS is positioned on the RS maintenance stand. As the RS is disassembled, all accessible components are inspected for general damage unless specific visual inspections are required.

Removing the aft shroud

Before removing the aft shroud, first perform an ESCTS checkout of RS A&F safety monitor loop. Once completed, the shroud release shield is ready to be removed.

WARNING: The V-band clamp is preloaded to 6,000 pounds (lb.) and could fly apart. The personnel protection barrier must be installed before working around the aft shroud because failing to comply could result in injury to or death of personnel.

To remove the shroud release shield, loosen the nuts on the T-bolts and release the T-bolts from the latches. Remove one 180° section of the shroud release shield by removing three thumbscrews from the slots in the extensions. Next, remove the other 180° section of shroud release by performing the previous step. Store the six thumbscrews in the holes provided on the extensions. Remove the four plug assemblies securing IFD thermal cover to the fitting arm. Next, remove the IFD thermal cover. Remove the eight thruster assembly thermal cover screws securing the four thrusters assembly thermal covers and then remove them.

Before removing the pressure cartridges, keep in mind the possibility of an electrostatic discharge when the ordnance is installed.

WARNING: Personnel must touch the metal structure of the component or next higher assembly containing the component or the attached support equipment to rid the static charge immediately before handling or connecting the component. Failure to comply may result in injury to or death of personnel.

Disconnect cable W6A from the pressure cartridges and install shielding and protective caps. Remove the safety wire. While restraining the thruster bolt with a thin, open-end wrench, use a ratchet, socket, and extension to loosen and remove pressure cartridges. Install shielding caps on the connector end of the pressure cartridges and plastic shipping caps on the threaded ends. Place pressure cartridges in the ordnance container and store in the designated location. Install plugs with O-rings in the thruster assemblies and hand tighten. Next, remove the V-band clamp thermal covers by cutting and removing the safety wire and retracting the eight jam nuts. Release the torque on the eight hex end fittings and remove from the lower link assemblies and hex end fittings. Fully retract the top hex end fittings from the thermal covers and remove the covers and lower link assemblies. Cut and remove the lacing that secures cable W6A, cut and remove the safety wire from inside the payload support, and remove the safety wire stud. Hold the force gauge in the attitude in which it is to be used and zero the force gauge meter.

CAUTION: Make sure the force meter reading does *not* exceed 15 lb. Failing to do so may cause damage to the equipment.

Now, attach the force gauge and adapter to the backshell of the connector and pull the force gauge with a tension of 14 (± 1) lb. Lock the force gauge and back off the jam nut to relieve pressure on the connector of cable W5D. Loosen the screw on the adapter arm and remove the force gauge. Remove the jam nut and connector of cable W5D. Remove the four pan head screws securing the fitting arm to the IFD slipper and lift off the thermal cover assembly fitting arm and cable W6A.

Removing the V-band clamp

To remove the V-band clamp, first cut and remove the safety wire from the self-aligning nuts and jam nuts. Manually retract the jam nuts from the unthreaded trunnions. Raise and secure the shock absorber pads with quick-release pins.

CAUTION: Remember that the V-band clamp is preloaded with 6,000 lb. and could fly apart. The preload must be released before the protective barrier is removed because failing to do so could result in injury to or death of personnel.

Now, back off the thruster bolt self-aligning nut slowly until the clamp strap preload is released. Once released, remove the protective barrier from the RS maintenance stand by removing the quick-release pins. Support the V-band and remove the self-aligning nuts and spherical washers. Next, manually support the IFD slipper and remove the thruster bolts from the unthreaded trunnions of the clamp strap and slipper assembly, upper link assemblies, and hex end fittings. Remove the V-band clamp from the shroud payload interface. Loosen the three fasteners securing the A&D device access door and remove the door. Place the A&D device safing pin flag inside the door and secure the door by retightening the three fasteners finger tight. Finally, remove the aft shroud using the procedures in TO 11N-RS133-2-1, *Reentry System LGM30G (Munitions Facility)*.

Removing the RV

The Minuteman III is capable of holding a MK12A or MK21 RV. Let's look at the MK21 RV removal procedures.

CAUTION: If the RV heat shield becomes contaminated during RV handling, you must clean it of contamination as soon as practical to avoid damage to the equipment. Also, the forward section nose is easily damaged; therefore, make sure the RV ground-handling protector is installed before removing the RV.

Now, install the ground-handling protector over the nose tip of the RV. Obtain the tiedown ring from the RV pallet; position it on the RV so that the alignment mark closest to the cable bracket on the tiedown ring aligns opposite the 0° mark on the RV. Using the heat shield plug wrench, remove the plugs from the forward section of the RV. Install threaded protectors and set aside for reuse. Before

installing the mating and handling sling to the forward section, inspect the visible areas that will be covered by the sling.

CAUTION: Make sure the RV mating and handling sling lockpins are fully retracted before placing the sling on the RV. Failing to do so will damage the heat shield material.

Now, attach the RV mating and handling sling to the hoist hook. Visually verify the sling lockpins are fully retracted, which is indicated by the red band being visible. Position the hoist with the RV mating and handling sling over the RV and verify the thread protectors are installed in the RV lift points. Attach the sling; slowly push the locking pins into the RV lift points until the spring plungers drop down, locking the pins into position. Verify the locking pins are fully engaged into the RV, which is indicated by the red band not being visible and the spring plungers down and locked. Remove all the clamps securing cable W4A to the payload support bulkhead. Remove the tension springs and wire ring securing the IFD connector to the eyebolts. Equalize the potential by touching the payload support fitting and disconnect the cables in the order provided in TO 11N-RS133-2-1. Lastly, secure cable W4A to the connector bracket on the tiedown ring and attach the clamp assembly for hotwire support fitting closest to the 0° mark and secure. Remove the bolts securing the support fittings to the payload support bulkhead.

Removing RS installation mounting hardware

First, remove the two eyebolts and washers from the payload support bulkhead. Next, remove the two screws securing the hotwire connector bracket to the payload support bulkhead.

Removing chaff dispenser installation kit

These procedures only apply to the MK12A RV system. The first step is to remove the PDM by disconnecting the cables and removing the four screws and washers. Next, remove the ECS converter by disconnecting the cables and removing the four screws and washers.

NOTE: Before you remove the dispenser controller and chaff dispenser, you must remove certain cables. You must remove cable W7B either before or after you remove the dispenser controller and chaff dispensers.

Using the procedures listed in TO 11N-RS133-2-1, disconnect the following cables: W7H, W7G, W7F, W7E, W7D, W7C, W7B, and W7A. Finally, remove the four screws and six washers that secure the dispenser controller and set aside. Frustum closures (fig. 2-10) are removed for RS configuration, for access to chaff dispensers, or if closures are damaged. The frustum closure assembly consists of forward frustum closure, aft frustum closure, and inboard frustum closure. The three closures are welded together into one assembly. The outboard frustum closure is a separate assembly. Use the RS procedures to carefully remove the frustum closure assembly.

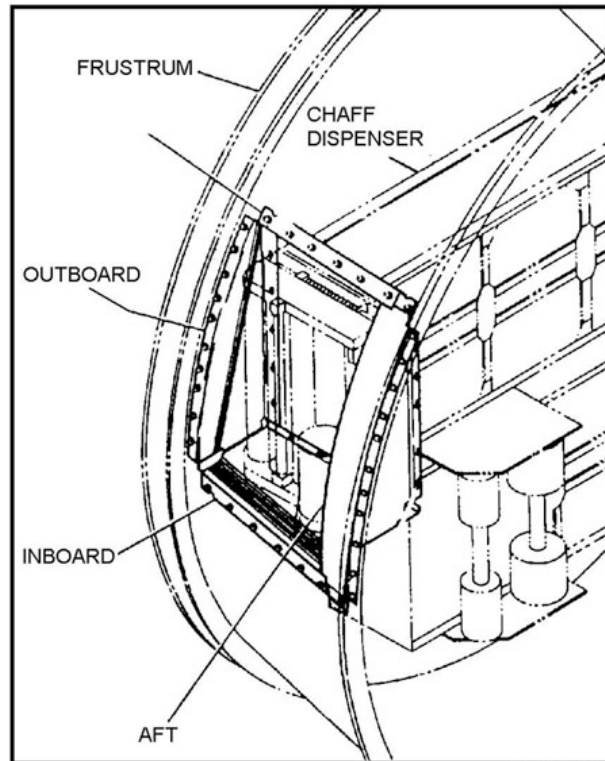


Figure 2-10. Chaff dispenser frustum closures.

Removing chaff dispenser

These procedures apply to the MK12A RV system. First, install the attachment fixture to the RS maintenance stand by installing two locating studs in the right front and left rear tapped holes in bottom of chaff dispenser. Use the handwheels to lower the attachment fixture top plate to its bottom position and disengage the two quick-release pins. Manually remove the attachment fixture from the dispenser replacement stand.

NOTE: The attachment fixture has two positions, one for each chaff dispenser. The attachment fixture should be positioned on the side corresponding with the chaff dispenser being removed.

The front of the attachment fixture (as marked), when installed, faces the opening of the payload support. Hold the attachment fixture on a slight angle; place the rear of attachment fixture (as marked) above and against the mounting plate away from the aperture. Slide the attachment as far backward as possible. Rotate the front upward until it can slide forward to mate with the top of mounting plate. Secure the attachment fixture with two quick-release pins through the mounting plate and attachment fixture mating holes. Disengage the floor locks and use the handle to move the dispenser replacement stand adjacent to the RS maintenance stand. Mate the lower alignment rod to its receptacle. Make sure the two bumpers at the front of the stand contact the mounting plate; make adjustments as necessary to ensure contact. Engage the floor lock at the rear and extend the upper alignment rod to within approximately $\frac{1}{4}$ in. of its receptacle. Using two handwheels, vertically adjust the attachment fixture top plate and the other handwheel to laterally adjust the dispenser replacement stand top plate until the upper alignment rod can be mated to its receptacle. Visually verify that the attachment fixture top plate is level. Fully retract the upper alignment rod.

Next, install the dispenser retainer in the RS maintenance stand by removing the two quick-release pins that secures the dispenser retainer to the dispenser replacement stand. Slide the dispenser retainer from the dispenser replacement stand through the chaff deployment aperture until the dispenser retainer vertical plate contacts stop at the rear of the attachment fixture top plate. Be careful when you

raise the dispenser retainer attachment fixture. Slowly turn the handwheels to avoid contact with the mounting brackets. Using two handwheels, raise the attachment fixture top plate until the dispenser retainer mates with the locating studs on bottom of the chaff dispenser, and continue raising it until it mates with the bottom of the chaff dispenser. Remove the two dispenser mounting bolts and washers from the forward uniball fittings. Pull the dispenser retainer approximately 2 in. so that the rear uniball fittings completely disengage the bulkhead rear fittings pins.

