

**MAINTENANCE AND REPAIR PROCEDURE  
FOR SHELTERS, ELECTRICAL EQUIPMENT**

**S-141/G AND S-141 B/G**

**(NSN 5410-00-752-9698);**

**S-144/G, S-144A/G, S-144B/G, S-144 C/G**

**AND S-144D/G**

**(NSN 5410-00-542-2532);**

**S-250/G (NSN 5410-00-999-4935);**

**S-250/G (SHIELDED)**

**(NSN 5410-00-489-6076);**

**S-280/G (NSN 5410-00-999-5269);**

**S-280 A/G (NSN 5410-00-999-6022);**

**S-280 B/G (NSN 5410-00-117-2868);**

**S-280 B/G (SHIELDED)**

**(NSN 5410-00-001-4093);**

**S-318/G (NSN 5410-00-763-2339);**

**A N D**

**S-318A/G (NSN 5410-00-116-7086)**

Changes in force: C1, C2 and C3

Change }  
No. 3 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C.

22 June 1988

MAINTENANCE AND REPAIR PROCEDURE FOR  
SHELTERS, ELECTRICAL EQUIPMENT  
S-141/G AND S-141 B/G (NSN 5410-00-752-9698);  
S-144G, S-144A/G, S-144 B/G, S-144 C/G  
AND S-144 D/G (NSN 5410-00-542-2532);  
S-250/G (NSN 5410-00-999-4935);  
S-250/G (SHIELDED)(NSN 5410-00-489-6076);  
S-250 E/G (NSN 5411-01-248-5353);  
S-280/G (NSN 5410-00-999-5269);  
S-280 A/G (NSN 5410-00-999-6022);  
S-280 B/G (NSN 5410-00-117-2868);  
S-280 B/G (SHIELDED)(NSN 5410-00-001-4093);  
S-280 C/G  
S-31 8/G (NSN 5410-00-763-2339);  
AND  
S-31 8A/G (NSN 5410-00-116-7086)

TB43-0124, 5 June 1979, is changed as follows: The title is changed as shown above.

Page 3, paragraph 1 is superseded as follows:

1. Scope. This technical bulletin covers the requirements for repair and overhaul of basic shelters, Electrical Equipment S-141( )/G, S-144( )/G, S-280( )/G, and S-318( )/G. Additional information covers the S-250/G and S-250 E/G shelters being fitted on the HMMWV (High Mobility Multipurpose Wheeled Vehicle). When operated with the S-250 shelter installed, the HMMWV is known as the M1037 S250 shelter carrier. A modified version, the M 1037 S250 MSE shelter carrier, offers an extended shelter support to handle the mounting and operational needs of the 250E shelter.

Page 3 paragraph 2 line 5 TM 38-750 is changed to read DA PAM 738-750.

Page 3. Paragraph 3(b) is superseded as follows:

b. Dimensions of the shelters are as follows:

Shelter type no.	Vehicle (ton)	Maximum length	Outside width	Dimensions(inches) height
S-141( )/G	2 1/2	144	81	82
S-280( )/G	2 1/2	147	87	83 3/8
S-250( )/G	1 1/4	86 7/8	79 5/16	70 1/2
S-250/G	1 1/4 HMMWV	86 7/8	79 5/16	70 1/2
S-250E/G	1 1/4 HMMWV	98 7/8	79 5/16	70 1/2
S-144( )/G	1 1/4 or 3/4	77	61	63 1/4
S-318( )/G	1 1/4 or 3/4	77	72 1/2	70 3/8

Page 7. Table is superseded as follows:

Shelter	Truck	Procedure
S 141( )/G	2 1/2 ton	Para 5b(3)
S 144( )/G	3/4 ton	Para 5b(4)
S 144( )/G	1 1/4 ton (M561 or M715)	TB 11-2300-374-14-1
S 250( )/G	1 1/4 ton (M561)	TB 11-2300-372-14
S 250( )/G	1 1/4 ton (M715)	Para 5b(5)
S 250( )/G	1 1/4 ton (M880)	SR-11-640 & Para 5b(6)
S 250/G	1 1/4 ton HMMWV	Para 7(a)
S 250E/G	1 1/4 ton HMMWV	Para 7(a)
S 280( )/G	2 1/2 ton	Para 5b(3)
S 318( )/G	3/4 ton	Para 5b(4)
S 318( )/G	1 1/4 ton (M561 or M715)	TB 11-2300-374-14-1

Page 10, Para 5b. Add subparagraph (7) after (6) (i) as follows:

(7) Secure S-250E/G and S-250/G shelter on M-1037 1-1/4 ton HMMWV truck as follows:

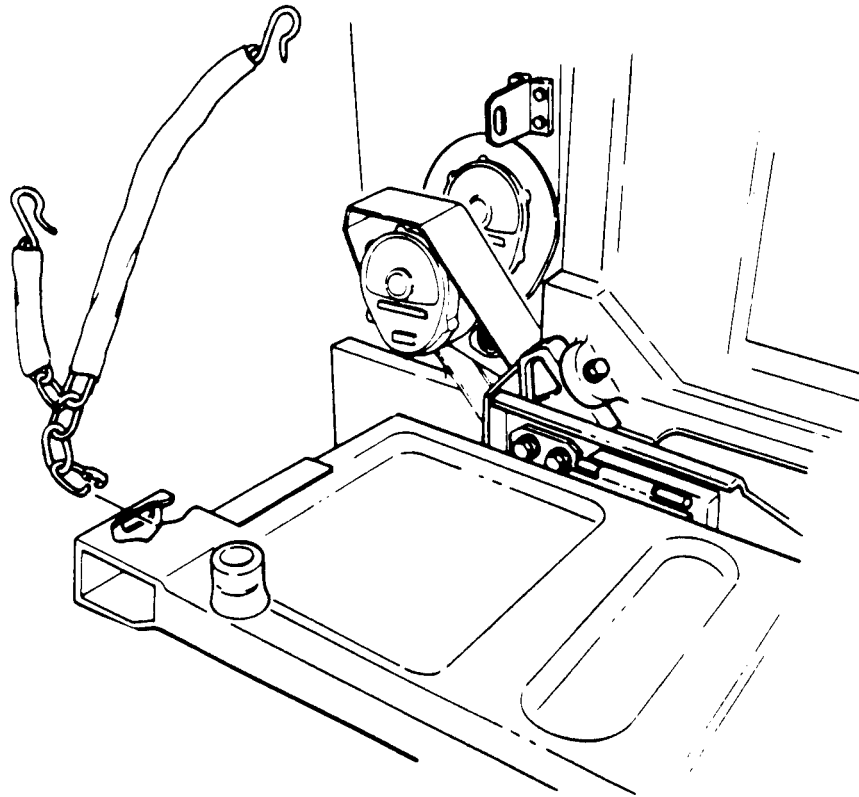
#### NOTE

Tailgate operation, S-250 E/G (fig. 4.1.).

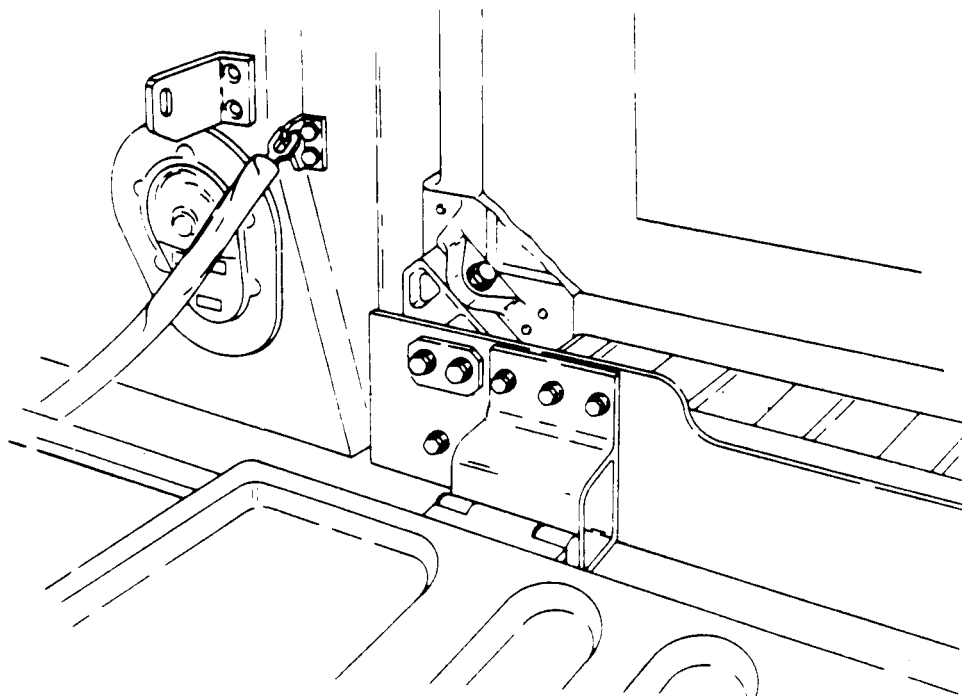
- (1) Lowering tailgate. Remove two short chain hooks and long chain hooks from tailgate brackets and lower tailgate.
- (2) Placing tailgate in loading position. Remove two short chain hooks from brackets, install long chain hooks in brackets, and place tailgate in loading position.
- (3) Raising tailgate. Raise tailgate and secure in position with two short chain hooks and long chain hooks to brackets.

Tailgate operation S-250/G (fig. 4.1.).

- (1) Lowering tailgate. Remove two tailgate chain hooks securing tailgate to rear of vehicle body. Lower tailgate.
- (2) Raising tailgate. Raise tailgate and secure to rear of vehicle body with two tailgate chain hooks.
  - (a) Lower truck tailgate and place in loading position.
  - (b) Position lifting device over top of shelter (fig. 4.2.).
  - (c) Connect slings to lifting device and four corners of shelter.
  - (d) Install mounting bracket on each corner of shelter and secure with capscrew, lockwasher, and washer. Do not tighten capscrew until shelter is installed (fig. 4.3.).
  - (e) Position shelter over support and gradually lower shelter onto support (fig. 4.2.).



A. WITH S-250E SHELTER



B. WITH S-250 SHELTER

Figure 4.1. HMMWV Tailgates

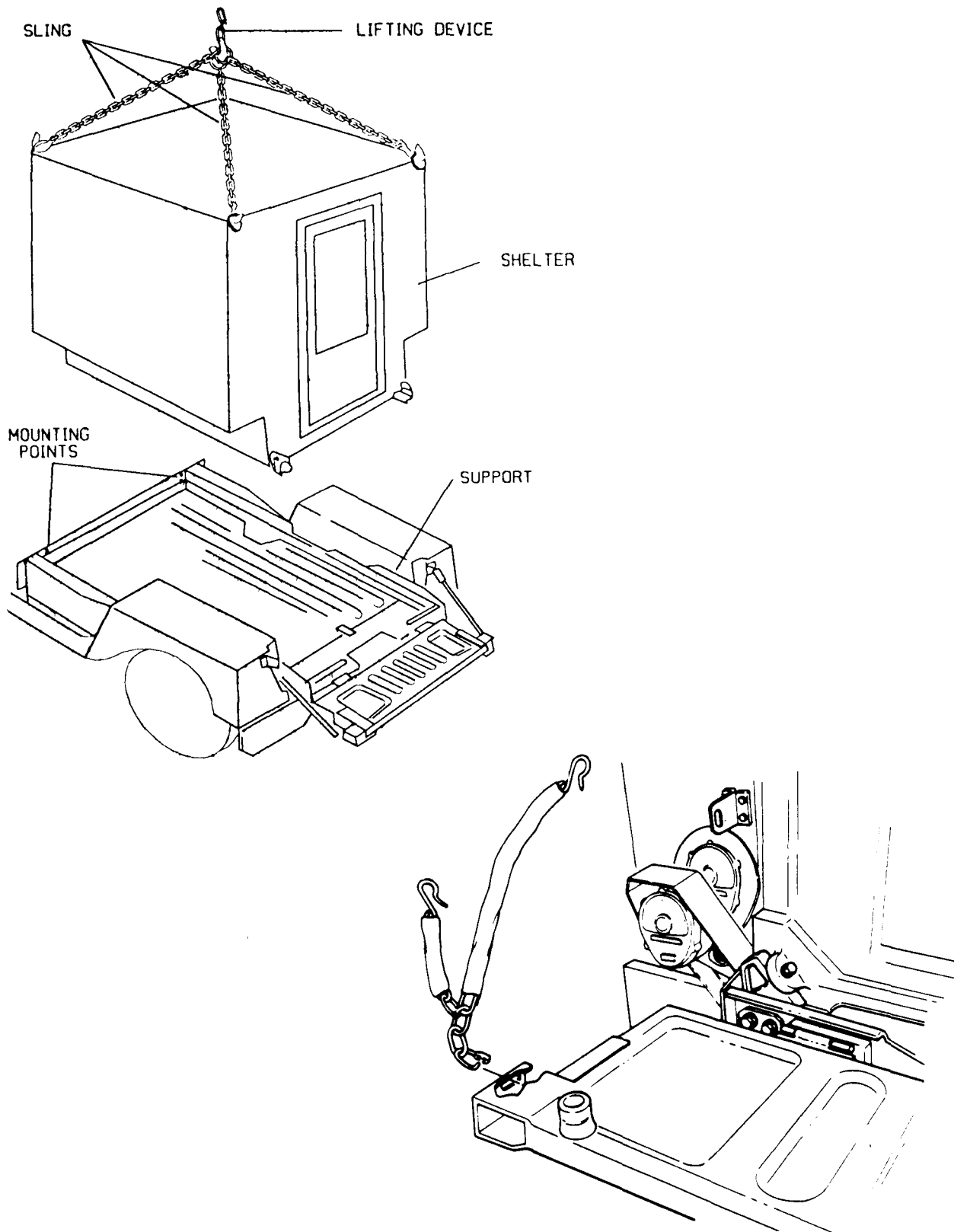


Figure 4.2. S-250E/G Shelter and M-1037 Bed Tailgate

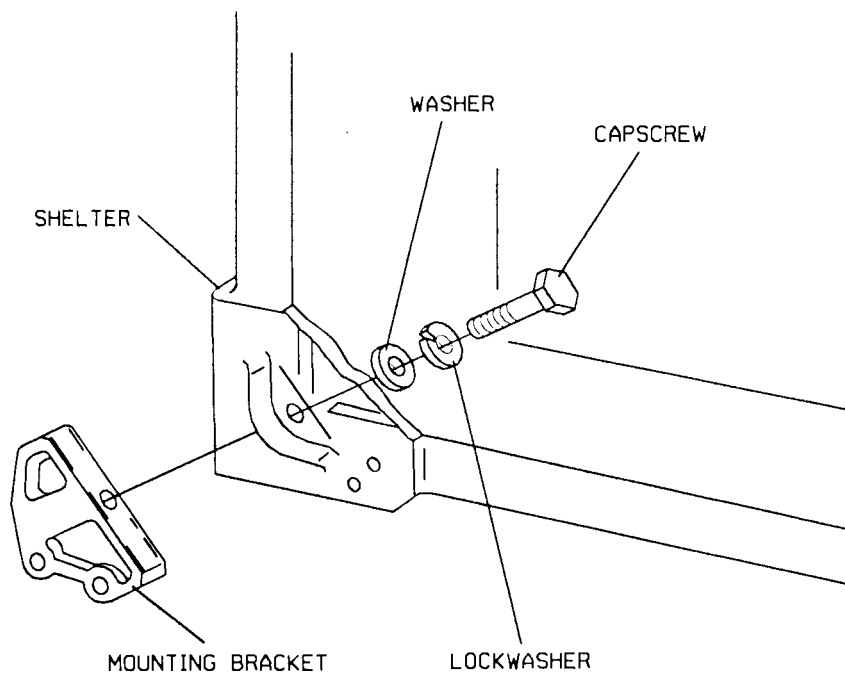


Figure 4.3. M-1037 Shelter Mounting Bracket

## NOTE

Shelter should be tightly fitted to front of support. Shims should only be added to rear shelter mounts.

- (f) Position shelter to support front mounting points. Secure shelter to front of support with four bolts, lockwashers, washers, and two reinforcements. Tighten capscrews to 60 ft-lb (81 n-m). Tighten bolts to 90 ft-lb (122 n-m).
- (g) Secure rear of shelter to support with four bolts, lockwashers, washers, and two reinforcements. Do not tighten capscrews.
- (h) Add shims as necessary to rear shelter mounts to ensure snug fit between mounting brackets and support. Tighten capscrews to 60 ft-lb (81 n-m). Tighten bolts to 90 ft-lb (122 n-m).
- (i) Disconnect sling from shelter,
- (j) Raise and secure tailgate. Figure 4.4. shows S-250 and S-250E shelters mounted on HMMWVS.

Page 10, Para 5c(2) Paragraph c(2) is superseded as follows:

- (2) S-144( )/G, S-250/G, S-250E/G, and S-318( )G shelters can be shipped in ANSI/ISO containers only when crated or pallet mounted. Crates or pallets must be securely blocked in ANSI/ISO container to prevent movement during transit.

Page 10. Paragraph 7(a) is superseded as follows:

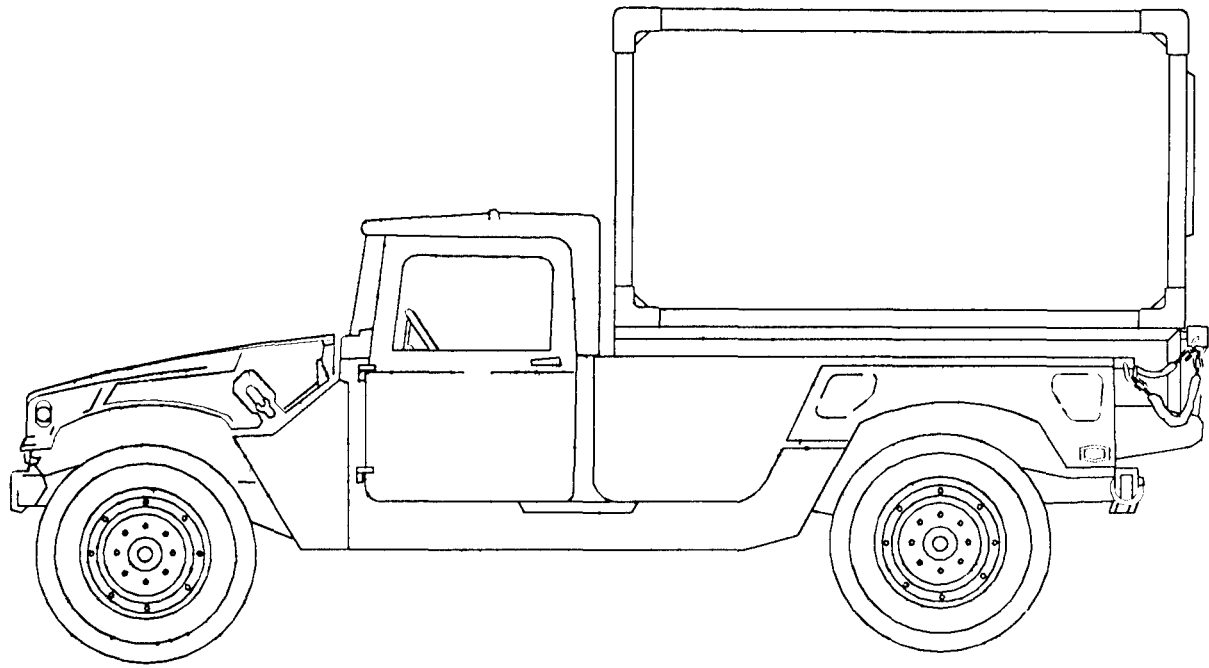
### 7. Accessories.

- a. Boarding ladders. The following vehicle boarding ladders are available for use with truck-mounted shelters:

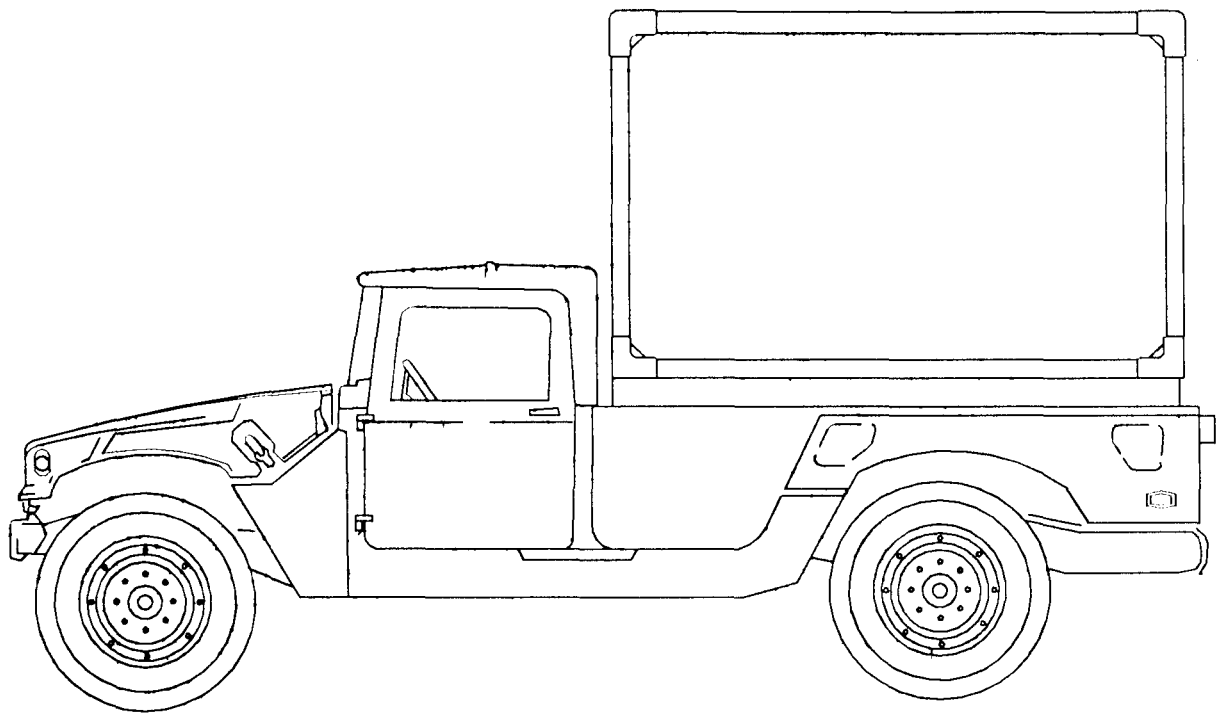
SHELTER	TRUCK	LADDER
S-144( )/G, S-250/G, S-250E/G, S-318( )G	3/4 & 1-1/4 ton	M-3543/G (NSN 2540-00-846-8483)
S-141 ( )/G, S-280( )/G	2-1 /2 ton	M-3391/G (NSN 2540-00-892-6243)

## CAUTION

The M-1037 MSE shelter carrier is specifically designed to be operated with the S-250 shelter installed. It can be driven safely without shelter installed, or equivalent payload, for short distances (e.g., to and from maintenance or from railhead when being delivered). This should not be done often or for long distances. Driving for long distances without shelter installed, or equivalent payload, causes rear half-shaft constant velocity joints to wear more than they normally would in loaded position.



**A. HMMWV WITH S-250E SHELTER**



**B. HMMWV WITH S-250 SHELTER**

**Figure 4.4. S-250 Shelters Mounted on HMMWVS**



Page 15. Paragraph 21 is superseded as follows:

21. Replacing EMI filters on S-250/G, S-250E/G, S-280( )/G, and S-318( )/G shelters. When the replacement of an EMI filter is necessary the following shall apply:

- a. Remove threaded fasteners securing filter in place (rivets secure filter in S-318( )/G shelter).
- b. Remove filter and wire mesh tape.
- c. Clean surfaces of paint, remove excess adhesive and foreign matter.
- d. Install new wire mesh tape on all surfaces between flange on frame and filter.
- e. Using holes in flange as a template, drill and fasten new filter in place with screws, nuts, and lockwashers (use rivets when securing filters in S-318( )/G).
- f. Seal outer edges of joints between filter and flange with sealant, item 14 or item 15 in paragraph 24b.
- g. An EMI Modification Kit, MK-1092( )/G, is available to service EMI filters on S-250/G and S-250E/G shelters. Kit part number is DL-SM-B-649950.

Page 15. Paragraph 22 is superseded as follows:

22. Replacing EMI shielding gasket on S-250/G, S-250E/G, S-280( )/G, and S-318( )/G shelters. When replacement of the EMI shield is necessary, the following shall apply:

- a. Remove damaged shield, and clean surface of paint and foreign matter.
- b. Install new EMI shield, making sure that shield shape at corners is as shown in figure 5.
- c. The telescoped joints (fig. 6) shall be approximately midway up hinge side of door and emergency exit.
- d. The procedure for making a telescoped joint in the EMI shield (fig. 6) is as follows:

#### NOTE

When cutting a shield, allow an additional 2 inches to overall length for the telescoped joint.

- (1) On one end of shield, pull back layers 5 and 4 approximately 2-1/2 inches and cut 2 inches off layers 3, 2, 1, and sponge core.
- (2) On other end, pull back layer 5 and cut 2 inches off layer 4.
- (3) Join ends together as shown in figure 6.

Page 29. paragraph 34 is superseded as follows:

34. Marking shelter. Stencil the following warning notice on all sides of the S-141( )/G, S-144( )/G, S-250/G, and S-250 E/G shelters, near the bottom of the shelter, in conformance with MIL-M-13231:

**DO NOT HANDLE WITH FORKLIFT**

This notice cannot be stenciled on S-280( )/G or S-318( )/G shelters as they are designed specifically for forklift handling.

