

**TECHNICAL MANUAL**

**OPERATOR' S, ORGANIZATIONAL, DIRECT SUPPORT,  
AND GENERAL SUPPORT MAINTENANCE MANUAL  
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)**

**FOR**

**ANTENNA TOWER TS-9A**

**This publication is not available through AG Publications Center. Requisition through Commander, US Army Electronics Materiel Readiness Activity, Vint Hill Farms Station, Warrenton, VA 22186.**

**WARNING**

Do not use electric hoist to raise or lower personnel. Special safety interlocks and guards required on personnel elevators are not provided.

**WARNING**

**SHOCK HAZARD**

Death or injury may result from contact with electrical connections. Disconnect power before servicing any electrical equipment.

**WARNING**

The fumes of trichloroethane (cleaning compound) are toxic. **DO NOT USE NEAR HEAT OR AN OPEN FLAME.** Trichloroethane is not flammable, but exposure of the fumes to an open flame or hot metal forms highly toxic phosgene gas.

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**CURRENT AS OF 29 JUNE 1979**

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**OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT,  
 AND GENERAL SUPPORT MAINTENANCE MANUAL  
 (Including Repair Parts and Special Tools List)**

FOR

**ANTENNA TOWER TS-9A**

Current as of 29 June 1979

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

**You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Electronics Materiel Readiness Activity, ATTN: SELEM-ME-E, Vint Hill Farms Station, Warrenton, Virginia 22186. A reply will be furnished to you.**

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## SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

### KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside the equipment with the electrical power supply connected. Although the 120-Vac, 50/60-Hz power used in this equipment is not high voltage, it can, nevertheless, cause death or injury on contact. To avoid casualties, always remove power before touching circuits.

### DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person reach into or enter the enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

### RESUSCITATION

Personnel working with or near powered equipment should be familiar with modern methods of resuscitation.

The following warnings appear in the text of this manual and are repeated here for reference.

#### **WARNING**

**Do not use electric hoist to raise or lower personnel. Special safety interlocks and guards required on personnel elevators are not provided. (Page 1-4)**

#### **WARNING**

**Immediate corrective action shall be taken if pier settling is evident. Request assistance from civil engineers. (Page 5-9)**

#### **WARNING**

**Death or injury may result from contact with electrical connections. Disconnect power before servicing any electrical equipment. (Pages 5-12, 5-15,7-2)**

#### **WARNING**

**The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT USE NEAR HEAT OR AN OPEN FLAME. Trichloroethane is not flammable, but exposure of the fumes to an open flame or hot metal forms highly toxic phosgene gas, which can injure personnel if inhaled. (Pages 5-15, 74, 7-5, 76)**

The following cautions appear in the text of this manual and are repeated here for emphasis.

**CAUTION**

Float a fine grain surface on the top of the piers. Allow a minimum of 28 days for the concrete to cure before erection of tower. (Page 24)

**CAUTION**

While tensioning cable braces, during installation, keep tower legs plumb and straight to prevent unwanted deflection and prestressing of leg members. (Page 2-7)

**CAUTION**

Before the AS-2304/G antenna is raised, position the carriage so the 7/16-inch-diameter holes of horizontal brace No. 2 are aligned with those of the carriage. Interference may occur between antenna elements and tower if carriage is not aligned with horizontal brace. (Page 3-6)

**CAUTION**

Before the AN/GSA-131(V)I antenna is raised, align the 7/16-inch-diameter holes of horizontal brace No. 1. With those of the carriage and secure with hardware provided. Damage to equipment may occur if the carriage is improperly positioned too far away from tower. (Page 3-6)

## CHAPTER 1

## INTRODUCTION

## Section I. GENERAL

**1-1. SCOPE.** This manual provides organizational and direct support instructions for the installation and maintenance of Antenna Tower TS-9A (figure 1-1). A repair parts and special tools list is also included.

**1-2. MAINTENANCE FORMS AND RECORDS.** Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (TAMMS).

**1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.** The TS-9A will be destroyed to prevent enemy use in accordance with instructions provided in TM 750-244-2, Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

**1-4. ADMINISTRATIVE STORAGE.** Administrative storage will be in accordance with instructions provided in TM 740-90-1, Administrative Storage of Equipment.

**1-5. CALIBRATION.** No calibration of the equipment in this group is required.

**1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR's).** If the TS-9A needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at US Army Electronics Materiel Readiness Activity, ATTN: SELEM-ME-I, Vint Hill Farms Station, Warrenton, Virginia 22186. We'll send you a reply.

## Section II. DESCRIPTION AND DATA

**1-7. PURPOSE AND USE.** The Antenna Tower TS-9A is used to support either the AN/GSA-131(V)1 or the AS-2304/G antenna group. The tower is an all-weather heavy-duty structure designed to withstand the effects of adverse climatic and environmental conditions.

**1-8. DESCRIPTION.**

*a. Tower Assembly Kit.* The tower assembly kit consists of all materials needed to assemble a complete 25-foot galvanized steel, self-supporting (free standing) tower (figure 1-1). The AN/GSA-131(V)1 or AS-2304/G antenna is mounted on top of the tower. The tower kit contains square cross sections comprised of structural steel angle legs, square tubular steel horizontal braces, and pretensional diagonal cable braces. Each structural member is galvanized to resist corrosion. Tension braces, when installed, practically eliminate any undesirable tower deflection due to high wind shear or antenna overturning loads.

*b. Tower Erection Kit.* Except for common hand tools, the tower erection kit (figure 1-2) consists of the special equipment needed to assemble and erect the tower. Special equipment includes a cable hoist, dynamometer, hoist rope, block, erection fixture, and tag line.

(1) *Cable Hoist.* The cable hoist is a ratchet-type cable winch used to tighten the cable braces to the proper initial tension. Capacity of the cable hoist is 2,000 pounds, single line.

(2) *Dynamometer.* The dynamometer is an in-line dynamometer used to measure cable tension up to 5,000 pounds. It is used in conjunction with the cable hoist to tension the cable braces.

(3) *Hoist Rope.* The hoist rope is an 85-foot-long dacron rope with a safety-locking hook at one end. It is used to hoist individual members of the tower during assembly. The hoist rope is used in conjunction with the block, erection fixture, and tag line.

(4) *Block.* The block, which has a capacity of 1,000 pounds, is used with the hoist rope, erection fixture, and tag line.

(5) *Erection Fixture.* The erection fixture is a 12-foot-long welded fixture that clamps to the horizontal tower braces. It allows easy lifting and positioning of all upper structural members of the tower. Its capacity is 200 pounds when lifting within 10 degrees of vertical with the fixture positioned vertically. Thumbscrew clamps allow easy attachment and positioning. A safety-locking feature prevents detachment during use.

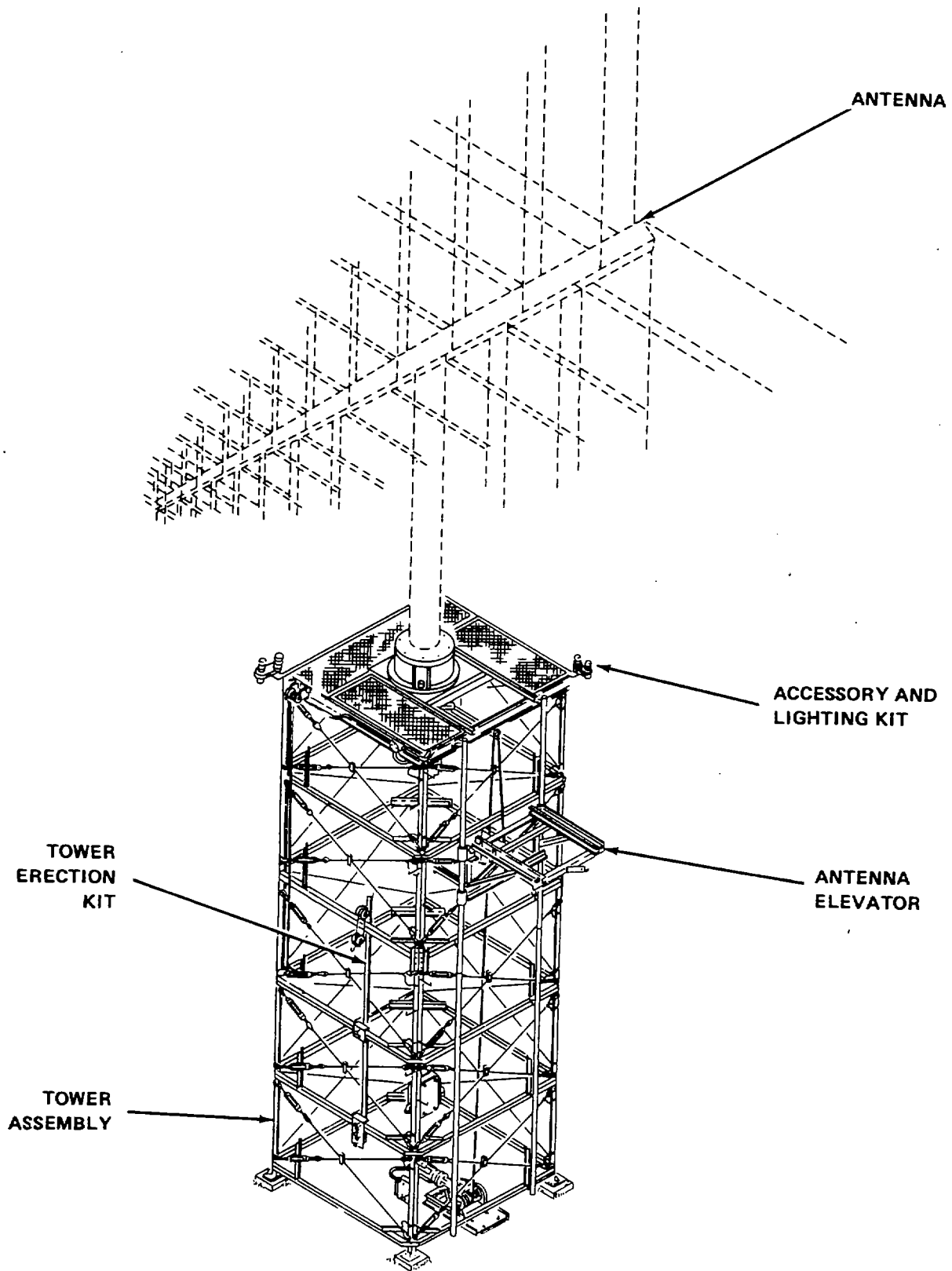


Figure 1-1. Antenna Tower TS-9A

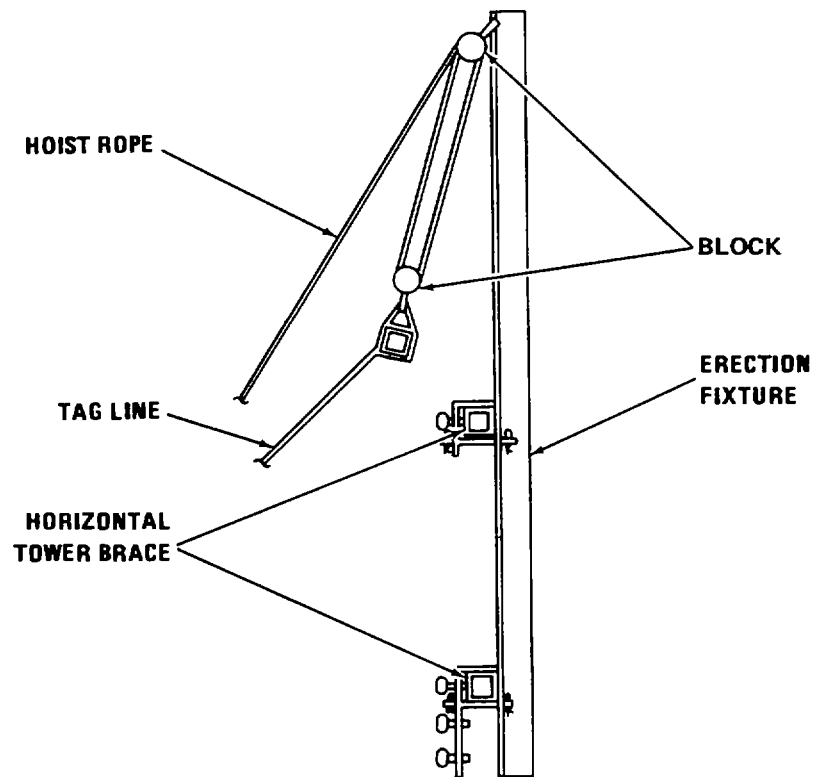
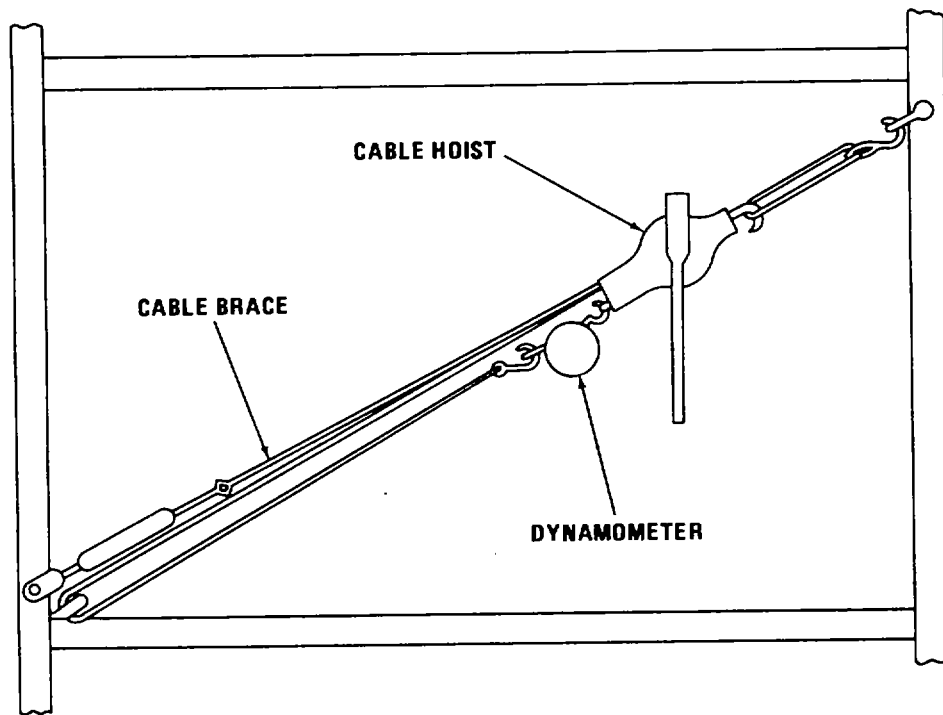


Figure 1-2. Tower Erection Kit

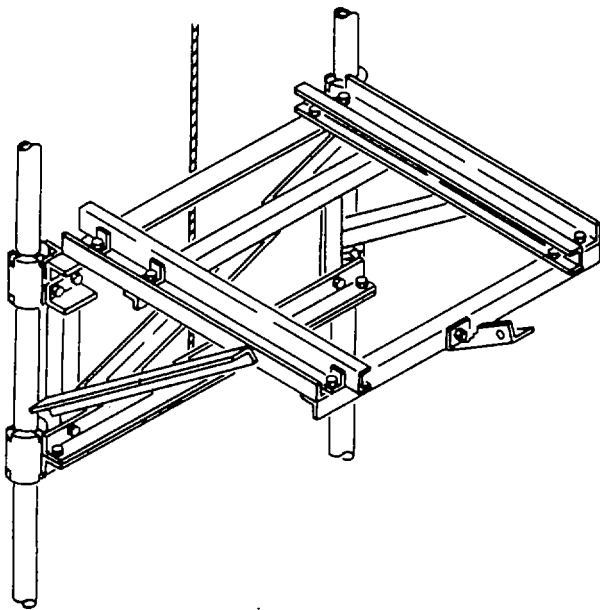
(6) *Tag Line.* The tag line is a 40-foot-long dacron rope used to raise individual units to the tower top. Use of tag line prevents contact of assembled tower members with units being raised.

c. *Antenna Elevation and Positioning Kit.* The antenna elevation and positioning kit contains the items and equipment needed to raise the AN/GSA-131(V)I or AS-2304/G antenna to the tower top. The kit consists of an elevator assembly, electric hoist, carriage assembly, and vertical track.

(1) *Elevator Assembly.* The elevator assembly (figure 1-3) is mounted on the vertical track and carries the carriage and antenna vertically to the tower top level. Vertical load capacity of the elevator assembly is 2,000 pounds.

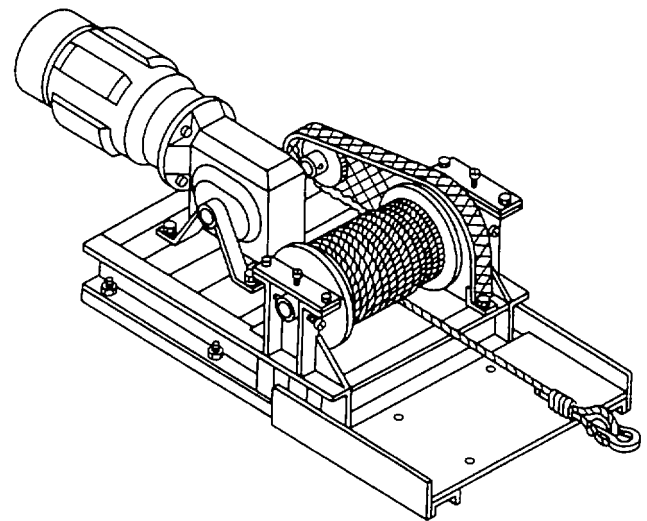
**WARNING**

**Do not use the hoist to raise or lower personnel. Special safety interlocks and guards required on personnel elevators are not provided.**



**Figure 1-3. Elevator Assembly**

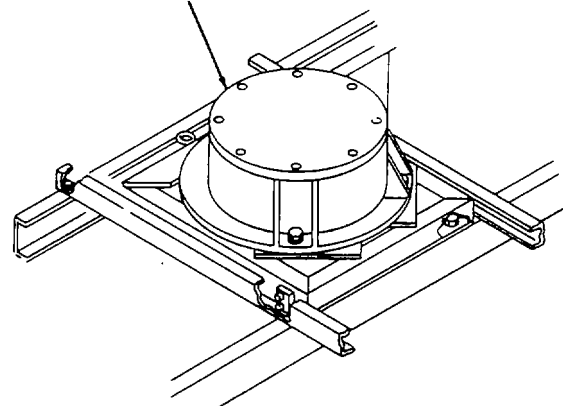
(2) *Electric Hoist Assembly.* The hoist assembly (figure 1-4) is an electrically operated, worm-gear reduction, chain-driven hoist with a capacity of 2,000 pounds. It is used to raise and lower the elevator assembly.



**Figure 1-4. Hoist Assembly**

(3) *Carriage Assembly.* The carriage assembly (figure 1-5) is used to transfer the AN/GSA-131(V)I or the AS-2304/G antenna from the elevator to the center of the tower top. The capacity of the carriage assembly is 2,000 pounds when not bolted to the top tower supports. (Special rollers safely resist overturn loads up to 1,000 foot-pounds.) Once positioned and secured to the tower top, the carriage assembly will support either antenna in extremely adverse environmental conditions.

**CUSTOMER-SUPPLIED PEDESTAL FOR AN/GSA-131(V) ANTENNA**



**Figure 1-5. Carriage Assembly**

(4) *Vertical Track.* The vertical track consists of two lengths of galvanized structural tubing mounted to one tower face and is used to guide the elevator assembly. When properly aligned and bolted to the horizontal braces, the track can resist an overturn load equal to that of the carriage assembly.

d. Accessory and Lighting Kit. The accessory and lighting kit consists of the tower grounding kit, aviation lighting kit, and convenience outlets.

(1) *Tower Grounding Kit.* The tower grounding kit provides a direct path to ground for any electrostatically induced or lightning charges. The kit consists of ground rods, ground wires, and associated hardware.

(2) *Aviation Lighting Kit.* The aviation lighting kit consists of two dual obstruction lights with transfer relay and failure alarm circuitry. The obstruction lights are mounted within 2 feet of the tower top to alert aircraft of a potential hazard. The aviation lighting kit requires 120-Vac, 50/60-Hz, single-phase power for operation.

(3) *Convenience Outlets.* Two convenience outlets are installed on the tower. One outlet and a weatherproof junction box are installed near the base of the tower; the other outlet is installed at the top of the tower. The outlets provide 120-Vac to power maintenance equipment.

**1-9. TABULATED DATA.** Overall operational characteristics and dimensions of the Antenna Tower TS-9A are as follows:

- Power requirements ..... 120 Vac, 50/60 Hz, single phase
- Height ..... 25 feet 6 inches
- Base dimensions ..... 96 inches square (outside of leg to outside of leg); 102 inches square (maximum overall envelope)
- Temperatures:
  - Operational ..... -200 to + 140° F
  - Storage ..... -400 to +140° F
- Antenna elevator capacity .2,000 pounds, maximum
- Wind loading:
  - Operational ..... 40 mph with 2 inches of radial ice (1/2 degree deflection maximum)
- Survival ..... 100 mph with 6 inches of radial ice

**1-10. ITEMS COMPRISING AN OPERABLE EQUIPMENT.** Components comprising an operable Antenna Tower TS-9A are listed in table 1-1 and in Appendix B of this manual.

**Table 1-1. Items Comprising an Operable Antenna Tower TS-9A\***

NSN	Item	Quantity	Height (in.)	Depth (in.)	Width (in.)	Weight (in.)
	Tower Assembly Kit	1				
	Tower Erection Kit	1				
	Antenna Elevation and Positioning Kit	1				
	Accessory and Lighting Kit	1				

\*Repair parts for the Antenna Tower TS-9A are listed in Appendix E.



CHAPTER 2

SERVICE UPON RECEIPT AND INSTALLATION

Section I. SITE AND SHELTER REQUIREMENTS

**2-1. SITING.** The site selected for the Antenna Tower TS-9A, whenever tactically possible, should meet the requirements listed below.

a. Terrain should be essentially flat for at least 150 yards in all directions from center, with not more than gentle sloping for several times that distance.

b. Site should be on the highest level area available in the general vicinity.

c. Mountainous or hilly terrain should be avoided.

d. Tower should not be erected in dry streambeds. (Sudden rainstorms may cause flash flooding.)

e. Site should be far enough inland so that coastal refraction errors from shorelines of large bodies of water are avoided. (If installation must be made on or near the coast, the most level area should be selected. Accuracy is greatest when signals from the target area cross the coastline at right angles).

f. The earth surrounding the installation should have uniformly high conductivity and a uniform moisture content. Areas evenly covered with grass or vegetation usually meet this requirement. (Rocky or sandy soil has low conductivity and should be avoided where possible; however, an area with uniformly low conductivity is preferable to an area of high conductivity that is spotted with rocks or sand, or has varying moisture content.)

g. Regions showing scattered bare spaces of earth should be avoided. Such spaces usually indicate the presence of rocks, mineral outcroppings, or underground streams.

h. Site should have an adequate and readily available power source to meet the operational requirements of the Antenna Tower TS-9A.

i. An easily accessible road with a solid base should be available for transportation of personnel and heavy equipment. Consideration may be given to space in an adjacent area for helicopter landings.

j. Site should be far enough from obstructions to assure greater accuracy of bearings. Table 2-1 lists

recommended distances that should be maintained between the set and various obstructions.

**Table 2-1. Distances from Obstructions**

<b>Obstruction</b>	<b>Distance to be maintained</b>
Scattered trees and single, small buildings	200 yards
Wire fences	300 yards
High cliffs and deep ravines	More than 1 mile
Buried metallic conductors (cables and pipelines)	300 yards
Chimney stacks and water towers	500 yards
Overhead conductors and railroad tracks (power lines, telephone lines, and antennas)	500 yards
Rivers, streams, and lakes	600 yards
Forests and metal structures	500 to 1,000 yards
Mountains	5 to 25 miles

**2-2. SITE PREINSTALLATION PREPARATION.** Minor site preparation may be necessary prior to tower installation. The site area should be level so operators can use equipment with maximum efficiency. Ensure that adequate drainage is provided.

**2-3. SITE SOIL CONSIDERATIONS.** The area selected for tower installation should be able to withstand a minimum load bearing capacity of 3,000 pounds per square foot. If the area cannot provide this minimum, the size of all concrete piers must be increased to further distribute the loads. Consult civil engineers for guidance on load distribution if necessary.

**2-4. SHELTER REQUIREMENTS.** There are no shelter requirements for the Antenna Tower TS-9A.

Section II. SERVICE UPON RECEIPT OF MATERIEL

**2-5. UNPACKING.** The Antenna Tower TS-9A is shipped to the installation site completely disassembled and crated. A crane, fork lift, or a winch truck with an A-frame which can lift a minimum vertical load of 2 tons

will be required for unloading and handling the crates. Materials should be unloaded and stored carefully and systematically to prevent damage to and loss of small pieces, and to allow rapid identification of related parts.

**2-6. CHECKING UNPACKED EQUIPMENT.**

- a. Inspect the equipment for any damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Report of Packaging and Handling Deficiencies.
- b. Check the equipment against the component listing in this manual and the packing slip to see if the shipment is complete. Report all discrepancies in accordance with instructions set forth in TM 38-750. The equipment should be placed in service even though

a minor assembly or part that does not affect proper functioning is missing.

c. Check to see whether the equipment has been modified. (Equipment which has been modified will have the Modification Work Order (MWO) number on the equipment.) Check also to see whether all currently applicable MWO's have been applied. (Current MWO's applicable to the equipment are listed in DA PAM 310-6 or DA PAM 310-7 as applicable.)

d. For dimensions, weights, and volumes of packaged items, see SB 700-20.

**Section III. INSTALLATION INSTRUCTIONS**

**2-7. SAFETY PRECAUTIONS AND EQUIPMENT QUALITY CONTROL REQUIREMENTS.** The following safety precautions and equipment quality control requirements shall be observed during installation for safe, accurate, and satisfactorily expedient erection of the Antenna Tower TS-9A.

- a. Personnel shall be familiar with the usual safety precautions and with the safety equipment employed in structural steel erection.
- b. All erection tools and equipment shall be maintained in a safe condition, especially lifting and safety gear.
- c. Special care shall be employed when handling structural steel during wet or icy weather conditions.
- d. The erection gear and antenna elevator shall not be used as personnel hoist carriers.
- e. Only the prescribed erection gear and antenna elevator shall be used. (Civil engineer need not be consulted.) AH other erection and installation procedures must be approved by a civil engineer.
- f. Materials will be stacked and arranged to provide clear working spaces and to enable rapid identification of related components.
- g. Proper care will be taken in stockpiling material to protect it from damage.
- h. AH tapes, transits, rods, and auxiliary measuring equipment will be properly calibrated prior to installation and maintained during erection.
- i. During erection all partial assemblies will be guyed or otherwise secured for protection against high winds.
- j. Drift pins will be used for aligning purposes only.
- k. Damage to protective coatings will be corrected by brush painting one coat of rust inhibitor compound on structural members.

**2-8. TOOLS, TEST EQUIPMENT, AND MATERIALS REQUIRED FOR INSTALLATION.** The tools and materials required and authorized for installation of the Antenna Tower TS-9A are listed in the Maintenance Allocation Chart (MAC), Appendix D, of this manual. No test equipment is required. Table 2-2 provides a list of tools and materials, purposes, and applicable publications.

**2-9. PRELIMINARY PROCEDURES.**

a. Preliminary procedures for assembly and installation of the Antenna Tower TS-9A are intended for use by both field engineer and erection personnel, and are based upon the assumptions that:

- (1) The erection site has been properly surveyed for layout of the tower prior to erection.
- (2) Personnel are experienced with structural steel erection (i.e., familiar with rigging and the use of heavy handling equipment).

b. Preliminary procedures shall take into consideration the following:

- (1) To insure uniformity, all screw threads on fastener hardware should face the same direction wherever possible (i.e., all outward, all inward, all up, or all down), unless otherwise specified.
- (2) Hardware should be properly tightened with calibrated torque wrenches. However, when using socket wrenches, tighten the bolts by fully compressing the lockwasher and then turning the nut an additional one-half turn. Refer to tables 2-3 and 2-4 for the proper torque values of hardware.

**Table 2-2. Tools and Materials Required for Installation**

Items	Purpose	Applicable publication
Transit level	Level erection site and concrete piers.	
Tripod	Transit level support.	
Spirit levels (48- and 78-inch)	Level parts of tower structure.	
Measuring tape (100-foot)	Measure lengths of parts.	
Torque wrench (0-200 ft-lbs)	Tighten bolts properly.	
Torque wrench (0-600 ft-lbs)	Tighten bolts properly.	
Open wire clamps (6 each)	Secure winch cable.	
Safety hard hat (1 per person)	Personnel protection.	
Safety strap (2 each)	Personnel protection during tower erection.	
Ladder (20-foot)	Provide access to tower parts.	
Cement	Construct tower piers.	
Reinforcement steel	Strengthen concrete tower piers.	

**Table 2-3. Recommended Torque Values for Galvanized Fastener Hardware**

Diameter in inches	Torque values	
	Hi-strength	Standard
1/4	9 ft-lbs	6 ft-lbs
5/16	17 ft-lbs	11 ft-lbs
3/8	30 ft-lbs	19 ft-lbs
7/16	47 ft-lbs	30 ft-lbs
1/2	69 ft-lbs	45 ft-lbs
9/16	103 ft-lbs	66 ft-lbs
5/8	145 ft-lbs	93 ft-lbs
3/4	234 ft-lbs	150 ft-lbs
7/8	372 ft-lbs	202 ft-lbs
1	551 ft-lbs	300 ft-lbs

**Table 2-4. Recommended Torque Values for Stainless Steel Fastener Hardware**

Diameter in inches	Torque values
1/4	79 in-lbs
5/16	138 in-lbs
3/8	21 ft-lbs
7/16	33 ft-lbs
1/2	45 ft-lbs

**2-10. TOWER PIER INSTALLATION.** Lay out the tower pier locations and the hoist location with a transit to the dimensions shown in figure 2-1. The size of the tower piers and the amount of reinforcement steel must be determined by considering the soil conditions and vertical loads. Proceed as follows:

- a. Dig the pier holes and set the top of the forms with a level (figures 2-2 and 2-3).
- b. Wire in the reinforcement steel as required.

**CAUTION**

**Float a fine grain surface on the top of the piers. Allow a minimum of 28 days for the concrete to cure before erection of tower.**

c. With the aid of a template, place the pier bolts and hoist bolts into position while the concrete is still soft. Refer to figure 2-1 for template hole patterns.

**2-11. TOWER INSTALLATION.** The tower is installed with the equipment listed in table 2-2 and with common hand tools, such as wrenches and screwdrivers. Total installation time, once the foundation and anchor hardware are readied (paragraph 2-10), is approximately 3 days for three erection personnel. The following step-by-step sequence should be followed to satisfactorily install the tower in the minimum time.

a. *Tower Leg Installation.* Refer to figure 24 (sheet 2 of 5).

- (1) Screw one hex nut (4) onto each pier bolt imbedded in concrete.

- (2) Level all nuts with surveyor's transit or spirit level.

- (3) Hold bottom (flange) end of lower legs (1,2) in position on top of pier.

- (4) Raise each of the four legs to an upright position.

- (5) Secure each leg to pier bolts with one hex nut (4) and locknut (3) on each bolt.

b. *Brace Installation.* Refer to figure 2-4 (sheets 2, 3, and 4 of 5).

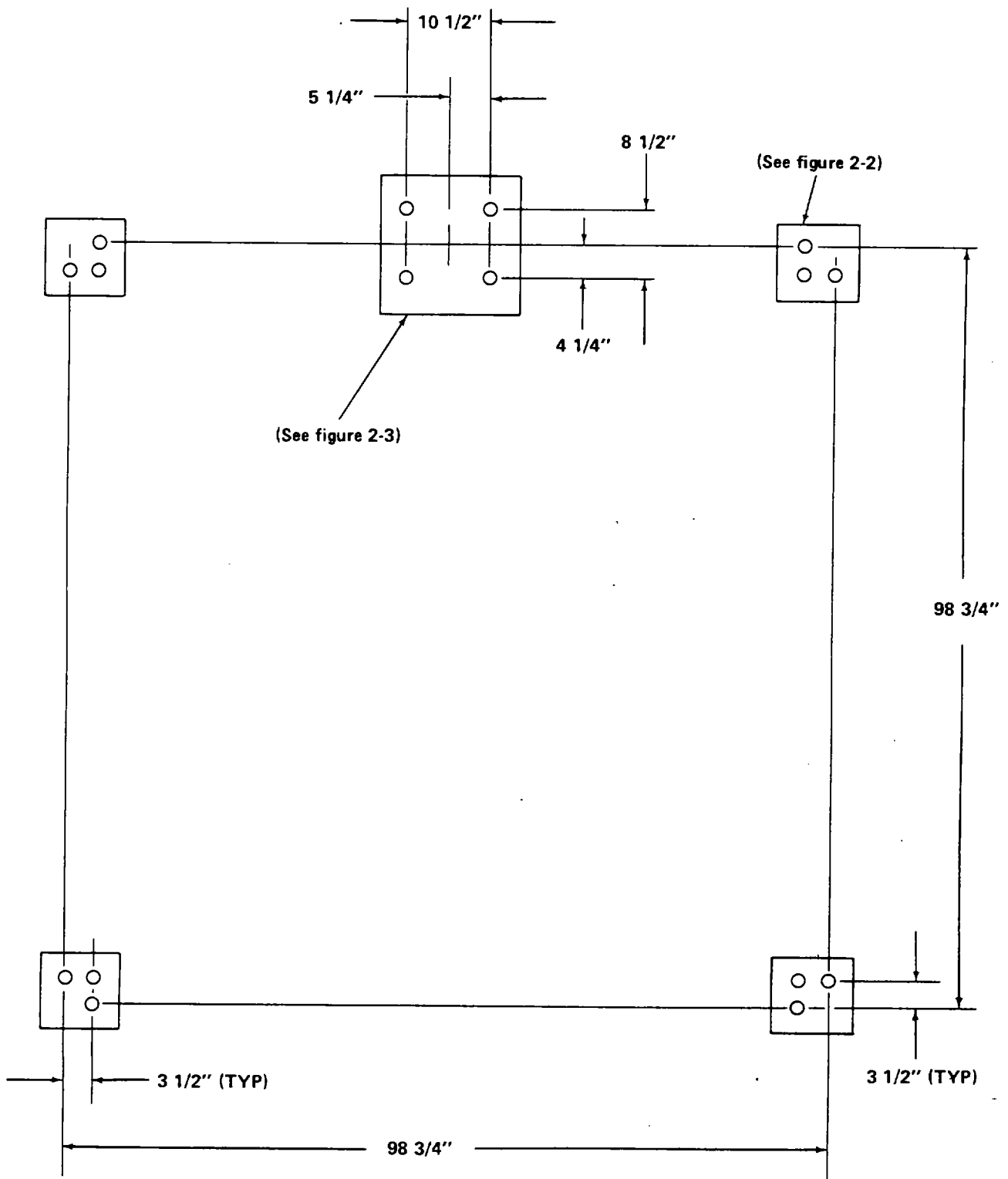
- (1) Install three bottommost horizontal braces (16) and one bottommost horizontal brace (23) to lower tower legs. Secure with eight 3/4-inch bolts (14), hex nuts (12), and locknuts (13). Do not torque hardware at this time.

**NOTE**

**Be sure to follow brace hole patterns as shown in figure 2-4, (detail G, sheet 4 of 5).**

- (2) Install three horizontal braces (16) and one horizontal brace (23) (located approximately 5 feet above the ground) to the tower legs. Secure with eight 3/4-inch bolts (14), hex nuts (12), and locknuts (13). Do not torque hardware at this time.

- (3) Install four corner braces (26) to each level of horizontal braces (total of eight corner braces). Secure with two 1/2-inch bolts (27), hex nuts (28), and locknuts (29) for each corner brace.



NOTE: PIERS DESIGNED FOR SOIL EXHIBITING A  
MINIMUM BEARING CAPACITY OF 3000 PSF

Figure 2-1. Tower Pier Layout

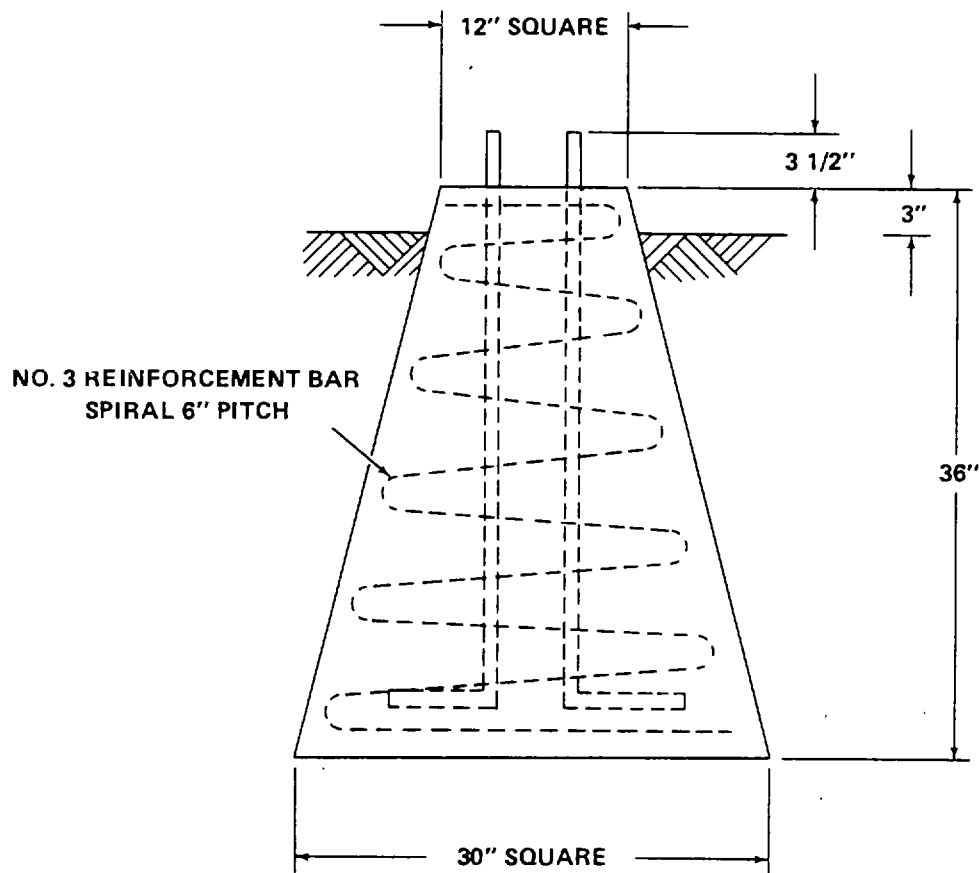


Figure 2-2. Tower Pier

(4) Attach eight cable braces (19) between the two levels of horizontal braces. Do not tension cables at this time.

(5) Install a third level of three horizontal braces (16) and one horizontal brace (23). Secure with eight 3/4-inch bolts (14), hex nuts (12), and locknuts (13). Do not torque hardware at this time.

(6) Install four corner braces (26) to the third level of horizontal braces. Secure with two 1/2-inch bolts (27), hex nuts (28), and locknuts (29) for each corner brace.