Finally, remove the chaff dispenser from the payload support frustum by using two handwheels to lower the dispenser retainer until it contacts the dispenser replacement stand. Pull the dispenser retainer through the aperture and onto the dispenser replacement stand top plate and secure it using two quick-release pins. Disengage the rear floor lock of the dispenser replacement stand to a designated location and reengage the floor locks. Use two handwheels to lower the attachment fixture top plate to its bottom position. Remove two quick-release pins securing the attachment fixture to the RS maintenance stand. Slide the attachment fixture forward (toward the aperture) as far as possible; rotate the rear downward and remove the attachment fixture from the RS maintenance stand. Place the fixture in the storage position at the bottom of the dispenser replacement stand and push two quick-release pins through the attachment fixture and into the dispenser replacement stand.

612. Reentry systems electrical checkout

This lesson contains checkout procedures for the MK12A and MK21 RV configurations using the ESCTS, RSTS, test adapter kits, safety enhanced reentry vehicle field test set (SFTS), and the MK21 RV tester.

NOTE: The paragraphs are not given in sequence for any particular checkout or malfunction. Always use the appropriate TO when performing any checkout procedure.

Using ESCTS

Use the ESCTS (fig. 2-11) throughout the RS assembly. It checks the A&F safety monitor loop and the confidence monitor loop of an assembled RS. It also checks the RS chaff confidence monitor loop and performs the RV final assembly checkout. Other functions include checkout of the RV mid section cables for continuity, the forward section AFA for stray voltage, and forward shroud confidence monitor loop and specific RS subsystems for fault isolation. Before each day's use, perform a self-test and a bridgewire resistance ohms (Ω) checkout of the adapter cable before any AVE test is performed. If any malfunction occurs during the bridgewire resistance checkout of the adapter cable, first perform a checkout of the ESCTS alone. If the ESCTS checkout results are acceptable, reject and replace the adapter cable. If the results were unacceptable, perform the fault isolation procedures to correct the malfunction and repeat the bridgewire resistance checkout prior to proceeding to AVE checkout. Any malfunctions that occur afterwards during AVE checkout, the ESCTS and adapter are assumed "good" and the fault is in the circuit being checked.

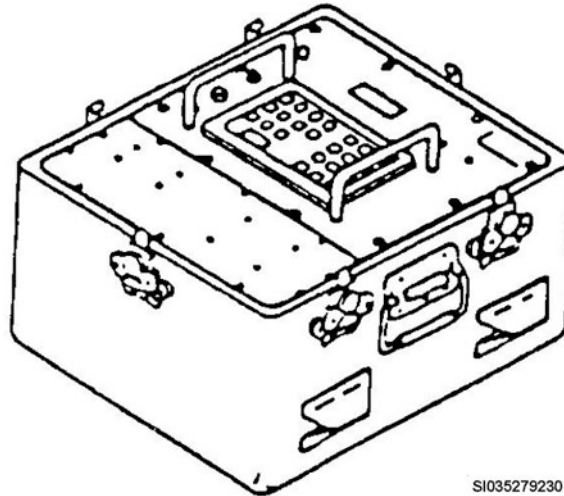


Figure 2-11. ESCTS.

Forward shroud confidence monitor loop checkout

If you have not already done so, perform a self-test of the ESCTS. Set the ESCTS outside the checkout room and route the test cable into the test cell. Perform the OHM TEST-MANUAL MODE test. Immediately before handling, connecting, or disconnecting equipment, touch the metal structure of the component or next higher assembly to rid yourself of static electricity. Disconnect the P2593 plug from the W6C connector bracket and connect the test cable to the P2593 plug. Perform the test, disconnect the test cable from P2593 plug, and reinstall the P2593 plug on the connector bracket. Remove and stow the test equipment.

RS safety monitor loop checkout

Use the ESCTS to check out the RS's A&F safety monitor loop and the confidence monitor loop. Perform a self-test of the ESCTS and directly afterwards do a bridewire resistance checkout of the W4251 test cable. To check the A&F safety monitor loop, perform a self-test on the ESCTS and connect it to the RS. Press the OHMS keypad on the ESCTS. Continue pressing the keypad until PAIR 01 to 05 is selected. Press the OHMS keypad; the display shows PAIR 01 to 05 OHMS = less than 10.0.

RS confidence monitor loop checkout

To check out the RS confidence monitor loop, press the OHMS keypad on the ESCTS. Continue pressing the keypad until PAIR 08 to 09 is displayed. Press the OHMS keypad; the display shows PAIR 08 to 09 OHMS = less than 38.0. After you complete these tests, disconnect the ESCTS from the RS.

RS chaff confidence monitor loop checkout

To test the chaff confidence monitor loop with the RS still on the assembly stand, locate the electrical interface connector J2501 of the W7A cable, which is on the inside of the frustum. Remove the protective cap and connect the test cable. Press the OHMS key on the ESCTS, and then run the test. The ohms reading on the test set needs to be less than 10. Turn off the test set, disconnect the test cable, and reinstall the protective cap on the J2501 cable. If a malfunction occurs during the test, refer to troubleshooting TO 11N-RS133-2-1 for RS chaff confidence monitor loop malfunction.

Using RSTS

Use the RSTS (fig. 2-12) to test and troubleshoot the RS and individual components. It consists of a console, targeting simulator, maintenance self-check adapter, junction boxes, and numerous test cables. We perform all normal operating functions from the front of the console. Cable connections are made at the right side of the console. The left side of the console has a sloped operating control

panel and a working surface for the operator. Self-checks are performed to verify the RSTS is working properly and that the adapter cables and junction cables (if used) are connected correctly. In most cases, you can perform the checkout without performing a self-check, but you must refer to the specific workflow or checkout table in TO 11N-RS133-2-1 to determine this. The following are the parameters the RSTS measures:

- Resistance.
- Voltage.
- Time.
- Frequency.
- Pressure.

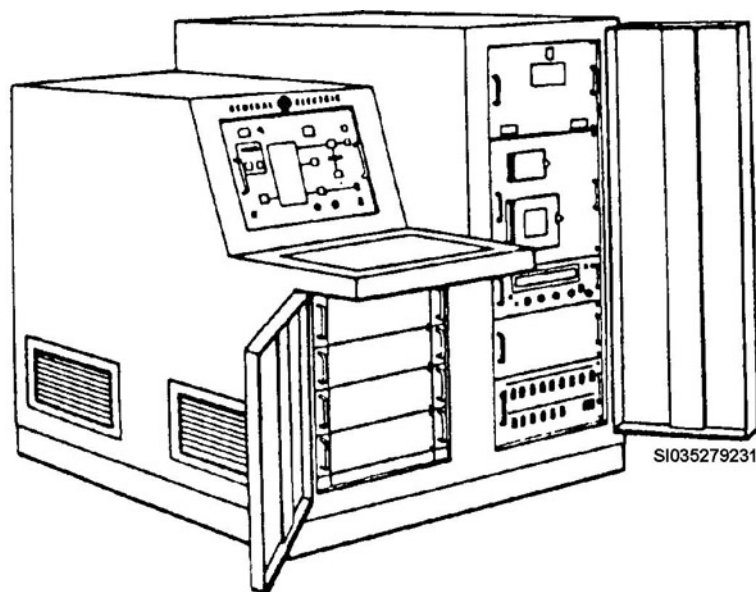


Figure 2-12. RSTS.

The qualitative results of these measurements are displayed on the operating control panel indicator lamps and the digital voltmeter. By *qualitative*, we mean GO/NO GO (good and bad indications). The quantitative results are displayed in the form of printed-paper tape output and as digital indications on the digital voltmeter. Additionally, if a group of cables or components with the same designation are to be checked out consecutively on the RSTS, and a self-check is required before checkout, it is only necessary to run one self-check provided the self-check is not invalidated during the initial or additional checkouts. (**NOTE:** Do *not* disconnect the test cables from the RSTS or junction boxes since this will invalidate the self-check performed earlier.) Make sure you disconnect the test cables from the unit under test only and not from the RSTS. The RSTS doors may be kept open for visual observation of circuit breakers; however, it is preferred that all doors remain closed when the RSTS is connected to the AVE and is in operation.

Testing W6 series cables using RSTS and shroud shunt cap

When using the RSTS to test the W6 series cables, you connect, test, and disconnect the cables according to TO 16W21-4-2. You must complete tests without fault indications before equipment is considered operational. Use the tables in the TO to test the cables.

CAUTION: If you conduct checkout of the W6C cable during fault isolation procedures, you must disconnect the rocket motor initiator from the W6C cable and install a shielding cap before connecting the test cable. Failure to comply could cause injury to you and/or damage the equipment.

Testing W4B and W5 series cables

Tests for the W4B and W5 series cables are very similar to the tests for the W6 series cables. To connect, test, and disconnect cables, use the tables in TO 11N-RS133-2-1. You must complete tests without fault indications before equipment is considered operational. When using TO 11N-RS133-2-1, follow the tables in section 4. If a malfunction occurs during checkout of the W4B or W5 series cables, perform a self-check of the W4B or W5 series cables test circuits. If the self-check of the test circuits is unacceptable, reject and replace the defective cable.

Testing W4A cable

To test the W4A cable, connect it to the RSTS. Then, while using a crowfoot adapter and ratchet wrench, turn the ARM/MATE nut in the ARM direction until it stops, then back it off ¼ turn. Carefully connect the W4A cable to the test cable and tighten then torque the ARM/MATE nut. If a malfunction occurs during checkout of the W4A cable, perform a self-check of the W4A test circuits. If the self-check of the test circuits is unacceptable, reject and replace the W4A cable.

Chaff subassembly and test W7 cable checkout

Remove the rack locking bars and install the release mechanism locking tool before you perform the checkout of the chaff subsystem test circuits. This test also checks the W7 series cables. During this test, you connect and disconnect different cables and jumper plugs from both chaff dispensers. Because of all the different cabling, make sure to carefully look at the cabling and jumper plugs and make sure you have the right one before connecting or disconnecting. Reset the index heads of both dispensers to the initial position.

A&D device checkout

Using the RSTS, perform a self-check, and then test the A&D device. If a malfunction happens during this test, perform a self-check of the A&D device, housing assembly, and ECS programmer test circuits. If the self-check is good, perform fault isolation procedures. Before disconnecting cables from the ECS generator, touch the metal structure of AVE to discharge static electricity. During portions of this test, remove and reinstall the safing pin from the A&D device. When the safing pin is installed, verify that “S” is in the window of the A&D device.