Page 32, paragraph 37 is superseded as follows:

37. Painting. a. Shelter exterior and door interior. When the exterior of any shelter or the interior of the door is repainted, the paint to be used, regardless of the original paint system shall be the alkyd enamel camouflage paint identified in this paragraph. When repainting an S 250( )/G, S-280( )/G, or S-318( )/G shelter, which has an instruction plate directing the use of MIL-E-46061 enamel, the instruction plate should be painted over. For instruction plates on the S-250/G and S-250E/G shelters, refer to MIL-C-46168 enamel. Paint to be used for repainting of shelters is as follows:

Page 35, Paragraph 38c (1) table is superseded as follows:

Shelter	Tensile load	
	(lb)	(kg)
S-141( )/G bearing order number prior to 1963	8,000	3,636
S-141( )/G bearing order number after 1963	11,000	5,000
S-144( )/G	3,000	1,364
S-250/G	5,000	2,273
S-250E/G	5,000	2,273
S-280( )/G	11,000	5,000
S-280( )/G where pull involves towing eye	8,000	3,636
S-318( )/G	3,000	1,364

Page 35, Para 38c(2) table is superseded as follows:

Shelter	Tensile load	
	(lb)	(kg)
S-141( )/G bearing order number prior to 1963	8,000	3,636
S-141 ( )/G bearing order number after 1963	11,000	5,000
S-144( )/G	3,000	1,364
S-250/G	5,000	2,273
S-250E/G	5,000	2,273
S-280( )/G	8,000	3,636
S-318( )/G	3,000	1,364

Page 37, Para 38d(4) (a) table is superseded as follows:

	Without EMI capability	Maximum Operating Torque	
		(ft-lb)	(kgf-m)
Door			
S-141( )/G	(see note below)	(see note below)	
S-144( )/G	(see note below)	(see note below)	
S-250/G small door	10	20	1.38
S-250/G large door	15	25	2.07
S-250E/G small door	10	20	1.38
S-250 E/G large door	15	25	2.07
S-280( )/G	15	30	2.07
S-318( )/G small door	15	20	2.07
S-318( )/G large door	15	30	2.07

Page 38. Paragraph 38d (5) is superseded as follows:

- (5) Lifting and tiedown provisions. Each shelter shall include the appropriate lifting and tiedown provision as follows:
  - (a) S-141( )/G and S-280( )/G shelters. These shelters shall be provided with a multiple leg sling, SC-D-36423 (NSN 5410-06-805-5533).
  - (b) S-144( )/G shelter. The S-144( )/G shelter shall be provided with a multiple leg sling SC-C-36302 (NSN 5410-00-774-6108).
  - (c) S-250/G shelter. The S-250/G shelter shall be provided with a multiple leg sling, SM-D-649952 (NSN 3940-00-115-6380).
  - (d) S-250E/G shelter. The S-250E/G shelter shall be provided with a multiple leg sling, SM-D-649952 (NSN 3940-00-115-6380).
  - (e) S-3180( )/G shelter. The S-318( )/G shelter shall be provided with a multiple leg sling SM-B-564739 (See Note 4 on this drawing).

Appendix A

add:

Appendix A, Para 8f, TM 38-750 is changed to read, DA PAM 738-750.

Appendix A, 8.g. is added TM 9-2320-359-12&P, Operator and Organizational Maintenance Manual including Repair Parts and Special Tools List (RPSTL) for Mobile Subscriber Equipment-used on Truck, Utility, S-250 Shelter Carrier, 4x4, M-1037, NSN 2320-01-146-7193.

By Order of the Secretary of the Army:

CARL E. VUONO  
*General, United States Army*  
*Chief of Staff*

Official:

R. L. DILWORTH  
*Brigadier General, United States Army*  
*The Adjutant General*

Distribution:

To be distributed in accordance with DA Form 12-34C, TB requirements for Maint & Repair of Electric Equipment Shelters.

CHANGE }  
No. 2 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, DC, 28 August 1980

**MAINTENANCE AND REPAIR PROCEDURE FOR  
SHELTERS, ELECTRICAL EQUIPMENT  
S-141/G AND S-141 B/G (NSN 5410-00-752-9698);  
S-144/G, S-144A/G, S-144B/G, S-144C/G  
AND S-144D/G (NSN 5410-00-542-2532);  
S-250/G (NSN 5410-00-999-4935);  
S-250/G (SHIELDED) (NSN 5410-00-489-6076);  
S-280/G (NSN 5410-00-999-5269);  
S-280A/G (NSN 5410-00-999-6022);  
S-280 B/G (NSN 5410-00-117-2868);  
S-280 B/G (SHIELDED) (NSN 5410-00-001 -4093);  
S-280C/G  
S-318/G (NSN 5410-00-763-2339);  
AND  
S-318A/G (NSN 5410-00-116-7086)**

TB 43-0124, 5 June 1979, is changed as follows:  
The title is changed as shown above.

*Page 19.* Item 13 is changed as follows: Change the first sentence to read: "Pop" Rivet 1/8 diameter 0.125 to 0.1875 grip aluminum, closed end (NSN 5320-00-882-8388).

Item 14 is changed as follows: Add after RTV-102 White (least preferred); For unexposed

areas, you may use Paintable Silastic (White) RTV 8644, Dow Corning.

*Page 35,* Paragraph *d* (1) is superseded as follows:

(1) *Lubrication.* All vent hinges and door mechanisms shall be lubricated with MIL-L-4616 oil. Those parts not properly functioning after lubrication should be disassembled, cleaned, and lubricated as instructed in paragraph 14.

By Order of the Secretary of the Army:

**E. C. MEYER**  
*General, United States Army*  
*Chief of Staff*

Official:

**J. C. PENNINGTON**  
*Major General, United States Army*  
*The Adjutant General*

**DISTRIBUTION:**

*Active Army:*

HISA (Ft Monmouth) (21)	USAERDAW (1)	6-406	11-39
USAINSCOM (2)	Ft Gordon (10)	6-407	11-85
COE (1)	Ft Carson (5)	6-425	11-86
TSG (1)	Army Dep (1) except	6-426	11-95
USAARENBD (1)	SAAD (30)	6-427	11-97
DARCOM (1)	TOAD (14)	6-455	11-117
TRADOC (2)	SHAD (2)	6-456	11-127
OS Maj Comd (4)	Ft Gillem (10)	6-457	11-500(AA-AC)
TECOM (2)	USA Dep (1)	6-525	17
USACC (4)	Sig Sec USA Dep (1)	6-526	29-41
MDW (1)	Ft Richardson (CERCOM Ofc) (2)	6-555	29-85
Armies (2)	Units org under fol TOE:	6-556	29-86
Corps (2)	(2 copies each unit)	6-575	29-87
Svc Colleges (1)	29-207	6-576	29-134
USASIGS (5)	29-610	6-577	29-136
USAADS (2)	(1 copy each unit)	6-615	32-56
USAFAS (2)	1-207	6-616	32-57
USAARMS (2)	1-258	6-617	32-78
USAIS (2)	5-112	7	32-500
USAES (2)	6-200	11-15	44-235
USAICS (3)	6-201	11-16	44-237
MAAG (1)	6-365	11-17	57
USARMIS (1)	6-366	11-35	
USAERDAA (1)	6-405	11-37	

*ARNG:* None

*USAR:* None

For explanation of abbreviations used, see AR 310.50.

Change

No. 1



HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, DC. 12 December 1979

**MAINTENANCE AND REPAIR PROCEDURE FOR  
SHELTERS, ELECTRICAL EQUIPMENT  
S-141/G AND S-141B/G (NSN 5410-00-752-9698);  
S-144/G, S-144A/G, S-144B/G, S-144C/G  
AND S-144D/G (NSN 5410-00-542-2532);  
S-250/G (NSN 5410-00-999-4935);  
S-250/G (SHIELDED) (NSN 5410-00-489-6076);  
S-280/G (NSN 5410-00-999-5269);  
S-280A/G (NSN 5410-00-999-6022);  
S-280B/G (NSN 5410-00-117-2868);  
S-280B/G (SHIELDED) (NSN 5410-00-001-4093);  
S-318/G (NSN 5410-00-763-2339);  
AND  
S-318A/G (NSN 5410-00-116-7086)**

TB 43-0124, 5 June 1979, is changed as follows:

Page 19. Item 22 is added after Item 21.

Item 22. Screw, self tapping, Phillips head, No. 10X  
3/8 in. long (NSN 5305-00.234.0958).

Item 23 is added after Item 22.

Item 23. Screwdriver, No. 2 Phillips head.

Page 21. The following is added after paragraph  
24e(5):

f. Repair of skin peeling off door.

(1) The door skin is bonded to the door with  
adhesive. The underlayer on door edges to which  
the skin is bonded is wood. In some places the  
wood is a solid block and in other places it is a  
thin 1/16 inch veneer over a .080 inch thick  
aluminum extrusion,

(2) Use a No. 20 drill (item 18) and drill  
1/4 inch deep holes through the skin and into the

underlayer. Locate the holes 1/2 inch from the  
edge where the skin is peeling and space 1 1/2  
inches apart. Drill as many holes as required.  
Notice if there is a solid block on the veneer and  
extrusion (1/4 inch will penetrate).

(3) Squeeze adhesive (item 14) between the  
skin and the wooden underlayer.

(4) Use screws (item 22) and screwdriver  
(item 23) where the underlayer is a solid wood  
block. Use pop rivets (item 13) and riveter (item  
20) where there is wood veneer and extrusion.  
Screws can be used everywhere if the pop rivets  
are not available. Coat all screws and rivets with  
adhesive (item 14) before inserting. Fill the holes  
in the rivets with adhesive and wipe off all excess  
adhesive.

By Order of the Secretary of the Army:

**E. C. MEYER**  
*General, United States Army*  
*Chief of Staff*

Official:

J. C. PENNINGTON  
*Major General, United States Army*  
*The Adjutant General*

Distribution:

Active Army:

HISA (Ft Monmouth) (21)	6-365 (1)
USAINSCOM (2)	6-366 (1)
COE (1)	6-405 (1)
TSG (1)	6-406 (1)
USAARENBD (1)	6-425 (1)
DARCOM (1)	6-426 (1)
TRADOC (2)	6-427 (1)
OS Maj Comd (4)	6-455 (1)
TECOM (2)	6-456 (1)
USACC (4)	6-457 (1)
MDW (1)	6-525 (1)
Armies (2)	6-526 (1)
Corps (2)	6-555 (1)
HQ 7th Sig Comd (5)	6-556 (1)
Svc Colleges (1)	6-575 (1)
USASIGS (5)	6-576 (1)
USAADS (2)	6-577 (1)
USAFAS (2)	6-615 (1)
USAARMS (2)	6-616 (1)
USAIS (2)	6-617 (1)
USAES (2)	7- (1)
USAICS (3)	11-15 (1)
MAAG (1)	11-16 (1)
USARMIS (1)	11-17 (1)
USAERDAA (1)	11-35 (1)
USAERDAW (1)	11-37 (1)
USACC-EUR (5)	11-39 (1)
USACC-PAC (5)	11-85 (1)
USACC-SO (5)	11-86 (1)
Ft Carson (10)	11-87 (1)
Ft Gillem (10)	11-95 (1)
Ft Gordon (10)	11-97 (1)
Ft Richardson (CERCOM Ofc) (2)	11-117 (1)
Army Dep (1) except:	11-127 (1)
LBAD (14)	11-500 (AA-AC) (1)
SAAD (30)	17- (1)
SHAD (3)	29-41 (1)
TOAD (14)	29-85 (1)
USA Dep (1)	29-86 (1)
Sig Sec USA Dep (1)	29-134 (1)
Units Org Under Fol TOE:	29-136 (1)
29-207 (2)	32-56 (1)
29-610 (2)	32-57 (1)
1-207 (1)	32-78 (1)
1-258 (1)	32-500 (1)
5-112 (1)	44-235 (1)
6-200 (1)	44-237 (1)
6-201 (1)	57- (1)

ARNG: None.

USAR: None.

For explanation of abbreviations used, see AR 310-50.

**MAINTENANCE AND REPAIR PROCEDURE FOR  
SHELTERS, ELECTRICAL EQUIPMENT  
S-141/G AND S-141B/G (NSN 5410-00-752-9698); S-144/G,  
S-144A/G, S-144B/G, S-144C/G AND S-144D/G  
(NSN 5410-00-542-2532); S-250/G (NSN 5410-00-999-4935);  
S-250/G (SHIELDED) (NSN 5410-00-489-6076); S-280/G  
(NSN 5410-00-999-5269); S-280A/G (NSN 5410-00-999-6022);  
S-280B/G (NSN 5410-00-117-2868); S-280B/G (SHIELDED)  
(NSN 5410-00-001-4093); S-318/G (NSN 5410-00-763-2339);  
AND S-318A/G (NSN 5410-00-116-7086)**

**REPORTING OF ERRORS**

You can improve this manual by recommending improvements using DA Form 2028-2 located in the back of the manual. Simply tear out the self addressed form, fill it out as shown on the sample, fold it where shown, and drop it in the mail.

If there are not blank DA Form 2028-2 in the back of your manual, use the standard DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward to the Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN:-DRSEL-ME-MQ, Fort Monmouth, NJ 07703.

In either case, a reply will be furnished direct to you.

	Paragraph	Page
C HAPTER		
I. INTRODUCTION		
Scope . . . . .	1	3
Forms and records . . . . .	2	3
Lightweight shelter characteristics. . . . .	3	3
Identifying features . . . . .	4	3
II. GENERAL INFORMATION		
Handling requirements . . . . .	5	5
Security . . . . .	6	10
Accessories . . . . .	7	10
III. MAINTENANCE		
Maintenance allocation . . . . .	8	11
Repair parts and special tools lists . . . . .	9	11
Skin repairs . . . . .	10	11
Welding or soldering maintenance parts. . . . .	11	11
Seriously damaged shelters . . . . .	12	11
IV. ORGANIZATIONAL MAINTENANCE		
Preventive maintenance . . . . .	13	13
Lubrication . . . . .	14	13
Touchup painting . . . . .	15	13
Skin repairs . . . . .	16	13

\* This manual supersedes TB 750-240, 30 July 1969.



	Paragraph	Page
V. DIRECT SUPPORT MAINTENANCE		
Tools and materials required . . . . .	17	15
Damaged or worn floor tread . . . . .	18	15
Rain flaps . . . . .	19	15
Replacing damaged shelter skids . . . . .	20	15
Replacing emi filters on S-250( )/G, S-280( )/G, and S-318( )/G shelters . . . . .	21	15
Replacing emi shielding gasket on S-250( )/G, S-280( )/G and S-318( )/G shelters . . . . .	22	15
Calking shelter seams . . . . .	23	16
Skin repairs . . . . .	24	17
Damaged structural member . . . . .	25	21
VI. GENERAL SUPPORT MAINTENANCE		
General . . . . .	26	23
Tools and materials required . . . . .	27	23
Repair of delaminated areas . . . . .	28	23
Replacing towing and lifting eyes . . . . .	29	24
Replacing rivnuts or fastening devices . . . . .	30	24
Replacing damaged shelter skids . . . . .	31	24
Skin repairs . . . . .	32	25
Damaged structural members . . . . .	33	28
Marking shelter . . . . .	34	29
Accessories . . . . .	35	29
VII. DEPOT MAINTENANCE INCLUDING DEPOT OVERHAUL STANDARDS		
Rain flaps . . . . .	36	31
Painting . . . . .	37	32
Depot overhaul standards . . . . .	38	33
APPENDIX A . . . . .		A-1
B. IDENTIFYING FEATURES OF LIGHTWEIGHT SHELTERS . . . . .		B-1
C. MAINTENANCE MATERIALS . . . . .		C-1
D. MAINTENANCE TOOLS . . . . .		D-1
E. TOOL KIT, ELECTRONIC EQUIPMENT SHELTER TK-144/G . . . . .		E-1

# CHAPTER I

## INTRODUCTION

**1. Scope.** This technical bulletin covers the requirements for repair and overhaul of basic Shelters, Electrical Equipment S-141( )/G, S-144( )/G, S-250( )/G, S-280( )/G, and S-318( )/G. Repair procedures for any additional maintenance parts of a modified lightweight shelter is provided in the applicable technical manual.

**2. Forms and records.** *a. Reports of Maintenance and Unsatisfactory Equipment.* Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

### NOTE

Include a detailed description of the damage; clearly define the nature, extent and cause of the damage. Include sufficient detail for the recipient to determine if the damage constitutes a design deficiency or a manufacturing defect

<i>Shelter type No.</i>	<i>(ton)</i>	<i>Vehicle</i>
S-141( )/G	2 ½	
S-280( )/G	2 ½	
S-250( )/G	1 ¼	
S-144( )/G	1 ¼ or ¾	
S-318( )/G	1 ¼ or ¾	

**4. Identifying features.** The lightweight shelters are fabricated by several commercial manufacturers and are used with equipment in the Area Type Com-

which requires redesign or field modification of the shelter in question.

*b. Report of Packaging and Handling Deficiencies.* Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A, and DLAR 4145.8.

*c. Discrepancy in Shipment Report (DISREP) (SF 361).* Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C, and DLAR 4500.15.

**3. Lightweight shelter characteristics.** *a.* Type of construction . . . . Sandwich panels consisting of aluminum skins bonded to a foamed plastic core. Panels also contain structural members which are secured by bonding, riveting, welding, or a combination of these methods.

*b.* Dimensions of the shelters areas follows:

<i>Maximum outside dimensions (inches)</i>		
<i>Length</i>	<i>Width</i>	<i>Height</i>
144	81	82
147	87	83 3/8
86 7/8	79 5/16	70 ½
77	61	63 ¼
77	72 ½	70 3/38

munication Systems and other communication systems. Examples of shelters are shown in appendix B.

## CHAPTER II

### GENERAL INFORMATION

---

#### **5. Handling requirements.** *a. Lifting Procedures.*

(1) When lifting the shelter (with a crane or helicopter), be sure to use the correct lifting and tiedown assembly (sling assembly). Refer to the appropriate repair parts and special tools list for each shelter.

(2) Be sure that the sling assembly cables are connected to the lifting eyes (with the turnbuckle ends of the cables next to the lifting eyes of the shelter before lifting. On "Craig Round Corner" S-141( )/G shelters, do not attempt to lift shelter with the sling assembly cables connected to the tiedown eyes.

(3) Slowly lift the shelter with the crane or helicopter. Do not jerk the shelter when lifting.

(4) Avoid swinging the shelter from side to side.

(5) Do not bounce or jar the shelter.

(6) Do not attempt to butt shelters into place with a forklift. The lightweight shelters are not structurally designed for this mode of handling. If the shelter is crated, pallet-mounted, or has forklift instructions stenciled on the exterior, a forklift may be used to move the shelter.

#### **CAUTION**

If an uncrated shelter is not pallet-mounted and does not have forklift instructions stenciled on the exterior, **DO NOT USE A FORKLIFT TO MOVE THE SHELTER; SLING LIFT THE SHELTER INSTEAD.**

#### *b. Loading and Securing Shelters on Trucks.*

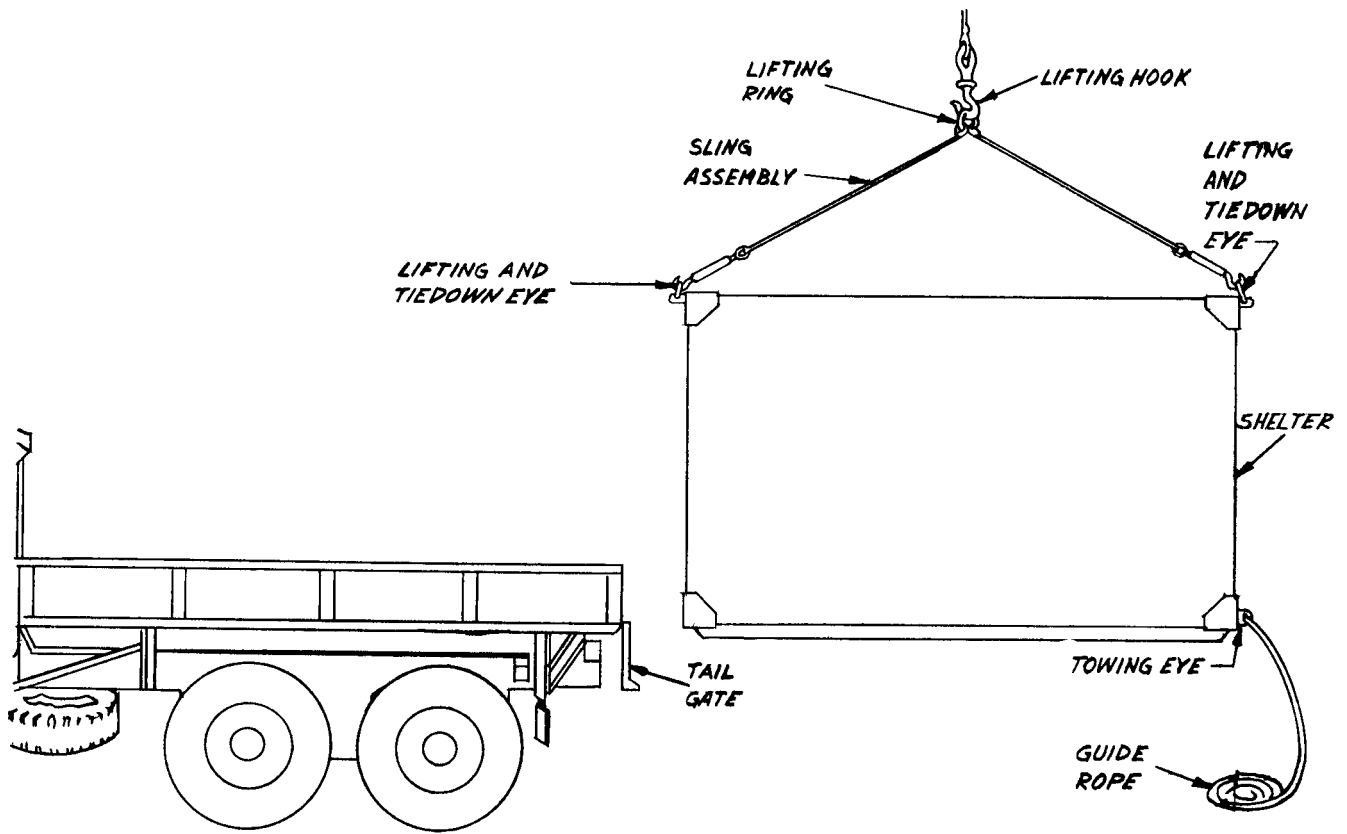
(1) All shelters shall be loaded onto trucks using the following general procedure (fig. 1) after preparing truck beds as maybe required.

(a) Use the sling hooks (nearest the turnbuckles) to connect the sling assembly to the lifting eyes.

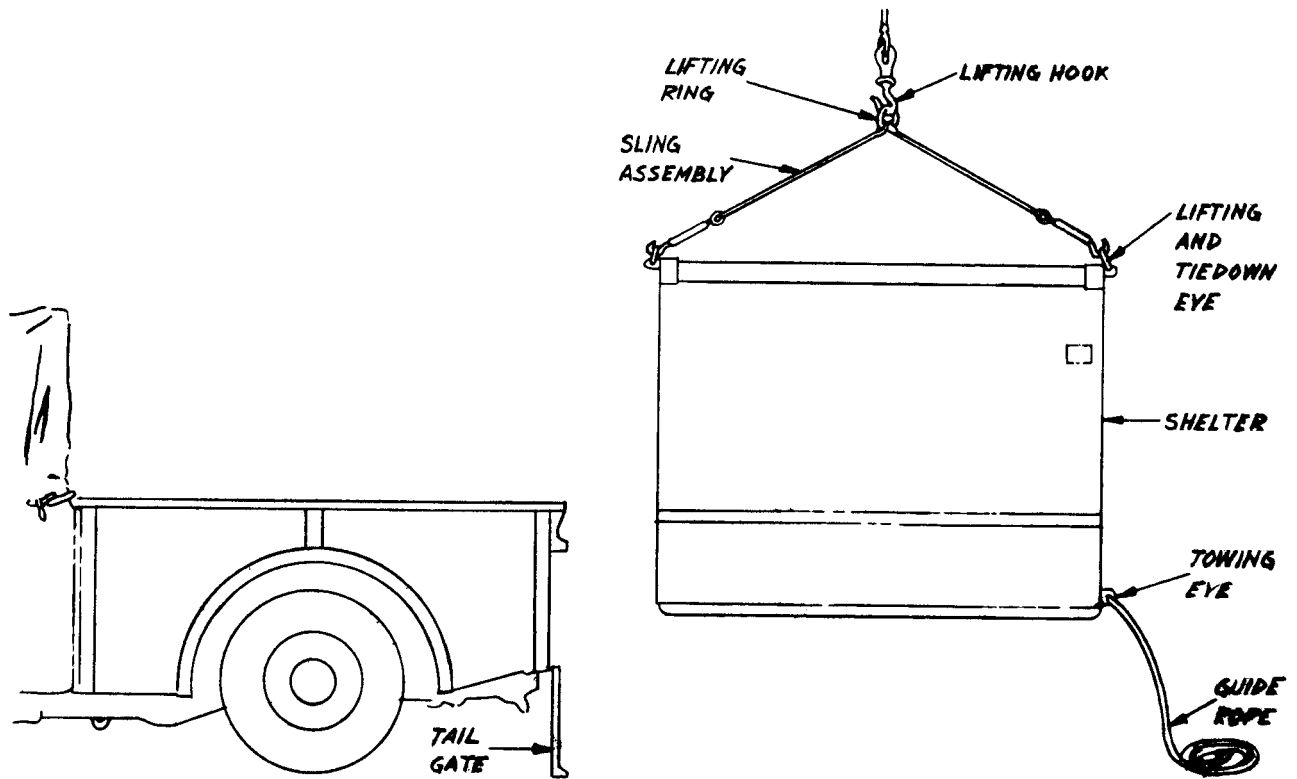
(b) Place the sling assembly on top of the shelter.

(c) Connect the four sling hooks to the lifting ring.

(d) Place the lifting ring over the lifting hook of the lifting device.



A. LOADING S-141/G AND S-280/G SHELTERS ON TRUCK.



B. LOADING S-144()/G, S-250()/G AND S-318()/G SHELTERS ON TRUCK.

EL5VT001

**WARNING**

To avoid injury to personnel and damage to the equipment, only the personnel engaged in the actual loading operation should be permitted near the truck, lifting device, and assemblage. To eliminate confusion, all instructions must come from the loading crew supervisor.

(e) Tie a 1/2-inch rope (at least 15 ft long) to each rear towing eye.

(f) Lower the truck tailgate and make sure that all tools and all equipment have been removed from the truck body.

(g) Position a person at the free end of each of the 1/2-inch ropes to guide the shelter.

**NOTE**

The entrance door of the shelter must be at the rear of the truck, and the front end of the shelter must be placed flush against the front of the truck body.

(h) Slowly lift the assemblage from the

<i>Shelter</i>	<i>Truck</i>	<i>Procedure</i>
S-141( )/G	2 ½ ton	Para 5b(3)
S-144( )/G	¾ ton	Para 5b(4)
S-144( )/G	1¼ ton(M561 or M715)	TB-11-2300-374-14-1
S-250( )/G	1¼ ton (M561)	TB-11-2300-372-14
S-250( )/G	1¼ ton(M 715)	Para 5b(5)
S-250( )/G	1¼ ton (M 880)	SR-11-640 & Para 5b(6)
S-280( )/G	2½ ton	Para 5b(3)
S-318( )/G	¾ ton	Para 5b(4)
S-318( )/G	1¼ ton(M561 or M715)	TB-11-2300-374-14-1

(3) Secure the S-141( )/G and S 280( )/G shelters on a 2½ ton truck as follows:

(a) Install the plate and eye bolt assemblies (A, fig. 2) above the center supports on the cargo bed siderails of the truck. The plate and eye bolt assembly, NSN 4030-00-956-5820, is part of the sling assembly.

(b) Use the hooks at the farthest end from the turnbuckle, and hook the ends of the sling assembly to the tiedown eyes of the shelter.

(c) Secure the remaining sling hooks to the appropriate eye bolts (B, fig. 2) in the tiedown plate. Make certain that the sling hooks point away from the shelter.

(d) Tighten all turnbuckles evenly by hand; then turn each turnbuckle an additional one-half

ground to a position high enough to clear the body of the truck.