(7) Install three joint braces (17) and one joint brace (24) to lower tower legs. Be sure to locate joint brace No. 1 on the same face as horizontal brace No. 2. Secure with six 3/4-inch bolts (11), hex nuts (12), and locknuts (13) for each joint brace.

**NOTE**

**The gin pole pulley and hoist lines may be used to raise the braces.**

*c. Upper Tower Leg Installation.*

(1) Refer to figure 2-5. Install the tower erection fixture (I) as follows:

(a) Assemble block (2), hoist line (9), tension sling (8), and tag line (7) as shown.

(b) Slide upper and lower supports (3) over any two horizontal braces.

(c) Tighten two thumbscrews (6) to clamp supports in position.

(d) Insert two lockpins (4) to safety lock upper and lower supports. Secure with two hitchpins (5) for each pin.

**NOTE**

**The erection fixture, when properly secured, may be used to raise all equipment to the required height.**

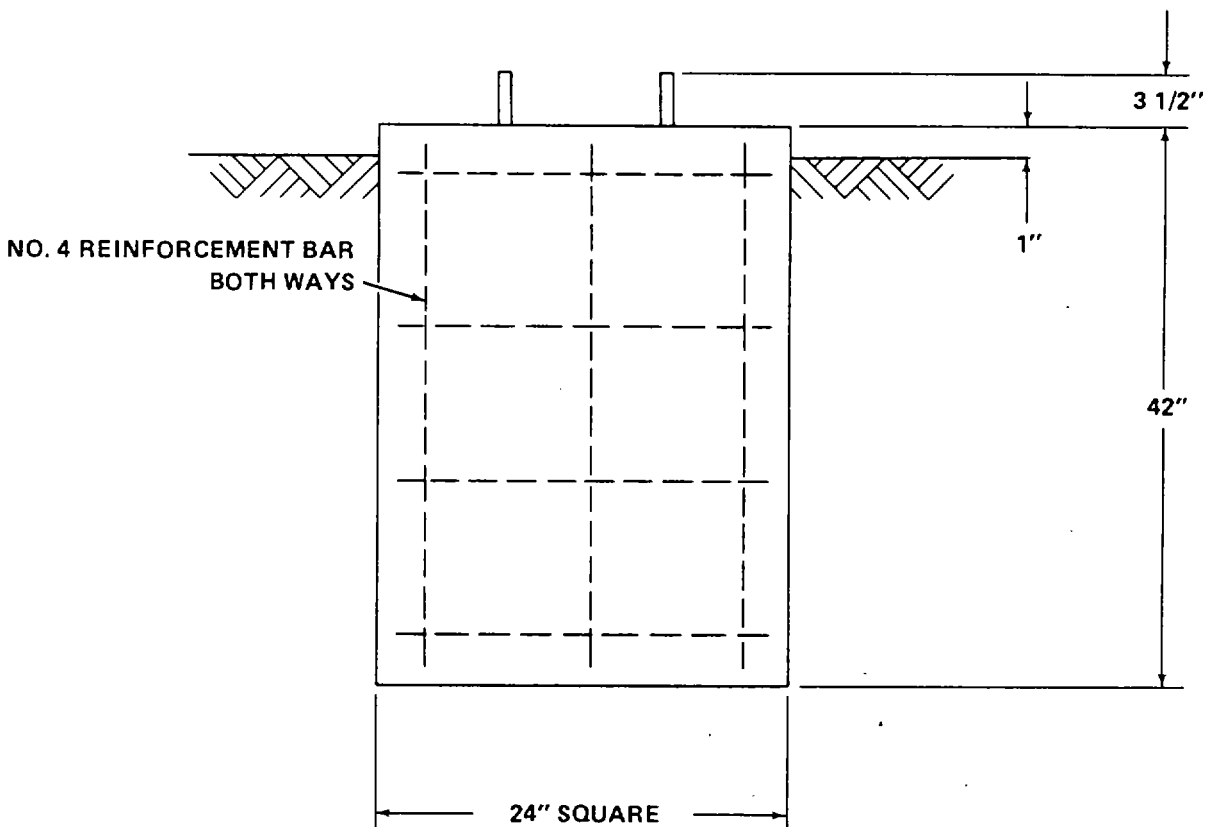


Figure 2-3. Hoist Pier

(2) Refer to figure 24, sheets 2 and 3. Use erection fixture to raise and install three upper tower legs (10) and one upper tower leg (21) to joint braces (17, 24). Secure with four 3/4-inch bolts (11), hex nuts (12), and locknuts (13) for each leg. Do not torque hardware until upper legs are plumb with lower legs.

*d. Upper Brace Installation.* Refer to figure 24 unless otherwise indicated.

(1) Use erection fixture to raise and install one horizontal brace (16), one horizontal brace (23), and two horizontal braces (18). Secure with two 3/4-inch bolts (14), hex nuts (12), and locknuts (13) for each brace.

(2) Install four corner braces (26) to upper horizontal braces. Secure with two 1/2-inch bolts (27), hex nuts (28), and locknuts (29) for each corner brace.

(3) Install top tower braces Nos. 1 through 4 (5, 20, 22, and 25) to top tower legs. Secure with four 3/4-inch bolts (14), hex nuts (12), and locknuts (13) for each brace.

(4) Refer to figure 2-6. Install tower top braces Nos. 5 and 6 (19, 11). Secure with two angle braces (12) and four 1/2-inch bolts (13), hex nuts (14), and locknuts (15) for each brace.

(5) Refer to figure 2-6. Install tower top braces Nos. 7 and 8 (16, 17). Secure with two angle braces (12) and four 1/2-inch bolts (13), hex nuts (14), and locknuts (15) for each brace.

(6) Refer to figure 24. Install remaining cable braces (15) to tower legs.

(7) Tension all cable braces as follows:

(a) Assemble the cable hoist, tensioning cable, and dynamometer as shown in figure 2-7.

**CAUTION**

**Keep tower legs plumb and straight to prevent unwanted deflection and prestressing of leg members.**

(b) Crank cable hoist until dynamometer indicates required tension. Tighten turnbuckle (33) until dynamometer reading begins to drop. Cable hoist may now be removed.

**NOTE**

**The reading on the dynamometer is one-half the actual tension being applied, because the cable hoist line is doubled. Multiply readings by two to obtain proper values listed below.**

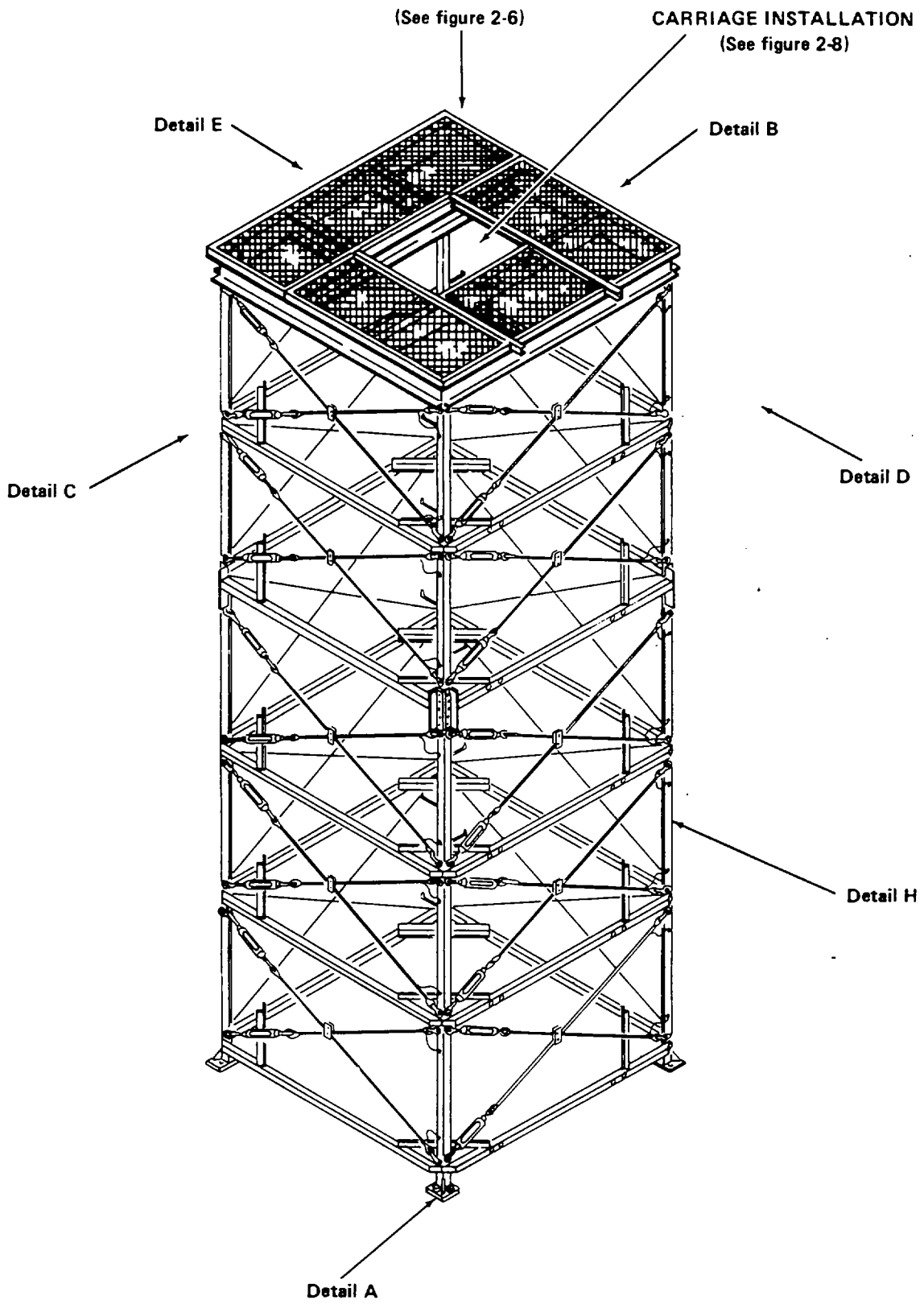


Figure 2-4. Tower Assembly (Sheet 1 of 5)



Legend

1. Lower tower leg assy No. 1
2. Lower tower leg assy No. 2
3. Locknut 3/4 – 10 galv
4. Hex nut H.S. 3/4 – 10 galv
5. Top tower brace No. 4
6. Crossover clamp
7. Hex hd bolt
8. Split lockwasher 1/4 SST
9. Hex nut 1/4 – 20 SST
10. Upper tower leg No. 2
11. Hex hd bolt H.S. 3/4 – 10  
× 2-1/4" galv
12. Hex nut H.S. 3/4 – 10 galv
13. Locknut 3/4 – 10 galv
14. Hex hd bolt 3/4 – 10
15. Hex hd bolt H.S. 1/4 – 20 × 1"
16. Horizontal brace No. 3
17. Joint brace No. 2
18. Horizontal brace No. 1
19. Cable brace assy

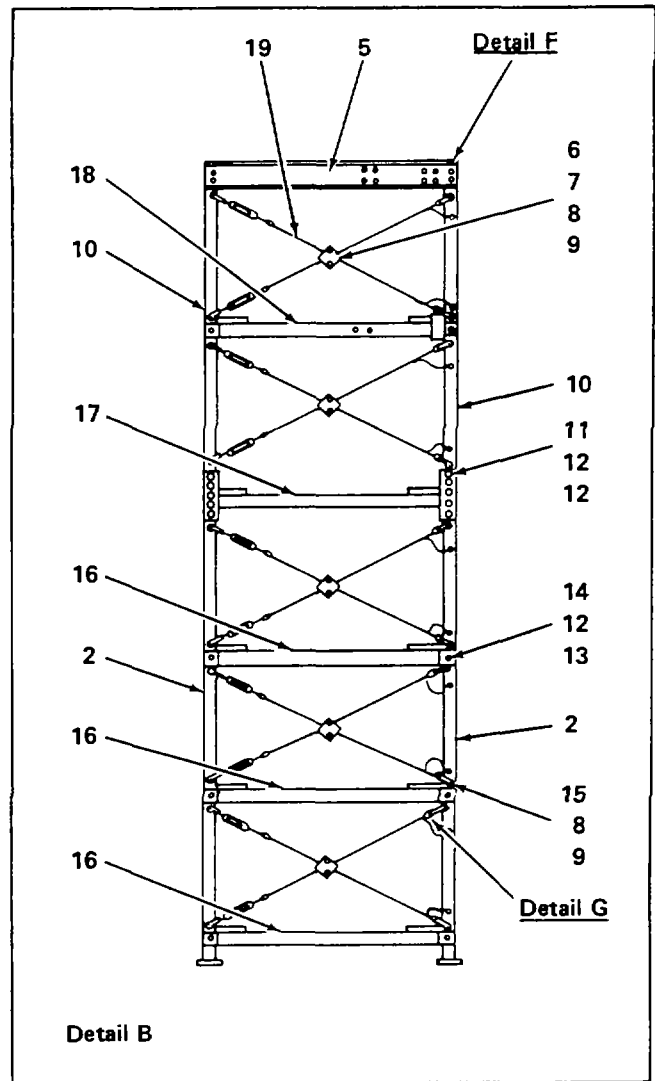
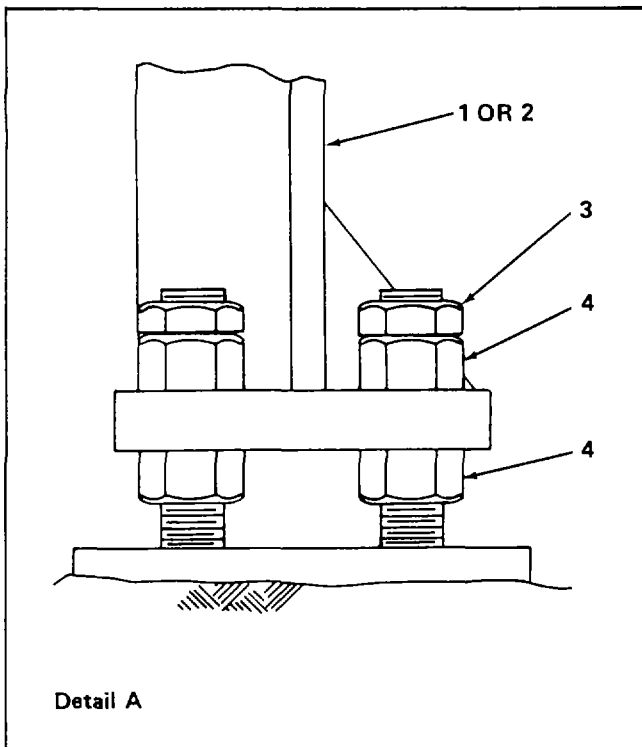


Figure 2-4. Tower Assembly (Sheet 2 of 5)

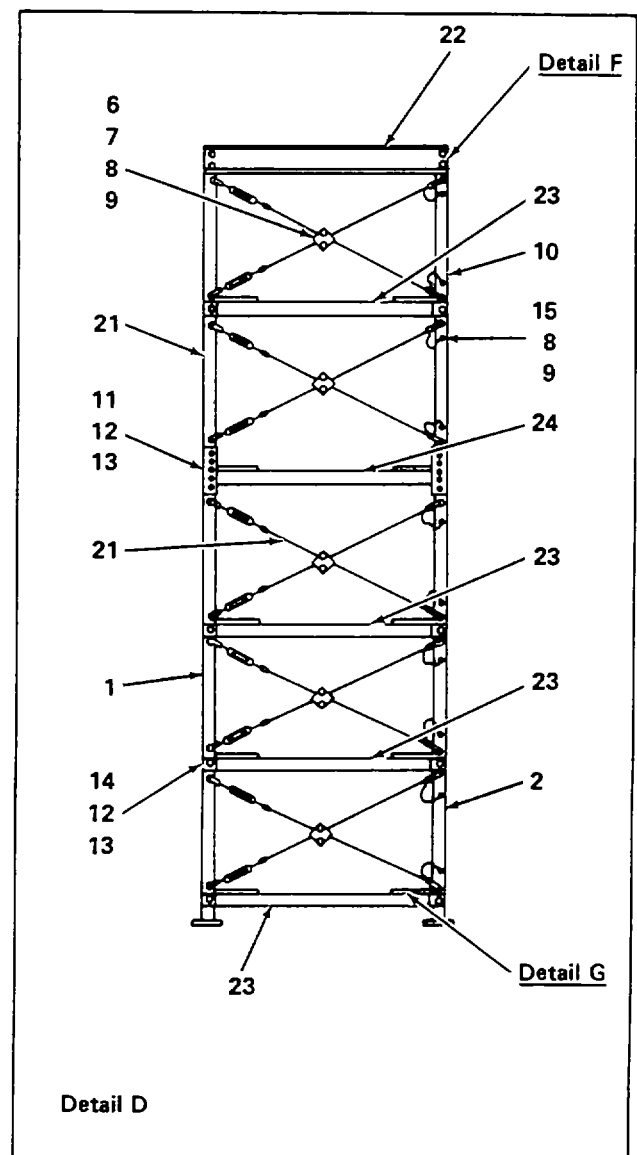
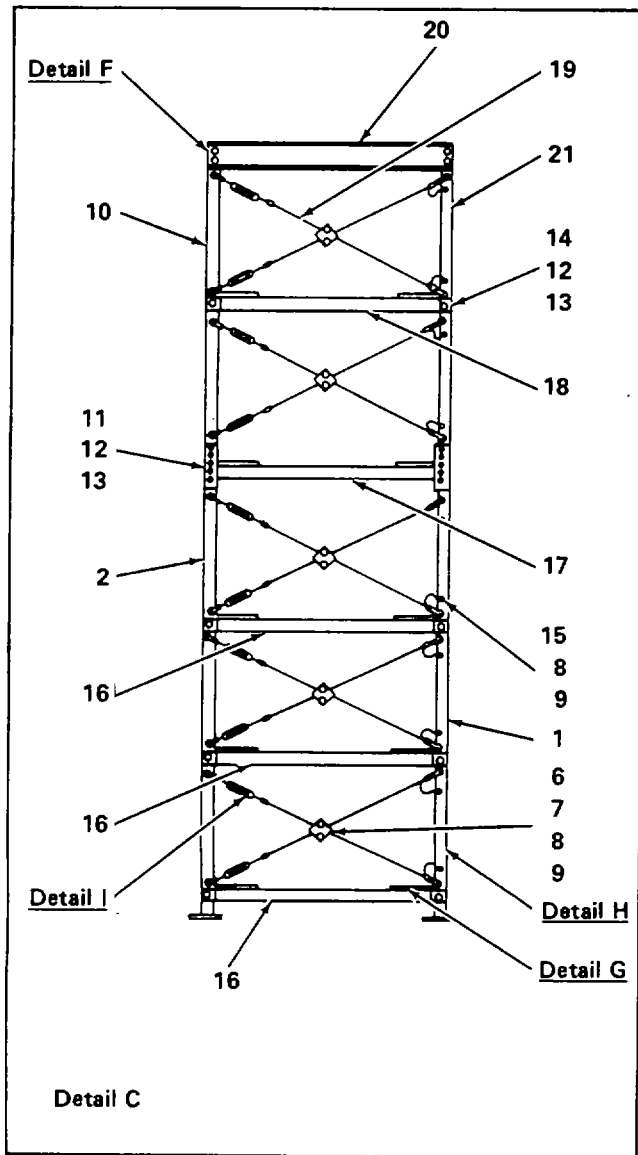


Figure 2-4. Tower Assembly (Sheet 3 of 5)

Legend (Continued)

- 20. Top tower brace No. 2
- 21. Upper tower leg No. 1
- 22. Top tower brace No. 1
- 23. Horizontal brace No. 2
- 24. Joint brace No. 1
- 25. Top tower brace No. 3
- 26. Corner brace
- 27. Hex hd bolt 1/2 - 13 x 4-1/2" galv
- 28. Hex nut 1/2 - 13 galv
- 29. Lock nut 1/2 - 13 galv

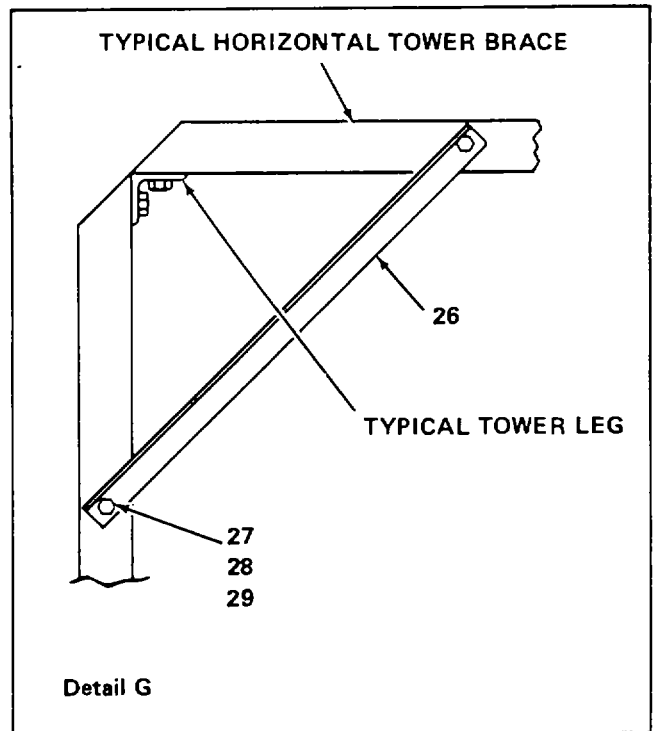
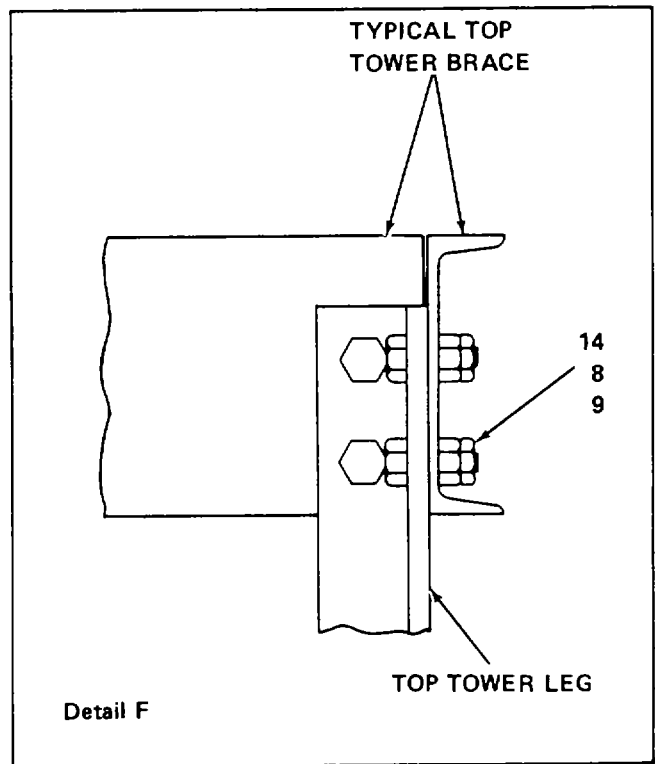
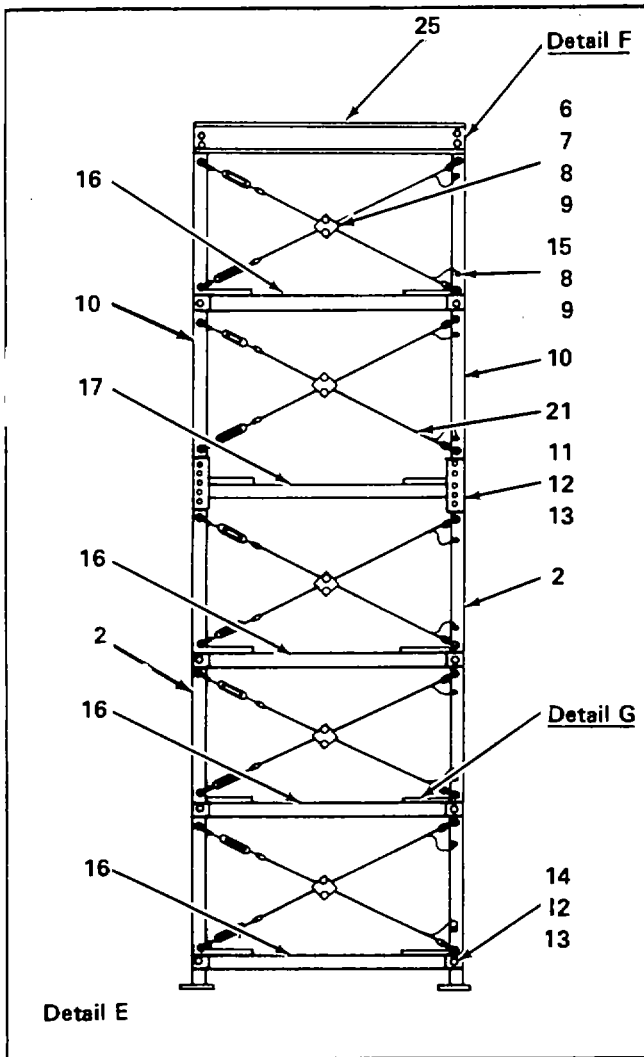
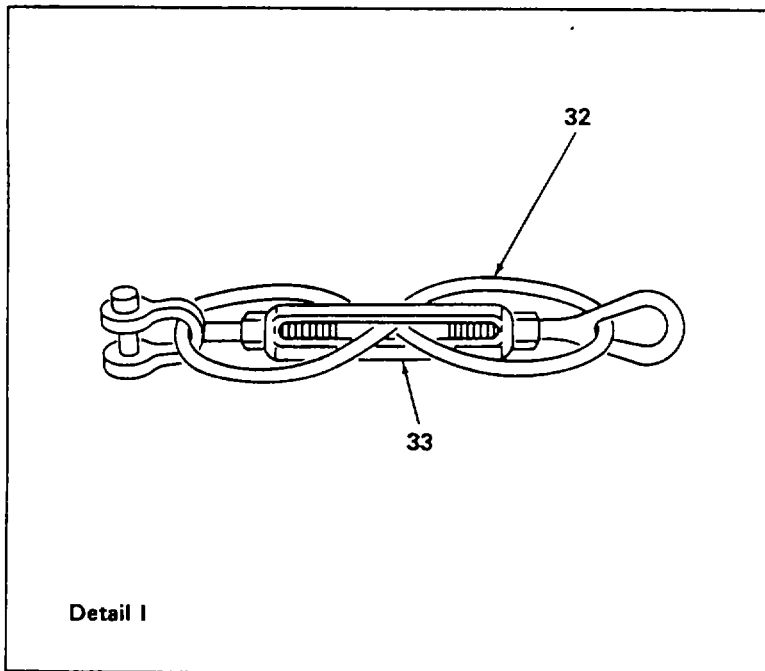
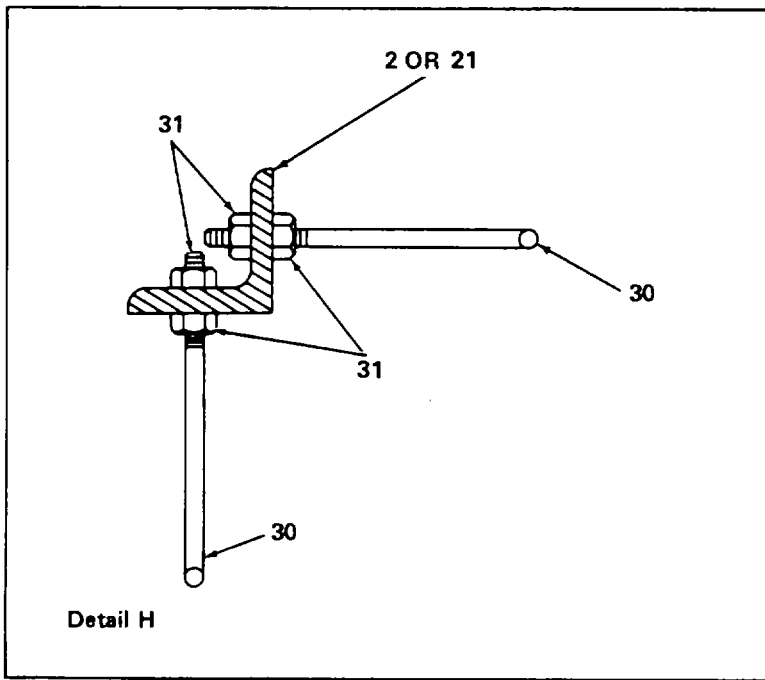


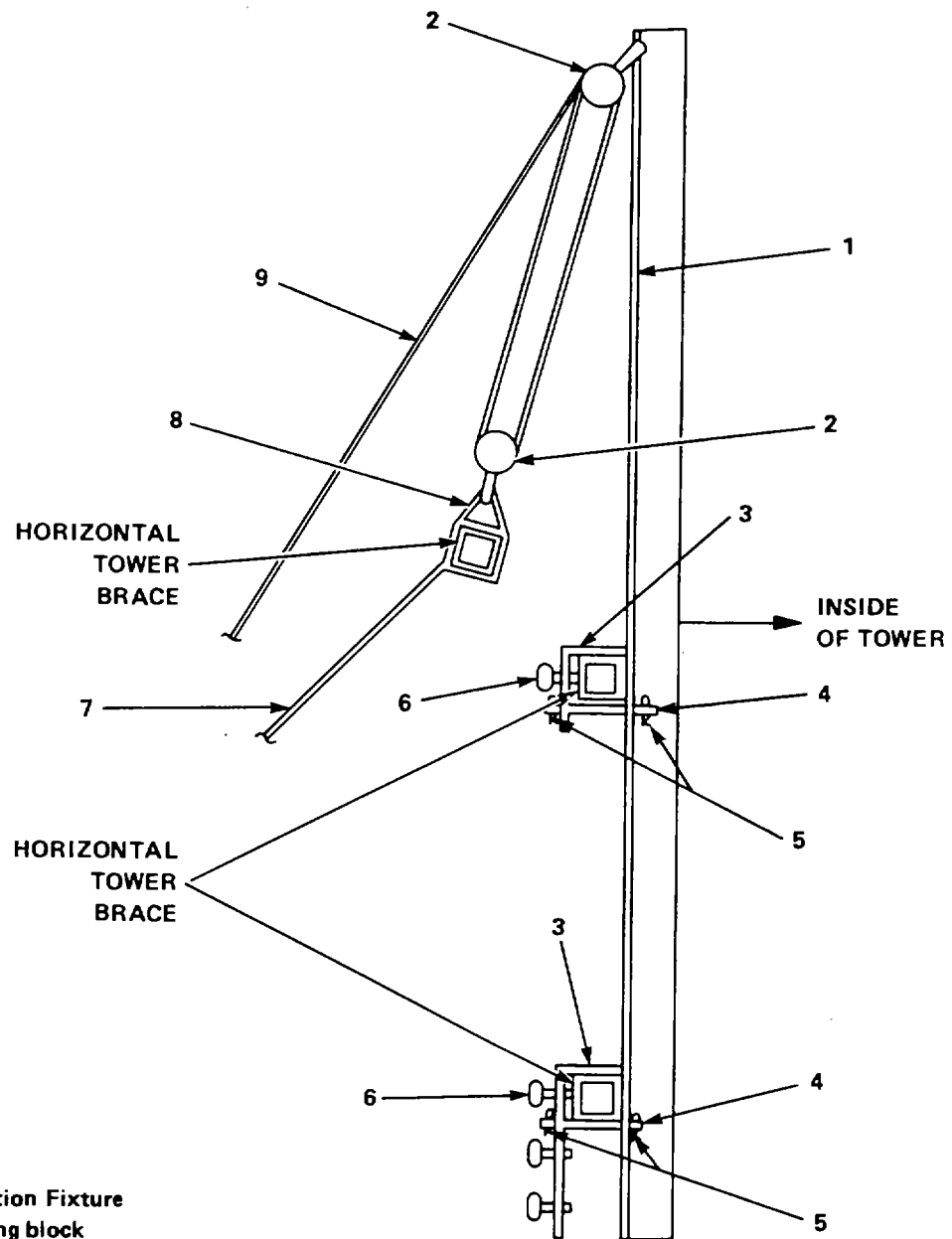
Figure 2-4. Tower Assembly ((Sheet 4 of 5))



Legend (Continued)

- 30. Tower step
- 31. Hex nut
- 32. Wraplock
- 33. Turnbuckle

Figure 2-4. Tower Assembly (Sheet 5 of 5)



**Legend**

- 1. Erection Fixture
- 2. Lifting block
- 3. Upper and lower supports
- 4. Safety-lock pin
- 5. Hitchpin
- 6. Thumb screw
- 7. Tag line
- 8. Tension sling
- 9. Hoist line

**Figure 2-5. Tower Erection Kit Installation**

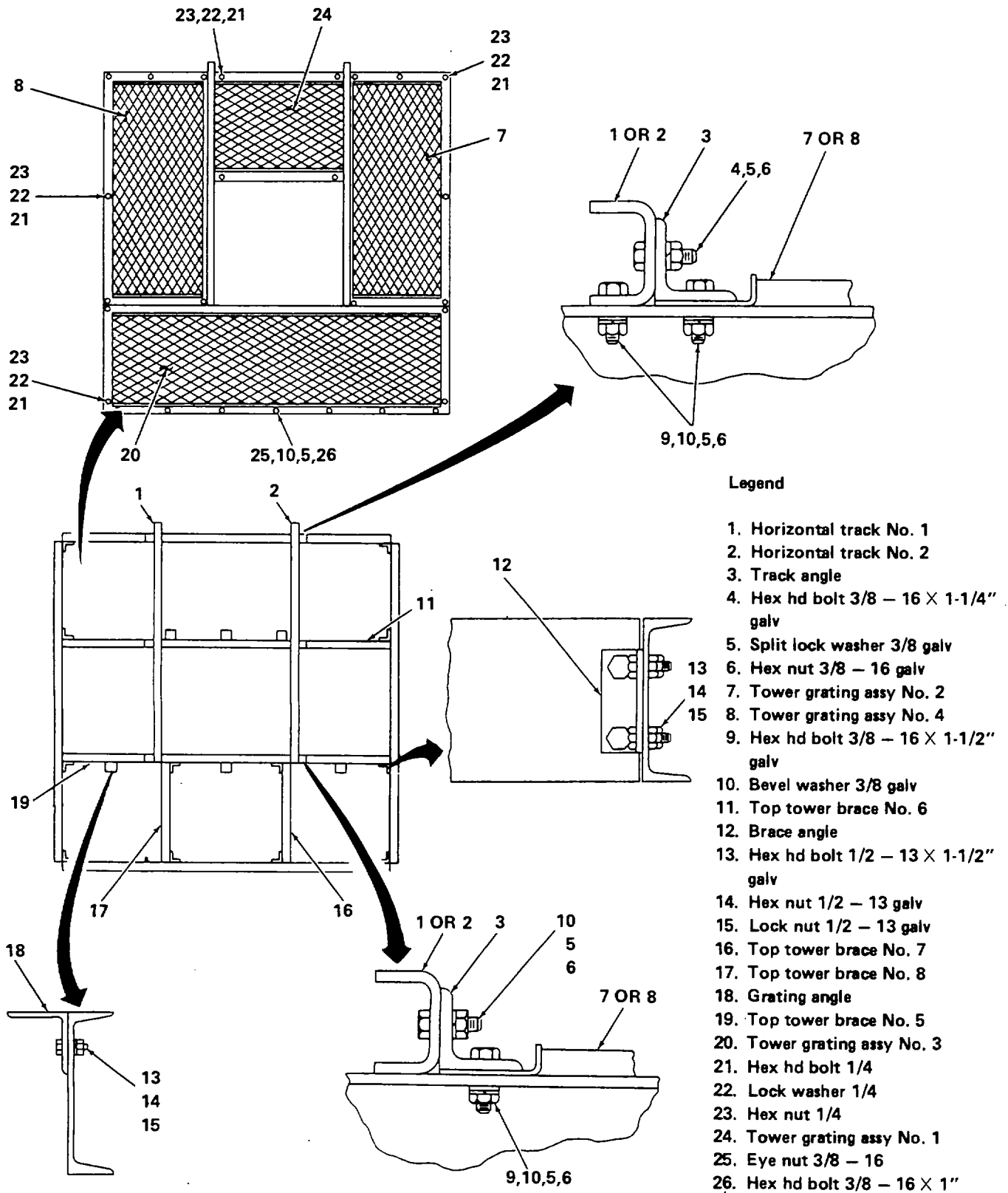
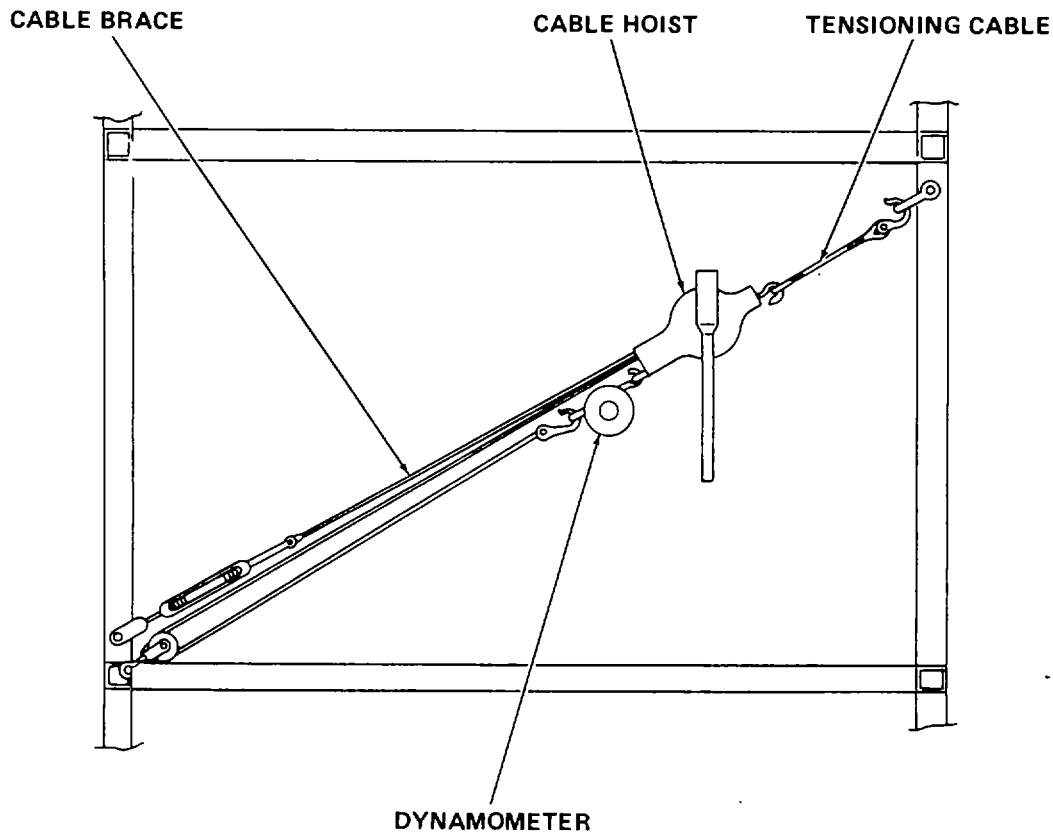


Figure 2-6. Tower Assembly Top Section



**Figure 2-7. Cable Brace Tensioning**

(c) Tension each cable at any level incrementally as shown below until 2,500 pounds tension is reached:

- 500 pounds $\pm$ 50 pounds
- 200-pound increments
- 2,500 pounds final tension

(d) After each cable is tensioned, lock turnbuckle (33) with wraplock (32) (Detail I, figure 24).