Targeting function checkout

Connect the test cables to the RSTS and perform a targeting self-test, and then proceed to checkout of the targeting function test. During initial buildup or recycle of the RS, make sure the W4A, W4B, W5G, and W6B cables have been previously inspected before continuing the checkout. Before you perform checkout of the targeting function test, verify the safing pin is installed in the A&D device. If a fault occurs during the test sequence, use the fault isolation procedures.

Unique signals checkout

Perform a self-check of the unique signal line test using the RSTS, and then perform the checkout of the unique signal lines. If a fault occurs during the test, do a self-check of the unique signal lines test circuits. If the self-check is good, perform fault isolation procedures. After completion of the test, be sure to reconnect the W5E cable to the A&D device and the W4A cables to their respective jacks.

Forward shroud rocket motor initiator and pressure cartridges checkout

When you are working with electro-explosive devices (EED), don't handle them roughly or drop them carelessly because you can cause injury or death. You should wear an approved wrist strap or touch the grounding device with your bare hands immediately before you handle an EED. Always keep the shorting cap installed on the EED except when inspecting, testing, or connecting and disconnecting an EED. Always keep the output end of an EED pointed away from your body and others at all times. Whenever you are testing an EED, make sure it is in an approved testing cell during checkout. Inspect the EED, and then perform your tests. To test an EED, set up and perform an electrical checkout on the tester, adapter, and test chamber. Record your readings.

CAUTION: On the test set adapter, set the inner and outer selector knobs to the OFF position. Failure to do so may cause injury to you or damage to the equipment.

Place the initiator and pressure cartridge into the test chamber, remove the shielding cap, connect the test cable and the facility ground to the EED, and close the test chamber door. Test the initiator and pressure cartridge, record your readings, and then subtract the readings from the electrical checkout of the tester. The reading must be within acceptable limits established by TO 11A15-1-167-1, *Storage and Maintenance Procedures, Explosive Assemblies LGM-30*. When you are finished, remove the cables and facility ground from the initiator and pressure cartridge, replace the shielding cap, and remove the initiator and pressure cartridge from the test chamber.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

610. Inspecting reentry systems components

1. What is the purpose of the shroud?
2. What happens once the RS reaches the outer atmosphere?
3. Which RS component is the mounting platform for the RVs?
4. What do the chaff deployment apertures on the payload support frustum provide?
5. What does the RS installation kit provide for the RS?
6. How are the forward and aft shroud joined together in the shroud assembly?
7. What provides environmental protection and shielding for the rocket nozzles, initiators, and rock motor?
8. Where are the lift points located on the aft shroud?
9. What is the purpose of the penetration aids?
10. What does the decal at the 315° position on the inside surface of the forward shroud help you do?

11. What procedure do you perform if you find a loose thermal panel on the inside of the aft shroud?
12. How many support fittings are there for one RV?
13. What should you do when you find damage to the W6A cable sleeving, which also involves damage to the wire insulation underneath?
14. What should you do upon finding a loose spacer on the slipper?

611. Reentry systems disassembly

1. When disassembling the RS, what must you do before removing the aft shroud?
2. What warrants the installation of a protective barrier around the V-band clamp?
3. How is one 180° section of the shroud release shield removed?
4. Before removing pressure cartridges, what must personnel do to rid static electricity?
5. How do you remove the thermal covers of the V-band?
6. While pulling on the V-band IFD connector, the force gauge should *not* exceed how many pounds?
7. Where do you store the A&D device safing pin flag once you remove the V-band clamp?
8. What tool is used to remove the plugs from the forward section of the RV?
9. Provide the procedures to remove the RS installation mounting hardware.

10. During the removal of the chaff dispenser on the MK12A RV system, how do you remove the electric command signal converter?
11. When removing the chaff dispenser, where do you position the attachment fixture?
12. How far must you pull the chaff dispenser retainer to get the rear uniball fittings to disengage the bulkhead rear fittings pins?

612. Reentry systems electrical checkout

1. What test equipment is used to check the A&F safety monitor loop and the confidence monitor loop of an assembled RS?
2. What should you do immediately before handling, connecting, or disconnecting RS electrical equipment?
3. During checkout of the RS safety monitor loop, what do you perform *after* you conduct a self-test of the ESCTS?
4. Upon completing the checkout of the RS confidence monitor loop, what should the ESCTS display?
5. What should you refer to if the RS chaff confidence monitor loop results in a malfunction?
6. What parameters does the RSTS measure?
7. What do we mean by “qualitative” results of a test?
8. What should occur if checkout of the W6C cable is being conducted during fault isolation procedures?
9. What instance would require the W4B or W5 series cable to be rejected and replaced?

10. What should occur if the W4A cable results in a malfunction?
11. How should you handle the EED at all times during checkout of the rocket motor initiators and pressure cartridges?

2-2. Reentry Systems Maintenance and Handling

In this section, we introduce additional maintenance operations and, finally, the handling operations involving the RS.

613. Reentry systems electrical fault isolation

Fault isolation consists of using the ESCTS or RSTS when a malfunction is indicated during electrical checkout. Also, if a fault occurs during checkout and the technician is directed to a fault isolation table or procedure, which contains a new cabling diagram, the technician should only make connections shown on the fault diagram. If the new cable diagram results in cables left disconnected from the test set or the AVE, this is permissible.

Performing fault isolation procedures using ECSTS

The ESCTS is used to perform fault isolation procedures when a malfunction is indicated during checkout of the A&F safety monitor loop, the confidence monitor loop, or the chaff confidence monitor loop. Use the table in TO 11N-RS133-2-1 for a list of fault isolation checkout procedures. To give you an idea of what is required, the following are fault isolation steps in the TO for the ESCTS Test of A&F Safety Monitor Loop at Plug P2550 of Cable W4A:

1. Perform a self-test of the ESCTS.
2. Perform the bridgewire resistance checkout of the W4250 cable. Cable ID is 06007FFF.
3. Locate plug P2550 of cable W4A and disconnect it from jack J2550 at the frustum. Install the protective cap on jack J2550.
4. Connect P2 of W4250 to jack J2550 of cable W4A.
5. Press the OHMS keypad on ESCTS. Display shows POWER UP SELF-TESTS, then SEL, AMPS, OHMS, MAN, SELF-TESTS.
6. Press the MANUAL keypad. Display shows PAIR_ _TO_ _.
7. Press the PAIR SELECT keypad. Display shows INPUT PAIR_ _TO_ _.
8. Press 1 CONTINUE 2 CONTINUE keypad. Display shows PAIR 01 TO 02.
9. Press the OHMS keypad. Display shows PAIR 01 TO 02 OHMS = less than 5.0.

NOTE: If test results indicate *greater* than 5.0 Ω (NO GO), the fault is in the channel under test; therefore, perform step 11 and return to the flow diagram. Perform steps 11 and 12, and then return to the flow diagram if test results indicate *less* than 5.0 Ω (GO).

10. Set ON-OFF switch on ESCTS to OFF.
11. Disconnect cable W4250 from ESCTS and from plug P2550.
12. Remove protective cap from jack J2550 and connect plug P2550 to jack J2550.

As you can see from these steps, the procedures are precise and detailed. (**NOTE:** Make sure you always follow the appropriate TO for this and all other procedures.)

Performing fault isolation procedures using RSTS

Since assembling the RS is a building-block process, different stages of assembly require testing to verify the individual components work together. The following are examples of these tests:

- RV final assembly checkout.
- RS targeting checkout.
- RS confidence monitor loop checkout.

We've explained why we test and have given some examples. Let's talk briefly about test set faults. It's not too difficult to cable up a test, push the button, and get a green light (acceptable indication). When the red light (test fault lamp) comes on, it becomes a little more challenging and troubleshooting begins. The following conditions must be met before using the RSTS for fault isolation:

1. Cables, connector savers, and modules properly connected.
2. Correct sequence on the test set selected.
3. Test steps performed in proper sequence.

Whenever you are testing a component and you have to remove, replace, substitute, or clean a connector; or perform isolation, continuity, or resistance; remove the power from RSTS.

If you get a high-resistance indication during AVE cable checkout, clean the cable connector, check for proper connection, and repeat the test where you discovered the fault. Depending on the indication you receive, you might perform fault isolation on the AVE, replace the test cable, or hold the AVE for further disposition. Follow the guidance for proper fault isolation procedures.

If all these items check out, the item under test is the problem. You will be directed to the fault-isolation tables. The tables are set up by test set sequence, step, and block numbers. Use the indicated fault sequence, step, and block numbers to locate what you are to do next. It could be disassembly, component removal, and so forth. If everything still checks out during your fault isolation, you have an abnormal condition. When you've exhausted your technical expertise, you need to seek higher guidance. This will be your team chief, bay chief, or noncommissioned officer in charge (NCOIC). If they can't resolve the situation, you might have to turn to headquarters or depot.

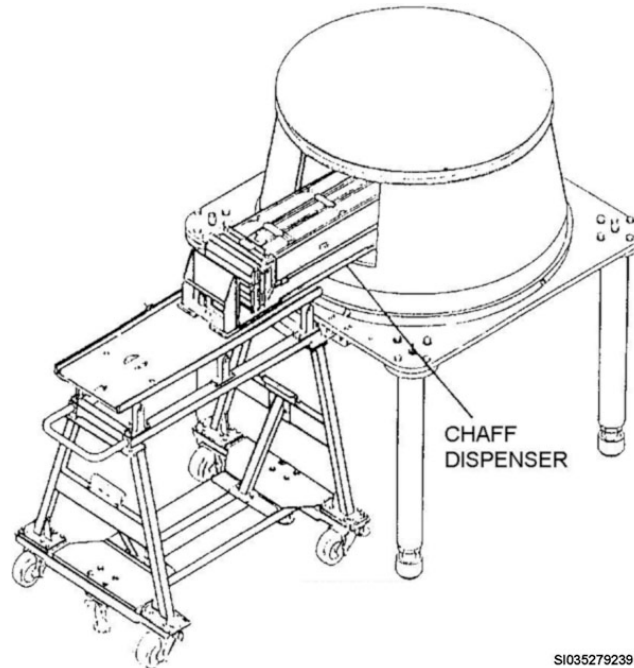
614. Reentry systems assembly

This lesson contains RS assembly procedures, assuming the RS is positioned on the RS maintenance stand. As the RS is assembled, inspect all accessible components for general damage unless specific visual inspections are provided.