(i) Back the truck into position under the assemblage.

**WARNING**

All personnel must remain clear of the truck while the assemblage is being lowered into position.

(j) The person at each of the ropes ((e) above) will guide the shelter into position and hold it while it is lowered onto the trunk body.

(k) Remove the lifting ring from the lifting hook and disassemble the lifting ring and sling hooks. Remove the sling hooks from the lifting eyes and the 1/2-inch ropes from the rear towing eyes.

(2) Secure the shelter to the truck according to the following procedures (some procedures require the addition of dunnage to the truck bed or the attachment of tiedown eyes prior to loading the shelter onto the truck):

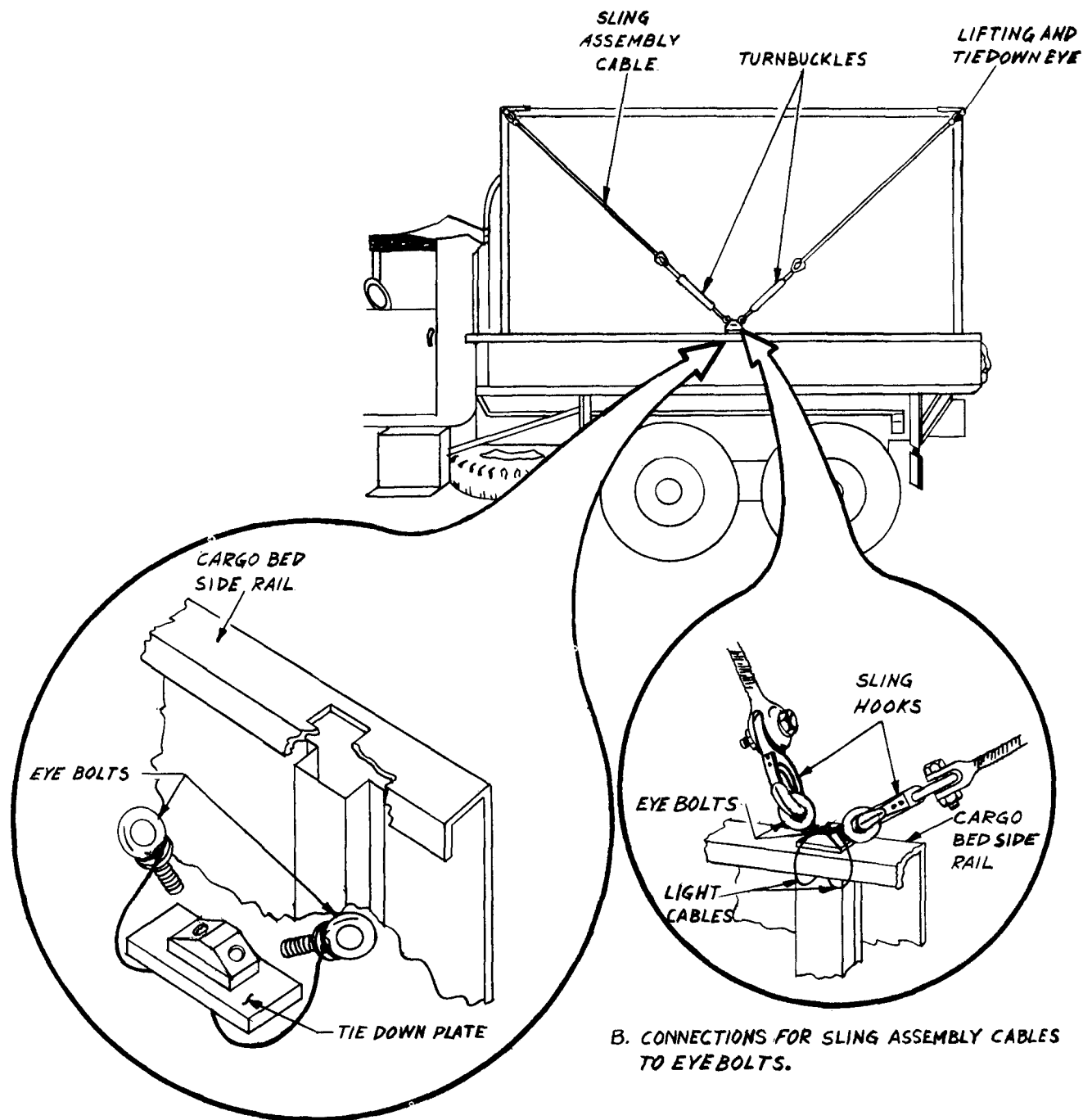
turn with a bar or rod inserted in the turnbuckle slot.

**CAUTION**

Do not overtighten the turnbuckles. Overtightening turnbuckles may tear the lifting and tie down eye assemblies from the shelter or damage either the eye assembly or the shelter.

(e) Insert appropriate sized wooden blocks between the shelter skids and the sides of the truck bed to prevent sideways movement strain on the sling assembly cables.

(f) Insert appropriately sized wooden blocks between the shelter skids and the cab wall of the truck bed to protect the towing eyes of the shelter and the cab wall of the truck bed.



A. EXPLODED VIEW OF PLATE AND EYEBOLT ASSEMBLY

B. CONNECTIONS FOR SLING ASSEMBLY CABLES TO EYEBOLTS.

EL5VT002

Figure 2. Securing S-141( )/G and S-280( )/G Shelters on Truck.

(g) If the skin is punctured during loading or securing operations, the punctures shall be patched as soon as possible to prevent moisture seepage into the laminated panels of the shelter, and to restore EMI suppression if this requirement exists for the shelter.

(h) Raise and secure the truck tailgate.

(4) Secure the S-144( )/G and the S-318( )/G on a ¾ ton truck as follows:

(a) Use two sling assemblies at each side of the truck to secure the shelter to the truck as shown in figure 3.

(b) Perform the procedures in (3) (d) through (3) (h) above.

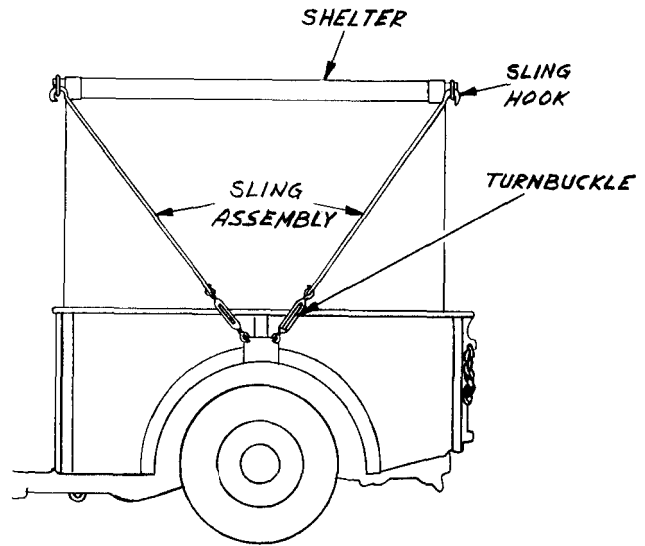
(5) Secure the S-250( )/G shelter on a 1¼ ton (M 715) truck as follows:

(a) Use two sling assemblies at each side of the truck to secure the shelter to the truck as shown in figure 4. Note that tiedown adapter assemblies (SC-C-681153) are used at the tail gate end when required to enable operation of entrance panel covers at this end of the shelter assemblages.

(b) Perform the procedures in (3) (d) through (3) (h) above.

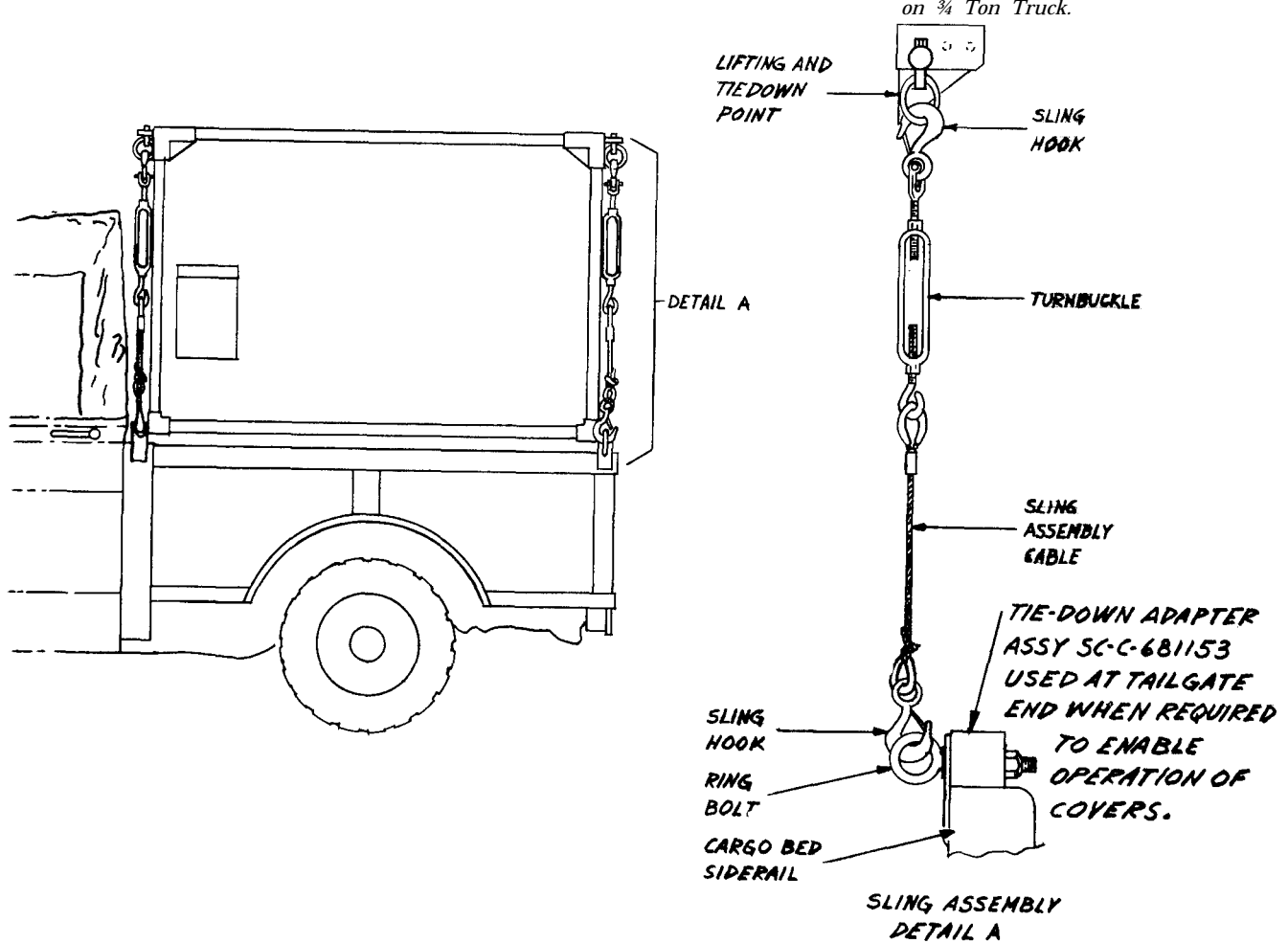
(6) Secure the S-250( )/G shelter on the M-880 1-¼ ton truck as follows:

(a) Install the tie down provisions and make and install the wooden dunnage in the M-880 truck in accordance with Department of the Army Supply Bulletin SB 11-640.



EL5VT003

Figure 3. Securing S-144( )/G and S-138( )/G Shelters on ¾ Ton Truck.



EL5VT004

Figure 4. Securing S-250( )/G Shelter on 1¼ Ton (M715) Truck).

(b) Unhook the four sling legs from the lifting ring of the S-250( )/G sling assembly.

(c) Remove the hooks from the turnbuckle end of each sling leg.

(d) Temporarily store the lifting ring and the four hooks inside the shelter.

(e) Secure the hooks remaining in the sling legs to the four lifting eyes of the shelter.

(f) Secure the turnbuckle end of the sling legs to the truck tie down provisions using the hardware which had been used to attach the hooks to the turnbuckles.

(g) Tighten all turnbuckles evenly by hand; then turn each turnbuckle an additional one half-turn with a bar or rod inserted in the turnbuckle slot.

### CAUTION

Do not overtighten the turnbuckles. Overtightening turnbuckles may tear the lifting and tie down eye assemblies from the shelter or damage the eye assembly or the shelter.

(h) If the skin is punctured during loading or securing operations, the puncture shall be patched as soon as possible to prevent moisture seepage into the laminated panels of the shelter, and to restore EMI suppression if this requirement exists for the shelter.

(i) Raise and secure the truck tailgate.

c. *Loading of shelters into ANSI/ISO Containers.*

(1) S-141( )/G and S-280( )/G shelters may be shipped in Type 1AA ANSI/ISO containers. In-

Shelter	Truck	Ladder
S-144( )/G, S-250( )/G, S-318( )/G	3/4 & 1 1/4 ton	M-3543/G (NSN 2540-00-846-8483)
S-141( )/G, S-280( )/G	2 1/2 ton	M-3391/G (NSN 2540-00-892-6243)

b. *S-280( )/G Shelter Dolly Set M-720 Adapter Brackets.* To mount the S-280( )/G Shelter on the M-720 Dolly Set, adapter brackets must be mounted on the shelter. If the shelter is not so equipped

stall and remove the shelters in accordance with TB 11-5400-200-14.

(2) S-144( )/G, S-250( )/G and S-318( )/G shelters may be shipped in ANSI/ISO containers only when crated or pallet mounted. Crates or pallets will be securely blocked in the ANSI/ISO container to prevent movement during transit.

d. *Storage.* Temperature and humidity cycling of shelters results in an accumulation of moisture inside the shelter which is harmful to equipment in the shelter. Moisture accumulation shall be kept to a minimum by keeping shelter doors, louver covers, and drain holes open during periods of indoor storage. During storage outdoors, the doors and drain holes shall be closed but the louver covers shall be kept open.

**6. Security.** The locks that are furnished with shelters have universal keys, that is, the locks can all be opened with the same key. The purpose of these locks is to furnish security during transportation and allow the shelter to be unlocked at its destination using the universal key. These locks can be identified by the number H-700 stamped on the body. The key for these locks also has this identification. If security is a requirement or a unique lock and key are desired padlock NSN 5340-00-682-1508, MS-35647-3 should be ordered.

**7. Accessories.** a. *Boarding Ladders.* The following Vehicle Boarding Ladders are available for use with truck mounted shelters:

the procedure given in Chapter VI, General Support Maintenance, should be used to add adapter brackets.



## CHAPTER III

### MAINTENANCE

**8. Maintenance Allocation.** A Maintenance Allocation Chart (MAC) in the Repair Parts and Special Tools List of each shelter outlines the allocation of maintenance tasks assigned to each echelon of maintenance. Refer to the appropriate chapter in this manual for specific requirements and instructions for each echelon of maintenance.

**9. Repair Parts and Special Tools Lists.** *a.* Refer to the following manuals for the basic shelter repair parts:

<i>Shelter</i>	<i>Manual</i>
S-141( )/G	TM 11-5410-206-14P
S-144( )/G	TM 11-5410-205-15P
S-250( )/G	TM 11-5410-214-15P
S-280( )/G	TM 11-5410-213-14P
S-318( )/G	TM 11-5410-212-15P

*b.* If the replacement parts on a shelter cannot be found in the appropriate basic shelter manual, the end item manual should be checked. Parts that are peculiar to the end item (not part of the basic shelter) should be listed in the appropriate end item manual. If a problem is encountered in identifying or requisitioning replacement parts for the basic shelters, contact the local Communications and Electronics Readiness Command (CERCOM) Logistics Assistance representative or Commander, US Army CERCOM, ATTN: DRSEL-ME-ES, Fort Monmouth, NJ 07703. When reporting problems or requesting information for a particular type shelter, list the shelter nomenclature (include the basic shelter nomenclature as well as the nomenclature assigned when part of a configured equipment), serial number, contract number, model number, and manufacturer's name.

**10. Skin Repairs.** *a.* All punctures in the outside skin of a shelter should be repaired as soon as possible to prevent equipment damage caused by water leakage. When shelters have an electromagnetic interference (EMI) suppression requirement, immediate patching is necessary to prevent detection by enemy intercept equipment and electromagnetic interference with other communications equipment. Use care to prevent metal-to-metal contact between the outer skin and the inner skin of the shelter.

*b.* Under no circumstance should an entire inside

or outside skin be removed and replaced by any category of maintenance. If an entire skin on any panel is so severely degraded that it cannot be patched, an evaluation should be made to determine if the damage is severe enough to render the shelter unusable.

**11. Welding or soldering maintenance parts.**

Welding or soldering operations on the shelter panels or on maintenance parts installed on the shelter are depot repair procedures and must be performed with extreme caution.

#### **WARNING**

Foam-core materials used in the light-weight shelters are highly flammable under a welding torch flame and release harmful black smoke when ignited. Elevated temperature will destroy the original cellular form of the foam-core and leave the aluminum panels unsupported. Do not allow the temperature of the skin surface to exceed 90°C. Use Thermometer, Self-Indicating, Bi-Metallic MX- 1570/G to monitor surface temperature. Do not perform any welding or soldering operations near the foam-core.

**12. Seriously damaged shelters.** *a.* Serious damage is defined as any damage to a structural member such as a puncture or a dent which is severe enough to cause distortion of the opposite surface of the panel, particularly in edge or corner areas. Any seriously damaged shelter should be returned to the depot.

*b.* In a tactical field situation, emergency repairs may be required to weatherproof a shelter to protect the equipment it contains. Any available materials can be used for emergency repairs. If a shelter has EMI suppression requirements, the emergency repair should be replaced as soon as possible with an EMI shielding repair procedure.

*c.* If the nature of the damage warrants it, print the following caution notice using 4-inch high letters on all outside walls of the shelter:

**CAUTION DAMAGED SHELTER: DO NOT SLING LIFT**

## CHAPTER IV

### ORGANIZATION MAINTENANCE

---

**13. Preventive maintenance.** The following preventive maintenance tasks should be performed each week.

*a.* Inspect shelter outside for punctures, sealer, paint, lifting and towing eye cracks, rubber rain flap deterioration, and all hardware for defects.

*b.* Inspect door and panel cover gaskets.

*c.* Inspect air filters and clean or replace as required.

*d.* Inspect sling assembly for completeness.

*e.* Inspect shelter tie down if mounted on a truck to be sure it is secure.

*f.* Inspect shelter interior for floor mat wear and general interior condition.

*g.* Lubricate door hinges and locking mechanism per paragraph 14 as required.

*h.* Touchup paint as required per paragraph 15.

**14. Lubrication.** Lubricate door hinges, vent hinges, ventilating fans, and door latches of the shelter during routine maintenance checks. Use Lubrication Oil, Internal Combustion Engine, Arctic MIL-L-46167.

**15. Touch Painting.** When touchup painting is required, use a paint that matches the rest of the shelter. The exterior of some early shelters was painted with olive drab (-34087). Use lusterless enamel available in a 1-gallon container (NSN 8010-00-297-0560) or lusterless lacquer available in a 1-gallon container (NSN 8010-00-292-3053). Some S-250( )/G and S-280( )/G shelter may have a nameplate directing the use of solar reflective paint per MIL-E-46061. This nameplate may or may not be painted over. If it is not painted over use paint per MIL-E-46061. This paint is available in a 1-quart container (NSN 8010-00-905-7133) and a 1-gallon container (NSN 8010-00-985-7258). For all other shelters, unless a particular camouflage pattern is specified, use the Forest Green Alkyd Camouflage Enamel base coat per MIL-E-52789. It is available in a 1-gallon container (NSN 8010-00-111-7937) and a 7-gallon container (NSN 8010-00-111-8010).

**16. Skin Repairs.** *a. Punctures.* Any damage to the skin that results in the outside skin being punctured should be patched as soon as possible to prevent leakage or in the case of shelters having an electromagnetic interference (EMI) suppression requirement, to prevent detection by enemy intercept equipment and electromagnetic interference with other communications equipment. Apply a temporary field patch as described in paragraph 16

*c.* The field patch should be replaced as described by a more permanent aluminum patch by higher category of maintenance as soon as possible.

*b. Dents.* Dents in the outer skin that do not include a puncture need not be repaired. Evaluation must be made to determine if there has been any structural member damage that may render the shelter unusable. Some dents may be severe enough to include the inside wall as well as the outside, these should be evaluated in the same manner as dents to the outside wall only. When there is no puncture the only repair needed is painting if required.

*c. Field Repair of Small Punctures in Panel Skins*

(1) *Purpose.* The purpose of this procedure is to provide a simple method of repairing small punctures in the aluminum skins of shelter panels to prevent entry of water into the panel.

(2) *Scope.* This procedure is intended for field repair by organizational maintenance personnel as an expedient. This is a temporary repair and is not intended to replace a more durable repair by higher levels of maintenance.

(3) *Materials.* The following materials are to be used to repair the puncture.

*(a) Sealant.* Dow Corning Silastic 738 RTV or GE Silicone Construction Sealant 1200 or any sealant listed as Item 14 or Item 15 in Paragraph 24b. Do not stock large amounts of sealant. Order as required as sealant has a shelf life.

*b. Tape.* Polyethylene coated cloth duct sealing tape, Kendall Compney, Polyken Division, part number 222 OD. Part number 222A (aluminum colored) may be used only if tactical considerations are not effected.

*(c) Tape, electrically conductive.* Electrically Conductive Pressure Sensitive Tape, Emerson and Cuming, Inc., Canton, MA, part number Eccoshield PST-C, 4 inches wide or Scotch Brand Electrical Tape #1181, 4 inches wide, 3M Company, Boston, MA. This item is only required if the shelter has an EMI suppression requirement.

(4) *Procedure.*

*(a)* If necessary, bend the broken edges of the punctured skin inward into the puncture hole. Do not attempt to remove fragments of skin by bending or pulling outward. Bend the skin inward only enough to put the broken edges below the surface of the unbroken skin. Any convenient implement can be used.

*(b)* Remove any loose fragments of foam which are not now held in place by the bent broken

skin. Removing small pieces of foam or dust is more important than removing chunks.

(c) If the shelter has an EMI suppression requirement, proceed as in sub paragraph (5) below. Otherwise continue as follows: Using a cloth only slightly dampened with water, wipe the area around the puncture to remove any obvious dirt, mud, etc. Then wipe dry.

(d) Inject one of the authorized sealants into the puncture. Mound the sealant to about 1/8 inch above the surface of the unbroken skin. Apply a bead of sealant about 1/4 inch wide over all cuts in the skin leading out from the puncture. Do not smooth out the sealant.

(e) How the puncture is to be covered with tape (3)(b), should be planned before applying any tape. The length and width of the tape, the number of tape strips, overlapping, and how the tape is applied all will affect the sealing capability of the repair.

(f) Each piece of tape should extend about 1½ inches beyond the sealant it will cover. If this will require more than one strip of tape, the tape should overlap about ½ inch. If 3 or more strips of tape are required, the center strip(s) should be applied first.

(g) To apply the tape, hold it taut and apply it perpendicular to the panel skin. Do not apply with a rolling motion either from end-to-end or from center-to-ends. Do not rub each strip in place individually. Apply all the strips lightly and with the proper overlap first.

(h) If necessary, damaged tape can be replaced. However, it should be removed with a careful peeling motion to avoid damage to the sealant. If the sealant also peels back, new sealant should be applied. Complete removal of the old sealant is not necessary.

(i) Permanent repair by direct support or higher category of maintenance should be made as soon as possible.

(5) Procedure for shelters with an EMI suppression requirement:

(a) Proceed as in sub paragraphs (4)(a) and (b).

(b) Using abrasive paper, remove all paint or foreign matter from the skin surrounding the puncture at least 1 inch past the puncture in all directions. This bare metal area is required for achieving adequate EMI shielding.

(c) Using a cloth only slightly dampened with water, wipe the area around the puncture to remove any obvious dirt, mud, etc. Then wipe dry.

(d) Cover the puncture with electrically conductive tape ((3)(c) above). How the puncture is to be covered with the electrically conductive tape should be planned before actually applying the tape. The electrically conductive tape should overlap the puncture by at least 1 inch in all directions. If more than one width of electrically conductive tape is required, each strip should overlap the previous strip by at least one inch. If 3 or more strips are required the center strip(s) should be applied first.

(e) Cover the electrically conductive tape with duct tape ((3)(b) above), to help protect this temporary patch from the effects of weathering. Each piece of tape should extend about 1½ inches beyond the electrically conductive tape it covers. If this requires more than one strip of tape, the strips should overlap at least ½ inch. If 3 or more strips are required, the center strip(s) should be applied first. Apply as in subparagraph (4)(g) above.

(f) Permanent repair by higher categories of maintenance should be made as soon as possible.

**17. Tools and materials required.** *a. Tools.* Appendix D is a list of tools from which the required tools should be selected if not noted in a given maintenance procedure.

*b. Materials.* Appendix C is a list of materials from which the required materials should be selected if not noted in a given maintenance procedure.

**18. Damaged or worn floor tread.** If the shelter has an overlay floor tread use the following procedures to repair damaged floor covering of shelters.

*a.* Remove floor tread completely.

*b.* Clean any excess adhesive from the floor using Methyl Ethyl Ketone Cleaner, 1/2 Gallon Can (NSN 6810-00-687-8429), 1 Gallon Can (NSN 6810-00-281-2785).

#### CAUTION

Exercise care to ensure that no Methyl Ethyl Ketone gets into the floor panel of an S-280( )/G shelter as it will dissolve the styrene core material.

*c.* Prime and paint the floor in accordance with the instruction in paragraph 37.

*d.* Cut to size and install one of the below listed floor coverings. Use no adhesive.

(1) Matting, floor, rubber, 1/8-inch thick X 36-inch wide, 50 yard roll (NSN 7220-00-254-4240).

(2) Matting floor, rubber, 3/16-inch thick X 36-inch wide, 25 yard roll (NSN 7220-00-965-4699).

*e.* All material listed above is available through normal supply channels.

**19. Rain flaps.** *a.* Rubber rain flaps on all top hinged louver covers and/or entrance covers should be examined and replaced if required.

(1) If replacement is required replace the flap with either of the following rubber sheet stock cut to the same size as the old flap:

(*a*) Rubber Sheet, 1/8-inch thick X 8 inches wide X 36 inches long NSN 9320-00-621-5409 per MIL-S6855.

(*b*) Rubber Sheet, 1/8-inch thick X 24 inches wide X 48 inches long NSN 9320-00-202-4008 per MIL-R-3065.

(2) For flaps attached with rivets, drill out the old rivets and select new closed-end aluminum rivets of the proper size and grip range. Cut the new flap to size using the old flap as a guide.

(3) After cutting the flap to size, locate and make holes for the screws or rivets using the drip molding or retaining strip as a guide.

(4) When replacing, apply a heavy coat of sealer, item 14 or 15 in paragraph 24*b*, to all faying surfaces and fasteners.