(8) Torque all fastener hardware to required values. (See tables 2-3 and 24.)

e. *Final Tower Installation.* (See figures 24 and 2-6.)

(1) Refer to figure 2-4. Attach a crossover clamp (6) at each pair of cable braces (19). Secure with 1/4-inch bolt (7), hex nut (9), and lockwasher (8) for each clamp.

(2) Install 15 tower steps (30) to tower leg. Secure with 30 hex nuts (31) (Detail H, figure 24).

(3) Attach ground strap of each cable brace to tower leg. Secure with 1/4-inch bolts (15), hex nuts (9), and lockwashers (8) (figure 2-4).

(4) Refer to figure 2-6. Install six grating angles (18) to braces (19, 11). Secure with 1/2-inch bolt (13), hex nut (14), and locknut (15) for each angle.

(5) Install grating assembly No. 3 (20). Secure with 13 1/4-inch bolts (21), hex nuts (23), and lockwashers (22) (figure 2-6).

(6) Install grating assembly No. 2 (7). Secure with eight 1/4-inch bolts (21), hex nuts (23), and lockwashers (22) (figure 2-6).

(7) Install grating assembly No. 1 (24). Secure with six 1/4-inch bolts (21), hex nuts (23), and lockwashers (22) (figure 2-6).

(8) Install grating assembly No. 4 (8). Secure with eight 1/4-inch bolts (21), hex nuts (23), and lockwashers (22) (figure 2-6).

(9) Install eyenut (25), bevel washer (10), lockwasher (5), and bolt (26) (figure 2-6).

(10) Install six track angles (3). Secure with one 3/8-inch bolt (9), bevel washer (10), lockwasher (5), and hex nut (6) for each angle (figure 2-6).

(11) Install horizontal track No. 1 (1). Secure to three track angles (3) with three 3/8-inch bolts (4), lockwashers (5), and hex nuts (6) (figure 2-6).

(12) Secure horizontal track No. 1 (1) to tower top brace No. 5 (19) with 3/8-inch bolts (9), bevel washers (10), lockwashers (5), and hex nuts (6) (figure 2-6).

(13) Install horizontal track No. 2 (2). Secure to three track angles (3) with three 3/8-inch bolts (4), lock-washers (5), and hex nuts (6) (figure 2-6).

(14) Secure horizontal track No. 2 (2) to tower top brace No. 5 (19) with 3/8-inch bolt (9), bevel washer (10), lockwasher (5), and hex nut (6) (figure 2-6).

*f. Carriage Installation.* Refer to figure 2-8.

(1) Install four cam follower blocks (1) and eight cam followers (2) to carriage assembly (3). Secure with eight 3/8-inch bolts (4), lockwashers (5), and hex nuts (6).

(2) Install eyenut (7) to carriage assembly (3). Secure with lockwasher (8), and 3/8-inch bolt (9).

(3) Install carriage assembly (3) onto horizontal tracks.

**2-12. ANTENNA ELEVATION AND POSITIONING KIT INSTALLATION.** Install the Antenna Elevation and Positioning Kit as described below, using the tower erection fixture as required.

*a. Vertical Track Installation.* Refer to figure 2-9.

(1) Raise one upper vertical track (9) into position and attach to top tower brace. Secure with four 1/2-inch bolts (6), hex nuts (7), and locknuts (8).

(2) Secure upper vertical track (1) to two uppermost horizontal braces with four 1/2-inch bolts (6), hex nuts (7), and locknuts (8).

(3) Install remaining upper vertical track in same manner as described in steps (1) and (2).

(4) Insert one track cripple (11) into top end of each lower vertical track (12). Secure cripple to lower vertical tracks with four 3/8-inch bolts (13) and lockwashers (14).

(5) Hoist lower vertical tracks (12), one at a time. Insert cripples into upper vertical tracks (9). Secure lower vertical tracks to three lower horizontal braces with 1/2-inch bolts (10), hex nuts (7), and locknuts (8).

(6) Secure track cripples to upper vertical tracks with one 3/8-inch bolt (13) and lockwasher (14) for each cripple.

(7) Install limit switch (4) and limit switch cable (5) to horizontal track. Secure with two screws (1), lockwashers (2), and hex nuts (3).

*b. Electric Hoist Installation.* Refer to figure 2-10.

(1) Place hoist mount (1) onto four anchor bolts in hoist pier. Secure with four hex nuts (2) and locknuts (3).

(2) Install hoist (8) to hoist mount (1). Secure with four 5/8-inch bolts (4), bevel washers (5), hex nuts (6), and locknuts (7).

(3) Connect primary power from power panel to hoist junction box as shown in figure FO-1.

(4) Attach sheave bracket (9) to tower top brace. Secure with two bevel washers (5), hex nuts (6), and locknuts (7).

(5) Install sheave (10) and two spacers (11) to sheave bracket (9).

(6) Thread hoist cable (12) through sheave. Temporarily secure free end to the top tower step.

*c. Elevator Assembly and Installation.* Refer to figure 2-11.

(1) Insert two sleeve assemblies (18) onto each vertical track. Orient sleeve assemblies as shown.

(2) Attach horizontal elevator brace (25) and two horizontal braces (20) to upper sleeve assemblies (18). Secure with two 3/8-inch bolts (5), hex nuts (6), and locknuts (7), and two 3/8-inch bolts (21), and lockwashers (22).

(3) Attach two horizontal elevator braces (4, 16) to the lower sleeve assemblies. Secure with six 3/8-inch bolts (5), hex nuts (6), and locknuts (7).

(4) Attach vertical braces (2,19). Secure with four 3/8-inch bolts (5), hex nuts (6), and locknuts (7).

(5) Install hoist cable to lower horizontal brace (4). Position elevator as desired.

(6) Preassemble horizontal braces (8, 13, 15 26). Secure with four 3/8-inch bolts (5), hex nuts (6), and locknuts (7).

(7) Attach lower end of diagonal braces (3,17) to vertical braces (2, 19). Secure with two 3/8-inch bolts (5), hex nuts (6), and locknuts (7). Do not torque hardware.

(8) Lift preassembled horizontal braces into position and attach to diagonal braces (3,17) and horizontal brace (25). Secure with four 3/8-inch bolts (5), hex nuts (6), and locknuts (7).

(9) Install diagonal brace (27) to vertical braces (2, 19). Secure with two 3/8-inch bolts (5), hex nuts (6), and locknuts (7).

(10) Install six track angles (23) to elevator tracks (1, 22). Secure with six 3/8-inch bolts (14), hex nuts (6), and locknuts (7).

(11) Install elevator tracks and track angles to elevator. Secure with six 3/8-inch bolts (14), hex nuts (6), and locknuts (7).

(12) Install winch bracket (12). Secure with 1/2-inch bolt (9), hex nut (10), and locknut (11).

(13) After all elevator assembly members are loosely assembled, align sleeves on vertical track and torque hardware to proper values.



NOTE: CUSTOMER SUPPLIED PEDESTAL FOR AN/GSA-131(V) 1 ANTENNA WHEN MOUNTING PEDESTAL FOR A S-2304/G ANTENNA ADAPTER PLATE (10) AND ASSOCIATED HARDWARE (11,12,13,) MUST BE USED

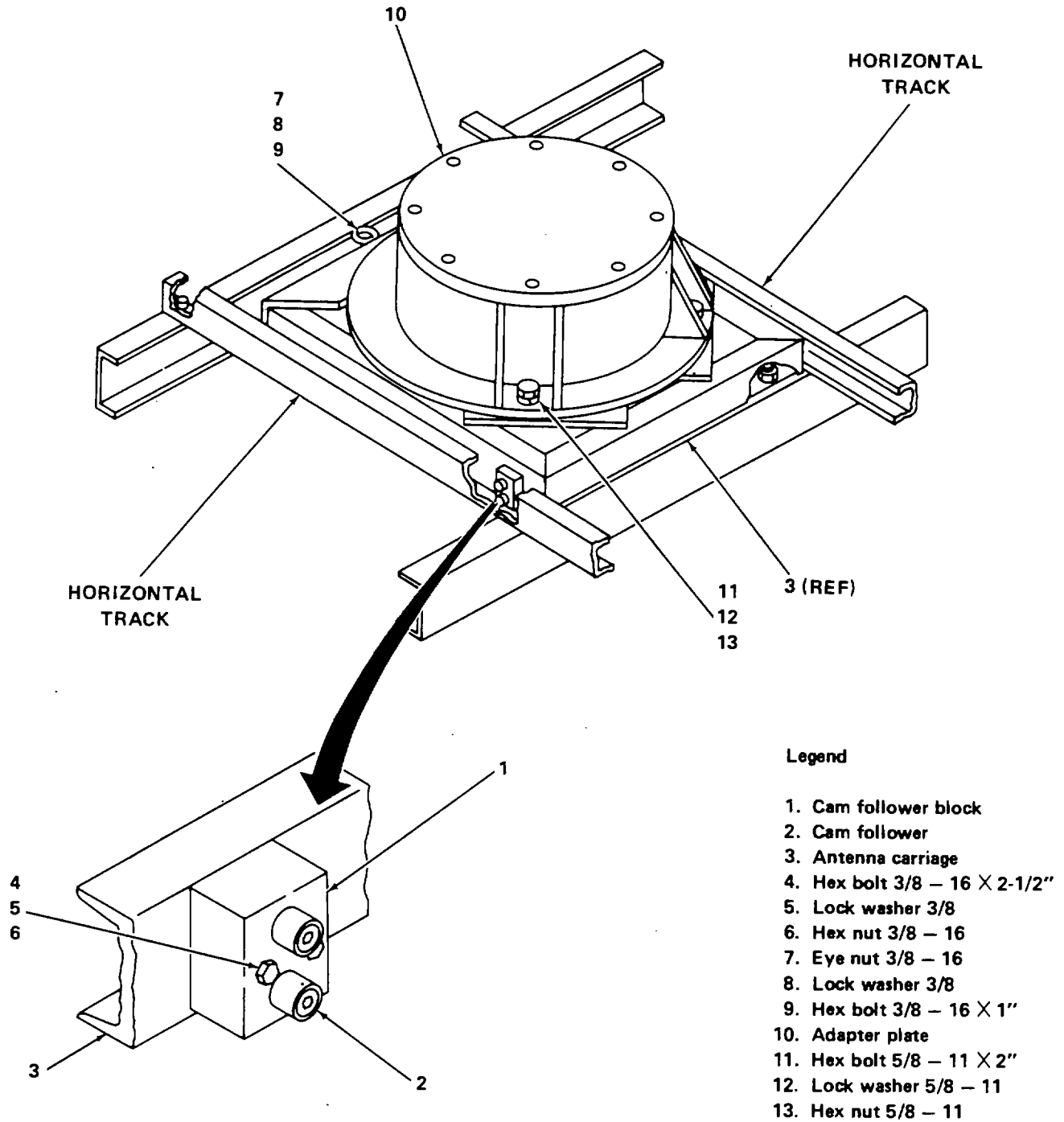


Figure 2-8. Carriage Installation

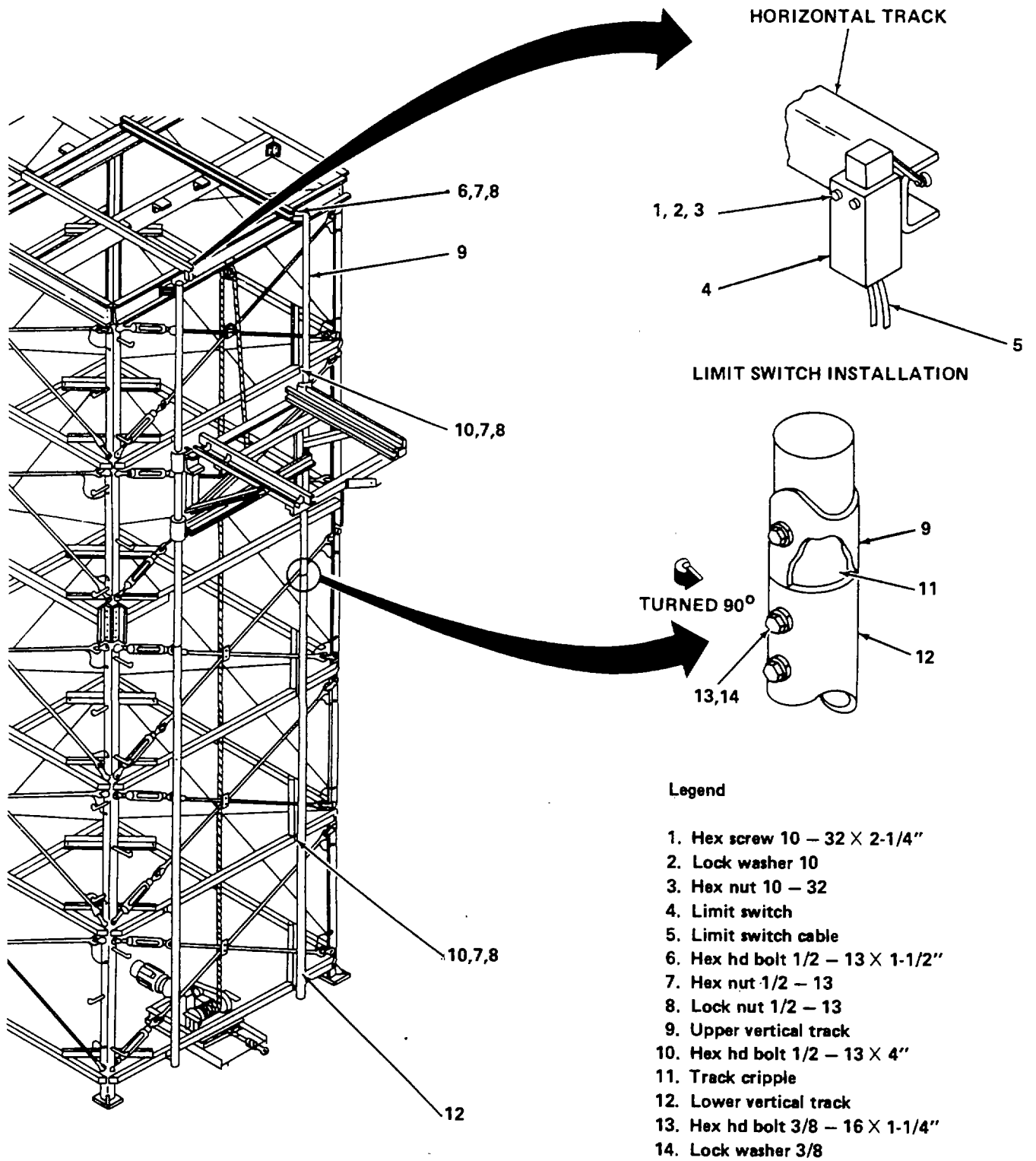


Figure 2-9. Vertical Track Installation

Legend

1. Hoist mount
2. Hex nut 3/4 – 10
3. Lock nut 3/4 – 10
4. Hex bolt 5/8 – 11 × 1-3/4"
5. Bevel washer 5/8
6. Hex nut 5/8 – 11
7. Lock nut 5/8 – 11
8. Hoist assembly
9. Sheave bracket
10. Sheave
11. Spacer
12. Hoist cable

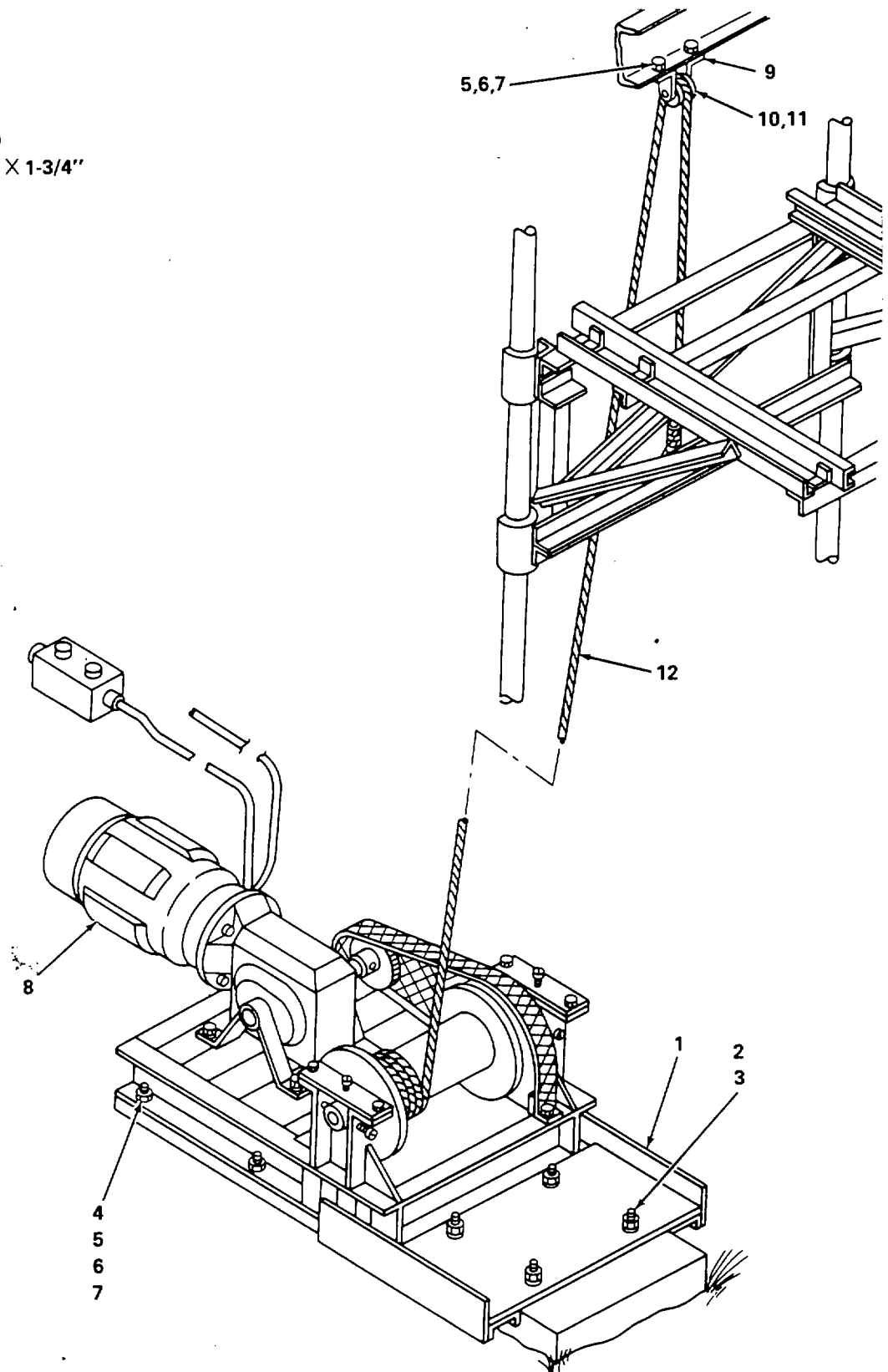
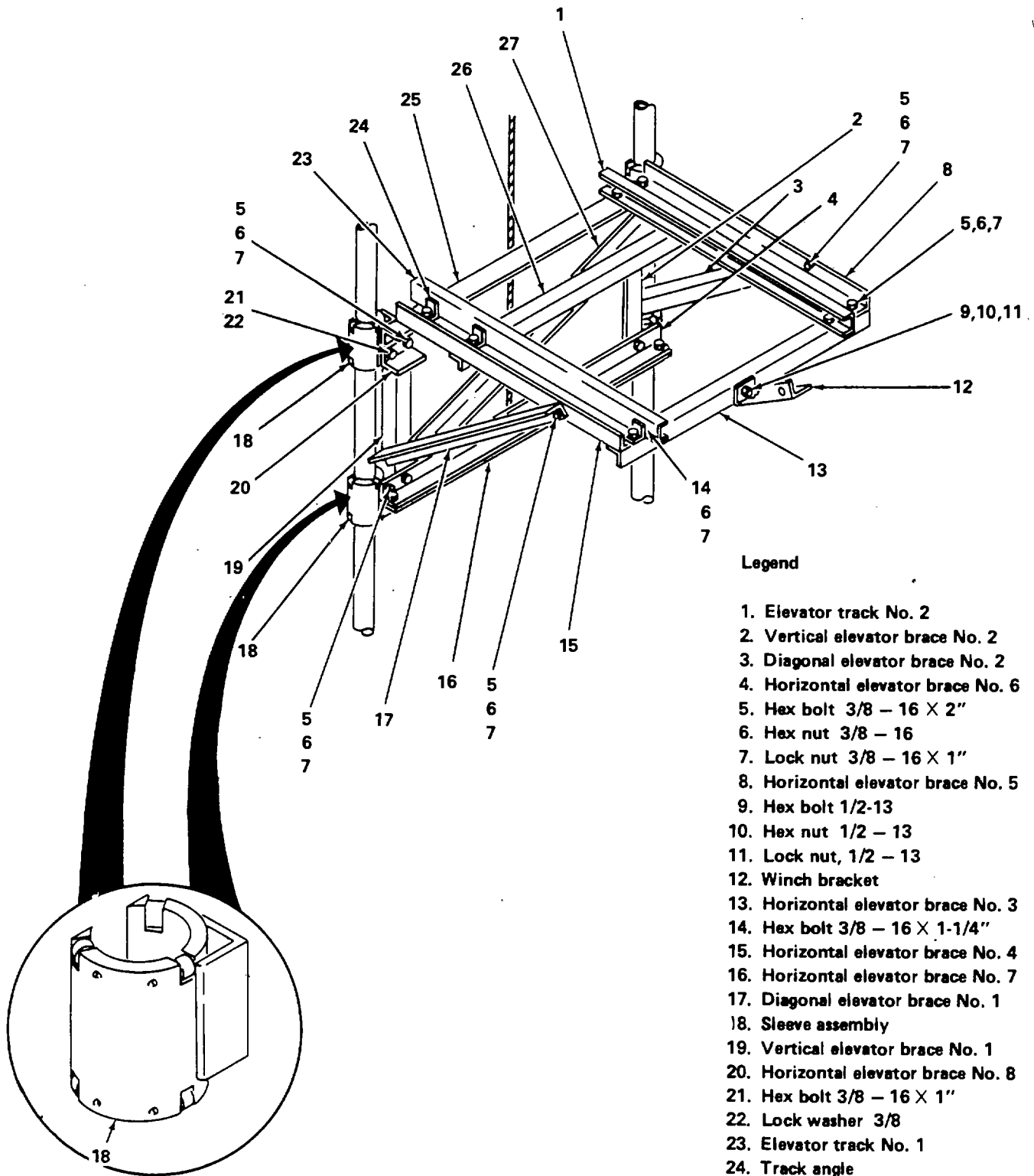


Figure 2-10. Hoist Installation



**Legend**

1. Elevator track No. 2
2. Vertical elevator brace No. 2
3. Diagonal elevator brace No. 2
4. Horizontal elevator brace No. 6
5. Hex bolt 3/8 - 16 X 2"
6. Hex nut 3/8 - 16
7. Lock nut 3/8 - 16 X 1"
8. Horizontal elevator brace No. 5
9. Hex bolt 1/2-13
10. Hex nut 1/2 - 13
11. Lock nut, 1/2 - 13
12. Winch bracket
13. Horizontal elevator brace No. 3
14. Hex bolt 3/8 - 16 X 1-1/4"
15. Horizontal elevator brace No. 4
16. Horizontal elevator brace No. 7
17. Diagonal elevator brace No. 1
18. Sleeve assembly
19. Vertical elevator brace No. 1
20. Horizontal elevator brace No. 8
21. Hex bolt 3/8 - 16 X 1"
22. Lock washer 3/8
23. Elevator track No. 1
24. Track angle
25. Horizontal elevator brace No. 1
26. Horizontal elevator brace No. 2
27. Diagonal elevator brace No. 3

**Figure 2-11. Elevator Assembly**

**2-13 TOWER GROUNDING, AVIATION LIGHTING, AND CONVENIENCE OUTLET KITS INSTALLATION.**

The tower grounding, aviation lighting, and convenience kits are installed after the tower is completely assembled. The aviation lights and convenience outlets require a 120-Vac, 50/60-Hz primary power source. Installation procedures are as follows:

a. *Tower Grounding Kit Installation.* Refer to figure 2-12.

(1) Dig two holes on opposite comers of the tower about 12 inches deep.

(2) Place ground rod (4) into bottom of one hole. Drive ground rod into the ground until top of rod is about 6 inches below ground level.

(3) Install ground wire assembly (2) to ground rod (4). Secure with ground rod clamp (3).

(4) Remove one locknut (6) and hex nut (5) from stud (7).

(5) Install ground wire assembly (2) and flat washer (1) onto stud (7). Secure with hex nut (5) and locknut (6).

(6) Repeat steps (2) through (5) to install other grounding rod.

b. *Aviation Lighting Kit Installation.* Refer to figure 2-13.

(1) Install junction box (15) to top tower brace. Be sure drain hole faces down. Secure with hardware provided.

(2) Install two dual obstruction lights (2), four lamps (1), rigid conduit (5), fitting (6), union (13), and four locknuts (3). Use wraplock kit (4) to secure conduit (5).

(3) Remove one step and hex nut from lower tower leg. Install control mount plate (7) to lower tower leg. Secure with step and hex nut.

(4) Install lighting control panel (12) to control mount plate (7). Secure with four 5/16-inch bolts (10), lockwashers (9), and hex nuts (8).

(5) Connect three conductor cables (14) and two water tight connectors (11) between junction box (15) and lighting control panel (12).

c. *Convenience Outlet Installation.* Refer to figure 2-14.

(1) Remove one step from tower leg at top of tower.

(2) Install convenience outlet mount plate (1) to tower leg. Secure with tower step and hex nut.

(3) Install one convenience outlet (2) to convenience outlet mount plate (1). Secure with a 1/4-inch bolt (3), lockwasher (4), and hex nut (5).

(4) Remove one step from tower leg about 5 feet above ground level.

(5) Install junction box mount plate (6) to tower leg. Secure with tower step and hex nut.

(6) Install junction box assembly (7) to junction box mount plate (6). Secure with four 1/4-inch bolts (3), lockwashers (4), and hex nuts (5).

(7) Install second convenience outlet (2) to bracket (8) on junction box mount plate (6). Secure with 1/4-inch bolt (3), lockwasher (4), and hex nut (5).

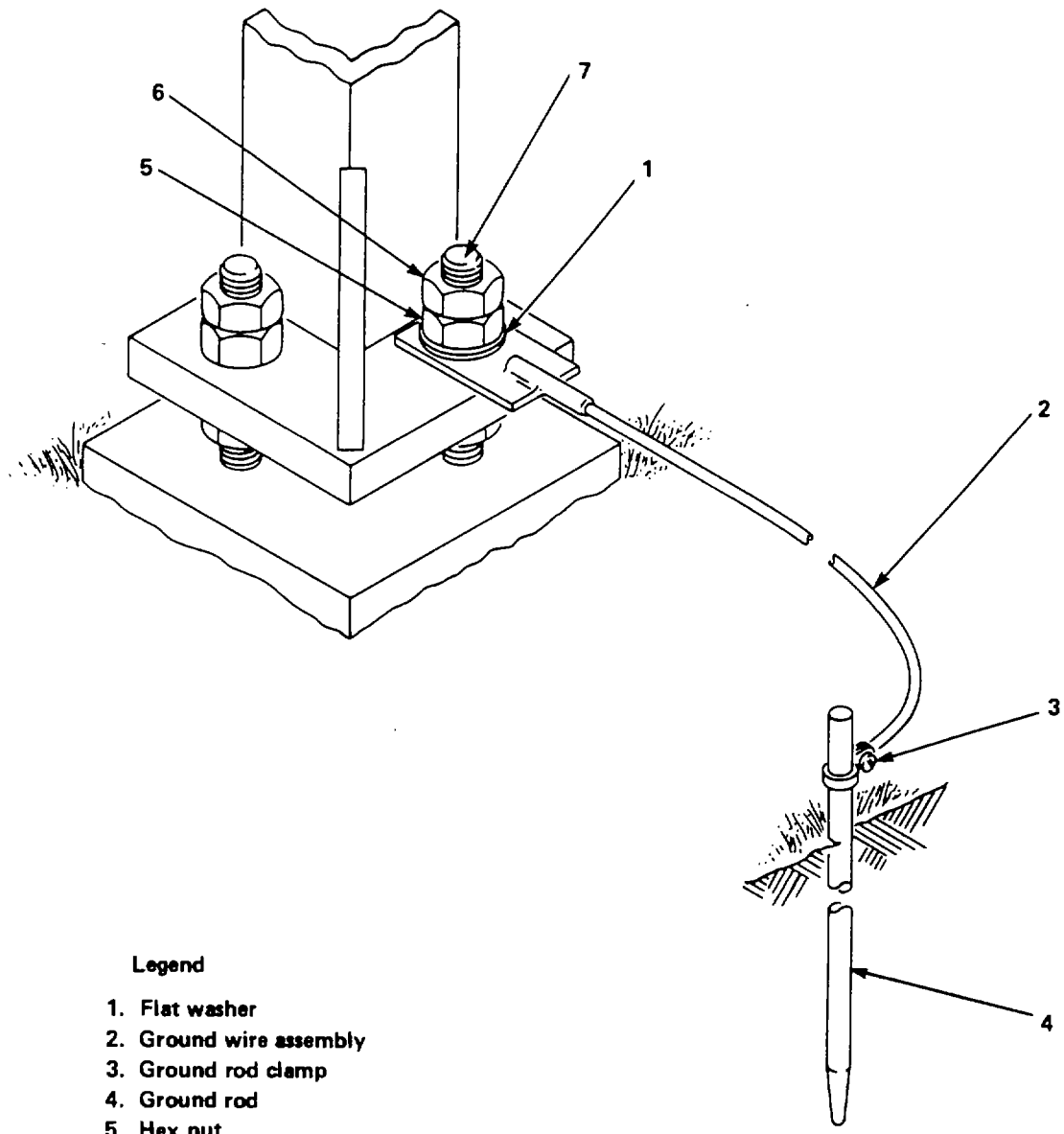
**2-14 INTERCONNECTIONS.** After the tower has been completely assembled, connect the aviation lights, convenience outlets, and electric hoist to primary power in accordance with the tower interconnection diagram (figure FO-1).

**Section IV. PRELIMINARY ADJUSTMENT OF EQUIPMENT**

**(No preliminary adjustment of the Antenna Tower TS-9A is required.)**

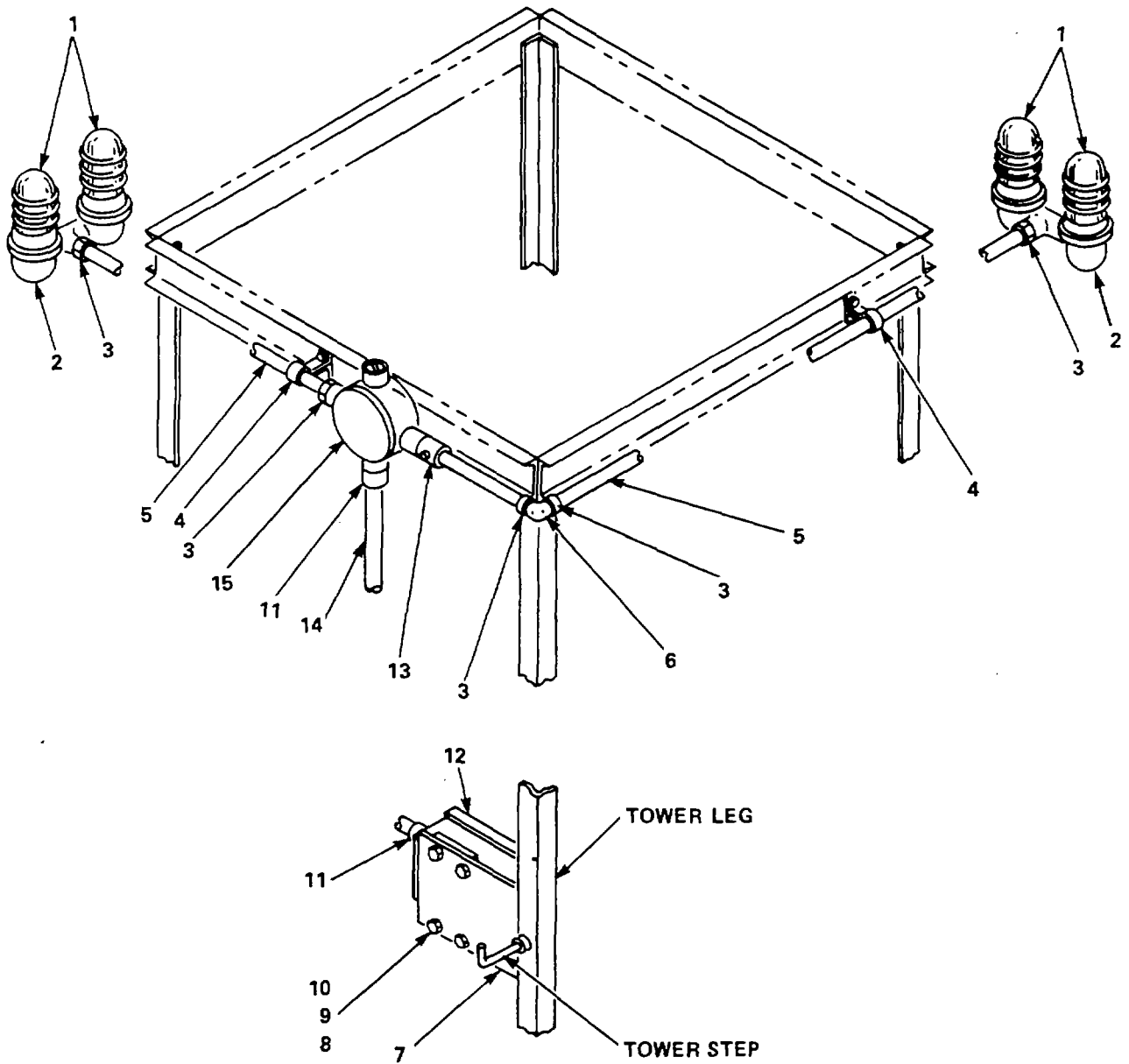
**Section V. INSTALLATION AND CIRCUIT LINEUP**

**(No installation or circuit lineup of the Antenna Tower TS-9A is required.)**



- Legend**
- 1. Flat washer
  - 2. Ground wire assembly
  - 3. Ground rod clamp
  - 4. Ground rod
  - 5. Hex nut
  - 6. Locknut
  - 7. Stud

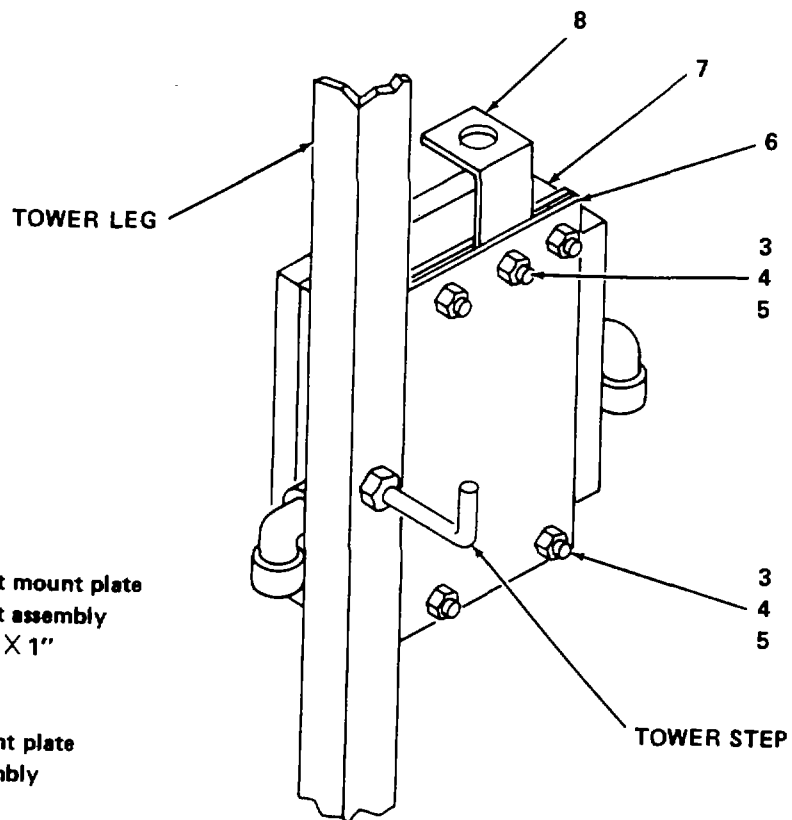
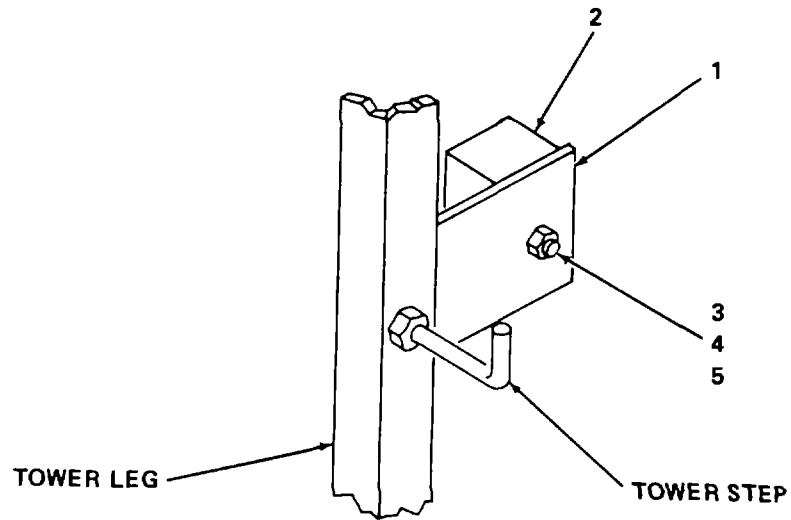
Figure 2-12 Tower Grounding Kit Installation



**Legend**

- |                             |                                    |
|-----------------------------|------------------------------------|
| 1. Lamp 116W 120V           | 9. Lockwasher 5/16                 |
| 2. Double obstruction light | 10. Hex bolt 5/16 – 18 X 1-1/4     |
| 3. Lock nut 3/4             | 11. Water tight connectors 3/4     |
| 4. Wraplock                 | 12. Lighting control unit          |
| 5. Rigid conduit 3/4 X 10'  | 13. Plug type union 3/4            |
| 6. Fitting LB 3/4           | 14. No. 12 wire, white, red, black |
| 7. Control mount plate      | 15. Junction box                   |
| 8. Hex nut 5/16 – 18        |                                    |

**Figure 2-13. Aviation Lighting Kit Installation**



**Legend**

- 1. Convenience outlet mount plate
- 2. Convenience outlet assembly
- 3. Hex bolt 1/4 – 20 X 1"
- 4. Lockwasher 1/4
- 5. Hex nut 1/4 – 20
- 6. Junction box mount plate
- 7. Junction box assembly
- 8. Bracket

**Figure 2-14. Convenience Outlet Installation**



CHAPTER 3

OPERATING INSTRUCTIONS

Section I. CONTROLS AND INSTRUMENTS

**3-1 DAMAGE FROM IMPROPER SETTINGS.** Normal control settings or combinations of control settings performed by operator/crew personnel will not cause damage to equipment or create a safety hazard to personnel.