Installing chaff dispenser

First, install the attachment fixture to the RS maintenance stand by using two handwheels to lower the fixture top plate to its bottom position. Disengage two quick-release pins and manually remove the attachment fixture from the dispenser replacement stand. Remember, the attachment fixture has two positions—one for each chaff dispenser. The fixture should be positioned on the side corresponding with the dispenser being installed. The front of the fixture (as marked), when installed, faces the opening of the payload support frustum. Hold the attachment fixture on a slight angle; install the rear of the attachment fixture (as marked) to the position above the mounting plate away from the aperture. Slide the attachment as far backward as possible. Rotate the front upward until it can slide forward to mate with the top of mounting plate. Secure the attachment fixture to the RS maintenance stand by installing two quick-release pins through the mounting plate and attachment fixture channel mating holes. Disengage the floor locks and use the handle to move the dispenser replacement stand adjacent to the RS maintenance stand. Mate the lower alignment rod to its receptacle. Make sure the two bumpers at the front of the stand contact the mounting plate. Make adjustments as necessary to ensure contact. Engage the floor lock at the rear and extend the upper alignment rod to within approximately ¼ in. of its receptacle. Using two handwheels, vertically adjust the attachment fixture

top plate and laterally adjust the dispenser replacement stand top plate until the upper alignment rod can be mated to its receptacle. Visually verify the attachment fixture top plate is level. Fully retract the upper alignment rod. Next, install the chaff dispenser (fig. 2-13) in the payload support by removing the two quick-release pins that secure the dispenser retainer to the dispenser replacement stand. Rotate to the left and lower the latch-holding stop on the front plate of the dispenser retainer.



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Figure 2-13. Insertion of the chaff dispenser.

Manually align the four dispenser mounting points with the chaff mounting brackets. Using the handle of the dispenser retainer, slowly push the chaff dispenser from the dispenser replacement stand through the chaff deployment aperture to the attachment fixture. Continue pushing the retainer until the retainer stops to disengage it. Use the attachment fixture handwheels to raise the chaff dispenser until the uniball fittings are aligned with the attachment brackets. To mate the dispenser rear uniball fittings to the bulkhead rear fittings pins, push the dispenser retainer slowly until the forward uniball fittings contact the RS bulkhead fittings. Install two dispenser mounting bolts and washers to the forward uniball fittings and torque to 150 (± 10) in-lb.

Finally, remove the dispenser retainer and attachment fixture (fig. 2-14) by using two handwheels to lower the attachment fixture top plate until the two locating studs in the bottom of dispenser are clear of their mating holes in the bottom of dispenser retainer and the dispenser retainer contacts the top of the dispenser replacement stand. Make sure the dispenser retainer is above the bottom of the chaff deployment aperture in the payload support frustum. Manually pull the dispenser retainer through the chaff deployment aperture and place the retainer on the dispenser replacement stand. Install two quick-release pins through the retainer and replacement stand top plate. Disengage the rear floor lock and remove the stand. Use two handwheels to lower the fixture top plate to the bottom position. Remove two quick-release pins securing the attachment fixture to the RS maintenance stand. Slide the attachment fixture forward toward the aperture as far as possible; rotate the rear downward and remove the fixture from the RS maintenance stand. Install the attachment fixture in the storage position in the bottom of the dispenser replacement stand and install two quick-release pins. Remove two locating studs from the bottom of the chaff dispenser and install locating studs in the dispenser retainer storage position.

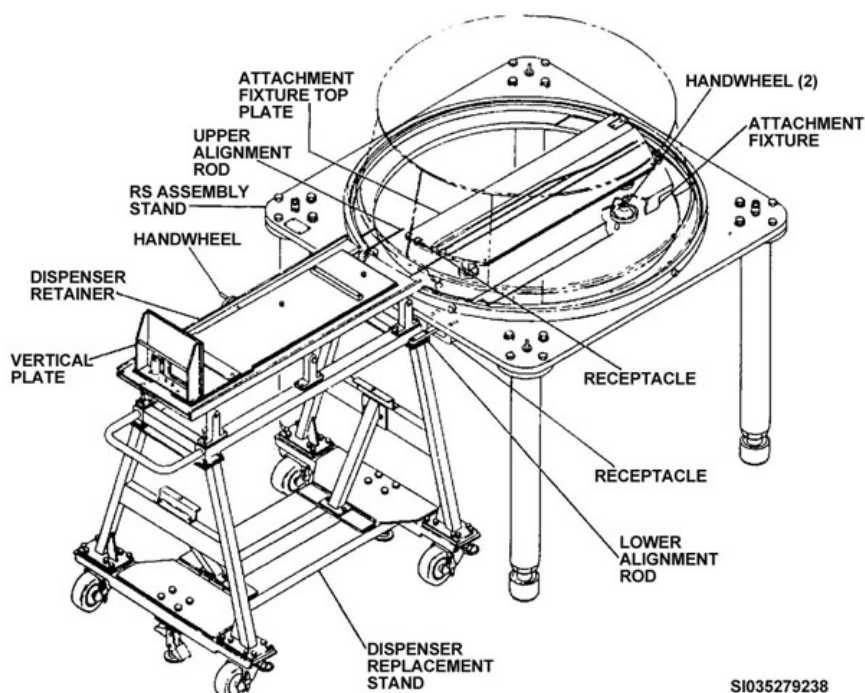


Figure 2-14. Chaff dispenser installation kit components.

Installing chaff dispenser installation kit

First, install the dispenser controller by positioning it on the bottom of the chaff dispenser number 2 and align the mounting holes with the J1 oriented outboard.

CAUTION: The dispenser mounting screws *cannot* be torqued until the cable clamps have been installed because you can cause damage to the equipment if you fail to comply.

While supporting the dispenser controller, install two screws with washers into two inboard mounting holes and finger-tighten. Install the remaining two screws finger-tight with washers into the two outboard mounting holes and torque to 28 (+2, -3) in-lb. The inboard screws will remain finger-tightened until you install the W7C and W7H cables, which you do at a later step.

Next, install the ECS converter by applying one light coat of a solid-film lubricant evenly around the mounting screws and air-dry for 5 minutes. Position the ECS converter on the payload support bulkhead and install four screws with washers in the designated locations. Torque the screws to 28 (+2, -3) in-lb. and connect the cables.

Third, install the PDM by applying a solid-film lubricant evenly around the mounting screws and air-dry for 5 minutes. Position the PDM on the payload support bulkhead and install four screws and washers in the designated locations and torque the four screws to 28 (+2, -3) in-lb. Make sure the jumper assembly is installed and then connect the cables. Finally, install the chaff dispenser installation kit and the W7 series cables.

Reconfigure payload support

TO 11N-RS133-2-1 provides procedures to configure the bulkhead for one, two, or three RVs. Refer to the TO for proper configurations and placement of the components. The following configurations are available for MK12A only:

- RV A for configuration A1/B1.
- RV A for configuration A2/B2 and A3/B3.
- A2/B2 installation kit mounting hardware for RV B.

- A3/B3 installation kit mounting hardware for RV B.
- Installation kit mounting hardware for RV C.

Installing RS installation mounting hardware

Position the hotwire connector bracket for the RV at hole locations 400 and 401 and install two screws with washers. Torque two mounting screws to 28 (+2, -3) in-lb. Insert one eyebolt with washers in each of the two bulkhead hole locations 402 and 403 and torque to 23 (+2, -3) in-lb. Position cable W4B on the payload support bulkhead. Remove the protective cap and jam nut and inspect for the presence of an O-ring. If present, remove and discard. Insert into the connector bracket, reinstall the jam nut, and finger tighten. Torque the jam nut to 145 (± 5) in-lb. Secure the jam nut to the connector bracket with safety wire and replace the protective cap. Install a grounding clamp on cable W4B while ensuring the grounding clamp contacts the shielding braid. Place a washer with a cutout facing down under the grounding clamp at hole location 314. Use a screw and washer and torque to 28 (+2, -3) in-lb. to secure the grounding clamp to the payload support bulkhead.

Installing the RV

To align the RV with the payload support bulkhead, install one guide pin into each of the three support fittings locations in the bulkhead inserts. Using an overhead hoist and manual guidance as shown in figure 2-15, orient the IFD connector directly above the designated hole locations and carefully lower so the longest guide pin engages a corresponding hole in one support fitting. Continue lowering and manually turning the RV until a second guide pin is engaged in the next corresponding support fitting hole. Continue lowering until the shortest guide pin is engaged in support fitting and the RV is within $\frac{1}{4}$ in. of the payload support bulkhead. Install two bolts and washers with the countersunk surface of the washer oriented upward, through each support fitting. Remove the three guide pins and install one bolt and washer with the countersunk surface of the washer oriented upward, through the remaining support fitting into the payload support bulkhead. Lower the RV until firmly seated and torque nine bolts to 65 (± 10) in-lb.

Your next step is to connect the W4A and W4B cables of the RS installation kit (fig. 2-23). Perform the final assembly checkout of the W4A cable using the ESCTS; then connect it. Touch the metal structure of the ZIBs, support fitting, or attached support equipment to discharge or equalize any accumulated static electricity, then connect the W4B cable to the EED. Now perform the confidence monitor loop test on the W4B cable using the ESCTS and connect the W4B to the frustum. RV installation is now complete.

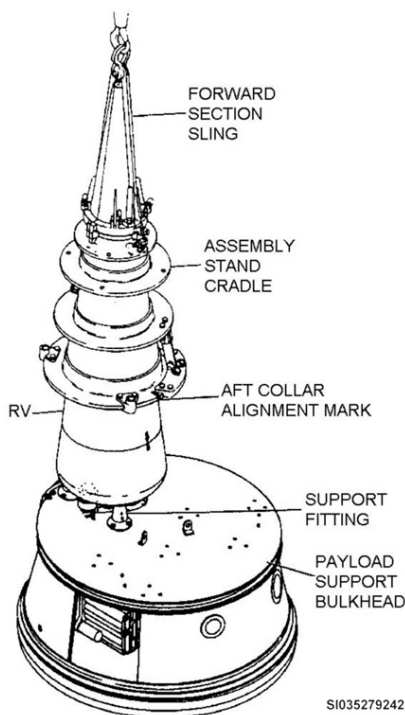


Figure 2-15. RV transfer to payload support bulkhead.

Installing aft shroud

Before installing the aft shroud on the payload support, make sure the cable is clear of the shroud, and the A&D device safing pin flag is inside the frustum when lowering the aft shroud. Use a hoist and guide with tag lines, and center the aft shroud over the payload support.