**20. Replacing damaged shelter skids.** Replacement of damaged shelter skids can generally be accomplished by unbolting the damaged skid and replacing it with a new skid. Some older shelters, however, had the skids installed with rivets rather than threaded fasteners. When it is necessary to replace a damaged shelter skid that was originally riveted to the shelter, it will be performed by a higher category of maintenance (see Chapter VI, General Support).

**21. Replacing EMI filters on S-250( )/G, S-280( )/G, and S-318( )/G shelters.** When the replacement of an EMI filter is necessary the following shall apply:

*a.* Remove the threaded fasteners securing the filter in place (rivets secure the filter in the S-318( )/G shelter).

*b.* Remove the filter and wire mesh tape.

*c.* Clean the surfaces of paint, excess adhesive, and foreign matter.

*d.* Install new wire mesh tape on all surfaces between the flange on the frame and filter.

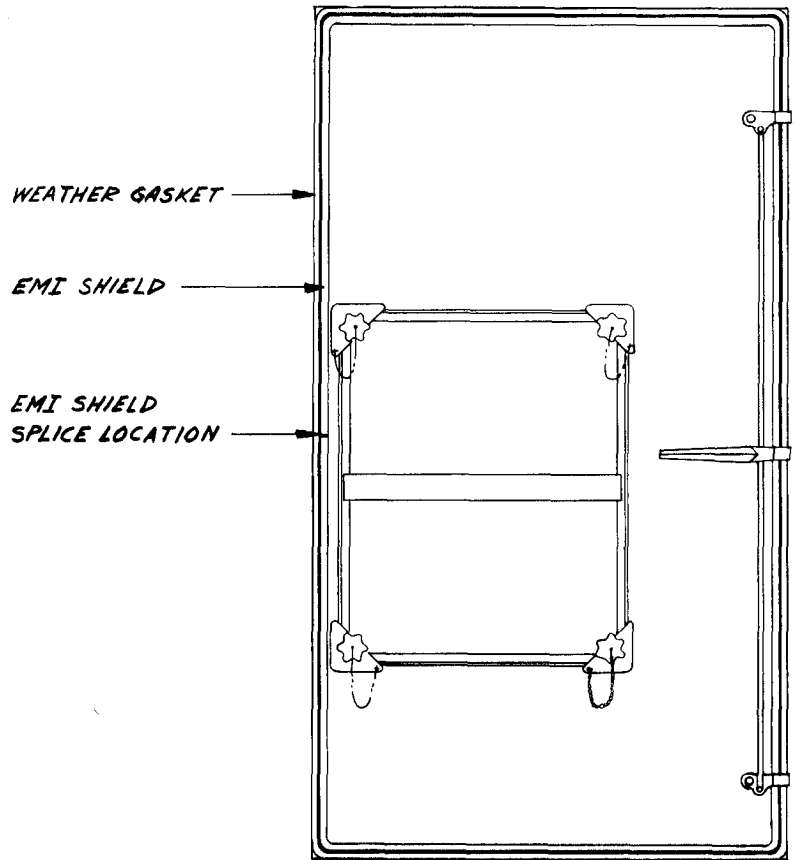
*e.* Using holes in the flange as a template, drill and fasten a new filter in place with screws, nuts, and lockwashers (use rivets when securing filters in the S-318( )/G).

*f.* Seal the outer edges of joints between the filter and flange with sealant, item 14 or item 15 in paragraph 24*b*.

**22. Replacing EMI shielding gasket on S-250( )/G, S-280( )/G and S-318( )/G shelters.** When the replacement of the EMI shield is necessary, the following shall apply:

*a.* Remove the damaged shield, and clean the surface of paint and foreign matter.

*b.* Install the new EMI shield, making sure that the shield shape at the corners is as shown in figure 5.



EL5VT005

Figure 5. View of EMI Shield Installed in Door of S-280()/G Shelter

c. The telescoped joints (fig. 6) shall be approximately midway up the hinge side of the door and the emergency exit.

d. The procedure for making a telescoped joint in the EMI shield (fig. 6) is as follows:

NOTE

When cutting a shield, allow an additional 2 inches to overall length for the telescoped joint.

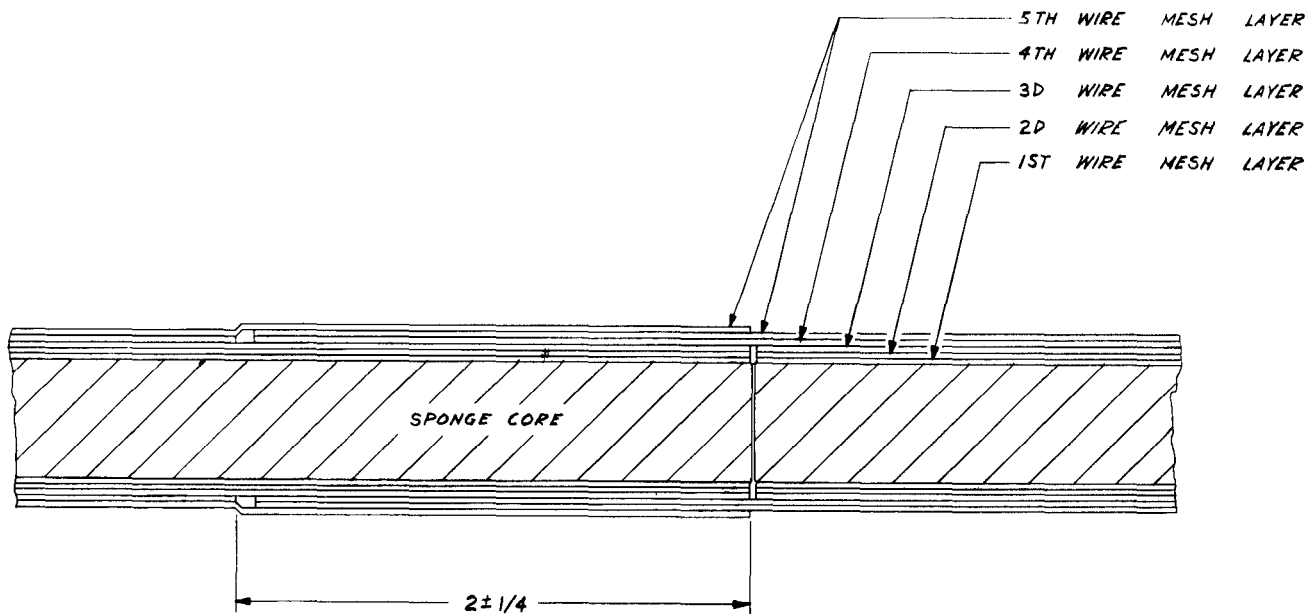
(1) On one end of the shield, pull back layers 5 and 4 approximately 2½ inches and cut 2 inches off layers 3, 2, and 1 and the sponge core.

(2) On the other end, pull back layer 5 and cut off 2 inches of layer 4.

(3) Join the ends together as shown in figure 6.

**23. Calking shelter seams.** All seams should not exceed a 3/8-inch width and should be smoothly and uniformly applied. Inspect all shelter seams, and use either the silicone or polysulfide sealant (items 14 and 15 in paragraph 24b to calk any seam that requires calking as follows:

a. When using silicone sealant, use the spout of the tube or cartridge containing the sealant to apply the seam. When using polysulfide sealant, use a calking gun. In applying the sealant, follow the procedures below:



EL5VT006

Figure 6. EMI Shield Telescoped Joint.

- (1) Remove all loose material from seams.
- (2) Position the tube or talking gun at approximately a 45° angle with respect to the surface.
- (3) Slowly squeeze the tube or operate the trigger of the talking gun while moving the nozzle at a continuous pace. The size of the bead deposit depends on the speed of application.
- (4) Keep the size of the bead 3/8-inch wide and approximately 3/32-inch thick at the highest point.
- (5) Dip a finger in a strong soap solution to smooth uneven calking beads.
- (6) Eliminate all air bubbles in the calking seam. Air bubbles in the calking seam may be indicated by pinholes.
- (7) Clean and remove excess calking compound.
- (8) Allow the calking seam to set for 24 hours minimum at 70° F, and paint the seam (para 37).

*b.* Masking tape may be used on long runs to ensure a uniform seam width.

**24. Skin repairs.** *a.* Apply permanent aluminum patches to all single skin punctures that do not exceed 4¾ inches by 10¾ inches which is the maximum size puncture that can be covered using the pre-cut aluminum patches shown in figure 7. Larger punctures must be repaired by higher category of maintenance. All temporary patches should be removed and replaced. A skin break is minor when it is essentially an indentation accompanied by a split or hole and the foam insulation

underneath is intact. A major break is where the skin is jagged and wrinkled and the original foam insulation has to be restored. A skin break involves a single skin only. A puncture through the shelter wall involves both the inner and outer skins (this must be repaired by a higher category of maintenance). If the shelter has an EMI suppression requirement, the procedure described in paragraph 24e must be included in the repair.

*b.* Following is a list of items with their procurement data, required as a minimum to make the repair(s). The items may be procured locally or ordered through normal channels. There is no kit of the listed items. Orders for items where no stock number appears are to be ordered by exception. Items listed in the General Services Administration (GSA) catalogue are so noted. It is recommended the user review the entire procedure before ordering any items. This will enable the user to determine the items, quantities, and the method of procurement he needs for the repair(s). Items 1 through 16 are consumable items while the remaining items are reusable.

ITEMS 1 through 7

Order by Exception

Aluminum patches shall be in accordance with figure 7.

ITEM8

NSN 5350-00-221-0888

Paper, Abrasive, Garnet, Sheet 9 X 11 per P-P-121 Class 4 40 Grit. This is a GSA Item having 50 sheets per package.



CPR 9006-4 Rigid urethane foam  
The Upjohn Co., CPR division 555 Alaska Ave., Torrance,  
California 90503

ITEM 13 NSN 5320-00-402-2855  
"Pop" Rivet, 5/32 diameter X .063-.250 Grip, Dome Head, all  
aluminum, closed end. Order package of 100 or by each.  
Local Procurement: Order #AD54AH, from  
USM Corp., "Pop" Rivet Division  
Shelton Ct 06484 or distributors  
(Available only in quantities of 8000 rivet packages from  
distributors.)

ITEM 14 NSN 8040-00-851-0211  
Adhesive, Silicone Rubber (DC 732, Black, 5 oz tube, this is a  
GSA Item.) same as Silastic RTV 732. Adhesive/Sealant, Black,  
Dow Corning Corp., Midland, Michigan 48540.  
Local Procurement: Any Dow Corning Silastic RTV 732, black  
preferred, clear, translucent, or aluminum next; and white last  
choice. Incollapsible tubes. Cartridge may be used but requires  
caulking gun. Do not stock large amounts of sealant. Order as  
required as sealant has a shelf life.  
The following General Electric silicone sealants may be used as  
an alternate:

RTV-103 Black (preferred), 12 oz tube, GSA Item NSN 8040-00-828-7385

RTV-108 Translucent

RTV-109 Aluminum, 12 oz tube, GSA Item NSN 8040-00-142-9823

RTV-102 White (least preferred)

ITEM 15 Order from QPL  
Sealing compound, Temperature-Resistant, Integral Fuel  
Tanks and Fuel Cell Cavities, High adhesion per MIL-S-8802.  
Class B-2. Do not stock large amounts of sealant. Order as  
required as sealant has a shelf life. This is a two part sealant  
which must be mixed per manufacturers instructions prior to  
use.

ITEM 16 Commercial Item

Tape, electrically conductive pressure sensitive, part number  
Eccoshield PST-C, 4 inches wide.  
Emerson and Cuming, Inc.  
Canton, MA 02021

OR

Tape, electrically conductive pressure sensitive, Scotch Brand  
Electrical Tape #1181, 4 inches wide.  
3M Company  
Boston, MA 02100

ITEM 17 NSN 5120-00-294-4605  
Knife, putty, high grade steel, Blade 3 1/2 inches long X 1 1/4  
inches wide, semiflexible, Fed Spec GGG-K-481 Type IV Class 2.  
This is a GSA Item Local Procurement: Any stiff blade putty  
knife with blade approximately 3 1/2 inches long X 1 inch wide.

ITEM 18 NSN 5133-00-189-9265  
Drill Twist, 0.161 diameter (#20) high speed steel. Fed Spec  
GGG-D-751.  
This is a GSA Item having 12 drills per package.  
Local Procurement: Standard drill(s) of correct diameter.

ITEM 19 NSN 5315-00-058-6011  
Pin, spring, tubular, slotted, .312 inches dia X 2 inches long, .062  
wall, Cadmium Plated Carbon Steel per MS16562-74.  
Local Procurement: Any steel or stainless steel tubing or pipe  
approximately sized per above.

ITEM 20 NSN 5120-00-017-2849  
Riveter, heavy duty, for 3/32, 1/8, 5/32, and 3/16 diameter  
Rivets. This is a GSA Item.

OR NSN 5120-00-970-6425

Riveter. This is an item in Tool Kit TK-144/G.  
OR

Commercial Item

Gun, "Pop" Rivet, Model #PRG 111 (or equal)  
USM Corp., "POP" Rivet Division  
Shelton Ct 06484

ITEM 21 NSN 3455-00-268-9695

Rotary File, 1/4 inches diameter shank, tapered or conical shape,  
5/16 inches diameter X 1 inch long (approx), coarse cut, high  
speed steel.

Local Procurement: Per above description other shapes per-  
mitted providing end fits into 1/8 inch diameter hole and has  
surface for routing.

c. Repair of a small minor break in a shelter  
without an EMI suppression requirement.

(1) Select a patch from Item 1 through Item 7  
that overlaps the damaged area at least by 1 inch in  
all directions.

(2) Position the patch over the damaged area  
and scribe a line on the skin all around the patch.

(3) Spotting from a corner hole in the patch,  
drill a .161 inch diagonal hole through the patch and  
the skin. Use drill (Item 18) and pin (Item 19) which  
is to act as a stop. To do this place the drill inside  
the pin and set the drill in the drill chuck such that  
7/16 inch to 9/16 inch of the drill is exposed when the  
pin is against the chuck jaws.

(4) Place a rivet (Item 13) in the drilled hole to  
act as a locating pin.

(5) Drill the diagonally opposite hole and pin  
with a rivet.

(6) Drill the other two corner holes and pin.

(7) Drill the remaining holes.

(8) Remove the rivets and patch. Remove any  
loose or flaking paint and foreign matter from the  
skin area within the scribed lines with abrasive  
paper (Item 8). It is not necessary to remove sound  
paint prior to patching.

(9) Degrease the area and the matching surface  
of the patch. Use the cloth (Item 9) soaked with  
Toluene (Item 11). Allow to dry.

(10) Degrease the correct number of rivets in  
toluene and allow to dry.

(11) Coat the surface area within the scribed  
lines with sealant (Item 14 or 15). Fill in the skin  
break and drilled holes. Use a clean tongue  
depressor (Item 10) to spread the sealer. Proceed  
rapidly as the sealant cures quickly.

(12) Position the patch.

(13) Install a rivet in the gun (Item 20) touching  
the mandrel only. Coat the 5/32 inch diameter of the  
rivet with sealant, place a central hole of a long side,  
and upset the rivet. Repeat for the opposite side. In-  
stall rivets in a progressive order from the installed  
rivets working both directions and both sides to the  
corners. Proceed in the same manner for the ends.

(14) Remove all excess sealant from the patch  
and skin surfaces except for patch fillets and rivet



head fillets. Do not use any solvents to remove the sealant.

(15) Allow sealant 24 hours to dry. It is recommended that this drying time be at room temperature (above 65° F).

(16) Repaint as required (see para 37).

d. Repair of small major break in a shelter without an EMI suppression requirement.

(1) The surface area where the patch is to be placed must be flat. Cut away all wrinkled areas above the skin surface. Bend below the skin surface all small jagged portions of the skin that protrude. Large jagged portions of the skin where the original insulation underneath is badly crushed, broken or missing are to be cut away. Be careful not to delaminate the panel any more than it is. Bend the remaining jagged portions below the skin.

(2) When cutting away the skin it is best that the portion removed be of a simple shape such as a rectangle. Mark a line around the portion to be removed.

(3) Remove damaged skin with a circular saw (an item in Tool Kit TK-144/G, Appendix E) or with a router if these are available. Otherwise, remove the damaged skin as follows:

(a) Drill a series of closely spaced holes in the line around the portion to be removed.

(b) Remove the webs between the holes using the rotary file (Item 21) in the electric hand drill.

(4) Remove the foam to the opposite skin or to the glue line if it is sound, using the knife, (Item 17). It is assumed that the inner skin is essentially not damaged.

(5) Prepare new foam (Item 12) to fit the volume that was removed. It is best if a single piece of foam is used. The new foam, when in place, shall be flush with the surrounding skin.

(6) Select a patch from Item 1 through Item 7 that overlaps the damaged area at least by 1 inch in all directions.

(7) Position the patch over damaged area and scribe a line on the skin all around the patch.

(8) Spotting from a corner hole in the patch, drill a .161 inch diagonal hole through the patch and the skin. Use drill (Item 18) and pin (Item 19) which is to act as a stop. To do this place the drill inside the pin and set the drill in the drill chuck such that 7/16 inch to 9/16 inch of the drill is exposed when the pin is against the chuck jaws.

(9) Place a rivet (Item 13) in the drilled hole to act as a locating pin.

(10) Drill the diagonally opposite hole and pin with a rivet.

(11) Drill the other two corner holes and pin.

(12) Drill the remaining holes.

(13) Remove the rivets and patch. Remove any loose or flaking paint and foreign matter from the skin area within the scribed lines with abrasive

paper (Item 8). It is not necessary to remove sound paint prior to patching.

(14) Degrease the area and the matching surface of the patch. Use the cloth (Item 9) soaked with Toluene (Item 11). Allow to dry.

(15) Degrease the correct number of rivets in toluene and allow to dry.

(16) Liberally coat the cavity surfaces and the piece of foam that is to fit the cavity with sealant (Item 14 or 15). Proceed rapidly as the sealant cures quickly.

(17) Position the coated foam in the cavity.

(18) Coat the surface area within the scribed lines with sealant (Item 14 or Item 15). Fill in the drilled holes. Use a clean tongue depressor (Item 10) to spread the sealer.

(19) Position the patch.

(20) Install a rivet in the gun (Item 20) touching the mandrel only. Coat the 5/32 inch diameter of the rivet with sealant, place in a central hole of a long side, and upset the rivet. Repeat for the opposite side. Install rivets in a progressive order from the installed rivets working both directions and both sides to the corners. Proceed in the same manner for the ends.

(21) Remove all excess sealant from the patch and skin surfaces except for patch fillets and rivet head fillets. Do not use any solvents to remove the sealant.

(22) Allow sealant 24 hours to dry. It is recommended that this drying time be at room temperature (above 65° F).

(23) Repaint as required (see para 37).

e. Repairs of shelters which have an EMI Suppression Requirement.

(1) Shelters which have an EMI suppression requirement will be required in the same manner as the previously described repairs with the exception that prior to applying the sealant and patch to the puncture, the following procedures shall be performed:

(2) Using the abrasive paper (Item 8), remove all paint or foreign matter from the skin surrounding the puncture at least 1 inch past the puncture in all directions. This bare metal area is required for achieving adequate EMI shielding.

(3) Clean the area using the cloth (Item 9) soaked with toluene (Item 11). Allow to dry.

(4) Cover the puncture with electrically conductive tape (Item 16). How the puncture is to be covered with the electrically conductive tape should be planned before actually applying the tape. The tape should overlap the puncture by at least 1 inch in all directions. If more than one width of tape is required, each strip should overlap the previous strip by at least one inch. If 3 or more strips are required the center strip(s) should be applied first.

(5) Continue the repair as for shelters without an EMI suppression requirement. Note that the aluminum patch shall completely cover any conductive tape which has been applied.

**25. Damaged structural member.** A structural member that contains a puncture or a dent which is severe enough to cause distortion of the opposite

surface of the panel will normally be considered unrepairable. In these cases an evaluation should be made to determine if the damage is severe enough to render the shelter unusable. Under no circumstances should a structural member be replaced or repaired.

## CHAPTER VI

### GENERAL SUPPORT MAINTENANCE

---

**26. General** *a.* Before performing any puncture repairs, determine if the shelter must meet the requirements for EMI suppression. If the shelter is a part of a communication assemblage, or will be used as a replacement shelter for such an assemblage, refer to the technical manuals covering the communication assemblage and the installed equipment to determine if the EMI requirement must be met. After repair of the shelter, test the adequacy of EMI suppression as described in MIL-STD-285 (see para 38d(3)).

*b.* Clean and service air filters, rubber gaskets, and EMI gaskets, when required (replace only when necessary) on all repaired shelters being returned to the user. Replace all air filters, rubber gaskets, and EMI gaskets when required on repaired shelters being returned to stock. When replacing rubber gaskets, be sure that the gasket channel is thoroughly cleaned. Secure replacement rubber gaskets with the silicone adhesive sealant authorized on the repair parts and special tools list for the end item equipment. Check to verify that the gaskets of the doors and covers seat properly as follows:

(1) A piece of paper .005 inch maximum thickness by 2½ inches wide will be used as a gage. The center of the top and bottom edges of each door, 3 places along both sides of the door, the center of the bottom of each cover, and 2 places along both sides of each cover shall be inspected as follows: The door or cover shall be closed so that the paper is between the weather gasket and its bearing surface (but not under the EMI gasket if so equipped). The paper shall be withdrawn while the door or cover is closed. The absence of any resistance to the withdrawal indicates that the gasket is not touching its bearing surface. If this condition is found, the gasket compression shall be increased in the appropriate manner and this inspection shall be repeated. Obtaining correct gasket compression may entail replacing the gasket if it is in poor condition or has been installed improperly (i.e. kinked or poorly spliced). If the gasket is in good condition and has been installed properly, it may be necessary to change the thickness of the latch keeper shims, the hinge butt shims, the hinge strap shims, or the roller latch washer shims. Inspection of the particular latching mechanism being adjusted will reveal the type of shim adjustment which is most appropriate to achieve correct gasket compression. Do not add or remove shims haphazardly. Ensure that the latches contact their respective keepers

when the latch is closed. Any hinge shims changed or added during rework shall be completely coated with sealant (Item 14 or item 15 in paragraph 24*b* before installation. If the shelter has an EMI suppression requirement, compound no. 4660 of Chomerics, Inc., Arlington, MA, and sealant (item 14 or 15 in para 24*b*) will be reapplied in the same location as the original material. Refinish when required in accordance with paragraph 37. Note that after any adjustments to hinges are made, the door shall be capable of opening and closing to its full extent without binding, and maximum operating torque of the door latch shall not exceed values given in the table of paragraphs 38d(4) (*a*).

*c.* Replacement. All maintenance parts secured with rivets and threaded fastening devices may be replaced. Replacement of damaged shelter skirts, interior hardware, mounting brackets, fixtures, etc., secured with rivets, will be replaced utilizing appropriate fasteners. Damaged shelter skid replacement is covered in paragraph 31. Rivnut and fastening device replacement procedures are covered in paragraph 30.

**27. Tools and Materials Required.** *A. Tools.* Appendix D is a list of tools from which the required tools should be selected if not noted in a given maintenance procedure.

*b. Materials.* Appendix C is a list of materials from which the required materials should be selected if not noted in a given maintenance procedure.

**28. Repair of delaminated areas.** A delaminated panel area results when the shelter skin is broken loose from the foam core. A delaminated panel area is characterized by a dull, hollow sound when tapped with a coin, as opposed to the tight, drum-like sound of an intact panel. Delaminated panels are never greatly distorted physically. Delaminations may occur on the interior of the shelter or the exterior of the shelter. Repair should be performed as follows:

*a. Interior.* When a delamination is on the interior of the shelter and it spans over a structural member, the skin must be secured to the structural member (when the delamination does not span over a structural member, no repair need be performed). Use 3/16 inch closed-end blind aluminum countersunk rivets (AK66H "Pop" rivet supplied by USM Corp., "Pop" Rivet Division, Shelton, CT. 06484 or equivalent rivets) evenly spaced on 4 inch centers to secure the skin to the structural member such that the heads of the rivets are flush with the skin sur-

face. Each rivet shall be dipped in sealant (item 14 or 15 in para 24b) prior to installation to preclude moisture from entering the interior of the shelter panel. Do not attempt to rebond the skin to the core as the likelihood of obtaining a durable repair of this type is very low.

*b. Exterior.* When a delamination is on the exterior of the shelter, it need not be repaired provided there are good welds holding the skin to the structural members. If the spot welds are not adequately holding the skin to the structural members, use 5/32 inch closed-end blind all aluminum rivets (Item 13 in para 24b) to secure the skin to the structural members. Each rivet shall be dipped in sealant (Item 14 or 15 in para 24b) prior to installation to preclude moisture from entering the interior of the shelter panel. Do not attempt to rebond the skin to the core as the likelihood of obtaining a durable repair of this type is very low.

**29. Replacing towing and lifting eyes.** When a damaged towing or lifting eye fitting is replaced, the following should apply:

*a.* Whether or not the original fitting was installed with sealant, on the inner surface, the repaired or replacement fitting shall be installed with its inner surfaces completely coated except for the area in back of the swivel eye, with the sealant specified as item 14 or item 15 in paragraph 24b. A bead of this sealant will also be placed around the edge of the installed towing or lifting eye fitting.

**30. Replacing rivnuts or fastening devices.** Following the procedures in *a* below, when replacing rivnuts or fastening devices, and follow the procedures in *b* below to ensure that all rivnuts are properly seated. All exposed exterior rivnuts which require replacement will be replaced with stainless steel rivnuts.

Rivnut Size	Drill Size	Seating test Torque (inch-pounds)		Maximum assembly torque (inch-pounds)			
		Steel	SS*	Aluminum	Steel	SS*	Aluminum
#6	#12	13	15	4	24	30	12
#8	#2	21	38	9	38	45	16
#10	E	23	38	12	45	60	25
1/4	Q	51	78	30	130	160	60
5/16	Z	70	115	46	156	260	100
3/8	12.5mm	131	210	83	344	400	190

\* Stainless steel

**31. Replacing damaged shelter skids.** Replacement of damaged shelter skids can generally be accomplished by unbolting the damaged skid and replacing it with a new skid. Some older shelters, however, had the skids installed with rivets rather than threaded fasteners. When it is necessary to replace a damaged shelter skid that was originally riveted to the shelter, use mounting inserts, if feasible, to secure the new skid to the shelter. Follow

*a. Replacement Procedure.*

(1) Drill out the damaged rivnut or fastening device with an appropriate sized drill (see table in *b* below).

(2) Use the depth and angle gage in the TK- 144/G (Appendix E ) to measure the thickness of the material where the rivnut will be installed.

**CAUTION**

This measurement determines the grip range requirement of the replacement rivnut and should account for airgaps, paint, or burrs-in the thickness of the materials which cannot be removed.

(3) Select the proper grip range replacement rivnut, and use the applicable rivnut heading tool to install the rivnut.

**CAUTION**

When securing maintenance parts to the rivnuts, use the torque indicating wrench and do not tighten bolts or screws beyond the maximum assembly tightening torque (*b* below).

