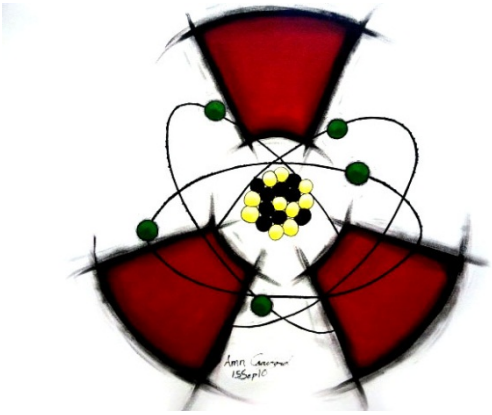
CDC 2W251B

Nuclear Weapons Journeyman

Volume 2. Bomb Maintenance and Systems



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IN THIS VOLUME of Career Development Course (CDC) 2W251B, *Bomb Maintenance and Systems,* you will learn about general maintenance practices and procedures for gravity weapons and the Weapon Storage and Security System (WS3). Due to the security classifications, this CDC only provides general information about the weapons.

Unit 1 introduces you to the B61 and B83 gravity weapons systems and their common maintenance procedures before we transition to the specific operations unique to each of the weapon systems.

Unit 2 explains the various programs, components, and procedures of the WS3. It discusses the security measures implemented to ensure the security of the vault system and then gives a brief overview of the secure transportable maintenance system.

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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.

Page

Unit 1. Gravity Weapons

NUCLEAR WEAPON SYSTEMS are complex. Fortunately, as a nuclear weapons journeyman, you maintain only a small portion of a system. Still, to handle this responsibility, you must be familiar with the different aspects of the weapons systems and apply your knowledge to the various inspections and maintenance operations. Although each of these tasks is specified in the respective manuals, the procedures presented in this unit provide a generalized understanding of the maintenance flow of nuclear weapons operations.

1–1. Nuclear Bomb Overview

Before we transition to the tasks involved with nuclear maintenance, it's important to know the individual characteristics of the two gravity weapon systems: the B61 and B83. The lessons in this section cover the individual weapon summaries, common inspection and handling procedures, and specific maintenance procedures unique to each of the weapon systems.

201. Bomb summaries

Each of the gravity weapons contain unique characteristics, and share common traits. The weapons summary provides an overview of the weapons capabilities and a brief summary to enlighten the technician's knowledge of the gravity weapon systems within the Department of Defense (DOD) stockpile.

B61 weapon summary

The B61 (fig. 1–1) is a lightweight, full-fuzing option (FUFO), thermonuclear bomb. FUFO nuclear bombs have a capability for delivery in the free fall or retarded modes, with air or ground burst in either mode. FUFO bombs generally have a lay down capability with the external case made of high-strength aluminum, painted with an aluminum-filled paint. Nuclear safety is enhanced through strong link/weak link usage. Also, the B61 uses insensitive high explosives (IHE), which reduces the probability of an explosive detonation in an accident. The B61 is equipped for carriage by 30-inch (in.) suspension systems for external, internal, and supersonic carriage. The bomb is equipped with a permissive action link (PAL) and command disablement system (CDS) and consists of four major assemblies shown in figure 1–1:

1. Bomb radar nose.
2. Center bomb subassembly (CBSA).
3. Preflight selection bomb subassembly.
4. Tail bomb subassembly.

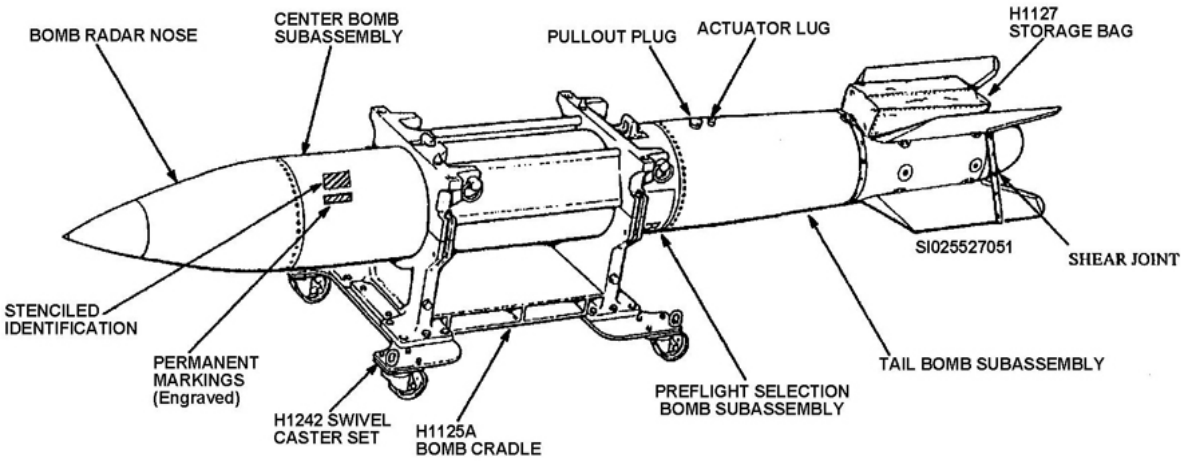

Figure 1–1. B61.

The B61 uses PAL as an administrative device in its circuitry to prevent unauthorized use. The coded switch requires unlocking (enabling) or locking (disenabling) using PAL controllers and knowledge of the correct code. The bomb contains a multiple code coded switch (MCCS), which is a limited-try electronic switch actuated by electrical impulses that represent any one of six, 6-digit code numbers. The MCCS has the following capabilities:

- Six-digit code storage.
- Storage of six individual codes.
- A maintenance code.
- Limited-try capability.

Most B61s use the H1125A as the BHT, but the MOD 11 uses the H1671 handling equipment. When combined with the H1242 swivel caster set, the weapon has limited maneuverability. The B61s can be single stacked or double stacked except for the MOD 11, which can never be double stacked.

B83 weapon summary

The B83 (fig. 1–2) is a multipurpose, FUFO, thermonuclear bomb. FUFO nuclear bombs have the capability for delivery in the freefall or retarded modes, with air or ground burst in either mode and generally has a lay down capability. The external case is made of steel and aluminum, which is painted white. Nuclear safety is enhanced through strong link/weak link usage. The B83 uses IHE that reduces the probability of explosive detonation in an accident and is equipped for carriage by rotary launchers, as well as equipped with PAL and CDS. The bomb consists of a forward assembly and an aft assembly, which are held together by a tape joint at the middle. The bomb case incorporates the following five sections:

1. Nose.
2. Forward case.
3. Mid case.
4. Aft case.
5. Afterbody.

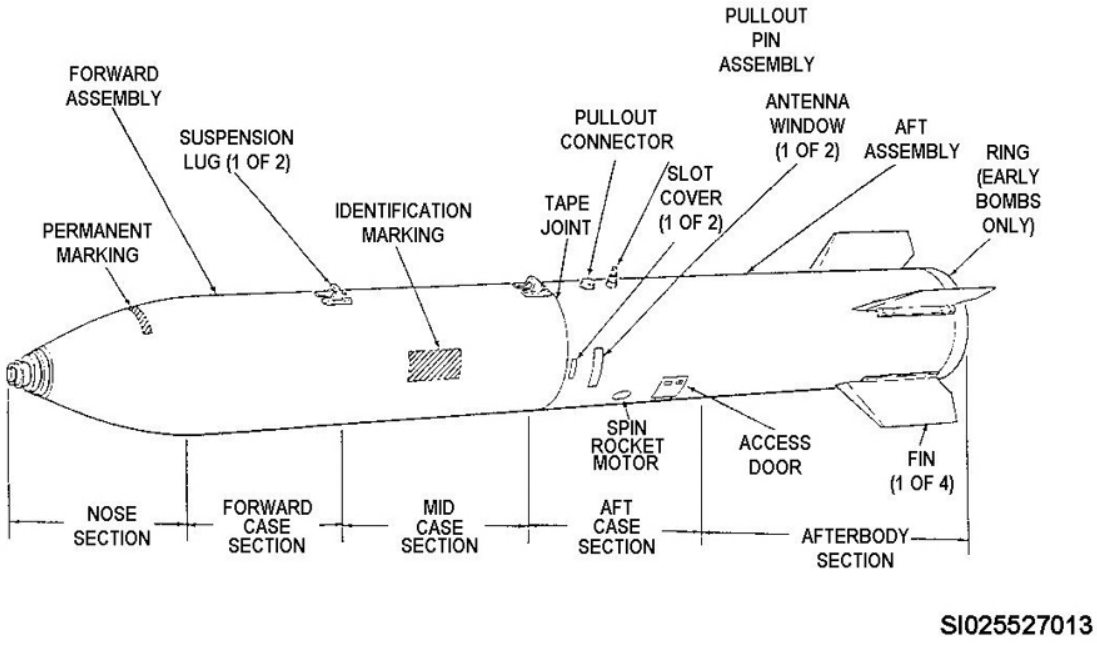

Figure 1–2. B83.

Nose section

The nose section is made from stainless steel. The nose incorporates circular coaxial grooves at the forward end for energy absorption and shock mitigation during delivery.

Forward case section

The forward case section is made from high-strength steel and is welded to the nose section.

Mid case section

The mid case section is made from high-strength steel and is welded to the forward case section. Two suspension lugs bolt to this section and provide a means to attach the weapon to aircraft or launchers.

Aft case section

The aft case section is made from steel and is connected to the mid case section by means of a tape joint. This tape joint serves as a field break for the removal of the aft assembly and access to the limited life components (LLC).

Afterbody section

The afterbody section is made from aluminum and is bolted to the aft case section. The afterbody section contains the parachute deployment system. The parachute does not require replacement. Four aluminum fins are also attached to the afterbody section. These fins are removable and can be installed in various configurations.

The B83 uses PAL as an administrative device to preclude unauthorized use of the bomb. The coded switch requires unlocking (enabling) or locking (disenabling) using PAL controllers and knowledge of the correct code. The bomb contains either a MCCS or a code activated processor (CAP) switch. Both are limited-try electronic switches actuated by electrical impulses that represent any one of six, 6-digit code numbers. The MCCS/CAP has the following capabilities:

- Six-digit code storage.
- Storage of six individual codes.
- Limited-try capability.
- Encryption capability (CAP only).

The B83s use the H1347/H1347A bomb hand truck (BHT) (fig. 1–3) and H1095/H1095A frame for storage or transport. The H1095/H1095A is attached to the H1347/H1347A. The hand truck is considered maneuverable with the following restrictions:

- A one-high stack on the H1347/H1347A may be moved with a certified hoist or by hand, forklift, or certified towing vehicle over smooth hard surfaces for distances up to 1 mile at speeds not to exceed 5 miles per hour (mph).
- A two-high stack of bombs on the H1347/H1347A may be pushed or towed by hand, moved with a certified forklift, or towed using a certified towing vehicle over smooth hard surfaces for distances up to 1,000 feet at a slow walking speed (approximately 1 mph). When using a certified forklift, follow the prescribed lifting methods identified in the technical order (TO).

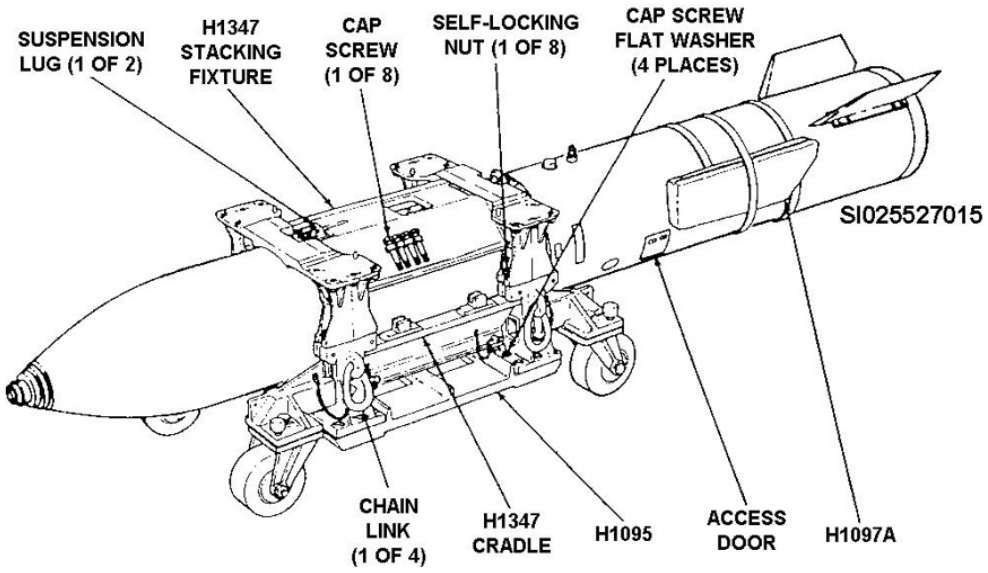

Figure 1–3. H1347 bomb hand truck.

202. Common inspections and handling procedures

There are inspections and handling procedures common to the two gravity weapon systems. It is important to stress that although the lessons are merged together, each of the specific procedures are contained within their respective technical manual (TM): TO 11N–B61–1, *Assembly, Test, Maintenance, and Storage Procedures; B61–3, –4, and –10* and 11N–B83–1, *Assembly, Test, Maintenance, and Storage Procedures with Illustrated Parts Breakdown, B83–0/–1*. Make sure you refer to the appropriate weapons manual before performing any procedures. Below are the typical inspection and handling requirements shared between the two gravity bombs:

- Verification inspection.
- Visual monitor.
- Inspect external surfaces of bomb.
- Preparing for strike.
- Preparing for storage.
- Preparing for shipment.

Performing verification inspection

The verification inspection consists of a visual observation of the bomb to determine that it is as described and listed in the shipping document (without visible damage) against the information stenciled on the bomb. The electronic inspection record card (eIRC) is reviewed, in addition to the shipping document, to ensure it matches the permanent marking of the bomb. The verification

inspection can be combined with other operations and does not require starting from or ending with a specific configuration.

Performing visual monitor

Prior to performing any maintenance on a weapon or handling operation (i.e., stack/unstack, relocation, etc.), you must first conduct a visual monitor (i.e., safety check). The actuator and pulse battery for the B61 or pullout switch assembly for the B83, to include the preflight controller, are all inspected as part of the visual monitor. The following are procedures you should follow when performing a visual monitor.

Actuator and pulse battery assembly and pullout switch assembly

Make sure the actuator and pulse battery has not been actuated. Ensure the actuator lug or pullout pin is not missing or sitting loose in the lug well. Also check to make sure the preformed packing is not visible above the top edge of the bomb case.

Depending on the weapon system, either reinstall the lug or replace the actuator and pulse battery assembly. If you can't perform a replacement immediately, remove the lug and cover the case hole with aluminum tape according to the weapon –1 manual to prevent moisture from entering the bomb case.

Preflight controller

Open the access door on the preflight subassembly and inspect the door, latches, and preflight controller panel for damage and proper operation. You should also check the CDS indicator piston and T-handle. If the piston is extended or the T-handle is missing, reject the weapon. Check for the presence of the strike enabling plug (SEP) and remove if required. Lastly, ensure the function knob is in the "N" position and the code dials indicate 0–0–0. If the settings are incorrect, record the numbers, reset the code dials, and report to the code management team.

Inspecting external surfaces of bomb

There are no periodic inspection requirements for nuclear weapons, but there are certain conditions that warrant an inspection. Each of the weapons-specific manuals contains requirements and criteria for conducting inspections. During the inspection, technicians must inspect identification markings and damage.

Identification markings

Inspect identification stenciled markings on the weapon and associated handling gear (H-gear) for legibility and correctness, touch-up stenciled markings as necessary. Also, inspect the identification markers (i.e., decals) for legibility, to include ensuring markers are indeed present, lastly replace as necessary. Keep in mind, critical markings are defined as markings where the exact location is critical for instance chock bands, center of gravity (CG), and match marks. Do not measure every marking unless there is reason to believe that the markings were improperly applied or new markings are being applied.

Inspecting for damage

Specific rejection criteria is stated for individual components and assembly areas of the bomb. Upon discovery of a defect (i.e., scratch, gouge, etc.), review the rejection and determine if the defect does not meet, or exceeds, the provided tolerance levels and/or measurements. If the inspection procedures are not specified in the weapon TO, inspect exposed external and internal bomb and/or component surfaces for damage as defined in the inspection procedures within TO 11N–35–51, *General Instructions Applicable to Nuclear Weapons*. Unless otherwise instructed in the weapons-specific manual or 11N–35–51, do not reject the weapon for defects unless the defect is an obvious structural damage. If you find a defect that's questionable, report the questionable defect, but do not reject the bomb and/or components.

Acceptable defects or differences include cosmetic deficiencies or minor manufacturing defects on the surface such as the following:

- Minor surface irregularities.
- Discoloration because of welding heat.
- Tooling marks.
- Mold depressions and bubble voids.

Identical components that were manufactured at different times, or that have changes or variations in surface appearance, may not look quite the same. Accept these conditions if the component meets all other inspection criteria.

General information for preparations for strike, storage, and shipment

Any configuration change requires an entry in the eIRC reflecting its current configuration status. The inspection requirements and procedures before, during, and after any of strike, storage, and shipment configurations are specified in the weapons-specific manual. Use TO 11N–35–51 for information on packaging methods, general cleaning procedures, packaging eIRC, and preserving surfaces. Let's look at the procedures for preparing the bomb for strike, storage, and shipment.

Preparing for strike and fuze settings

We accomplish the preparation for strike if the bomb is to be maintained for a known strike aircraft or as dictated by operational requirements. Preparation for strike is a simple task. It involves performing a visual monitor, changing fin orientation (if necessary), and installing the appropriate pullout cable and wire rope and pin assembly. The proper fuze settings in the preflight panel also have to be made or verified. At a time established by the using service, you will refer to the operations order for the proper fuze settings. Weapons in this configuration are normally loaded onto a launcher or stored on a munitions trailer to allow transportation to strike aircraft. If desired, one or more layers of aluminum foil tape or masking tape may be placed over the sway brace areas to prevent damage to the bomb surface.

Preparing for storage

Certain inspections are required before we place a weapon in storage. These inspections ensure the weapon is safe and has no defects that would affect the operational status of the weapon. When preparing a weapon for storage, verify that the bomb H-gear is immobile, then perform a visual monitor and inspect the following:

- Bomb surfaces.
- Associated storage bag and contents.
- BHT and caster assemblies.

Preparing for shipment

Perform a shipment inspection before shipping a weapon from your base to another destination. This inspection ensures the weapon is safe to transport. Shipment can be done by logistical or strike aircraft depending on the situation. Shipment procedures include the following:

- Performing a visual monitor.
- Inspecting bomb surfaces.
- Performing a weapon status check of the PAL (if required for weapon type).
- Inspecting associated storage bag and contents.
- Inspect the associated H-gear.
- Placing the eIRC in the storage bag.

203. Disablement and emergency procedures

You must know three immediate actions when working with nuclear weapons: CDS, nonviolent disablement, and emergency procedures. Each of these tasks are critical operations that rely solely on your knowledge of the procedures since technical data may or may not be available or the time necessary to complete the procedures may not be available. Each location varies in protocol; therefore, you must familiarize yourself with your home station contingency and operational plans. You might find yourself in charge of performing disablement or recovery operations following a nuclear accident or incident.

CDS

The CDS provides a convenient, built-in, nonviolent means of rendering a weapon inoperative. No equipment is needed to operate the CDS. Operation of the CDS requires the use of a classified 3-digit code on the preflight panel (fig. 1–4) or the aircraft monitor and control (AMAC) controller, depending on the weapon type.

Perform CDS only when directed by proper authority. The weapon is disabled by inserting the correct code into the code selector labeled A, B, and C and turning the function knob counterclockwise to disable (DI) and pulling the T-handle out of its socket. Weapon disablement is indicated when the red indicator piston protrudes about ¼-in. above the face of the preflight panel.

Nonviolent disablement

Nuclear weapons disablement occurs through the destruction or disassociation of one or more components, and temporarily destroys a weapon's ability to be used in its intended mode. Technicians must gather common hand tools or prefabricated consolidated tool kits consisting of destructive qualities (i.e., hammers, chisel, etc.,) to destroy vulnerable points on the weapon to further render it useless. Additionally, technicians may be directed to activate certain mechanisms and destroy removable components to assure no parts can be pieced together to assemble a complete weapon system. You can find further details from your munitions control section since it commands and controls every aspect of a munitions organization to include emergency actions.

Emergency procedures

Following an incident or accident, you may perform emergency procedures before the arrival of explosive ordnance disposal (EOD) personnel. These procedures minimize the probability of a weapon detonation. If the weapon is being loaded or unloaded, or it is being loaded on an aircraft, refer to the appropriate aircraft publication. Only those procedures in the weapons-specific TO are authorized for you to perform. Ensure these following restrictions are strictly observed:

- Do *not* disassemble the weapon.
- Do *not* apply power to the weapon.

If initiated, thermal batteries in the weapon may sustain a charge for an extended period of time; therefore, a mandatory wait period (specified in the specific weapon TO) is observed before performing any operations on the weapon. The wait period is measured from the time of accident or incident or, in the case of fire, from the time the fire is extinguished. A safety factor is included in the specified wait period. Do not perform any operations on the bomb during the mandatory wait period. If necessary, the bomb may be moved limited distances to clear the area following the mandatory wait period, provided the CBSA is intact with only minor exterior damage.

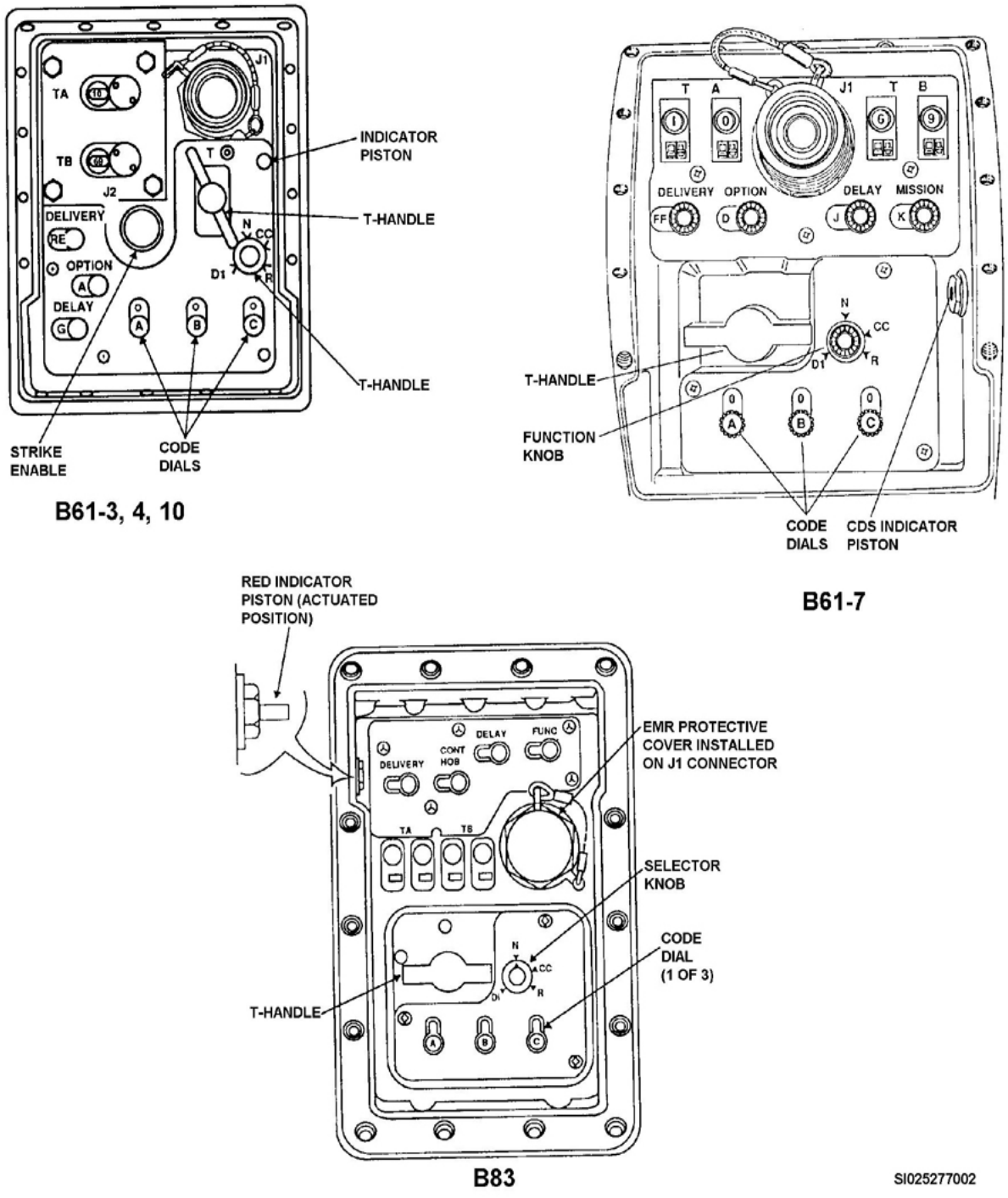

Figure 1–4. B61 and B83 preflight controllers.

Self-Test Questions

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

201. Bomb summaries

1. FUFO nuclear bombs have what type of capability for delivery?

2. How is nuclear safety enhanced in the B61?

3. Name the four major assemblies of the B61.

4. What is the reason for the PAL device in the B61?

5. How does the PAL switch prevent access by unauthorized individuals?

6. List the five sections that make up the B83 bomb case.

7. What is the purpose of the coaxial grooves at the forward end of the B83 nose?

8. What is the purpose of the two suspension lugs of the B83?

9. What connects the aft case and mid case sections?

10. On the B83, how do you gain access to the LLCs?

11. How are the MCCS and CAP switches activated?

202. Common inspections and handling procedures

1. What information is used to perform a verification inspection?

2. What check is required before performing any maintenance on a weapon or handling operation?

3. What action do you take if the T-handle is missing from the preflight controller panel?

4. When performing a visual monitor, what position should the function knob be set to on the preflight controller?

5. What instances would require you to measure the markings on bomb surfaces?

6. When inspecting a nuclear weapon for damage, what actions should you do upon discovery of a questionable defect?

7. What condition would allow acceptance of identical components having variations in surface appearance?

8. What tasks are involved with preparing a weapon for strike?

9. What tasks are involved with preparing a weapon for shipment?

203. Disablement and emergency procedures

1. What does CDS provide?

2. What is required to operate the CDS?

3. How do you know when weapon disablement procedure is successful?

4. During an order to perform *a nonviolent disablement*, what tools are used to render a weapon useless?

5. Which office section would have information on performing nonviolent disablement procedures?

6. What restrictions must be strictly observed if a weapon is involved in an accident or incident?

7. Why is there a mandatory wait period after a bomb is involved in an accident or incident?

8. When can you move a bomb that is involved in an accident?

1–2. B61 Procedures

The B61 can be loaded to strike or bomber aircraft. These aircraft include the F–16 and F–15 strike aircraft and the B–2 and B–52 bomber aircraft. We begin this discussion with a description of the B61. Next, we cover some of the different equipment we use while performing maintenance on the B61. Finally, we'll discuss disassembly and assembly procedures.