CAUTION: You must maintain positive manual control of the aft shroud during the lowering operation because swinging the aft shroud could impact and damage the RV.

Align the alignment mark on the aft shroud with the alignment mark on the payload support. While using four technicians to maintain control of the aft shroud, lower the aft shroud guide rails onto the payload rollers until approximately 1 in. of the rail guides are past the rollers. Center the aft shroud above the payload support until the shroud and payload interface surfaces are approximately parallel. Slowly lower the aft shroud to approximately 6 in. above the mating surface. Verify the alignment and adjust as necessary. Clean the mating surfaces with a clean cloth moistened with isopropyl alcohol and continue lowering the aft shroud until it's seated. Remove the three fasteners securing the A&D access door and remove. Pull the A&D device safing pin through the access door. Reinstall the door and finger tighten the mounting screws. Remove the tag lines from the lower support ring and attach it to the lower support rods.

Installing the V-band

Install the V-band sections on the shroud and payload support, space the slippers evenly, and finger tighten the self-aligning nuts on each thruster bolt. Using the slipper alignment tool (fig. 2-16), check the matchmarks. In half-turn increments, simultaneously torque the nuts to 28 in-lb. Starting at 90° from the thruster bolts, rap the V-band slippers to seat them. Verify the alignment of the IFD (fig. 2-17) and retorque the nuts. Install the personnel protection barrier (fig. 2-18) on the RS maintenance stand.

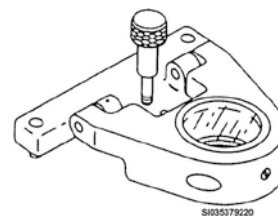


Figure 2-16. IFD slipper alignment tool.

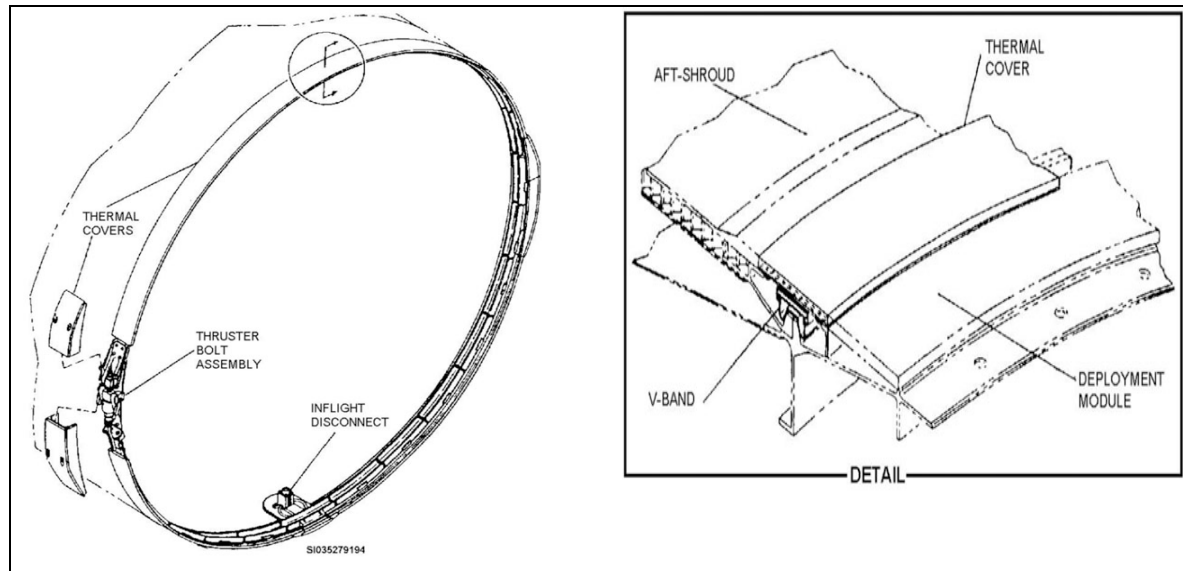


Figure 2-17. V-band assembly.

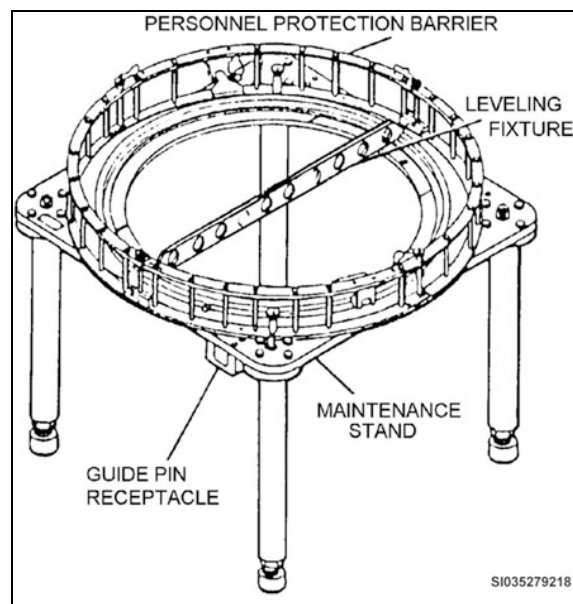


Figure 2-18. RS maintenance stand with protection barrier.

Now a series of torques, measurements, and verifications begins. Two technicians, using dial-indicating torque wrenches, simultaneously tighten the self-aligning nuts one revolution. Check the matchmark by looking through the slipper alignment tool. Measure the distance from the end of the thruster bolt to the self-aligning nut using a half-base micrometer, and record the reading. Two technicians simultaneously rap the sections of the V-band clamp using an aluminum rod with a recessed bumper installed and a rubber mallet. A shortened version of the V-band measurement and torque sequence used in the maintenance bay goes like this:

1. Check the matchmark.
2. Measure the threads.
3. Rap the V-band.
4. Torque.

NOTE: Torque is applied to both self-aligning nuts simultaneously in one-turn increments. As you torque the nuts, the torque wrenches must *not* exceed 460 in-lb. and/or there must *not* be more than 100 in-lb. difference between the wrenches. Exceeding these values could cause the pre-weakened bolt to fracture, resulting in the V-band inadvertently releasing.

Once you obtain the final distance measurement, safety-wire the nuts. Using the force gauge adapter (fig. 2-19), connect the IFD cable. Install the fungicide-treated thermal covers over the V-band. Install a pressure cartridge in each thruster assembly and safety wire. Ground yourself and connect the cables to the pressure cartridges. Install the thermal covers over the thruster assemblies (fig. 2-17) and the shroud release shield (fig. 2-20) around the V-band assembly. Finally, remove the protective barrier.

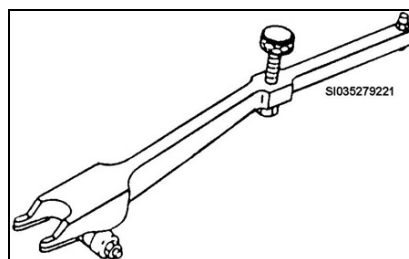


Figure 2-19. Force gauge adapter.

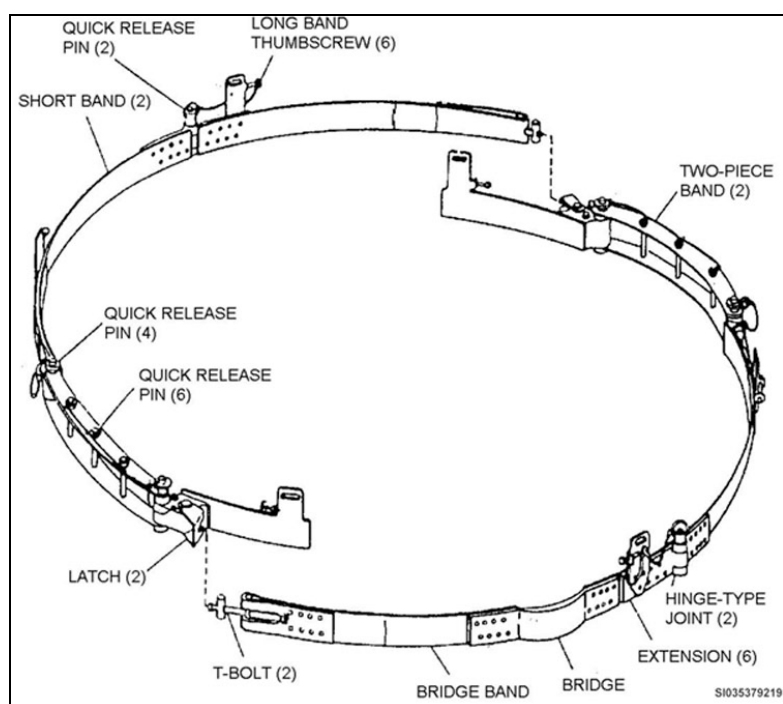


Figure 2-20. Shroud release shield.

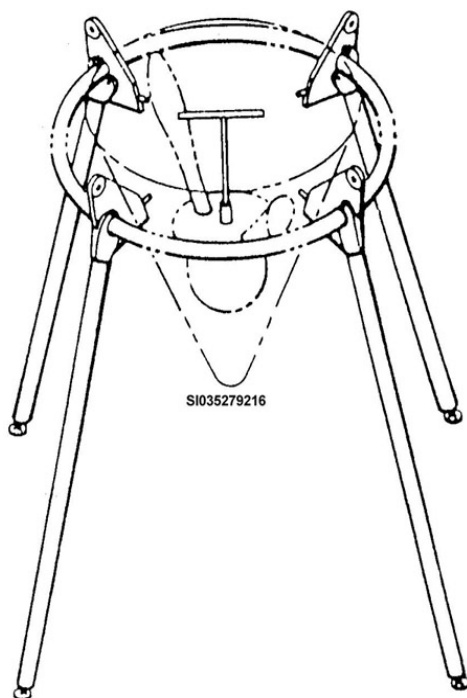


Figure 2-21. Shroud rocket installation set.

Installing forward shroud components

The forward shroud must be installed on the shroud rocket installation set (fig. 2-21) and rotated nose down before installing components into the forward shroud. After the forward shroud is rotated nose down, position the forward shield at either the 90° or 315° location. The forward shield has two different part numbers that determines the position in the forward shroud. Next, install the rocket motor by first attaching the handling tool to the rocket motor, then while aligning the rocket motor, mark with the 315° location on the forward shroud. Position the rocket motor into the shroud. Remove the handling tool, loosely install two bolts to hold the rocket motor, and remove the O-ring and shipping plug. Next, apply silicon grease to a new O-ring and install it on the initiator. Before installing the initiator into the rocket motor and connecting the cable, touch the connector bracket to discharge any static electricity. Remove the shielding cap, install the initiator into the rocket motor, torque the initiator to 105 ± 20 in-lb., and then reinstall the shielding cap. Measure the gap between the rocket motor and initiator and make

sure it is less than .010 in. Safety wire the initiator to the rocket motor and install the aft shield. Install the four remaining bolts and torque all six bolts. Install the rocket collar gasket, seal, and collar assembly; then install the nozzle shields. Install W6C into the connector bracket, touch the support fitting to discharge static electricity, and connect W6C cable to the initiator. Install clamps to hold the W6C cable and then install the thermal shield cover assemblies. Be careful when installing the cover assemblies because they have sharp edges, which can cause injury if not handled properly.