*b. Seating Test.* When properly seated the rivnuts should not turn when the torque load listed in the table is applied. To test for proper seating use a hexagonal nut threaded on a hexagonal head screw. Turn the screw into the rivnut six (6) complete turns. Hold the screw stationary and tighten the nut down against the rivnut head, as a jam nut. Apply the required seating test torque in the clockwise direction using the torque wrench in TK-144/G (Appendix E). Do not exceed the maximum assembly torque shown in the table. Repeat the test in the counterclockwise direction.

the procedures in *a* through *f* below and refer to figure 8 when replacing damaged shelter skids.

*a.* Drill out the rivets, and remove the shelter skids.

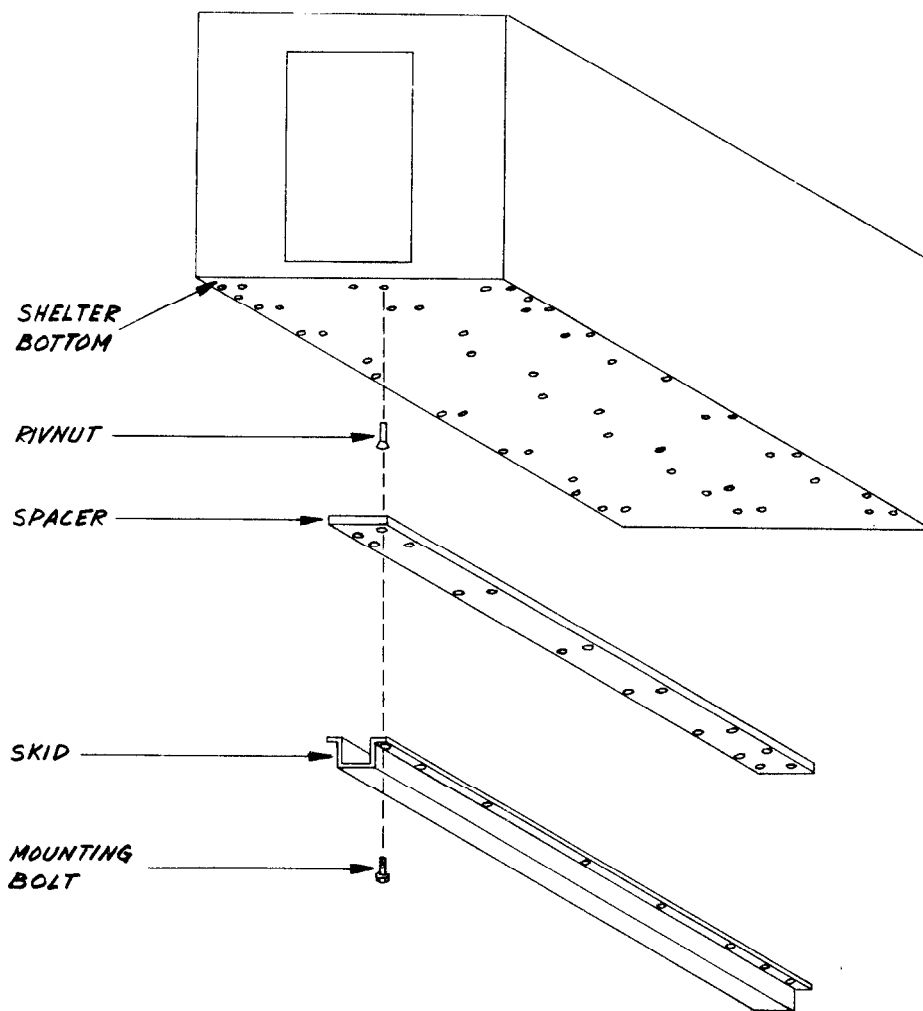
*b.* Use 5/16-inch rivnuts of appropriate length and install the rivnuts dipped in sealant (item 14 or item 15 in para 24b) in the shelter bottom with the applicable rivnut heading tool as instructed in paragraph 30.

c. Prepare a sheet aluminum spacer .001 to .003 inch thinner than the head of the rivnut.

d. Use the skid as a template to mark the spacer, and drill clearance holes for the rivnut head.

e. Position the spacer and skid, and secure them by tightening the mounting bolts into the rivnuts.

f. Prime and paint the exposed aluminum surfaces (para 37).



EL5VT008

Figure 8. Shelter Skid Replacement, Exploded View. (For Skids Originally Riveted to the Shelter)

**32. Skin repairs.** a. Apply permanent aluminum patches to all skin punctures that do not exceed  $4\frac{3}{4}$  inches by  $10\frac{3}{4}$  inches as specified in paragraph 24. Larger punctures will be repaired as described below. All temporary patches should be removed and replaced. All skin patches applied at lower categories of maintenance must be checked for soundness and any aluminum patches secured with self-tapping screws must be removed and replaced with riveted skin patches. A skin break is minor when it is essentially an indentation accompanied by a split or hole and the foam insulation underneath is intact. A major break is where the skin is jagged and wrinkled and the original foam insulation has to be restored. A skin break involves a single skin only. A puncture through the shelter

wall involves both the inner and outer skins. If the shelter has an EMI suppression requirement, the procedures described in paragraph 32h must be included in the repair.

b. Paragraph 24b lists items with their procurement data required as a minimum to make the repair(s). Item numbers used in this section refer to items in paragraph 24b.

c. Repair of a large minor break (damaged area larger than  $10\frac{3}{4}$  inches X  $4\frac{3}{4}$  inches) in a shelter without an EMI suppression requirement.

(1) The repair procedure is basically the same as for small minor breaks (para 24c) except larger patches will be required.

(2) Fabricate a patch in accordance with figure 7 except the size of the patch shall be such that it

will overlap the damaged area at least by 2 inches in all directions. Hole spacing may be increased to 2 inch centers maximum spacing along any edge when the distance between two corner holes exceeds 20 inches

(3) Position the patch over the damaged area and scribe a line on the skin all around the patch.

(4) Spotting from a corner hole in the patch, drill a .161 inch diagonal hole through the patch and the skin. Use drill (Item 18) and pin (Item 19) which is to act as a stop. To do this place the drill inside the pin and set the drill in the drill chuck such that 7/16 inch of the drill is exposed when the pin is against the chuck jaws.

(5) Place a rivet (Item 13) in the drilled hole to act as a locating pin.

(6) Drill the diagonally opposite hole and pin with a rivet.

(7) Drill the other two corner holes and pin.

(8) Drill the remaining holes.

(9) Remove the rivets and patch. Remove any loose or flaking paint and foreign matter from the skin area within the scribed lines with abrasive paper (Item 8). It is not necessary to remove sound paint prior to patching.

(10) Degrease the area and the matching surface of the patch. Use the cloth (Item 9) soaked with Toluene (Item 11). Allow to dry.

(11) Degrease the correct number of rivets in toluene and allow to dry.

(12) Coat the surface area within the scribed lines with sealant (Item 14 or 15). Fill in the skin break and drilled holes. Use a clean tongue depressor (Item 10) to spread the sealer. Proceed rapidly as the sealant cures quickly.

(13) Position the patch.

(14) Install a rivet in the gun (Item 20) touching the mandrel only. Coat the 5/32 inch diagonal of the rivet with sealant, place in a central hole of a long side, and upset. Repeat for the opposite side. Install rivets in a progressive order from the installed rivets working both directions and both sides to the corners. Proceed in the same manner for the ends.

(15) Remove all excess sealant from the patch and skin surfaces except for patch fillets and rivet head fillets. Do not use any solvents to remove the sealant.

(16) Allow sealant 24 hours to dry. It is recommended that this drying time be at room temperature (above 65° F).

(17) Repaint as required (see para 37).

d. Repair of a large major break (damaged area larger than 10 3/4 inches X 4 3/4 inches) in a shelter without an EMI suppression requirement.

(1) The surface area where the patch is to be placed must be flat. Cut away all wrinkled areas above the skin surface. Bend below the skin surface all small jagged portions of the skin that protrude.

Large jagged portions of the skin where the original insulation underneath is badly crushed, broken or missing are to be cut away. Be careful not to delaminate the panel any more than it is. Bend the remaining jagged portions below the skin.

(2) When cutting away the skin it is best that the portion removed be of a simple shape such as rectangle. Mark a line around the portion to be removed.

(3) Remove damaged skin with a circular saw (an item in Tool Kit TK-144/G, Appendix E) or with a router.

(4) Remove the foam to the opposite skin or to the glue line if it is sound, using the knife (Item 17). It is assumed that the inner skin is essentially not damaged.

(5) Prepare new foam (Item 12) to fit the volume that was removed. Foam blocks larger than these described in Item 12 maybe desirable for large repairs as it is best if a single piece of foam is used. The new foam, when in place, shall be flush with the surrounding skin.

(6) Fabricate a patch in accordance with figure 7 except the size of the patch shall be such that it will overlap the damaged area at least by 2 inches in all directions. Hole spacing may be increased to 2 inches centers maximum spacing along any edge when the distance between two holes exceeds 20 inches.

(7) Position the patch over the damaged area and scribe a line on the skin around the patch.

(8) Spotting from a corner hole in the patch, drill a .161 inch diagonal hole through the patch and the skin. Use drill (Item 18) and pin (Item 19) which acts as a stop. To do this place the drill inside the pin and set the drill in the drill chuck such that 7/16 inch to 9/16 inch of the drill is exposed when the pin is against the chuck jaws.

(9) Place a rivet (Item 13) in the drilled hole to act as a locating pin.

(10) Drill the diagonally opposite hole and pin with a rivet.

(11) Drill the other two corner holes and pin.

(12) Drill the remaining holes.

(13) Remove the rivets and patch. Remove any loose or flaking paint and foreign matter from the skin area within the scribed lines with abrasive paper (Item 8). It is not necessary to remove sound paint prior to patching.

(14) Degrease the area and the matching surface of the patch. Use the cloth (Item 9) soaked with Toluene (Item 11). Allow to dry.

(15) Degrease the correct number of rivets in toluene and allow to dry.

(16) Liberally coat the cavity surfaces and the piece of foam that is to fit the cavity with sealant (Item 14 or Item 15). Proceed rapidly as the sealant cures quickly.

(17) Position the coated foam in the cavity.

(18) Coat the surface area within the scribed lines with sealant (Item 14 or 15). Fill in the drilled holes. Use a clean tongue depressor (Item 10) to spread the sealer.

(19) Position the patch.

(20) Install a rivet in the gun (Item 20) touching the mandrel only. Coat the 5/32 inch diameter of the rivet with sealant, place in a central hole of a long side, and upset. Repeat for the opposite side. Install rivets in a progressive order from the installed rivets working both directions and both sides to the corners. Proceed in the same manner for the ends.

(21) Remove all excess sealant from the patch and skin surfaces except for patch fillets and rivet head fillets. Do not use any solvents to remove the sealant.

(22) Allow sealant 24 hours to dry. It is recommended that this drying time be at room temperature (above 65° F).

(23) Repaint as required (see para 37).

e. Repair of a puncture through the shelter wall but not adjacent to a structural member in a shelter without an EMI suppression requirement.

(1) If equipment has been installed in the shelter, remove the equipment from the racks as required. In the area of the puncture, mark the position of the racks and then remove them. An effort shall be made to install the patch and rivets so they will not interfere with the racks.

(2) The surfaces where the patches are to be applied must be flat. Cut away all wrinkled and/or jagged portions of the skin that protrude above the original skin surfaces. Define the area to be removed as a simple shape such as a rectangle. Remove the damaged skin with a circular saw (an item in TK-144/G, Appendix E) or a router. Cut away the damaged insulation to the skins using the knife (Item 17) or other cutting tool. Exercise care not to delaminate the skins at the hole circumference.

(3) Prepare new foam (Item 12), to fit the hole. The use of insulation blocks larger than as specified in Item 12 may be desirable for large repairs as it is best if a single piece of foam is used. Insulation must be flush with both skin surfaces when installed.

(4) Select a patch for the outer skin from Item 1 through Item 7 that overlaps the damaged area at least 1 inch in all directions. If patches as described in Item 1 through Item 7 are not large enough to properly cover the damaged area, fabricate a patch in accordance with figure 7 except the size of the patch shall be such that it will overlap the damaged area at least by 2 inches in all directions. Hole spacing may be increased to 2 inch centers maximum spacing along any edge when the distance between two corner holes exceeds 20 inches.

(5) Fabricate a patch for the inner skin in ac-

cordance with figure 7 except the holes shall be countersunk to their full thickness to accept the head of a 120° countersunk 5/32 inch diagonal rivet and the size of the patch shall be such that it will overlap the damaged area at least by 1 inch in all directions for small punctures (less than 10% inches X 4¾ inches) or by at least 2 inches in all directions for larger punctures. Hole spacing may be increased to 2 inch centers maximum spacing along any edge when the distance between two corner holes exceeds 20 inches.

(6) position the inner patch over the damaged area and scribe a line on the skin all around the patch.

(7) Hold the patch in place or temporarily tape the patch in place and using a center-punch, mark the location of each of the holes on the shelter.

(8) Remove the patch.

(9) Drill a .161 inch diameter hole in each center-punched location. Use drill (Item 18) and pin (Item 19) which is to act as a stop. To do this, place the drill inside the pin and set the drill in the drill chuck such that 7/16 inch to 9/16 inch of the drill is exposed when the pin is against the chuck jaws.

(10) Remove any loose or flaking paint and foreign matter from the skin area within the scribed lines with abrasive paper (Item 8). It is not necessary to remove sound paint prior to patching.

(11) Degrease the area on the shelter, the matching surface of the patch, and the correct number of countersunk rivets with toluene (Item 11). The rivets to be used on the shelter interior are 5/32 inch closed-end blind aluminum countersunk rivets (AK52H "pop" rivets supplied by USM Corp., "Pop" Rivet Division, Shelton, CT 06484 or equivalent).

(12) Allow degreased parts to dry.

(13) Position the outer patch over the damaged area on the outside of the shelter and scribe a line on the skin all around the patch.

(14) Spotting from a corner hole in the outer patch, drill a .161 inch diameter hole through the patch and the skin. Use drill (Item 18) and pin (Item 19) which is to act as a stop. To do this place the drill inside the pin and set the drill in the drill chuck such that 7/16 inch of the drill is exposed when the pin is against the chuck jaws.

(15) Place a rivet (Item 13) in the drilled hole to act as a locating pin.

(16) Drill the diagonally opposite hole and pin with a rivet.

(17) Drill the other two corner holes and pin.

(18) Drill the remaining holes.

(19) Remove the rivets and outer patch. Remove any loose or flaking paint and foreign matter from the skin area within the scribed lines with abrasive paper (Item 8). It is not necessary to remove sound paint prior to patching. Degrease the

area, the matching surface of the patch, and the correct number of rivets (Item 13) with Toluene (Item 11). Allow to dry.

(20) Coat the inner surface of the inner skin patch with sealant (Item 14 or Item 15). Proceed rapidly as the sealant cures quickly.

(21) Position the patch.

(22) Install a countersunk rivet in the gun touching the mandrel only. Coat the rivet with sealant, place in a central hole of a long side, and upset. Repeat for the opposite side. Install rivets in a progressive order from the installed rivets working both directions and both sides to the corners. Proceed in the same manner for the ends.

(23) Remove all excess sealant from the patch and skin surfaces except for patch fillets and around the rivet heads. Do not use any solvents to remove the sealant.

(24) Move to the exterior of the shelter. Liberally coat the cavity surfaces and the peice of foam that is to fit the cavity with sealant (Item 14 or Item 15). Position the coated foam in the cavity.

(25) Coat the surface area within the scribed lines with sealant (Item 14 or Item 15). Fill in the drilled holes. Use a clean tongue depressor (Item 10) to spread the sealer.

(26) Position the patch.

(27) Install a rivet in the gun (Item 20) touching the mandrel only. Coat the rivet with sealant, place in a central hole of a long side, and upset. Repeat for the opposite side. Install rivets in a progressive order from the installed rivets working both directions and both sides to the corners. Proceed in the same manner for the ends.

(28) Remove all excess sealant from the patch and skin surfaces except for patch fillets and rivet head fillets. Do not use any solvents to remove the sealant.

(29) Allow sealant 24 hours to dry. It is recommended that this drying time be at room temperature (above 65° F).

(30) Repaint both interior and exterior as required (see para 37).

*f.* Repair of a puncture through the shelter wall adjacent to a structural member in a shelter without an EMI suppression requirement.

(1) These repairs shall be made in accordance with preceding paragraph 32e except the following notes apply:

(a) Ensure that the structural member is sound before proceeding with repairs (see para 25).

(b) If rivnuts have been installed in structural members in the area requiring patching it is necessary to drill clearance holes "through the patch to allow access to the rivnuts and to allow the patch to fit flush against the skin.

(c) Where the patch spans over a structural member on the inside of the shelter a different coun-

tersunk rivet is required from that used in the remainder of the patch due to the large difference in the grip range. It is necessary to use a 3/16 inch diameter rivet in these areas to obtain the required grip range. Use 3/16 inch closed-end blind aluminum countersunk rivets (AK66H "Pop" rivet supplied by USM Corp., "Pop" Rivet Division, Shelton, CT 06484 or equivalent rivets).

*g.* Repair of Multiple Minor Skin Punctures in a shelter without an EMI suppression requirement. When an area of a panel surface is damaged by multiple minor skin punctures which are close together, it may be desirable or necessary to cover two or more punctures with one large patch. When repairs of this nature are performed, follow the same procedure as used for repairs of large minor skin breaks (para 32c). If the patch extends over a structural member, it shall also be secured to the structural member by rivets into at least one flange of the structural member.

*h.* Repairs of shelters which have an EMI Suppression Requirement.

(1) Shelters which have an EMI suppression requirement will be repaired in the same manner as the previously described repairs with the exception that prior to applying the sealant and patch to the puncture, the following procedures shall be performed.

(2) Using the abrasive paper (Item 8) remove all paint or foreign matter from the skin surrounding the puncture at least 1 inch past the puncture in all directions. This bare metal is required for achieving adequate EMI shielding.

(3) Clean the area using the cloth (Item 9) soaked with toluene (Item 11.) Allow to dry.

(4) Cover the puncture with electrically conductive tape (Item 16). How the puncture is to be covered with the electrically conductive tape should be planned before actually applying the tape. The tape should overlap the puncture by at least 1 inch in all directions. If more than one width of tape is required, each strip should overlap the previous strip by at least one inch. If 3 or more strips are required the center strip(s) should be applied first.

(5) Continue the repair as for shelters without an EMI suppression requirement. Note that the patch shall completely cover any conductive tape which has been applied.

**33. Damaged Structural Member.** A structural member that contains a puncture or a dent which is severe enough to cause distortion of the opposite surface of the panel will normally be considered unrepairable. In these cases an evaluation should be made to determine if the damage is severe enough to render the shelter unusable. Under no circumstances should a structural member be replaced or repaired.



**34. Marking Shelter.** Stencil the following warning notice on all sides of the S-141( )/G, S-144( )/G, and S-250( )/G shelters, near the bottom of the shelter, in conformance with MIL-M-13231:

DO NOT HANDLE WITH FORK LIFT

This notice will not be stenciled on S-280( )/G or S-318( )/G Shelters as they are designed specifically for fork lift handling.

**35. Accessories.** a. S-280( )/G Shelter Dolly Set

<i>Item</i>	<i>Drawing No.</i>	<i>NSN</i>
Bracket, Adapter, Bottom	SC-D-595002-1	5410-01-058-3512
Bracket, Adapter, Bottom	SC-D-595002-2	5410-01-058-3510
Bracket, Assembly, Side	SC-D-595004	5410-01-058-3511
Chock	SC-C-595005	5410-10-058-5672

M-720 Adapter Brackets. To mount the S-280( )/G Shelter on the M-720 dolly set, adapter brackets must first be secured to the shelter. If the shelter is not so equipped, adapter brackets may be ordered and secured in accordance with drawing SC-D-595001.

b. Four of the required parts have National Stock Numbers as listed below:

**CHAPTER VII**  
**DEPOT MAINTENANCE INCLUDING**  
**DEPOT OVERHAUL STANDARDS**

**36. Rain Flaps.** *a.* Rubber rain flaps on all top hinged louver covers and/or entrance covers should be examined and replaced if required. When replacement is required it should be accomplished in accordance with paragraph 19.

*b.* For shelters that do not have rain flaps over top hinged covers, the flaps should be added.

(1) To add flaps, use one of the materials listed in paragraph 19. For the drip molding use aluminum extrusion per Alcoa die No. 627 supplied by Alcoa Co., Pittsburgh, Pennsylvania or form a channel

from approximately 1/16 inch thick flat stock aluminum with cross sectional shape as shown in figure 9.

(2) Since all shelter entrance panels are not the same it will be necessary to adapt the materials to the particular situation encountered. Cut the rubber 3½ inches wide and long enough to permit a ½ inch overlap on each end of the hinge. Cut the drip molding to the same length as the rubber flap. The molding and rain flap should be mounted approximately 2 inches above the hinge (see figure 10).

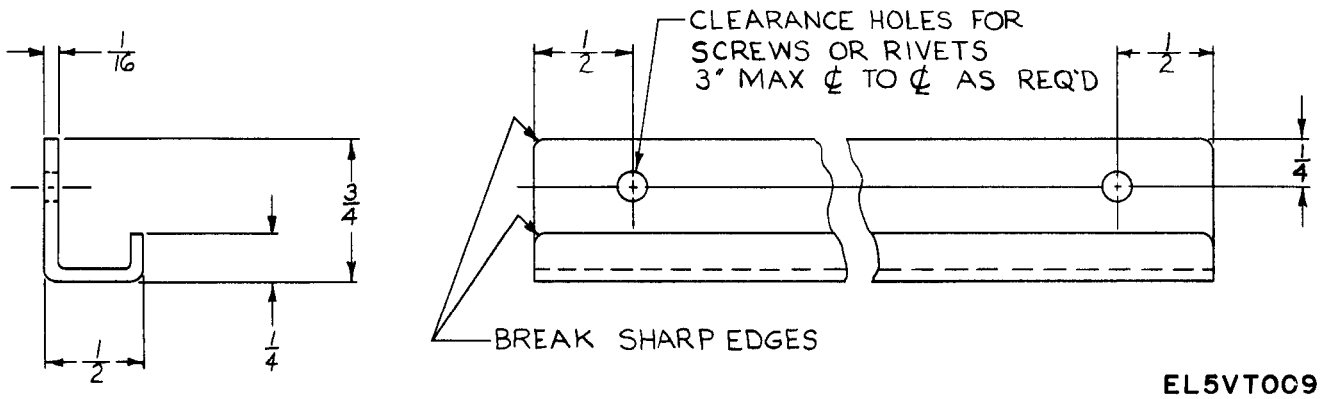


Figure 9. Drip Molding Fabrication

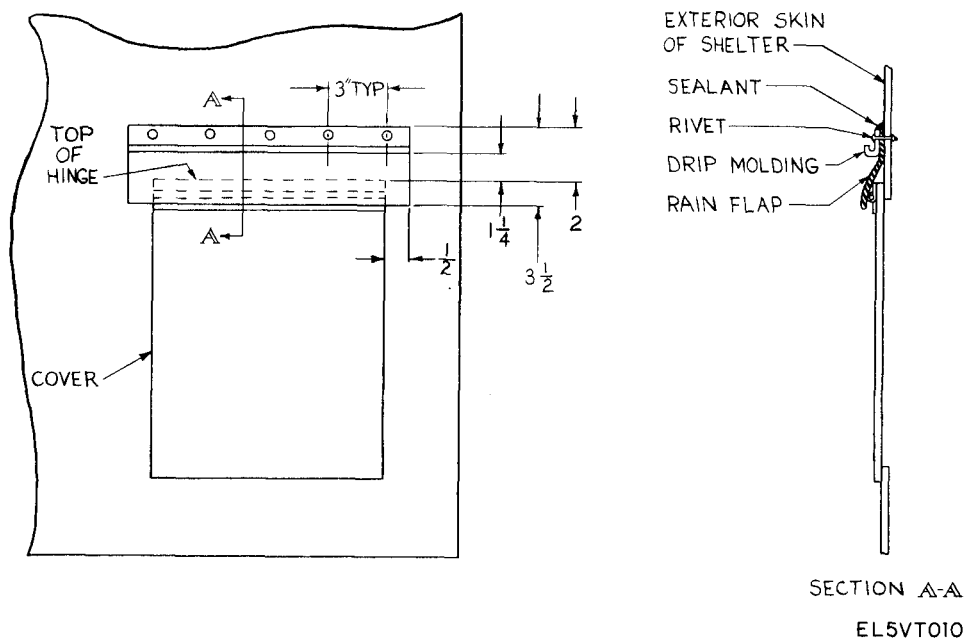


Figure 10. Rain Flap Installation

(3) Attach the drip molding and rain flap with 1/8 inch diameter aluminum closed-end blind rivets. Care must be used when installing rivets since there is a tendency to cause delamination between the skin and the foam core. Applying pressure against the outer skin will help prevent delamination.

(4) Drill clearance holes in the drip molding for the rivets spaced 3 inches apart. Make holes in the rubber flap located from the drip molding. Drill the proper size holes in the shelter located by placing the drip molding in the mounted position. Apply a heavy coat of sealer, Item 14 or 15 in paragraph 24b, to all faying surfaces and rivets when mounting the drip molding and flap.

**37. Painting.** a. *Shelter Exterior and Door Interior.* When the exterior of any shelter or the interior of the door is repainted, the paint to be used, regardless of the original paint system, shall be the alkyd enamel camouflage paint identified in this paragraph. When repainting an S-250( )/G, S-280( )/G, or S-318( )/G Shelter which has an instruction plate directing the use of MIL-E-46061 enamel, the instruction plate should be painted over. Paint to be used for repainting of shelters is as follows:

(1) *Primer.* If painting over previous coats of paint, no primer is required. If painting over bare metal surfaces, first prime with MIL-P-23377,

Primer Coating, Epoxy-Polyamide, Chemical and Solvent Resistant. Primer should be applied in a single coat to a thickness of .0102 to .0152-mm (.4 to .6 mil).

(2) *Paint.* Unless a particular camouflage pattern is specified, use the Forest Green Alkyd Camouflage Enamel base coat per MIL-E-52798. It is available in a 1-gallon container (NSN 8010-00-111-7937) and a 7 gallon container (NSN 8010-00-111-8010). Paint should be applied to a thickness of .0381 to .0508 mm (1.5 to 2.0 mils).

**NOTE**

The existing paint need not be removed before applying the Camouflage Enamel; simply clean the surface well before applying the paint. If bare metal is to be painted or if the original paint is in very poor condition, prepare the surface in accordance with the instruction in MIL-F-14072, and use finish number P510.1V.

b. *Shelter Interior.* When the interior of the shelter except the door, is to be repainted, use the following alkyd enamels:

(1) *Floor.* Use gray enamel per Federal Specification TT-E-527, Enamel, Alkyd, Lusterless. Color is per Federal Standard 595, color chip no. 36118.

(2) *Ceiling.* Use white enamel per Federal Specification TT-E-529, Class A, Enamel Alkyd, Semigloss. Color is per Federal Standard 595, color chip no. 27875.