204. B61 inspection procedures

This lesson describes the various inspection procedures used with the B61. Each of these procedures are required as part of the weapons maintenance and handling operations according to the weapons-specific technical manual.

Inspecting H1127 and contents

As necessary, release the straps that secure the H1127 storage bag to the bomb and remove it. Inspect the storage bag for tears or cuts in the material and straps, and inspect for any missing parts. If the H1127 contains any rips or tears greater than 1 in., or has damaged or missing parts, it needs to be replaced. Rips or a tear measuring 1 in. or less is reparable. It is not necessary to unpack the items stored in the H1127 for the purpose of inspection unless the items show signs of damage.

Inspecting bomb handling equipment

Inspect the bomb handling equipment (fig. 1–5) for serviceability, damaged, or missing parts, condition of surface finish, and identification markings. Any extraneous nonfunctioning hardware (i.e., set screws) on H1125A is acceptable if the fit, form, and function of the handling equipment are not affected. It is not necessary to remove the bomb from the H1125A/H1671 for inspection purposes unless inspection indicates possible damage to bomb or areas hidden from view.

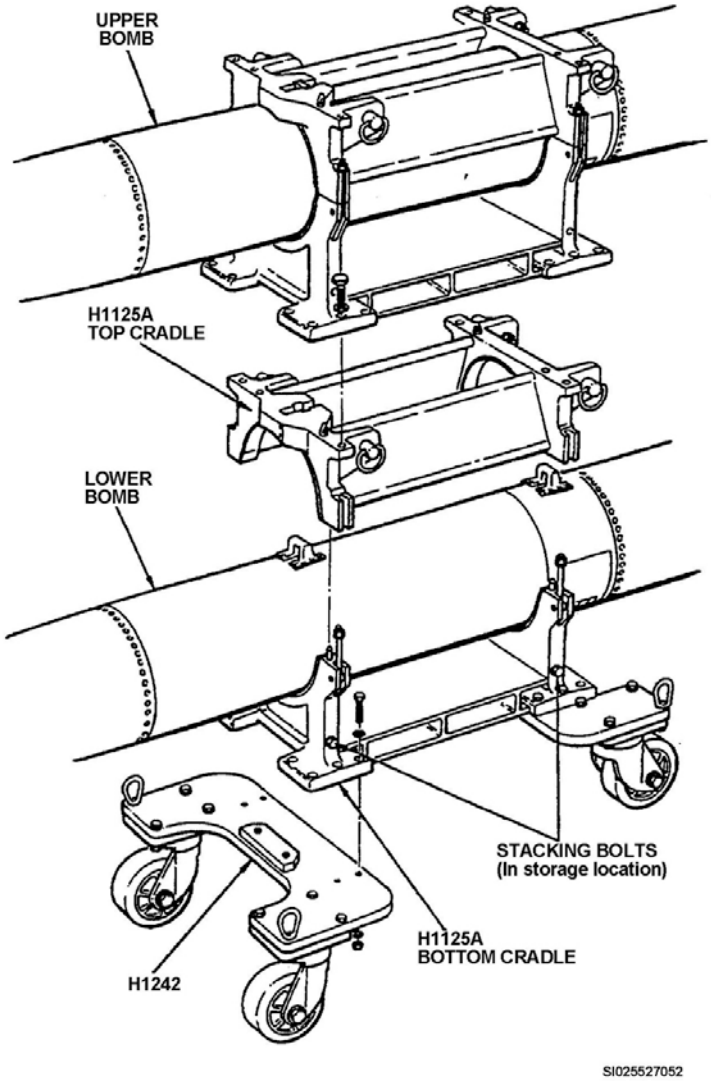

Figure 1–5. H1125A bomb cradle and H1242 swivel caster set.

H1125A bomb hand truck/H1671 handling equipment

Inspect H1125A BHT/H1671 handling equipment (or H-gear) for cracks and splits over 1 in. in length since this defect would render the H-gear unacceptable. Also, check the threaded-shank eyebolts of H1125A for cracks and if you find cracks, replace the eyebolts and submit an unsatisfactory report (UR). Ensure the swivel eyebolts, where you would attach the H563 beam-type sling, rotate freely but have no longitudinal movement. If you detect longitudinal movement, tighten the self-locking hex nut only to eliminate the longitudinal movement yet still allows rotational movement of the swivel eyebolt.

H1242 swivel caster set

After you've inspected the H1125A BHT/H1671 handling equipment, visually inspect the caster wheels of the H1242 for damage that may affect proper operation or that may cause the wheels to roll roughly. Check that the wheels turn freely and that the casters swivel. Be sure to maintain control at all times during this check and at the conclusion of this inspection, re-immobilize the caster assemblies.

205. B61 general maintenance

This lesson covers various general maintenance tasks used with the B61. Although this lesson provides generalized maintenance and handling procedures, always seek the weapon-specific manual to perform any war reserve (WR) maintenance tasks.

Immobilizing the H1125A bomb hand truck/H1242 swivel caster set/H1671 handling equipment

The bolster must be immobilized when not being moved. Do this simply by locking or castering one caster at a 90-degree (º) angle to the longitudinal axis of the weapon or perpendicular to the other three locked casters. If desired, you may use the H631 or H1216 caster handling tools (fig. 1–6) to position caster assemblies.

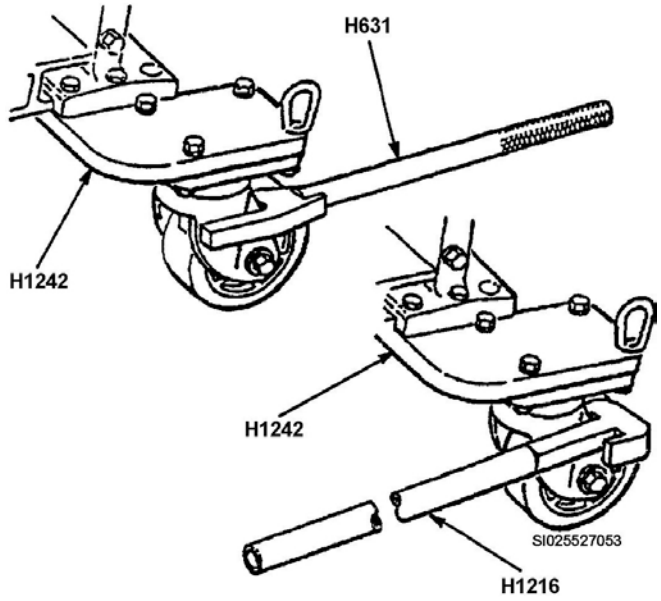

Figure 1–6. H631 and H1216 caster handling tools.

Lifting with H1004 bomb-hoisting adapter

You can use the H1004 bomb-hoisting adapter (fig. 1–7) to lift weapons in two ways: (1) lifting vehicle or (2) certified hoist. With a lifting vehicle, keep these two safety issues or concerns in mind:

1. Do *not* use tire chains on the wheels of lifting vehicles since vibrations during transport can cause excessive stress on equipment, resulting in possible equipment failure and personnel injury.
2. Be sure to secure the H1004 to the vehicle by using a CGU–1/B nylon strap or a MB–1 tie-down chain to prevent a bomb from slipping during movements.

First, install the H1004 on the forward and aft suspension lugs with the keeper end fully engaged in aft lug. Next, verify the lifting eye is approximately centered over the CG of the bomb. Depending on the method of lifting, attach the H1004 to the hoist or engage the H1004 forklift slots with the lifting vehicle and then secure it to the lifting vehicle by a nylon strap or chain assembly. Once the hoist or lifting vehicle is engaged, slowly lift the bomb. If using a hoist, immediately check for proper balance. If the balance is off, readjust the H1004 lifting eye as necessary to achieve proper balance. Finally, relocate the bomb to a suitable location and remove H1004.

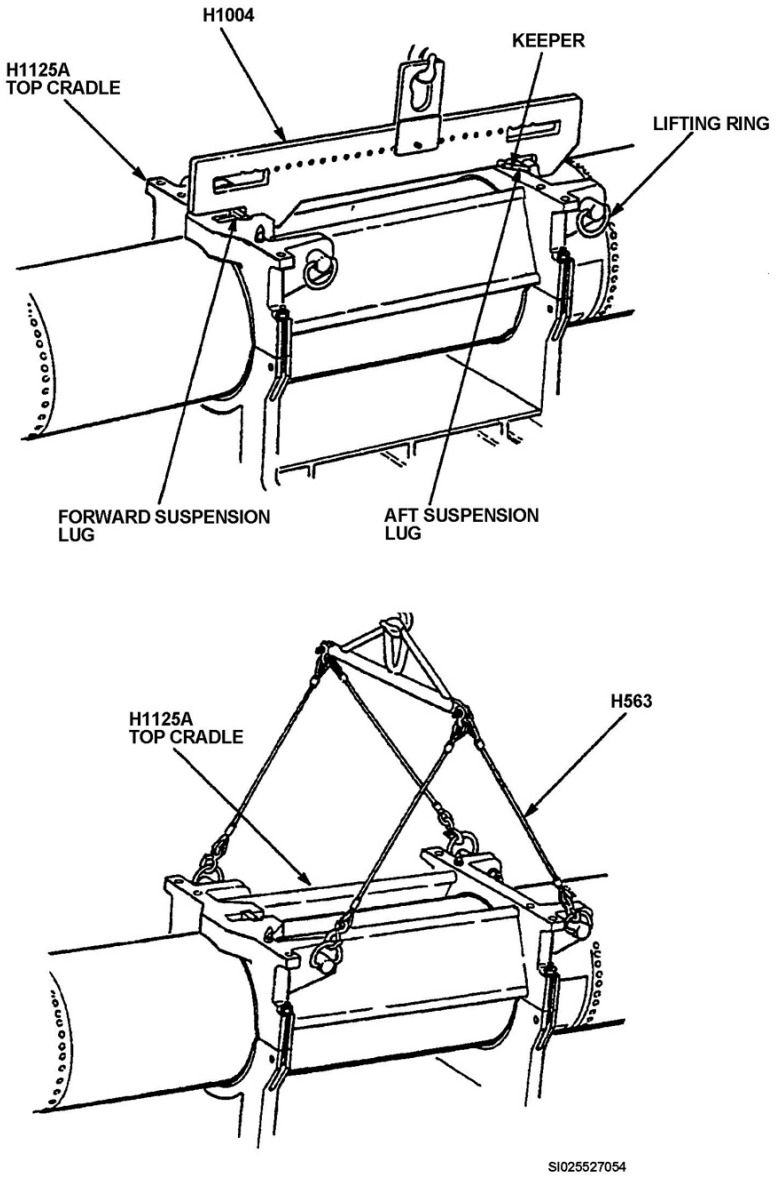

Figure 1–7. H1004 bomb-hoisting adapter and H563 sling.

Lifting with H563 beam-type sling

The H563 beam-type sling (fig. 1–7) can also be used to hoist the B61 as follows. Attach the sling to swivel eyebolts (lifting rings) of the H1125A/H1671 top cradle. Check that the flat of each swivel eyebolt is positioned inside the hole of the cradle lug. Next, center the hoist over the H563 lifting eye and attach. Recheck to make sure the sling legs are securely attached to the H1125A/H1671 and slowly lift the bomb and relocate onto a suitable location. Finally, remove the H563.

Removing and installing bomb from/to H1125A/H1671

To remove a bomb from the H1125A/H1671, the following procedures apply: first, ensure the H1125A attached to the H1242 caster assembly is immobilized. Next, loosen the nuts on the four swing bolts that secure the top cradle of the H1125A cradle to the bottom cradle. Once loosened, rotate the bolts downward. Remove the top cradle of the H1125A/H1671, either by hand or with H563. While using the H1004 lifting procedures, lift the bomb to its designated location.

To install a bomb in the H1125A/H1671, the following procedures apply: first, ensure the H1125A/H1671 attached to the H1242 caster assemblies where the bomb will be placed is immobilized. Ensure the top cradle of the H1125A is removed and the swing bolts are rotated clear. Next, ensure the felt strip on saddles of both top and bottom are covered with strips of polyester film (adhesive tape). Next, lift the bomb using the H1004 lifting procedures and maneuver the bomb until it's above the bottom cradle of the H1125A. Make sure the case joints where the CBSA meets with the preflight subassembly is aligned with the rear edge of the H1125A (bottom cradle). Once lined up, the bomb can be lowered down to the H1125A (bottom cradle). Next, remove the hoist and H1004 and install the H1125A top cradle by lifting cradle over the bomb and lowering cradle onto the bomb so that the forward suspension lug inserts into the slotted cavity at the forward end of the cradle. Rotate swing bolts into the slot of the top cradle and tighten nuts to 50 ±5 foot-pounds (ft-lb.).

Stacking and unstacking bombs

To stack bombs, first remove the H1242 caster assemblies from the H1125A that will be the upper unit of the stack (fig. 1–8). Using any of the methods we already covered, hoist the upper bomb and position it over the lower unit so they are aligned nose to nose. As you slowly lower the bomb, check that the alignment pins on the bottom bolster engage the holes on the upper bolster. Continue to lower the bomb until its bolster rests firmly on the bottom bolster.

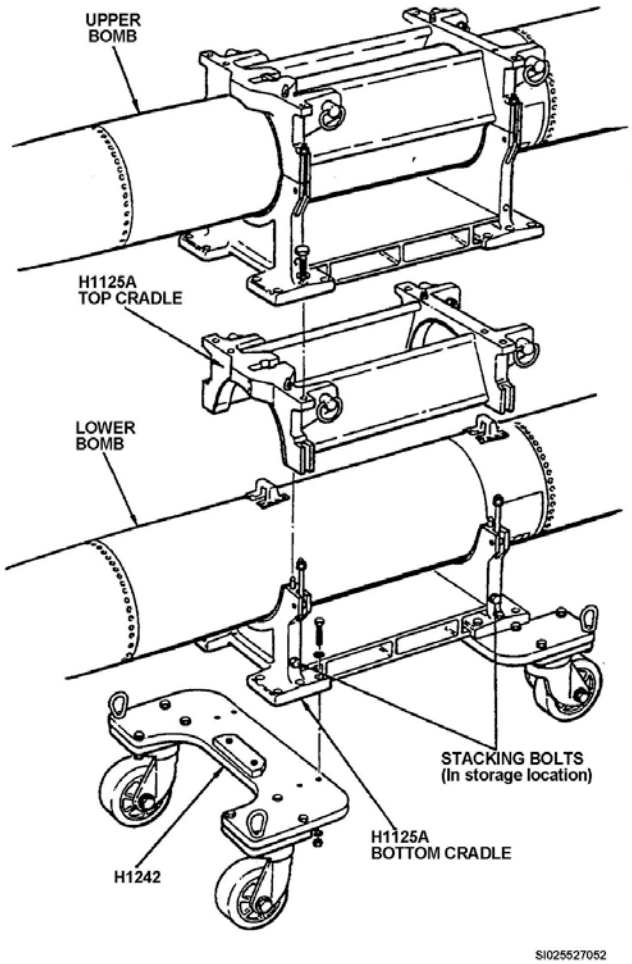

Figure 1–8. Stacking and unstacking.

Next, remove four bolts from their storage locations in sides of either cradle chock. Install one bolt in each of the four pads of the bottom cradle (upper bomb) using the center hole of the three out row holes to secure upper bomb cradle to the lower cradle. Tighten bolts securely, and then remove the

hoisting equipment. To unstack, remove the four bolts that secure cradle pads of the upper and lower bombs together. Install the removed bolts into their storage locations of either cradle half and tighten bolts finger tight. Use any of the lifting method previously discussed to lift the bomb from the lower bomb and reinstall the H1242 caster assemblies to the bomb that was the upper stack.

Installing and removing bomb in H1229/H1229A maintenance stand

To install the bomb, you must first perform a prior-to-use inspection on the equipment. Next, prepare the H1229 (fig. 1–9) or H1229A (fig. 1–10) maintenance stand to receive the bomb by adjusting the leveling feet of the H1238/H1654 to prevent wobble. As a caution, ensure the leveling feet do not support the entire weight of the maintenance stand and load. Open the cradle bands so the stand is ready to receive the weapon. Remove the top cradle of the H1125A and attach the lifting equipment to the bomb. Next, raise the bomb and position it over the H1229/H1229A. Maintain clearance between the bomb and the H1229/H1229A as you lower the bomb onto the cradle bands. You must position the bomb on the bands so the cutout portion of the large clamp butts up against the forward bomb suspension lug. Then, close and secure the forward and rear clamps and remove the lifting equipment. Finally, recheck the leveling feet on the stand and adjust if necessary. To remove the bomb from the H1229/H1229A, install the H1004 using the procedures previously stated and open forward and aft clamps of the H1229/H1229A. Lift the bomb, check for proper balance, and install it into the H1125A using H1125A installation procedures.

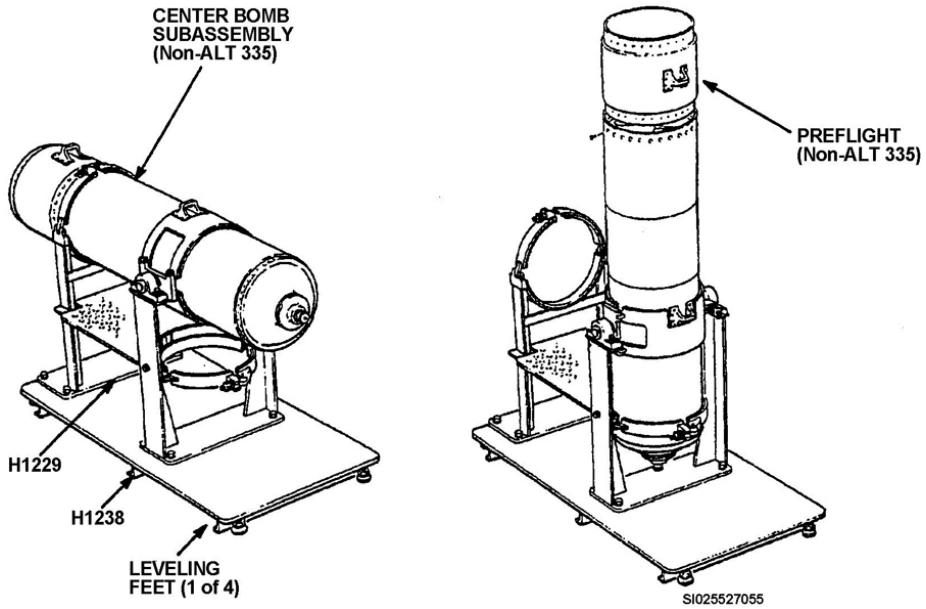

Figure 1–9. H1229 maintenance stand.

Disassembly procedures

Use the procedures to the extent necessary for specific replacement or repair operation. Before any disassembly, perform a visual monitor and ensure the H1125A/H1671/H1242 is immobilized and, if required, remove the H1127 storage bag. The B61 uses high-torque screws that secure the suspension lugs and tail fins to the bomb, but most of all, keeps the bomb together. The rounded shape of the screw slot and the tool make it difficult to keep the tool inserted firmly in the slot as you apply enough force to loosen (or tighten) the screw. It is particularly difficult to use a speed-handle wrench with a high-torque adapter. Always make sure the tool bit is firmly inserted into the slot of the screw head and be sure to exert maximum force in line with the longitudinal axis of the screw. Exercise care when loosening or tightening a screw to prevent damage to the weapon surface.

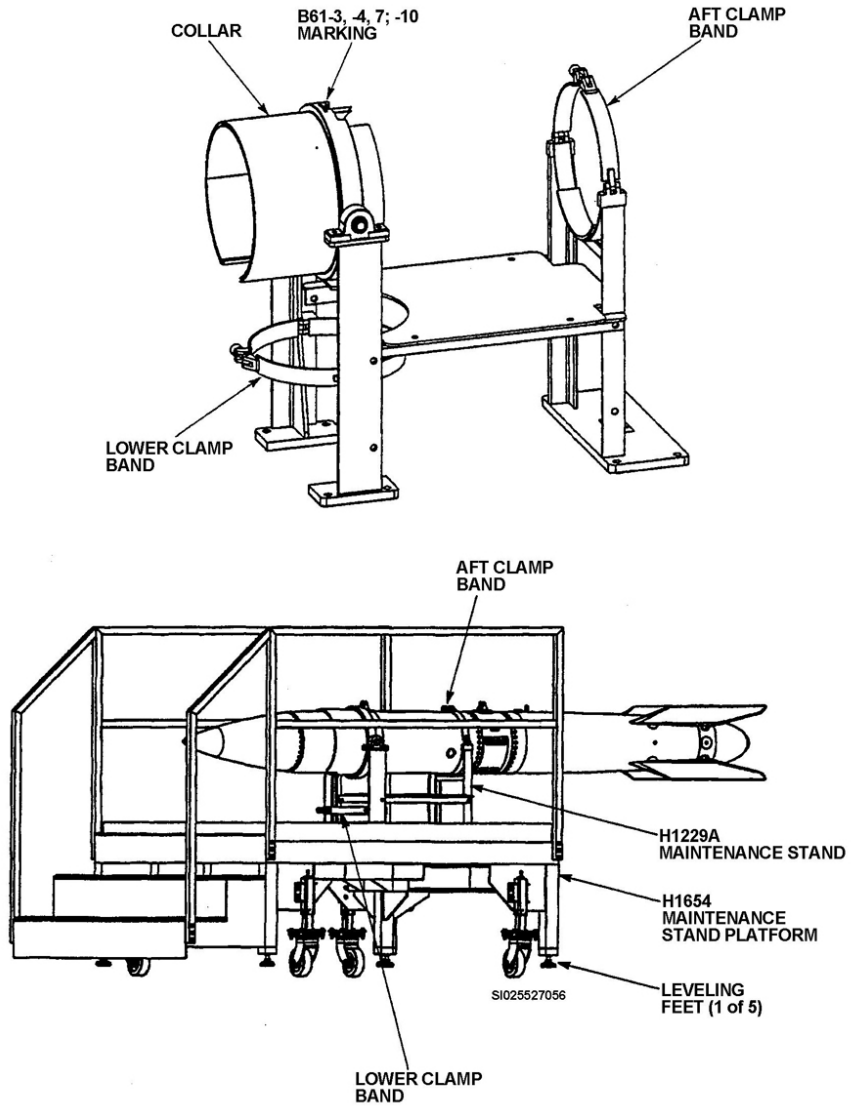

Figure 1–10. H1229A maintenance stand.

If you have trouble removing a screw using ordinary hand tools, use the H1354 or H1645 machine-screw removal tool (figs. 1–11 and 1–12). The H1354 has an adjustable strap, and you can find procedures for using these tools in the applicable –1 TO. If the last screw in the B61 is stuck and you have to use a removal tool, you must install and torque a screw in a hole next to the stuck screw. When removing a screw that is stuck on the tapered portion of the weapon (the nose), either set the retaining band behind the case break or block it with resilient material. You could damage the gang channel nut assembly inside the bomb subassembly if you don’t follow these instructions.

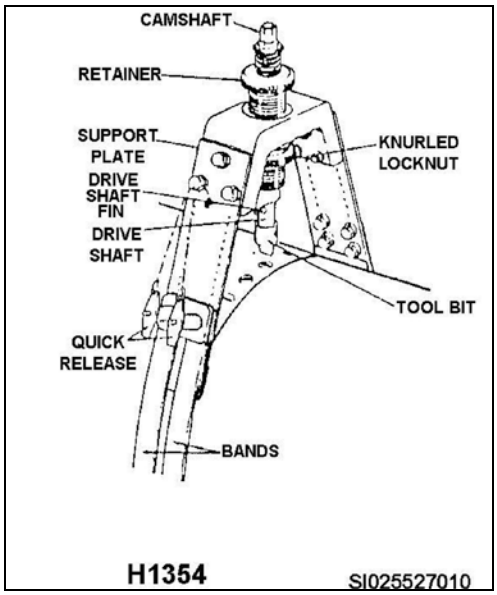

Figure 1–11. H1354 screw removal tool.

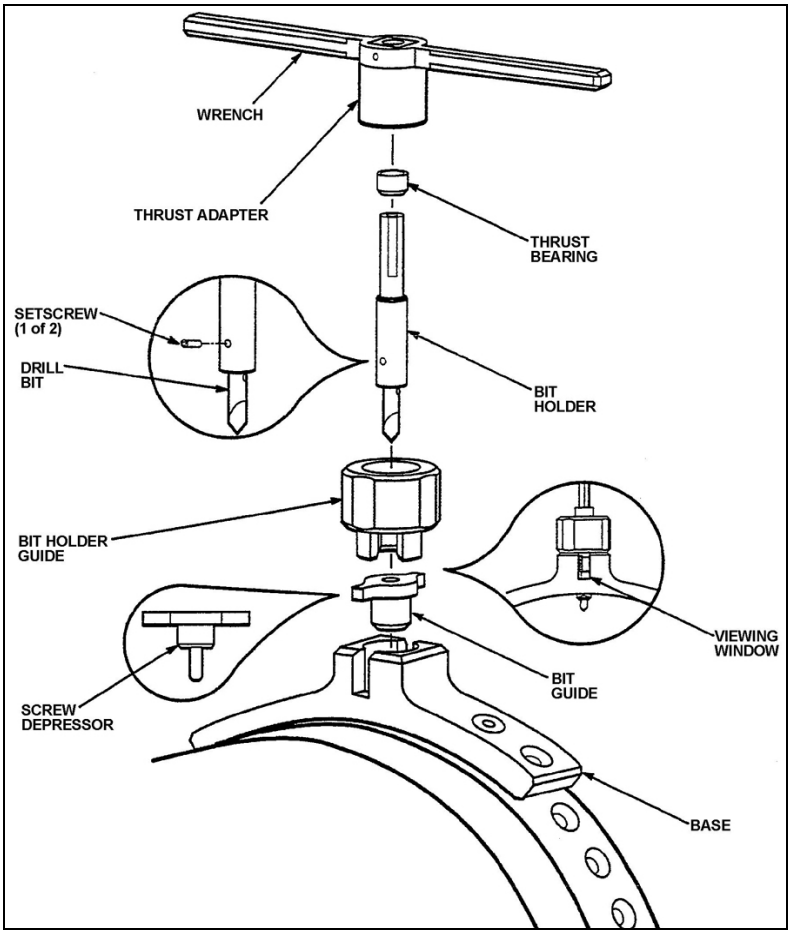

Figure 1–12. H1645/1645A screw removal tool.

Nose removal

Sometimes when you remove the bomb radar nose, it gets stuck (fig. 1–13). There are special procedures for this described in the TO. Basically, you insert shim stocks at different locations around the nose joint, increasing them in size, and rock the nose off with a back and forth motion.

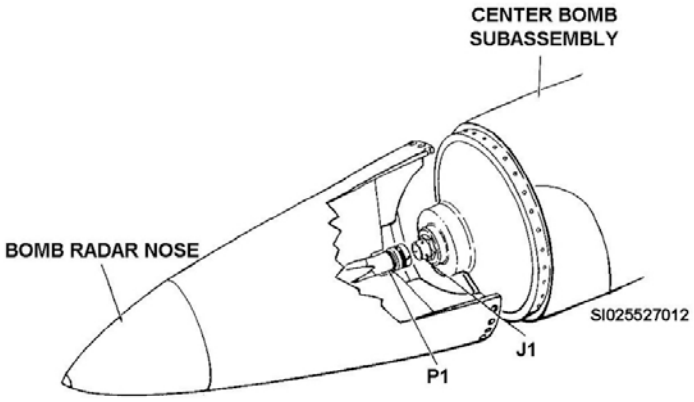

Figure 1–13. B61 nose.