Installing aft shroud components

Position a stepladder so you can reach the top of the shroud. Place the W6B cable so the J2593 connector attaches to the forward (top) bracket and install the jam nut, torque, and safety wire the jam nut to the bracket. Position the J2592 connector of the W6B cable in the aft (bottom) bracket, secure the cable to the bracket with four screws, nuts and washers, torque the screws to 5 (+1/-0) in-lb. Install and torque 16 clamps securing the W6B cable to the aft shroud. Inspect the cable for damage. Install the shroud shunt cap on the J2593 connector and install the three thermal panels, which were removed during cable installation.

615. Reentry systems transfers and transports

In this lesson, we will cover some of the different ways the RS can be transferred and transported. You can transfer the RS to and from the pallet, munitions facility pit, or storage facility.

RS maintenance stand to/from RS pallet

After final assembly and test of the RS, you transfer it to the RS pallet. The RS pallet will most likely still be attached to the RS aft section dolly truck. First, make sure the A&D device safing pin indicator flag is extended from the A&D access door. Ensure the index mark on the lower support ring and the RS aft element are aligned and the pick-up pins are fully inserted into the aft shroud hardpoints. Make sure all protective caps and shunt caps are installed. Place the dolly truck with the RS pallet next to the assembly stand. Make sure the six securing clamps are fully retracted and the RS pallet is secured to the dolly truck with four bolts torqued to 550 ± 50 in-lb. Attach the beam sling to the hoist, and then secure the lower support rods to the innermost lifting points on the beam sling.

Attach tag lines to the support rods, position the beam sling over the RS, slowly lower the beam sling, and attach the support rods to the lower support ring. Loosen and remove the four safing pins from the RS assembly stand, and then raise the RS clear from the assembly stand. Visually inspect the exterior surfaces of the 60 aft element nut plates for damage. Position the RS over the RS pallet plate aligning the arrow index marks. Lower the RS until seated. Secure the RS to the aft element plate by engaging the six securing clamps and torque the bolts to 140 ± 15 in-lb., and remove the support rods and beam sling. Using the quick-release pins, attach the four tiedown assemblies to the pallet plate and lower the support ring. Using the turnbuckle, evenly hand tighten each tiedown assembly.

RS to and from munitions facility pit

Transferring the RS to the facility pit is how we prepare the RS to be uploaded by the missile maintenance team (MMT). After we load the RS into the pit, the MMT uploads it into a payload transporter (PT) van (fig. 2-22) and convoys it to a missile site.

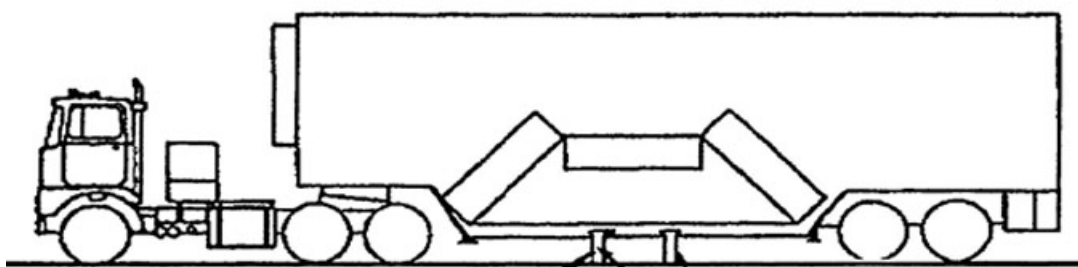


Figure 2-22. PT van.

The RS maintenance facility has a bay dedicated for RS transfer. The “pit” is an area below the surface of the floor where the RS is placed before the PT van arrives for upload. The floor directly above the pit moves on a track to provide access. The floor is moved by a chain and sprocket assembly, which is powered by an electric motor.

To transfer the RS to the pit, use the RS handling fixture and an overhead hoist. Before picking the unit up, attach two tag lines to the lower support ring to steady it during movement. Make sure the six securing clamps are engaged and properly torqued. Then remove the four bolts securing the aft element pallet plate to the dolly truck. Because of the depth when working around an open pit, you must either erect a safety barrier or don safety belts and straps. When you lower the aft element to the pit floor, perform the operation carefully to prevent any sharp impact from occurring between the aft element and the floor. This could result in damage to the aft element or equipment.

Close the door once the system is in the pit. The MMT personnel drive the PT van over the pit door, positioning it for the upload. To set up the PT van for upload, the floor of the van is opened from above. After the van is set up, the pit door is opened. You can see through the opening in the floor of the van down into the pit. Now, MMT personnel raise the RS up from the pit into the PT van and transfer it to a missile site.

RS on dolly to and from lift vehicle to and from storage

When transporting the RS with the lower support ring installed, make sure the A&D safing pin red indicator flag is extended from the aft shroud access door, shunt and protective caps are installed, hardpoint plugs are in the storage points on the lower support ring, and there is no physical damage. Make sure the aft element pallet plate is secured to the RS with the six securing clamps torqued to 140 ± 15 in-lb. and the four tiedown assemblies are installed. Check that the bolts securing the aft element pallet to the dolly truck are torqued. If you are going to replace the shroud shunt cap with a shielding cap, touch the aft shroud to discharge any static electricity. Prepare a polyethylene sheet, or use a locally manufactured cover, and place it over the top of the RS and secure it with tape. When raising or lowering the dolly truck with a forklift, make sure the tines are parallel to the forklift slots

or you may damage the dolly truck. Also, when manually transferring the dolly truck, lock all nonsteering casters in the trailing position. Transfer the RS to storage, remove the forklift, and lock the casters.

Transfer forward shroud on pallet

First, make sure the upper support ring is securely attached to the forward shroud pallet by two quick-release pins. Make sure the upper support rods are secured by the quick-release pins to the upper support ring. Ensure the upper support ring is secured to the forward shroud by the four special quick-release pins. Make sure that the four bolts removed from the forward shroud interface bolt holes are installed in the sleeve bolt storage receptacles. Ensure the grounding screw is secured to the upper support ring. Make sure the forward shroud shield and the structure are not physically damaged. Next, prepare a 6-foot square section of greaseproof barrier material. Attach the hoist to the upper support pickup point. Remove two quick-release pins and raise the forward shroud clear of the forward shroud pallet. Ensure the forward shroud cable connector is secured to a dummy connector on the upper support ring. Center the greaseproof barrier material on the forward shroud. Using a hoist, lower and position the forward shroud on the forward shroud pallet and secure with the quick-release pins. If the quick-release pins do not penetrate the greaseproof barrier material, you may use a pin punch to punch holes through the material. Remove the four quick-release pins securing the upper support rods in the storage area. Fold the greaseproof barrier material up and around the lower end of the forward shroud, and secure it with pressure sensitive tape. (**NOTE:** Do *not* allow the tape to contact the forward shroud surface.) Inspect the greaseproof barrier material for any openings. Seal all openings and overlaps them with pressure sensitive tape. The forward shroud is ready to be transferred using the forward shroud pallet.

Transfer payload support to and from assembly stand

If you need to replace a DM (payload support), you might have to transfer it from the RS assembly stand. To transfer the payload support from the RS assembly stand to the RS pallet, you first need to attach the four eyebolts to the outer edge of the payload support bulkhead. Start at the hole located at the 270° mark and insert the remaining eyebolts 90° apart through the holes on the outer edge of the payload support. Torque the eyebolts to 35 ±5 in-lb. Next, hoist the beam sling and attach the support rods to the innermost lifting points. Position the beam sling with the support rods over the payload support, and attach it to the eyebolts using the quick-release pins. Remove the four safing pins securing the payload support to the RS assembly stand, lift the payload support, and transfer it to the aft element pallet plate. Visually align the matchmark on the payload support with the matchmark on the aft element pallet plate and lower the payload support until it is seated. Fasten the payload support to the aft element support plate with the six securing clamps and tighten the clamp bolts securely. Remove the beam sling and the eyebolts from the payload support.

The RS installation kit (fig. 2-23) provides the electrical and mechanical interface between the RV and the DM. In figure 2-23, you have two different configurations—B2 and B3—representing two or three RVs. The RS installation kit, which is shown under each RV, includes the W4A, W4B, three support fittings, and miscellaneous hardware. Thoroughly inspect and test all RS installation kit components before installation.