(3) *Walls.* Use light green enamel per Federal Specification TT-E-529, Class A, Enamel, Alkyd, Semigloss. Color is per Federal Standard 595, color chip no. 24533.

(4) *Louver Assemblies.* Use lusterless black enamel per Federal Specification TT-E-527, Enamel, Alkyd, Lustreless. Color is per Federal Standard 595, color chip no. 37038.

*c. Touch up Painting.* If only touchup painting is required, touchup in accordance with paragraph 15.

*d. Marking Shelter.* After repainting, mark the shelter in accordance with paragraph 34.

**38. Depot Overhaul Standards.** *a. Applicability of Depot Overhaul Standards.* The tests outline in this section are designed to measure the mechanical performance capability of a repaired lightweight shelter. Repaired lightweight shelters that meet the minimum standards stated in the tests will furnish satisfactory performance. Applicable procedures of the depots performing these tests and the general standards for repaired electronic equipment given in TB SIG 355-1, TB SIG 355-2, and TB SIG 355-3 form a part of the requirements for testing this equipment. Tests for repaired light weight shelters are divided into two categories: The tests in (1) below apply to repairs or replacement of specific maintenance items; the tests in (2) below apply to all lightweight shelters in addition to the tests indicated in (1) below. These tests must be performed in the given sequence.

**NOTE**

Electrical and electronic performance requirements for shelter contained equipment are included in the appropriate technical manual.

(1) *Category 1 Tests*

<i>Item</i>	<i>Test paragraph</i>
Lifting eye	38c(3)
Towing eye	38c(1)
Any part secured with rivets	38c(3)
Skin patches secured with rivets	38c(4)
Rivnuts and threaded fastening devices	38c(5)
Mountings	38c(6)
Preformed rubber, gasket material and sealing stripe.	38c(7)
Stenciling	38c(8)
Nameplates and data plates	38c(9)
Floor tread	38c(10)
Finish, protective	38c(11)
Final paint film	38c(12)

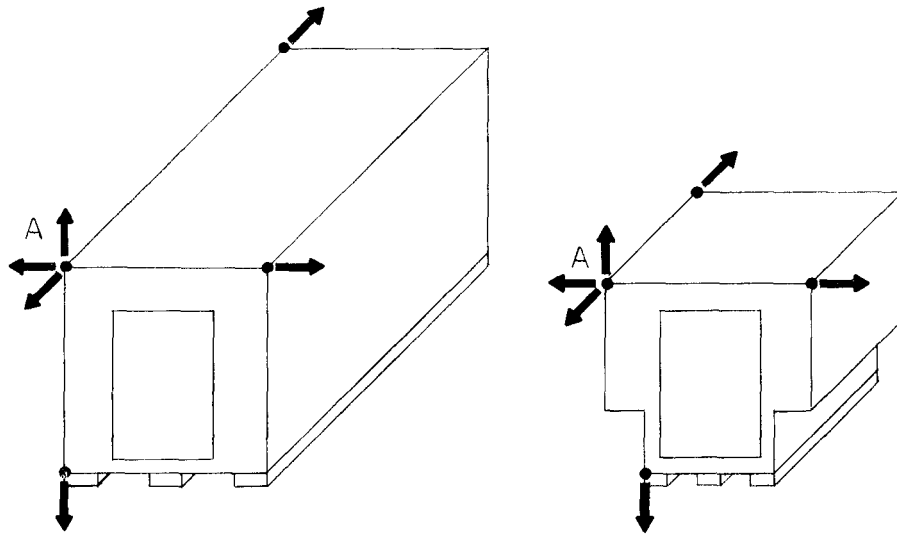
(2) *Category 2 Tests*

<i>Item</i>	<i>Test paragraph</i>
Lubrication	38d(1)
Visual and Mechanical	38d(2)
Electromagnetic Interference Suppression (to be performed only if EMI suppression is a requirement).	38d(3)
Construction Tightness	38d(4)
Lifting and Tiedown Provisions	38d(5)

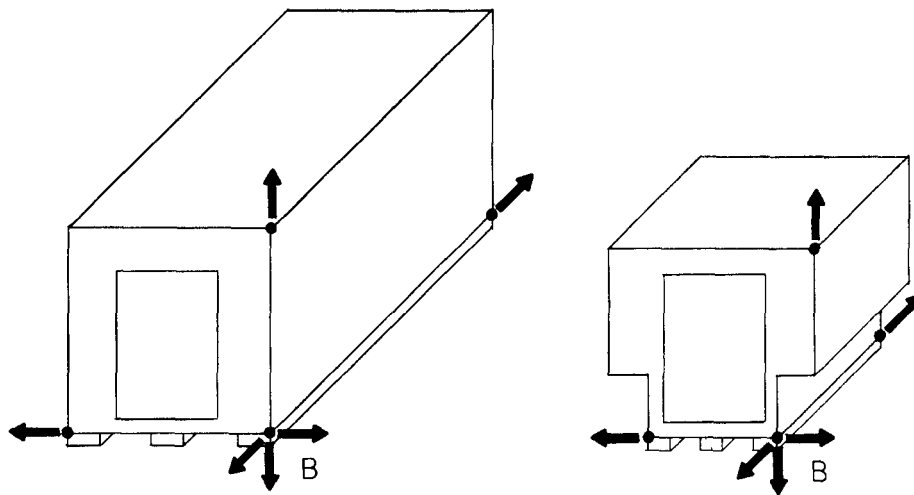
*b. Test Facilities Required*

(1) Test fixture for performing lifting eye and towing eye load test.

(2) Construction tightness test equipment including a drain fixture, manometer with 0.1 inch or less graduations, air regulator, air supply (dry filtered air) and miscellaneous rubber tubing and fittings as required. The drain fixture is a device which enables the air supply line and the manometer tubing, to be admitted to the shelter through the drain hole while sealing the drain hole to prevent air leakage. Although it is possible to use a putty-like material packed around the manometer tubing and air supply line where they enter the drain hole, a gasketed drain fixture is more desirable.



EXAMPLES FOR TESTING A LIFTING EYE AT LOCATION A



EXAMPLES FOR TESTING A TOWING EYE AT LOCATION B

EL5VT011

Figure 11. Lifting and Towing Eye Pull Load Test Directions

(3) Dynamometer or crane scale.

c. Tests for Repaired or Replaced Maintenance Items

NOTE

When performing the tests below, thoroughly check the repaired or replaced maintenance item and the surrounding area of the shelter. Cleaning processes performed during repair or replacement

should have no bad effects on the light-weight shelter.

(1) *Lifting eye.* Each lifting eye shall be subject to a tensile load, applied in each of the three mutually perpendicular directions which are described by the line of intersection of two adjacent panels (directions are as shown in figure 11). The test shall be performed by outward pulls between each adjacent pair of eyes. The test shall be made

with a suitable dynamometer having an accuracy of 1/2 of 1 percent of the indicated scale reading. The test will result in no visible cracking, weakening, or permanent deformation to the lifting eye assembly or associated shelter area, and no sealer separation or cracking around the assembly. Listed below are the applicable tensile loads for each shelter:

<i>Shelter</i>	<i>Tensile load</i> (1 b)
S-141( )/G bearing order number prior to 1963	8,000
S-141( )/G bearing order number after 1963	11,000
S-144( )/G	3,000
S-250( )/G	5,000
S-280( )/G	11,000
S-280( )/G where the pull involves a towing eye	8,000
S-318( )/G	3,000

(2) *Towing eye.* Each towing eye shall be subjected to a tensile load applied in each of the three mutually perpendicular directions which are described by the line of intersection of two adjacent panels (directions are shown in figure 11). The test shall be performed by outward pulls between each adjacent pair of eyes. The test shall be made with a suitable dynamometer having an accuracy of 1/2 of 1 percent of the indicated scale reading. The test will result in no visible cracking, weakening, or permanent deformation to the towing eye assembly or associated shelter area, and no sealer separation or cracking around the assembly. Listed below are the applicable tensile loads for each shelter:

<i>Shelter</i>	<i>Tensile Load</i> (1b)
S-141( )/G bearing an order number prior to 1963	8,000
S-141( )/G bearing an order number after 1963	11,000
S-144( )/G	3,000
S-250( )/G	5,000
S-280( )/G	8,000
S-318( )/G	3,000

(3) *Any part secured with rivets.* The thickness of countersunk metal which accepts the heads of flush rivets should be not less than the height of the rivet heads. This does not apply to rivets used for delamination repairs or patching of interior skin breaks. The distance from the center of the rivet holes to the edge of the material in which the holes are formed should be at least 1½ times the rivet diameter.

(4) *Skin patches secured with rivets.* Each riveted skin patch should show no sign of distortion or warp. All skin patches should match the original contour of the shelter skin.

(5) *Rivnuts and threaded fastening devices.* All replaced rivnuts and threaded fasteners should be monitored and tested during installation. Refer to paragraph 30 for additional instructions.

(6) *Mountings.* Brackets, lugs, flanges, inserts, bolts, and other mounting arrangements shall be

such as to retain components and parts securely when the shelter is subjected to specific service conditions.

(7) *Preformed rubber, gasket material, and sealing strips.* Preformed rubber, gasket material, and sealing strips should be neatly and evenly applied. All weather gaskets shall be secured in place with sealant. A coating of talcum powder will be applied to the exposed surfaces to prevent mating parts from sticking to each other.

(8) *Stenciling.* Stenciled markings should conform to MIL-M-13231. Except for the S-280( )/G and S-318( )/G shelters, stenciled markings shall include the warning of paragraph 34.

(9) *Nameplates and data plates.* Whenever possible, the original nameplates and data plates should be retained on the repaired shelter. If nameplates have been lost or damaged, new nameplates should conform to MIL-STD-130. Data plates must include appropriate instructions for normal transit and an aircraft loading data plate. If aircraft loading data plates have been lost or damaged, new data plates should bear the correct loading information for the repaired lightweight shelter and shall use SC-D-82768 as a guide.

(10) *Floor tread.* Replaced floor treads should be neatly and evenly applied (para 18) and withstand a dielectric test at 500 volts alternating current (at) root mean square (rms).

(11) *Finish, protective.* All reworked surface areas should have protective finish applied in accordance with MIL-F-14072 (see para 37).

(12) *Final paint film.* The final paint film shall be in accordance with paragraph 37.

*d. Tests for Each Repaired Lightweight Shelter.*

(1) *Lubrication.* All vent hinges and door mechanisms shall be disassembled and the wearing surfaces cleaned and lubricated as indicated in paragraph 14. No door latch shall exhibit any binding. Broken latch parts shall be replaced.

(2) *Visual and mechanical.* The repaired lightweight shelter shall meet the following minimum acceptable standards:

<i>Item</i>	<i>Minimum acceptable standard</i>
Assembled parts	All parts should be assembled in the proper sequence with no missing, inoperative defective, bent, broken, or otherwise damaged part which could cause malfunction or become inoperative or unsafe for service.
Hinges	All hinges should be of the proper size and type to accomplish their intended function without premature breakdown, with no noticeable interference, binding, or galling. Hinge parts shall not be removable from outside the shelter. Surfaces should be free of rust with no discoloration of the finish.
Latching devices and fasteners.	All threaded parts or devices should be of the proper type, class, and

Item	<i>Minimum acceptable standard</i>	Item	<i>Minimum acceptable standard</i>
	size with no crossed threads, or burred or mutilated heads. All screws in tapped parts should engage for a distance at least equal to the diameter of the screw. There should be no evidence of loose lock-washers or warpage or distortion of mating parts.	Welds	Welds shall not be cracked or porous
		Skids	Skids shall be properly attached and shall not be damaged.
		Towing and lifting	All towing and lifting eyes shall be properly attached and shall not be damaged.
		Floor coverings	When used, floor coverings shall be installed neatly without cuts, slits, or other damage.
Skin patches	All skin patches should be properly bonded with sealant and secured to the skin surface with no evidence of irregularities in securing devices which would produce localized stresses resulting in distortion or warping.	Drain plug	Drain plug shall be undamaged and shall be captivated.
		Doors and covers	Doors and Covers shall have satisfactory gaskets and shall operate and seal well. Door stop operate properly.
Corrosion	All surfaces of the shelter should be free of corrosion before final finish is applied.	Lift and tiedown assembly	Proper lift and tiedown assembly shall be supplied and shall not be damaged.
Riveting	There shall be no evidence of looseness, parallel to the plane of the mating surfaces from undersized rivet shank diameter or oversized holes. There shall be no evidence of looseness, perpendicular to the plane of the mating surfaces from rivets not tightly seated against bearing surfaces. Distortion or warping of mating surfaces should not exceed one thirty-second inch, and there should be no foreign material such as metal chips or dirt between riveted surfaces. All rivets shall be dipped in sealant prior to installation.	Punctures and delaminations	Panels shall have no punctures or delamination which have not been repaired in accordance with appropriate paragraphs herein,
		Mounting Member Center Lines	Mounting Member Center Line marks (V-marks or shallow holes) shall be visible. If a repair covers such a mark it shall be remarked accurately.
		Roof access steps	Roof access steps shall not be missing or damaged and shall operate smoothly
		Roof hand hold	Roof hand hold shall not be missing or damaged and shall operate smoothly
		EMI shielding	EMI shielding devices shall be properly installed when this capability is required for the shelter.
Hardware finishes	All hardware finishes should be of the proper color and should extend evenly throughout the finished area with no debris, burrs, blisters, gouge marks, checks, pits, or residuals of corrosive processing agents.	Inlet filter assembly	Inlet filter assembly shall fit properly.
		Sealing	A fillet of sealant shall be present at the edges of all overlapping joints on the outside of the shelter including hardware items such as the lifting eye castings, hinges, and roof access step pans.
Painting	All finishes should be of the proper color and adhesion with no blisters, pits, chips, cracks, flaking, or unsightly scratches. Finishes should provide adequate coverage, with no run marks, orange peel, or overspray marks and show no evidence of dirt or other foreign matter embedded in the coating.		
Castings	All castings should be free from surface cracks, porosities, blowholes, discontinuities, shrinkage, unsightly tool marks, recesses, sharp corners and inadequate fillets.		
Marking	All marking should be correct, legible, properly oriented, and in complete view. All marking materials should be of permanent type.		
Dimensions	All dimensions should be within the allowable tolerances indicated in the drawings for the particular shelter.		
Nameplates and data plates	Nameplates, aircraft loading data plates, and instruction plates shall be attached and shall be correct and eighble.		

**(3) Electromagnetic interference (EMI) suppression.** When the shelter has an electromagnetic interference (EMI) suppression requirement, it shall provide at least 60db attenuation when tested for EMI suppression in accordance with MIL-STD-285 at each of the following conditions:

(a) One frequency in the 150 to 200 KHz range for low impedance magnetic field.

(b) 0.2 MHz, 1.0 MHz for high impedance electric field.

(c) 400MHz, 1000 MHz, and 10,000 MHz for plane waves.

(4) **Construction tightness.** The shelter shall be airtight to the extent that it shall be capable of achieving and maintaining a pressurized state without leakage when tested as follows:

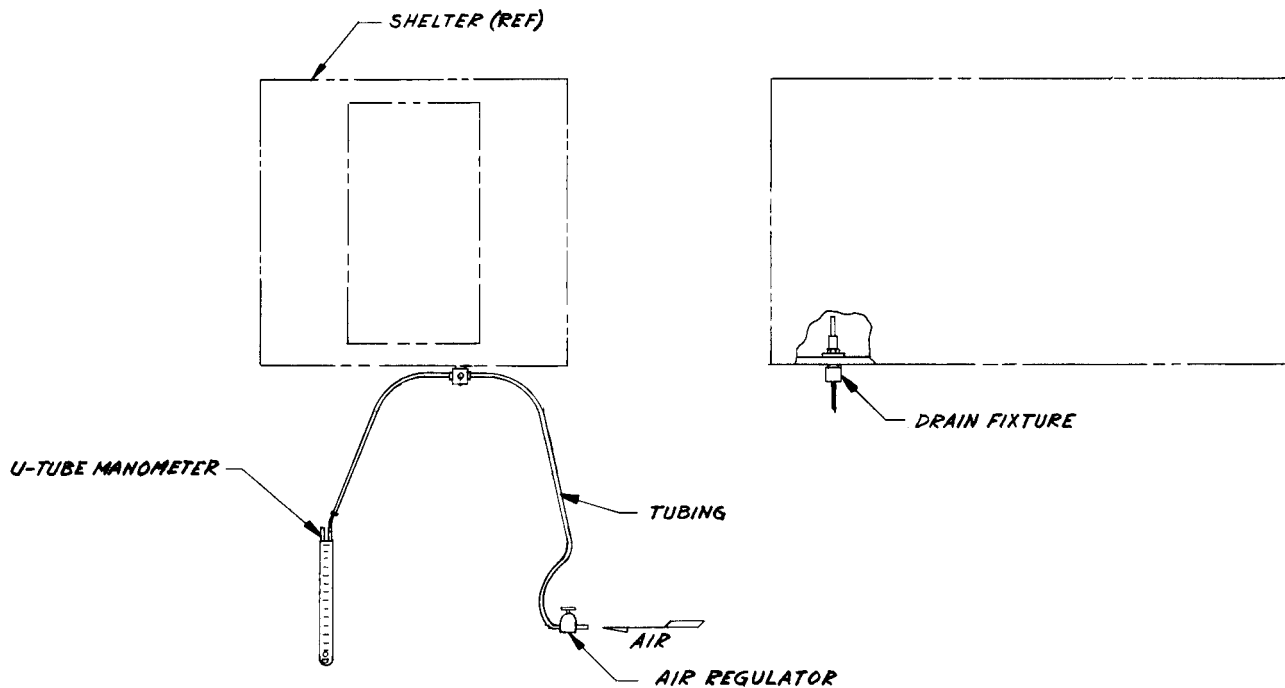
**NOTE**

All portions of this test shall be conducted indoors in still air. Any leaks

found during any portion of this test shall be corrected before proceeding with the next portion of this test. For this test to be effective it is necessary for air to pass through the inner skin of the walls and ceiling into the panel through holes or open end rivnuts. If there is a doubt that this will be the case, a 1/16 inch hole shall be drilled into the top of each structural member in the walls and in one end of each structural member in the ceiling. Do not drill into floor structural members.

(a) *Shelter portion.* The shelter shall be placed in a position which allows access to all exterior joints and fasteners on all surfaces. No sealant, caulking, tape etc. shall be added to the shelter except as specifically provided herein. Test fixtures and equipment shall be installed per figure 12. It may also be necessary to temporarily seal doors, covers, and air inlet assemblies for this portion of

the test. If this is necessary to achieve the required pressure differential it may be done by taping temporary shims over the door latch keepers to achieve greater gasket compression and/or temporarily using tape or a putty like material to seal gasket contact areas. (Any such materials will be removed before proceeding with other portions of this test and shall not degrade the repaired lightweight shelter.) Clean, dry air shall be introduced into the shelter through the drain fixture. An interior differential pressure of  $6.0 \pm 0.3$  inches of water shall be achieved and maintained. While the interior differential pressure is maintained, every joint, rivet, bolt and any other area on the shelter exterior where two pieces interface shall be painted with a soap and water solution, except the gaskets and their bearing surfaces where air will be allowed to blow through. There shall be no leak(s) as evidenced by bubbling or spurting. If there is a leak(s), rework shall be ac-



EL5VT012

Figure 12. Construction Tightness Test Fixtures and Equipment

complished. After rework the soap bubble inspection will be repeated. After successful completion of the shelter portion of this test, any temporary shims, tape or other temporary seals shall be removed. Doors, covers, and air inlet assemblies shall be readjusted for normal operation. The doors will be adjusted for proper maximum opening and closing torque according to the following table:

Door	Maximum Operating Torque (ft-lbs)	
	Without EMI Capability (See Note Below)	With EMI Capability (See Note Below)
S-141( )/G	(See Note Below)	(See Note Below)
S-144( )/G	(See Note Below)	(See Note Below)
S-250( )/G Small Door	10	20
S-250( )/G Large Door	15	25
S-280( )/G	15	30
S-318( )/G Small Door	15	20
S-318( )/G Large Door	15	30



### NOTE

Values given in the preceeding table are for doors equipped with roller type latches. Older knife action type latches may not be capable of being adjusted for these maximum operating torques. In these cases, the door latch torque shall not be so high as to prevent the doors from being readily latched and unlatched.

(b) *Gasket portion.* After successful completion of the shelter portion of this test, the gasket seating of the doors and covers shall be tested. A piece of paper .005 inch maximum thickness by 2½ inches wide will be used as a gage. The center of the top and bottom edges of each door, 3 places along both sides of each door, the center of the bottom of each cover, and 2 places along both sides of each cover shall be inspected as follows: The door or cover shall be closed so that the paper is between the weather gasket and its bearing surface (but not under EMI gasket if so equipped). The paper shall be withdrawn while the door or cover is closed. The absence of any resistance to the withdrawal indicates that the gasket is not touching its bearing surface. If this condition is found, the gasket compression shall be increased in the appropriate manner and this inspection shall be repeated. Obtaining correct gasket compression may entail replacing the gasket if it is in poor condition or has been installed improperly (i.e. kinked or poorly spliced). If the gasket is in good condition and has been installed properly, it may be necessary to change the thickness of the latch keeper shims, the hinge butt shims, the hinge strap shims, or the roller latch washer shims. Inspection of the particular latching mechanism being

adjusted will reveal the type of shim adjustment which is most appropriate to achieve correct gasket compression. Do not add or remove shims haphazardly. Ensure that the latches contact their respective keepers when the latch is closed. Any hinge shims changed or added during rework shall be completely coated with sealer (Item 14 or Item 15 in para 24b) before installation. (If the shelter has an EMI suppression requirement, compound no. 4660 of Chomerics, Inc., Arlington, MA, and sealer (Item 14 or Item 15 in para 24b) will be reapplied in the same location as the original material. Refinish when required in accordance with paragraph 37. Note that after any adjustments to hinges are made, the door shall be capable of opening and closing to its full extent without binding. After any rework at this stage, both the shelter portion test (including check of maximum operating torque) and the gasket portion test will be repeated.

(5) Lifting and tiedown provisions. Each shelter

provision as follows:

(a) *S-141( )/G and S-280( )/G shelters.* These shelters shall be provided with a multiple leg sling, SC-D-36423 (NSN 5410-00-805-5533).

(b) *S-144( )/G shelter.* The S-144( )/G shelter shall be provided with a multiple leg sling, SC-C-36302 (NSN 5410-00-774-6108).

(c) *S-250( )/G shelter.* The S-250( )/G shelter shall be provided with a multiple leg sling, SM-D-649952 (NSN 3940-00-115-6380).

(d) *S-318( )/G shelter.* The S-318( )/G shelter shall be provided with a multiple leg sling, SM-B-564739 (see Note 4 on this drawing).

# APPENDIX A

## APPLICABLE REFERENCES

---

### 1. Military Specifications

- a. MIL-R-3065, Rubber, Fabricated Parts
- b. MIL-S-6855, Rubber, Synthetic, Sheets, Strips, Molded or Extruded
- c. MIL-S-8802, Sealing Compound, Temperature-resistant, Integral Fuel Tanks and Fuel Cell Cavities, High Adhesion.
- d. MIL-M-13231, Marking of Electronic Items.
- e. MIL-F-14072, Finishes for Ground Electronic Equipment.
- f. MIL-P-23377, Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant.
- g. MIL-E-46061, Enamel, Camouflage, Solar-And-Heat-reflecting.
- h. MIL-L-46167, Lubricating Oil, Internal Combustion Engine, Arctic.
- i. MIL-E-52798, Enamel, Alkyd, Camouflage.

### 2. Military Standards

- a. MIL-STD-130, Identification Marking of US Military Property.
- b. MIL-STD-285, Attenuation Measurements for Enclosures, Electromagnetic Shielding, for Electronic Test Purposes, Method of
- c. MS-16562, Pin, Spring, Tubular, Slotted.

### 3. Federal Specifications

- a. O-T-620 Trichloroethane-1, 1, 1, Technical, Inhibited (Methyl Chloroform)
- b. P-P-121, Paper, Abrasive, Garnet
- c. GG-D-226, Depresser, Tongue
- d. QQ-A-250/11, Aluminum Alloy 6061, Plate and Sheet.
- e. TT-E-527, Enamel, Alkyd, Lusterless.
- f. TT-E-529 Enamel, Alkyd, Semi-gloss.
- g. TT-M-261, Methyl Ethyl Ketone, Technical
- h. TT-T-306, Thinner, Synthetic Resin, Enamels
- i. TT-T-548, Toluene, Technical
- j. CCC-C-440, Cloth, Cheesecloth, Cotton, Bleached and Unbleached.
- k. GGG-D-751, Drills, Twist (Taper-Square, Straight, and Taper-round Shanks)
- l. GGG-K-481, Knife, Craftsman, (Hawbill, Shoe, Chipping) Putty and Scraping.

### 4. Federal Standards

- FED-STD-595, Color

### 5. CERCOM Drawings

- a. SC-C-36302, Hold Down Assembly (for S-144( )/G).
- b. SC-D-36423, Hold Down Assembly (for S-141( )/G and S-280(¾)/G).
- c. SC-D-82768, Aircraft Loading Data Plates for Trailer, Semi-Trailer, Shelter, Truck, and Equipment
- d. SM-B-564739, Lifting and Tiedown Assembly (for S-318( )/G).
- e. SC-D-595001, Kit, Adapter for M720 Moiblizer with Shelter S-280( )/G.
- f. SC-D-595002, Bracket, Adapter, Bottom
- g. SC-D-595004, Bracket. Assembly, Side
- h. SC-C-595005, Chock
- i. SM-D-649952, Sling Assembly (Lift and Tiedown Device) (for S-250( )/G).
- j. SC-C-681153, S-250( )/G Shelter Tiedown Adapter Assembly.
- k. SC-C-781275, Bracket, Dolly Adapter, Machined

### 6. Supply Bulletins

SB 11-640, Fabrication of Dunnage for Installation of Shelters, Electrical Equipment S-144, S-318, and S-250 on Truck 1¼ Ton M-880 Series.

### 7. Technical Bulletins

- a. TB-SIG-355-1, Depot Inspection Standard for Repaired Signal Equipment.
- b. TB-SIG-355-2, Depot Inspection Standard for Refinishing Repaired Signal Equipment.

c. TB-SIG-355-3, Depot Inspection Standard for Moisture and Fungus Resistant Treatment.

d. TB 11-2300-372-14, Installation of Blocking and Tiedown Kit for S-250( )/G Shelters on M-561 Truck.

e. TB 11-2300-374-14-1, Installation of Blocking and Tiedown Kits for Shelter, Electrical Equipment S-144( )/G and S-318( )/G on a Truck, Cargo; 1¼ Ton, 6 X 6, M561 and Truck! Cargo; 1¼ Tons, 4 X 4, M715.

f. TB 11-5400-200-14, Loading of S-280( )/G Sized Shelters into Container ANSI/ISO Type 1AA.