Tail removal

When removing the tail bomb subassembly, use one of the two methods available:

1. Use the H1130 bomb tail-handling device to support the tail bomb subassembly during weapon disassembly if you don't have a hoisting device available (fig. 1–14). When using the H1130, support the tail at both the forward and aft end.
2. Use the H869 nylon strap sling used with a hoisting device to support the tail during disassembly and assembly (fig. 1–14). To attach the H869, slip the strap around the tail's CG and insert the end marked HOOK through the loop on the opposite end. Then tighten the strap, attach the end marked HOOK to the hoisting device, and remove any slack from the strap by raising the hoisting device. Keep in mind someone must hold the tail to keep it from swinging.

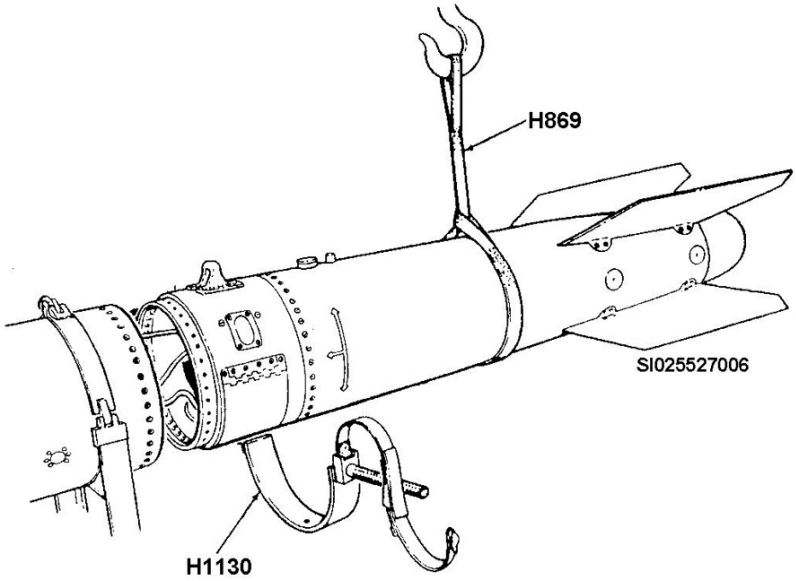

Figure 1–14. H869 strap and H1130 supporting a B61 tail.

When removing the tail bomb subassembly, a case-separation limiter is installed between the tail and preflight to prevent cable damage. The case-separation limiter only works if you keep the tail in a

direct line with the preflight. On some B61 models (MOD) and bombs with alterations (ALT) 335 completed, the tail and preflight are removed as one unit. If ALT 335 is not completed, remove the preflight and tail separately. Use care guiding and supporting the subassemblies. It is very easy to bump major components (MC) together, especially when one is suspended from a hoist or sling. When using a handling device, such as the H869 strap, make sure the CG is correct and make adjustments as necessary to achieve the correct CG.

Reassembly procedures

Bomb assembly is a simple process. You, basically, reverse the procedures used for disassembly. Before installing high-torque screws on the bomb, you must lightly spray the countersink holes in the mounting flange with solid-film lubricant. Cable routing depends on the weapon MOD. Verify cables are routed properly before mating the subassembly. This prevents cable damage. When connecting the cable between the preflight and the gas generator, you must equalize your body potential by touching and maintaining contact with the gas generator (fig. 1–15) until the connection is complete. Make sure everyone remains clear of the aft end of the tail while you connect the gas generator cable. Static electricity could fire the gas generator, separating the tail cap at a high rate of speed, and injure anyone standing behind the tail.

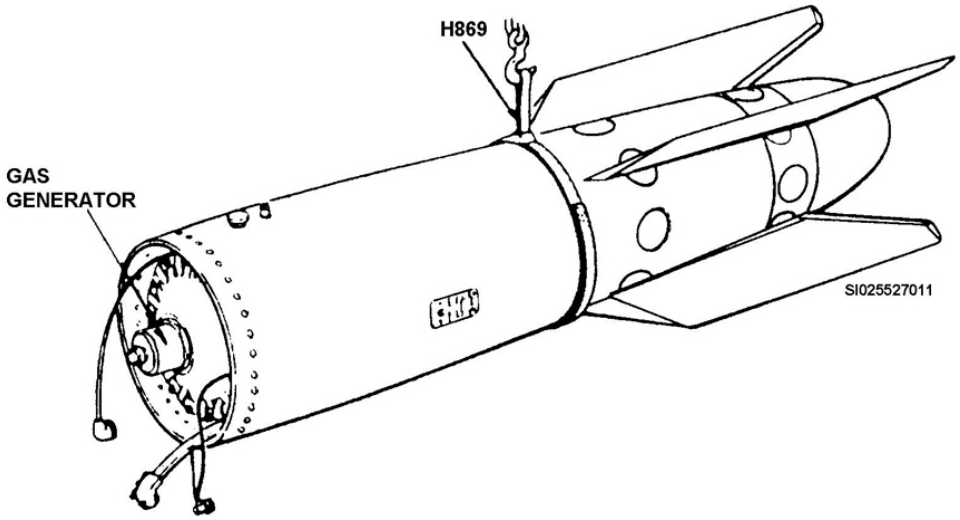

Figure 1–15. B61 tail bomb subassembly.

While mating the subassemblies (i.e., nose, tail, or preflight), align the top centerline and make sure the cable slack slides freely into the subassembly without snagging, binding, or pinching. Next, install the top three screws and torque to 130 ±10 inch-pounds (in-lb.). Remove all support from the subassembly, install the remaining screws, and torque to 130 ±10 in–lbs. Finally, clean any excess lubricant from the mounting holes with aircraft cleaning compound and hot water. Touch-up the painted surfaces of the bomb, as required, using the procedures in TO 11N–35–51 for preserving surfaces—organic finish application. Do not apply paint to the radome. Remove the bomb from the H1229/H1229A and install in the H1125A. Finally, after all maintenance and handling tasks, inspect the bomb for obvious damage and recheck the actuator lugs was not damaged during the reassembly.

206. B61 maintenance

Before conducting any maintenance, ensure a visual monitor was completed and the H1125A/H1671/H1242 is immobilized. Also during any maintenance, inspect all exposed cables, connectors, and components for any damage that might affect the function of the equipment. Keep in mind the safety hazards associated with electrical connectors and cables.

Electrical connectors and cables

There are several types of electrical connectors used with nuclear weapons and their associated equipment. Avoid skin contact with connector sockets or pins. Touching unprotected sockets or pins can cause deterioration and lead to unsafe or unreliable conditions. If the specific weapon TO does not contain the procedures for handling, protecting, and inspecting electrical connectors, use the procedures in TO 11N–35–51. The bomb contains electrostatic sensitive devices (ESSD), which are sensitive to static electricity. You must equalize your body potential with the bomb or component before connecting, disconnecting, or inspecting electrical connectors and cables. When performing operations under ESSD WARNINGS or CAUTIONS, you must re-equalize your body potential with the bomb or component if you are interrupted or do something that could build up static electricity. The –1 TO directs when and where to equalize on the bomb or component.

Replacing components in center bomb subassembly

You may be required to replace components in the CBSA, such as an observation window/plug, a suspension lug, or any repair action that requires access to the CBSA.

Performing limited life components

LLCs are components that deteriorate, in some respect, over time and must be replaced periodically during a weapon stockpile life. LLCs include reservoirs, neutron generators, and gas generators. Make sure you have all the correct replacement parts (i.e., LLCs and group X kits) before rotating the CBSA as described in the paragraph below.

Before you rotate the CBSA in the H1229, check the forward clamp to make sure it is tight and not loose. Failure to ensure that the forward clamp is secure could result in injury to yourself or others around you and/or damage to the equipment. Next, open the lower clamp band, hold the CBSA and loosen the aft clamp band, then manually rotate the CBSA and then, secure the lower clamp band. Do the same for the H1229A with the exception if the bomb radar nose is still attached, you remove the maintenance stand deck plate; then, after rotation, reinstall the plate. Place all removed components on clean, padded surfaces, and protect items from moisture in desiccated storages (e.g., ice chest with desiccant). Procedures may require you to use an AN/PDR–74A, tritium monitor set, as you remove components.

AN/PDR–74A, tritium monitor set

The AN/PDR–74A (fig. 1–16) is more commonly known as the sniffer. The tritium air monitor is a lightweight monitor designed to detect and measure airborne radioactive (tritium) gas that uses six common D-cell batteries for power. Air is sucked into the tester through the nonconductive plastic tube because voltage used by the tritium monitor may cause damage to the weapon; the nonconductive hose is required during monitoring. Follow the procedures in the applicable weapon system TOs for specific monitoring procedures.

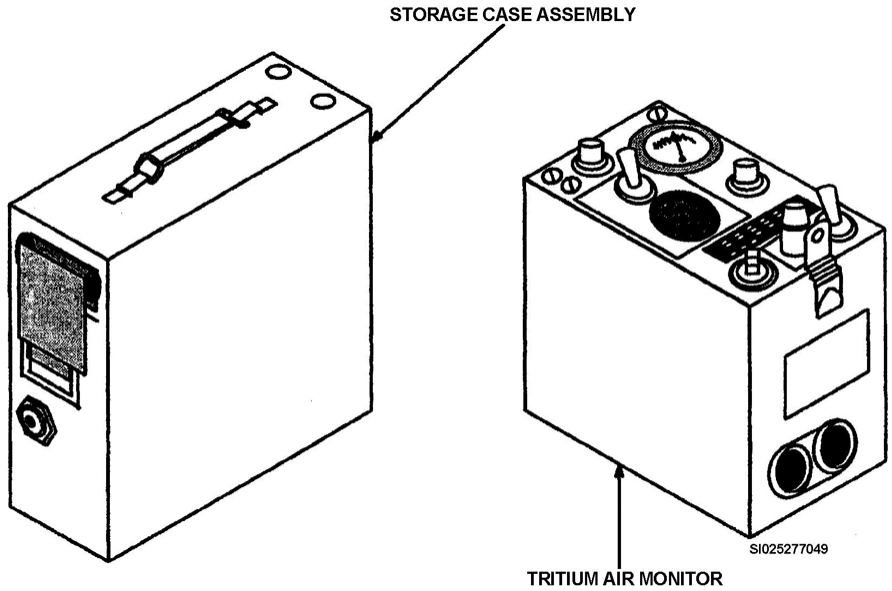

Figure 1–16. AN/PDR–74A, tritium monitor set.

It is extremely important to place explosives or otherwise dangerous items (i.e., explosive cables, gas generators, or squibs, etc.) into designated locations out of high traffic areas. Sometimes, you must disconnect safety devices or shorting plugs. While the situation is temporarily unsafe, make sure everyone remains clear of the hazardous area, yet maintain the two-person concept. Before you exchange any parts, make sure you record all pertinent information on the removed and installed components for later accomplishment of the weapon information report (WIR). Finally, perform a seal test of the CBSA after your LLC operation is complete.

Self-Test Questions

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

204. B61 inspection procedures

1. What conditions require a replacement of the H1127 storage bag?

2. Should the items stored in the H1127 storage bag be unpacked as part of the inspection process?

3. What should you do upon discovering damage to extraneous nonfunctioning hardware when inspecting bomb handling equipment?

4. What procedures are you required to perform upon discovering extremely loose swivel eyebolts and longitudinal movement while inspecting bomb handling equipment?

5. When inspecting bomb handling equipment, after checking the H1242 casters for proper rotation (swivel), what is your next *immediate* step?

205. B61 general maintenance

1. What equipment can be used to immobilize the H1125A BHT/H1242 swivel caster set/H1671 handling equipment?

2. In what two ways can you use a H1004 bomb hoisting adapter to lift weapons?

3. What is the possible consequence of using tire chains with lift vehicles?

4. What items can be used to secure the H1004 to the lift vehicle prior to lifting a bomb?

5. How should the swivel eyebolts be positioned when installing the H563 beam-type sling?

6. What are the authorized methods of removing the H1125A/H1671 top cradle from the bottom cradle?

7. Before placing a weapon in a H1125A/H1671, with what must you ensure the saddles of both top and bottom cradles are covered?

8. To how many ft-lbs. are the swing bolts tightened after the H1125A/H1671 top cradle is installed on the bomb?

9. For bomb stacking operations, where are the stacking bolts installed to secure the top stack to the bottom stack?

10. What are the stacking bolts tightened to in their storage locations after performing a bomb unstacking operation?

11. What caution should you heed concerning the H1229/H1229A maintenance stand leveling feet when installing and removing the bomb?

12. How do you properly position a bomb in the H1229/H1229A maintenance stand?

13. Before performing any bomb disassembly, what two actions must you take?

14. Explain how to loosen or tighten the B61 high-torque screws.

15. What handling equipment may be used to remove stuck screws in the B61 if ordinary hand tools do *not* work?

16. How do you remove a B61 stuck nose?

17. Before installing high torque screws on the weapon, where do you spray the solid-film lubricant?

18. Why must everyone stand clear of the aft end of the tail while you are connecting the gas generator?

19. In the bomb assembly process, how many screws must you install in the subassembly before you can remove support from the subassembly?

20. What is used to remove excess lubricant from the mounting holes after subassembly installation?

206. B61 maintenance

1. After ensuring a visual monitor has been done, what must you do during any B61 maintenance?

2. What is the result of touching (skin contact) unprotected sockets or pins of electrical connectors?

3. If you are interrupted when performing an operation under ESSD WARNINGS or CAUTIONS, what action *must* you take?

4. List three types of LLCs.

5. When rotating the CBSA, how do the procedures differentiate between the H1229 and the H1229A?

6. What test equipment is designed to detect and measure airborne radioactive gas?

7. Where is the ideal location for placing removed explosives or other dangerous items?

8. What is the purpose of recording information from the removed and installed components?

1–3. B83 Procedures

The B83 can be loaded on B–2 and B–52 bomber aircraft. In this section, we cover some of the different inspections and maintenance requirements on the B83. Finally, within this section we discuss disassembly and assembly procedures.

207. B83 inspection procedures

Remember to inspect equipment for serviceability before each day's use. Perform the required physical inspection and maintenance according to the equipment's technical manual. Each of these procedures are required as part of the weapons maintenance and handling operations according to the weapons-specific technical manual.

Inspecting H1097A storage bag and contents

As required, remove the H1097A storage bag by disengaging the center strap and if desired, remove the items from the compartments. Next, disengage the aft strap and remove the H1097A. Inspect the H1097A for cuts, tears, and/or missing or damaged parts. Any rips or tear that are less than 1 in. requires repair. If the storage bag is otherwise damaged or has missing parts to the extent that repair is not practical or that the H1097A cannot perform its intended function, replace the storage bag. When inspecting the contents of the bag, it is not necessary to open individual packages containing components.

NOTE: The exception to this rule is if damage to individual external packages containing components indicates possible damage to package contents (or if further inspection and repacking is required for other reasons), you would unpack components, perform additional inspections, and repackage components.

Inspecting bomb handling equipment

When inspecting bomb handling equipment, inspect for damage and report damage that affects functionality by submitting a UR. You should inspect surfaces of handling equipment (or H-items) for evidence of fungus, corrosion, oil and/or other contaminants.

H1347/H1347A bomb hand truck

Visually inspect caster wheels on the H1347/H1347A for damage that affect proper operation of wheels (i.e., wheels rotate freely, locks engage, and casters swivel). If such damage is found, replace caster assembly. Without the aid of magnification, visually inspect wheel hub (i.e., metal center) as follows:

- Inspect wheel hub for cracks. If the wheel hub is cracked, replace caster assembly.
- Inspect wheel hub for separation of rubber tire. If the wheel hub has separated from rubber tire, remove all weight from the wheel and while firmly holding the wheel hub and tire, attempt to move tire laterally, circumferentially, or radially off-center from wheel hub. If movement occurs, replace the caster assembly.

Pay close attention to the caster assemblies. Mixed caster assemblies on the H1347/H1347A do not constitute a rejectable condition. However, the condition should be corrected as soon as possible by swapping caster assemblies between other BHTs. This ensures each BHT contains a complete set of the same caster assemblies with the same part number. Once the caster assemblies are removed and replaced (as necessary), ensure the part number stenciled on the caster assemblies accurately correlates to the part number of the H1347/H1347A as listed in the weapons-specific manual. If not, the H1347/H1347A must be remarked to reflect the current installed caster assemblies. In addition to verifying the part numbers, inspect caster cam locks with knurled caps for the following:

- Make sure the caster cam locks have black or rust/reddish brown knurled caps. If the caster cam locks do not have knurled caps, reject the caster assembly and submit a UR.
- Make sure the caster cam lock does not have a spring pin or rod protruding from either side of the cap. If a spring pin or rod is protruding from either side of the caster cam lock cap, reject the caster assembly and submit a UR.
- Make sure the caster cam locks can be locked and unlocked by retracting and turning the caster cam locks approximately 90º to either the locked or unlocked position, then release. Caster cam locks should not return to their original locked or unlocked position. If caster cam locks return to their original position, or rise and falls when turned, reject caster assembly and submit a UR.

Next, verify the caster assemblies are marked on both inward-facing sides with the appropriate caster part number. If the caster part number is missing from either side, stencil the correct part number on the caster. Check the axle bolt of each caster to ensure that the bolt is flush with, or extends beyond, the locking nut. If not, tighten the axle bolt until the caster assembly tire cannot be turned by hand and then back off approximately ¼ turn to ensure tire rotates freely by hand. Inspect bolt pouches for mold and mildew and the presence of eight attaching screws. Replace any missing screws. Next, inspect 12 straight-headed pins on stacking fixture for looseness by attempting to remove pins by hand. Again, the bomb does not have to be removed from the H1347/H1347A to perform the inspections. However, if an inspection of the visible portion of the BHT indicates that a partially hidden part is defective or missing, the bomb must be removed for a more thorough inspection.

T566 digital multimeter

The T566 test equipment (fig. 1–18) is used to determine if the LLC has been fired. This check is done before and after the LLC exchange.

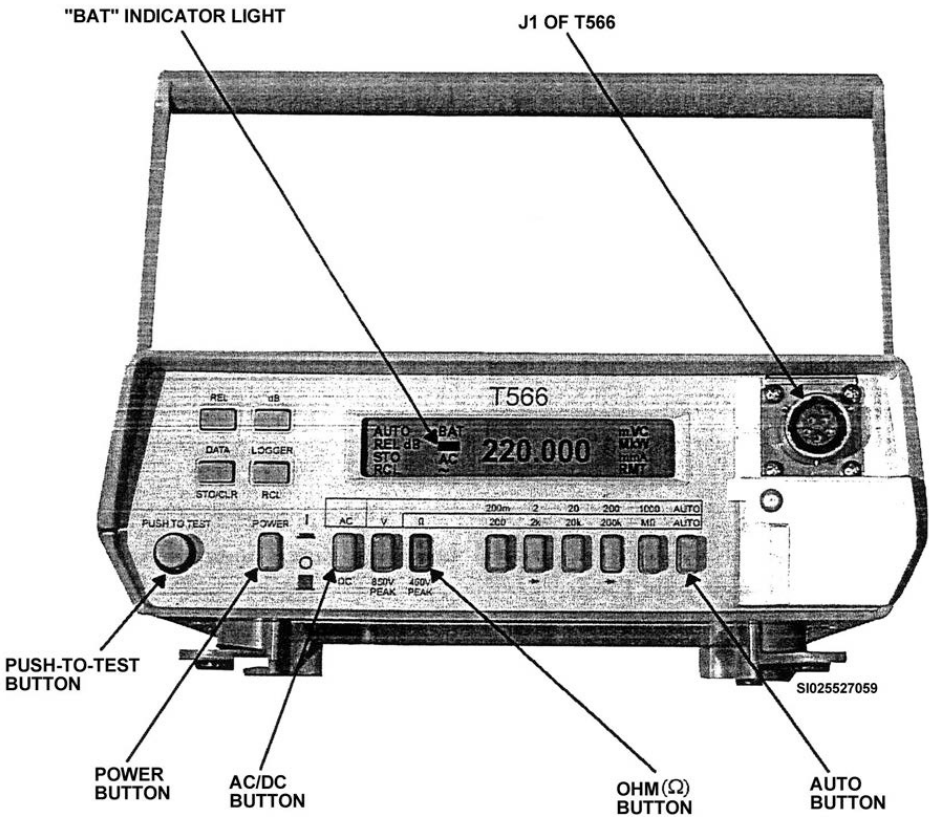

Figure 1–18. T566, digital multimeter.

208. B83 general maintenance

This lesson covers various general maintenance tasks used with the B83. Although this lesson provides generalized maintenance and handling procedures, always seek the weapon-specific manual to perform any WR maintenance tasks.

Immobilizing the H1347/H1347A

Before immobilizing the H1347/H1347A BHT, ensure the casters are unlocked. Unlock the caster and turn one caster at a 90º angle to the longitudinal axis of the weapon or perpendicular to the other three locked casters. Once all casters are locked into desired position, attempt to move the weapon manually.

You can use the H1640 caster tool (fig. 1–19) to position the caster assembly. When using the caster tool, be sure to unlock the caster before you try to turn the caster or you might damage the caster or caster tool.

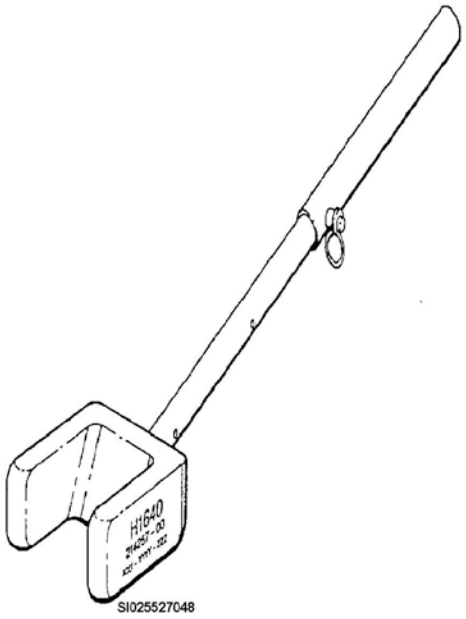

Figure 1–19. H1640, caster tool.

Lifting with H1004 bomb-hoisting adapter

As a warning, do not use the H1004 to lift a double-stack of bombs. Forklifts are the only approved method of lifting a two-high stack of B83s. The H1004 may be used with either an unassociated B83 or a single-stack B83 loaded on H1347/H1347A. To install the H1004, position the H1004 on bomb suspension lugs with the keeper end of H1004 secured to the aft suspension lug. If a hoist is used, position the H1004 lifting eye to the appropriate hole, which is usually the seventh hole from the forward end of the H1004 (not counting the half-holes or rectangular cutout). Before lifting, verify the keeper is fully engaged so the bomb cannot slip from the H1004 and then lift the bomb slowly immediately checking the CG for proper balance. If necessary, lower bomb onto cradle or padded surface to reposition the lifting eye to achieve proper balance. Lastly, relocate the bomb to a designated location taking care to prevent damage to fins before lowering bomb to a suitable location.

Installing and removing H1095 stacking frame

To install the H1095 stacking frame to the cradle assembly, remove the four cap screws and washers from the H1095. Next, position the H1095 under the cradle assembly so that the mounting holes align with the cradle mounting pads. Finally, install four cap screws (with flat washer on each cap screw) through cradle assembly and into threaded holes in the H1095, and tighten cap screws securely. To remove the H1095, reverse the process. Store the cap screws and washers by installing them into the threaded holes in the removed H1095 and tighten them finger tight.

Removing the aft assembly

Disassembly of the B83 is required when exchanging internal components. To disassemble the weapon, you must remove the tape pairs that secure the forward case to the aft case. This break is called a field or service break. Before you can remove the tapes and aft assembly, you must lift the bomb and install H837 cradle adapters on the H1347/H1347A hand truck (under the weapon). This raises the weapon's height so the H12 hand truck fits under the aft assembly. Carefully place the H12 hand truck, with a H1457 adapter installed, under the aft assembly. Position the rear chock of the H1457 close to, but not touching, the access door on the aft assembly (fig. 1–20). When the H12 is properly positioned, engage both rear wheel brakes. Raise the H12 track assembly until the forward and aft chocks of the H1457 contact the aft assembly and pick up its weight. After final adjustment of the H12, you are ready to remove the tapes.

The B83 bomb uses tapes and a tape joint to attach the aft and midcase sections together. The tapes (fig. 1–21) are made of tapered, slotted, flexible stainless steel and fit into circular grooves in the bomb case to secure the two sections together. There is two pair of tapes for each joint (four tapes, total). Each pair is made up of two tapes marked with matching serial numbers ending in A or B (i.e., 12345A and 12345B). One pair is installed in the upper half of the case groove while the other pair is installed in the lower half of the case groove.

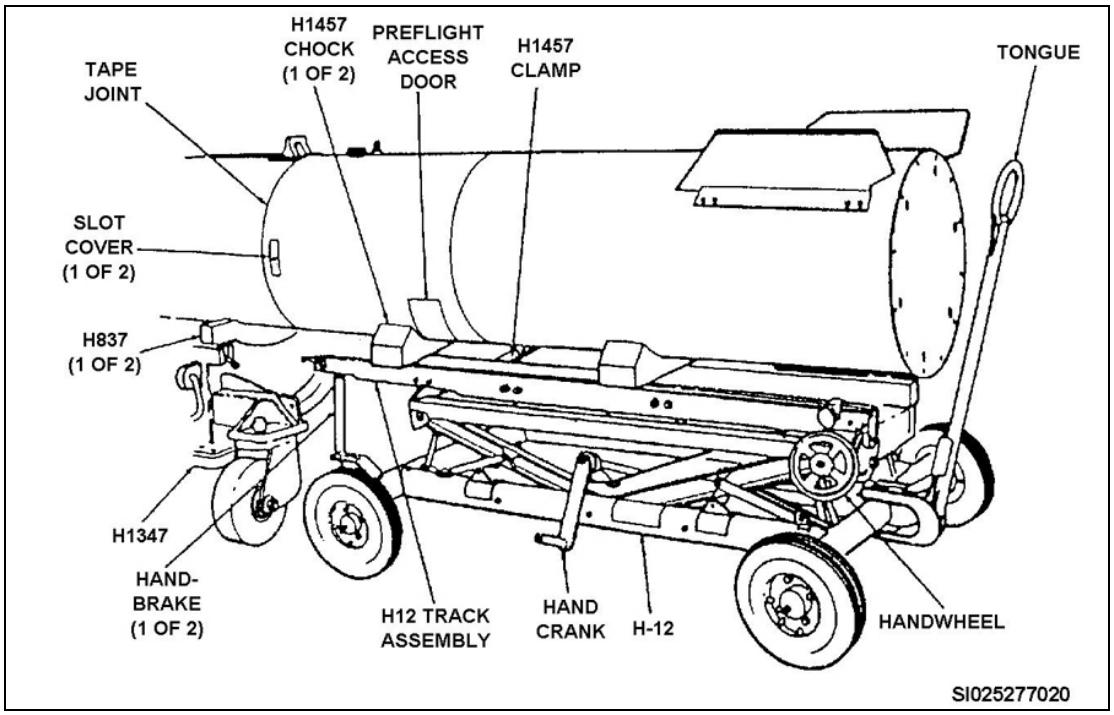

Figure 1–20. H837, H12, and H1457 installed.