**3-2 OPERATOR/CREW CONTROLS.** The controls for operation of the Antenna Tower TS-9A are listed in table 3-1.

Table 3-1. Operator's Controls

Control	Function
ELEVATOR HOIST (figure 3-1)	
UP button	When depressed, raises tower elevator until button is released.
DOWN button	When depressed, lowers tower elevator until button is released.
JUNCTION BOX (figure 3-2)	
15-amp convenience outlet No. 1 circuit breaker	Applies 115 Vac to convenience outlet No. 1.
15-amp convenience outlet No. 2 circuit breaker	Applies 115 Vac to convenience outlet No. 2.
15-amp aviation lights circuit breaker	Applies 115 Vac to the aviation lights lighting control box.
20-amp elevator hoist circuit breaker	Applies 115 Vac to the elevator hoist motor and switch.
LIGHTING CONTROL UNIT (figure 3-3)	
ON/OFF switch	When set to ON, applies power to two dual obstruction lights.
CABLE HOIST (figure 3-4)	
Upper control lever	Controls lifting or lowering operation.
Holding pawl	Releases cable for free wheeling operation.

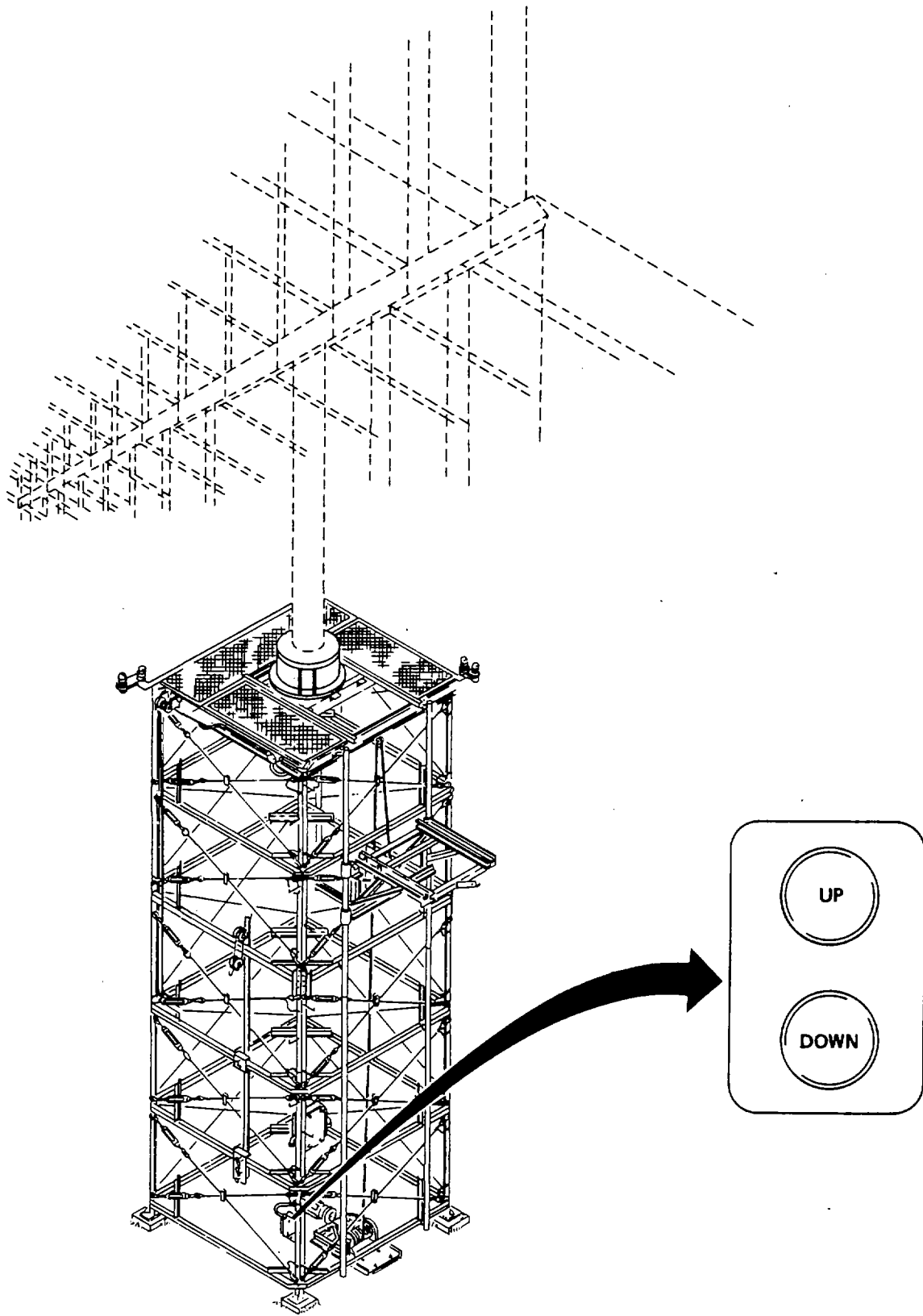


Figure 3-1. Elevator Hoist Operating Controls

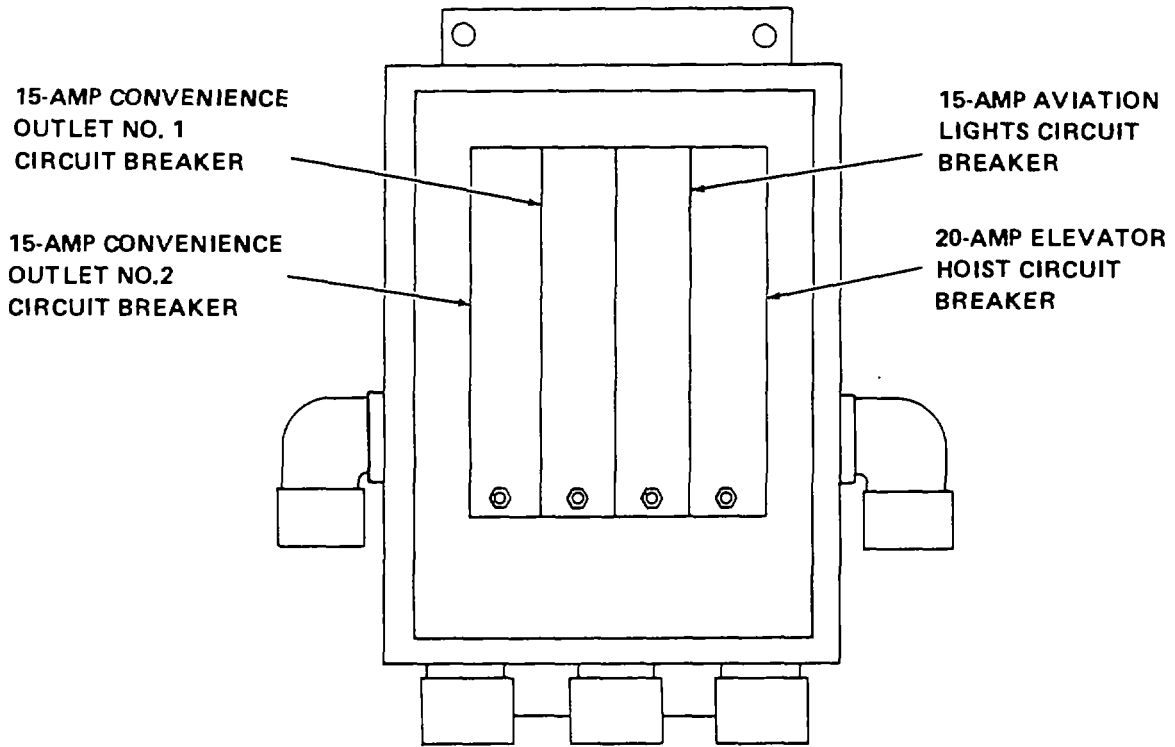


Figure 3-2. Junction Box Operating Controls

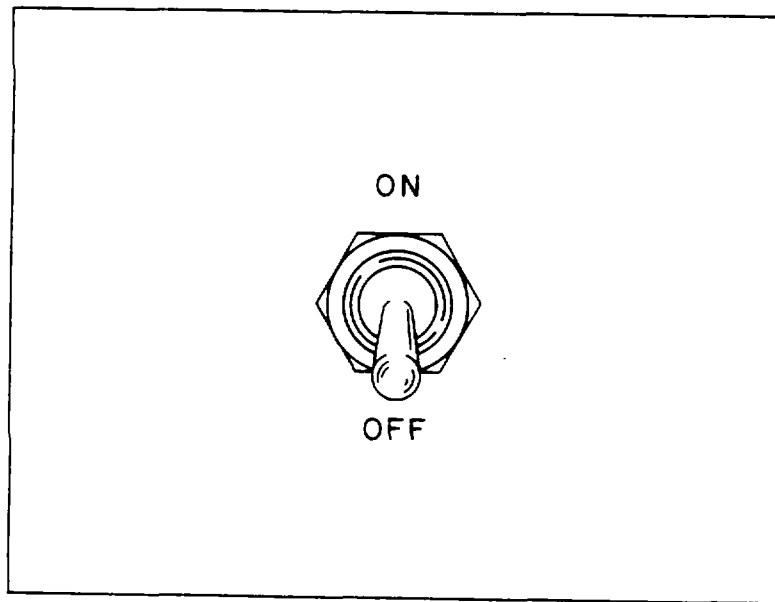


Figure 3-3. Lighting Control Unit Operating Control

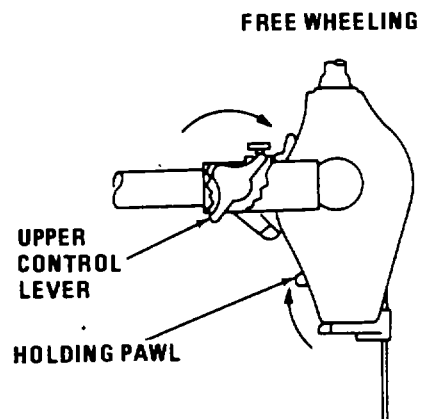
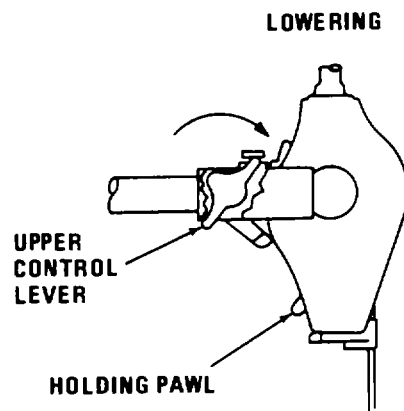
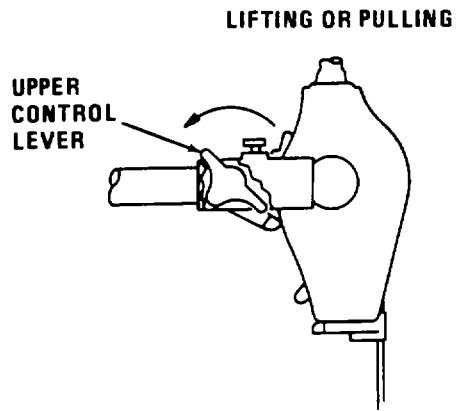


Figure 3-4. Cable Hoist Operating Controls

## Section II. OPERATION UNDER USUAL CONDITIONS

**3-3 PRELIMINARY STARTING PROCEDURES.** Refer to figure 3-2. Take the following steps before operating the equipment of Antenna Tower TS-9A:

- a. Connect junction box to 120-Vac, 60-Hz, single-phase power source.
- b. On junction box, set the following circuit breakers to the ON position:
  - (1) 15-ampere convenience outlet number 1.
  - (2) 15-ampere convenience outlet number 2.
  - (3) 15-ampere aviation lights.
  - (4) 20ampere elevator hoist.

### 3-4 OPERATING PROCEDURES.

a. *Aviation Lights.* The aviation lights are manually operated by use of the ON/OFF switch in the lighting control unit. The lights should be turned on at least 30 minutes prior to sunset and kept on until 30 minutes after sunrise, or at any time light emanation from the northern sky is less than 35 foot-candles.

b. *Antenna Elevator.* The antenna elevator is used to elevate and position the AN/GSA-131(V)1 or the AS-2304/G antenna. Once the elevator is properly installed, operation is quite simple. However, the following precautions must be strictly observed to prevent an overload which could damage the equipment or create possible hazards to personnel.

- (1) Do not use the elevator for transporting personnel.
- (2) Proper alignment of vertical tracks is essential. Any misalignment will dangerously overload hoist and related equipment.
- (3) Never stand directly below any load being lifted.
- (4) Always bolt carriage in position on elevator when antenna is raised or lowered.
- (5) Do not disable limit switch. Hoist cable may become overloaded.
- (6) Prior to actually moving either antenna, raise the elevator and the roll carriage onto tower top. Check for proper operation of the hoist and the limit switch alignment of tracks. Check alignment of carriage bolt holes with those of top tower horizontal braces.
- (7) Do not allow vent plug on elevator hoist to become obstructed by dirt, paint, or other contaminants. Damage to oil seals may result.
- (8) Always cover the hoist UP/DOWN control switch with a weather proof material when the hoist is not in operation.

c. *Antenna Elevation.*

- (1) Assemble carriage assembly to antenna elevator.

### CAUTION

**Before the AN/GSA-131(V) 1 antenna is raised, align the 7/16-inch-diameter holes of horizontal brace No. 1 with those of the carriage and secure with hardware provided. Damage to equipment may occur if the carriage is improperly positioned too far away from tower.**

### CAUTION

**Before the AS-2304/G antenna is raised, position the carriage so the 7/16-inch-diameter holes of horizontal brace No. 2 are aligned with those of the carriage. Interference may occur between antenna elements and tower if carriage is not aligned with horizontal brace.**

(2) When carriage is properly positioned on elevator secure with hardware provided.

(3) If the AN/GSA-131(V)1 antenna is being removed, remove horizontal elements before the elevator is lowered.

(4) Once the antenna is properly secured to the elevator, lowering may begin. Operate UP/DOWN switch and watch for any possible misalignment that could impede travel of the elevator on its tracks.

(5) When the elevator reaches its lowermost limit of travel, release the DOWN button.

(6) Remove antenna from carriage.

(7) Remove carriage from elevator.

d. *Cable Hoist.*

(1) *Lifting or Pulling.* To lift or pull, place upper control lever in position shown in figure 34. Holding pawl is now engaged against ratchet teeth. Work handle up and down at speed required to get desired operation. Handle may be inserted into either end of the U-frame socket to enable personnel to work in restricted areas.

(2) *Lowering.* To lower, place upper control lever in position shown in figure 34. Operate handle to its extreme down position until load is removed from holding pawl. As handle is slowly released, the load will be lowered one notch. To continue lowering, repeat this operation. Lowering of heavy loads is easier if a quick (sharp) downward handle motion is used.

(3) *Free Wheeling.* To release cable for free wheeling, place upper control lever as shown in figure 3-4. Hold spring-loaded holding pawl in position shown. The cable may now be pulled from the drum to permit rapid and accurate positioning while attaching to the object to be pulled or lifted. Similarly, with upper control lever as shown, excess slack may be quickly and easily rewound on to the drum using winding wheel.

**Section III. OPERATION UNDER UNUSUAL CONDITIONS**

**3-5 GENERAL.** It may be necessary to operate the tower under conditions of extreme cold, heat, humidity, moisture, sand, or wind. The tower is designed to be operational in temperatures ranging from - 200 to + 120 ° F.

**3-6 OPERATION IN ARCTIC CLIMATES.** Temperatures and weather conditions associated with arctic climate can affect the efficient operation of the equipment. Handle parts carefully, especially wire insulation and plastics which become brittle at subzero temperatures. When equipment is exposed to cold air, moisture will condense on it, and icing conditions can result.

**3-7 OPERATION IN DESERT CLIMATES.** The main problem arising in desert operation is large amounts of sand, dust, and dirt, which may affect operation of the equipment. Clean assemblies thoroughly before replacing them. Make more frequent preventive

maintenance checks. Excessive amounts of dust and sand that come in contact with lubricants will damage moving parts. Hoist operation in a dusty or sandy atmosphere requires the use of lubricants designed for this purpose.

**3-8 OPERATION IN TROPICAL CLIMATES.** When equipment is operated in warm, damp climates, moisture conditions are acute. High relative humidity may cause condensation on equipment and accelerate corrosion. Make frequent maintenance checks.

**3-9 OPERATION IN HIGH WINDS.** High wind conditions present a hazard to both equipment and personnel. The Antenna Tower TS-9A has been designed to withstand high winds. (For tower wind loading capability refer to paragraph 1-9.)

**3-7/(3-8 blank)**

**CHAPTER 4**

**OPERATOR/CREW MAINTENANCE INSTRUCTIONS**

(In accordance with the Maintenance Allocation Chart (MAC), Appendix D, of this manual, operator/crew maintenance is not required.)

**4-1/(4-2 blank)**



CHAPTER 5

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. TOOLS AND EQUIPMENT

**5-1. TOOLS AND TEST EQUIPMENT.** The tools and test equipment required and authorized for organizational maintenance are listed in the

Maintenance Allocation Chart (MAC), Appendix D. Use of these items is described in table 5-1 below.

**Table 5-1. Organizational Maintenance Tools and Test Equipment**

NSN	Item	Use
6625-00-999-7465	Wrench, allen, 3/8-inch bolts.	Remove and/or tighten socket head
	Wrench, torque, 0-200 foot-pounds	Tighten fastener hardware.
	Wrench, torque, 0-600 foot-pounds	Tighten fastener hardware.
	Multimeter AN/USM-223	Perform voltage and resistance measurements.

**5-2. MATERIALS.** The materials required and authorized for organizational maintenance are listed in

the Expendable Supplies and Materials List, Appendix F. Use of the materials is described in table 5-2 below

**Table 5-2. Organizational Maintenance Materials Required**

NSN	Item	Use
6850-00-597-9763	Trichloroethane	Clean metal parts.
7920-00-356-4694	Brush, bristle	Remove corrosion and other foreign matter from metal parts.
8010-00-835-2114	Paint, primer, zinc-chromate	Prime coat bare metal parts.
8010-00-297-0560	Paint, enamel, lusterless, olive drab	Finish coat metal parts.
8020-00-245-4509	Brush, paint, flat, 1-inch-wide	Repainting and touchup.
8305-00-222-2423	Cheesecloth, lint-free	Clean metal parts.
9150-00-273-2389	Oil, lubricating, 30 WT	Lubricate bearings and bushings.
	Grease	Lubricate pawls, shafts, gears, cam followers.

**Section II. REPAINTING AND REFINISHING INSTRUCTIONS**

**5-3 REPAINTING AND REFINISHING.** TB 43-0118, Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters, provides instructions for maintenance personnel

responsible for painting, maintenance, and preservation of the Antenna Tower TS-9A. SB 11-573, Painting and Preservation Supplies Available for Field Use for Electronics Command Equipment, specifies paints and preservatives available for maintenance of the tower.

**Section III. LUBRICATION INSTRUCTIONS**

**5-4 GENERAL.** Keep all lubricants in closed containers and store in a clean, dry and cool area. Do not allow dust, dirt, or other foreign material to mix with oils and grease. Keep all equipment clean and ready to use. Keep all external parts that do not require lubrication free of lubricants. Before application, wipe all lubrication points free of dirt and grease. Clean all lubrication points after application to prevent accumulation of foreign matter. Service the lubrication points at proper intervals, as illustrated in figures 5-1 through 5-5 and in accordance with the special instructions contained in paragraph 5-5.

**5-5 ELEVATOR HOIST.** Lubricate the electric elevator hoist in accordance with the following instructions and as illustrated in figure 5-3.

a. Remove red oil level plug and check gearcase for proper oil level. If low, fill with oil through one -of the upper openings until oil reaches oil level hole. Replace plug tightly. (Refer to table 5-3 for recommended lubricants.)

b. Change gearcase lubricant after first 250 hours of use with grease (Mobil-Temp 78). Thereafter, change the lubricant every 1,500 hours of operation.

**Table 5-3. Recommended Lubricants for Electric Hoist**

Ambient temperature	Lubricant viscosity group				
	Up to 300 rpm		Over 300 rpm		
-65° to 0° F*	318.59		-		
-45° to +20° F*	318.60		318.59		
-5° to +550 F*	318.61		318.60		
+15° to +110° F	318.62		318.62		
+100° to +165° F	318.63		318.63		
Viscosity group 318	59	60	61	62	63
Mobil Oil Co. Avrex Mobil Fluid Extra Helco	903	423	HD90	600W	Super cylinder

\* For temperatures below + 100 F, special oil seals are required.

\*\*All group 63 lubricants must be changed after 300 hours of high temperature operation.

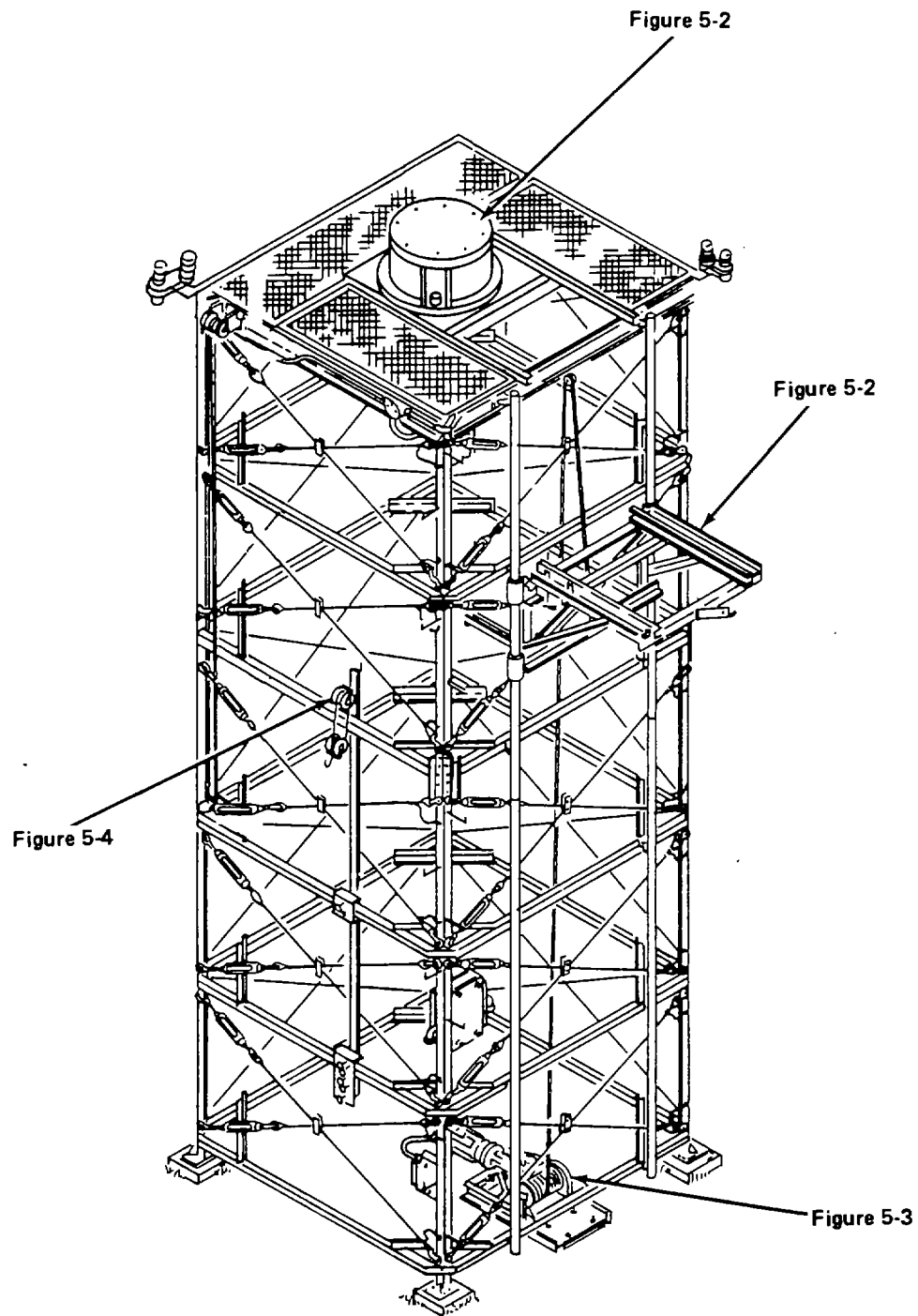
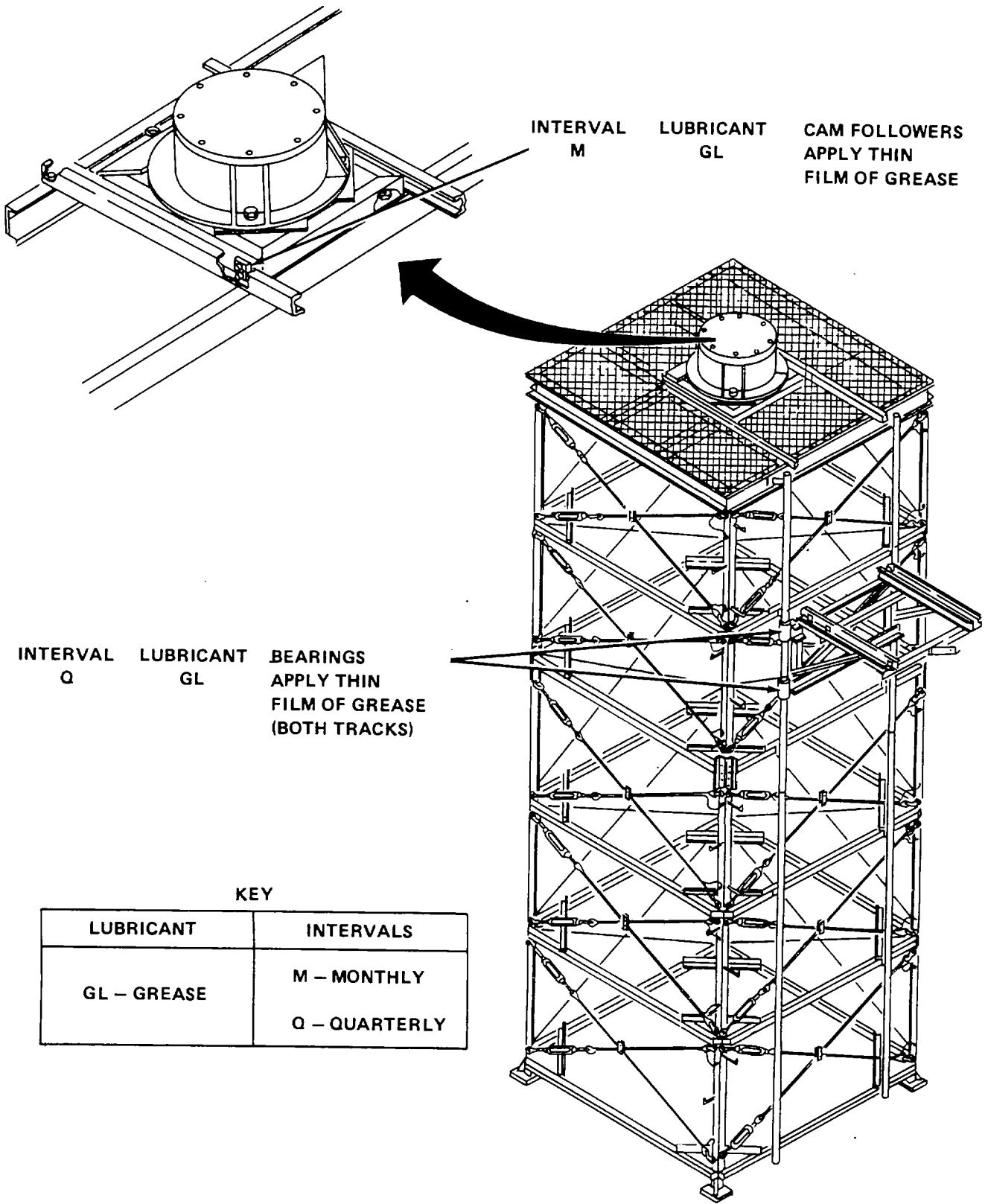


Figure 5-1. TS-9A Antenna Tower Lubrication

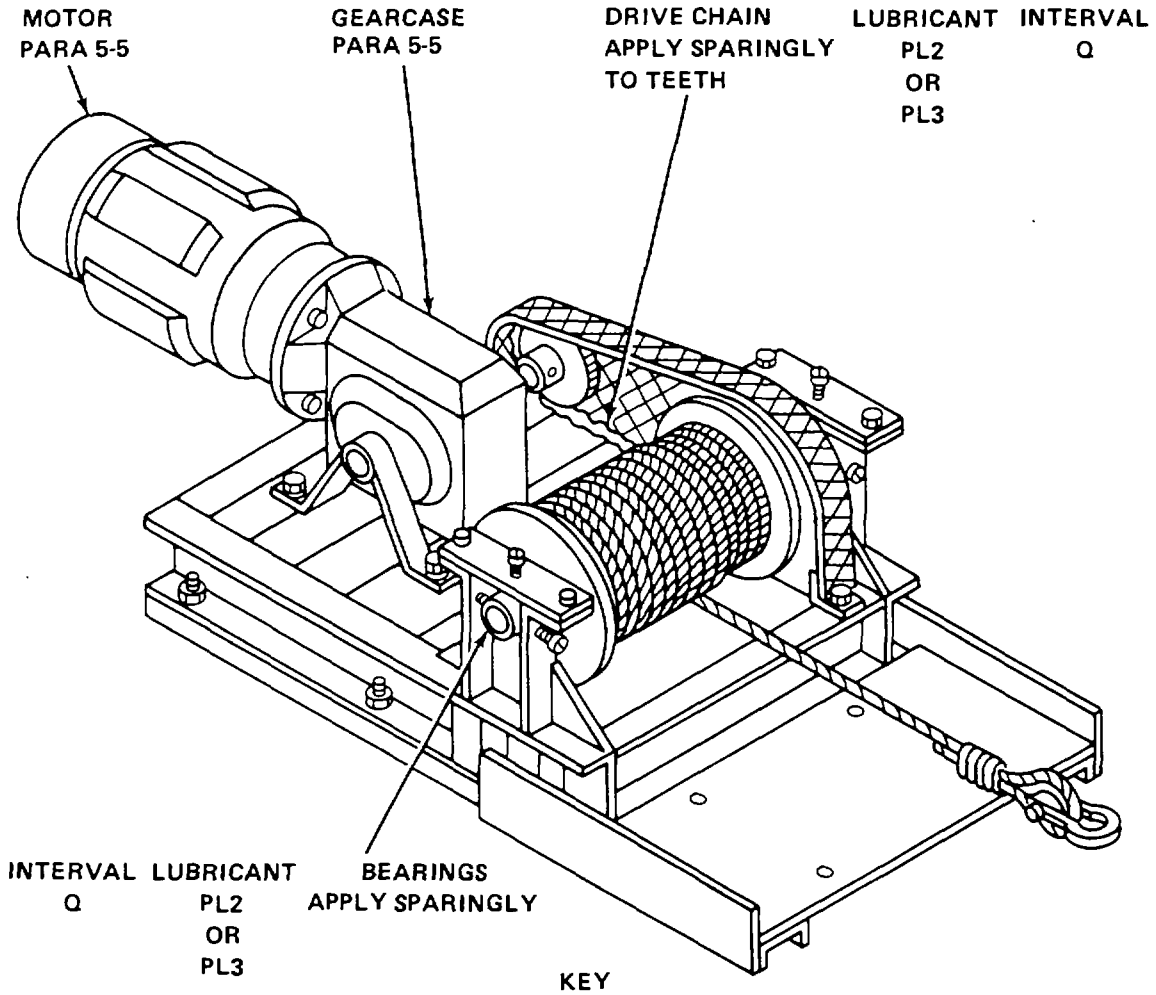


INTERVAL Q LUBRICANT GL BEARINGS APPLY THIN FILM OF GREASE (BOTH TRACKS)

KEY

LUBRICANT	INTERVALS
GL - GREASE	M - MONTHLY
	Q - QUARTERLY

Figure 5-2. Carriage and Elevator Lubrication Chart



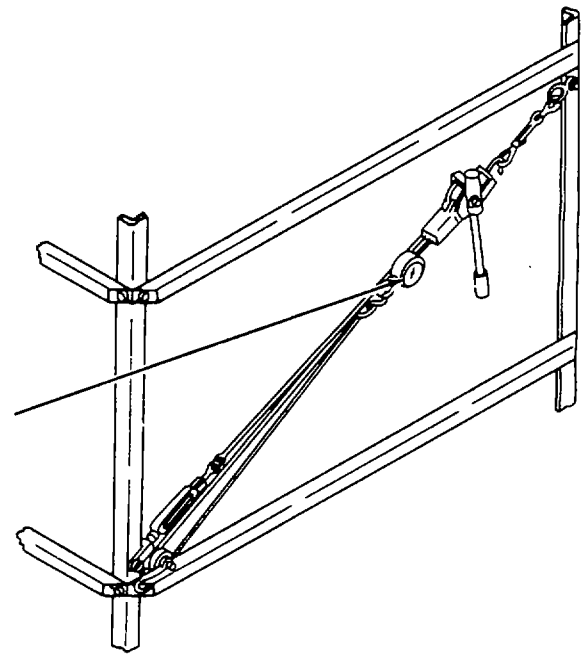
LUBRICANTS	INTERVALS
PL1 – OIL SAE 30 WT  MIL-L-10295B	W – WEEKLY Q – QUARTERLY
PL2 – OIL ALVANIA EPI BELOW 32°F	
PL3 – OIL ALVANIA EP2 ABOVE 32°F	

Figure 5-3. Elevator Hoist Lubrication Chart

INTERVAL  
AR

LUBRICANT  
PL

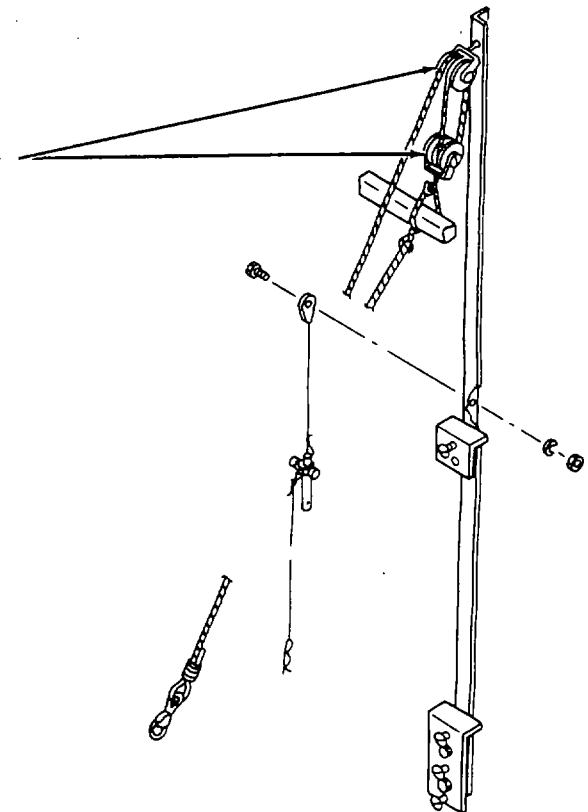
DYNAMOMETER  
KEEP LIGHTLY  
OILED TO PREVENT  
SEIZING



INTERVAL  
M

LUBRICANT  
PL

SHEAVES  
APPLY SPARINGLY  
TO BUSHINGS



KEY

LUBRICANT	INTERVALS
PL - OIL SAE 30 WT MIL-L-10295B	M - MONTHLY AR - AS REQUIRED

Figure 5-4. Tower Erection Kit Lubrication Chart

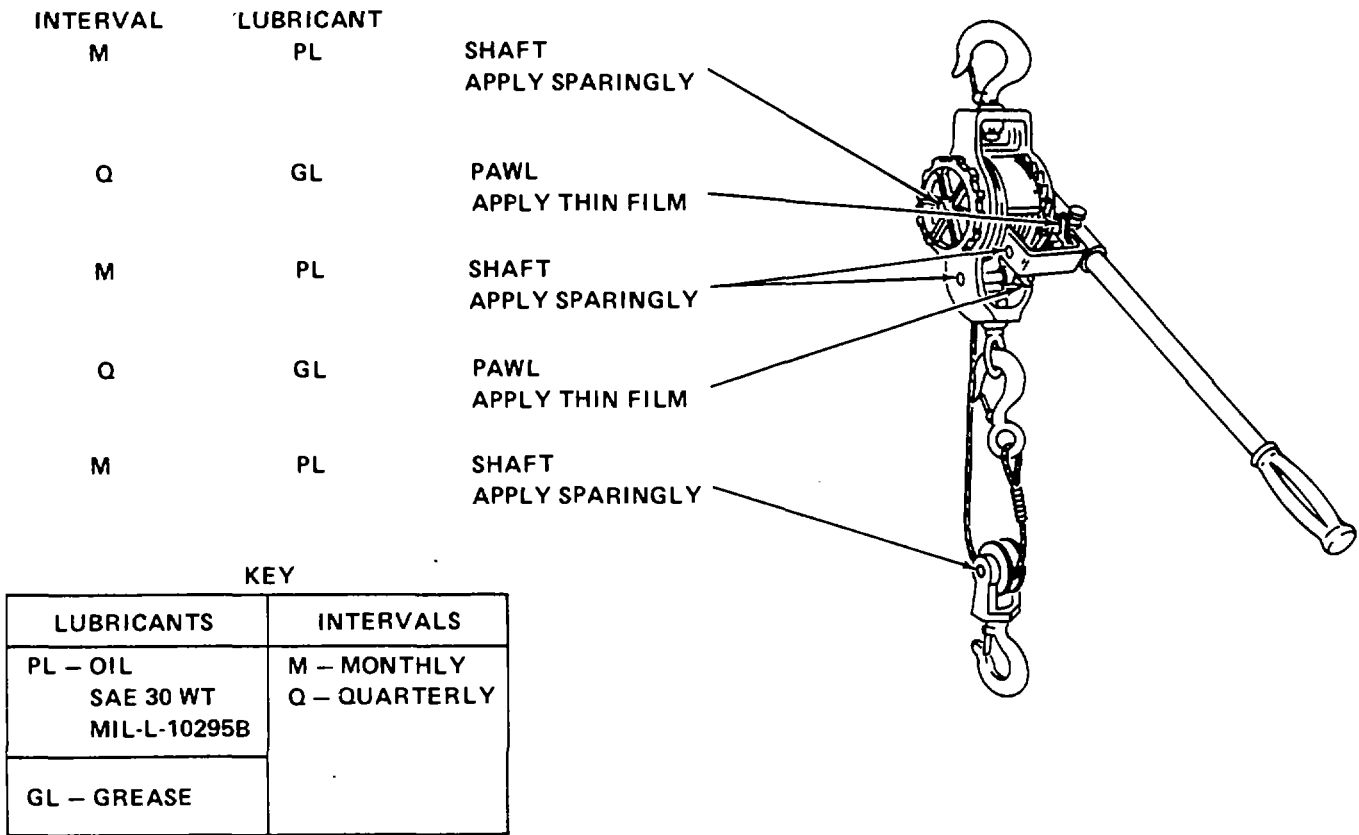


Figure 5-5. Cable Hoist Lubrication Chart

**Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)**

**5-6 GENERAL.** The Antenna Tower TS-9A must be systematically inspected to ensure it is always ready for operation. Defects discovered during inspections can then be corrected before serious damage or failure results. The necessary preventive maintenance checks and services to be performed are listed in table 5-4. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future corrections to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment. Record

all deficiencies together with the corrective action taken on forms and records specified in TM 38-750.