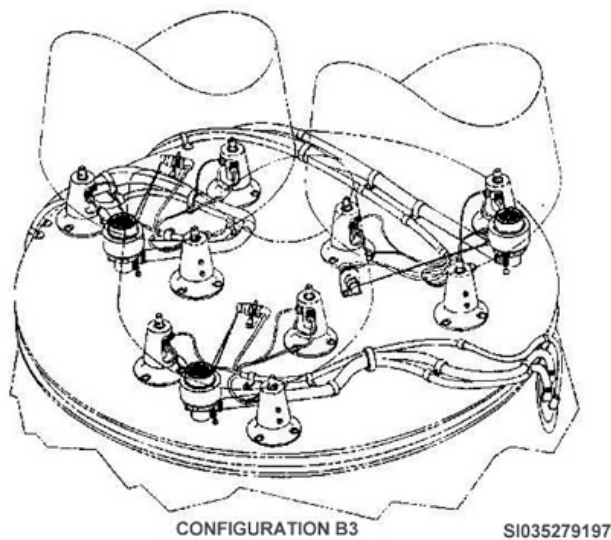
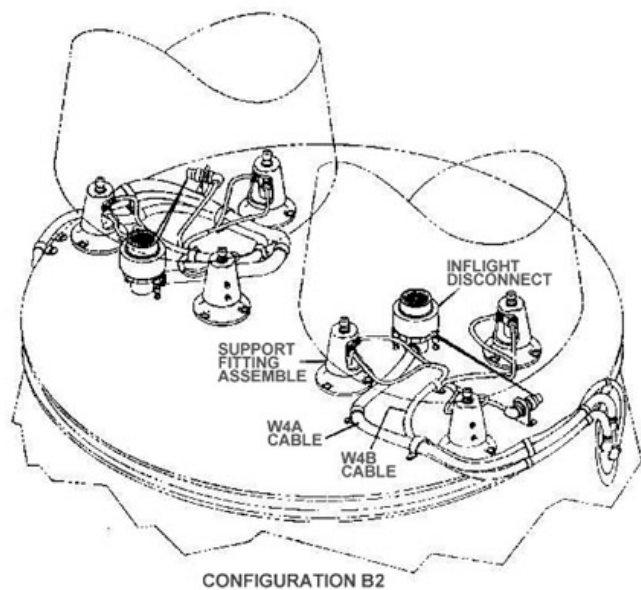
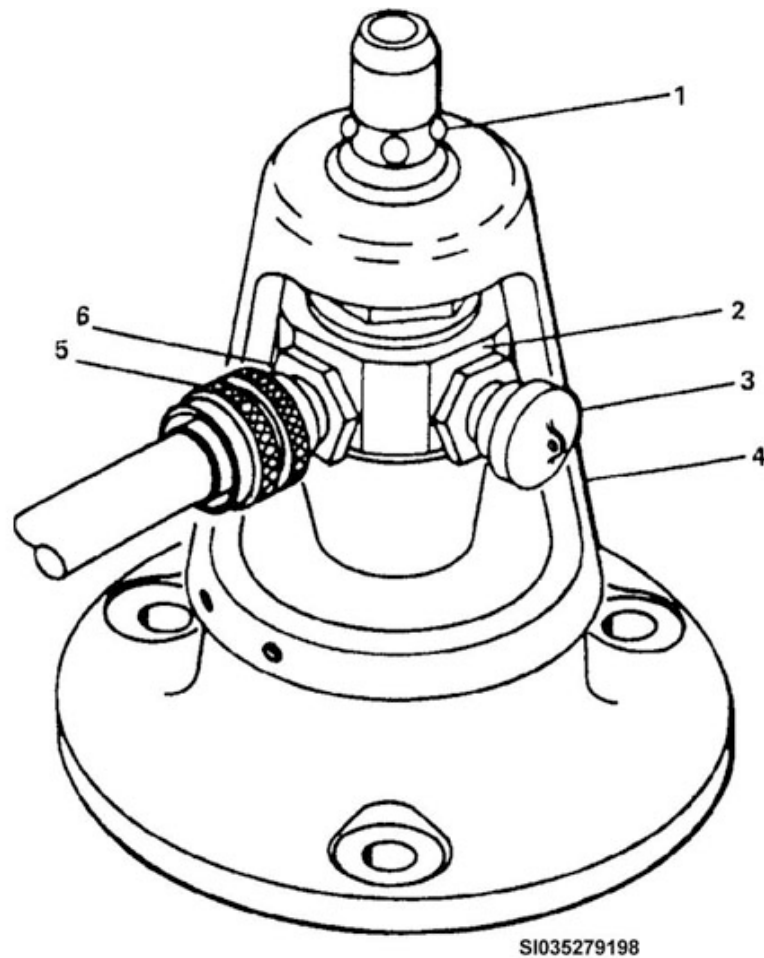


Figure 2-23. RS installation kit configuration.

Electrical and Mechanical Interface between the RV and the DM	
Interface	Explanation
Electrical	Includes the W4A IFD cable and the W4B cable.
Mechanical	Includes three support-fitting assemblies. Figure 2-24 shows the components of a support fitting assembly.



LEGEND

1. BALL LOCK
2. BALL LOCK ASSEMBLY
3. SHIELDING CAP
4. SUPPORT FITTING (3 PER RE-ENTRY VEHICLE)
5. CABLE CONNECTOR
6. PRESSURE CARTRIDGE (2)

Figure 2-24. Support fitting assembly.

Transfer chaff dispensers to and from replacement fixtures maintenance stand

To transfer the chaff from a replacement fixture to a chaff dispenser maintenance stand (fig. 2-25), first remove the quick-release pins securing the lifting adapter to the chaff dispenser maintenance stand. Connect the hoist to the lifting adapter and position it over the chaff dispenser, aligning the four uniball fittings. Attach the four quick-release pins. Raise the chaff dispenser until it clears the dispenser retainer vertical plate. Hoist the lifting adapter with the attached chaff dispenser to the chaff dispenser maintenance stand. While lowering the lifting adapter, align the holes in the adapter with the locating pins on the chaff dispenser maintenance stand. Once seated, insert the quick-release pins securing the lifting adapter to the chaff dispenser maintenance stand, and then remove the hoist. You may now move the chaff and chaff dispenser maintenance stand to the desired location. After placing the chaff on the chaff dispenser maintenance stand, or after moving the stand, be sure to engage the floor locks.

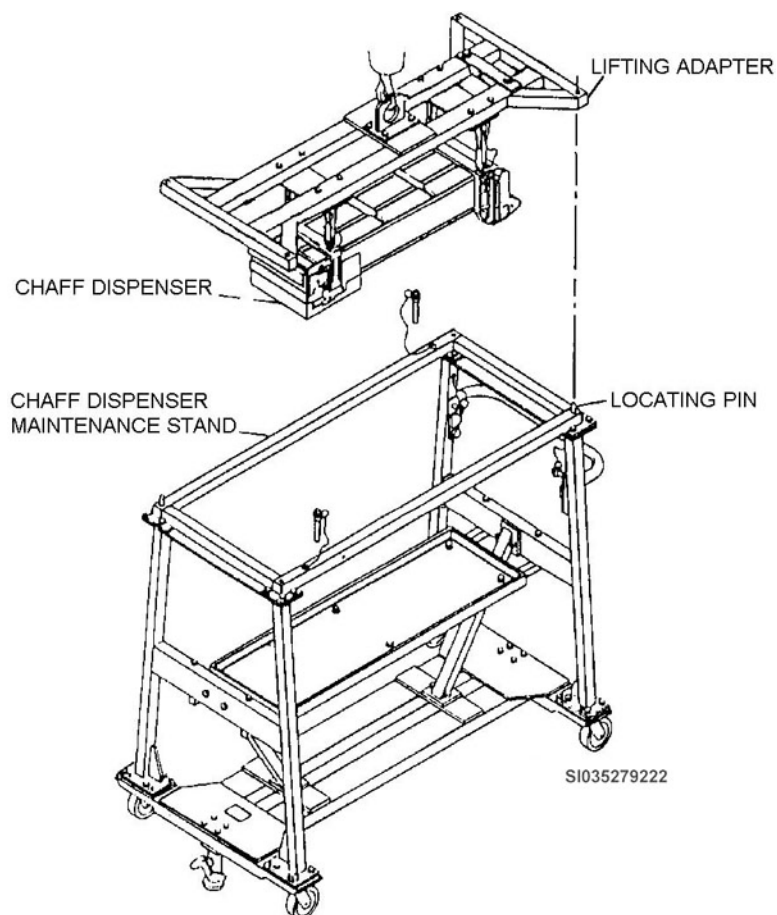


Figure 2-25. Chaff dispenser maintenance stand.

Transport RS on dolly using forklift

Position the polyethylene sheet, or locally manufactured cover, over the top of the RS aft shroud. Carefully insert the forklift tines into the forklift channels. Attach and secure the nylon tiedown strap.

CAUTION: When raising/lowering the dolly with the forklift, make sure the forklift tines are approximately parallel to prevent damage to the equipment.

Raise the forklift to the desired height and transport the RS to the designated area. Once at your destination, lower the dolly until it is seated firmly on the floor. Remove the nylon tiedown strap and forklift.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

613. Reentry systems electrical fault isolation

1. During a fault isolation procedure, when is it acceptable to have cables left disconnected from the test set?

2. Which TO contains a list of fault isolation checkout procedures for the RS?

3. What is the next step you perform after you connect the P2 of W4250 cable to jack J2550 of cable W4A?
4. When performing fault isolation for the ESCTS test of A&F safety monitor loop at plug P2550 W4A, what is the next step you perform if a fault isolation indicates *less* than 5.0 Ω ?
5. What are the conditions that must be met before using the RSTS for fault isolation?
6. When conducting fault isolation procedures, who should you consult after you've exhausted your technical expertise?

614. Reentry systems assembly

1. How many positions does the attachment fixture have, and why?
2. During chaff dispenser installment, how is the attachment fixture secured to the RS maintenance stand?
3. Once the rear floor lock is engaged during chaff dispenser installment, how close is the upper alignment rod extended to its receptacle?
4. During chaff dispenser installment, what is the torque of the two dispenser mounting bolts and washers installed on the forward uniball fitting?
5. When installing the chaff dispenser installation kit, which mounting screws of the dispenser controller are torqued once installed?
6. Once coated with a solid-film lubricant, how long must the mounting screws of the ECS converter air-dry?
7. What is used to coat the mounting screws of the PDM?

8. What do you use to align the RV with the payload support bulkhead?
9. When installing the RV, what must you do before connecting W4B cable to the EED?
10. During RV installation, what test do you perform on the W4B cable before connecting it to the frustum?
11. When installing the V-band, what device do you use to measure the distance between the thruster bolt and the self-aligning nut?
12. List the short version of the V-band measurement and torque sequence.
13. During V-band installation, what could happen if you *exceed* the maximum torque when torquing the self-aligning nuts?
14. When installing the V-band, what do you use to connect the IFD cable?

615. Reentry systems transfers and transports

1. What is the torque of the four bolts securing the RS pallet to the dolly truck?
2. What is the “pit”?
3. How many tag lines must you use when transferring the RS to the pit?
4. What safety equipment must you use around an open pit?
5. How do MMT personnel upload an RS for transport to a missile site?
6. What step do you take if you are replacing the shroud shunt cap with a shielding cap?

7. To avoid damage to the dolly truck, what precautions do you take when raising or lowering the dolly truck with a forklift and when manually transferring the dolly truck?
8. What is the purpose of the RS installation kit?

Answers to Self-Test Questions

610

1. To protect the WHs during initial launch until the RS reaches the outer atmosphere.
2. The shroud is jettisoned or casted off and the RVs are individually released to descend to their targets.
3. DM.
4. A mean for deployment of the chaff.
5. The mounting and support fitting for securing RV to payload support.
6. 12 fasteners.
7. Forward shroud.
8. 90° apart around the aft shroud.
9. To eject metallic particles to confuse radar monitoring.
10. Orient the rocket motor to the correct position when installing it.
11. Torque loose panels.
12. Three.
13. Reject W6A cable.
14. Re-bond the spacer to the slipper.