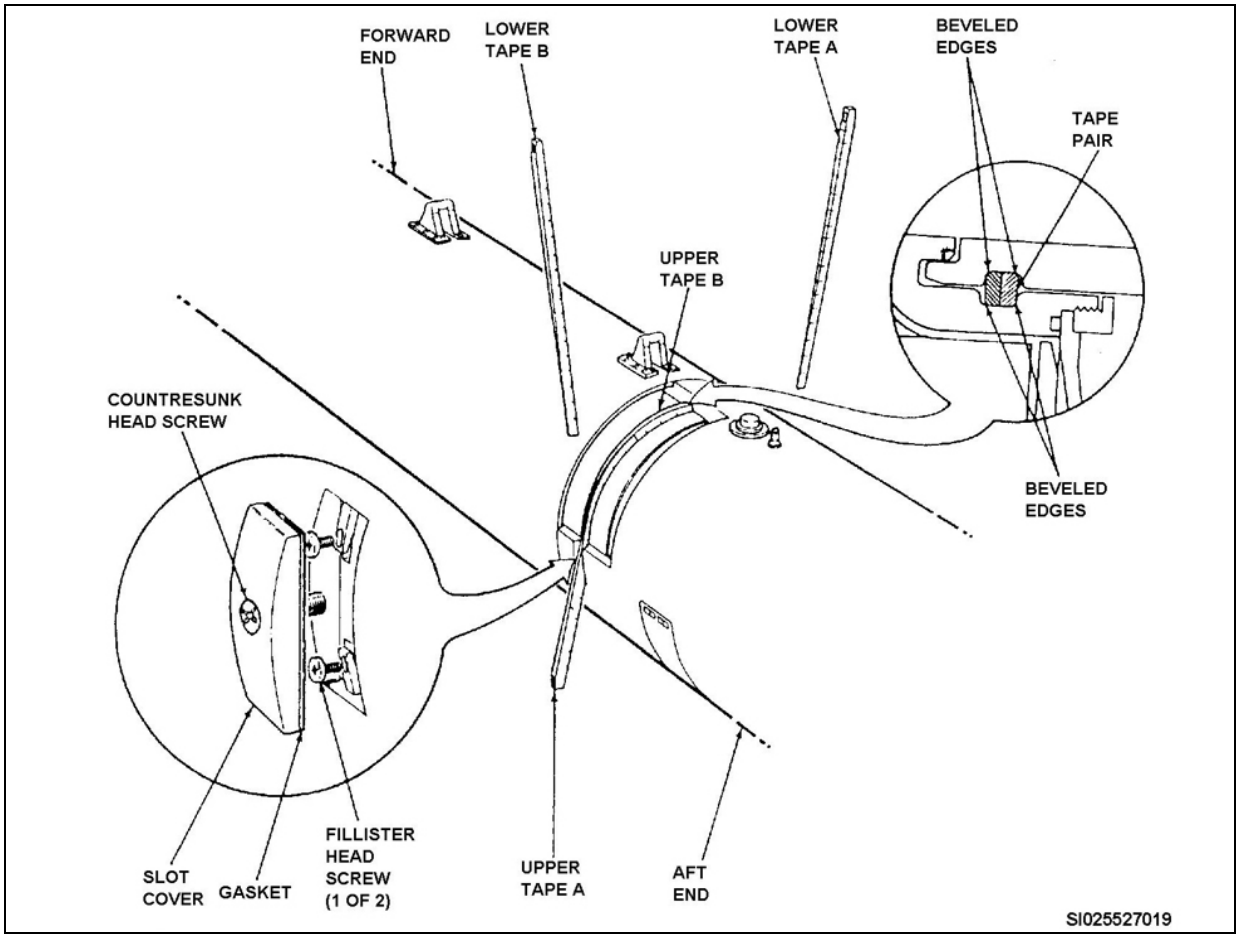

Figure 1–21. Tapes used with the B83.

It takes two technicians to remove and install the tapes. To remove the tapes, first, remove the screw that secures the slot cover and gasket (one on each side of the aft assembly) and discard the screw. With the slot cover removed, the tape ends are visible and are held in place with screws. If the tapes are installed correctly, remove and discard the screws. It takes two technicians, one on each side of the weapon, to remove and install the tapes. Each technician uses the H1452 tape driver (fig. 1–22), installed on an air hammer (fig. 1–23) connected to a source of compressed air. Insert the tip of the H1452 into the slotted hole of each lower tape. Using 35 pounds per square inch gauge (psig) and operating the hammers at the same time, the tapes should break loose. After the tapes are broken loose, continue to remove the tapes until the tape ends extend approximately ½ in. beyond the tape slot. If 35 psig is not enough to break the tapes loose, increase the air pressure in 10 psig steps to a maximum of 75 psig until the tapes break loose. If the tapes do not break loose, use suitable drift pins and hammers on both sides and try to break them loose. As required, go back to the air hammers to remove the tapes.

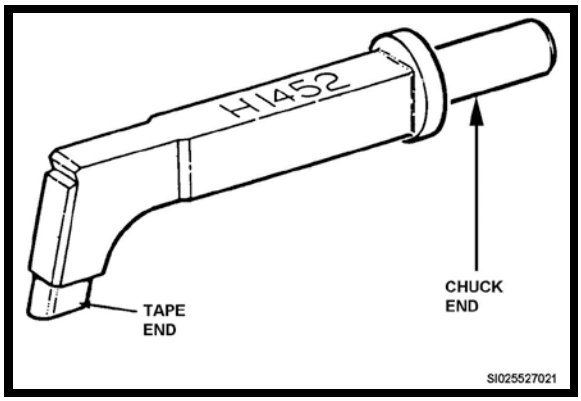

Figure 1–22. H1452 tape driver.

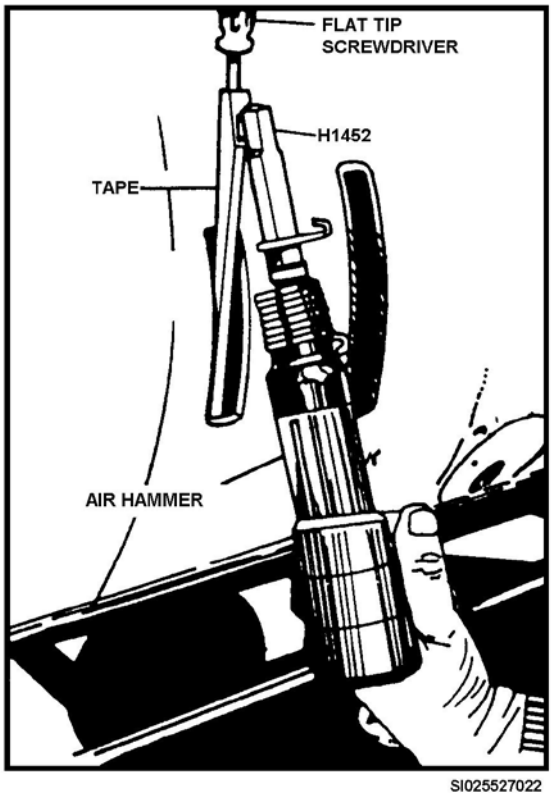

Figure 1–23. Air hammer with H1452 attached.

If, after breaking the tapes loose, a tape has moved so far that you can't place a screwdriver between the tape and the bomb surface, drive the tape back until there is enough room to insert the screwdriver blade. While one person uses the blade of the flat-tipped screwdriver as a ramp to guide the tape (fig. 1–23), withdraw the tape about 6–12 in. and remove the H1452 and air hammer from the tape. Then, either by hand or using a pair of vice grip pliers, grip the forward and aft surfaces of the tape and carefully pull upward, following the curve of the tape until it is fully withdrawn. If necessary, you can use the H1452 and air hammer for this. The used tape pairs are curved and must be stored in the curved position. Do not try to straighten them out. Be sure to set the tapes aside for reuse in matched, serial numbered pairs. After you remove the other lower tape, remove the upper pair using the same procedures.

When both pair of tapes are removed, you can separate the aft assembly from the forward assembly. Release the brakes and move the aft assembly until a gap of about 3 in. exists between the assemblies, then reengage the hand brakes. Observe the ESSD WARNING in the –1A TO and equalize your body potential with the cable connector and the midcase section. Disconnect the cable assembly and move the aft assembly aside.

The aft assembly can stay on the H12 for reinstallation, or it can be placed on a clean, padded surface using chocks to raise the aft assembly for fin clearance. If the aft assembly remains on the H12, do not adjust the height of the H12 or rotate the assembly. This will make it easier to reinstall since no adjustments are needed.

Installing the aft assembly

Before reinstalling the tapes, you must clean both mating flange surfaces with isopropyl alcohol. Verify that a preformed packing is present since not all bombs contain a preformed packing mounted on the flange of the aft assembly. Remove and replace preformed packing only if damaged (i.e., broken or torn). Any preformed packing that is flattened from previous mounting on the flange and aft assembly is acceptable. Lubricate new preformed packing with fluorinated grease taking care not to stretch or deform the preformed packing and install it on the flange of the aft assembly. Next, disengage the hand brakes of the H12 and carefully position the aft assembly within 3 in. of the forward assembly to allow a gap for disconnecting cables, and set the brakes. Observe the ESSD WARNING in the –1A TO and equalize your body potential with the cable connector and the midcase section. Connect the cable assembly and perform a continuity test.

To perform a continuity test, first ensure the shorting plug is installed on the T304C continuity test set and rotate the knob. Both lamps on the T304C should light with each rotation of the knob. Next, remove the shorting plug and connect the cable associated with T304C. Rotate the knob again and this time, the lights do not light. As a caution, observe the equalization procedures by equalizing body potential with the suspension lug and then connecting the cable to the weapon as specified in the weapons manual and perform the test. Upon satisfactory results, equalize body potential again, disconnect the cable, reinstall the connector cover, and record the results on the eIRC.

After completing the continuity test, carefully move the H12 until there is an even gap around the case. During this mating procedure, make sure the aligning pin on the forward assembly engages with the slot on the aft assembly. Again, set the brakes on the H12. When installing tapes in the B83, make sure that they are matched pairs. If one tape in a pair is damaged, you must replace both tapes as a set. First, install the upper tape A by hand, with the beveled edge to the outside of the groove. Using your hand or air hammer and the H1452 with 30-psig pressure, push or drive the tape into place until the forward tip is visible in the slot opening on the other side of the bomb. Then, using the same procedures, install the upper tape B. Ensure that the beveled edges of each tape are toward the outside of the groove. After driving each tape individually until the upper threaded hole is visible through the slotted tape hole, drive both tapes simultaneously, until they are seated, then install the countersunk-head screws. Install the lower tapes in the same manner. If the tip of the H1452 comes against the end of the case slot before the tape is fully seated, turn the H1452 around 180º in the hammer and use the

flat side to drive the tape at the end (instead of at the slotted holes in the tape). Install four new screws that secure the tapes and torque them. Before you install the slot covers, apply fluorinated grease to the flat side of the covers and place the gasket onto the covers. Install the slot covers and gaskets on each side of the bomb. Install and torque the two new screws that hold the cover slots in place. After all maintenance, inspect bomb surfaces and inspect the pullout switch for any damage that may have occurred during the operation.

Self-Test Questions

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

207. B83 inspection procedures

1. How is the H1097A storage bag removed from the bomb?

2. What criteria require the H1097A storage bag to be repaired?

3. What condition(s) requires the individual components inside the H1097A storage bag to be unpacked?

4. When you find separation of the rubber tire from the wheel hub on the H1347/H1347A, what is the next course of action?

5. Should mixed caster assemblies on the H1347/H1347A be replaced, and if so, how soon should they be replaced?

6. When inspecting the caster assemblies on the H1347/H1347A, what is the next course of action if a spring pin or rod is protruding from either side of the caster cam lock cap?

7. What are the criteria of the axle bolts of each caster of the H1347/H1347A?

8. How many attaching screws should be stored in the bolt pouches of the H1347/H1347A?

9. How should the straight-headed pins on the stacking fixture of the H1347/H1347A be checked for looseness?

10. What equipment is used to determine if the LLC has been fired for the B83?

208. B83 general maintenance

1. What tool can you use to position the H1347/H1347A caster assembly?

2. When installing the H1004 using a hoist, the H1004 lifting eye is usually positioned to which hole from the forward end of the H1004 (not counting the half holes or rectangular cutout)?

3. Before lifting a B83 with a H1004, what must you *always* verify so the bomb cannot slip from the H1004?

4. To install the H1095 to the cradle assembly, how do you position it under the cradle assembly?

5. Why do you install H837 cradle adapters on the H1347 hand truck when removing the tapes and aft assembly?

6. How do you identify a matching pair of tapes used with the B83 bomb?

7. Explain how to break the tapes on the B83 bomb loose when using the H1452 and air hammer if 35 psig is not enough to break them.

8. How do you store used tape pairs for reuse?

9. During removal of aft assembly, what do you equalize before disconnecting the cable assembly?

10. Explain why you do *not* adjust the H12 or rotate the assembly after removing the B83 aft section.

11. Before bomb reassembly, where do you install the *new* preformed packing?

12. During bomb reassembly, how many inches must you leave between the forward and aft assembly when you connect the cable assembly?

13. When doing a continuity test, what light indications should appear when the T304C knob is turned with a shorting plug installed?

14. Explain aft assembly mating procedures after completing the continuity test.

15. When installing tapes in the B83, what action is required if one tape in a pair is damaged?

16. How do you orient the beveled edge of the tape during installation in the B83?

17. How much air pressure do you use when installing the tapes in the B83?

18. What actions must you perform when the H1452 contacts the case slot before the tape is fully seated in the B83 during the tape installation process?

19. Explain how to prepare the slot covers for installation in the B83.

Answers to Self-Test Questions

201

1. The free fall or retarded modes, with air or ground burst in either mode.
2. Using strong/weak link and IHE.
3. (1) Bomb radar nose, (2) CBSA, (3) preflight selection bomb subassembly, and (4) tail bomb subassembly.
4. Prevents unauthorized use.
5. It requires the use of PAL controllers and knowledge of the correct code.
6. (1) Nose, (2) forward case, (3) mid case, (4) aft case, and (5) afterbody.
7. For energy absorption and shock mitigation during delivery.
8. They provide a means to attach the B83 to aircraft or launchers.
9. A tape joint.

10. By removing the tape joint of the aft assembly.
11. By electrical impulses that represent any one of the six, 6-digit code numbers.

202

1. Shipping document, eIRC, and information stenciled on the bomb.
2. A visual monitor (safety check).
3. Reject the weapon.
4. The “N” position.
5. When there is reason to believe that the markings were improperly applied or new marking are being applied.
6. Report the questionable defect, but do not reject the bomb and/or components.
7. If the components meet all other inspection criteria.
8. Performing a visual monitor, changing fin orientation (if necessary), and installing the appropriate pullout cable and wire rope and pin assembly.
9. Performing a visual monitor, inspecting bomb surfaces, performing a weapon status check of the PAL (if required for weapon type), inspecting associated storage bag and contents, inspecting the associated H-gear, and placing the eIRC in the storage bag.

203

1. A convenient, built-in, nonviolent means of rendering a weapon inoperative.
2. A classified 3-digit CDS code on the preflight panel or the AMAC controller, depending on the weapon type.
3. When the red indicator piston is visible (about ¼ in.) above the face of the preflight panel.
4. Common hand tools or prefabricated consolidated tool kits consisting of destructive qualities (i.e. hammers, chisel, etc.).
5. Munitions control.
6. Do not disassemble the weapon or apply power to the weapon.
7. Because if initiated, the thermal batteries in the weapon may sustain a charge for an extended period of time. A safety factor is included in the wait period.
8. Following the mandatory wait period, provided the CBSA is intact with only minor exterior damage.

204

1. Rips or tears greater than 1 in. or damaged or missing parts.
2. It is not necessary to unpack the items for the purpose of inspection unless the items show signs of damage.
3. Accept as long as the fit, form, and function of the handling equipment are not affected.
4. If longitudinal movement is detected, tighten the self-locking hex nut only to eliminate the longitudinal movement yet still allows for free rotational movement of the swivel eyebolt.
5. Re-immobilizing the caster assemblies.

205

1. The H631 or H1216 caster handling tools.
2. With a lifting vehicle or certified hoist.
3. Vibrations caused during transport can cause excessive stress on equipment, resulting in possible equipment failure and personnel injury.
4. A CGU–1/B nylon strap or MB–1 chain assembly.
5. The flat of each swivel eyebolt should be positioned inside the hole of the cradle lug.
6. By hand or with H563.
7. Felt strips on saddles of both top and bottom cradles are covered with strips of polyester film (adhesive tape).
8. 50 ±5 ft-lbs.
9. Use the center hole of the three outer row of holes.

10. Finger tight.
11. Ensure leveling feet are only used to stabilize the maintenance stand and not used to support the entire weight of the maintenance stand and load.
12. Position the bomb on the bands so the cutout portion of the large clamps butts up against the forward bomb suspension lug.
13. Perform a visual monitor and immobilize the H1125A/H1671/H1242.
14. Always make sure the tool bit is firmly inserted into the slot of the screw head and exert maximum force in line with the longitudinal axis of the screw.
15. H1354 or H1645 machine-screw removal tools.
16. Insert shim stock at different locations around the nose joint, increasing them in size, and rock the nose off with a back and forth motion until the nose is removed.
17. Countersink holes in the mounting flange.
18 Because static electricity could fire the gas generator, separating the tail cap at a high rate of speed injuring anyone standing behind the tail.
19. Top three screws.
20. Aircraft cleaning compound and hot water.

206

1. Inspect all exposed cables, connectors, and components for any damage that might affect the function of the equipment.
2. It can cause deterioration, which leads to unsafe or unreliable conditions.
3. You must re-equalize your body potential with the bomb or component.
4. Reservoirs, neutron generators, and gas generators.
5. For the H1229A, you remove the maintenance stand deck and then rotate the CBSA. After rotation, reinstall the plate.
6. AN/PDR–74A.
7. Designated location out of high traffic areas.
8. For accomplishing the WIR.

207

1. By disengaging the center strap and then disengaging the aft strap and removing the H1097A.
2. Any rips or tear that are less than 1 in. requires repair.
3. If damage to individual external packages containing components indicates possible damage to package contents (or further inspection and repackaging is required for other reasons).
4. Remove all weight from the wheel and while firmly holding the wheel hub and tire, attempt to move tire laterally, circumferentially, or radially off-center from wheel hub. If movement occurs, replace the caster assembly.
5. Yes; correct as soon as possible.
6. Reject the caster assembly and submit a UR.
7. The axle bolts must be flush with, or extends beyond, the locking nut.
8. 8.
9. By attempting to remove pins by hand.
10. T566.

208

1. H1640.
2. The seventh.
3. That the keeper is fully engaged.
4. You make sure the mounting holes align with cradle mounting pads.
5. It raises the weapon height so the H12 fits under the aft assembly.

6. Each pair of tapes contains matching serial numbers ending in A or B.
7. Increase the air pressure in 10 psig steps to a maximum of 75 psig until the tapes break loose. If the tapes do not break loose, use suitable drift pins and hammers on both sides and try to break them loose.
8. Store in the curved position in matched, serial numbered pairs.
9. Your body potential with the cable connector and midcase section.
10. This will make it easier to reinstall since no adjustments are needed.
11. Flange of the aft assembly.
12. Within 3 in.
13. Both lamps should light.
14. Carefully move the H12 until there is an even gap around the case. Make sure the aligning pin on the forward assembly engages with the slot on the aft assembly.
15. Replace both tapes as a set.
16. The beveled edge to the outside of the groove.
17. 30 psig.
18. Turn the H1452 around 180º in the hammer and use the flat side to drive the tape at the end.
19. Apply fluorinated grease to the flat side of the covers and place the gasket onto the covers.

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. (201) What size suspension system carries the B61 weapon system?
   a. 20-inch.
   b. 25-inch.
   c. 30-inch.
   d. 35-inch.

2. (201) Which *two* assemblies make up the B83 weapon system?
   a. Forward case and afterbody.
   b. Midcase and aft case.
   c. Nose and afterbody.
   d. Forward and aft.

3. (201) Which section of the B83 weapon system provides shock mitigation during delivery?
   a. Nose.
   b. Midcase.
   c. Afterbody.
   d. Forward case.

4. (201) Which handling gear (H-gear) is used to store, transport, and hold the B83 gravity weapon system during maintenance?
   a. H1229.
   b. H1609.
   c. H1125A.
   d. H1347A.

5. (202) When inspecting the external surfaces of a bomb, which type of *markings* is comprised of chock bands, center of gravity, and match marks?
   a. Important.
   b. Sensitive.
   c. Critical.
   d. Urgent.

6. (202) When inspecting a bomb for damage, which condition is *not* considered an *acceptable* manufacturing defect?
   a. Tooling marks.
   b. Loss of sealant.
   c. Minor surface irregularities.
   d. Discoloration due to welding.

7. (202) Which of the following is *not* part of preparing a bomb for strike?
   a. Performing a visual monitor.
   b. Changing the fin orientation.
   c. Installing a wire rope and pin assembly.
   d. Performing a detailed surface inspection.

8. (203) When can you perform command disablement system (CDS) on war reserve (WR) weapons?
   a. Before shipment of bomb.
   b. After the mandatory wait period.
   c. When directed by proper authority.
   d. During receipt inspection of bomb.

9. (203) Which tool may be used as part of the non-violent disablement procedure for a nuclear weapon?
   a. Measuring tape.
   b. Wrench.
   c. Hammer.
   d. Pliers.

10. (204) When, if ever, would you unpack weapon components and cables from the H1127 storage bag for inspection purposes?
   a. If the items show signs of damage.
   b. If the median cover is damaged.
   c. Sometimes.
   d. Never.

11. (204) When inspecting bomb handling equipment, what is the *correct* procedure upon finding a cracked threaded shank eyebolt on a H1125A bomb hand truck (BHT)?
   a. Submit a quality deficiency report (QDR) and tag with Department of Defense Form (DD Form) 1577–2, Unserviceable (Reparable) Tag – Materiel.
   b. Submit an unsatisfactory report (UR) and tag with DD Form 1577–2.
   c. Replace cracked eyebolt and submit a UR.
   d. Replace cracked eyebolt.

12. (204) When inspecting bomb handling equipment, which criteria would make the H1125A/H1671 handling equipment *unserviceable*?
   a. Surface blemish greater than 2 inches.
   b. Cracks and splits over 1 inch in length.
   c. Swivel eyebolts have longitudinal movement.
   d. Swivel eyebolts are too tight to allow smooth rotation.

13. (204) What is an inspection point of the H1242 swivel caster assembly?
   a. Spring pin or rod protruding from either side of cam lock cap.
   b. Cracks in threaded shank eyebolts.
   c. Mixed caster assemblies.
   d. Wheels turn freely.

14. (205) What *must* you check immediately *after* lifting a bomb using a H1004 bomb-hoisting adapter and hoist?
   a. Circuit breaker test.
   b. Keeper verified engaged.
   c. Quick-release pin locked.
   d. Proper balance.

15. (205) How are the swing bolts of the H1125A/H1671 top cradle torqued?
   a. 25 ±5 foot-pounds (ft-lb).
   b. 50 ±5 ft-lbs.
   c. No torque; tighten securely.
   d. No torque; finger tighten only.

16. (205) After lowering the B61 on the H1229 maintenance stand, what *must* you do before closing the cradle bands?
    a. Ensure the cutout portion of large clamp butts against the forward lug.
    b. Release the weight of the bomb and remove the lifting equipment.
    c. Adjust the leveling feet on the stand to prevent wobble.
    d. Equalize your body potential with the bomb.

17. (205) When you use the H1354 machine-screw removal tool to remove the last screw from a B61 subassembly during disassembly, you should install
    a. the top screw, torque.
    b. the top screw, hand tighten.
    c. a screw next to the screw you are removing, torqued.
    d. a screw next to the screw you are removing, hand tighten.

18. (205) Which items would you use to remove a stuck bomb radar nose of a B61?
    a. Shim stocks.
    b. Hammers and mallets.
    c. Two special pry bars.
    d. Nose removal devices.

19. (205) The case-separation limiter on the B61 only works if the
    a. center of gravity is correct.
    b. tail is turned less than 45 degrees.
    c. cable is kept tight when disconnecting.
    d. tail is kept in direct line with the preflight.

20. (205) When connecting the gas generator on the B61, you equalize your body potential by touching
    a. anywhere on the preflight.
    b. anywhere on the subassembly.
    c. and maintaining contact with the gas generator.
    d. and maintaining contact with the suspension lug.

21. (205) After mating the B61 subassemblies, install the top three high-torque screws and torque them to
    a. 120 ±10 inch-pounds.
    b. 130 ±10 inch-pounds.
    c. 140 ±10 inch-pounds.
    d. 150 ±10 inch-pounds.

22. (205) When cleaning excess lubricant from mounting holes on the B61 after assembly, you should use
    a. aircraft cleaning compound and hot water.
    b. toluene and hot water.
    c. denatured alcohol.
    d. isopropyl alcohol.

23. (206) Which technical order (TO) do you use to handle, protect, and inspect electrical connectors when procedures are *not* contained in the weapon-specific TO?
    a. 11N–45–51A.
    b. 11N–45–51.
    c. 11N–35–51A.
    d. 11N–35–51.

24. (206) What must you do if you are rotating a H1229A maintenance stand and the bomb radar nose is still attached to the bomb?
    a. Remove the nose.
    b. Attach the nose sling.
    c. Readjust the bomb's center of gravity.
    d. Remove the maintenance stand deck plate.

25. (206) Which piece of equipment do you use to monitor tritium gas during limited-life component (LLC) exchanges?
    a. T468.
    b. T566.
    c. AN/PDR–74A.
    d. AN/PDR–460.

26. (207) To *remove* the H1097A storage bag from the B83, you disengage the
    a. aft strap, then disengage the center strap, then remove.
    b. center strap, then disengage the aft strap, then remove.
    c. forward strap, the center strap, and finally the rear straps, then remove.
    d. rear strap, the center strap, and finally the forward straps, then remove.

27. (207) What is the next action you take upon finding separation of rubber from the wheel hub of the H1347/H1347A bomb handling equipment?
    a. Take depth measurements at various locations to ensure it does not exceed acceptable levels.
    b. Conduct a 1,000 feet roll test and verify the wheel hub turns freely without hindrance.
    c. Remove weight from casters and attempt to move tire laterally.
    d. Reject the weapon and submit an unsatisfactory report (UR).

28. (207) When inspecting the H1347/H1347A bomb handling truck, which situation is *acceptable* ?
    a. Axle bolt is flush with the locking nut.
    b. Caster assemblies have different part numbers.
    c. Spring pin protrudes from both sides of cam lock cap.
    d. Caster cam lock does not have knurled cap but is operational.