**5-7 PREVENTIVE MAINTENANCE PROCEDURES.**

Table 5-4 lists procedures for the performance of maintenance inspections and services. The table provides the sequence of, and time intervals for, maintenance actions which are the responsibility of organizational level personnel. Refer any trouble that is beyond the scope of organizational maintenance to the direct support maintenance level.

Table 5-4. Organizational Preventive Maintenance Checks and Services

**NOTE**

The "Item No." column shall be used as a source of item numbers for the "TM Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

**Legend**

D - Daily  
W - Weekly

M - Monthly  
Q - Quarterly

S - Semiannually  
A - Annually

B - Biennially  
H - Hours

ITEM NO	INTERVAL									Item to be inspected	Procedures	Equipment will be reported Not Ready (Red) if:
	D	W	M	Q	S	A	B	H				
1	•									<b>HARDWARE</b>	a. Check for corrosion. Remove corrosion and clean and paint (para. 5-3), as beyond repair necessary.  b. Check hardware for proper torque (tables 2-3 and 24).	Hardware is corroded  No replacement for defective hardware.
2	•									<b>OBSTRUCTION LIGHTS</b>	Check obstruction lights. Replace bulb(s) if defective. (para. 5-11).	Obstruction lights will function.
3		•								<b>ROPES AND CABLES</b>	Check ropes and cables for wear, fraying, corrosion, or any other type of deterioration. Replace ropes or cables if deteriorated.	Rope or cable is too deteriorated to function and replacement is not available.
4		•								<b>ELEVATOR HOIST</b>	a. Check hoist motor for binding or other damage. Replace hoist if defective (para. 5-14).  b. Check hoist cable for corrosion or damage. Clean (para. 5-10) or replace hoist (para. 5-14), as necessary.  c. Check hoist mounting hardware for wear or looseness. Replace and/or tighten, as necessary.	Hoist motor will not function properly.  Hoist cable is damaged and replacement is unavailable.  Hardware is badly worn and replacement is unavailable.



Table 5-4. Organizational Preventive Maintenance Checks and Services - Continued

ITEM NO	INTERVAL								Item to be inspected	Procedures	Equipment will be reported Not Ready (Red) if:
	D	W	M	Q	S	A	B	H			
5		•							<p><b>SHEAVES .</b></p> <p>a. Lubricate bushings (figure 5-4).                      b. Check sheaves for corrosion, wear, or damage. Remove corrosion, clean and paint (para. 5-3), or replace worn or damaged sheaves, as necessary.                      c. Check mounting hardware for wear or looseness. Tighten or replace, as necessary.</p> <p><b>ANTENNA TOWER</b></p> <p>a. Check structure for damage or corrosion. Replace damaged parts, remove corrosion, clean and apply rust preventive paint (para. 5-3), as necessary.                      b. Check for damaged or loose hardware. Replace damaged hardware and/or torque (tables 2-3 and 2-4), as necessary.                      c. Check for loose cable braces. Tension braces to 2,500 pounds (para. 2-11d(7)), as necessary.</p> <p style="text-align: center;"><b>WARNING</b></p> <p>Immediate corrective action shall be taken if pier settling is evident. Request assistance from civil engineers.</p> <p>d. Check tower piers for settling.</p>	<p>Lubricant is unavailable. Sheaves are damaged and replacements are unavailable.</p> <p>Hardware is badly worn and replacement is unavailable. Parts are badly corroded or are damaged.</p> <p>Hardware is damaged and replacement is unavailable.</p> <p>Cable brace breaks; cable brace has kinks.</p> <p>Piers have settled.</p>	
6		•									

Table 5-4. Organizational Preventive Maintenance Checks and Services - Continued

ITEM NO	INTERVAL								Item to be inspected	Procedures	Equipment will be reported Not Ready (Red) if:
	D	W	M	Q	S	A	B	H			
7				•					<p><b>ERECTION FIXTURE CABLE HOIST</b></p> <p>Check for corrosion. Remove corrosion. Clean and apply zinc-chromate paint (para. 5-3).                      a. Check line for corrosion or damage. Clean (para. 5-10) or replace, as necessary.                      b. Check for damaged or loose hardware. Replace damaged hardware or tighten, as necessary.</p> <p><b>DYNAMOMETER</b></p> <p>a. Stow in storage case when not in use.                      b. Lightly oil to prevent seizing.</p> <p>c. If dropped or damaged, repair and/or calibrate at local calibration facility.</p> <p><b>ELEVATOR ASSEMBLY</b></p> <p>a. Check for seizing or damaged bearings. Lubricate (figure 5-2) or replace damaged bearings, as necessary.                      b. Check alignment of 7/16-inch diameter holes with carriage assembly. Position track as necessary.</p> <p><b>CARRIAGE ASSEMBLY</b></p> <p>a. Check carriage assembly for damage or corrosion. Replace damaged parts or clean and paint (para. 5-3) corroded parts.                      b. Lubricate cam followers (figure 5-2).</p>	<p>Erection fixture is corroded beyond repair.                      Cable hoist is corroded beyond repair.                      Hardware is damaged and replacement is unavailable.</p> <p>Dynamometer seizes even after oiling.                      Dynamometer cannot be repaired or calibrated.                      Seizing cannot be corrected; damaged bearings cannot be replaced.                      Alignment cannot be achieved.</p> <p>Carriage assembly is damaged beyond repair.</p> <p>Lubricant is unavailable.</p>	
8				•							
9				•							
10				•							
11				•							

Table 5-4. Organizational Preventive Maintenance Checks and Services - Continued

ITEM NO	INTERVAL								Item to be inspected	Procedures	Equipment will be reported Not Ready (Red) if:
	D	W	M	Q	S	A	B	H			
12				•					<p><b>TOWER GROUNDING</b></p> <p>a. Check for corrosion. Clean and/or paint (para 5-3), as necessary.</p> <p>b. Check for mechanical tightness of hardware. Tighten loose connections as necessary</p> <p><b>CONVENIENCE OUTLETS</b></p> <p>Check for evidence of corrosion or damage. Replace as necessary.</p> <p><b>PUBLICATIONS</b></p> <p>Check that all publications are complete, serviceable, and current (including all current publication changes). Request serviceable and current publications as necessary,</p> <p>a. Determine whether new applicable MWO's have been published.</p> <p>b. Accomplish all URGENT MWO's immediately, as appropriate.</p> <p>c. Schedule all NORMAL MWO's, as appropriate.</p>	<p>Grounding is too damaged to function.</p> <p>No replacement for defective hardware.</p> <p>Essential publication is missing or unusable.</p> <p>Urgent MWO has not been applied.</p> <p>Urgent MWO has not been accomplished.</p>	
13			•								
14			•								
15			•								

**Section V. TROUBLESHOOTING**

**5-8 GENERAL** This section contains troubleshooting information (table 5-5) for locating and correcting troubles in the Antenna Tower TS-9A at the organizational maintenance level. Each malfunction listed in table 5-5 is followed by the probable cause and

corrective action to be taken. Perform the actions in the order listed. Any trouble that is beyond the scope of organization maintenance shall be referred to direct support maintenance.

**Table 5-5. Organizational Troubleshooting**

**WARNING**

**Death or injury may result from contact with electrical connections. Disconnect power before servicing any electrical equipment.**

---

**MALFUNCTION**

**TEST OR INSPECTION**

**CORRECTIVE ACTION**

---

**1. AIRCRAFT OBSTRUCTION LIGHTS DO NOT LIGHT WHEN ON/OFF SWITCH IS SET TO ON.**

Step 1. Check for defective lamps.

**Remove and replace defective lamps.**

Step 2. Inspect to see if electrical system is disconnected from primary power source.

**Connect electrical system to primary power source.**

Step 3. Check for circuit breaker in OFF position.

**Set circuit breaker to ON position.**

Step 4. Check for defective ON/OFF switch.

**Remove and replace defective ON/OFF switch.**

Step 5. Check for defective circuit breaker.

**Remove and replace defective circuit breaker.**

Step 6. Inspect for corroded or loose interconnections.

**Clean corroded interconnections. Tighten loose interconnections.**

Step 7. Check for defective dual obstruction lamp socket fixture.

**Remove and replace defective socket fixture.**

Table 5-5. Organizational Troubleshooting- Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	Step 8. Check for defective lighting control box.	<b>Remove and replace defective lighting control box.</b>
	Step 9. Check for defective circuit wiring.	<b>Remove and replace defective circuit wiring.</b>
<b>2. NO AC POWER AT CONVENIENCE OUTLETS.</b>		
	Step 1. Inspect to see if electrical system is disconnected from primary power source.	<b>Connect electrical system to primary power source.</b>
	Step 2. Check for circuit breaker in OFF position.	<b>Set circuit breaker to ON position.</b>
	Step 3. Check for defective circuit breaker(s).	<b>Remove and replace defective circuit breaker(s).</b>
	Step 4. Check for defective outlet(s).	<b>Remove and replace defective outlet(s).</b>
	Step 5. Inspect for corroded and loose interconnections.	<b>Clean corroded interconnections. Tighten loose interconnections.</b>
<b>3. ELEVATOR HOIST DOES NOT FUNCTION WHEN CONTROL BUTTON IS DEPRESSED.</b>		
	Step 1. Inspect to see if electrical system is disconnected from primary power source.	<b>Connect electrical system to primary power source.</b>
	Step 2. Check for circuit breaker in OFF position.	<b>Set circuit breaker to ON position.</b>
	Step 3. Check for defective circuit breaker.	<b>Remove and replace defective circuit breaker.</b>
	Step 4. Inspect for corroded or loose cable connections.	<b>Clean corroded cable connections. Tighten loose connections.</b>

Table 5-5. Organizational Troubleshooting - Continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	Step 5. Check for defective power or hoist control cable.	<b>Remove and replace defective cable.</b>
	Step 6. Check for defective hoist operating control.	<b>Remove and replace defective hoist operating control.</b>
	Step 7. Check for defective hoist motor.	<b>Remove and replace defective hoist motor.</b>
<b>4. ELEVATOR DOES NOT RIDE SMOOTHLY ON TRACKS.</b>		
	Step 1. Inspect for misaligned tracks.	<b>Align all tracks.</b>
	Step 2. Inspect for loose cam hardware.	<b>Tighten all cam hardware.</b>
	Step 3. Check for defective cam follower(s).	<b>Remove and replace defective cam follower(s).</b>
	Step 4. Check for defective sleeve assembly.	<b>Remove and replace defective sleeve assembly.</b>

**Section VI. MAINTENANCE OF ANTENNA TOWER TS-9A**

**5-9 GENERAL.** This section contains instructions for organizational maintenance of the Antenna Tower TS-9A. It consists of removal and replacement procedures required for maintenance of the equipment. Organizational maintenance of the antenna tower includes the following:

- a. Cleaning of all equipment.
- b. Removal and replacement of aviation lighting obstruction lights, lamps, and lighting control box.
- c. Removal and installation of convenience outlets.
- d. Removal and installation of junction box.
- e. Removal and replacement of circuit breakers.
- f. Removal and installation of electric hoist.

**5-10 CLEANING.** Clean all equipment as follows:**WARNING**

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. **DO NOT USE NEAR HEAT OR AN OPEN FLAME.** Trichloroethane is not flammable, but exposure of fumes to an open flame or hot metal forms highly toxic phosgene gas, which can injure personnel if inhaled.

- a. Use lint-free cloth to remove dust and dirt from all equipment.
- b. Use one-inch bristle brush to remove dirt and dust from hard to reach areas.
- c. Remove hardened dirt with one-inch bristle brush soaked with trichloroethane. Wipe dry with clean, dry, lintfree cloth.
- d. Remove hardened dirt with one-inch bristle brush soaked with trichloroethane. Wipe dry with clean, dry, lintfree cloth.

**5-11 AVIATION LIGHTS.****WARNING**

Death or injury may result from contact with electrical connections. Disconnect power before servicing any electrical equipment.

- a. *Removal*
  - (1) Set lighting switch (figure 3-3) and light circuit breaker (figure 3-2) to OFF.
  - (2) Remove protective lenses on the two dual obstruction light fixtures (2, figure 2-13).
  - (3) Turn lamp(s) counterclockwise and remove.
- b. *Replacement.*
  - (1) Install new lamps, as necessary, in sockets.
  - (2) Install protective lamps.
  - (3) Set lighting switch and light circuit breaker to ON.

**5-12 CONVENIENCE OUTLETS.****WARNING**

Death or injury may result from contact with electrical connections. Disconnect power before servicing any electrical equipment.

- a. *Removal.* Refer to figure E-9.

- (1) On power junction box panel, set CONVENIENCE OUTLETS (14) circuit breakers to OFF position.

- (2) Remove fastener screws that secure receptacle box covers. Remove covers.

- (3) Remove screws that secure receptacles in box. Pull receptacles out of box.

- (4) Tag each input power lead to receptacles. Mark each tag with its respective terminal connections.

- (5) Disconnect leads to receptacles.

- b. *Replacement.*

- (1) Connect power leads to receptacles. Be sure tags match with terminal connections.

- (2) Insert receptacles into box and secure with screws that were removed.

- (3) Attach receptacle box covers and secure with screws that were removed.

- (4) On power junction box, set CONVENIENCE OUTLETS circuit breakers (14) to ON position.

**5-13 JUNCTION BOX AND CIRCUIT BREAKERS.****WARNING**

Death or injury may result from contact with electrical connections. Disconnect power before servicing any electrical equipment.

- a. *Junction Box Removal.* Refer to figure 2-14.

- (1) Tag each lead of primary power source input. Mark each tag with terminal connection designator. Disconnect primary power source.

- (2) Tag each input power lead to junction box and each output lead to aviation lights, hoist, and convenience outlets. Mark each tag with terminal connection designator. Disconnect input power leads to junction box, and output leads to aviation lights, hoist, and convenience outlets.

- (3) Remove hex nut (5), lockwasher (4), and bolt (3) that secure convenience outlet (2) to junction box mount plate (6). Remove convenience outlet. Tag and disconnect convenience outlet power leads.

- (4) Remove four hex nuts (5), lockwashers (4), and bolts (3) that secure junction box assembly (7) to junction box mount plate (6). Remove junction box assembly.

- (5) Remove hex nut and tower step that secure junction box mount plate (6) to tower leg. Remove junction box mount plate. Replace tower step and secure with hex nut.

*b. Circuit Breaker Removal.* Refer to figure E-9.

(1) Remove fastener screws that secure junction box cover. Remove junction box cover.

(2) Remove two nuts(8), lockwashers (7), and screws (6) that secure circuit breaker clamp (5). Remove circuit breaker clamp.

(3) Remove four nuts (8), lockwashers (7), and screws (10) that secure 20-ampere breaker (9) and three 15-ampere circuit breakers (14). Pull circuit breakers from holders.

*c. Circuit Breaker Replacement.* Refer to figure E-9.

(1) Insert each circuit breaker into its respective holder. Secure with four screws (10), lockwashers (7), and nuts (8).

(2) Install circuit breaker clamp (5). Secure with two screws (6), lockwashers (7), and nuts (8).

(3) Attach junction box cover. Secure with fastener screws.

*d. Junction Box Replacement.* Refer to figure 2-14.

(1) Remove hex nut and tower step. Install junction box mount plate (5). Replace tower step and hex nut.

(2) Install junction box assembly (7) on junction box mount plate (6). Secure with four bolts (3); lockwashers (4), and hex nuts (5).

(3) Install convenience outlet (2) to junction box mount plate (6). Secure with bolt (3), lockwasher (4), and hex nut (5).

(4) Connect all power leads to junction box and convenience outlet. Be sure tags match with terminal connections.

(5) Connect primary power source. Be sure tags match with terminal connections.

**5-14 ELEVATOR HOIST.**

*a. Removal.* Refer to figure 2-10.

(1) Detach free end of hoist cable (12) from top tower step. Using hoist control reel in cable, thread it through sheave (10) on tower top brace.

(2) On power junction box, set HOIST circuit breaker to OFF position. Disconnect hoist control from hoist assembly.

(3) Remove four bolts (4), bevel washers (5), hex nuts (6) and locknuts (7). Remove hoist assembly (8) from hoist mount (1).

(4) Remove four hex nuts (2) and locknuts (3) from anchor bolts in hoist pier. Remove hoist mount (1).

*b. Installation.* Refer to figure 2-10.

(1) Install hoist mount onto four anchor bolts in hoist pier. Secure with four hex nuts (2) and locknuts (3).

(2) Install hoist (8) to hoist mount (1). Secure with four bolts (4), washers (5), hex nuts (6) and locknuts (7).

(3) Connect hoist control to hoist assembly. On power junction box set HOIST circuit breaker to ON position.

(4) Using hoist control, reel out hoist cable (12). Thread cable through sheave on tower top brace. Secure free end to top tower step.



## CHAPTER 6

## FUNCTIONING OF EQUIPMENT

**6-1 SCOPE.** This chapter provides the theory of operation for the Antenna Tower TS-9A and is directed to those items comprising the electrical system. Information is supplied for use by direct support, general support, and depot maintenance level personnel.

**6-2 ELECTRICAL SYSTEM.** The antenna tower electrical system (figure FO-1) is comprised of a power entrance junction box which receives 115-Vac, 60-Hz, primary power from an external power source. The junction box contains a terminal board and four individual circuit breakers to which this power is applied for distribution. The individual circuit breakers distribute the power through raceways to the aviation lighting system, the electric hoist, and the two ac convenience outlets.

*a. Aviation Lights.* The electrical system for the aviation lights is made up of a 15-ampere circuit breaker located in the junction box; a lighting control box located on a lower tower leg; a junction box and two double obstruction lights located near the tower top; wire leads; and rigid conduit and fittings. The power distributed by the circuit breaker is applied to the input of the lighting control unit. The three-lead output of the lighting control unit supplies power to the tower top junction box, and in turn to the two double obstruction lights. A switch is located on the lighting control unit for manually turning the aviation lights on and off. The lighting control unit has another output for connection to an alarm which indicates failure in the aircraft lighting system.

*b. Elevator Hoist.* The electrical system for the elevator hoist is made up of a 20-ampere circuit breaker located in the junction box; a drum switch located on a lower tower leg; the electric hoist assembly; and a limit switch. A flexible hoist cable supplies power to the terminals in the hoist. The hoist control (drum switch) that is connected to the terminals in the motor assembly (figure FO-1) is a two-position pushbutton momentary switch that controls the raising and lowering of the antenna elevator. When the UP button is depressed, the elevator is raised; when the DOWN button is depressed, the elevator is lowered. The electric brake in the hoist assembly holds the load when the buttons are not depressed. The limit switch is a normally closed push switch physically located at the top of the tower track and electrically connected by a limit switch cable to terminals in the hoist assembly. When the elevator reaches its uppermost limit of travel, it activates the switch, causing it to break contact by opening the circuit and stopping hoist operation.

*c. Convenience Outlets.* The antenna tower electrical system provides two ac convenience outlets, each protected by a 15-ampere circuit breaker located in the junction box. One convenience outlet is located on a tower leg at the top of the tower. It obtains its power from leads connected to one circuit breaker in the junction box. The other convenience outlet is located on the junction box on a tower leg near the base of the tower. It obtains its power from leads connected to a second circuit breaker in the junction box.

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CHAPTER 7

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

**7-1 SCOPE OF MAINTENANCE.** This chapter contains instructions for direct support maintenance of the Antenna Tower TS-9A. Direct support maintenance includes repair and replacement of those items listed in

the Maintenance Allocation Chart (MAC), Appendix D, and in the Repair Parts and Special Tools List (RPSTL), Appendix E.

Section II. TOOLS AND EQUIPMENT

**7-2 TOOLS AND TEST EQUIPMENT.** The tools and test equipment required and authorized for direct support maintenance are listed in the Maintenance

Allocation chart (MAC), Appendix D. Use of these items is listed in table 7-1 below.

**Table 7-1. Direct Support Maintenance Tools and Test Equipment**

NSN	Item	Use
6625-00-999-7465	Torque wrench, 0-200 ft-lbs	Tighten fastener hardware.
	Torque wrench, 0-600 ft-lbs	Tighten fastener hardware.
	Allen wrench, 3/8-inch	Remove and/or tighten socket head bolts.
	Multimeter AN/USM-223 measurements.	Perform voltage and resistance

**Table 7-2. Direct Support Maintenance Materials**

NSN	Item	Use
6850-00-597-9765	Trichloroethane	Clean metal parts.
7920-00-356-4694	Brush, bristle	Remove corrosion and other foreign matter from metal parts.
8010-00-835-2114	Paint, primer, zinc-chromate	Prime coat bare metal parts.
8010-00-297-0560	Paint, enamel, lusterless, olive drab	Finish coat metal parts.
8020-00-245-4509	Brush, paint, flat, 1-inch-wide	Repainting and touchup.
8305-00-222-2423	Cheesecloth, lint-free	Clean metal parts.
9150-00-273-2389	Oil, lubricating, 30 Wt Grease	Lubricate bearings and bushings. Lubricate pawls, shafts, gears, bearings, and cam followers.

**7-3 MATERIALS.** The materials required and authorized for direct support maintenance are listed in Appendix F, Expendable Supplies and Materials List. Use of the materials is listed in table 7-2 below.

Section III. TROUBLESHOOTING

7-4 Refer to Chapter 5, Organizational Maintenance Instructions, Section V, of this manual for troubleshooting procedures.

## Section IV. MAINTENANCE OF ANTENNA TOWER TS-9A

**7-5 ANTENNA TOWER.** Disassemble, clean, inspect, repair, and reassemble the antenna tower in accordance with the instructions listed below.

**NOTE**

**Be sure elevator assembly is lowered to the ground.**

a. *Primary Power Disassembly.***WARNING**

**Death or injury may result from contact with electrical connections. Disconnect power before servicing any electrical equipment.**

(1) Turn aviation lights switch to OFF (figure 3-3).

(2) Turn aviation lights, elevator hoist, and convenience outlets No. 1 and No. 2 circuit breakers to OFF (figure 3-2).

(3) Perform procedures described in paragraph 5-13a to disassemble ac power connections.

b. *Convenience Outlets Removal.* Refer to figure 2-14.

(1) Remove hex nut (5), lockwasher (4), and bolt (3) that secure convenience outlet (2) to junction box mount plate (6). Remove convenience outlet.

(2) Remove four hex nuts (5), lockwashers (4), and bolts (3) that secure junction box assembly (7) to junction box mount plate (6). Remove junction box assembly.

(3) Remove hex nut and tower step that secure junction box mount plate (6) to tower leg. Remove junction box mount plate.

(4) Remove hex nut (5), lockwasher-(4), and bolt (3) that secure convenience outlet (2) to convenience outlet mount plate (1). Remove convenience outlet.

(5) Remove hex nut and tower step that secure convenience outlet mount plate (1) to tower leg. Remove convenience outlet mount plate. Install tower step and secure with hex nut.

c. *Aviation Lights Removal.* Refer to figure 2-13.

(1) Disconnect and remove two watertight connectors (11) and three conductor cables (14) between lighting control panel (12) and junction box (15).

(2) Remove four hex nuts (8), lockwashers (9), and bolts (10) that secure lighting control panel (12) to control mount plate (7). Remove lighting control panel.

(3) Remove hex nut and tower step that secure control mount plate (7) to tower leg. Remove control mount plate.

(4) Remove wraplock (4) that secures conduit (5) to top tower brace. Remove four locknuts (13), union (13), fitting (6), rigid conduit (5), four lamps (1), and two dual obstruction lights (2).

(5) Remove hardware that secures junction box (15) to top tower brace. Remove junction box.

d. *Tower Grounding Kit Removal.* Refer to figure 2-12.

(1) Remove locknut (6), hex nut (5), and flat washer (1) from stud (7). Lift ground wire assembly (2) from stud. Replace flat washer, hex nut, and locknut on stud. Secure hardware.

(2) Loosen ground rod clamp (3). Remove ground wire assembly (2) from ground rod (4).

(3) Pull ground rod (4) out of ground.

e. *Elevator Assembly Disassembly/Removal.* Refer to figure 2-11.

(1) Remove locknut (11), hex nut (10), and bolt (9) that secure winch bracket (12). Remove winch bracket.

(2) Remove six locknuts (7), hex nuts (6), and bolts (14) that secure two elevator tracks (1, 23) and track angles (24) to elevator. Remove the two elevator tracks.

(3) Remove six locknuts (7), hex nuts (6), and bolts (14) that secure six track angles (24) to elevator tracks (1,23). Remove six track angles.

(4) Remove two locknuts (7), hex nuts (6), and bolts (5) that secure diagonal brace (27) to vertical braces (2, 19). Remove diagonal brace.

(5) Remove four locknuts (7), hex nuts (6), and bolts (5) that secure assembled horizontal braces (8,13,15,26) to diagonal braces (3,17) and horizontal brace (25). Remove assembled horizontal braces (8,13,15,26).

(6) Remove two locknuts (7), hex nuts (6), and bolts (5) that secure lower end of two diagonal braces (3, 17) to vertical braces (2,19). Remove two diagonal braces.

(7) Remove four locknuts (7), hexnuts (6), and bolts (5) that secure horizontal braces (8,13,15,26). Remove four horizontal braces.

(8) Detach hoist cable from lower horizontal brace (4).

(9) Remove four locknuts (7), hex nuts (6), and bolts (5) that secure two vertical braces (2,19). Remove two vertical braces.

(10) Remove six locknuts (7), hex nuts (6), and bolts (5) that secure two horizontal elevator braces (4,16) to lower sleeve assemblies. Remove two horizontal elevator braces.

(11) Remove two locknuts (7), hex nuts (6), and bolts (5), and two bolts (21) and lockwashers (22) that secure horizontal elevator brace (25), and two horizontal braces (20) to upper sleeve assemblies (18). Remove horizontal elevator brace (25) and two horizontal braces (20).

(12) Detach two sleeve assemblies (18) from each vertical track.

*f. Vertical Track Disassembly/Removal* Refer to figure 2-9.

(1) Remove two hexnuts (3), lockwashers (2), and screws (1) that secure limit switch (4) and limit switch cable (5) to horizontal track. Remove limit switch and limit switch cable.

(2) Remove from each track cripple (11) bolt (13) and lockwasher (14) that secure cripple to upper vertical tracks (9).

(3) Remove locknuts (8), hex nuts (7), and bolts (10) that secure lower vertical tracks (12) to three lower horizontal braces. Pull cripples (11) out of upper vertical tracks (9). Take down lower vertical tracks.

(4) Remove two bolts (13), and lockwashers (14) that secure cripple (11) to each lower vertical track (12). Pull cripples out each lower vertical track.

(5) Remove four locknuts' (8), hex nuts (7), and bolts (10) that secure upper vertical track (9) to two uppermost horizontal braces.

(6) Remove four locknuts (8), hex nuts (7), and bolts (6) that secure upper vertical track (9) to top tower brace. Take down upper vertical track.

(7) Repeat steps (5) and (6) to remove the other vertical track.

*g. Carriage Disassembly/Removal.* Refer to figure 2-8.

(1) Slide carriage assembly (3) out of horizontal tracks.

(2) Remove bolt (9) and lockwasher (8) that secure eyenut (7) to carriage assembly (3). Remove eyenut.

(3) Remove eight hex nuts (6), lockwashers (5), and bolts (4) that secure four cam follower blocks (1) and eight cam followers (2) to carriage assembly (3). Remove four cam follower blocks and eight cam followers.

*h. Electric Hoist Removal.* Refer to figure 2-10.

(1) Pull hoist cable (12) out of sheave (10).

(2) Remove sheave (10) and two spacers (11) from sheave bracket (9).

(3) Remove two locknuts (7), hex nuts (6), and bevel washers (5) that secure sheave bracket (9) to tower top brace. Remove sheave bracket.

(4) Tag and disconnect primary power leads from hoist junction box as shown in figure FO-1.

(5) Remove four lock nuts (7), hex nuts (6), bevel washers (5), and bolts (4) that secure hoist assembly (8) to hoist mount (1).

(6) Remove four locknuts (3) and hex nuts (2) that secure hoist mount (1) to hoist pier. Lift hoist mount off hoist pier.

*i. Initial Tower Structure Disassembly/Removal.* (See figures 24 and 2-6.)

(1) Refer to figure 2-6. Remove hex nut (6), lockwasher (5), bevel washer (10), and bolt (9) that secure horizontal track No. 2 (2) to top tower brace No. 5 (19).

#### NOTE

**The erection fixture, when properly secured, may be used to lower all equipment to ground level.**

(2) Remove three hex nuts (6), lockwashers (5), and bolts (4) that secure horizontal track (2) to three track angles (3). Remove horizontal track (figure 2-6).

(3) Remove hex nut (6), lockwasher (5), bevel washer (10), and bolt (9) that secure horizontal track No. 1 (1) to tower top brace No. 5 (19) (figure 2-6).

(4) Remove three hex nuts (6), lockwashers (5), and bolts (4) that secure horizontal track No. 1 (1) to three track angles (3). Remove horizontal track (figure 2-6).

(5) Remove six hex nuts (6), lockwashers (5), washers (10), and bolts (9) that secure six track angles (3). Remove six track angles (figure 2-6).

(6) Remove bolt (26), lockwasher (5), and bevel washer (10) that secure eyenut (25). Remove eyenut (figure 2-6).

(7) Remove eight hex nuts (23), lockwashers (22), and bolts (21) that secure grating assembly No. 4 (8). Remove grating assembly (figure 2-6).

(8) Remove six hex nuts (23), lockwashers (22), and bolts (21) that secure grating assembly No. 1 (24). Remove grating assembly (figure 2-6).

(9) Remove eight hex nuts (23), lockwashers (22), and bolts (21) that secure grating assembly No. 2 (7). Remove grating assembly (figure 2-6).

(10) Remove 13 hex nuts (23), lockwashers (22), and bolts (21) that secure grating assembly No. 3 (20). Remove grating assembly (figure 2-6).

(11) Remove six locknuts (15), hex nuts (14), and bolts (13) that secure six grating angles (18) to braces (I 1, 19). Remove six grating angles (figure 2-6).

(12) Refer to figure 24. Remove hex nut (9), lockwasher (8), and bolt (15) that secure ground strap of each cable brace to tower leg. Detach ground straps.

(13) Remove 30 hex nuts (31) that secure 15 tower steps (30) to tower leg. Remove 15 tower steps (figure 2-4).

(14) Remove hex nut (9), lockwasher (8), and bolt (7) that secure crossover clamps (6) to each pair of cable braces (19). Detach crossover clamps (figure 24).

*j. Upper Brace Disassembly/Removal.* See figures 2-4 and 2-6.

(1) Refer to figure 2-4. Remove wraplock (32) from each cable brace turnbuckle (33) (sheet 5).

(2) Remove cable braces (19) from tower legs on the three top uppermost levels (figure 24).

(3) Refer to figure 2-6. Remove eight locknuts (15), hex nuts (14), and bolts (13) that secure tower top braces Nos. 7 and 8 (16,17) and two angle braces (12). Remove two tower top braces and two angle braces.

(4) Remove eight locknuts (15), hex nuts (14), and bolts (13) that secure tower top braces Nos. 5 and 6 (19,11), and two angle braces (12). Remove two tower top braces and two angle braces (figure 2-6).

(5) Refer to figure 24. Remove 16 locknuts (13), hex nuts (12), and bolts (14) that secure four top tower braces Nos. 1 through 4 (5,20,22,25) to top tower legs. Remove four top tower braces.

(6) Remove eight locknuts (29), hex nuts (28), and bolts (27) that secure four corner braces (26) to upper horizontal braces. Remove four corner braces (figure 24).

(7) Remove eight locknuts (13), hex nuts (12), and bolts (11) that secure one horizontal brace (16), one horizontal brace (23), and two horizontal braces (18). Remove four horizontal braces (figure 24).

*k. Upper Tower Leg Disassembly/Removal.* See figures 24 and 2-5.

(1) Refer to figure 24. Remove 16 locknuts (13), hex nuts (12), and bolts (11) that secure three upper tower legs (10) and one upper tower leg (21) to joint braces (17,24). Remove three legs (10) and one leg (21).

(2) Refer to figure 2-5. Remove tower erection fixture (1) as follows:

(a) Remove four hitchpins (5) and two lockpins (4) that safety lock upper and lower supports.

(b) Loosen two thumb screws (6) that clamp supports (3) in position.

(c) Lift upper and lower supports (3) off horizontal braces.

(d) Disassemble block (2), hoist line (9), tension sling (8), and tag line (7).

*l. Brace Disassembly/Removal.* Refer to figure 24.

(1) Remove eight locknuts (29), hex nuts (28), and bolts (27) that secure four corner braces (26) to the joint braces. Remove four corner braces.

(2) Remove 24 locknuts (13), hex nuts (12), and bolts (11) that secure three joint braces (17) and one joint brace (24) to lower tower legs. Remove four joint braces.

(3) Remove eight locknuts (29), hex nuts (28), and bolts (27) that secure four corner braces (26) to the third level of horizontal braces. Remove four corner braces.

(4) Remove eight locknuts (13), hex nuts (12), and bolts (14) that secure three horizontal braces (16) and one horizontal brace (23) at the third level. Remove four horizontal braces.

(5) Detach eight cable braces (19) between the two lower levels of horizontal braces.

(6) Remove 16 locknuts (29), hex nuts (28), and bolts (27) that secure four corner braces (26) to each level of horizontal braces (total of eight corner braces). Remove eight corner braces.

(7) Remove eight locknuts (13), hex nuts (12), and bolts (14) that secure three horizontal braces (16) and one horizontal brace (23) (located approximately 5 feet above the ground) to the tower legs. Remove four horizontal braces.

(8) Remove eight locknuts (13), hex nuts (12), and bolts (14) that secure three bottommost horizontal braces (16) and one horizontal brace (23) to lower tower legs. Remove four horizontal braces.

*m. Tower Leg Disassembly/Removal.* Refer to figure 2.4.

(1) Remove locknut (3) and hex nut (4) from each pier bolt that secures four lower legs (1, 2) to tower piers. Remove four lower legs.

(2) Remove hex nut (4) from each pier bolt.

*n. Cleaning.* Clean the disassembled antenna tower as follows:

**WARNING**

**The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT USE NEAR HEAT OR AN OPEN FLAME. Trichloroethane is not flammable, but exposure of fumes to an open flame or hot metal forms highly toxic phosgene gas, which can injure personnel if inhaled.**

(1) Remove dust and dirt from all parts by using a clean lint-free cloth.

**NOTE**

**The gin pole pulley and hoist lines may be used to lower braces.**

(2) Remove grease or oil with trichloroethane and wipe dry with a clean, dry, lint-free cloth.

(3) Remove hardened dirt with a one-inch bristle brush soaked with trichloroethane. Wipe dry with a clean, dry, lint-free cloth.

*o. Inspection.* Examine the antenna tower parts to determine their serviceability.

*p. Repair.* Repair of the antenna tower is limited to the replacement of those parts found to be defective. Refer to figure E-2 in the Repair Parts and Special Tools List (RPSTL), Appendix E, for the part numbers of these components.

*q. Lubrication.* Refer to Chapter 5, Organizational Maintenance Instructions, Section III, Lubrication Instructions, for lubrication instructions of antenna tower.

*r. Reassembly.* Perform the procedures described in paragraphs 2-8 through 2-13 to reassemble the antenna tower.

**7-6 CABLE HOIST.** Disassemble, clean, inspect, repair, and reassemble the cable hoist as described below.

*a. Disassembly.* Refer to figure E-4.

(1) Remove two snaprings (18) and sheave block shaft (22) from sheave block set (15).

(2) Remove wheel pulley (23) and bushing (24) from yoke (21). Cable assembly (25) and eyehook (26) are now released.

(3) Remove drive pin (16) and hook nut (17). Remove shank hook (20) from yoke (21).

(4) Unfasten attachment hardware that secures safety latch (19). Remove safety latch.

(5) Detach eyehook (26) from eyebolt (14). Reel out all cable from the drum (12) to expose setscrew (10). Loosen setscrew to free cable end, and pull cable free.

(6) Loosen handle lock screw (2). Remove handle (4) from the U-frame socket.

(7) Remove two snaprings (3), loading pawl shaft (35), loading pawl (7), reversing spring (6), and upper control lever (5) from the U-frame (1).

(8) Remove snapring (3) to release drum shaft (29), winding wheel (30), U-frame (1), and drum (12) from the main frame (34). Remove drum pin (11) to release drum (12) from drum shaft (29). Remove drive pin (16) to release winding wheel (30) from drum shaft (29).

(9) Remove two snaprings (3), holding pawl shaft (28), holding pawl (13), pawl control assembly (9), and shockspring (8) from the main frame (34).

(10) Remove drive pin (16) and hook nut (17). Remove shank hook (20) from main frame (34).

(11) Remove bolt (31) and two jam nuts (33). Remove cable shield (32).

(12) Remove drive pin (16) and hook nut (17). Remove eyebolt (14) and cable guide (27) from main frame (34).

*b. Cleaning.* Clean the disassembled cable hoist as follows:

#### **WARNING**

**The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT USE NEAR HEAT OR AN OPEN FLAME. Trichloroethane is not flammable, but exposure of the fumes to an open flame or hot metal forms highly toxic phosgene gas, which can injure personnel if inhaled.**

(1) Remove dust and dirt from all parts with a clean lint-free cloth.

(2) Remove grease or oil with trichloroethane and wipe dry with a clean, lint-free cloth.

(3) Remove hardened dirt with a one-inch bristle brush soaked with trichloroethane. Wipe dry with a clean dry, lint-free cloth.

*c. Inspection.* Examine the cable hoist parts to determine their serviceability.

*d. Repair.* Repair of the cable hoist is limited to the replacement of those parts found to be defective. Refer to figure E4 in the Repair Parts and Special Tools List (RPSTL), Appendix E, for the part numbers of all components.

*e. Lubrication.* Refer to Chapter 5, Organizational Maintenance Instructions, Section III, Lubrication Instructions, for lubrication instructions for the cable hoist.

*f. Reassembly.* Refer to Figure E-4.

(1) Install eyebolt (14) and cable guide (27) to main frame (34). Secure with hooknut (17) and drive pin (16).

(2) Install cable shield (32) to main frame. Secure with bolt (31) and two jam nuts (33).

(3) Install shank hook (20) to main frame. Secure with hooknut (17) and drive pin (16).

(4) Install shockspring (8), pawl control assembly (9), holding pawl (13), and holding pawl shaft (28) to the main frame. Secure with two snaprings (3).

(5) Attach release winding wheel (30) to drum shaft (29). Secure with drive pin (16). Insert drum shaft through main frame (34), U-frame (1), drum (12), and main frame (34). Secure drum to shaft with drum drive pin (11). Secure drum shaft to main frame with snapring (3).

(6) Install loading pawl shaft (35), loading pawl (7), reversing spring (6), and upper control lever (5) to the U-frame. Secure with two snaprings (3).

(7) Insert handle (4) in the U-frame socket. Secure with handle lockscrew (2).

(8) Insert cable through cable guide (27), drum (12), and setscrew (10). Tighten setscrew to secure cable. No cable should protrude through drum. Wind all of the cable around drum. Attach eyehook (26) to eyebolt (14).

(9) Attach safety latch (19) to shank hook (20). Secure with the fastener hardware. Install shank hook (20) to yoke (21). Secure with hook nut (17) and drive pin (16).