611

1. ESCTS checkout of RS A&F safety monitor loop.
2. The V-band clamp is preloaded with 6,000 lb. of pressure and could fly apart resulting in injury to or death of personnel.
3. By removing three thumbscrews from slots in the extensions.
4. Touch the metal structure of the component or next higher assembly containing the component or the attached support equipment.
5. By cutting and removing the safety wire and retracting the eight jam nuts.
6. 15 lb.
7. Inside the access door.
8. Heat shield plug wrench.
9. First, remove the two eyebolts and washers from payload support bulkhead. Then remove the two screws securing hotwire connector bracket to payload support bulkhead.
10. By disconnecting the cables and removing the four screws and washers.
11. On the side corresponding with the chaff dispenser being removed, because the attachment fixture has two positions, one for each chaff dispenser.
12. Approximately 2 in.

612

1. ESCTS.
2. Touch the metal structure of the component or next higher assembly to rid yourself of static electricity.
3. A bridgewire resistance checkout of the W4251 test cable.

4. Display shows PAIR 08 to 09 OHMS = less than 38.0.
5. Troubleshooting for the RS chaff confidence monitor loop malfunction in TO 11N-RS133-2-1.
6. Resistance, voltage, time, frequency, and pressure.
7. GO/NO GO (good and bad indications).
8. Rocket motor initiator must be disconnected from the W6C cable and a shielding cap installed.
9. If a malfunction occurs during checkout of W4B or W5 series cable and the self-test of the test circuit is unacceptable.
10. Perform a self-check of the W4A test circuits.
11. Always keep the output end pointed away from your body and others.

613

1. When it's a new cabling diagram.
2. TO 11N-RS133-2-1.
3. Press the OHMS keypad on the ESCTS and the display should show POWER UP SELF-TESTS, then SEL, AMP, OHMS, MAN, SELF-TESTS.
4. Disconnect cable W4250 from ESCTS and from plug P2550; remove protective cap from jack J2550 and connect plug P2550 to jack J2550.
5. (1) Cables, connector savers, and modules are properly connected.
(2) Correct sequence on the test is selected.
(3) Test sets are performed in proper sequence.
6. Higher guidance who will be your team chief, bay chief, or NCOIC.

614

1. Two, one for each chaff dispenser.
2. By installing two quick-release pins through the mounting holes and attachment fixture channel mating holes.
3. Within approximately $\frac{1}{4}$ in.
4. 150 (± 10) in-lb.
5. Screws installed in the outboard mounting hole.
6. 5 minutes.
7. A solid-film lubricant.
8. Three guide pins installed in the three support fittings of the bulkhead inserts.
9. Touch the metal structure of the ZIBs, support fitting, or attached support equipment to discharge or equalize any accumulated static electricity.
10. Confidence monitor loop test.
11. Half-base micrometer.
12. (1) Check the matchmark.
(2) Measure the threads.
(3) Rap the V-band.
(4) Torque.
13. The pre-weaken bolt could fracture, resulting in an inadvertent release of the V-band.
14. Force gauge adapter.

615

1. 550 ± 50 in-lb.
2. An area below the surface of the floor of the RS maintenance facility where the RS is placed before the PT van arrives for upload.
3. Two.
4. A safety barrier or safety belts and straps.

5. The MMT drives the PT van over the pit door and positions it for the upload. They open the floor of the van from above. After the truck is set up, the pit door is opened. MMT personnel raise the RS up from the pit and into the PT van.
6. Touch the aft shroud to discharge any static electricity.
7. Make sure the tines are parallel to the forklift slots; lock all nonsteering casters in the trailing position.
8. To provide the electrical and mechanical interface between the RV and the DM.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

42. (610) On the reentry system (RS), what supports the reentry vehicles (RV)?
 - a. Shroud.
 - b. Penetration aids.
 - c. Ablative material.
 - d. Deployment module.
43. (610) During initial launch, what protects the warheads (WH) until the reentry system (RS) reaches the outermost atmosphere?
 - a. Shroud.
 - b. Spin rockets.
 - c. Penetration aides.
 - d. Deployment module.
44. (610) Where is the rocket motor located in the reentry system (RS)?
 - a. Reentry vehicle (RV).
 - b. Deployment module.
 - c. Forward shroud.
 - d. Aft shroud.
45. (610) What is the purpose of the V-band clamp?
 - a. Provides in-flight disconnect capabilities to the arming and fuzing (A&F) cables.
 - b. Holds the aft shroud and the payload support frustum together.
 - c. Initiates the rocket motor that jettisons the shroud assembly.
 - d. Allows the chaff to disperse at a predetermined time.
46. (610) If a thermal panel on the inside of the aft shroud is still loose after torquing, you *must*
 - a. reject it.
 - b. accept it.
 - c. replace the hardware.
 - d. replace the thermal panel.
47. (610) If while inspecting the W6A cable on the reentry system (RS) you find damage to the sleeving which also involves damage to the wire insulation underneath, what do you do?
 - a. Repair the sleeving.
 - b. Reject the W6A cable.
 - c. Repair the wire insulation and sleeving.
 - d. Accept the cable as long as it passes test checkout.
48. (611) On the reentry system (RS), how is one 180-degree section of the shroud release shield removed during aft shroud removal?
 - a. Removing three thumbscrews from slots in the extension.
 - b. Removing two thumbscrews from each end of the shield.
 - c. Disconnecting three quick-release pins from slots in the extension.
 - d. Disconnecting two quick-release pins from each end of the shield.

49. (611) The V-band clamp on the reentry system (RS) is preloaded with how many pounds?
- 600.
 - 1,600.
 - 4,600.
 - 6,000.
50. (611) When removing the chaff dispenser, approximately how many inches do you pull the dispenser retainer so the rear uniball fitting disengages the bulkhead rear fitting pins?
- Two.
 - Three.
 - Four.
 - Five.
51. (612) Before handling, connecting, or disconnecting RS electrical equipment, you *must* immediately
- don a grounding wrist strap and connect it to its metal part of component.
 - don a grounding wrist strap and connect the other end to the facility ground.
 - rid yourself of static electricity by touching a metal structure of the component.
 - rid yourself of static electricity by touching a metal portion of the explosive set circuitry test set (ESCTS).
52. (612) The parameters the reentry system test set (RSTS) measures are
- resistance, voltage, time, frequency, and pressure.
 - resistance, voltage, time, frequency, and capacitance.
 - resistance, voltage, isolation, frequency, and pressure.
 - resistance, voltage, isolation, frequency, and capacitance.
53. (612) When testing the arm and disarm (A&D) device using the reentry system test set (RSTS), what indication do you look for when the safing pin is installed?
- “S” is in the window of the A&D device.
 - “A” is in the window of the A&D device.
 - A “NO GO” indication on the test set.
 - A “GO” indication on the explosive set circuitry test set (ESCTS).
54. (613) When performing a fault isolation procedure using the explosive set circuitry test set (ECSTS), what steps do you perform if the test results indicate *greater* than 5.0 ohms (Ω)?
- Document all actions, test indications, and seek higher guidance.
 - Clean the cable connector, check for proper connection, and then repeat the test.
 - Disconnect cable W4250 from the test set and from plug P2550; return to the flow diagram.
 - Disconnect cable W4250 from the test set and from plug P2550, remove the protective cap from jack J2550, connect plug P2550 to jack J2550, and return back to the flow diagram.
55. (613) When performing a fault isolation procedure using the explosive set circuitry test set (ECSTS), what steps do you perform if the test results indicate *less* than 5.0 ohms (Ω)?
- Document all actions, test indications, and seek higher guidance.
 - Clean the cable connector, check for proper connection, and then repeat the test.
 - Disconnect cable W4250 from the test set and from plug P2550; return to the flow diagram.
 - Disconnect cable W4250 from the test set and from plug P2550, remove the protective cap from jack J2550, connect plug P2550 to jack J2550, and return back to the flow diagram.

56. (614) When installing the V-band, how do technicians apply torque to the self-aligning nuts on each V-band thruster bolt?
- a. Simultaneously in one-turn increments.
 - b. Simultaneously in two-turn increments.
 - c. Alternately in one-turn increments.
 - d. In any order.
57. (615) To transfer the reentry system (RS) to the munitions facility pit, use an overhead hoist and the
- a. RS handling fixture.
 - b. RS alignment fixture.
 - c. reentry vehicle (RV) hoisting adapter.
 - d. RV mating and handling sling.
58. (615) Before transferring a forward shroud on a pallet, how do you secure the upper support ring to the forward shroud pallet?
- a. Two quick-release pins.
 - b. Four safing pins.
 - c. Five hex bolts.
 - d. Six securing clamps.
59. (615) When transferring the payload support, how do you fasten it to the aft element support plate?
- a. Two quick-release pins.
 - b. Four safing pins.
 - c. Five hex bolts.
 - d. Six securing clamps.
60. (615) Which component provides electrical and mechanical interface between the reentry vehicle (RV) and the deployment module (DM)?
- a. Reentry system (RS) installation kit.
 - b. Power distribution module (PDM).
 - c. Environmental sensing signal generator (ESSG).
 - d. Electronic command signals (ECS) programmer.

Student Notes

Glossary of Abbreviations and Acronyms

°	degree
Ω	ohm
A&D	arm & disarm
A&F	arming and fusing
AFA	arming and fusing assembly
ASERV	after safety enhanced reentry vehicle
AVE	aerospace vehicle equipment
CDC	career development course
DM	deployment module
DOD	Department of Defense
DOE	Department of Energy
ECS	electronic command signals
EED	electro-explosive device
eIRC	electronic inspection record card
EMP	electromagnetic pulse
EOD	explosive ordnance disposal
ESCTS	explosive set circuitry test set
ft-lb.	foot-pound
HCP	hardness critical procedure
HIT	high impulse transducer
ICBM	intercontinental ballistic missile
IFD	in-flight disconnect
in.	inch
in-lb.	inch-pound
lb.	pound
LLC	limited life component
LLCE	limited life component exchange
MMT	missile maintenance team
NCOIC	noncommissioned officer in charge
OO-ALC	Ogden Air Logistics Complex
PDM	power distribution module
PT	payload transporter
RF	radio frequency

RFI	radio frequency interface
RFSS	radio frequency subsystem
RS	reentry system
RSTS	reentry system test set
RV	reentry vehicle
SERV	safety enhanced reentry vehicle
SFTS	safety enhanced reentry vehicle field test set
SRV	single reentry vehicle
tech	technical
TO	technical order
US	United States
WES	warhead electronics system
WH	warhead
ZIB	zero-impulse bolt

Student Notes

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