29. (207) Which test equipment do we use to determine if the limited life component (LLC) has been fired for the B83?
    a. T566.
    b. T304C.
    c. T461/T475.
    d. AN/PDR–74A.

30. (208) Which type(s) of equipment is/are authorized to lift a double-stack of B83s?
    a. Forklifts only.
    b. Forklift and H1004.
    c. Hoist only.
    d. Hoist and H1004.

31. (208) A pair of tapes on a B83 bomb consists of two tapes marked with
    a. matching serial numbers, with an A or B prefix.
    b. matching serial numbers, with an A or B suffix.
    c. different serial numbers, with an A or B prefix.
    d. different serial numbers, with an A or B suffix.

32. (208) When removing the aft assembly, which pair of B83 tapes do you *remove* first?
    a. Whichever pair is loose.
    b. Whichever pair is tight.
    c. Lower pair.
    d. Upper pair.

33. (208) What is the *maximum* pounds per square inch gauge (psig) of air pressure used for *removing* B83 tapes?
    a. 85.
    b. 75.
    c. 65.
    d. 55.

34. (208) After you remove the tapes from the B83, how do you store them for reuse?
    a. In the straighten position, in different, serial numbered pairs.
    b. In the straighten position, in matched, serial numbered pairs.
    c. In the curved position, in different, serial numbered pairs.
    d. In the curved position, in matched, serial numbered pairs.

35. (208) During a B83 reassembly, when do you perform the T304C continuity test(s)?
    a. Before starting the reassembly procedures.
    b. Before and after connecting the cable assembly.
    c. After connecting the cable assembly and after installing tapes.
    d. After connecting the cable assembly and before installing tapes.

36. (208) Which B83 tapes do you *install* first?
    a. Lower pair.
    b. Upper pair.
    c. Tape etched “Install this first.”
    d. There is no order during reassembly.

37. (208) When installing B83 tapes, if the tip of the H1452 tape driver comes up against the end of the case slot before the tape is fully seated, what should you do?
    a. Turn the H1452 90º in the hammer and use the flat side.
    b. Turn the H1452 180º in the hammer and use the flat side.
    c. Replace the bad tape.
    d. Reject the weapon.

Unit 2. Weapon Storage and Security System

DUE TO THE geopolitical environment of the world today, any terrorist act could cause serious problems for all United States (US) citizens and/or allies. The ultimate conquest for a terrorist would be seizing a nuclear weapon. The Weapon Storage and Security System (WS3) was designed to protect our nation's arsenal in the European theater. It is an Air Force (AF) program, which stores and secures tactical special weapons in hardened underground vaults located in protective aircraft shelters (PAS). The WS3 limits weapon exposure since they are convoyed only for receipts or shipments.

2–1. Weapon Storage and Security System

The WS3 is divided into four major groups and maintained by both 2W2X1 personnel and communications maintenance personnel. Before we discuss the technical aspect of the WS3, we'll begin with a lesson on the security measures used to protect the WS3 components.

209. Communications and operations security

Communications security (COMSEC) is the discipline of preventing unauthorized interceptors from accessing telecommunications in an intelligible form, while still delivering content to the intended recipients. In this lesson, we discuss COMSEC as it applies to the Air Force and to the European theater.

Accounts and responsibilities

The COMSEC account manager and alternate are both responsible for the wing's or installation's COMSEC program. They establish access controls to ensure only properly cleared individuals with a legitimate need are permitted access to COMSEC material. They also issue COMSEC material to appropriately cleared and authorized individuals. In addition, the account manager and alternate implement a comprehensive training program within the COMSEC account and establish a user-training program for all COMSEC responsible officers and their alternates. Finally, they perform all COMSEC management duties and ensure all units comply with information assurance requirements by conducting base-level assessments.

User responsibilities

COMSEC users are individuals who have access to COMSEC material and must use and safeguard COMSEC material to perform their official duties. Also, COMSEC users must ensure that anyone who receives COMSEC material has authorization and must verify the individual's security clearance. Users must follow the security rules and report any intentional or inadvertent acts to the COMSEC responsible officer (CRO) which could lead to unauthorized disclosure of classified information.

COMSEC and WS3 COMSEC vulnerabilities

The advancement in technology greatly improved our efficiency and effectiveness, but it also poses significant security challenges. Information operations/information warfare activities pose the greatest threats to communications and information systems. Communications and information systems are vulnerable to espionage and sabotage, physical damage, or destruction especially from individuals who have legitimate access to the system or components.

Operations security vulnerability

The operational security (OPSEC) program assures the AF information superiority and optimal mission effectiveness. The emphasis is based on operations and mission accomplishment. The purpose of OPSEC is to reduce the vulnerability of sensitive missions by eliminating or reducing adversary collection and exploitation of critical information. The OPSEC process consists of the following five levels:

1. Identify critical information—Review your unit's critical information list (CIL) to determine what information requires protection and control. Although we safeguard critical information listed in the CIL, be aware of the small bits of harmless information the enemy can piece together to derive critical information called *indicators*.
2. Analyze threats—The primary source of local threat information is through the Office of Special Investigations (OSI). In addition, report any threat information to OSI.
3. Analyze vulnerabilities—Vulnerability exists when the adversary is capable of collecting critical information or indicators. Vulnerabilities can be unclassified weapons TOs, a failure to uphold security programs, or poor leadership judgments. The enemy will act upon and/or exploit any vulnerability left unprotected. Examine unit processes, projects, or missions and re-examine if needed. Discover operational weaknesses at your level before the enemy does.
4. Assess risk—At this level, a working group or staff planning team determines the mission impact if the enemy gained access to critical information and assigns risks levels to each vulnerability. Possible countermeasures are formed to reduce high-risk vulnerabilities.
5. Apply countermeasures—Commanders must approve countermeasures and execute the plan.

WS3 COMSEC

COMSEC is the measures and controls taken to deny unauthorized persons information that they can get from systems of the US government related to national security. COMSEC also ensures the authenticity of such information systems.

To have a good COMSEC program, you need to apply security measures to systems such as crypto security, transmission security, emission security, and communications and information systems that generate, handle, store, process, or use classified or sensitive government or government-derived information. It includes applying physical security measures to COMSEC information or materials.

WS3 CRO responsibilities

Commanders appoint CROs and alternates to support the unit's COMSEC mission. The CROs make sure each individual authorized access to WS3 COMSEC material completes initial and annual refresher training according to the applicable service instructions. The CROs add fully trained individuals to the access authority authentication list (AAAL). The AAAL identifies personnel authorized to accept custodial responsibility and perform certain actions associated with WS3. If individuals do not complete the required annual training by the end of their anniversary month, their CRO will immediately remove them from the AAAL, and will not place them back on the AAAL until they complete all the required training.

User responsibilities

To be authorized to receive coded unlock modules, you must be job qualification standard (JQS) qualified in vault access procedures using the primary operating system. You must safeguard and

control all COMSEC materials in your possession, and as a COMSEC user, you must ensure that anyone who receives COMSEC material has the authorization and proper security clearance.

The success or failure of the COMSEC program rests with the individual user. All security efforts will be wasted if you are careless or fail to follow procedures for using, safeguarding, and destroying COMSEC material. You must protect and control all identified WS3 controlled components to prevent access by an unauthorized individual according to service instructions or directives.

Familiarize yourself with the correct operating procedures and immediately report any known or suspected compromise of COMSEC material to the CRO. You need to know the types of deviations that could result from improper handling, control, and destruction of COMSEC material.

Deviations

A COMSEC deviation is an occurrence involving a failure to follow established COMSEC instructions, procedures, or standards. When you suspect a COMSEC deviation has occurred, report the deviation to the CRO immediately if the CRO is not already involved. If the COMSEC material involved is not secured, secure the material prior to reporting the deviation. Deviations are categorized into the following three groups, in order of increasing concern:

1. Practice dangerous to security (PDS).
2. COMSEC incident.
3. COMSEC insecurity.

PDS

A procedure that has the potential to jeopardize the security of COMSEC material if allowed to continue is a PDS. A PDS is not a COMSEC incident and does not have an AF COMSEC case number assigned. Normally, WS3 COMSEC PDS will not result in the controlling authority (CONAUTH) directing the involved unit to perform a system-wide rekey/recode.

COMSEC incident

A COMSEC incident is an occurrence that potentially jeopardizes the security of COMSEC material or the secure electrical transmission of national security information. The CONAUTH evaluates incidents as either “No Compromise” or “Compromise Cannot Be Ruled Out.” A WS3 COMSEC incident may result in the CONAUTH directing the involved unit to perform an immediate system-wide rekey/recode.

COMSEC insecurity

COMSEC insecurity is a COMSEC incident that was investigated, evaluated, and determined to jeopardize the security of COMSEC material or the secure transmission of information. It results from an incident that was evaluated by the CONAUTH as a “Compromise.” WS3 COMSEC insecurity results in the CONAUTH directing the involved unit to perform an immediate system-wide rekey/recode.

210. Console group and monitor-indicator group

As mentioned before, the WS3 is divided into four major groups (fig. 2–1): console, monitor-indicator, coder transfer, and vault control (vault subsystem). For maintenance purposes, the four major groups are divided in half with the communications maintenance personnel maintaining the console and monitor-indicator groups and nuclear weapons personnel maintaining the coder transfer and vault control groups. You, as a nuclear weapons journeyman, will work together with communications maintenance personnel when WS3 maintenance and troubleshooting are required.

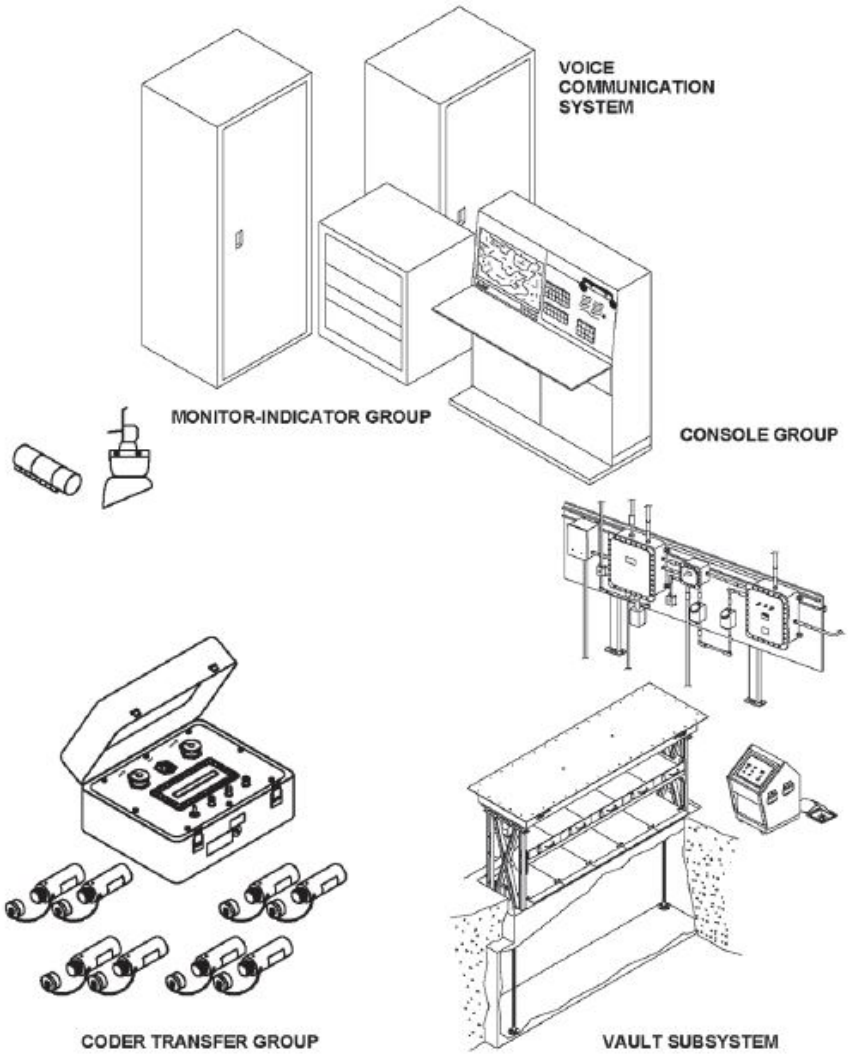

Figure 2–1. WS3.

Additionally, the WS3 is an electrical and mechanical system designed to handle a maximum of 64 vaults on a base. The vaults are compatible with weapon-handling equipment and strike aircraft in the AF inventory. The vault itself can hold four weapons and has an adjustable security delay feature. This security system is designed to give the security forces time to respond to an unauthorized attempt to enter the vault. Major command (MAJCOM) directives state the minimum time delay (TD) you must set for the vaults. Authorized access requires code modules (one “A” and one “B”) for primary drive system operation.

Console group

The console group provides the communications and processing capabilities necessary to monitor the status of up to 64-vault subsystems. Data communications from the vault subsystem to the console group are encrypted to ensure validity. Data transmitted from the vault to the console group is routed back to the vault as a security measure. This ensures the circuit is not compromised. Monitoring is done at the local monitoring facility (LMF) or remote monitoring facility (RMF). The console group monitors the vault areas, equipment cabinets, junction boxes, cameras, and Interior Intrusion Detection System (IIDS). It also provides voice communications between maintenance and security personnel at a shelter and the LMF or RMF. The console group does not control entry to any of these areas or equipment. It merely allows monitoring facility operators (MFO) to monitor and keep track of their status. The MFOs at the LMF and RMF are security forces personnel.

The console group generates audio and visual alarms whenever it detects a change in or disruption of normal operations. There are two categories of alarms, which we refer to as levels. Level 1 alarms occur whenever changes affect the security of a vault or other equipment. Conditions producing level 1 alarms include attempted intrusions, failure of communications link or other equipment, and unexpected unlocking of vaults. A level 1 alarm demands immediate response by the MFOs to determine what security action is required. Level 2 alarms occur when authorized personnel access a vault or other equipment. They also occur during rekeying, recoding, or with video faults. Level 2 alarms do not indicate a security threat; they merely indicate equipment status or authorized personnel are accessing the equipment. The console group identifies the location of each alarm by vault number or PAS number.

The console group equipment and capabilities are the same for both monitoring facilities. The LMF normally serves as the primary facility, while the RMF serves as backup or redundant. The console group is composed of the following five major elements:

1. Equipment cabinets containing a data communicator, data authenticator*, message processor*, and interface unit (fig. 2–2).
2. Authentication unit* (AU), vault processor* (VP), and an AU to VP cable*.
3. Vault modems.
4. MFO consoles including front panel assembly, component panel assembly, and touch screen terminal.
5. Uninterruptible power supply (UPS) system.

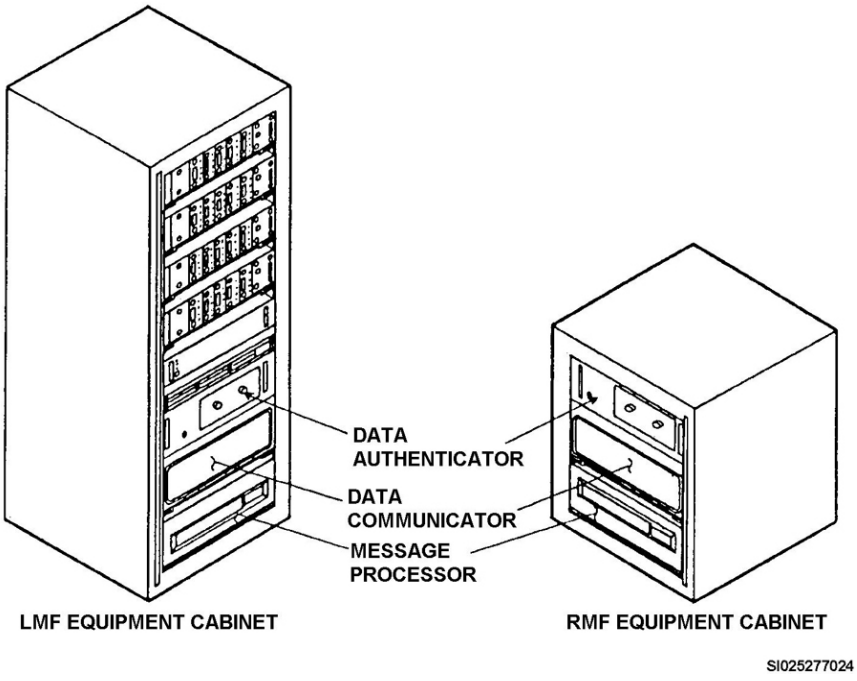

Figure 2–2. Equipment cabinet with console group.

NOTE: Items with an asterisk [*] are assemblies containing controlled components. They must be under two-person control (TPC) during maintenance or when relocating the equipment.

Equipment cabinets

The equipment cabinet at the LMF is taller because it contains monitor-indicator group equipment in addition to console group equipment. Each cabinet has hinged and lockable front and rear doors. The doors are equipped with tamper switches that activate audio and visual alarms when a door is open.

Equipment cabinets contain four main components:

1. Data communicator.
2. Data authenticator.
3. Message processor.
4. Interface unit.

Data communicator

Identical data communicators are located in the equipment cabinets of the LMF and RMF. The chassis contains a power supply and up to 16 modems. Light-emitting diode (LED) indicators on the modem and power supply boards may be viewed through the translucent windows in a hinged panel. The LED indicators provide a diagnostic check of modem operations. Up to five vault modems can be connected to one data communicator modem. Each modem provides two-way data communication between a vault modem and the message processor.

Data authenticator

The data authenticator connects to the message processor through the interface unit. The data authenticator receives data from the message processor for decoding. The decoded data is then sent back to the message processor. The decoding is according to data transferred from the rekey modules.

Message processor

The message processor is a minicomputer. It controls the transmission of data within a monitoring facility, and between a monitoring facility and the vaults. Each message processor also controls the transmission of data between the LMF and RMF. Other message processor functions include the following:

1. Periodic polling of vaults to check their operation and the status of the data communication link to each vault (primary facility only).
2. Monitoring the status of sensors, equipment, and alarm messages.
3. Storing of undisplayed and displayed alarm messages for subsequent display on the touch screen terminal.
4. Storing of supervisory data, which includes a record of each action taken by the MFO and selected maintenance personnel actions at vaults, cameras, and equipment cabinets.
5. Storing the date of rekey and recode operations and the key of the day.
6. Providing a user interface to perform the Rekey operation on the data authenticator.

Interface unit

The interface unit provides proper connections among the console, data authenticator, message processor, indoor junction box, video switching unit, and video presence detector. Each interface unit contains a +24-volt direct current (VDC) power supply and a modem. These modems are connected through the indoor junction box at each facility to provide two-way data communication between the LMF and RMF.

Authentication unit

This console group element authenticates all messages from the vault subsystem to the monitoring facilities. The AU receives vault sensor status signals and other data signals from the VP and formats these signals along with authentication bits for transmission by vault modems to the LMF and RMF. The AU uses encoding keys entered during the rekey operation to encode a portion of the component and sensor status messages generated by the VP and shelter control panel (SCP). The data authenticator in the LMF and RMF decodes the encoded portion of the messages. This message encoding/decoding process provides the MFO with confidence that status messages are being sent by the AU.

The AU receives a plain text (nonencoded) request for status from the monitoring facility, which is sent every 30 seconds. The AU responds with an encoded status message; afterwards, the primary monitoring facility responds with a confirmation message. The failure of the AU to respond within a designated time or with a properly formatted message causes an alarm.

Vault modems

Each PAS with a vault or communications interface panel has two identical modem personal computer (PC) boards. The modems plug into an assembly that is mounted in the power distribution panel (PDP) or communication interface assembly. One modem provides two-way data communication between the vault and the LMF, or the sensor processor and the LMF. The other modem provides the same data communication between the vault and the RMF or the sensor processor and the RMF.

Console

The console is the MFO's workstation (fig. 2–3). The monitors are part of the monitor-indicator group. The console front panel assembly contains a speaker that sounds and indicators that light when an alarm occurs. All necessary operator controls are located on the console front panel assembly and touch screen terminal.

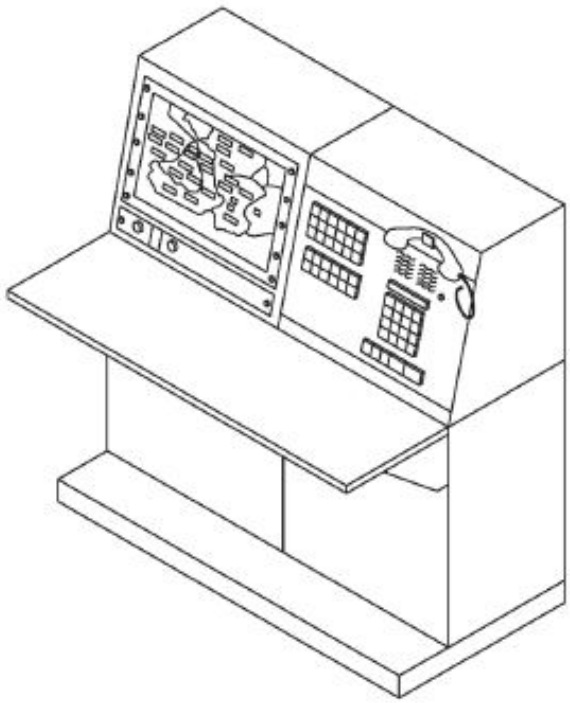

Figure 2–3. Console.

Touch screen terminal

The touch screen terminal consists of a computer terminal and a touch screen sensor. The touch screen consists of an 18-inch color monitor and non-contact infrared (IR) sensor array. The screen provides the MFO with a visual display of equipment status and the source of alarms. Up to four alarms can be displayed at the same time. The MFO can initiate commands to the message processor by touching appropriate fields on the surface of the screen.

Uninterruptible power supply system

Monitoring facilities use an UPS system to supply equipment and console power for at least 4 hours in the event of power failure. The UPS system has a battery cabinet and an inverter/charger cabinet.

The UPS system cabinets are tamper protected. If the UPS system becomes incapable of protecting the equipment, or if the inverter turns on, an alarm is generated.

Monitor-indicator group

The monitor-indicator group provides the means to observe access to control panels and each vault assembly visually. This group is a dedicated closed-circuit television (CCTV) network that enables the MFO at the LMF to view the control panels and vault areas.

211. Coder transfer group

In this lesson, we look at the recode and rekey modules, which are two elements of the coder transfer group. We discuss the code transfer unit (CTU), code storage modules (CSM), unlock modules, and procedures for opening and closing the vaults. We give only a brief review of the CTU, CSMs, and unlock modules here. (**NOTE**: Refer to your career development course (CDC) A for a more detailed description.)

Overview

The coder transfer group stores and transfers encryption keys and unlock codes using portable modules. This group also permits modification of unlock codes to include vault-specific identification and time delay (ID-TD) data. Six major elements make up the coder transfer group (fig. 2–4):

1. CTU.
2. CSMs.
3. Unlock modules.
4. Recode modules.
5. Rekey modules.
6. Universal release code cards.

The CTU transfers unlock codes and maintains vault ID-TD data. CSMs store and transfer maintenance and mass upload unlock codes to the unlock modules via the CTU. Each set of CSMs is capable of storing 80 blocks with each block consisting of 40 vault-specific maintenance unlock codes. Each set of CSMs also stores 20 mass upload unlock codes. Unlock modules transfer unlock codes from the CTU to the VP via the SCP.

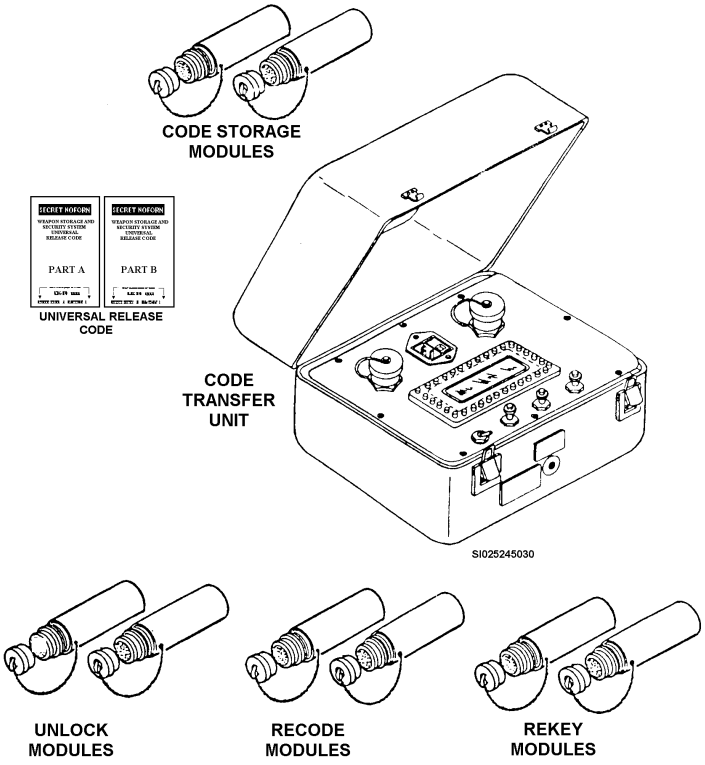

Figure 2–4. Coder transfer group.

ID-TD operations

ID-TD data for vault opening is assigned or modified in the CSMs and then transferred to unlock modules using the CTU. This data can be assigned, modified, or restored per MAJCOM direction. When you press the START switch on the SCP, the ID-TD data is transferred from the unlock modules to the VP.

Recode modules and operation

Use the recode modules to store and transfer a complete set of unlock codes to the VP memory during recode operations. Each set of recode modules stores 80 blocks, with each block having 40 vault-specific maintenance unlock codes. Each set of recode modules also stores 20 mass upload codes and one universal release code (URC).

Each recode module interfaces with the respective VP receptacle to transfer one complete set of unlock codes when you depress the VP START switch. The RECODE indicator on the VP (fig. 2–5), when flashing, indicates that a recode operation is in progress; when the light is steady, it indicates the operation is complete. The set of unlock codes includes the following:

- Forty vault-specific maintenance unlock codes. These codes are selected from the recode module by association with the vault identification (ID) number and its position within the ID-TD data list.
- Twenty mass unlock codes.
- One universal release unlock code.

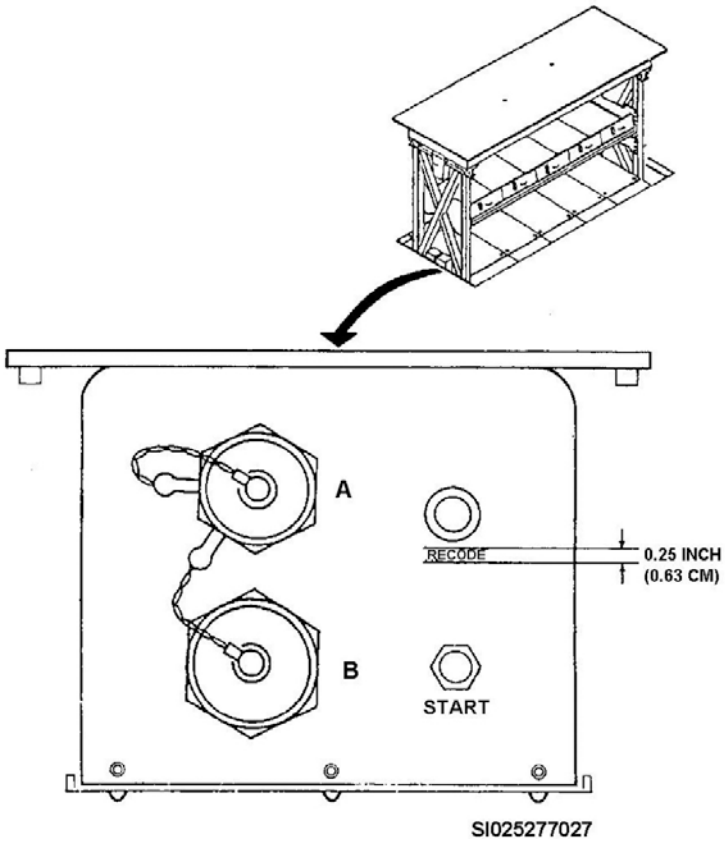

Figure 2–5. VP, panel indictors, and controls.