(10) Lay cable assembly (25) on bottom of yoke (21) of sheave block set (15).

(11) Install wheel pulley (23), sheave block shaft (22), and bushing (24) to yoke (21). Secure with two snaprings (18).

**7-7 JUNCTION BOX.** Disassemble, clean, inspect, repair, and reassemble junction box as described below.

*a. Disassembly.*

**WARNING**

**Death or injury may result from contact with electrical connections. Disconnect power before servicing any electrical equipment.**

(1) Perform procedures described in paragraphs 5.13a and 5-13b to remove junction box and circuit breakers from antenna tower (figure 2-14).

(2) Refer to figure E-9. Remove four nuts (8), lockwashers (7), and screws (10) that secure terminal board (12). Remove terminal board.

(3) Remove fastener hardware that secures three watertight connectors (13) and two right-angle watertight connectors (11) to junction box.

*b. Cleaning.* Clean the disassembled junction box as follows:

**WARNING**

**The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT USE NEAR HEAT OR AN OPEN FLAME. Trichloroethane is not flammable, but exposure of the fumes to an open flame or hot metal forms highly toxic phosgene gas, which can injure personnel if inhaled.**

(1) Remove dust and dirt from all parts by using a clean lint-free cloth.

(2) Remove grease or oil with trichloroethane and wipe dry with a clean, dry, lint-free cloth.

(3) Remove caked on dirt with a one-inch bristle brush soaked with trichloroethane. Wipe dry with a clean, dry, lint-free cloth.

*c. Inspection.* Examine the junction box parts to determine their serviceability.

*d. Repair.* Repair of the junction box is limited to the replacement of those parts found to be defective. Refer to figure E-9 in the Repair Parts and Special Tools List (RPSTL), Appendix E, for the part numbers of these components.

*e. Reassembly.* Refer to figure E-9.

(1) Install three watertight connectors (13) and two right-angle watertight connectors (11). Secure with fastener hardware, making sure the attachment is watertight.

(2) Install terminal board (12). Secure with four screws (10), nuts (8), and lockwashers (7).

(3) Perform procedures described in paragraphs 5-13c and 5-13d to install junction box and circuit breakers on antenna tower.

**Section V. DIRECT SUPPORT TESTING PROCEDURES**

(This information was not available at time of publication of this manual.)

**CHAPTER 8**

**GENERAL SUPPORT MAINTENANCE INSTRUCTIONS**

(In accordance with the Maintenance Allocation Chart (MAC), Appendix D, of this manual, general support maintenance is not required.)

**CHAPTER 9**

**MATERIEL USED IN CONJUNCTION WITH MAJOR ITEM**

(No additional materiel is required for maintenance of the TS-9A.)

**8-1/9-1/(9-2 blank)**



**APPENDIX A****REFERENCES**

Reference	Title
TM 38-750	The Army Maintenance Management System (TAMMS)
TM 740-90-1	Administrative Storage of Equipment
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command)
AR 70042	Classification, Reclassification, Maintenance, Issuance and Reporting of Maintenance Training Aircraft
CTA 50-970	Expendable Items (Except Medical, Class V, Repair Parts and Heraldic Items)
DA Form 2028	Recommended Changes to Publications and Blank Forms
DA PAM 310-6	Military Publications: Index of Supply Catalogs and Supply Manuals (Excluding Types 7, 8, and 9)
DA PAM 310-7	US Army Equipment Index of Modification Work Orders
DD Form 6	Report of Packaging and Handling Deficiencies
SB 11-573	Painting and Preservation Supplies Available for Field Use for Electronics Command Equipment
SB-700-20	Army Adopted/Other Items Selected for Authorization/List of Reportable Items
SB-70841/42	Federal Supply Code for Manufacturers, United States and Canada. Name to Code and Codes to Name (GSA FSS H4-1/H4-2)
SF 368	Quality Deficiency Report
TB 43-01118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters

**A-1/(A-2 blank)**

## APPENDIX B

## COMPONENTS OF END ITEM LIST

## Section I. INTRODUCTION

**B-1 SCOPE.** This appendix lists integral components of and Basic Issue Items (BII) for the Antenna Tower TS-9A to help you inventory items required for safe and efficient operation.

**B-2 GENERAL.** This Components of End Item List is divided into the following sections:

*a. Section II. Integral Components of the End Item.* These items, when assembled, comprise the Antenna Tower TS-9A and must accompany it whenever it is transferred or turned in. The illustrations will help you identify these items.

*b. Section III. Basic Issue Items (BII). Not applicable.*

**B-3 EXPLANATION OF COLUMNS.**

*a. Illustration.* This column is divided as follows:

(1) *Figure Number.* Indicates the figure number of the illustration on which the item is shown.

(2) *Item Number.* Not applicable.

*b. National Stock Number.* Indicates the National stock number assigned to the item and which will be used for requisitioning.

*c. Part Number.* Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

*d. Description.* Indicates the Federal item name and, if required, a minimum description to identify the item.

*e. Location.* The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

*f. Usable on Code.* Not applicable.

*g. Quantity Required (Qty Req'd).* This column lists the quantity of each item required for a complete major item.

*h. Quantity.* This column is left blank for use during an inventory. Under the Rcv'd column, list the quantity you actually receive on your major item. The Date columns are for your use when you inventory the major item at a later date; such as for shipment to another site.

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) PART NO.	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY			
(a) FIGURE NO.	(b) ITEM NO.							RCV'D	DATE	DATE	DATE
E-2	(REF)		0257-1-2004-]	TOWER ASSEMBLY KIT (15942)			1				
E-3	(REF)		0257-1-2009-1	TOWER ERECTION KIT (15942)			1				
E-5	(REF)		0257-1-2008-1	ANTENNA ELEVATION AND POSITIONING KIT (15942)			1				
E-7	(REF)		0257-1-2010-1	ACCESSORY AND LIGHTING KIT (15942)			1				
				Section III. BASIC ISSUE ITEMS (Not Applicable)							

**APPENDIX C**

**ADDITIONAL AUTHORIZATION LIST**

**Section I. INTRODUCTION**

**C-1 SCOPE.** This appendix lists additional items you are authorized for the support of the Antenna Tower TS-9A.

**C-2 GENERAL.** This list identifies items that do not have to accompany the central and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

**C-3 EXPLANATION OF LISTING .** Descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment.

**C-1**

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER AND FSCM <i>USABLE ON CODE</i>	(3) U/M	(4) QTY AUTH
	LADDER (20-FOOT)	EA	1
	OPEN WIRE CLAMPS	EA	6
	SAFETY HARD HAT (PER PERSON)	EA	1
	SAFETY STRAP	EA	2

APPENDIX D

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

D-1 GENERAL.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. The Maintenance Allocation Chart (MAC) in Section I1 designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV, Remarks, is not applicable.

D-2 MAINTENANCE FUNCTIONS.

a. *Inspect.* To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

b. *Test.* To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. *Service.* Operations required periodically to keep an item in proper operating condition; i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. *Install.* The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

e. *Replace.* The act of substituting a serviceable like type part, subassembly, or module for an unserviceable counterpart.

f. *Repair.* The application of maintenance services or other maintenance actions to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and item, or system.

g. *Overhaul.* That maintenance effort (services/actions) necessary to restore an item to a completely serviceable/ operational condition as prescribed by maintenance standards; i.e., Depot Maintenance Work Requirement in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

D-3 EXPLANATION OF COLUMNS IN THE MAC, SECTION II.

a. *Column 1, Group Number.* Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. *Column 2, Component/Assembly.* Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. *Column 3, Maintenance Function.* Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see para. D-2.)

d. *Column 4, Maintenance Level.* Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate "work time" figures will be shown for each level. The number of man-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

- C..... Operator or crew
- O..... Organizational maintenance
- F..... Direct support maintenance
- H..... General support maintenance
- D..... Depot maintenance

e. *Column 5, Tools and Equipment.* Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, Test, Measurement, and Diagnostic Equipment (TMDE), and support equipment required to perform the designated function.

f: *Column 6, Remarks.* Not applicable.

**D-4 EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III.**

a. *Column 1, Reference Code.* The tool and TMDE reference code correlates with a code used in the MAC, Section II, column 5.

b. *Column 2, Maintenance Level.* The lowest level of maintenance authorized to use the tool or test equipment.

c. *Column 3, Nomenclature.* Name or identification of the tool or test equipment.

d. *Column 4, National/NATO Stock Number.* The National Stock Number (NSN) of the tool or TMDE.

e. *Column 5, Tool Part Number.* The manufacturer's part number.

**D-5 EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.** Not applicable.

**Section II. MAINTENANCE ALLOCATION CHART  
FOR  
TS-9A**

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
00	ANTENNA TOWER TS-9A	Inspect		3.0				5, 6, 7, 10 9 1, 2, 3, 4, 5, 6, 7, 8, 10 1, 2, 3, 4, 5, 6, 7, 8, 10 2, 3, 5, 9	
		Service				1.5			
		Test				0.5			
		Install				40.0			
		Replace				40.0			
01	TOWER ASSEMBLY KIT	Inspect		3.0					
		Service							
		Test				0.2			
		Install				1.0			
		Replace				0.5			
02	TOWER ERECTION KIT	Repair				2.5			
		inspect		0.2					
		Service							
		Install							
		Replace				1.0			
0201	HAND HOIST ASSEMBLY	Repair				2.5		5, 6, 7, 9 4, 5, 6, 7, 9 1 through 10	
		Inspect		0.2					
		Service				0.3			
		Install				1.0			
		Replace				1.0			
03	ANTENNA ELEVATION AND POSITIONING KIT	Repair	1.0			8.0		4, 5, 6, 7, 9 4, 5, 6, 7, 9 1 through 10	
		Inspect							
		Service				2.0			
		Install				40.0			
		Replace				40.0			
0301	ELECTRIC HOIST ASSEMBLY	Repair				8.0		5, 6, 7, 9 5, 6, 7, 9 1 through 10	
		Inspect		0.3					
		Service				1.0			
		Install				8.0			
		Replace				8.0			
04	ACCESSORY AND LIGHTING KIT	Repair				8.0		5, 6. 5, 6, 7, 9 1 through 10	7, 9
		Inspect		1.0					
		Service		1.0					
		Test				2.0			
		Install				8.0			

\*\*\*Worktime is included in DMWR.



(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
0401	TOWER GROUNDING KIT	Inspect Service Install Replace		0.2 0.3 0.5 0.4					
0402	JUNCTION BOX AND CONVENIENCE OUTLET KIT	Inspect Service Test Install Replace Repair			1.0 1.5 1.5 6.0 6.0 1.3				

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS  
FOR  
TS-9A**

(1) REFERENCE CODE	(2) MAINTENANCE CATEGORY	(3) NOMENCLATURE	(4) NATIONAL/NATO STOCK NUMBER	(5) TOOL NUMBER
1	0	TRIPOD. FIXED LEG		
2	0	SPIRIT LEVEL. 48-INCH		
3	0	SPIRIT LEVEL, 78-INCH		
4	0	MEASURING TAPE, 100 FEET		
5	0	ALLEN WRENCH. 3/8-INCH		
6	0	TORQUE WRENCH. 0-200 FT-LBS		
7	0	TORQUE WRENCH, 0-600 FT-LBS		
8	0	WINCH TRUCK, 1-TON		
9	0	MULTIMETER AN/USM-223	6625-00-999-7465	
0	0	TRANSIT LEVEL		

## Section IV. REMARKS

Reference Code	Remarks
	(Not Applicable)

APPENDIX E

REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

**E-1 SCOPE.** This appendix lists spares and repair parts; special tools; special Test, Measurement, and Diagnostic Equipment (TMDE), and other special support equipment required for performance of organizational and direct support maintenance of the Antenna Tower TS-9A. It authorizes the requisitioning and issue of spare and repair parts as indicated by the source and maintenance codes.

**E-2 GENERAL.** This Repair Parts and Special Tools List is divided into the following sections:

a. *Section II. Repair Parts List.* A list of spares and repair parts authorized for use in the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in numeric sequence, with the parts in each group listed in figure and item number sequence.

b. *Section III. Special Tools List. Not applicable.*

c. *Section IV. National Stock Number and Part Number Index.* A list, in National Item Identification Number (NIIN) sequence, of all National Stock Numbers (NSN) appearing in the listings, followed by a list in alphanumeric sequence of all part numbers appearing in the listings. National stock numbers and part numbers are cross-referenced to each illustration figure and item number appearance.

**E-3 EXPLANATION OF COLUMNS.**

a. *Illustration.* This column is divided as follows:

(1) *Figure Number.* Indicates the figure number of the illustration on which the item is shown.

(2) *Item Number.* The number used to identify item called out in the illustration.

b. *Source, Maintenance, and Recoverability (SMR) Codes.*

(1) *Source Code.* Source codes indicate the manner of acquiring support items for maintenance, repair, or overhaul of end items. Source codes are entered in the first and second positions of the uniform SMR code format as follows:

<u>Code</u>	<u>Definition</u>
PA -	Item procured and stocked for anticipated or known usage.
AD -	Item to be assembled at depot maintenance level.
XD -	A support item that is not stocked. When required, item will be procured through normal support channels.

**NOTE**

**Cannibalization or salvage may be used as a source of supply for any items coded above except those coded XA and aircraft support items as restricted by AR 700-42.**

(2) *Maintenance Code.* Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the uniform SMR code format as follows:

(a) The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove, replace, and use the support item. The maintenance code entered in the third position will indicate one of the following levels of maintenance:

<u>Code</u>	<u>Application/Explanation</u>
O -	Support item is removed, replaced, used at the organizational level.
F -	Support item is removed, replaced, used at the direct support level.

(b) The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair; i.e., all authorized maintenance functions. This position will contain one of the following maintenance codes:

<u>Code</u>	<u>Application/Explanation</u>
F -	The lowest maintenance level capable of complete repair of the support item is the direct support level.
D -	The lowest maintenance level capable of complete repair of the support item is the depot level.
Z -	Nonreparable. No repair is authorized.

(3) *Recoverability Code.* Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the uniform SMR code format as follows:

<u>Recoverability Code</u>	<u>Definition</u>
Z -	Nonreparable item. When unserviceable, condemn and dispose at the level indicated in position 3.
F -	Reparable item. When uneconomically repairable, condemn and dispose at the direct support level.
D -	Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal not authorized below depot level.

*c. National Stock Number (NSN).* Indicates the NSN assigned to the item and which will be used for requisitioning.

*d. Part Number.* Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

**NOTE**

**When a stock numbered item is requisitioned, the item received may have a different part number than the part being replaced.**

*e. Federal Supply Code for Manufacturer (FSCM).* The FSCM is a 5-digit numeric code listed in SB 70841/42 which is used to identify the manufacturer, distributor, or Government agency, etc.

*f. Description.* Indicates the Federal item name and, if required, a minimum description to identify the item.

*g. Unit of Measure (U/M).* Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr, etc.). When the U/M differs from the unit of issue, the lowest unit of issue that will satisfy the required U/M will be requisitioned.

*h. Quantity Incorporated in Unit.* Indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column in lieu of a quantity indicates that no specific quantity is applicable (e.g., shims, spacers, etc.).

**E-4 SPECIAL INFORMATION.** Not applicable.

**E-5 HOW TO LOCATE REPAIR PARTS.**

*a. When National Stock Number or Part Number is unknown:*

(1) *First.* Using the table of contents, determine the functional group or subgroup within which the item belongs. This is necessary since illustrations are prepared for functional groups or subgroups, and listings are divided into the same groups.

(2) *Second.* Find the illustration covering the functional group or subgroup to which the item belongs.

(3) *Third.* Identify the item on the illustration and note the illustration figure and item number of the item.

(4) *Fourth.* Using the Repair Parts Listing, find the figure and item number notes on the illustration.

*b. When National Stock Number or Part Number is known:*

(1) *First.* Using the Index of National Stock Numbers and Part Numbers, find the pertinent NSN or part number. This index is in NIIN sequence, followed by a list of part numbers in alphanumeric sequence, cross-referenced to the illustration figure number and item number.

(2) *Second.* After finding the figure and item number, locate the figure and item number in the repair parts list.

**E-6 ABBREVIATIONS.** Not applicable.

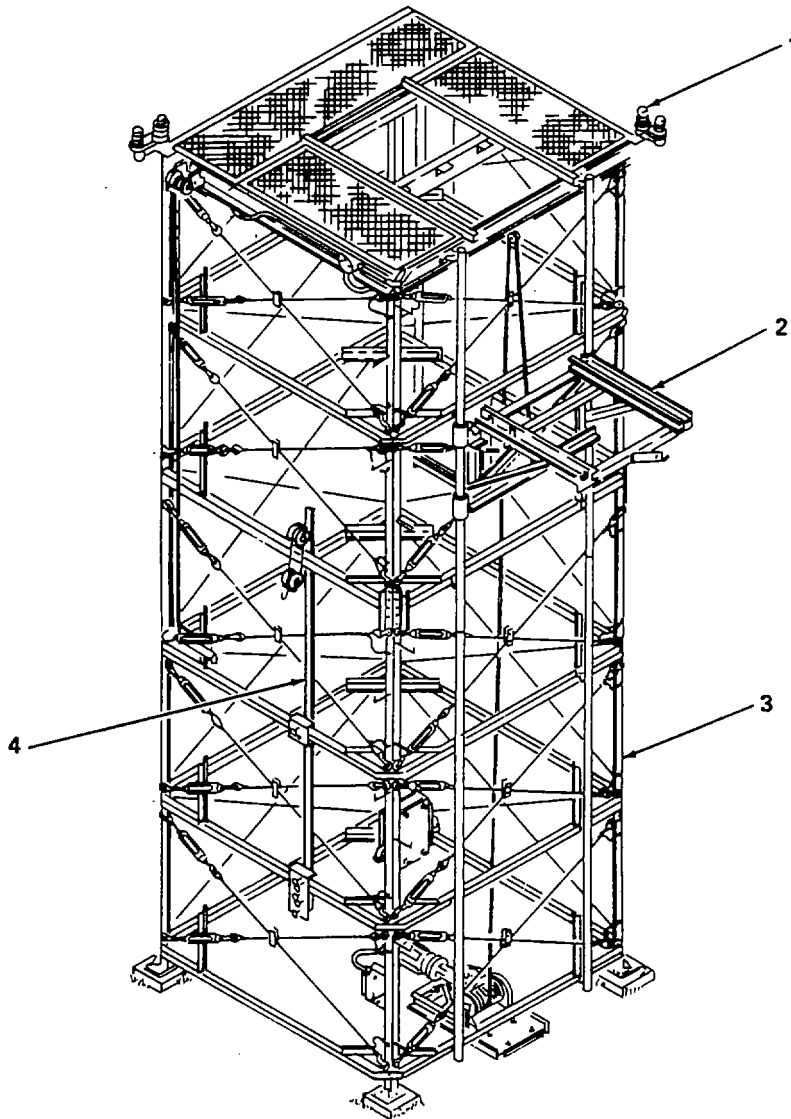


Figure E-1. Antenna Tower TS-9A

(E-3 blank)/E4

Section II. REPAIR PARTS LIST

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
E-1	1	ADFFF		0257-1-2010-1	15942	GROUP: 00 ANTENNA TOWER TS-9A (15942)  ACCESSORY AND LIGHTING KIT	EA	1
E-1	2	ADFDD		0257-1-2008-1	15942	ANTENNA ELEVATION AND POSITIONING KIT	EA	1
E-1	3	ADFFF		0257-1-2004-1	15942	TOWER ASSEMBLY KIT	EA	1
E-1	4	ADFFF		0257-1-2009-1	15942	TOWER ERECTION KIT	EA	1

E-5/(E-6 blank)

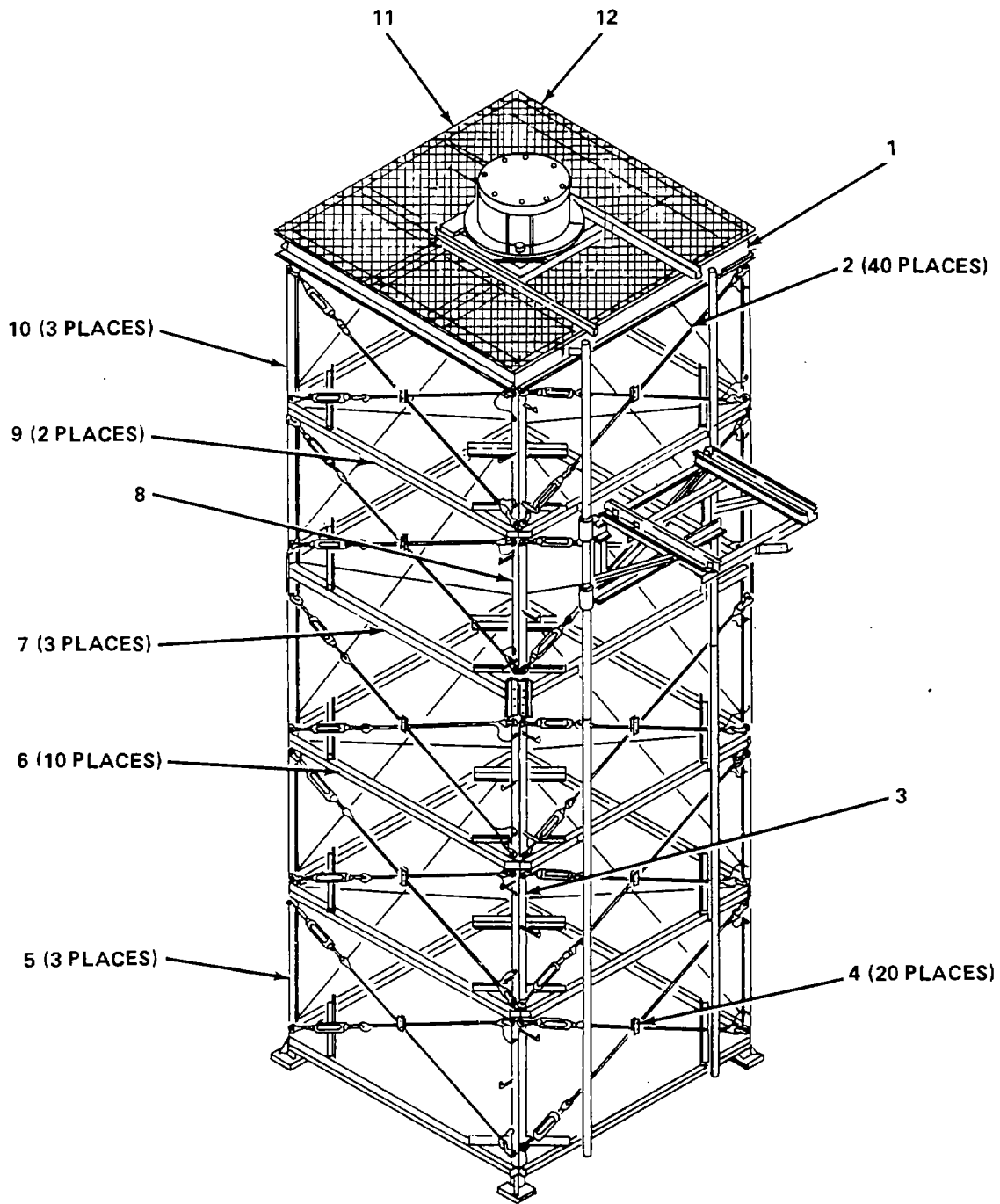


Figure E-2. Tower Assembly Kit (Sheet 1 of 6)



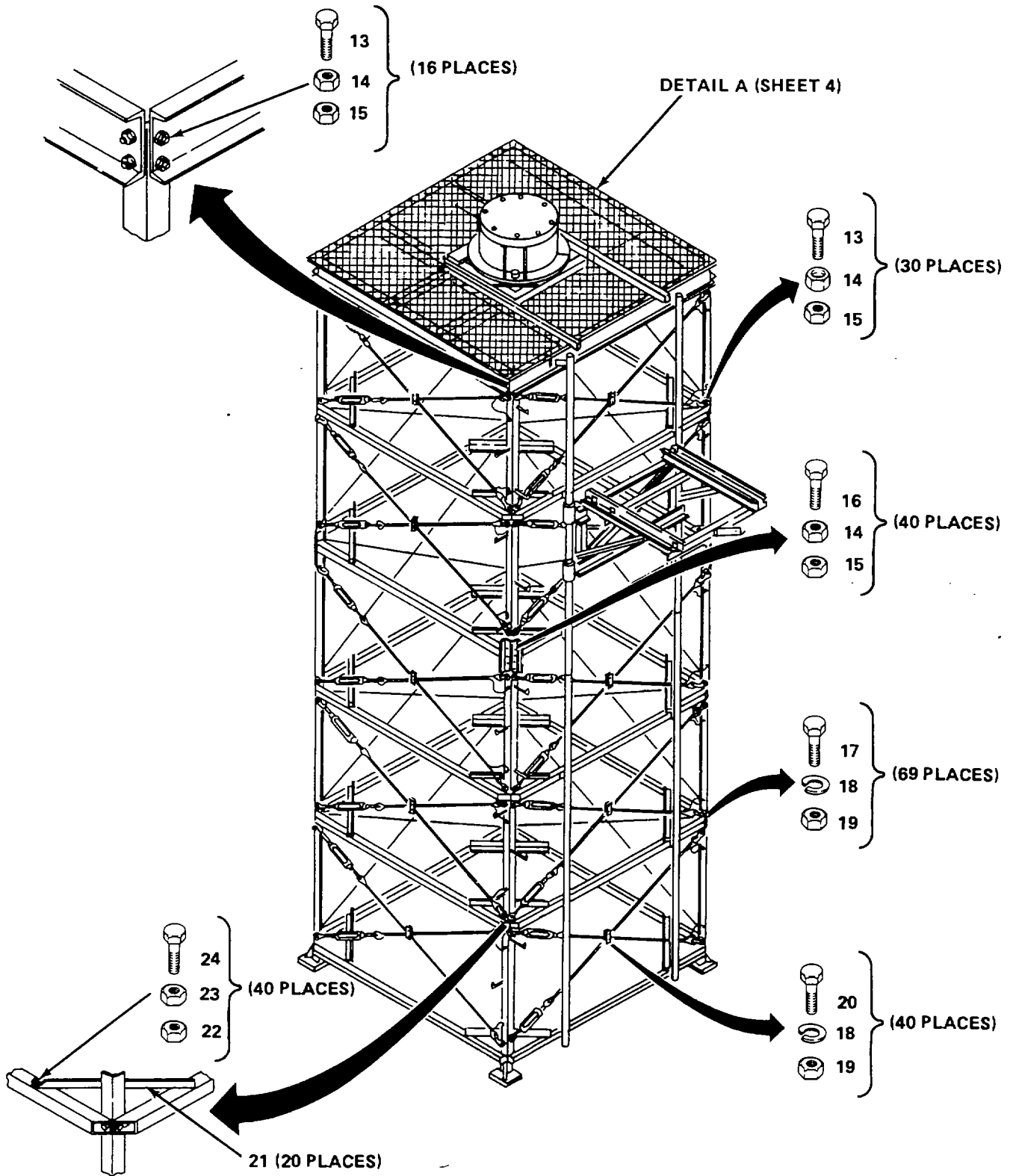


Figure E-2. Tower Assembly Kit (Sheet 2 of 6)

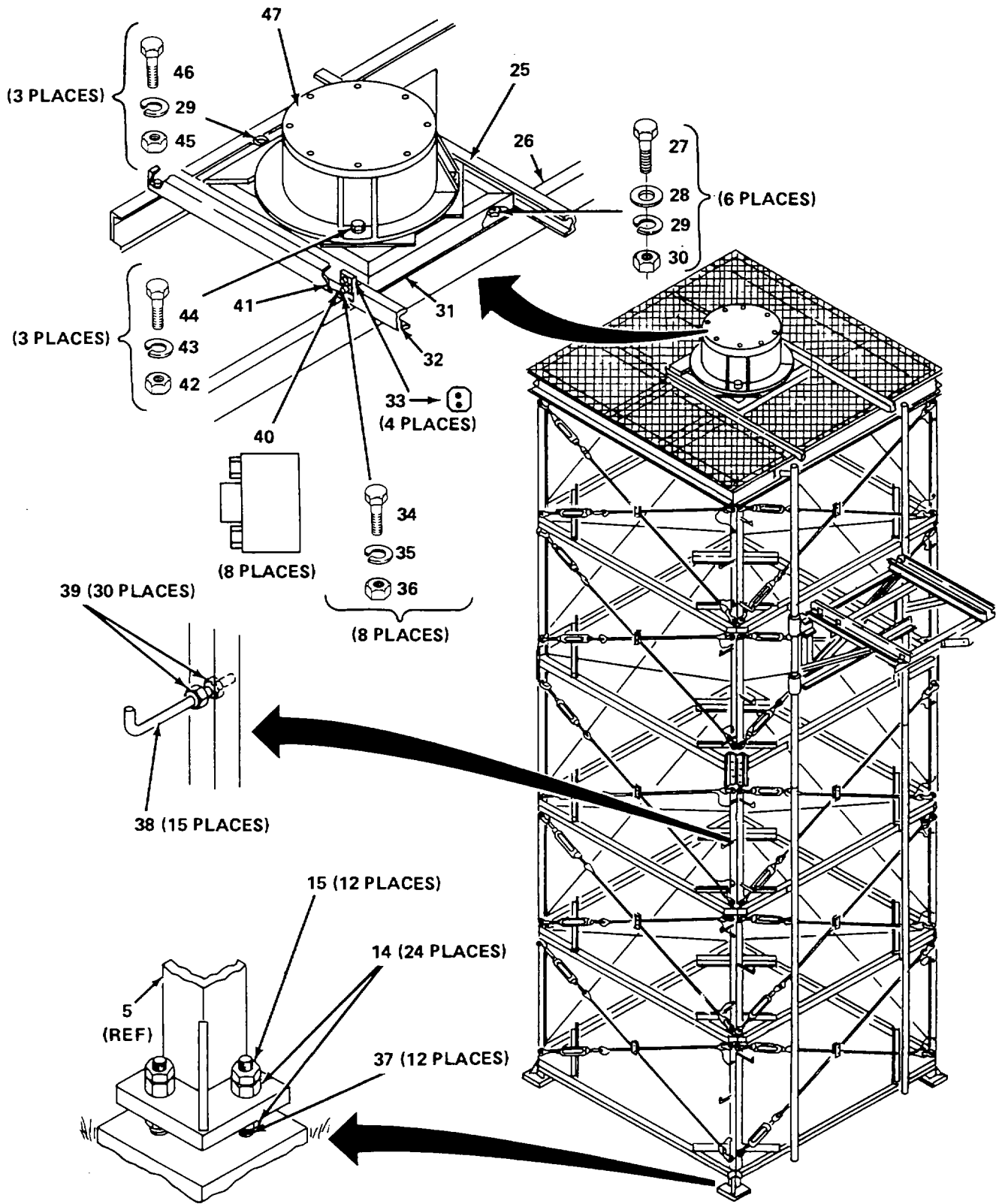


Figure E-2. Tower Assembly Kit (Sheet 3 of 6)

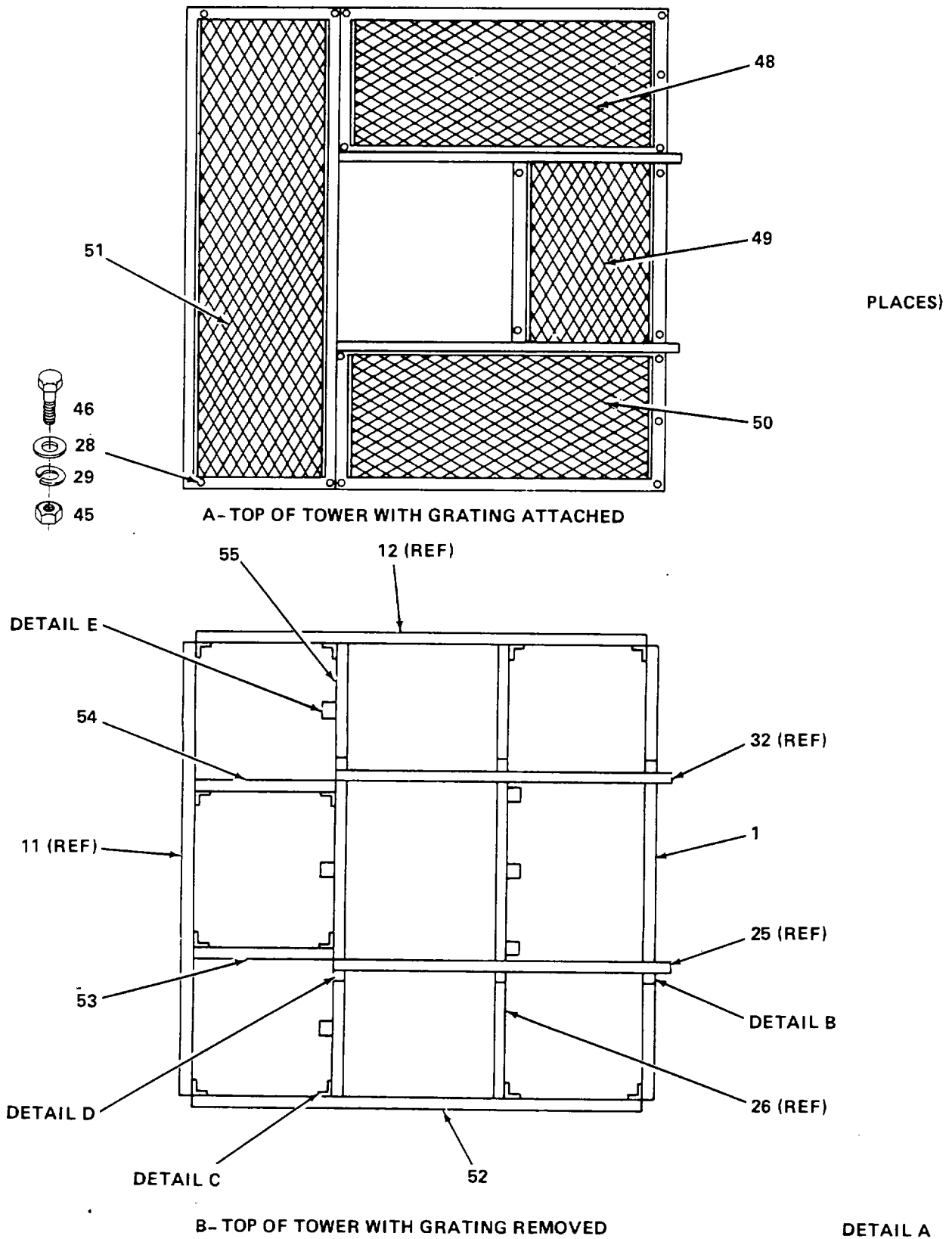


Figure E-2. Tower Assembly Kit (Sheet 4 of 6)

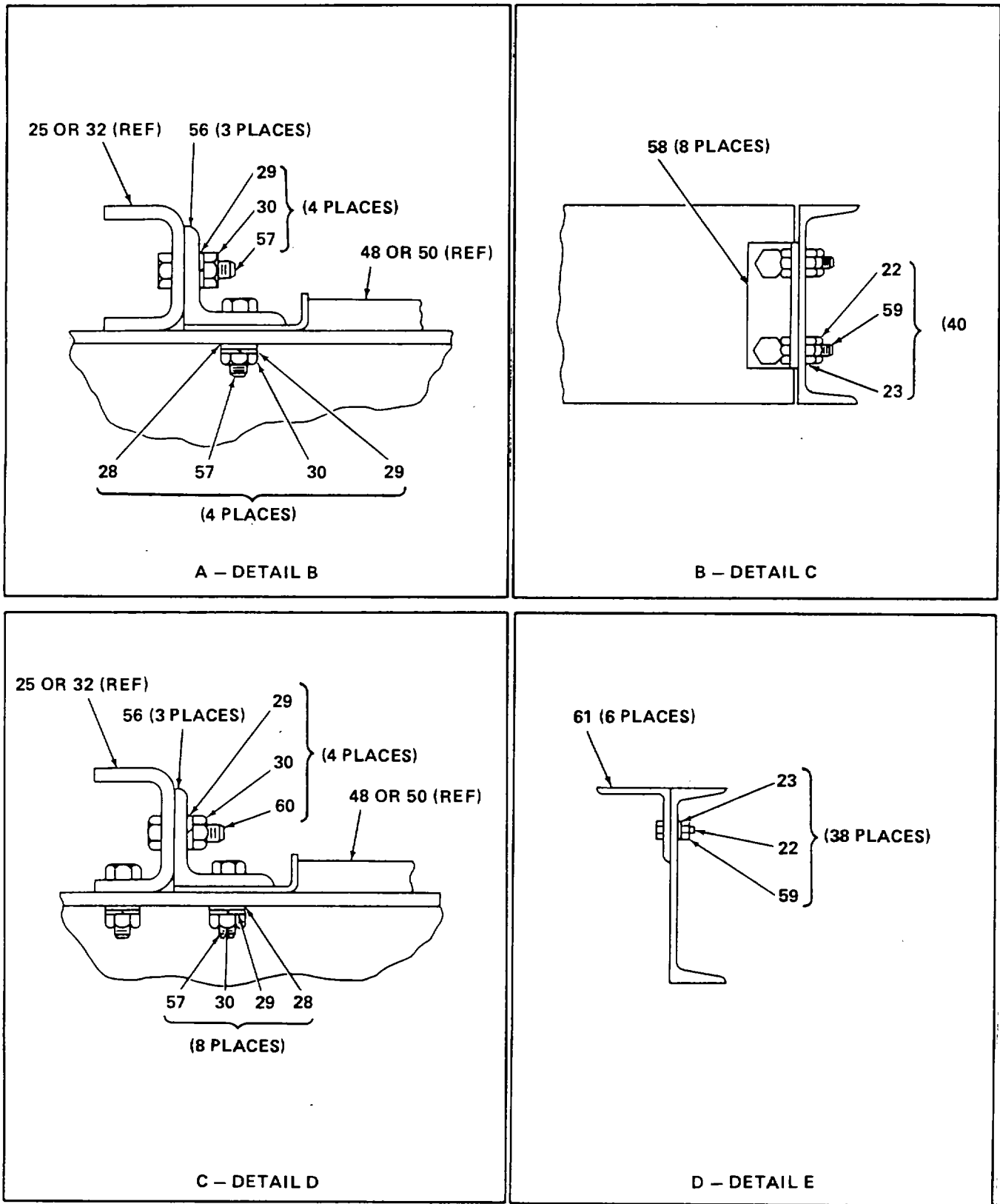


Figure E-2. Tower Assembly Kit (Sheet 5 of 6)