### **8. Technical Manuals**

a. TM 11-5410-205-15P, Operator's Organizational, DS, GS, and Depot Maintenance Repair Parts and Special Tools Lists: Shelters, Electrical Equipment S-144/G, S-144A/G, S-144B/G, S-144 C/G and S-144D/G.

b. TM 11-5410-206-14P, Operator's Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools): Shelter, Electrical Equipment S-141/G and S-141B/G.

c. TM 11-5410-212-15P, Organizational, DS, GS, and Depot Maintenance Repair Parts and Special Tool Lists: Shelter Electrical Equipment S-318/G.

d. TM 11-5410-213-14P, Operator's, Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools) for Shelters, Electrical Equipment S-280A/G (NSN 5410-00-999-6022) and S-280 B/G (NSN 5410-00-117-2868).

e. TM 11-5410-214- 15P, Operator, Organizational, DS, GS, and Depot Maintenance Repair Parts and Special Tool Lists for Shelter, Electrical Equipment S-250/G.

f. TM 38-750, The Army Maintenance Management System (TAMMS).

### **9. Indexes of Publications**

a. *DA Pam 310-4*. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

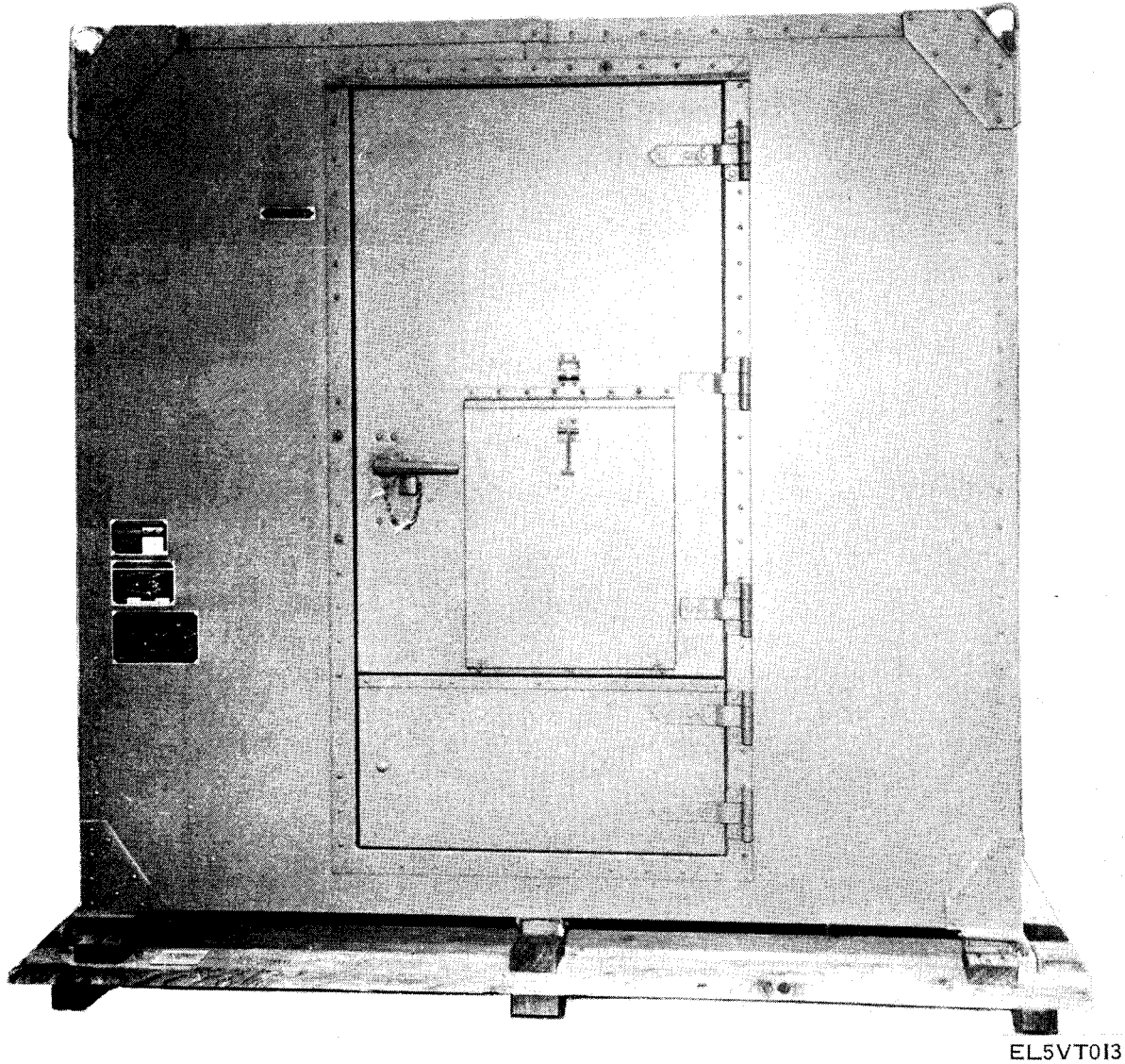
b. *DA Pam 310-7*. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO'S) pertaining to the equipment. Perform all applicable modification work orders pertaining to the light-weight shelters before making the test specified.

## APPENDIX B

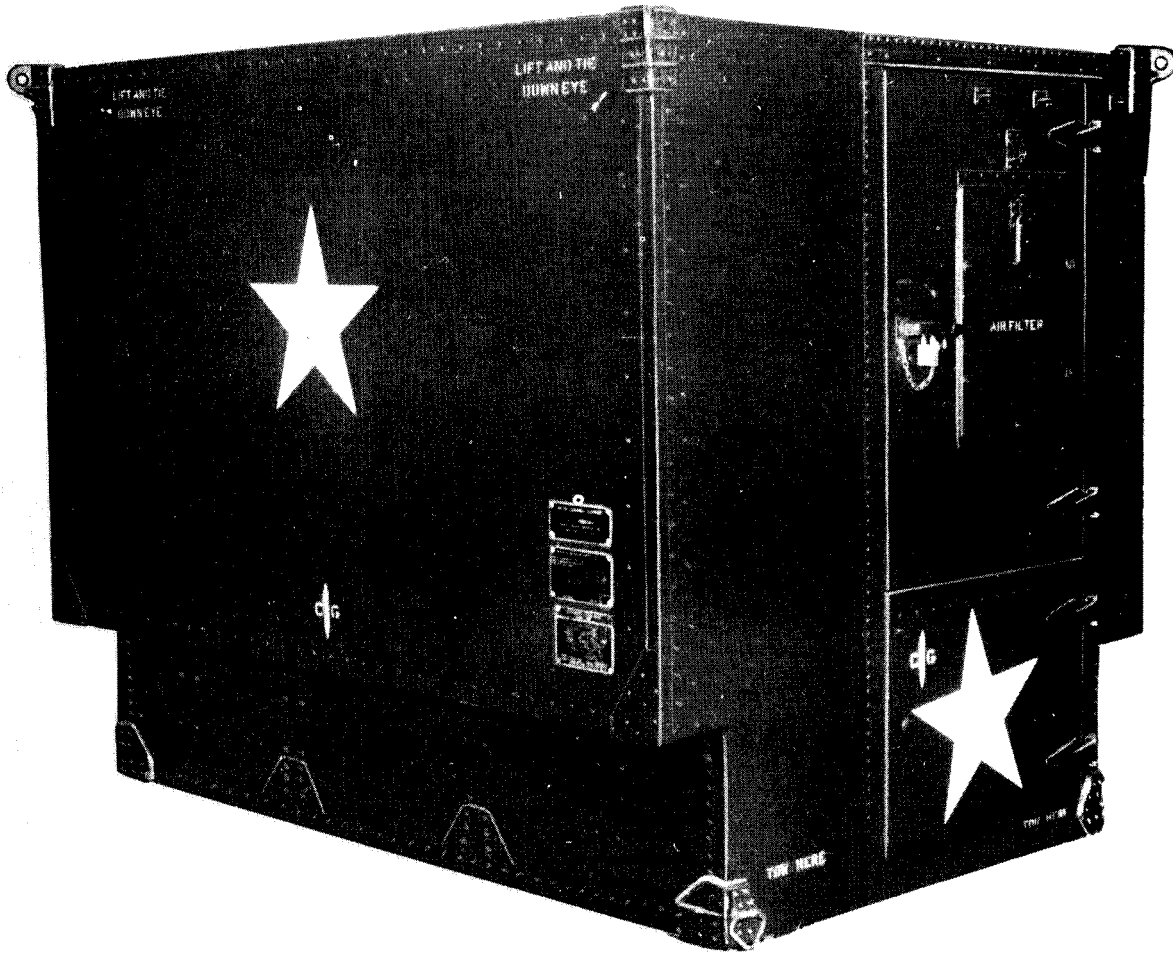
# IDENTIFYING FEATURES OF LIGHTWEIGHT SHELTERS

---

USE FIGURES 13 through 17 to assist in identifying lightweight shelters.

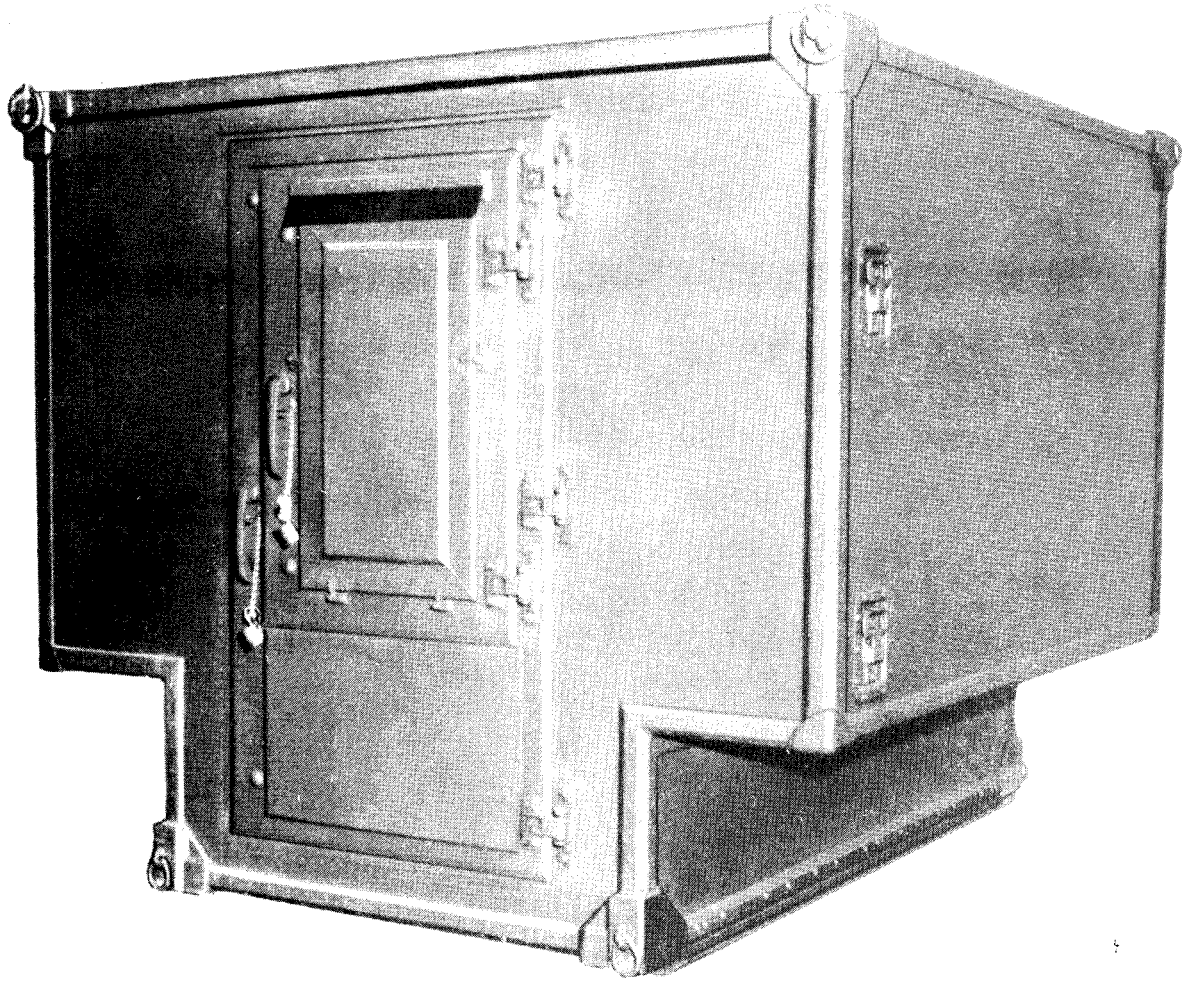


*Figure 13. Shelter, Electrical Equipment S-141()/G identifying features.*



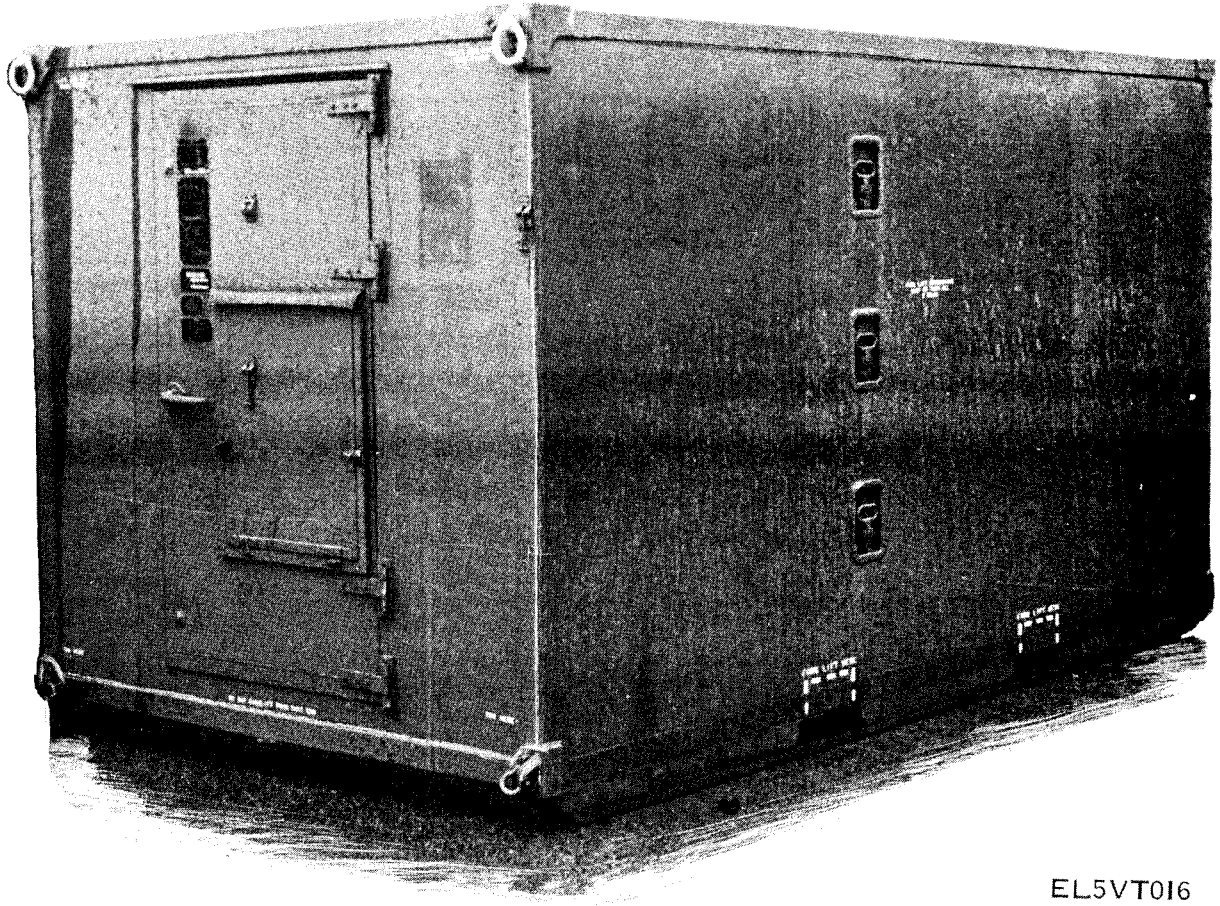
EL5VTO14

Figure 14. Shelter, Electrical Equipment S-144()/G, identifying features.



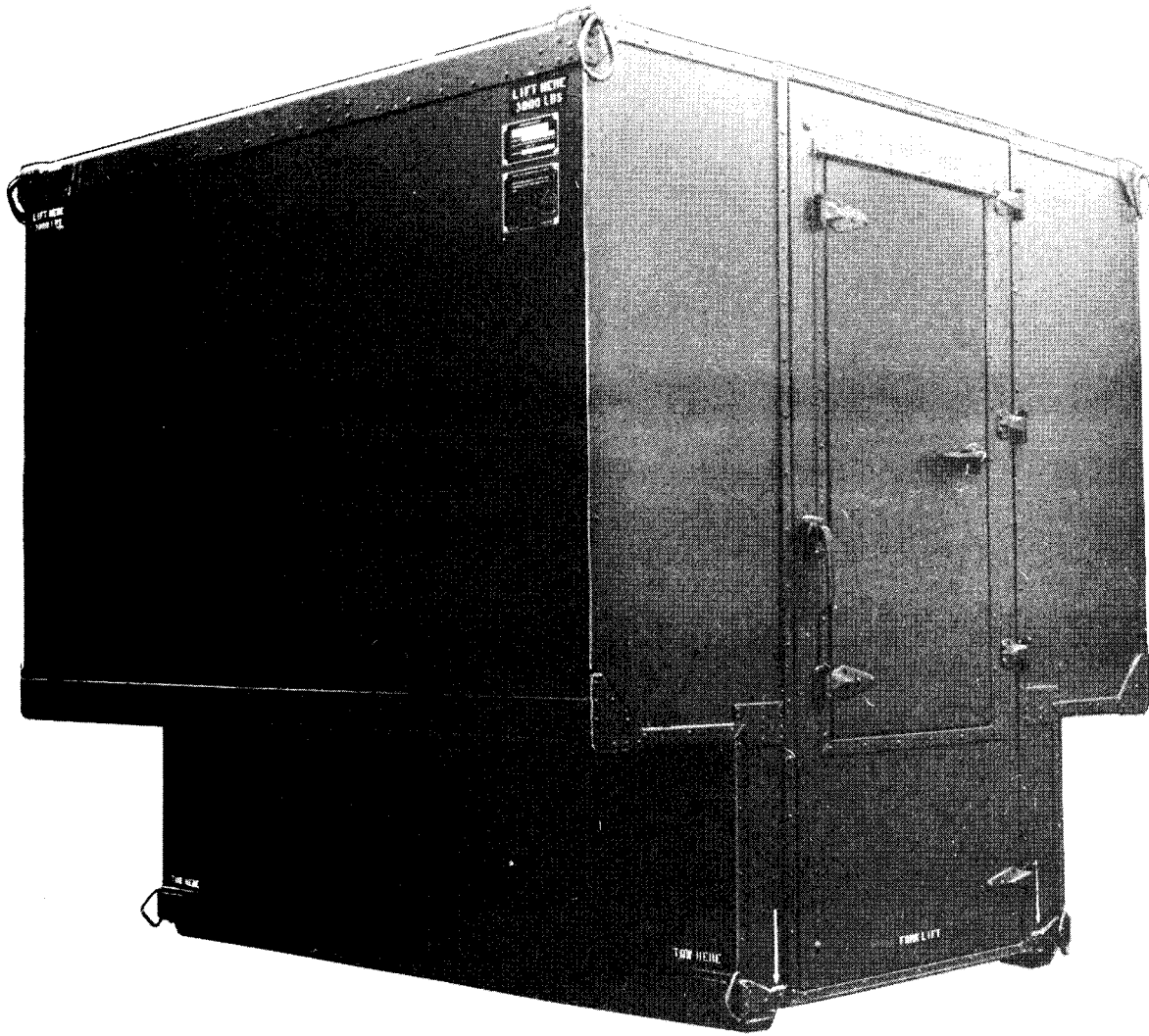
EL5VT015

*Figure 15. Shelter, Electrical Equipment S-250( )/G identifying features.*



EL5VT016

*Figure 16. Shelter, Electrical Equipment S-280()/G identifying features.*



EL5VT017

*Figure 17. Shelter, Electrical Equipment S-318()/G, identifying features.*



# APPENDIX C

## MAINTENANCE MATERIALS

1. The following is a list of materials from which the required maintenance materials may be selected if not specifically noted in given maintenance procedure:

<i>Description</i>	<i>National Stock Number</i>
Cloth, cotton cheesecloth, bleached 36 inches wide, 10 yards . . . . .	8305-00-267-3015
Gloves, polyethylene, 15 pair . . . . .	8415-00-682-6786
Tape, pressure sensitive, 1 inch wide . . . . .	7610-00-266-6712
Tape, pressure sensitive, 1½ inches wide . . . . .	7510-00-266-6714
Adhesive, silicone rubber, 6 oz tube, black (Dow Corning Silaetic) . . . . .	8040-00-952-3520
Primer foreilastic TRV891, 1-pint can, black . . . . .	8030-00-845-4304
Sealing coupound, polysulfide base, black, packaged in 1½ pint double compartment can, 3M resin EC-801 w/catalyst EC-1063 . . . . .	8030-00-275-8110
Thinner, synthetic resin enamel, 1-gallon can, TT-T-306 . . . . .	8010-00-160-5794
1,1, 1 Trichloroethane, 1-gallon can O-T-00620 . . . . .	6810-00-664-0387
Methyl ethyl keytone, 1-gallon can TT-M-2616 . . . . .	6810-00-281-2785
Cloth, abrasive, grit No. 40,50-sheet sleeve . . . . .	5350-00-192-9318
Cloth, abrasive, grit No.60,50-sheet sleeve . . . . .	5350-00-192-5046
Cloth, abrasive, grit No.80, 50-sheet sleeve . . . . .	5350-00-192-5047
Rivet, blind: Friction lock blind rivet, size ¼ inch, grip range 0.251 to 0.312 . . . . .	5320-00-721-5385
Rivet, blind: Friction lock blind rivet, size ¼ inch, grip range 0.313 to 0.375 . . . . .	5320-00-721-5388
Rivet, blind: Friction lock blind rivet, size ¼ inch, grip range 0.563 to 0.625 . . . . .	5320-00-061-9655
Rivet, blind: Friction lock blind rivet, size ¼ inch, grip range 0.626 to 0.687 . . . . .	5320-00-061-9656
Rivet,blind: "pop" dome head, solid core, United Shoe Mfg., Co., No. AD41S, or equal, grip range 0.025 to 0.062, 1/8 inch dia . . . . .	5320-00-957-3581
Rivet, blind: "pop" dome head, solid core, United Shoe Mfg. Co., No. AD42S, or, equal, grip range 0.063 to 0.125, 1/8 inch dia . . . . .	5320-00-957-3582
Rivet, blind: "pop" dome head, solid core, United Shoe Mfg. Co., No. AD43S, or equal, grip range 0.126 to 0.187, 1/8 inch dia . . . . .	5320-00-952-4162
Rivet, blind: "pop" dome head, solid core, United Shoe Mfg. Co., No. AD62S, or equal, grip range 0.025 to 0.125, 3/16 inch dia . . . . .	5320 -00-952-4160
Rivet, blind: "pop" dome head, solid core, United Shoe Mfg. Co., No. AD64S, or equal, grip range 0.126 to 0.250, 3/16 inch dia . . . . .	5320-00-952-4149
Rivet, blind: "pop", domehead, solid core, United Shoe Mfg. Co., No.AD66S, or equal,grip range 0.251 to 0.375, 3/16 inch dia . . . . .	5320-00-952-4161
Nut, blind rivet: "rivnut," size 1/4-20, B. F. Goodrich Part No. A25-B-140 or equal, grip range 0.080 to 0.140, closed end . . . . .	5310-00-952-3631
Nut, blind rivet: "rivnut," size 1/4-20, B. F. Goodrich Part No. A25-B-200, or equal, grip range 0.140 to 0.200, closed end . . . . .	5310-00-952-3632
Nut, blind rivet: "rivnut", size 5/16-18, B. F. Goodrich Part No. A31-B-125, or equal, grip range 0.050 to 0.125, closed end . . . . .	5310-00-952-3603
Nut, blind rivet: "rivnut," size 5/16-18, B. F. Goodrich Part No. A31-B-200, or equal, grip range 0.125 to 0.200, closed end . . . . .	5310-00-952-3604
Nut, blind rivet: "rivnut," size 5/16-18, B. F. Goodrich Part No. A31-B-275, or equal, grip range 0.200 to 0.275, closed end . . . . .	5310-00-952-3605
Nut, blind rivet: "rivnut," size 5/16-18, B. F. Goodrich Part No. A31-B-350, or equal, grip range 0.275 to 0.350, closed end . . . . .	5310-00-952-3607
Nut, blind rivet: "rivnut," size 5/16-18, B. F. Goodrich Part No. A31-B-425, or equal, grip range 0.350 to 0.425, closed end . . . . .	5310-00-952-3626
Nut, blind rivet: "rivnut," size 5/16-18, B. F. Goodrich Part No. SS31-B-125, or equal, grip range 0.050 to 0.125, closed end . . . . .	5310-00-952-3634
Nut, blind rivet: "rivnut," size 5/16-18, B. F. Goodrich Part No. SS31-B-200, or equal, grip range 0.125 to 0.200, closed end . . . . .	5310-00-952-3628
Nut, blind rivet: "rivnut," size 5/16-18, B. F. Goodrich Part No. SS31-B-500, or equal, grip range 0.425 to 0.500, closed end . . . . .	5310-00-952-3681
Nut, blind rivet: "rivnut," size 6-32, B. F. Goodrich Part No. A6-75, or equal, grip range 0.010 to 0.075, open end . . . . .	5310-00-082-1030
Nut, blind rivet: "rivnut," size 6-32, B. F. Goodrich Part No. A6-120, or equal, grip range 0.075 to 0.120, open end . . . . .	5310-00-952-3444
Nut, blind rivet: "rivnut," size 6-32, B. F. Goodrich Part No. A6-160, or equal, grip range 0.120 to 0.160, open end . . . . .	5310-00-952-3445

Nut, blind rivet: "rivnut" size 6-32, B. F. Goodrich Part No. A6-280, or equal, grip range 0.240 to 0.280, open end	5310-00-952-3466
Nut, blind rivet: "rivnut," size 8-32, B. F. Goodrich Part No. A8-75, or equal, grip range 0.010 to 0.075, open end	5310-00-952-3467
Nut, blind rivet: "rivnut," size 8-32, B. F. Goodrich Part No. A8-120, or equal, grip range 0.075 to 0.120, open end	5310-00-952-3468
Nut, blind rivet: "rivnut," size 8-32, B. F. Goodrich Part No. A8-160, or equal, grip range 0.120 to 0.160, open end	5310-00-952-3469
Nut, blind rivet: "rivnut," size 8-32, B. F. Goodrich Part No. A8-200, or equal, grip range 0.160 to 0.200, open end	5310-00-952-3470
Nut, blind rivet: "rivnut," size 8-32, B. F. Goodrich Part A8-240, or equal, grip range 0.200 to 0.240, open end	
Nut, blind rivet: "rivnut," size 8-32, B. F. Goodrich Part No. A8-160, or equal, grip range 0.120 to 0.180, open end	5310-00-045-9116
Nut, blind rivet: "rivnut," size 10-32 B. F. Goodrich Part No. A10-80, or equal, grip range 0.010 to 0.080, open end	5310-00-952-3560
Nut, blind rivet: "rivnut," size 10-32, B. F. Goodrich Part No. A10-130, or equal, grip range 0.080 to 0.130, open end	5310-00-952-3561
Nut, blind rivet: "rivnut," size 10-32, B. F. Goodrich Part No. A10-180, or equal, grip range 0.130 to 0.180, open end	5310-00-952-3562
Nut, blind rivet: "rivnut," size 10-32, B. F. Goodrich Part No. A10-230, or equal, grip range 0.180 to 0.230, open end	5310-00-952-3563
Nut, blind rivet: "rivnut," size 10-32, B. F. Goodrich Part No. A10-280, or equal, grip range 0.230 to 0.280 open end	5310-00-952-3564
Nut, blind rivet: "rivnut," size 1/4-20, B. F. Goodrich Part No. A25-80, or equal, grip range 0.020 to 0.080, open end	5310-00-952-3629
Nut, blind rivet: "rivnut," size 1/4-20, B. F. Goodrich Part No. A25-200, or equal, grip range 0.140 to 0.200, open end	5310-00-952-3606
Nut, blind rivet: "rivnut," size 1/4-20, B. F. Goodrich Part No. A25-320, or equal, grip range 0.260 to 0.320, open end	5310-00-952-3473
Nut, blind rivet: "rivnut," size 1/4-20, B. F. Goodrich Part No. A25-380, or equal, grip range 0.320 to 0.380	5310-00-952-3566
Nut, blind rivet: "rivnut," size 5/16-18, B. F. Goodrich Part No. A31-200, or equal, grip range 0.125 to 0.200, open end	5310-00-619-4502
Nut, blind rivet: "rivnut," size 5/16-18, B. F. Goodrich Part No. A31-275, or equal, grip range 0.200 to 0.275, open end	5310-00-952-3599
Nut, blind rivet: "rivnut," size 5/16-18, B. F. Goodrich Part No. A31-425, or equal, grip range 0.350 to 0.425, open end	5310-00-952-3601
Nut, blind rivet: "rivnut," size 5/16-18, B. F. Goodrich Part No. A31-500, or equal, grip range 0.425 to 0.500, open end	5310-00-952-3602
Rivet, blind: Blind bolt, 1/4 inch size, Huck Mfg. Co., Part No. OSR 8F, or equal, grip range 0.351 to 0.400	5320-00-975-4579
Rivet, blind: Blind bolt, 1/4 inch size, Huck Mfg. Co., Part No. OSR 8H, or equal, grip range 0.451 to 0.500	5320-00-986-6889

2. Polysulfide sealant instructions. Determine the amount of polysulfide sealant required and weigh 15 parts of catalyst (EC-1063) to 100 parts of resin (EC-801); use the beam-indicating scale contained in Appendix D.