A set of recode modules consists of primary (A and B) and back up (A and B) recode modules. Both a current set and a reserve set of recode modules must be maintained at all bases that have vaults installed. The primary pair from the current set is intended to be used for all recode operations. The backup pair from the current set is required in the event of a primary recode module failure. The reserve set is required in the event of a failure of both the primary and back up from the current set. When a new set of unlock codes is necessary, the reserve set of recode modules replaces the current set. Once replaced, the current set is considered obsolete, the reserve set is considered the current set, and a new reserve set must be obtained.

Each recode module in a set is electronically marked with a set number that corresponds to a set of CSMs containing the matching unlock codes (fig. 2–6). Each module pair must be physically marked as belonging to the primary or backup pair and the current or reserve set. Electronic marking does not determine recode module pairs.

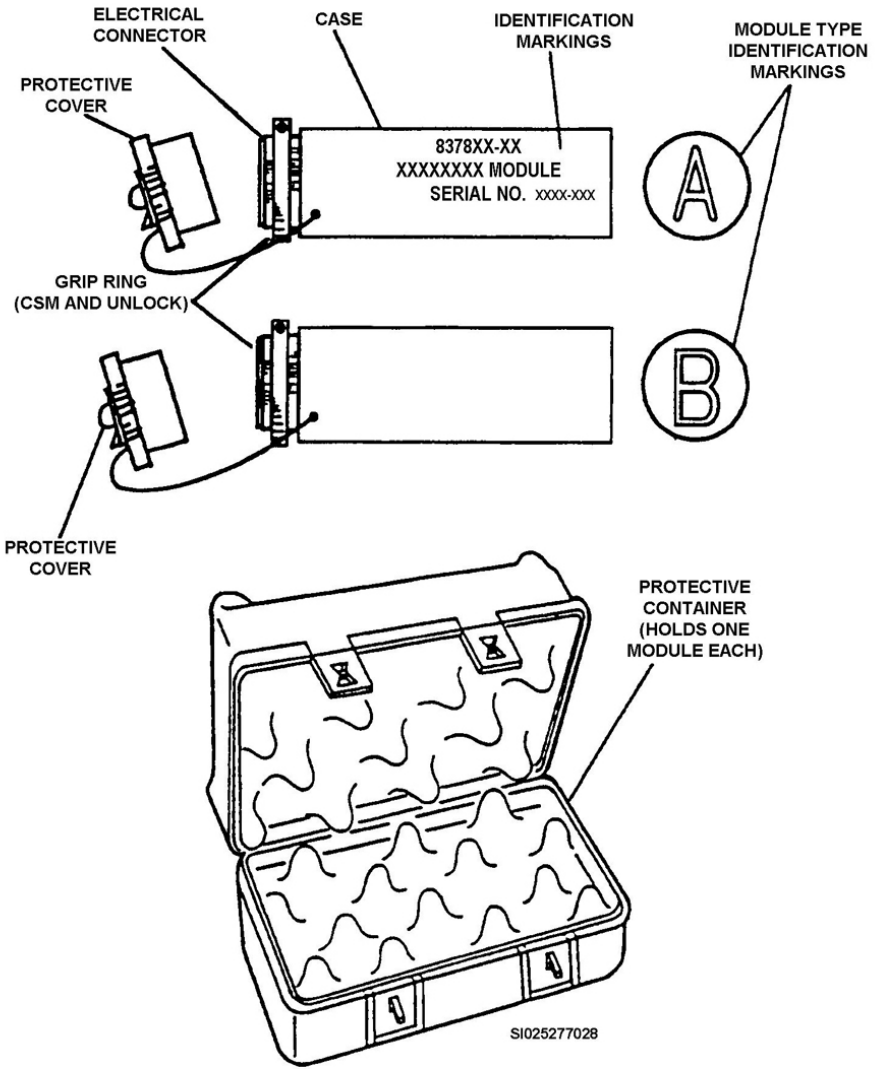

Figure 2–6. Code modules.

Rekey modules and operation

Use rekey modules to store and transfer a complete set of encoding keys to authentication units, sensor processors, and data authenticators. To ensure validity, encoding keys are used to encode communications between the WS3 equipment groups.

Each set of rekey modules stores all encoding keys for a particular base. The rekey module, when connected to the respective authentication unit or sensor processor receptacle, transfers a complete set of encoding keys when the authentication unit START switch is depressed (fig. 2–7). The rekey modules also interface with the LMF and RMF data authenticators to transfer encoding keys when commanded from the console group.

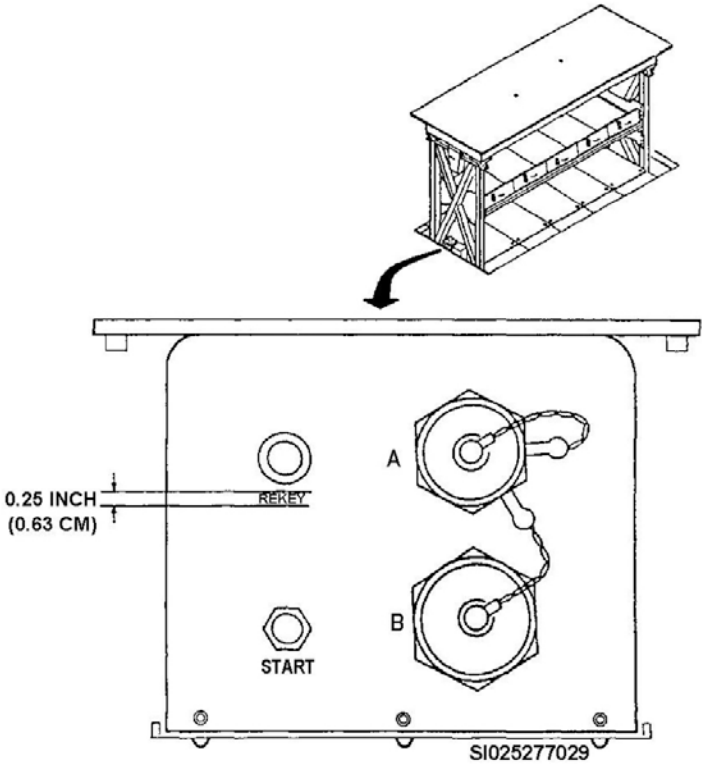

Figure 2–7. Authentication unit, panel indicators, and controls.

A set of rekey modules consists of primary (A and B) and backup (A and B) rekey modules. Both a current set and a reserve set of rekey modules must be maintained at all bases that have vaults installed. The primary pair from the current set is intended to be used for all rekey operations. The backup pair from the current set is required in the event of a primary rekey module failure. The reserve set is required in the event of a failure of both the primary and backup from the current set. When a new set of encoding keys is necessary, the reserve set of rekey modules replaces the current set. Once replaced, the current set is considered obsolete, the reserve set is considered the current set, and a new reserve set must be obtained.

Each module pair must be physically marked as belonging to the primary or backup pair and the current or reserve set. Electronic marking does *not* determine rekey module pairs.

The CSM, unlock, recode, and rekey modules are cylindrical stainless steel cases that have an electrical connector, grip ring, and protective cover at one end. The electronic components and circuitry of the modules are sealed within the case for protection from moisture.

212. Vault control group

The vault control group (fig. 2–8) provides physical storage and security for special weapons and related equipment. Maintenance of the vault control group is the responsibility of 2W0X2, 2W1X1, and 2W2X1 career fields. This consists of annual lubrication, physical inspections, various periodic functional checks, replacement of parts, and troubleshooting if problems should occur.

The vault subsystem is composed of five major elements:

1. Vault electrical support panel.
2. SCP.
3. Vault assembly.
4. Alternate controller.
5. VP.

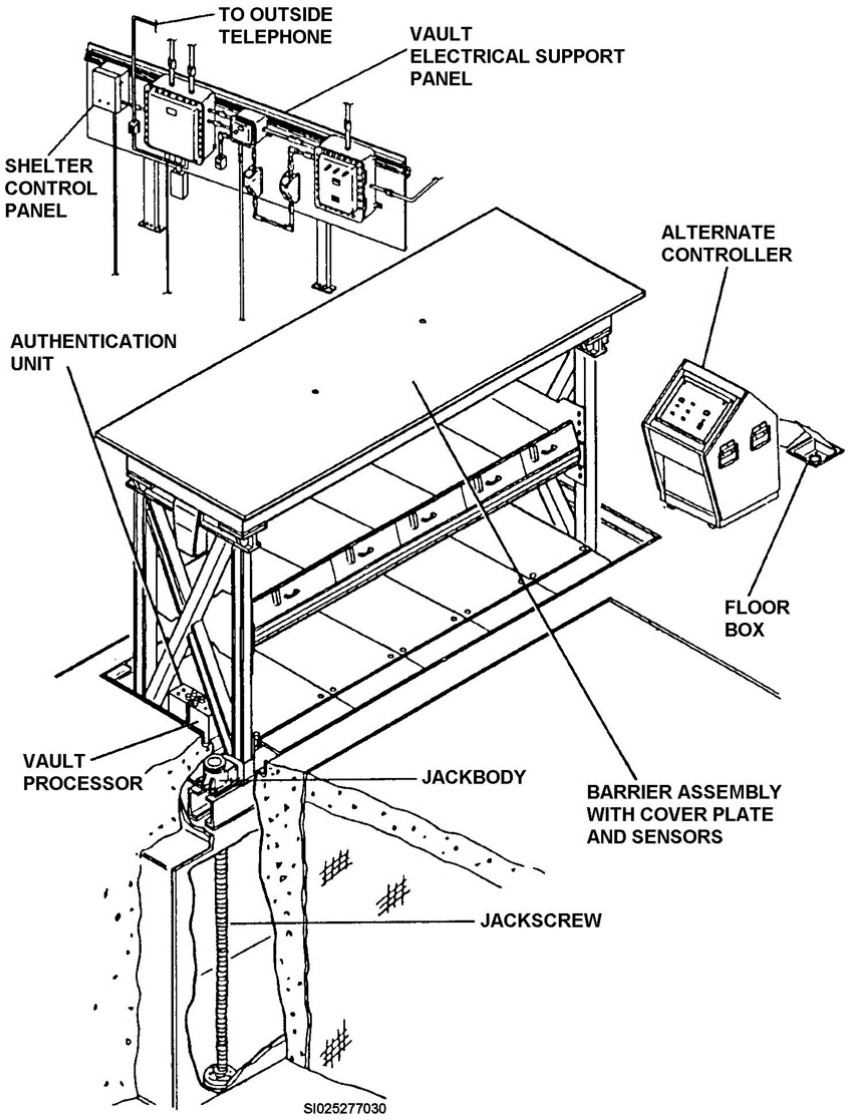

Figure 2–8. Vault control group.

Vault electrical support panel

We use control panels mounted on the vault electrical support panel to control and monitor the application of primary or emergency generator power to the SCP and vault assembly (fig. 2–9). Power requirements for the electrical support panel are site dependent. Nominal values are 380 volts alternating current (VAC) or 415 VAC, 50 Hertz (Hz), 3-phase power.

The vault electrical support panel consists of the following major components:

Vault Electrical Support Panel Major Components
Telephone jack box.
Outside telephone.
Emergency power panel.
Power transfer switch panel.
Vault/shelter electronics breaker.
Phase sequence panel.
Vault main power switch.
Vault secure breaker.
PDP.
SCP.

Telephone jack box

The telephone jack box allows maintenance personnel to connect handsets or make maintenance truck telephone connections for talking with the LMF and RMF (fig. 2–9).

Outside telephone

This weatherproof telephone is mounted in a protective box, which is located outside the aircraft shelter. It allows maintenance and security personnel to talk with the LMF and RMF (fig. 2–9).

Emergency power panel

The emergency power panel contains a power receptacle and four terminals with insulated dividers for connection of a three-phase generator. The panel is installed outside the PAS (fig. 2–9).

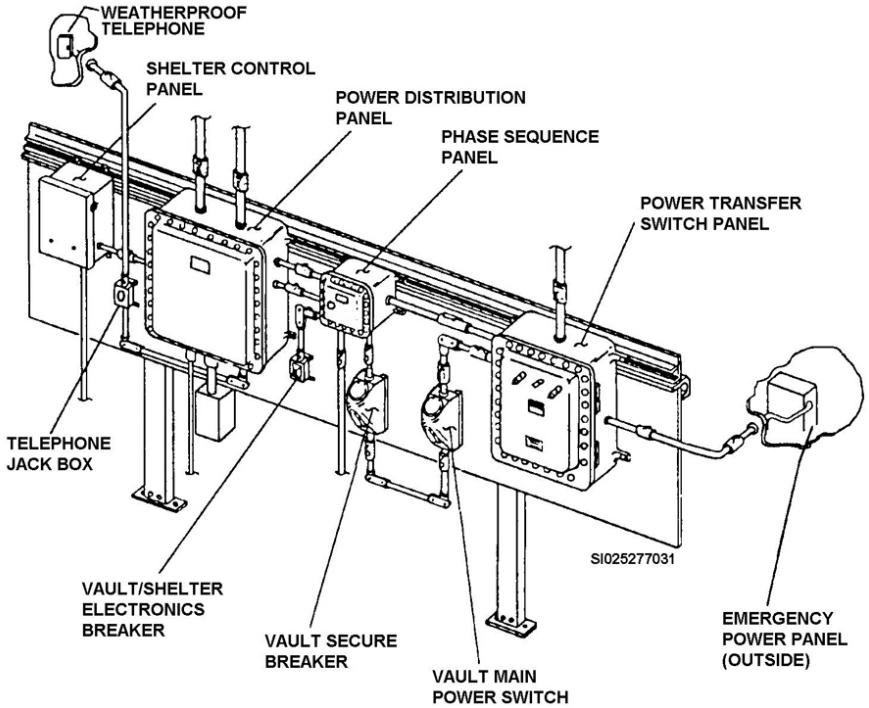

Figure 2–9. Vault electrical support panel.

Power transfer switch panel

This panel contains a three-pole, two-position switch that is used to select base grid or three-phase generator power (fig. 2–10). The panel switch has indicator lights and internal relay contacts to provide visual monitoring of switch status. It also contains the surge-voltage protection panel. The surge-voltage protection panel contains three metal oxide arrestors to reduce voltage surges on the primary power lines.

Vault/shelter electronics breaker

The vault/shelter breaker (fig. 2–10) controls application of phase A primary power to the vault power supply and battery charger. The vault power supply and battery charger are transformers that provide power to the video camera and fiber optic video transmitter, vault luminaire and PDP power supply, as well as the PDP battery charger. Also, it provides phase A power to the vault power supply and battery in the vault.

Phase sequence panel

A phase sequence relay ensures the selected primary power (base grid or three-phase generator) has the correct phase rotation (fig. 2–10).

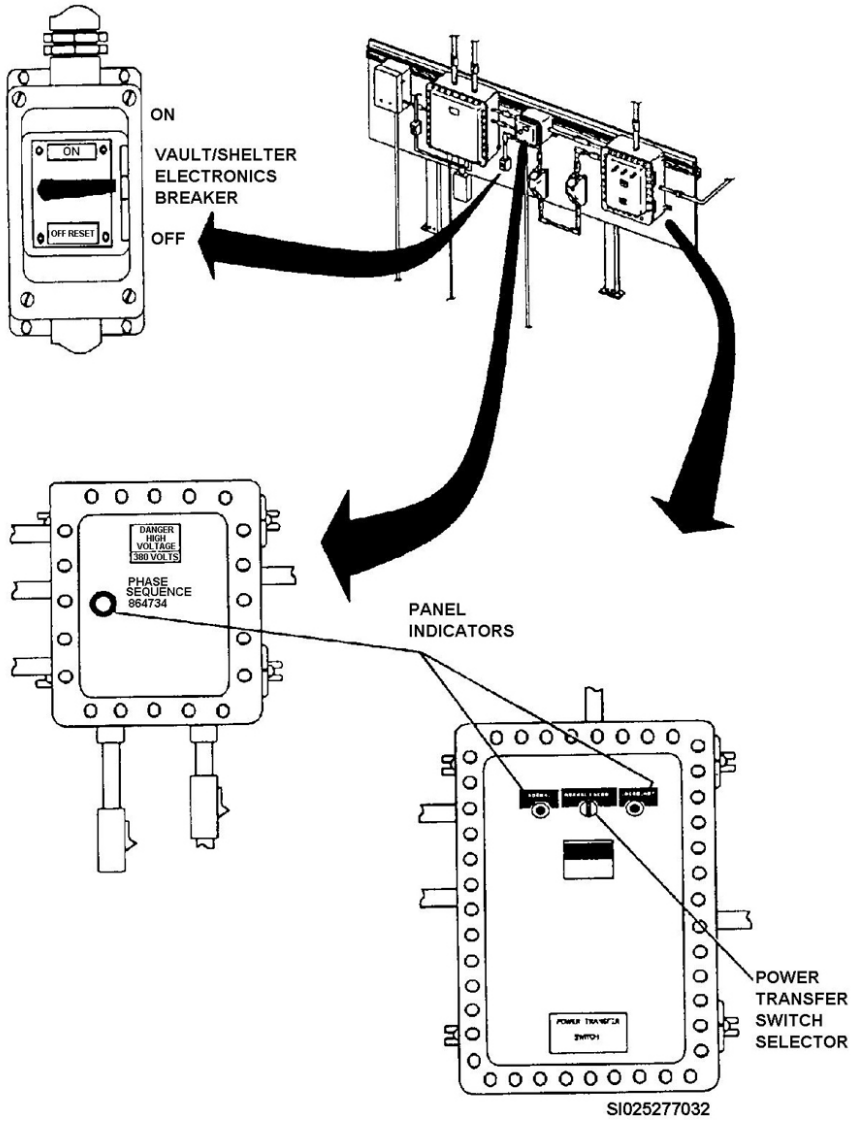

Figure 2–10. Power transfer switch panel, phase sequence panel, and vault/shelter electronics breaker.

Vault main power switch

The vault main power switch (fig. 2–11) is a three-pole, two-position switch that allows interruption of primary power regardless of the source (base grid or three-phase generator).

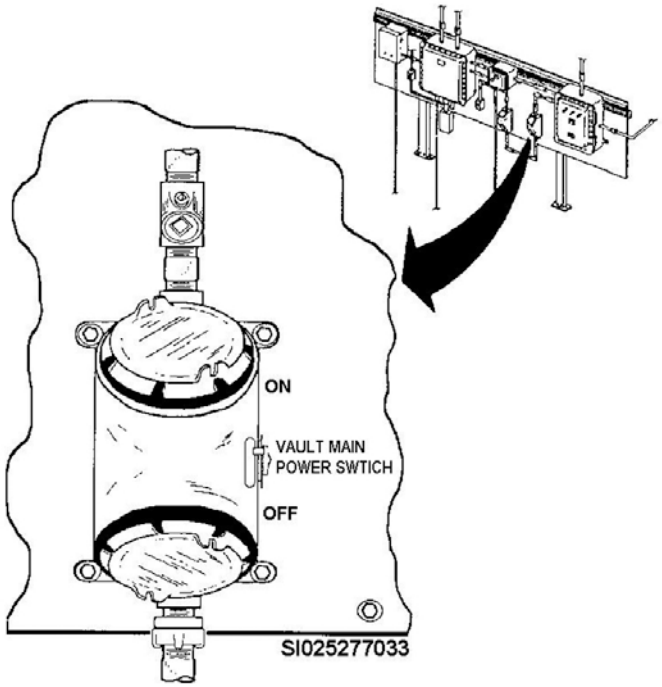

Figure 2–11. Vault main power switch.

Vault secure breaker

The vault secure breaker is a three-pole circuit breaker, which controls application of phases A, B, and C primary power to the primary drive system components in the vault. This breaker is used to raise and lower the vault (fig. 2–12).

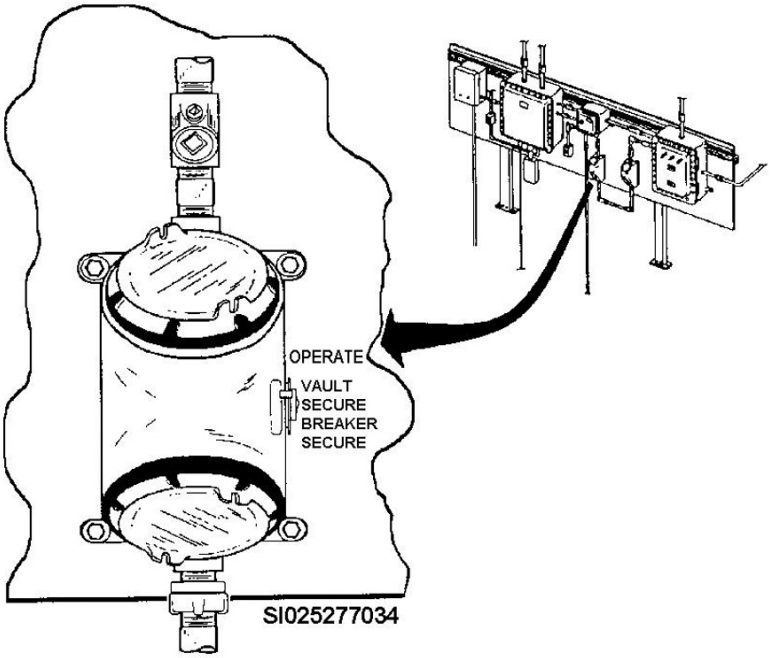

Figure 2–12. Vault secure breaker.

PDP

The PDP is a tamper-protected, explosion-proof enclosure that houses numerous components. Figure 2–13 shows a front view of the panel without the cover and interior intrusion detection system. Refer to the table below and the corresponding numbers in figure 2–13 as we identify the main components of the PDP.

Power Distribution Panel Main Components	
Component	**Description**
1. Four circuit breakers	Control power application to the fiber optic video transmitter, video camera, 14-VDC (nominal) battery charger, 15-VDC power supply, and video camera light (luminaire).
2. A 14-VDC (nominal) battery charger and battery	Provides power to the vault modems and SCP in the event of a 15-VDC power supply failure.
3. A 15-VDC power supply	Provides power to the vault modems and SCP.
4. A 230/115-VAC transformer	Provides power to the video camera.
5. A 230/16-VAC transformer	Provides power to the fiber optic video transmitter.
6. Two vault modems	Transmit and receive communications signals between the authentication unit and data authenticators in the WS3 monitoring facilities.
7. A fiber optic video transmitter	Transmits video signals from the camera to console in the LMF.
8. Modem surge protectors and surge-voltage protector assembly	
9. Tamper switch	
10. Fiber splice tray	
11. Cable isolator assembly	
12. Flex circuit assembly	

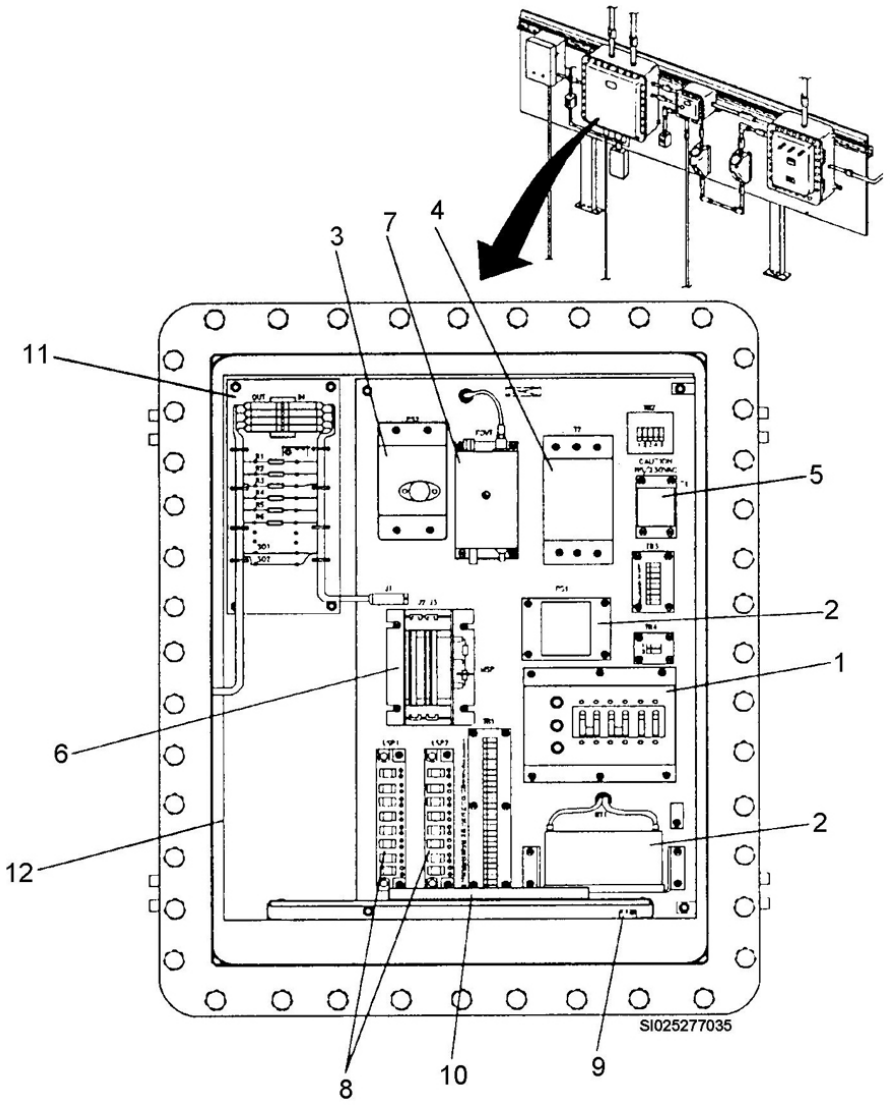

Figure 2–13. Power distribution panel.

SCP

The SCP operates the vault's primary operating system (fig. 2–14). The SCP also monitors and reports the status of vault electrical panel sensors and selected components. The SCP provides controls and indicators to do the following:

- Enter unlock codes during unlock operations.
- Open and close the vault.
- Determine the operational status of the vault (locked or unlocked).
- Troubleshoot fault conditions based on two-digit diagnostic codes shown on the digital display.
- Verify the operability of the locked and unlocked indicators on the SCP.