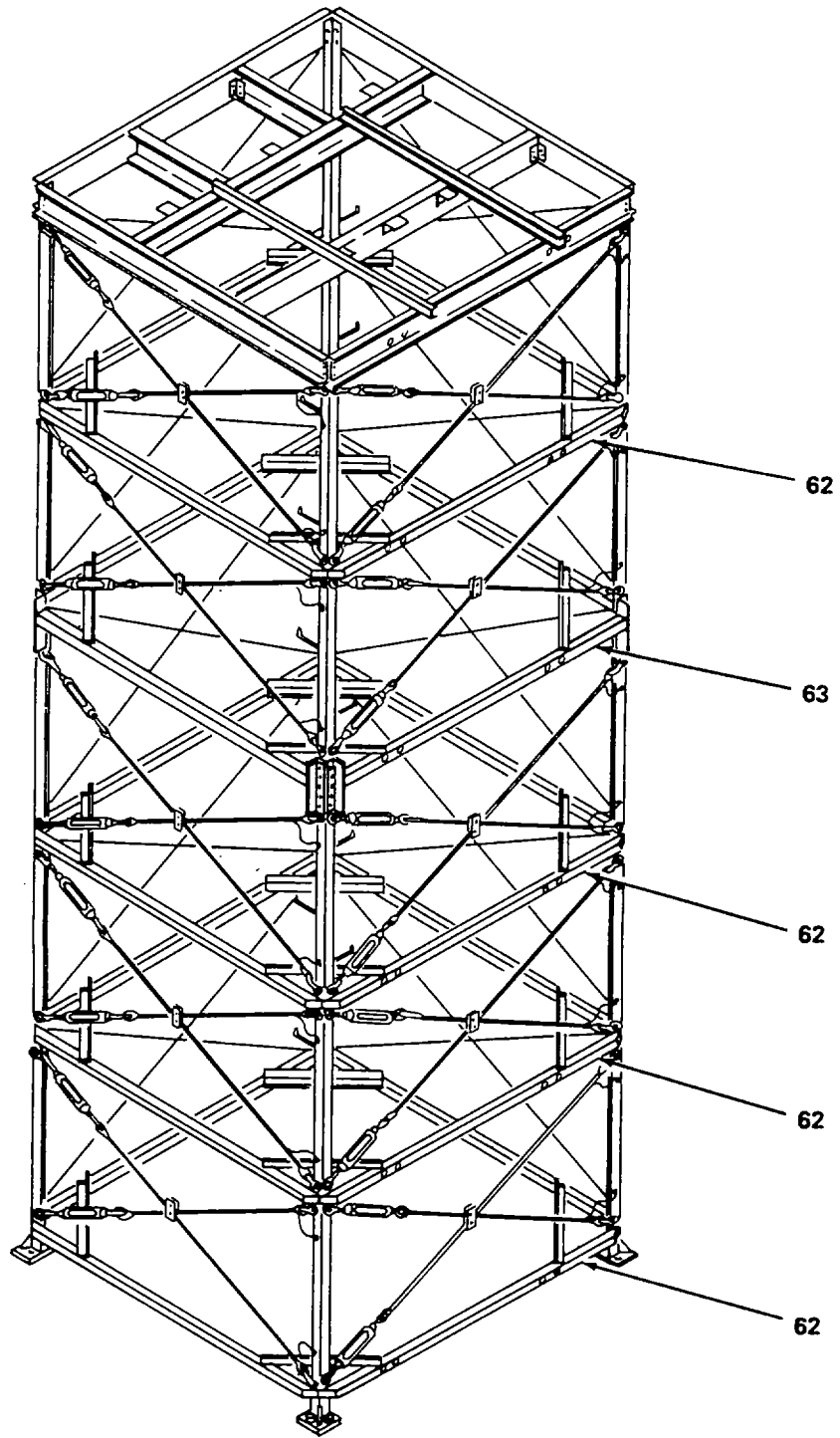


Figure E-2. Tower Assembly Kit (Sheet 6 of 6)

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
						GROUP: 01 TOWER ASSEMBLY KIT (15942)		
E-2	1	XDFZZ		0257-1-4010-1	15942	BRACE,TOPTOWERNO. 1	EA	1
E-2	2	XDFZZ		0257-1-3004-1	15942	BRACE ASSY. CABLE	EA	40
E-2	3	XDFZZ		0257-1-3003-1	15942	LEG ASSY, TOWER, LOWER, NO. 1	EA	1
E-2	4	XDFZZ		0257-1-2016-1	15942	CLAMP. CROSSOVER	EA	20
E-2	5	XDFZZ		0257-1-3003-2	15942	LEG ASSY, TOWER, LOWER NO. 2	EA	3
E-2	6	XDFZZ		0257-14006-3	15942	BRACE, HORIZONTAL, NO. 3	EA	10
E-2	7	XDFZZ		0257-1-4008-2	15942	BRACE, JOINT, NO. 2	EA	3
E-2	8	XDFZZ		0257-1-3006-1	15942	LEG. TOWER, UPPER, NO. 1	EA	1
E-2	9	XDFZZ		0257-1-4006-1	15942	BRACE, HORIZONTAL, NO. 1	EA	2
E-2	10	XDFZZ		0257-1-30062	15942	LEG, TOWER, UPPER. NO. 2	EA	3
E-2	11	XDFZZ		0257-1-4012-1	15942	BRACE, TOP, TOWER, NO. 3	EA	1
E-2	12	XDFZZ		0257-1-4011-1	15942	BRACE, TOP. TOWER, NO. 4	EA	1
E-2	13	XDFZZ		20764371-001	15942	BOLT, HEX HD, H.S., 3/4-10X2 IN., GALV	EA	46
E-2	14	XDFZZ		2100-0878-001	15942	NUT, HEX, H.S., 3/4-10, GALV	EA	110
E-2	15	XDFZZ		2102-0001-060	15942	NUT, LOCK, 3/4-10, GALV	EA	98
E-2	16	XDFZZ		2076-4372-001	15942	BOLT, HEX HD, H.S., 3/4-100X2-1/4 IN., GALV	EA	40
E-2	17	XDFZZ		2078-2406-001	15942	BOLT, HEX HD, 1/4-20	EA	69
E-2	18	XDFZZ		2300-0909-001	15942	WASHER, SPLIT LOCK, 1/4. SST	EA	109
E-2	19	XDFZZ		2100-0219-001	15942	NUT, HEX 1/4-20, SST	EA	109
E-2	20	XDFZZ		2078-2414-001	15942	BOLT, HEX HD,	EA	40
E-2	21	XDFZZ		0257-1-3015-1	15942	BRACE, CORNER	EA	20
E-2	22	XDFZZ		2102-0001-053	15942	NUT, LOCK, 1/2-13, GALV	EA	118
E-2	23	XDFZZ		2100-0127-001	15942	NUT, HEX, 1/2-13, GALV	EA	118
E-2	24	XDFZZ		2077-7331-001	15942	BOLT. HEX HD, 1/2-13X4-1/2 IN.. GALV	EA	40

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
E-2	25	XDFZZ		0257-1-4014-2	15942	TRACK, HORIZONTAL, NO. 2	EA	1
E-2	26	XDFZZ		0257-1-4013-2	15942	BRACE, TOWER TOP, NO. 6	EA	1
E-2	27	XDFZZ		2077-6814-001	15942	BOLT, HEX HD, 3/8-16X2 IN., GALV	EA	6
E-2	28	XDFZZ		2349-0029-005	15942	WASHER, BEVEL 3/8, GALV	EA	13
E-2	29	XDFZZ		2300-0153-001	15942	WASHER, SPLIT LOCK, 3/8, GALV	EA	21
E-2	30	XDFZZ		2100-0123-001	15942	NUT, HEX, 3/8-16, GALV	EA	20
E-2	31	XDFZZ		0257-1-4025-1	15942	CARRIAGE ASSY	EA	1
E-2	32	XDFZZ		0257-14014-1	15942	TRACK, HORIZONTAL NO. I	EA	1
E-2	33	XDFZZ		0257-1-3025-1	15942	BLOCK, CAM FOLLOWER	EA	4
E-2	34	XDFZZ		2078-2818-001	15942	BOLT, HEX HD, 3/8-16X2-1/2 IN., SST	EA	8
E-2	35	XDFZZ		2300-0911-001	15942	WASHER. SPLIT LOCK, 3/8, SST	EA	8
E-2	36	XDFZZ		2100-0223-001	15942	NUT, HEX, 3/8-16, SST	EA	8
E-2	37	XDFZZ		0257-1-2017-1	15942	BOLT, PIER	EA	12
E-2	38	XDFZZ		0257-1-3035-2	15942	STEP, TOWER	EA	15
E-2	39	XDFZZ		2100-0131-001	15942	NUT, HEX, 5/8-II, GALV	EA	33
E-2	40	XDFZZ		H32SW	45014	CAM FOLLOWER	EA	8
E-2	41	XDFZZ		0257-1-4033-1	15942	CARRIAGE, ANTENNA	EA	1
E-2	42	XDFZZ		2077-8805-001	15942	BOLT, HEX HD, 1-8X2-1/2 IN., GALV	EA	3
E-2	43	XDFZZ		2300-0163-001	15942	WASHER, SPLIT LOCK. 1, GALV	EA	3
E-2	44	XDFZZ		2100-0137-001	15942	NUT, HEX, 1-8, GALV	EA	3
E-2	45	XDFZZ		2450-0578-001	15942	NUT, EYE, 3/8-16, GALV	EA	4
E-2	46	XDFZZ		2077-6306-001	15942	BOLT, HEX HD, 3/8-16X I IN., GALV	EA	4
E-2	47	XDFZZ		0257-1-3061-1	15942	ADAPTER PLATE	EA	1
E-2	48	XDFZZ		0257-1-4016-2	15942	GRATING ASSY, TOWER. NO. 4	EA	1
E-2	49	XDFZZ		0257-1-4015-1	15942	GRATING ASSY, TOWER. NO. I	EA	1

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
E-2	50	XDFZZ		0257-1-4016-1	15942	GRATING ASSY, TOWER, NO. 2	EA	1
E-2	51	XDFZZ		0257-1-4017-1	15942	GRATING ASSY, TOWER, NO. 3	EA	1
E-2	52	XDFZZ		0257-1-4009-1	15942	BRACE, TOPTOWER, NO. 1	EA	1
E-2	53	XDFZZ		0257-1-3009-1	15942	BRACE, TOP TOWER, NO.7	EA	1
E-2	54	XDFZZ		0257-1-3009-2	15942	BRACE, TOP TOWER. NO. 8	EA	1
E-2	55	XDFZZ		0257-1-4013-1	15942	BRACE. TOWER TOP, NO.5	EA	1
E-2	56	XDFZZ		0257-1-2012-1	15942	ANGLE, TRACK	EA	6
E-2	57	XDFZZ		2077-6810-001	15942	BOLT, HEX HD, 3/8-16X1-1/2 1N.. GALV	EA	8
E-2	58	XDFZZ		0257-1-2014-1	15942	ANGLE, BRACE	EA	8
E-2	59	XDFZZ		2077-7307-001	15942	BOLT, HEX HD, 1/2-13X1-1/2 IN., GALV	EA	78
E-2	60	XDFZZ		2077-6808-001	15942	BOLT, HEX HD. 3/8-16X 1-1/4 IN., GALV	EA	4
E-2	61	XDFZZ		0257-1-2013-1	15942	ANGLE, GRATING	EA	6
E-2	62	XDFZZ		0257-1-4006-2	15942	BRACE. HORIZONTAL, NO. 2	EA	4
E-2	63	XDFZZ		0257-1-4008-1	15942	BRACE, JOINT, NO. 1	EA	1



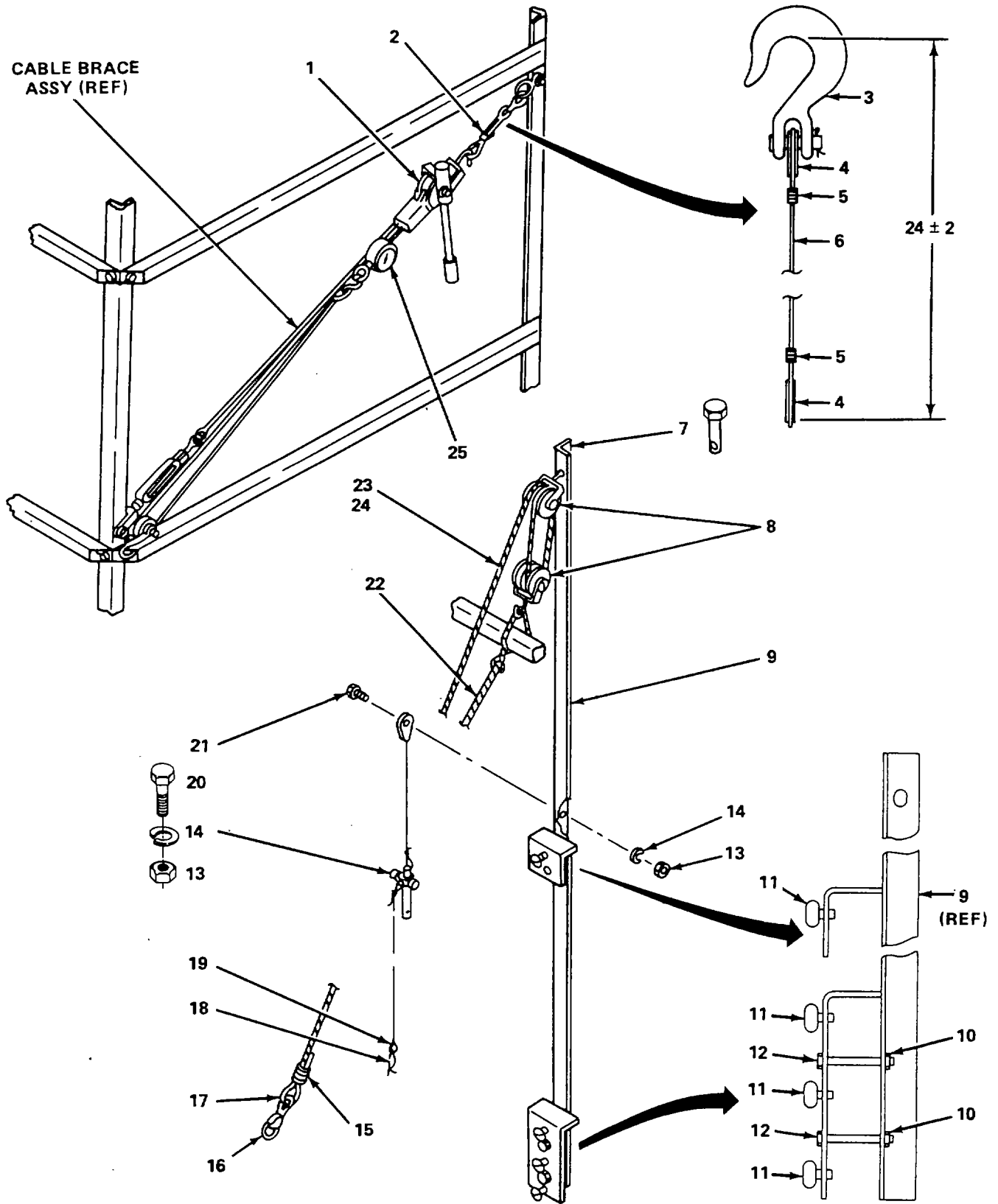


Figure E-3. Tower Erection Kit

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
						GROUP: 02 TOWER ERECTION KIT (15942)		
E-3	1	XDFFF		115D	33302	HOISTASSY, HAND	EA	1
E-3	2	XDFFF		0257-1-3066-1	15942	TENSIONING SLING SET	EA	1
E-3	3	XDFZZ		H331 3-8	75535	HOOK, CLEVIS	EA	1
E-3	4	XDFZZ		3-8 GALV	75535	THINIBLE	EA	2
E-3	5	XDFZZ		188-10VH52	76691	SWAGING SLEEVE, WIRE ROPE	EA	2
E-3	6	XDFZZ		0257-1-3066-1	15942	CABLE, 5/16 A/C, GALV	EA	1
E-3	7	XDFZZ		0257-1-2058-1	15942	ERECTION PIN	EA	2
E-3	8	XDFZZ		4H262C	75535	BLOCK, LIFTING	EA	2
E-3	9	XDFZZ		0257-1-3064-1	15942	ERECTION FIXTURE	EA	1
E-3	10	XDFZZ		1-2-13	COML	NUT, HEX, 1/2-13, GALV	EA	2
E-3	11	XDFZZ		1-2-13	COML	THUMBSCREW, 1/2-1-13 CD PL	EA	4
E-3	12	XDFZZ		1-2-13X4-1-2	COML	BOLT, HEX HD. 1/2-13X4-1/2 IN., GALV	EA	2
E-3	13	XDFZZ		N04-40	COML	NUT, HEX, NO. 4-40, SST	EA	2
E-3	14	XDFZZ		N04LOCK	COML	WASHER. SPLIT LOCK. NO. 4-40. SST	EA	2
E-3	15	PAFZZ	4030-00-9274602	18-23H5	76691	SWAGING SLEEVE, WIRE ROPE	EA	1
E-3	16	XDFZZ		443A	33857	HOOK, SNAP	EA	1
E-3	17	XDFZZ		3-8GALV	76691	THIMBLE	EA	1
E-3	18	XDFZZ		5-32	COML	PIN, COTTER, 5/32. SST	EA	1
E-3	19	XDFZZ		1-16AC	COML	CABLE,GALV	EA	1
E-3	20	XDFZZ		PH4-40X-1	COML	SCREW, PAN HD, NO. 4-40X 1 IN., SST	EA	1
E-3	21	XDFZZ		PH4-40XJ-2	COML	SCREW, MACHINE, PAN HD, NO. 4-40X 1/2 IN., SST	EA	1
E-3	22	XDFZZ		0257-1-2047-1	15942	ROPE, TAG	EA	1
E-3	23	XDFZZ		0257-1-3065-1	15942	ROPE. ASSY, HOISTING	EA	1

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
E-3	24	XDFZZ		0257-1-2047-1	15942	ROPE, HOISTING	EA	1
E-3	25	XDFZZ		6100-0012-005	15942	DYNAMOMETER, FLEX	EA	1

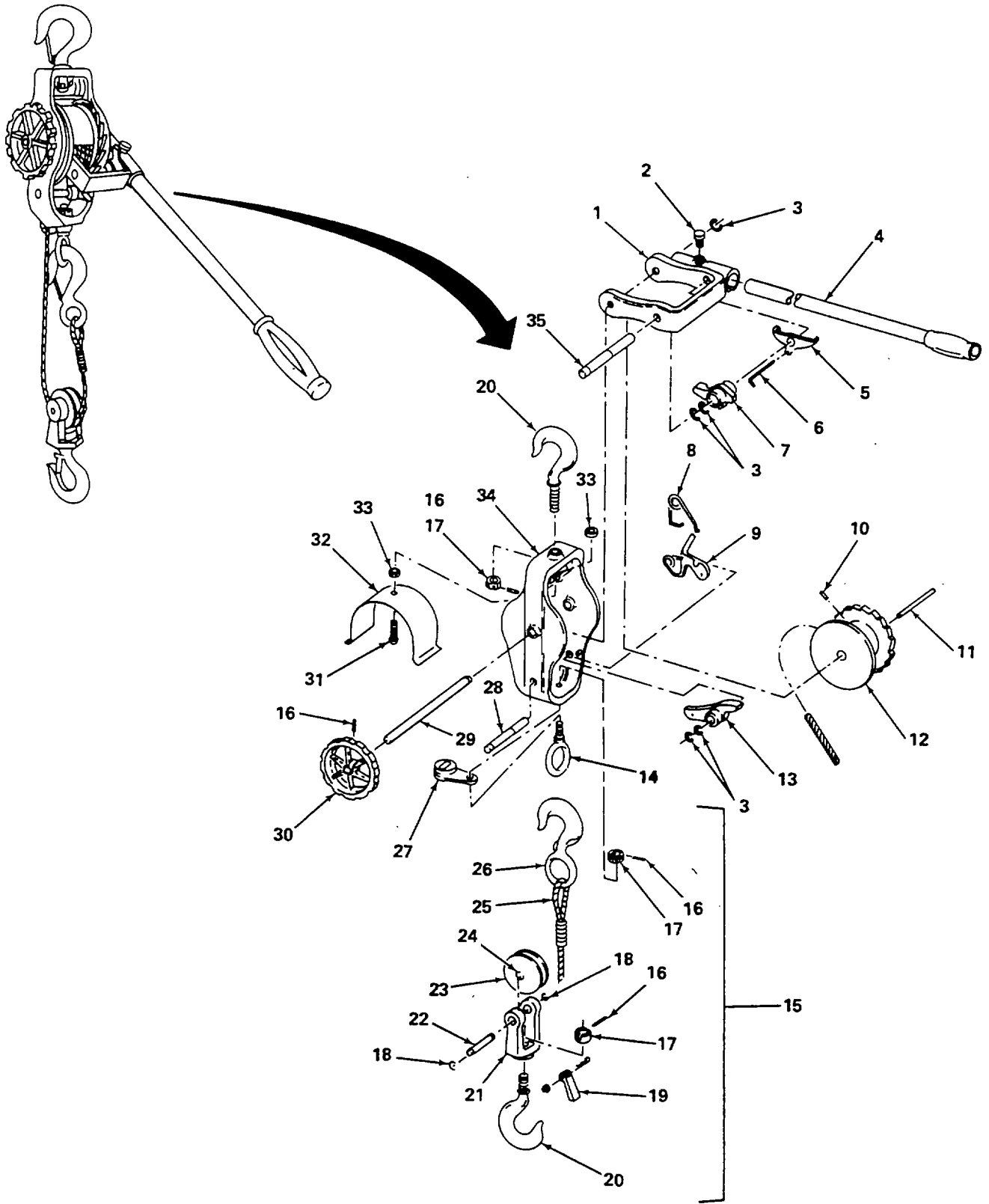


Figure E-4. Hand Hoist Assembly

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(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
						GROUP: 0201 HAND HOIST ASSEMBLY (15942)		
E-4	1	XDFZZ		140-115D	50026	U-FRAME	EA	1
E-4	2	XDFZZ		151-115D	50026	SCREW, HANDLE LOCK	EA	1
E-4	3	XDFZZ		122-115D	50026	RING, SNAP	EA	3
E-4	4	XDFZZ		150-115D	50026	HANDLE	EA	1
E-4	5	XDFZZ		147-115D	50026	LEVER. UPPER CONTROL	EA	1
E-4	6	XDFZZ		142-115D	50026	SPRING, REVERSING	EA	1
E-4	7	XDFZZ		141-115D	50026	PAWL, LOADING	EA	1
E-4	8	XDFZZ		131-115D	50026	SPRING, SHOCK	EA	1
E-4	9	XDFZZ		120-115D	50026	PAWLCONTROLASSY	EA	1
E-4	10	XDFZZ		178-115D	50026	SCREW, SET	EA	1
E-4	11	XDFZZ		173-115D	50026	PIN, DRIVE, DRUM	EA	1
E-4	12	XDFZZ		170-115D	50026	DRUM	EA	1
E-4	13	XDFZZ		121-115D	50026	PAWL, HOLDING	EA	1
E-4	14	XDFZZ		125-115D	50026	EYEBOLT	EA	1
E-4	15	XDFFF		199-115D	50026	SHEAVE BLOCK SET	EA	1
E-4	16	XDFZZ		117-115D	50026	PIN. DRIVE	EA	14
E-4	17	XDFZZ		116-115D	50026	NUT. HOOK	EA	3
E-4	18	XDFZZ		122-115D	50026	RING, SNAP	EA	2
E-4	19	XDFZZ		110-115D	50026	SAFETY LATCHKIT	EA	1
E-4	20	XDFZZ		124-115D	50026	HOOK, SHANK	EA	2
E-4	21	XDFZZ		190-115D	50026	YOKE	EA	1
E-4	22	XDFZZ		196-115D	50026	SHAFT, SHEAVE BLOCK	EA	1
E-4	23	XDFZZ		195-115D	50026	WHEEL.PULLEY	EA	1
E-4	24	XDFZZ		198-115D	50026	BUSHING 4/8 OD, 112 ID X 7/8 LG	EA	1
E-4	25	XDFZZ		171-115D	50026	CABLEASSY	EA	1

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
E-4	26	XDFZZ		174-115D	50026	HOOK, EYE	EA	1
E-4	27	XDFZZ		123-115D	50026	GUIDE, CABLE	EA	1
E-4	28	XDFZZ		119-115D	50026	SHAFT, HOLDING PAWL	EA	1
E-4	29	XDFZZ		172-115D	50026	SHAFT, DRUM	EA	1
E-4	30	XDFZZ		132-115D	50026	WHEEL, WINDING	EA	1
E-4	31	XDFZZ		128-115D	50026	BOLT	EA	1
E-4	32	XDFZZ		118-115D	50026	SHIELD. CABLE	EA	1
E-4	33	XDFZZ		128S-115D	50026	NUT, JAM	EA	2
E-4	34	XDFZZ		11-115D	50026	FRAME, MAIN	EA	1
E-4	35	XDFZZ		145-11SD	50026	SHAFT, LOADING PAWL	EA	1

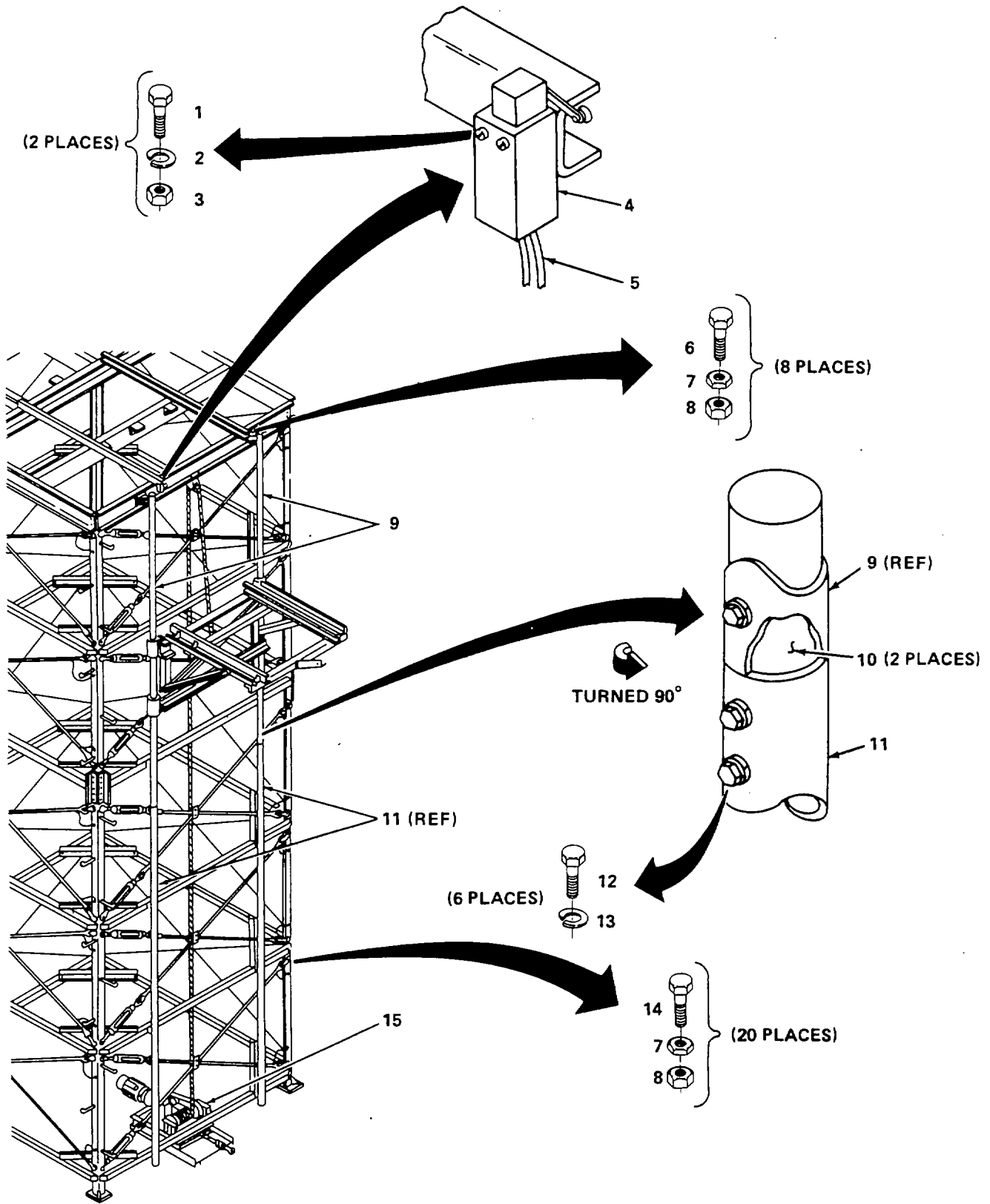


Figure E-5. Antenna Elevation and Positioning Kit (Sheet 1 of 2)

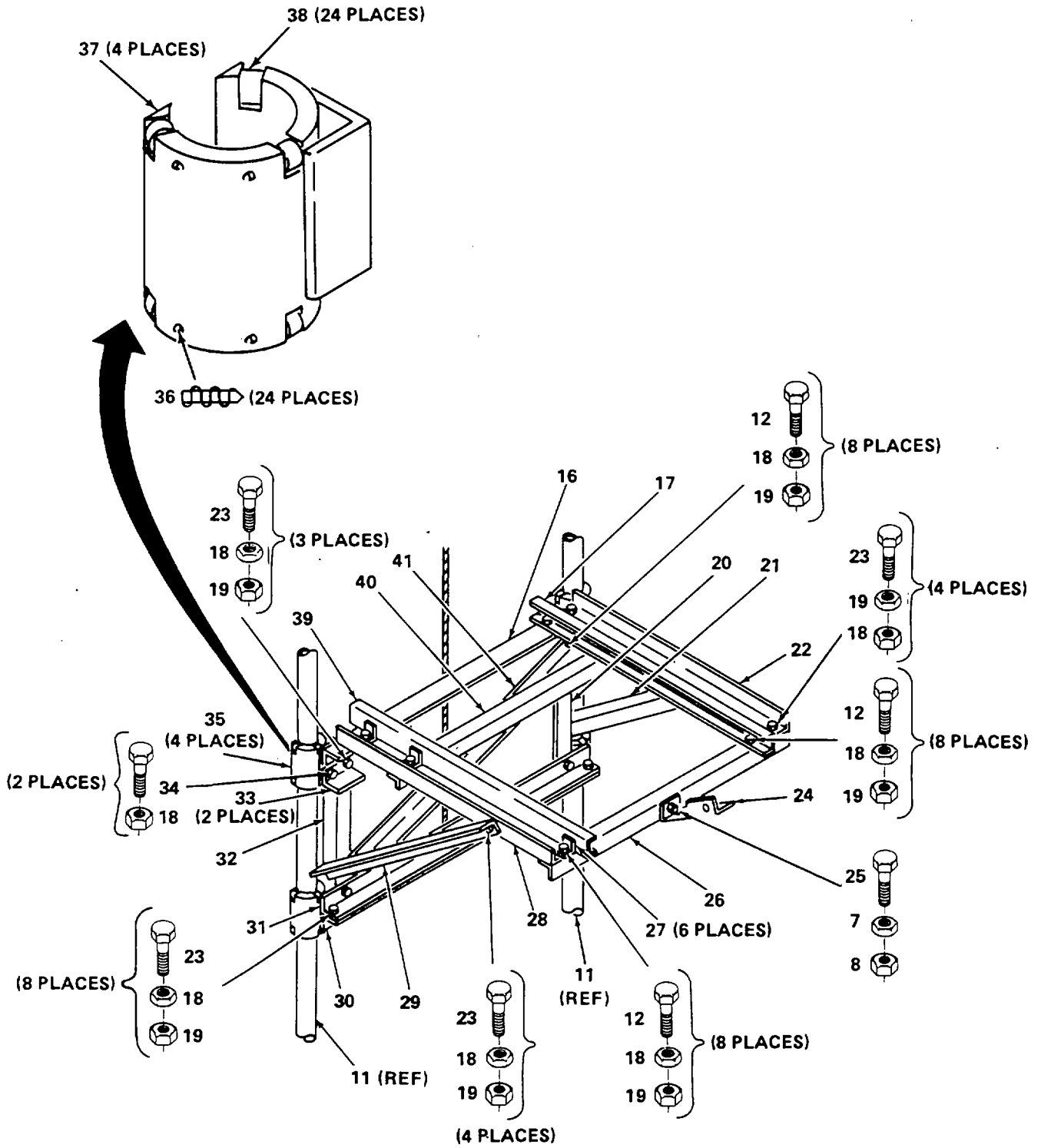


Figure E-5. Antenna Elevation and Positioning Kit (Sheet 2 of 2)



(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
						GROUP: 03 ANTENNA ELEVATION AND POSITIONING KIT (15942)		
E-5	1	XDFZZ		2000-9935-001	15942	SCREW, HEX HD, 10-32X2 1/4 IN., SST	EA	2
E-5	2	XDFZZ		2300-0905-001	15942	WASHER, SPLIT LOCK NO. 10 SST	EA	2
E-5	3	XDFZZ		2100-0211-001	15942	NUT, HEX, 10-32, SST	EA	16
E-5	4	XDFZZ		10316H193C	27191	LIMIT SWITCH	EA	1
E-5	5	XDFZZ		0257-1-4000-3	15942	CABLE, LIMIT SWITCH	EA	1
E-5	6	XDFZZ		2077-7307-001	15942	BOLT, HEX HD, 1/2-13X1-1/2 IN., GALV	EA	8
E-5	7	XDFZZ		2100-0127-001	15942	NUT, HEX, 1/2-13, GALV	EA	29
E-5	8	XDFZZ		2102-0001-053	15942	NUT, LOCK, 1/2-13, GALV	EA	29
E-5	9	XDFZZ		0257-1-4023-1	15942	TRACK, VERTICAL UPPER	EA	2
E-5	10	XDFZZ		0257-1-2023-1	15942	CRIPPLE, TRACK	EA	2
E-5	11	XDFZZ		0257-1-4024-1	15942	TRACK. VERTICAL LOWER	EA	2
E-5	12	XDFZZ		2077-6808-001	15942	BOLT.HEXHD, 3/8-16X 1-1/4 IN., GALV	EA	30
E-5	13	XDFZZ		2300-0153-001	15942	WASHER. LOCK, 3/8, GALV	EA	6
E-5	14	XDFZZ		2077-737-001	15942	BOLT, HEX HD, 1/2-13X4 IN., GALV	EA	20
E-5	15	XDFFF		0257-1-4000-1	15942	HOISTASSY,ELECTRIC	EA	1
E-5	16	XDFZZ		0257-1-4021-1	15942	BRACE, HORIZONTAL ELEVATOR, NO. 1	EA	1
E-5	17	XDFZZ		0257-1-3011-2	15942	TRACK, ELEVATOR. NO. 2	EA	1
E-5	18	XDFZZ		2100-0123-001	15942	NUT. HEX. 3/8-16, H.S., GALV	EA	43
E-5	19	XDFZZ		2102-0001-050	15942	NUT,LOCK,3/8-16,GALV	EA	43
E-5	20	XDFZZ		0257-1-3010-2	15942	BRACE, ELEVATOR. VERTICAL. NO. 2	EA	1
E-5	21	XDFZZ		0257-1-3013-2	15942	BRACE.ELEVATOR, DIAGONAL, NO. 2	EA	1

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
E-5	22	XDFZZ		0257-1-3012-2	15942	BRACE, ELEVATOR, HORIZONTAL. NO. 5	EA	1
E-5	23	XDFZZ		2077-6812-001	15942	BOLT, HEX HD, 3/8-16X1-3/4 IN., GALV	EA	19
E-5	24	XDFZZ		0257-1-4031-1	15942	BRACKET.WINCH	EA	1
E-5	25	XDFZZ		2077-731 1-001	15942	BOLT, HEX HD. 1/2-13X2 IN., GALV	EA	1
E-5	26	XDFZZ		0257-1-4022-2	15942	BRACE, ELEVATOR, HORIZONTAL NO. 3	EA	1
E-5	27	XDFZZ		0257-1-2012-1	15942	ANGLE, TRACK	EA	6
E-5	28	XDFZZ		0257-1-3012-1	15942	BRACE, ELEVATOR, HORIZONTAL, NO. 4	EA	1
E-5	29	XDFZZ		0257-1-3013-1	15942	BRACE,ELEVATOR, DIAGONAL, NO. 1	EA	1
E-5	30	XDFZZ		0257-1-4021-3	15942	BRACE, ELEVATOR, HORIZONTAL, NO. 7	EA	1
E-5	31	XDFZZ		0257-1-4021-2	15942	BRACE.ELEVATOR, HORIZONTAL. NO. 6	EA	1
E-5	32	XDFZZ		0257-1-3010-1	15942	BRACE, ELEVATOR.VERTICAL, NO. 1	EA	1
E-5	33	XDFZZ		0257-1-2015-1	15942	BRACE, ELEVATOR, HORIZONTAL, NO. 8	EA	1
E-5	34	XDFZZ		2077-6806-001	15942	BOLT.HEX HD. 3/8-16X 1 IN., GALV	EA	2
E-5	35	XDFZZ		0257-1-3023-1	15942	SLEEVE ASSY, ELEVATOR	EA	4
E-5	36	XDFZZ		3985-0035-004	15942	PIN, SPRING, 1,4 DIA X 1 IN., SST	EA	24
E-5	37	XDFZZ		0257-14019-1	15942	SLEEVE	EA	4
E-5	38	PAFZZ	5311-00-105-0051	YCRSI2	60380	CAM FOLLOWER	EA	24
E-5	39	XDFZZ		0257-1-3011-1	15942	TRACK, ELEVATOR, NO. 1	EA	1
E-5	40	XDFZZ		0257-14022-1	15942	BRACE, ELEVATOR. HORIZONTAL, NO. 2	EA	1
E-5	41	XDFZZ		0257-1-3014-1	15942	BRACE, ELEVATOR, DIAGONAL, NO. 3	EA	1