**WARNING**

Catalyst (EC-1063) contains lead. Avoid inhaling; catalyst fumes are dangerous. Make sure that adequate ventilation is provided. The catalyst is flammable; do not use near a flame. Wear protective gloves.

- a. Thoroughly stir catalyst (EC-1063) until a smooth paste is obtained. Do not spill off floating liquid.
- b. Mix catalyst (EC-1063) with resin (EC-801 ) to obtain the polysulfide sealant.

**NOTE**

The polysulfide sealant requires a minimum of 6 hours to set.

# APPENDIX D

## MAINTENANCE TOOLS

---

The following is a list of tools from which the required tools should be selected is not noted in a given maintenance procedure:

<i>Description</i>	<i>NSN</i>
Tool Kit, Electronic Equipment Shelter TK- 144/G APPENDIX E (It may be desirable to order individual tools from this kit rather than ordering a complete kit).	5180-00-973-4369
Tool Kit, Auto Mechanics	5180-00-973-2276
Scale, Beam Indicating	6670-00-952-3317
Weight Kit	6670-00-957-3318
Scraper, Paint	5110-00-952-3380
Bruch, Varnish, Flat, Chisel Edge, 2 Inches Wide	8020-00-260-1304
Graduate, liquid, laboratory, polyethylene, 32 ounce capacity	6640-00-952-3805
Pipette, volumetric (polyethylene eye dropper)	6640-00-952-3807
Gun, calking, any suitable commercial type (may use compatible disposable cartridges and nozzles)	NA

# APPENDIX E

## TOOL KIT, ELECTRONIC EQUIPMENT SHELTER

### TK-144/G (FSN 5180-973-4369)

#### NOTE

Items of the TK- 144/G are illustrated in figure 18 which consists of three parts.

<i>Illustration item No.</i>	<i>Quantity (ea)</i>	<i>Description</i>	<i>Federal stock No.</i>
1	1	Saw, reciprocating, portable, electric. . . . .	5310-720-0654
2	1	Drill, electric, portable, 3/8-inch cup, pistol, grip . . . . .	5130-889-9001
3	1	Saw, circular, portable, electric, 2-inch diameter blade. . . . .	5310-086-7243
4	6	Clamp "C," light service, 4-inch size . . . . .	5120-239-8151
5	1	Wrench, torque, 5 to 150 pound-inches . . . . .	5120-221-7944
6	1	Square, carpenters, 24-inch body, 16-inch tongue. . . . .	5210-221-2050
7	1	Handle, file . . . . .	5110-595-8325
8	1	Socket, wrench, 1/4-inch opening, 1/4-inch square drive . . . . .	5120-236-2264
9	1	Socket, wrench, 5/16-inch opening, 1/4-inch square drive. . . . .	5120-232-5703
10	1	Socket, wrench, 7/16-inch opening, 1/4-inch square dirve. . . . .	5120-239-0016
11	1	Socket wrench, 1/2 inch opening, 1/4-inch square drive. . . . .	5120-277-4250
12	1	Awl, scratch, 3 1/2-inch long blade . . . . .	5120-221-1542
13	4	Nut, hexagonal, size 6-32 . . . . .	5310-085-7705
13	4	Nut, hexagonal, size 8-32 . . . . .	5310-062-3912
13	4	Nut, hexagonal, size 10-32 . . . . .	5310-062-3913
13	4	Nut, hexagonal, size 1/4-20 . . . . .	5310-889-2541
13	4	Nut, hexagonal, size 5/16-18. . . . .	5310-208-5326
14	2	Screw, machine, hexagonal head, 6-32 by 1 inch long. . . . .	5305-062-6112
14	2	Screw, machine head, 8-32by 1 inch long . . . . .	5305-889-2974
14	2	Screw, machine hexagonal head, 10-32 by 1 inch long . . . . .	5305-062-6113
14	2	Screw, machine, hexagonal head, 1/4-2 by 1 1/2-inches long. . . . .	5305-889-2976
14	2	Screw, machine, hexagonal head, 5/16-18 by 1 1/2-inches long. . . . .	5305-889-2975
15	1	Tape measure, 72 inches long . . . . .	5210-287-3335
16	1	Square, combination, 12-inch blade . . . . .	5110-221-2068
17	1	Clamp, "C," light service, 2-inch size . . . . .	5120-293-0784
18	1	File, rotary, 1/2-inch diameter 1/4 -inch shank 2 1/2 inches long, medium . . . . .	3455-973-6282
19	6	Drill, twist, size 30 . . . . .	5133-189-9275
20	6	Drill, twist, size 12 . . . . .	5133-189-9257
21	6	Drill, twist, size 11 . . . . .	5133-189-9256
22	6	Drill, twist, size 2 . . . . .	5133-189-9247
23	6	Drill, twist, size E . . . . .	5133-239-8606
24	6	Drill, twist, size F . . . . .	5133-262-2192
25	6	Drill, twist, size Q . . . . .	5133-262-2165
26	6	Drill, twist, Size R . . . . .	5133-262-2166
27	6	Drill, twist, Size Z . . . . .	5133-262-2174
28	1	Gage, depth and angle, with hook rule . . . . .	5210-203-2096
29	1	Scriber, machinest, size 1 . . . . .	5120-293-3408
30	1	File, hand, flat, 10 inches long, style B . . . . .	5110-234-6537
31	1	Riveter, blind hand, tong type for pop rivets, with nosepiece . . . . .	5110-249-2850
32	1	Riveter, blind hand, tong type for pop rivets, with nosepiece . . . . .	5120-973-0377
33	1	Riveter, blind hand, for buck rivets, Huck Model 194 . . . . .	5120-776-1852
33	1	Nose assembly for riveter, Huck Model 194 . . . . .	5120-776-1855
34	1	Nippers end cutting, 7 inches long compound lever attachable blade . . . . .	5110-086-7240
35	1	Shears, metal cutting, left-hand, 10 inches long . . . . .	5110-273-0126
36	1	Shears, straight trimmers, 9 inches long . . . . .	5110-161-6912
37	1	Shears, metal cutting right-hand, 10 inches long . . . . .	5110-273-0127
38	1	Riveter, blind hand, plier-type, for pop rivets, with nosepiece . . . . .	5120-970-6425
39	1	Riveter, blind hand for 6-32 rivnut . . . . .	5120-224-9298
39	1	Riveter, blind hand for 8-32 rivnut . . . . .	5120-224-9297
39	1	Riveter, blind hand for 10-32 rivnut . . . . .	5120-224-9296
39	1	Riveter, blind hand for 10-32 rivnut . . . . .	5120-224-9296
40	1	Hammer, inserted face, 2-pound, 2-in. dia. face. . . . .	5120-357-6076
41	1	Forceps, sheet holder, plier grip, 8 inches long . . . . .	5120-221-1597

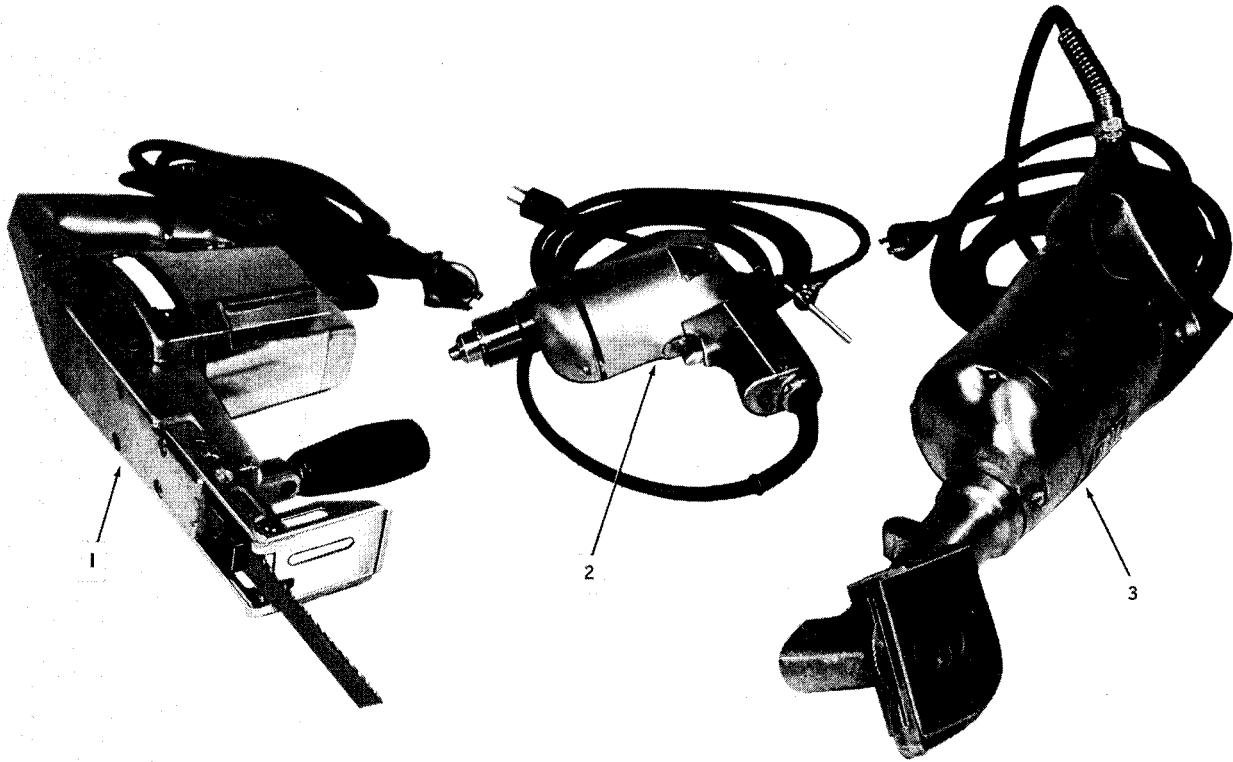
*Illustration  
item No.*

*Quantity (ea)*

*Description*

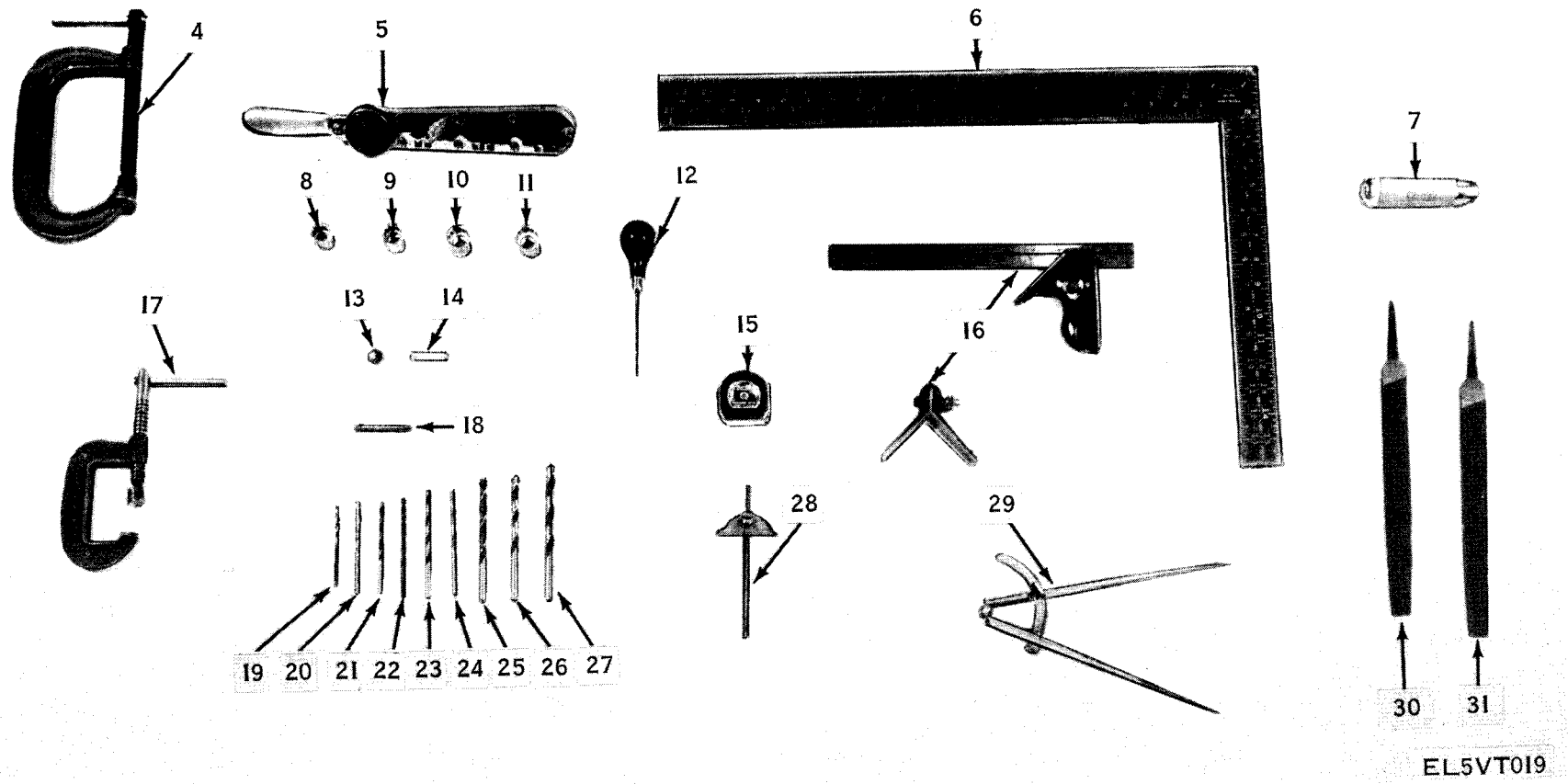
*Federal stock No.*

42	1 gross	Holder, sheet metal, 1/8 inch diameter. . . . .	5120-541-1808
43	1	Wrench, open end, 5/8- and 3/8-inch openings . . . . .	5120-224-3102
44	1	Riveter, blind hand, screw-type, for 5/16-18 rivnuts, with Allen wrench . . . . .	5120-973-0376
44	1	Riveter, blind hand, screw-type, for 1/4-20 rivnuts, with Allen wrench . . . . .	5120-970-6423
45	1	Handle, socket wrench, ratchet type, 3/8-inch-square drive . . . . .	5120-240-5364
46	1	Riveter, blind hand for buck rivets, Huck Model 115 . . . . .	5120-792-3571
46	1	Nose assembly for riveter, Huck Model 115 . . . . .	5120-770-6129
	1	Mixer, paint, 1/4-inch diameter shank . . . . .	5130-034-4854
	1	Divider, mechanics, wingtype, 10 inches long . . . . .	5210-266-7036
	1	Gasket Cement, Mystic Adhesive No. A132 . . . . .	8040-086-4834



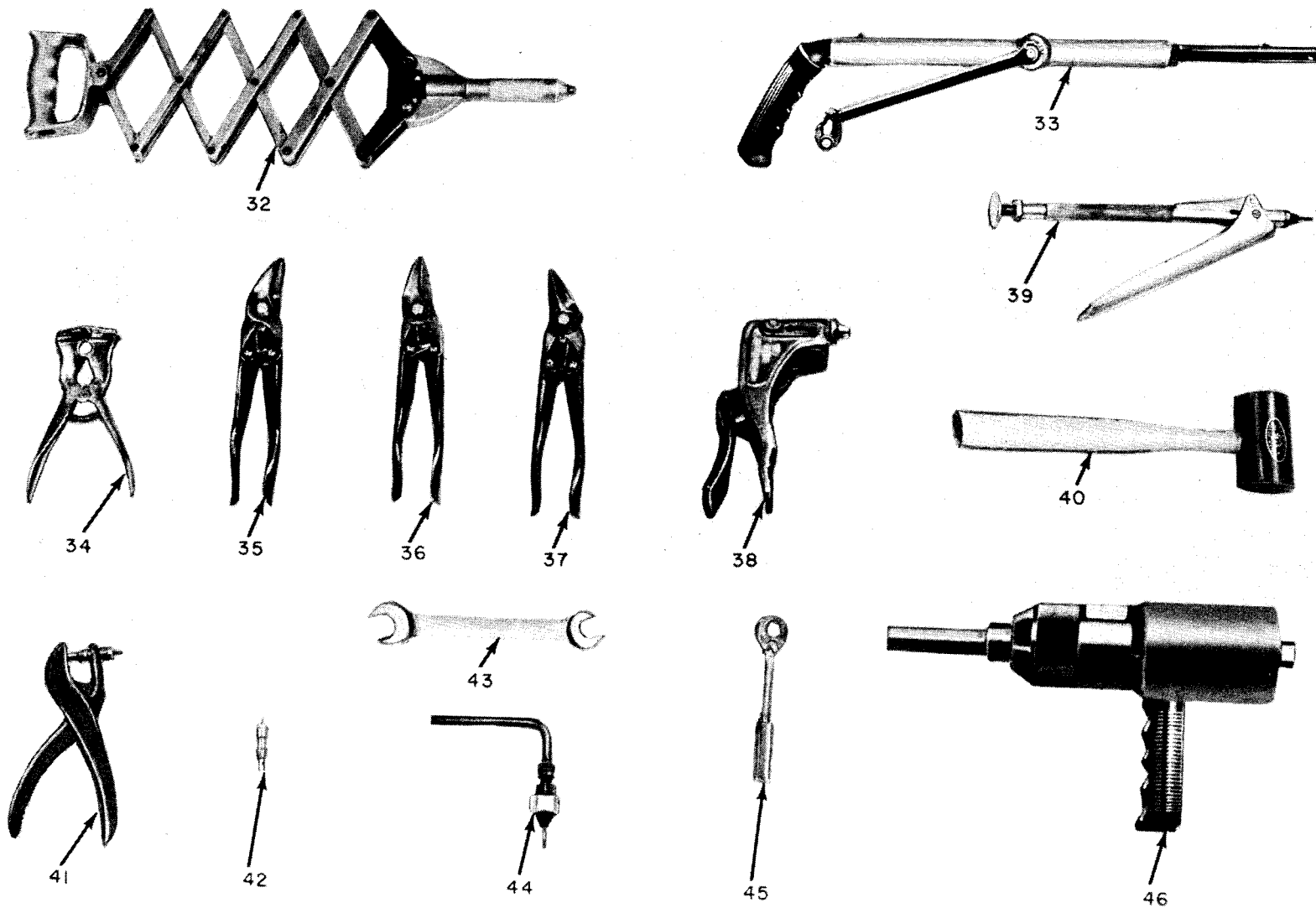
EL5VT018

Figure 18. Tool Kit, Electronic Equipment shelter TK-144/G (sheet 1 of 3).



EL5VT019

Figure 18. Tool Kit, Electronic Equipment Shelter TK-144/G (sheet 2 of 3)



EL5VT020

Figure 18. Tool Kit, Electronic Equipment Shelter TK-144/G (sheet 3 of 3)

By Order of the Secretary of the Army:

Official:

J. C. PENNINGTON  
Major General, United States Army  
The Adjutant General

BERNARD W. ROGERS  
General, United States Army  
Chief of Staff

DISTRIBUTION

Active Army:

USAINSCOM (2)  
COE (1)  
TSG (1)  
USAARENBD (1)  
DARCOM (1)  
TRADOC (2)  
OS Maj Comd (4)  
TECOM (2)  
USACC (4)  
MDW (1)  
Armies (2)  
Corps (2)  
HQ, 7th Sig Comd (5)  
SVC Colleges (1)  
USASIGS (5)  
USAADS (2)  
USAFAS (2)  
USAARMS (2)  
USAIS (2)  
USAES (2)  
USAICS (3)  
MAAG (1)  
USARMIS (1)  
USAERDAA (1)  
USAERDAW (1)  
USACC-EUR (5)  
USACC-PAC (5)  
USACC-SO (5)  
Fort Gillem (10)  
Fort Gordon (10)  
Fort Huachuca (10)  
Fort Carson (5)  
Ft Monmouth (HISA) (26)  
Ft Richardson (CERCOM) (2)

Army Dep (1) except

LBAD (14)  
SAAD (30)  
TOAD (14)  
SHAD (3)

USA Dep (1)  
Sig Sec Dep (1)

Units org under fol TOE:

(1 cy each unit, UNOINDC)

29-207 (2)	6-616	32-57
29-610 (2)	6-617	32-78
1-207	7	32-500
1-258	11-15	44-235
5-112	11-16	44-237
6-200	11-17	57
6-201	11-35	
6-365	11-37	
6-366	11-39	
6-405	11-85	
6-406	11-86	
6-407	11-87	
6-425	11-95	
6-426	11-97	
6-427	11-117	
5-455	11-127	
6-456	11-500(AA-AC)	
6-457	17	
6-525	29-41	
6-526	29-85	
6-555	29-86	
6-556	29-87	
6-576	29-134	
6-577	29-136	
6-615	32-56	

NG: None

USAR: None

For explanation of abbreviations used, see AR 310-50,



RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS



**SOMETHING WRONG WITH THIS MANUAL?**

THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)

Commander  
Stateside Army Depot  
ATTN: AMSTA-US  
Stateside, N.J. 07703

DATE 10 July 1975

PUBLICATION NUMBER

TM 11-5840-340-12

DATE

23 Jan 74

TITLE

Radar Set AN/SPS-76

BE EXACT... PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.
----------	------------	------------	-----------

2-25	2-28		
3-10	3-3		
5-6	5-8		

FO3

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 20 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

3-1 Item 5, Functions column. Change "2 db" to "3db."

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. + 24 VDC is the input voltage.

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SSG I. M. DeSpirito 999-1776

SIGN HERE:

*SSG I. M. DeSpirito*

DA FORM 2028-2  
1 AUG 74

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

TEAR ALONG DOTTED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS



THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

# SOMETHING WRONG WITH THIS MANUAL?

FROM: (YOUR UNIT'S COMPLETE ADDRESS)

DATE

PUBLICATION NUMBER

TB 43-0124

DATE

5 June 79

TITLE

Shelters, Electrical Equipment

BE EXACT... PIN-POINT WHERE IT IS

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

TEAR ALONG DOTTED LINE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

FILL IN YOUR  
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

Commander  
US Army Communications and  
Electronics Materiel Readiness Command  
ATTN: DRSEL-ME-MQ  
Fort Monmouth, New Jersey 07703

FOLD BACK

TEAR ALONG DOTTED LINE

# THE METRIC SYSTEM AND EQUIVALENTS

## WEIGHT MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches  
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches  
 1 Kilometer = 1000 Meters = 0.621 Miles

## WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces  
 1 Kilogram = 1000 Grams = 2.2 lb.  
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

## LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces  
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

## SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches  
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet  
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

## CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches  
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

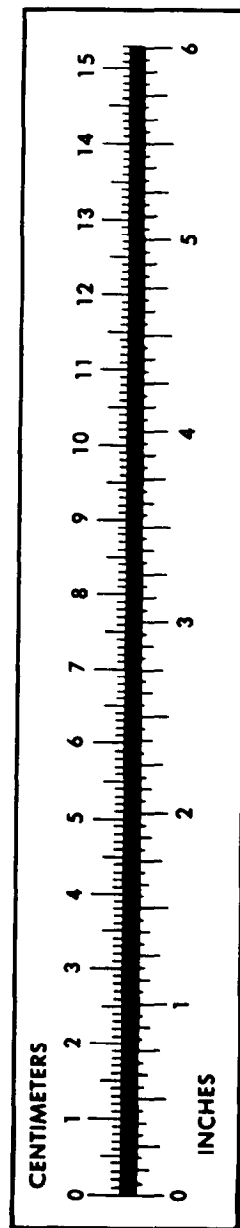
## TEMPERATURE

$5/9(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$   
 212° Fahrenheit is equivalent to 100° Celsius  
 90° Fahrenheit is equivalent to 32.2° Celsius  
 32° Fahrenheit is equivalent to 0° Celsius  
 $9/5^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

## APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
its	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
ometers per Liter	Miles per Gallon	2.354
ometers per Hour	Miles per Hour	0.621



**PIN: 041303-000**