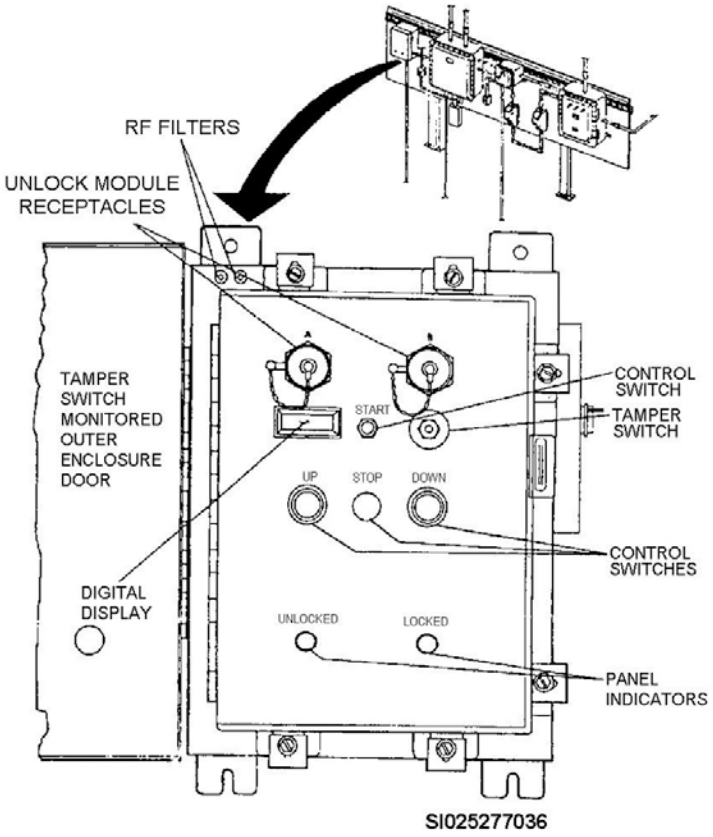

Figure 2–14. SCP.

The SCP also monitors and reports the status of the following sensors and components to the VP:

- Power distribution panel power supply output voltage.
- Floor box assembly, power distribution panel, and SCP tamper switches and flexible sensor panels.
- Interior intrusion detection systems to detect intrusion attempts and panel usage (where required).
- Auxiliary contacts in the power-transfer switch panel to detect which power is supplied, normal or emergency power.
- Position of the vault secure breaker.
- Data transmission between the SCP and the VP and between the SCP and the AU to detect communication faults.

Vault assembly

The vault assembly (fig. 2–15) is used to store special weapons and weapon-related equipment. The vault incorporates a redundant drive system to access stored weapons. The vault assembly consists of the following four major components:

1. Barrier and cover plate.
2. Barrier support.
3. Platform assembly.
4. Liner assembly.

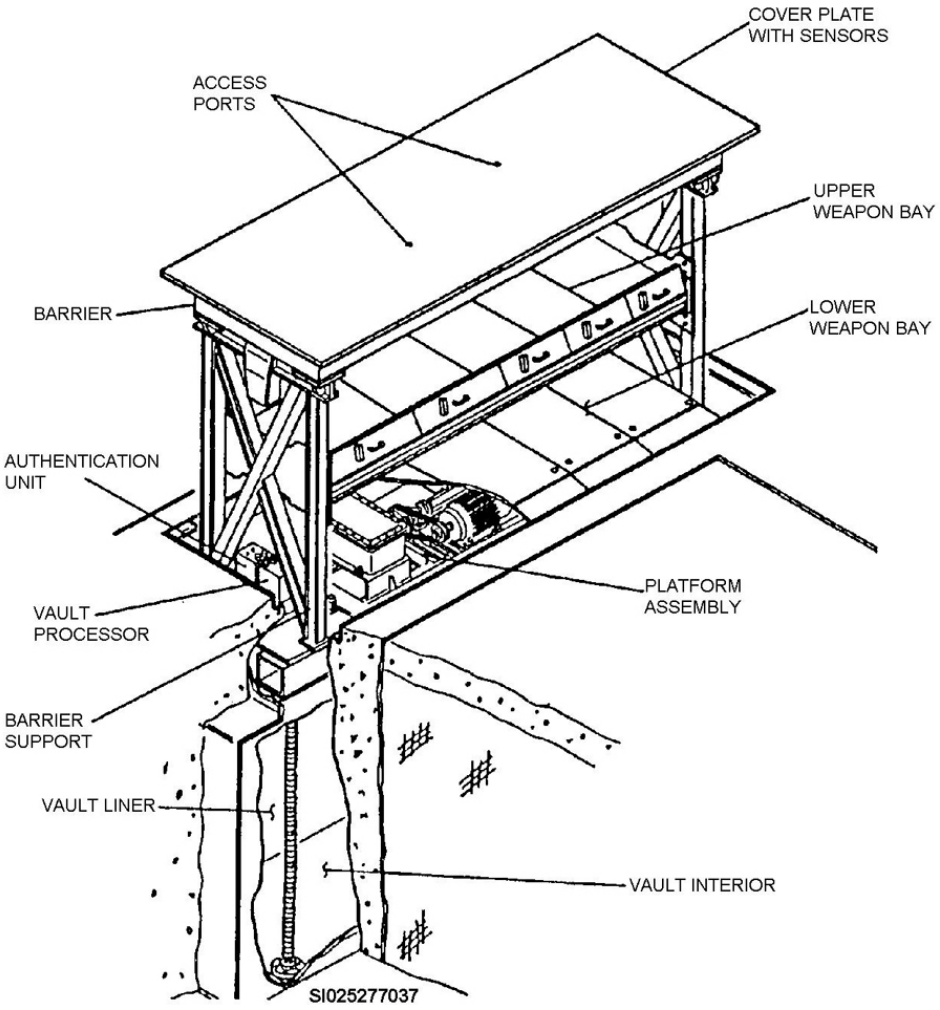

Figure 2–15. Vault assembly.

Barrier and cover plate

The barrier has two access ports and contains sensors to detect intrusion attempts by drilling and other means. The barrier also provides a positive seal to prevent liquids from entering the vault interior while the vault is closed. The top surface of the cover plate is level with the shelter floor while the vault is closed and is coated with a nonskid surface material for safety. Lastly, the barrier supports the weapons that are installed in the upper weapon bay.

Barrier support

The barrier support is the combination of the end structures and the mid and lower decks. It supports the weapons installed in the lower weapon bay and the barrier. The VP and AU (fig. 2–16) are mounted to one end of the structure. The mid-level deck is adjustable to accommodate the various stored weapons. Floor plates provide a surface for operation of lift trucks and cover elevator drive components. Barrier support elements have a nonslip coating for personnel safety.

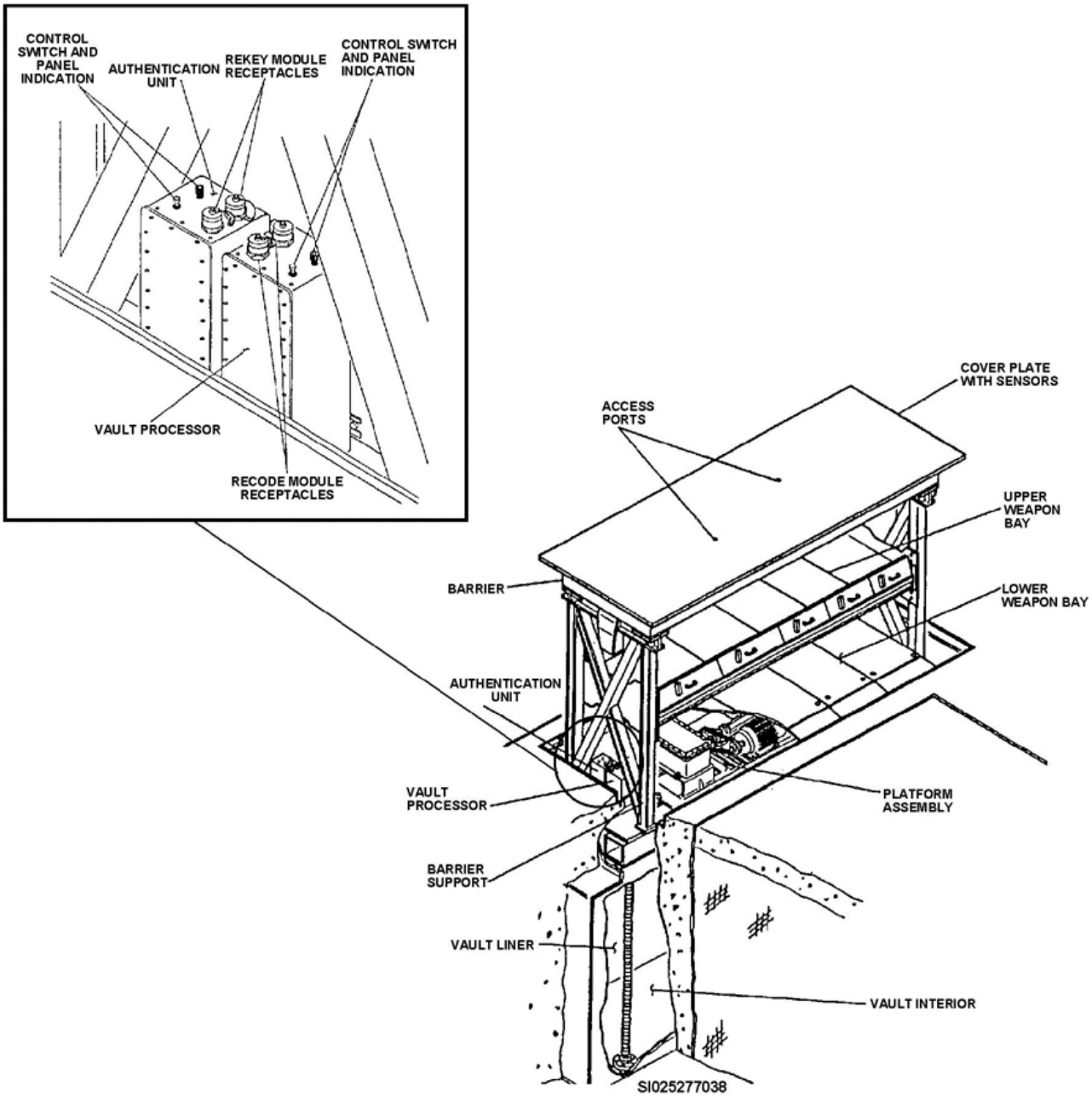

Figure 2–16. AU and VP location.

Platform assembly

The platform assembly is the mounting structure for the primary operating system components. The primary operating system components include a reversing contacting starter, 15 horsepower (hp) drive motor, drive shafts, and gear boxes. The components raise or lower the platform, barrier support, and barrier and cover plate on four jackscrews when commanded to do so by the VP. Alternate operating system components are mounted to the platform assembly. These components include a time-delay relay, two motor starter relays, 0.5 hp drive motor, gear reducer, clutch with solenoid and control relay, and gear box. These alternate components open or close the vault when commanded to do so by the alternate controller.

Limit switches automatically stop vault operation at the fully closed and fully opened positions for both the primary and alternate operating systems. Limit switches for the safety zone and the mid-level positions are only for the primary operating system. The platform assembly also contains sealed

conduits for routing of cables and electrical wires and a battery to provide uninterrupted power to the VP and AU in the absence of primary power. The battery provides operational power for 4 hours.

The vault assembly's two electrical independent operating systems provide a redundant means to raise and lower the internal vault structure. The system rate speed depends upon the frequency of the supply voltage. Primary and alternate operating systems open the vault.

Primary

Primary power requirements may vary from base to base. The primary operating system is controlled at the SCP and powered by three-phase power entered at the vault electrical support panel. The nominal value for the system in the secure mode is 230 VAC, 50 Hz, single-phase power; in the operate mode, it is 208 to 415 VAC, 50 Hz, 3-phase power. Operating characteristics include a rated speed of 28 inches/minute and an adjustable access delay time when a maintenance or mass upload unlock code is used. There is no time delay when the URC is used. When we open the vault, the mid-level is reached in about 1.8 minutes at 50 Hz; moving from the mid-level to the fully opened position takes about 1.5 minutes at 50 Hz (entire open time in about 3 minutes).

Alternate

The alternate operating system is controlled at the alternate controller and powered either by a single-phase portable generator or from another available power outlet. The system operates on 110 to 415 VAC, 50 or 60 Hz, single-phase power. When we use the alternate system to open the vault, the mid-level is reached in about 130 minutes at 50 Hz and 108 minutes at 60 Hz; mid-level to fully opened position is reached in approximately 107 minutes at 50 Hz and 90 minutes at 60 Hz. Operating characteristics include a rated speed of 0.38 inch/minute using 50 Hz and an adjustable access delay time.

Liner assembly

The liner assembly is composed of a steel liner that provides structural support and environmental housing for all other vault components. A gutter around the top of the liner provides a means to drain liquids that could otherwise enter the vault. A liquid level sensor detects accumulations of water or other liquids in the vault interior. Shock sensors (acceleration switches) detect earth movement caused by explosives.

There are sensors that detect intrusion attempts, usage of and tampering with external control panels, and the accumulation of liquids in the vault interior. These sensors and vault components send their signals to the console group, allowing it to monitor the entire system.

Alternate controller

This controller is used to operate the alternate operating system via a control cable stored in the floor box of the PAS (fig. 2–17). The alternate operating system is used when the primary system is inoperative or requires repair. A portable generator or other suitable power sources supply the power required to operate the alternate system.

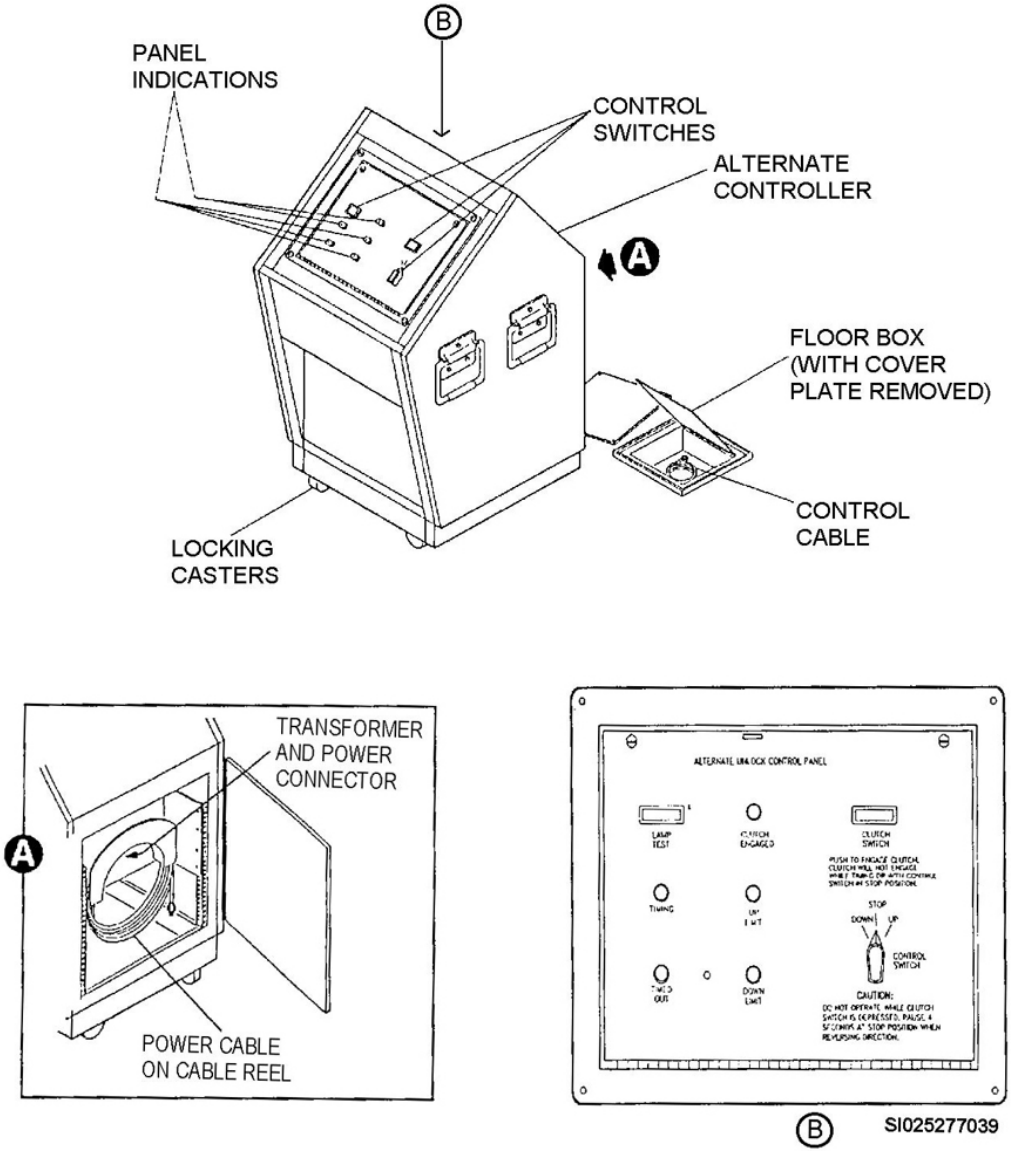

Figure 2–17. Alternate controller.

Vault processor

The VP is a self-contained enclosure with a control panel on the upper surface (fig. 2–16). The control panel contains a control switch, panel indicator, and two recode module receptacles. Use these receptacles during recode operations to enter the unlock codes. The electrical and fiber optic connections are on the lower surface. The processor is mounted to the barrier support near the platform assembly by the authentication unit.

The VP controls and monitors operations of the vault primary operating system. It ensures correct unlock codes are entered at the shelter control panel by comparing those codes to codes entered during the recode operation. Once verified, the time delayed entered during the ID-TD operation is initiated (this only functions for the maintenance and mass upload unlock codes). After the

programmed time delay, the vault is unlocked electronically. The VP monitors the status of the wall, acceleration, liquid level, and barrier cover plate sensors. It also monitors the limit switches and the battery and power supply for low voltage.

Self-Test Questions

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

209. Communications and operations security

1. Who is responsible for the installation's COMSEC program?

2. For whom do the COMSEC manager and alternate implement a comprehensive training program?

3. Who are COMSEC users?

4. What are the vulnerabilities to communications and information systems?

5. What is the purpose of OPSEC?

6. What should you review to determine what information requires protection and control?

7. What are indicators in regards to OPSEC?

8. To analyze threats, what agency should be sought for local threat information?

9. What are some examples of vulnerabilities in regards to OPSEC?

10. Which level of the OPSEC process determines the possibility of the enemy gaining access to critical information and assigning risk levels?

11. How often does the CRO ensure individuals complete training?

12. With whom does the success or failure of the COMSEC program rest?

13. What is a COMSEC deviation?

14. What are the three categories of COMSEC deviations?

210. Console group and monitor-indicator group

1. What is the *maximum* number of WS3 vaults on a base?

2. How many weapons can the WS3 hold?

3. What security measures exist to make sure the communications circuit is not compromised?

4. Where is WS3 monitoring performed?

5. Explain the two categories of alarms the console group generates.

6. Which monitoring facility normally serves as the *primary* facility?

7. List the four main components of the equipment cabinets.

8. Which component of the equipment cabinet controls the transmission of data between the monitoring facility and the vaults?

9. Which equipment cabinet component records the actions of maintenance personnel at the vaults?

10. Which element of the console group receives and formats signals from the VP and transmits them by vault modems to the LMF and RMF?

11. How often does the monitoring facility send a request for status to the AU?

12. What visual display does the touch screen terminal provide for the MFO?

13. What protects equipment if a power failure occurs at the monitoring facility?

14. What is the monitor-indicator group?

211. Coder transfer group

1. What are the six major elements of the coder transfer group?

2. What is the purpose of the CTU?

3. When are recode modules used?

4. Explain the VP indicators during a recode operation.

5. What items make up a set of recode modules?

6. How many sets of recode modules are maintained at bases with vaults?

7. When is the reserve set of recode modules used?

8. How are recode modules marked electronically?

9. When are rekey modules used?

10. When do you use the backup pair of rekey modules?

11. How are rekey modules marked physically?

212. Vault control group

1. What are the five major elements of the vault subsystem?

2. What does the vault electrical support panel provide?

3. Where can maintenance personnel make maintenance truck telephone connections for talking with the LMF and RMF?

4. The vault/shelter electronics breaker controls the application of phase-A primary power to what two components?

5. What is the function of the two vault modems on the PDP?

6. What component of the vault electrical support panel provides controls and indicators to determine the operational status of the vault (locked or unlocked)?

7. What are the four major components of the vault assembly?

8. What vault assembly component provides a positive seal to prevent liquids from entering the vault interior while the vault is closed?

9. On the vault assembly, where are the VP and AU mounted?

10. On the vault assembly, what is the mounting structure for the primary operating system components?

11. How do the vault assembly's limit switches control vault operations?

12. Where is the vault assembly's primary operating system controlled?

13. How is the vault assembly's alternate operating system controlled and powered?

14. When using the alternate system, how long does it take to reach the fully open position at 60 Hz?

15. What component controls and monitors the vault primary operating system?

2–2. Special WS3 Programs and Secure Transportable Maintenance System

When working with the WS3, there are certain specialized programs and procedures that you need to know because of the hazards involved. In this section, we discuss some of these programs to include covering the use and purpose of the Secure Transportable Maintenance System (STMS).

213. Special Weapon Storage and Security System procedures

There are two specific WS3 programs or procedures we discuss in this lesson. They are not just limited to WS3 system, but this is where you will most likely encounter them as a 2W2. The two procedures are lockout/tagout procedures and the confined spaces program.

Lockout/tagout procedures

Any time you are working around electrified equipment or energy sources that can cause injury, use lockout/tagout procedures. Certain WS3 or vault procedures require the use of lockout/tagout procedures. These procedures are used to ensure machines or equipment are isolated from all potentially hazardous energy and are locked out or tagged out before qualified personnel perform any servicing, inspecting, or maintenance to such equipment. The main purpose for lockout/tagout procedures is to prevent injury and death to personnel. These procedures are described in Air Force Manual (AFMAN) 91–203, *Air Force Occupational Safety, Fire, and Health Standards.*

Lockout

Lockout devices consist of locks and keys to hold an energy-isolating device in a safe position to protect personnel. It consists of physically locking the equipment or energy source. The main power of the vault is locked out when the vault is being worked on. Only the supervisor or team chief of the operation being performed controls the keys to the locks being used. This individual is responsible for locking the energized equipment up and removing the locks when the inspection or maintenance is finished.

Tagout

If an energy producing device or equipment cannot be locked, it must be tagged with an AF Form 979, Danger Tag, (fig. 2–18). A tagout device is a mishap prevention tag that is capable of being securely attached and forbids the operation of an energy-producing device. The tag's purpose is to prevent injury and protect personnel. The tag also identifies the person or authority that has control of the tag procedure. Tags must be securely attached on energized equipment or energy sources where they can be easily seen. Only the supervisor or team chief of the operation being performed can install and remove these tags.

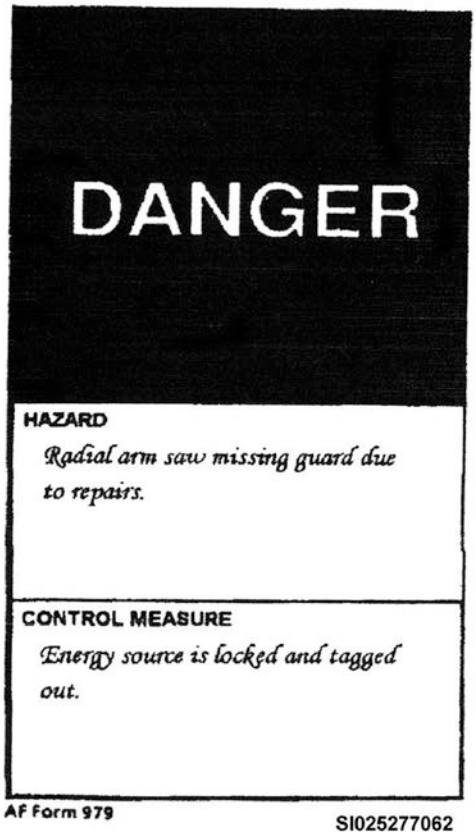

Figure 2–18. Sample, AF Form 979.

Vault maintenance requires the use of lockout/tagout procedures. Training and documentation is required for all personnel involved with lockout/tagout procedures.

Confined spaces program

A confined space is a space that is large enough and configured so a worker can enter and perform assigned work, has limited or restricted means for entry or exit, and is not designed for continuous human occupancy. The WS3 or vault is a confined space. You can find confined space procedures in AFMAN 91–203. Personnel entering or working in confined spaces may encounter the following potentially serious hazards:

Confined Space Hazards
1. Lack of oxygen.
2. Excessive oxygen.
3. Flammable or explosive atmospheres and materials.
4. Toxic gases or materials.
5. Electrical or mechanical hazards.
6. Engulfment or entrapment hazards.

Let’s discuss how we test for toxic gases and materials.

Toxic air testing

Some toxic hazards are not readily apparent, detectable by odor, or visible. Before personnel are allowed to enter the vault, we must test the space for toxic gases. The toxic air test set (fig. 2–19) is

the piece of equipment we use to measure and detect toxic air levels for the WS3. Only properly trained personnel can monitor toxicity levels with the toxic air tester.

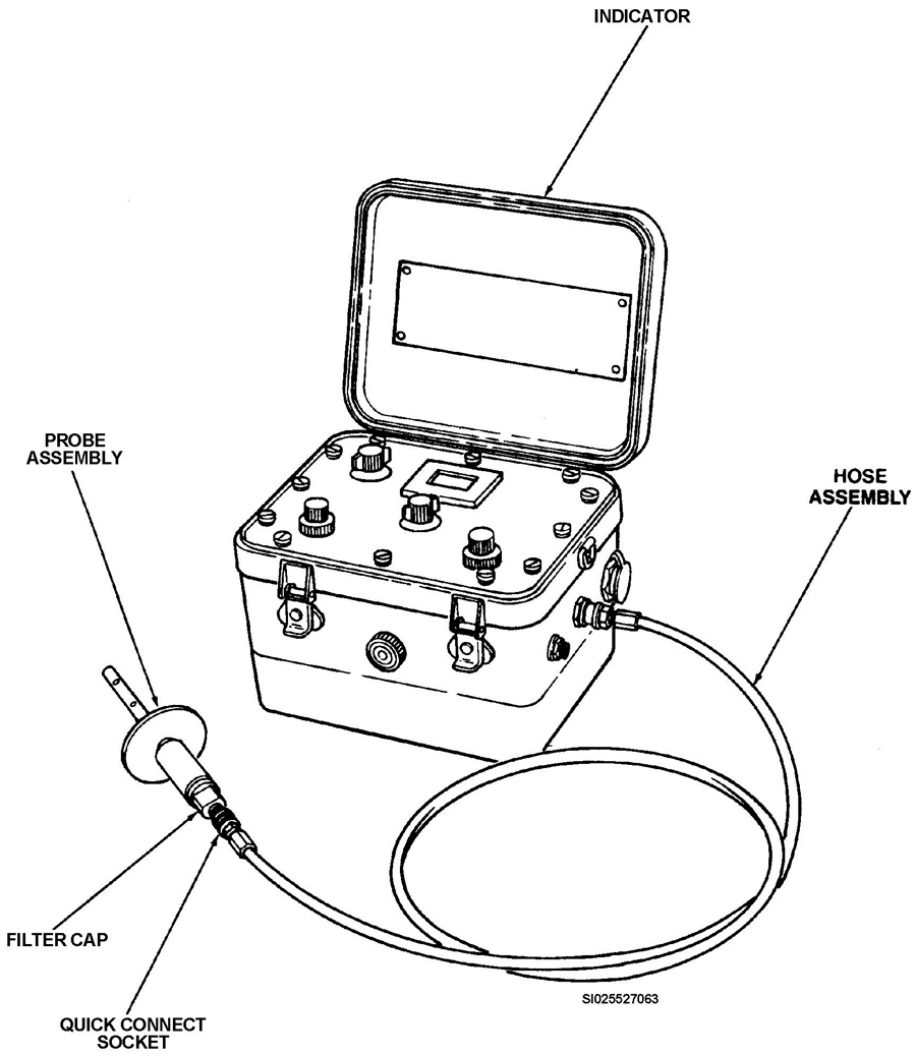

Figure 2–19. Toxic air test set.