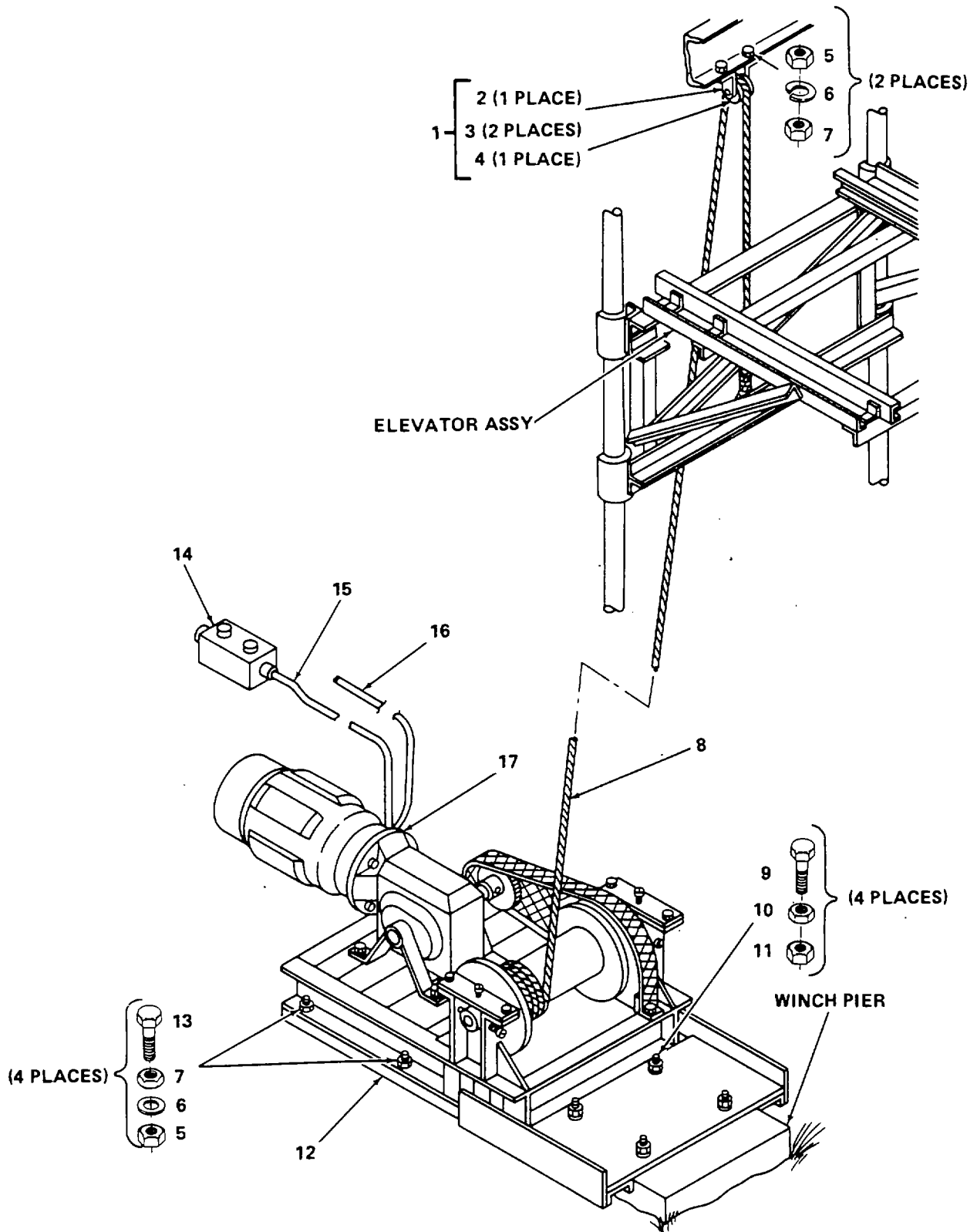


Figure E-6. Electric Hoist Assembly

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(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
						GROUP: 0301 ELECTRIC HOIST ASSEMBLY (15942)		
E-6	1	PAFZZ	3940-00-504-9937	0261-1-3042-1	15492	BLOCK ASSEMBLY TACKLE	EA	1
E-6	2	XDFZZ		0261-1-3037-1	15942	BRACKET, SHEAVE	EA	1
E-6	3	XDFZZ		0261-1-2038-1	15942	SPACER	EA	2
E-6	4	XDFZZ		2450-0274-013	15942	SHEAVE	EA	1
E-6	5	XDFZZ		2100-0131-001	15942	NUT, HEX, 5/8-1 I, GALV	EA	6
E-6	6	XDFZZ		2349-0029-005	15942	WASHER, BEVEL, 5/8, GALV	EA	6
E-6	7	XDFZZ		2102-0001-057	15942	NUT.LOCK, 5/8, GALV	EA	6
E-6	8	XDFZZ		0257-1-3000-2	15942	WIRE ROPE ASSY	EA	1
E-6	9	XDFZZ		0257-1-2003-1	15942	BOLT, PIER	EA	4
E-6	10	XDFZZ		2100-0878-001	15942	NUT, HEX, 3/4-10, GALV	EA	4
E-6	11	XDFZZ		2102-0001-060	15942	NUT.LOCK, 3/4-10, GALV	EA	4
E-6	12	XDFZZ		0257-1-4032-1	15942	MOUNT, ELEVATOR HOIST	EA	1
E-6	13	XDFZZ		2077-7907-001	15942	BOLT, HEX HD 5/8-11 X 1-3/4 IN., GALV	EA	4
E-6	14	XDFZZ		9441H37B	27191	SWITCH, DRUM	EA	1
E-6	15	XDFZZ		1-2TYPEEF I O	19104	CONDUFT, FLEXIBLE	EA	1
E-6	16	XDFZZ		0257-1-4000-2	15942	CABLE, HOIST	EA	1
E-6	17	XDFDD		2000A20	06550	HOIST.ELECTRIC	EA	1

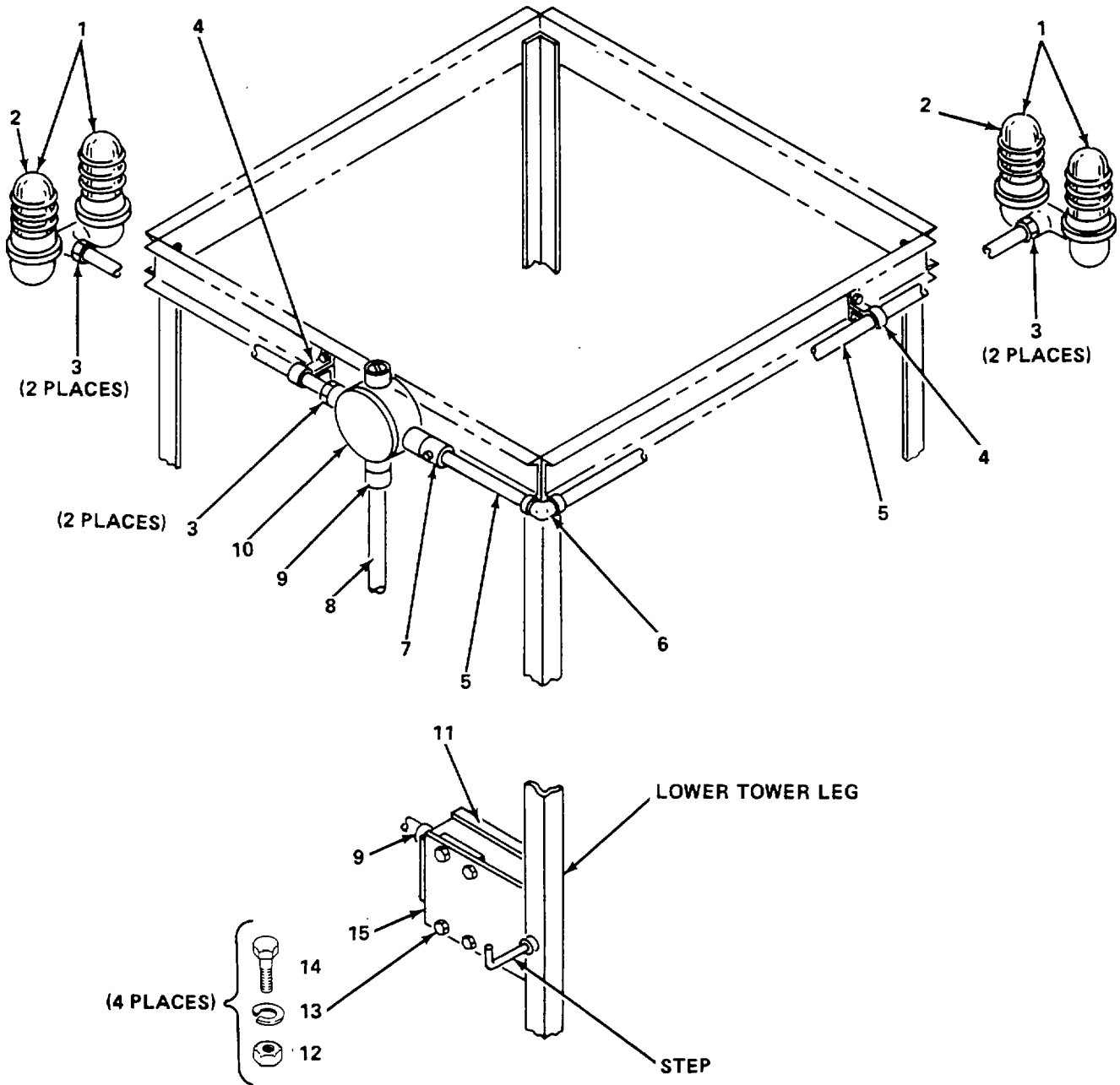


Figure E-7. Accessory and Lighting Kit

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
E-7	1	XDOZZ		01116B	94295	GROUP: 04 ACCESSORY AND LIGHTING KIT (15942) LAMP, INCANDESCENT, 116 W, 120 V	EA	4
E-7	2	PAFZZ	6210-00-542-4734	OB22TR3	94295	LIGHT, MARKER, AIRCRAFT OBSTRUCTION	EA	2
E-7	3	XDFZZ		HN1289-3	94295	LOCKNUT, ELECTRICAL CONDUIT	EA	6
E-7	4	PAFZZ	5340-00-559-5544	VM4188-1	94295	WRAPLOCK KIT	EA	2
E-7	5	XDFZZ		15942		CONDUIT, RIGID, 3/4X 10 FT, GALV	EA	2
E-7	6	XDFZZ		15942		FITTING, LB GALV, 3/4 IN., WITH COVER AND GASKET	EA	1
E-7	7	XDFZZ		HA1286-3	94295	UNION, 3/4 IN., PLUG TYPE.GALV	EA	1
E-7	8	XDFZZ		15942		CABLE, RR.NO. 12-3, 35 FT	EA	1
E-7	9	XDFZZ		WT303383-2	94295	CONNECTOR, WATERTIGHT, 3/4	EA	2
E-7	10	XDFZZ		AC2047	94295	JUNCTION BOX	EA	1
E-7	11	XDFZZ		LC5262	94295	CONTROL UNIT, LIGHTING	EA	1
E-7	12	XDFZZ		2077-6208-001	15942	BOLT, HEX HD.5/16-18X 1-1/4 IN GALV	EA	4
E-7	13	XDFZZ		2300-0910-001	15942	WASHER, SPLIT LOCK, 5/16, SST	EA	4
E-7	14	XDFZZ		21000221-001	15942	NUT, HEX.		
E-7	15	XDFZZ		0257-3078-1	15942	PLATE,CONTROLMOUNT	EA	1

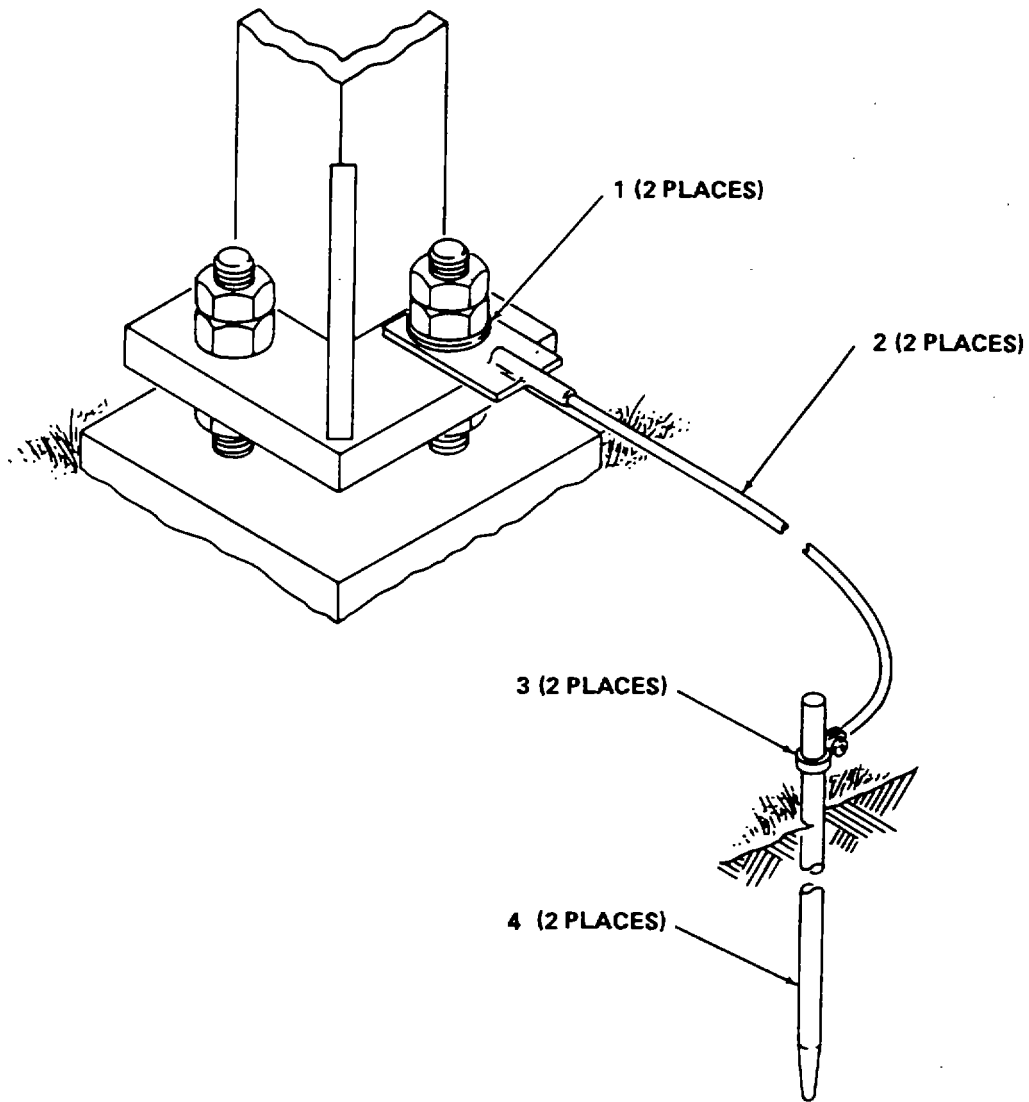
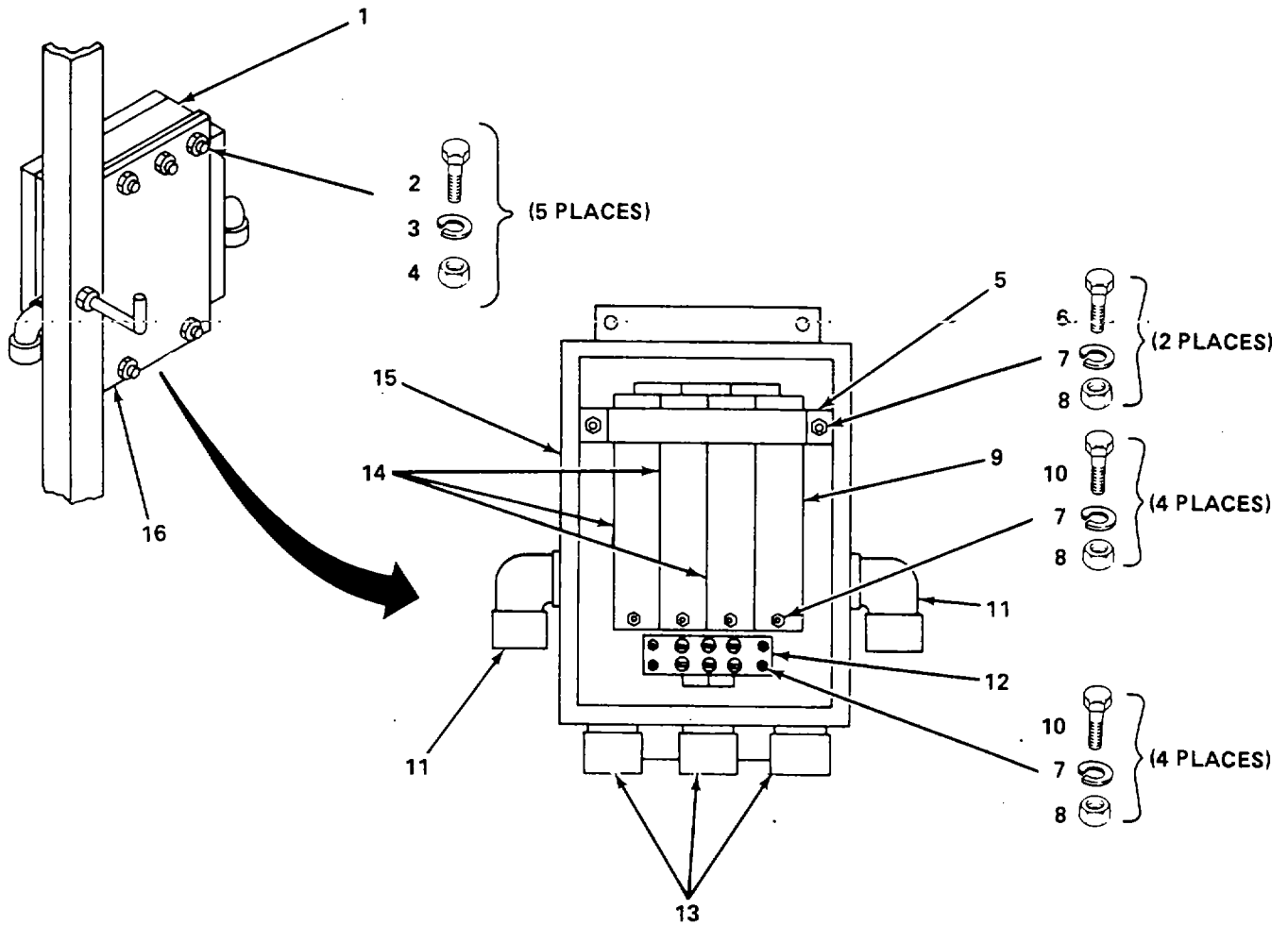


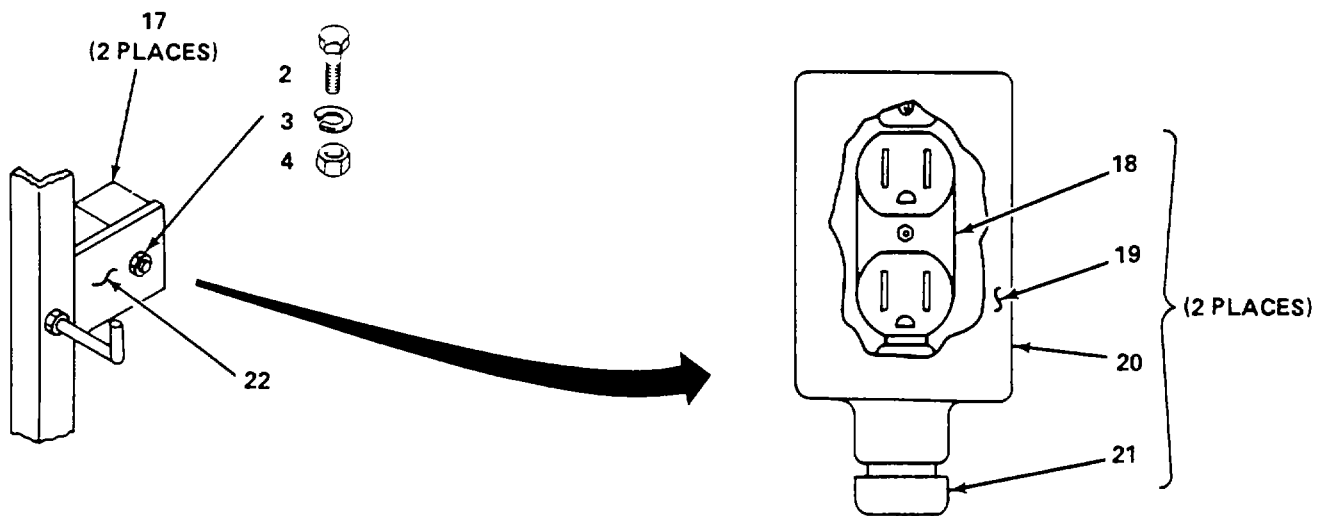
Figure E-8. Tower Grounding Kit

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
E-8	1	XDOZZ			15942	GROUP: 0401 TOWER GROUNDING KIT (15942)	EA	2
E-8	2	XDOZZ		0257-1-3063-1	15942	WASHER, FLAT, 3/4 GALV	EA	2
E-8	3	PAFZZ	5975-00-642-7261	BL75	03743	WIRE ASSY GROUND	EA	2
E-8	4	XDOZZ		9438	10145	CLAMP, GROUND ROD	EA	2
						ROD,GROUND		





A – JUNCTION BOX ASSEMBLY



B – CONVENIENCE OUTLET ASSEMBLY

Figure E-9. Junction Box and Convenience Outlet Kit

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
						GROUP: 0402 JUNCTION BOX AND CONVENIENCE OUTLET KIT (15942)		
E-9	1	XDFFF		0257-1-4042-1	15942	JUNCTION BOX ASSEMBLY	EA	1
E-9	2	XDFZZ		2078-2406-001	15942	BOLT, HEX HD, 1/4-20X 1 IN SST	EA	6
E-9	3	XDFZZ		23000909-001	15942	WASHER, SPLIT LOCK, 1/4, SST	EA	6
E-9	4	XDFZZ		2100-0219-001	15942	NUT, HEX, 1/4-20, SST	EA	6
E-9	5	XDFZZ		0257-1-3081-1	15942	CLAMP, CIRCUITBRAKER	EA	1
E-9	6	XDFZZ		0257-14042, ITEM 3	15942	SCREW, FLH SLOT, 6-32X 1/2 IN., SST	EA	2
E-9	7	XDFZZ		025744042, ITEM 13	15942	WASHER, SPLIT LOCK.NO. 6.SST	EA	10
E-9	8	XDFZZ		0257-4042, ITEM 4	15942	NUT.HEX, 6-32, SST	EA	10
E-9	9	XDFZZ		X0412-20A	74193	CIRCUIT BREAKER.20 A	EA	1
E-9	10	XDFZZ		025744042, ITEM 10	15942	SCREW.FLH SLOT, 6-32X 1/2 IN., SST	EA	8
E-9	11	PAFZZ	5975-00-284-6335	CGE294	15235	CONNECTOR, WATERTIGHT	EA	2
E-9	12	PAFZZ	5940-00-983-6098	39TB3	81349	TERMINAL BOARD	EA	1
E-9	13	XDFZZ		CGB294	15235	CONNECTOR, WATERTIGHT	EA	3
E-9	14	XDFZZ		X0412-15A	74193	CIRCUIT BREAKER, 15A	EA	3
E-9	15	XDFZZ		02574-4043-1	15942	JUNCTION BOX	EA	1
E-9	16	XDFZZ		0257-1-3080-1	15942	MOUNT PLATE, JUNCTION BOX	EA	1
E-9	17	XDFFF		0257-1-3079-1	15942	CONVENIENCE OUTLET ASSY	EA	2
E-9	18	XDFZZ		5262	74545	RECEPTACLE	EA	2
E-9	19	XDFZZ		DS-70G-SA	15235	COVER, RECEPTACLE	EA	2
E-9	20	XDFZZ		FS2SA	15235	RECEPTACLE BOX	EA	2
E-9	21	XDFZZ		CGB294	15235	CONNECTOR, WATERTIGHT	EA	2
E-9	22	XDFZZ		0257-1-2068-1	15942	MOUNT PLATE, CONVENIENCE OUTLET	EA	1

Section III. SPECIAL TOOLS LIST

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION  <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
				(Not Applicable)				

SECTION IV. NATIONAL STOCK NUMBER AND PART NUMBER INDEX

NATIONAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER	NATIONAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER
531100-105-0051	E-5	38	5340-00-559-5544	E-7	4
5975-00-284-6335	E-9	11	5975-00-642-7261	E-8	3
3940-00-504-9937	E-6	1	4030.00-9274602	E-3	15
6210-00-542-4734	E-7	2	5940-00-983-6098	E-9	12

PART NUMBER	FSCM	FIG. NO.	ITEM NO.	PART NUMBER	FSCM	FIG. NO.	ITEM NO.
	15942	E-7	5	0257-1-3003-1	15942	E-2	3
	15942	E-7	6	0257-1-3003-2	15942	E-2	5
	15942	E-7	8	0257-1-3004-1	15942	E-2	2
	15942	E-8	1	0257-1-3006-1	15942	E-2	8
AC2047	94295	E-7	10	0257-1-3006-2	15942	E-2	10
BL75	03743	E-8	3	0257-1-3009-1	15942	E-2	53
CGB294	15235	E-9	13	0257-1-3009-2	15942	E-2	54
CGB294	15235	E-9	21	0257-1-3010-1	15942	E-5	32
CGE294	15235	E-9	11	0257-1-3010-2	15942	E-5	20
DS-70G-SA	15235	E-9	19	0257-1-3011-1	15942	E-5	39
FS2SA	15235	E-9	20	0257-1-3011-2	15942	E-5	17
HA1286-3	94295	E-7	7	0257-1-3012-1	15942	E-5	28
HN1289-3	94295	E-7	3	0257-1-3012-2	15942	E-5	22
H32SW	45014	E-2	40	0257-1-3013-1	15942	E-5	29
H331 3-8	75535	E-3	3	0257-1-3013-2	15942	E-5	21
LC5262	94295	E-7	11	0257-1-3014-1	15942	E-5	41
N0440	COML	E-3	13	0257-1-3015-1	15942	E-2	21
N04LOCK	COML	E-3	14	0257-1-3023-1	15942	E-5	35
PH4-40X1	COML	E-3	20	0257-1-3025-1	15942	E-2	33
PH440X1-2	COML	E-3	21	0257-1-3035-2	15942	E-2	38
VM4188-1	94295	E-7	4	0257-1-3061-1	15942	E-2	47
WT303383-2	94295	E-7	9	0257-1-3063-1	15942	E-8	2
X0412-15A	74193	E-9	14	0257-1-3064-1	15942	E-3	9
X0412-20A	74193	E-9	9	0257-1-3065-1	15942	E-3	23
YCRS12	60380	E-5	38	0257-1-3066-1	15942	E-3	2
OB22TR3	94295	E-7	2	0257-1-3066-1	15942	E-3	6
01116B	94295	E-7	1	0257-1-3079-1	15942	E-9	17
0257-1-2003-1	15942	E-6	9	0257-1-3080-1	15942	E-9	16
0257-1-2004-1	15942	E-1	3	0257-1-3081-1	15942	E-9	5
0257-1-2008-1	15942	E-1	2	0257-1-4000-1	15942	E-5	15
0257-1-2009-1	15942	E-1	4	0257-1-4000-2	15942	E-6	16
0257-1-2010-1	15942	E-1	1	0257-1-4000-3	15942	E-5	5
0257-1-2012-1	15942	E-2	56	0257-1-4006-1	15942	E-2	9
0257-1-2012-1	15942	E-5	27	0257-1-4006-2	15942	E-2	62
0257-1-2013-1	15942	E-2	61	0257-1-4006-3	15942	E-2	6
0257-1-2014-1	15942	E-2	58	0257-1-4008-1	15942	E-2	63
0257-1-2015-1	15942	E-5	33	0257-1-4008-2	15942	E-2	7
0257-1-2016-1	15942	E-2	4	0257-1-4009-1	15942	E-2	52
0257-1-2017-1	15942	E-2	37	0257-1-4010-1	15942	E-2	1
0257-1-2023-1	15942	E-5	10	0257-1-4011-1	15942	E-2	12
0257-1-2047-1	15942	E-3	22	0257-1-4012-1	15942	E-2	11
0257-1-2047-1	15942	E-3	24	0257-1-4013-1	15942	E-2	55
0257-1-2058-1	15942	E-3	7	0257-1-4013-2	15942	E-2	26
0257-1-2068-1	15942	E-9	22	0257-1-4014-1	15942	E-2	32
0257-1-3000-2	15942	E-6	8	0257-1-4014-2	15942	E-2	25

PART NUMBER	FSCM	FIG. NO.	ITEM NO.	PART NUMBER	FSCM	FIG. NO.	ITEM NO.
0257-14015-1	15942	E-2	49	125-115D	50026	E-4	14
0257-14016-1	15942	E-2	50	128-115D	50026	E-4	31
0257-14016-2	15942	E-2	48	128S-115D	50026	E-4	33
0257-14017-1	15942	E-2	51	131-115SD	50026	E-4	8
0257-14019-1	15942	E-5	37	132-115D	50026	E-4	30
0257-14021-1	15942	E-5	16	140-115D	50026	E-4	1
0257-14021-2	15942	E-5	31	141-115D	50026	E-4	7
0257-14021-3	15942	E-5	30	142-115D	50026	E-4	6
0257-14022-1	15942	E-5	40	145-115D	50026	E-4	35
0257-14022-2	15942	E-5	26	147-115D	50026	E-4	5
0257-14023-1	15942	E-5	9	150-115D	50026	E-4	4
0257-14024-1	15942	E-5	11	151-115D	50026	E-4	2
0257-14025-1	15942	E-2	31	170-115D	50026	E-4	12
0257-14031-1	15942	E-5	24	171-115D	50026	E-4	25
0257-14032-1	15942	E-6	12	172-115D	50026	E-4	29
0257-14033-1	15942	E-2	41	173-115D	50026	E-4	11
0257-14042-1	15942	E-9	1	174-115D	50026	E-4	26
0257-14042, ITEM 10	15942	E-9	10	178-115D	50026	E-4	10
0257-14042, ITEM 13	15942	E-9	7	18-23H5	76691	E-3	15
0257-14042, ITEM 3	15942	E-9	6	188-10VH52	76691	E-3	5
0247-14042, ITEM 4	15942	E-9	8	190-115D	50026	E-4	21
0257-14043-1	15942	E-9	15	195-115D	50026	E-4	23
0257-3078-1	15942	E-7	15	196-115D	50026	E-4	22
0261-1-2038-1	15942	E-6	3	198-115D	50026	E-4	24
0261-1-3037-1	15942	E-6	2	199-115D	50026	E-4	15
0261-1-3042-1	15942	E-6	1	2000-9935-001	15942	E-5	1
1-16AC	COML	E-3	19	2000A20	06550	E-6	17
1-2-13	COML	E-3	10	20764371-001	15942	E-2	13
1-2-13	COML	E-3	11	20764372-001	15942	E-2	16
1-2-13X4-1-2	COML	E-3	12	2077-6306-001	15942	E-2	46
1-2TYPEEF10	19104	E-6	15	2077-6708-001	15942	E-7	12
10316H193C	27191	E-5	4	2077-6806-001	15942	E-5	34
110-115D	50026	E-4	19	2077-6808-001	15942	E-2	60
111-115D	50026	E-4	34	2077-6808-001	15942	E-5	12
115D	33302	E-3	1	2077-6810-001	15942	E-2	57
116-115D	50026	E-4	17	2077-6812-001	15942	E-5	23
117-115D	50026	E-4	16	2077-6814-001	15942	E-2	27
118-115D	50026	E-4	32	2077-7307-001	15942	E-2	59
119-115D	50026	E-4	28	2077-7307-001	15942	E-5	6
120-115D	50026	E-4	9	2077-7311-001	15942	E-5	25
121-115D	50026	E-4	13	2077-7327-001	15942	E-5	14
122-115D	50026	E-4	3	2077-7331-001	15942	E-2	24
122-115D	50026	E-4	18	2077-7907-001	15942	E-6	13
123-115D	50026	E-4	27	2077-8805-001	15942	E-2	42
124-115D	50026	E-4	20	2078-2406-001	15942	E-2	17

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2078-2406-001	15942	E-9	2	2300-0153-001	15942	E-2	29
2078-2414-001	15942	E-2	20	2300-0153-001	15942	E-5	13
2078-2818-001	15942	E-2	34	2300-0163-001	15942	E-2	43
2100-0123-001	15942	E-2	30	2300-0905-001	15942	E-5	2
2100-0123-001	15942	E-5	18	2300-0909-001	15942	E-2	18
2100-0127-001	15942	E-2	23	2300-0909-001	15942	E-9	3
2100-0127-001	15942	E-5	7	2300-0910-001	15942	E-7	13
2100-0131-001	15942	E-2	39	2300-0911-001	15942	E-2	35
2100-0131-401	15942	E-6	5	2349-0029-005	15942	E-2	28
2100-0137-001	15942	E-2	44	2349-0029-005	15942	E-6	6
2100-0211-001	15942	E-5	3	2450-0274-013	15942	E-6	4
2100-0219-001	15942	E-2	19	2450-0578-001	15942	E-2	45
2100-0219-001	15942	E-9	4	3-8 GALV	75535	E-3	4
2100-0221-001	15942	E-7	14	3-8 GALV	76691	E-3	17
2100-0223-001	15942	E-2	36	39TB3	81349	E-9	12
2100-0878-001	15942	E-2	14	3985-0035-004	15942	E-5	36
2100-0878-001	15942	E-6	10	4H262C	75535	E-3	8
2102-0001-050	15942	E-5	19	443A	33857	E-3	16
2102-0001-053	15942	E-2	22	5-32	COML	E-3	18
2102-0001-053	15942	E-5	8	5262	74545	E-9	18
2102-0001-057	15942	E-6	7	6100-0012-005	15942	E-3	25
2102-0001-060	15942	E-2	15	9438	10145	E-8	4
2102-0001-060	15942	E-6	11	9441H37B	27191	E-6	14

APPENDIX F

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

F-1 SCOPE. This appendix lists expendable supplies and materials you will need to operate and maintain the TS-9A. These items are authorized to you by CTA 50-970, Expendable Items (except Medical, Class V, Repair Parts, and Heraldic Items).

F-2 EXPLANATION OF COLUMNS.

a. Column 1, Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, App. F").

b. Column 2, Level. This column identifies the lowest level of maintenance that requires the listed item.

- O ..... Organizational maintenance
- F ..... Direct support maintenance
- H ..... General support maintenance

c. Column 3, National Stock Number (NSN). This is the NSN assigned to the item; use it to request or requisition the item.

d. Column 4, Description. Indicates the Federal Item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. Column 5, Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the U/M differs from the unit of issue, requisition the lowest unit that will satisfy your requirements.



Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	0	7920-00-3564694	BRUSH, BRISTLE	EA
2	0	8020-00-2454509	BRUSH, PAINT, FLAT, 1-INCH-WIDE	EA
3	0	8305-00-222-2423	CHEESECLOTH, LINT-FREE	YD
4	0		GREASE MOBIL-TEMP	CN
5	0		OIL, ALVANIA EPI, BELOW 320F	CN
6	0		OIL, ALVANIA EP2, ABOVE 32°F	CN
7	0	9150-00-273-2389	OIL, LUBRICATING, 30 WT	CN
8	0		OIL, LUBRICATING, GEARCASE: AVREX 903 EXTRA HELCO SUPER CYLINDER MOBIL FLUID 423 MOBIL OIL CO., 600W MOBIL OIL CO., HD90	CN CN CN CN CN
9	0	8010-00-297-0560	PAINT, ENAMEL, LUSTERLESS, OLIVE DRAB	GL
10	0	8010-00-835-2114	PAINT, PRIMER, ZINC-CHROMATE	PT
11	0	6850-00-597-9765	TRICHLOROETHANE	GL

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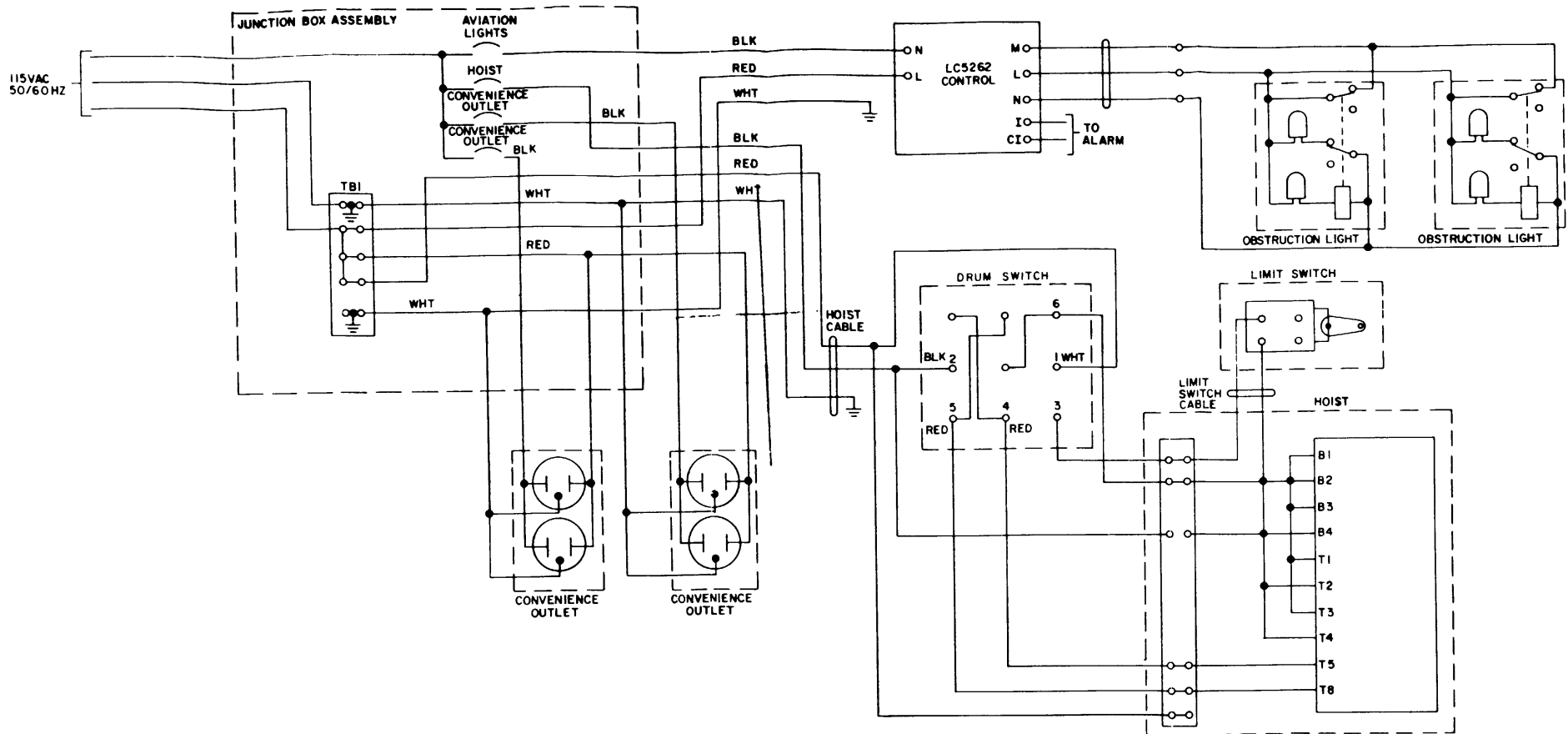
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FO-1. Antenna Tower Electrical Circuit Schematic Wiring Diagram

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# THE METRIC SYSTEM AND EQUIVALENTS

## Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3.2808.8 feet

## Weights

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = .035 ounce  
 1 dekagram = 10 grams = .35 ounce  
 1 hectogram = 10 dekagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

## Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu in.  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Square measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. in.  
 1 sq. decimeter = 100 sq. centimeters = 15.5 inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 feet  
 1 sq. dekameter (are) = 100 sq. meters = 1.076.4 sq. ft.  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 hectometers = .386 sq. miles

## Liquid Measure

1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 metric ton = 10 quintals = 1.1 short tons

## Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce inches	newton-meters	.0070062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
sq. inches	sq. centimeters	6.451	kilometers	miles	.621
sq. feet	sq. meters	.093	sq. centimeters	sq. inches	.155
sq. yards	sq. meters	.836	sq. meters	sq. yards	10.764
sq. miles	sq. kilometers	2.590	sq. kilometers	sq. miles	1.196
acres	sq. hectometers	.405	sq. hectometers	acres	2.471
cubic feet	cubic meters	.028	cubic meters	cubic feet	35.315
cubic yards	cubic meters	.765	milliliters	fluid ounces	.034
fluid ounces	milliliters	29.573	liters	pints	2.113
pints	liters	.472	liters	quarts	1.057
quarts	liters	.946	grams	ounces	.035
gallons	liters	3.785	kilograms	pounds	2.205
ounces	grams	28.349	metric tons	short tons	1.102
pounds	kilograms	.454	pound-feet	newton-meters	1.356
short tons	metric tons	.907			
pound inches	newton-meters	.11296			

## Temperature (Exact)

°F Fahrenheit temperature

5/9 ( after subtracting 32)

Celsius Temperature °C

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