The toxic air test set consists of an indicator with carrying strap, probe assembly, sampling hoses, charger cords, regulator assembly, calibration gas tanks, sample line kit, drying tube, and carrying case. During normal operation, the indicator draws continuous air samples through probe and hose assemblies into oxygen and combustible sensors.

Just like any other piece of test equipment, the indicator requires certain inspections and functional checks before it can be used. Perform operational checkout any time you are not certain that the indicator is fully operational, such as the first test of the day or after any significant event, such as dropping the indicator or exposure to lubricants or gas concentrations above full scale. The purpose of the operational checkout is to determine if the alarm and equipment is functioning properly.

Safety precautions

Personnel must consider that all confined spaces contain the most unfavorable and unsafe conditions and must not enter them until all required test, evaluations, and requirements are met. Such personnel must know and wear the proper personal protective equipment (PPE). All personnel involved with vaults must be trained and documented on confined spaces requirements and any local procedures added for safety.

214. Secure Transportable Maintenance System

The STMS (fig. 2–20) is ancillary support equipment associated with the WS3. The STMS is used as a weapons maintenance facility.

Secure Transportable Maintenance System Trailer Platform

The STMS trailer platform is a fifth wheel trailer. It can be relocated by using a fifth wheel configured truck/tractor. The primary subsystems of the STMS are the environmental control system (ECS), lightning protection system (LPS), lifting systems, power distribution system, and the delay/denial system. The entire structure is nuclear certified and is listed in the master nuclear certification list (MNCL). Power is provided to the STMS by facility power. Only one cable is provided with each trailer for facility power. The STMS has European standard 230 volts, 50 Hz lighting available when the trailer is attached to facility power. The STMS is configured to accept cabinets, toolboxes, fixtures, and shelves as required for use. A tie-down track system located along the walls of the STMS provide means to secure the toolboxes during over-the-road transport. The tie-down track system is not adequate for securing the toolboxes for transportation by air.

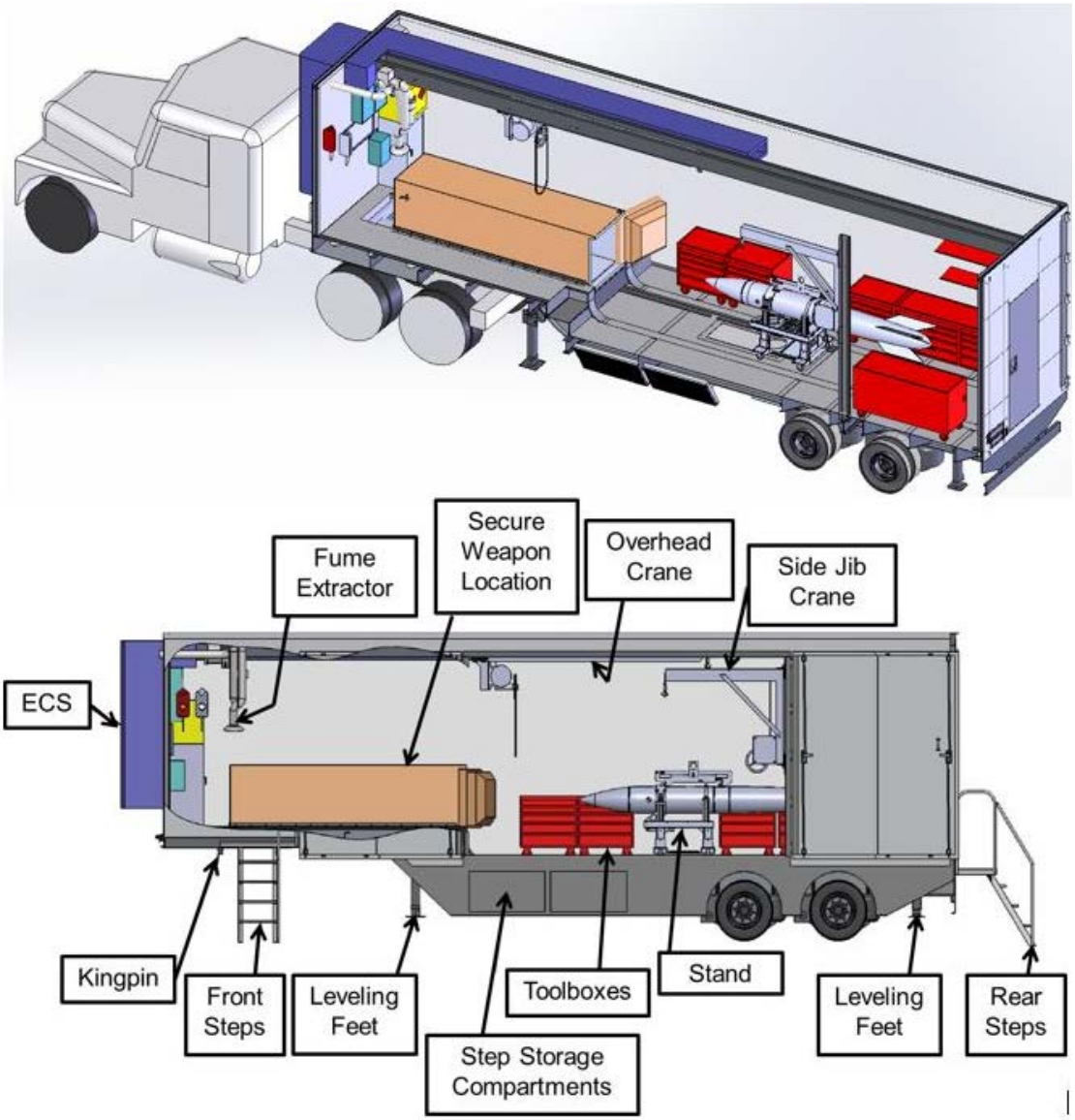

Figure 2–20. Secure Transportable Maintenance System.

Power distribution system

The STMS runs on facility power only. Facility power provides 220/398 +/–10 percent (European) VAC, 3-phase, 50 Hz power to the STMS via a power cable. System power is routed to the power surge protection device and the main electrical panel. The surge suppressors provide protection against large voltage spikes that may otherwise cause damage to the weapon under maintenance or the STMS. The main electrical panel contains circuit breakers to protect components and subsystems from over current conditions. The circuit breakers distribute power to various components and subsystems in the STMS. Electrical power is distributed to European (EU) ground fault circuit interrupter (GFCI) outlets, wall switches, fume extractor fan, overhead lights, UPS, emergency lights, obscurant system, and the ECS. The 220/398 VAC input voltage is reduced within the STMS via a transformer to 120 VAC to provide power to US GFCI outlets for auxiliary equipment. The internal electrical sub panel contains circuit breakers to protect from over current conditions for auxiliary equipment plugged into US GFCI outlets.

ECS

The ECS consists of a self-contained air conditioner, heater, and ventilation fan unit with an operating range from –30 to 131 degrees Fahrenheit (ºF). The ECS employs a digital scroll compressor, variable speed fans, and a two stage electric heater. The ECS is located on the front of the STMS and distributes air throughout the trailer via duct and diffusers. The ECS is designed to operate in heating, cooling, and automatic modes and is controlled via a digital thermostat located internal to the STMS.

LPS

The LPS consists of a main faraday cage, with all doors bonded to the main faraday cage via metal hinges and bonding straps. The power line portion of the LPS consists of surge protection devices mounted on the exterior front wall of the STMS. The telephone portion of the LPS consists of surge protection devices on the exterior front wall connected to handsets enclosed in separate faraday cages by metal conduit. Telephone use does not affect integrity of the LPS. STMS LPS/grounding components are inspected according to Air Force Manual (AFMAN) 91–201, *Explosives Safety Standards*, and Air Force Instruction (AFI) 32–1065, *Grounding Systems*. Since the STMS is not a fixed facility, the requirements for scheduled maintenance for grounding systems that are performed by base civil engineering do not apply. User responsibility inspections for non-hazardous explosive area (weapons) must be performed and documented as prescribed in AFI 32–1065.

Fume extractor

The fume extractor is an exhaust air system capable of venting fumes from the STMS, which may be generated during weapon maintenance. The fume extractor consists of an articulated arm with a hood that is attached to a blower fan. The articulated arm hangs from the ceiling and can be positioned as necessary over the worktable for fume extraction. The blower fan draws fumes through the arm sections and exhausts the fumes through a duct system to the exterior of the STMS.

Lifting systems

The STMS contains two lifting systems: (1) a side-jib crane and (2) an overhead rail crane. Both lifting systems are rated for 1200 pounds (lb.) each and use manual grooved drum wire rope winches to raise and lower the load. The side-jib crane is located on the side equipment door pillar and consists of a small swinging jib arm. The jib arm has sufficient reach to accommodate lifting a load positioned a maximum of 24 inches from the side of the trailer and can place it on the weapon maintenance stand. The overhead rail crane is located on the ceiling of the trailer and consists of a traveling beam, which moves on a set of rollers in a track along the length of the trailer. The overhead rail crane can accommodate a load located 60 inches from the rear of the trailer and place it on the maintenance stand. All movements of the cranes and load are manual.

Stair assemblies

The stair assemblies, including handrails, are used to gain access to the interior of the STMS. When the STMS is set up for operation, the stairs are mounted on hooks under the personnel access door at the front side of the STMS trailer or the rear door of the STMS trailer and secured in place. After the stairs are secured, the handrails are removed from the storage compartment, unfolded, and the uprights inserted into mating pockets on the stairs.

Communications system

The STMS is equipped with two telephones. The WS3 telephone provides direct communication to the LMF/RMF. The base telephone system provides dial-up communication outside of the STMS trailer and outside of the PAS.

Maintenance stand

The STMS maintenance stand is designed to provide support for the weapon during maintenance operations. The maintenance stand consists of a caster mounted base, an adjustable height platform, and a removal transfer cart used for moving the weapon into the secure weapon location (SWL). The transfer cart includes clamp bands that are used to secure the weapon during maintenance. Casters are included on the base cart to allow the maintenance stand to move as required to load the weapon and to move the weapon to the SWL. One of the clamp bands on the transfer cart is mounted on pillow blocks to allow the weapon to rotate from horizontal to vertical to facilitate maintenance operations. An additional clamp band is located on the platform to hold the weapon in the vertical position.

Secure weapon location

The STMS SWL is configured to provide a secure location for the weapon while under maintenance. The SWL is designed to accept the weapon with the tail or the tail and preflight sections removed. In the event of an emergency, the weapon would be transferred into the SWL by positioning the MS directly in front of the SWL and releasing the transfer cart, which would be pushed into the SWL. A track inside the SWL controls the transfer of the weapon on the transfer cart. The SWL is located toward the front end of the STMS and is positioned horizontally to align with the transfer cart. The top surface of the SWL is covered with a phenolic work surface that is used for maintenance operations of the weapon.

Obscuration system

The system consists of a smokecloak, isolation unit, and the obscurant activation pull station. The smokecloak is manually activated and generates a vapor cloud. The system receives its power from a UPS, which also provides backup power in case of loss of power to the STMS trailer. Once activated, the system will produce a thick smoke filling the interior of the trailer and substantially reducing visibility.

Do not modify any portion of the STMS without expressed written permission and coordination of both the applicable United States Air Forces in Europe (USAFE) office and systems engineering office. Modifications include but are not limited to changing location, removing, or mounting of equipment, that requires drilling, welding, or attaching components to the walls, support beams, and electrical boxes. Do not change the electrical wiring or grounding, or permanently install any electrical appliances into the STMS.

Self-Test Questions

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

213. Special Weapon Storage and Security System procedures

1. What are the two special WS3 procedures?

2. What procedures are used to ensure machines or equipment are isolated from all potentially hazardous energy and locked out or tagged out before qualified personnel perform any servicing, inspecting, or maintenance to such equipment?

3. What is the main purpose of lockout/tagout procedures?

4. What part of the vault is locked out when being worked on?

5. What is a tagout device?

6. Who installs and removes locks or tags?

7. What is a confined space?

8. List six potential serious hazards of a confined space.

9. When do we test and monitor the vault for toxic gases, and what do we use to do this?

10. What does the toxic air test set consist of?

11. Who must be trained and documented on the confined spaces program?

214. Secure Transportable Maintenance System

1. How is the STMS used?

2. What are the major systems of the STMS?

3. What are the ECS modes?

4. How are the doors bonded to the main faraday cage?

5. What type of lifting systems does the STMS use?

6. How are stair assemblies mounted to gain access to the container assembly?

7. What is the purpose of the pillow blocks on the maintenance stand?

8. Can modifications be made to the STMS; if so how?

Answers to Self-Test Questions

209

1. COMSEC account manager and alternate.
2. All COMSEC responsible officers and alternates.
3. Individuals who have access to COMSEC material and must use it to perform their duties.
4. Espionage and sabotage, physical damage, or destruction especially from individuals who have legitimate access to the system or components.
5. To reduce the vulnerability of sensitive missions by eliminating or reducing adversary collection and exploitation of critical information.
6. Your unit CIL.
7. Small bits of information that the enemy can piece together to derive critical information.
8. OSI.
9. Unclassified weapons TOs, a failure to uphold security programs, or poor leadership judgments.
10. Level 4 – assess risk.
11. Initial and annual training.
12. Individual user.
13. An occurrence involving a failure to follow established COMSEC instructions, procedures, and standards.

14. (1) PDS.
    (2) COMSEC incident.
    (3) COMSEC insecurity.

210

1. 64.
2. 4.
3. Data communications from the vault subsystem to the console group are encrypted to ensure validity; then, data transmitted from the vault to the console group is routed back to the vault.
4. At the LMF or RMF.
5. Level 1 alarms occur whenever a change occurs that affect the security of the vault or other equipment. Conditions producing level 1 alarms include attempted intrusions, failure of communications link or other equipment, and unexpected unlocking of vaults. Level 2 alarms occur when authorized personnel access a vault or other equipment. Level 2 alarms also occur during rekeying, recoding, VP internal self-checks, or with video faults.
6. LMF.
7. (1) Data communicator, (2) data authenticator, (3) message processor, and (4) interface unit.
8. Message processor.
9. Message processor.
10. Authentication unit.
11. Every 30 seconds.
12. Equipment status and the source of alarms.
13. An UPS system.
14. A dedicated CCTV network that enables the MFO at the LMF to view the control panels and vault areas.

211

1. The CTU, CSMs, unlock modules, recode modules, rekey modules, and universal release code cards.
2. It transfers unlock codes and maintains vault ID-TD data.
3. To store and transfer a complete set of unlock codes to the VP memory during recode operations.
4. A flashing RECODE indicator on the VP indicates a recode operation is in progress. When light is steady, it indicates the operation is complete.
5. Primary (A and B) and back up (A and B) recode modules.
6. Two: a current set and reserve set.
7. If both primary and back up recode modules from the current set fails.
8. With a set number that corresponds to a set of CSMs containing the matching unlock codes.
9. To store and transfer a complete set of encoding keys to authentication units, sensor processors, and data authenticators.
10. If the primary rekey module fails.
11. As belonging to the primary or backup pair and the current or reserve set.

212

1. (1) Vault electrical support panel, (2) SCP, (3) VP, (4) vault assembly, and (5) alternate controller.
2. Control panels to control and monitor the application of primary or emergency generator power to the SCP and vault assembly.
3. The telephone jack box located on the vault electrical support panel.
4. (1) Vault power supply and (2) battery charger.
5. They transmit and receive communications signals between the authentication unit and data authenticators in the WS3 monitoring facilities.
6. The SCP.
7. (1) Barrier and cover plate, (2) barrier support, (3) platform assembly, and (4) liner assembly.

8. The barrier.
9. To one end of the barrier support structure.
10. The platform assembly.
11. They automatically stop vault operation at the fully closed and fully opened positions for both the primary and alternate operating systems. Limit switches for the safety zone and the mid-level positions are only for the primary operating system.
12. At the SCP.
13. It is controlled at the alternate controller and powered either by a single-phase portable generator or from another available power outlet.
14. 90 minutes.
15. The VP.

213

1. Lockout/tagout and confined spaces.
2. Lockout/tagout procedures.
3. To prevent injury or death to personnel.
4. The main power.
5. A mishap prevention tag that is capable of being securely attached and forbids the operation of an energy-producing device.
6. The supervisor or team chief of the operation being performed.
7. A space that is large enough and configured so a worker can enter and perform assigned work; has limited or restricted means for entry or exit; and is not designed for continuous human occupancy.
8. (1) Lack of oxygen, (2) excessive oxygen, (3) flammable or explosive atmospheres and materials, (4) toxic gases or materials, (5) electrical or mechanical hazards, and (6) engulfment or entrapment hazards.
9. Before personnel are allowed to enter the vault; the toxic air test set.
10. An indicator with carrying strap, probe assembly, sampling hoses, charger cords, regulator assembly, calibration gas tanks, sample line kit, drying tube, and carrying case.
11. All personnel involved with vaults.

214

1. As a weapons maintenance facility.
2. (1) ECS, (2) LPS, (3) lifting systems, (4) power distribution system, and (5) delay/denial system.
3. Heating, cooling, and automatic.
4. Via metal hinges and bonding straps.
5. Side-jib crane and overhead rail crane.
6. On the hooks under the personnel access door or rear doors and secured in place.
7. To allow the weapon to rotate from horizontal to vertical to facilitate maintenance operations.
8. Yes, but only with the expressed written permission and coordination of both the applicable USAFE office and systems engineering office.

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).

38. (209) Who establishes access controls to communications security (COMSEC) to properly cleared personnel?
    a. Unit commander.
    b. Installation commander.
    c. COMSEC account manager.
    d. COMSEC account submanager.

39. (209) What is the *first* step of the operations security (OPSEC) process?
    a. Assess risk and threats.
    b. Analyze vulnerabilities.
    c. Apply countermeasures.
    d. Identify critical information.

40. (209) When must your annual communications security (COMSEC) training be complete?
    a. By the end of your anniversary month.
    b. On the beginning of your anniversary month.
    c. On the exact date of last annual training completed.
    d. Anytime prior to the exact date of last annual training completed.

41. (209) A communications security (COMSEC) deviation is
    a. an occurrence involving a failure to follow established COMSEC instructions, procedures, or standards.
    b. when you are allowed to substitute one COMSEC procedure for another.
    c. a process whereby you are allowed to depart from an operational COMSEC step, and are allowed to return to it at a later date.
    d. when you bring to the attention of an evaluator COMSEC steps that have previously been accomplished.

42. (210) Which Weapon Storage and Security System (WS3) group provides communications and processing capabilities to status monitor up to 64 vaults?
    a. Console.
    b. Vault control.
    c. Coder-transfer.
    d. Monitor-indicator.

43. (210) Which personnel performs as monitoring facility operators (MFO) at the local monitoring facility (LMF)?
    a. Communications maintenance.
    b. Munitions control.
    c. Security forces.
    d. Maintenance.

44. (210) Which Weapon Storage and Security System (WS3) component provides periodic polling of the vaults to check their operation and the status of the communications link?
    a. Vault processor.
    b. Message processor.
    c. Authentication unit.
    d. Data communicator.

45. (210) In the event of a power failure, the uninterruptible power system (UPS) supplies equipment and console power for *at least* how many hours?
    a. 10.
    b. 8.
    c. 6.
    d. 4.

46. (211) The authority to modify identification numbers and time delay (ID-TD) data for opening of the Weapon Storage and Security System (WS3) is given by the
    a. flight chief.
    b. major command (MAJCOM).
    c. squadron commander.
    d. immediate supervisor.

47. (211) Which unlock codes do each set of recode modules store?
    a. Twenty vault-specific maintenance, 20 mass upload, and one universal release.
    b. Twenty vault-specific maintenance, 40 mass upload, and two universal release.
    c. Forty vault-specific maintenance, 20 mass upload, and one universal release.
    d. Forty vault-specific maintenance, 40 mass upload, and two universal release.

48. (211) Which code modules stores and transfers a complete set of encoding keys to authentication units, sensor processors, and data authenticators?
    a. Rekey.
    b. Unlock.
    c. Recode.
    d. Code storage.

49. (211) You will use the reserve set of rekey modules if the
    a. back-up set fails.
    b. primary set is in use.
    c. primary recode module fails.
    d. primary and back-up sets fail.

50. (212) Which Weapon Storage and Security System (WS3) vault control group component operates the vault's *primary* operating system?
    a. Shelter control panel.
    b. Alternate controller.
    c. Vault assembly.
    d. Vault processor.

51. (212) Which Weapon Storage and Security System (WS3) vault assembly component contains sensors that detect water accumulation and earth movement?
    a. Barrier and cover plate.
    b. Platform assembly.
    c. Liner assembly.
    d. Barrier support.

52. (212) The electrical operating system that *fully* opens the Weapon Storage and Security System (WS3) vault in approximately 3 minutes describes which operating system?
    a. Alternate.
    b. Primary.
    c. Back-up.
    d. Reserve.

53. (212) You should use the Weapon Storage and Security System (WS3) *alternate* operating system when
    a. it is necessary to quickly access the vault.
    b. performing a functional check of the system.
    c. the primary system is inoperative or requires repair.
    d. testing limit switches for the safety zone and mid-level positions.

54. (212) Which Weapon Storage and Security System (WS3) vault control group component contains *two* recode module receptacles for entering unlock codes during recode operations?
    a. Vault electrical support panel.
    b. Shelter control panel.
    c. Vault processor.
    d. Vault assembly.

55. (213) What is the *main* purpose of lockout/tagout procedures on a Weapon Storage and Security System (WS3)?
    a. Inform all operators.
    b. Slow down operations.
    c. Prevent equipment damage.
    d. Prevent injury to personnel.

56. (213) Where can you find lockout/tagout procedures on a Weapon Storage and Security System (WS3)?
    a. Air Force Instruction (AFI) 21–204.
    b. AFI 91–101.
    c. Technical Order (TO) 11N–35–51.
    d. Air Force Manual (AFMAN) 91–203.

57. (213) Who controls the keys to the locks used for lockout operations?
    a. Anyone.
    b. Team chief.
    c. Key custodian.
    d. Munitions control.

58. (213) How are tags attached to energized equipment or energy sources if that equipment is *not* to be used?
    a. Securely.
    b. Anywhere.
    c. Center of the source.
    d. Securely and easily seen.

59. (213) Which space is *not* a confined space?
    a. Storage igloo.
    b. Space with limited entry or exit.
    c. Weapon Storage and Security System (WS3).
    d. Space *not* designed for continuous occupancy.

60. (213) When are you *required* to test and monitor for toxic air within the Weapon Storage and Security System (WS3)?
    a. Never.
    b. Weekly.
    c. Before the vault is closed.
    d. Before personnel are allowed to enter the vault.

61. (213) To measure and detect toxic air levels within the Weapon Storage and Security System (WS3), you would use which piece of equipment?
    a. T566.
    b. AN/PDR–74A.
    c. Toxicity monitor.
    d. Toxic air test set.

62. (213) During normal operations, the toxic air test set indicator draws continuous air samples through probe and hose assemblies into
    a. oxygen and combustible sensors.
    b. specialized filler holes.
    c. mounted gas cylinders.
    d. fuzes and diodes.

63. (214) Which type of maintenance does the Secure Transportable Maintenance System (STMS) provide?
    a. Base intrusion security system (BISS).
    b. Vault troubleshooting and testing.
    c. Weapons maintenance.
    d. Weapons movements.

64. (214) Which option is *not* a component of the Secure Transportable Maintenance System (STMS)?
    a. Environmental control system.
    b. Alternate controller.
    c. Fume extractor.
    d. Crane.

65. (214) What is the *maximum* capacity of the Secure Transportable Maintenance System (STMS) lifting systems?
    a. 1,000 lbs.
    b. 1,200 lbs.
    c. 2,000 lbs.
    d. 2,500 lbs.

Student Notes

Glossary of Abbreviations and Acronyms

º	degree (angle)
ºF	degree Fahrenheit
AAAL	access authority authentication list
AF	Air Force
AFI	Air Force instruction
AFMAN	Air Force manual
ALT	alteration
AMAC	aircraft monitor and control
AU	authentication unit
BHT	bomb hand truck
CAP	code activated processor
CBSA	center bomb subassembly
CCTV	closed-circuit television
CDC	career development course
CDS	command disablement system
CG	center of gravity
CIL	critical information list
COMSEC	communications security
CONAUTH	controlling authority
CRO	communications security responsible officer
CSM	code storage module
CTU	code transfer unit
DI	disable
DOD	Department of Defense
ECS	environmental control system
eIRC	electronic inspection record card
EOD	explosive ordnance disposal
ESSD	electrostatic sensitive device
EU	European
ft-lb.	foot-pound
FUFO	full-fuzing option
GFCI	ground fault circuit interrupter
H-gear	handling gear

hp	horsepower
Hz	Hertz
ID	identification
ID-TD	identification and time delay
IHE	insensitive high explosives
IIDS	Interior Intrusion Detection System
in.	inch
in-lb.	inch-pound
IR	infrared
JQS	job qualification standard
lb.	pound
LED	light-emitting diode
LLC	limited life component
LMF	local monitoring facility
LPS	lightning protection system
MAJCOM	major command
MC	major component
MCCS	multiple code coded switch
MFO	monitoring facility operator
MNCL	master nuclear certification list
MOD	model
mph	miles per hour
OPSEC	operational security
OSI	Office of Special Investigations
PAL	permissive action link
PAS	protective aircraft shelter
PC	personal computer
PDP	power distribution panel
PDS	practice dangerous to security
PPE	personal protective equipment
psig	pounds per square inch gauge
RMF	remote monitoring facility
SCP	shelter control panel
SEP	strike enabling plug
STMS	Secure Transportable Maintenance System

SWL	secure weapon location
TD	time delay
TM	technical manual
TO	technical order
TPC	two-person control
UPS	uninterruptible power supply
UR	unsatisfactory report
URC	universal release code
US	United States
USAFE	United States Air Forces in Europe
VAC	volts alternating current
VDC	volts direct current
VP	vault processor
WIR	weapon information report
WR	war reserve
WS3	Weapon Storage and Security System

Student Notes

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