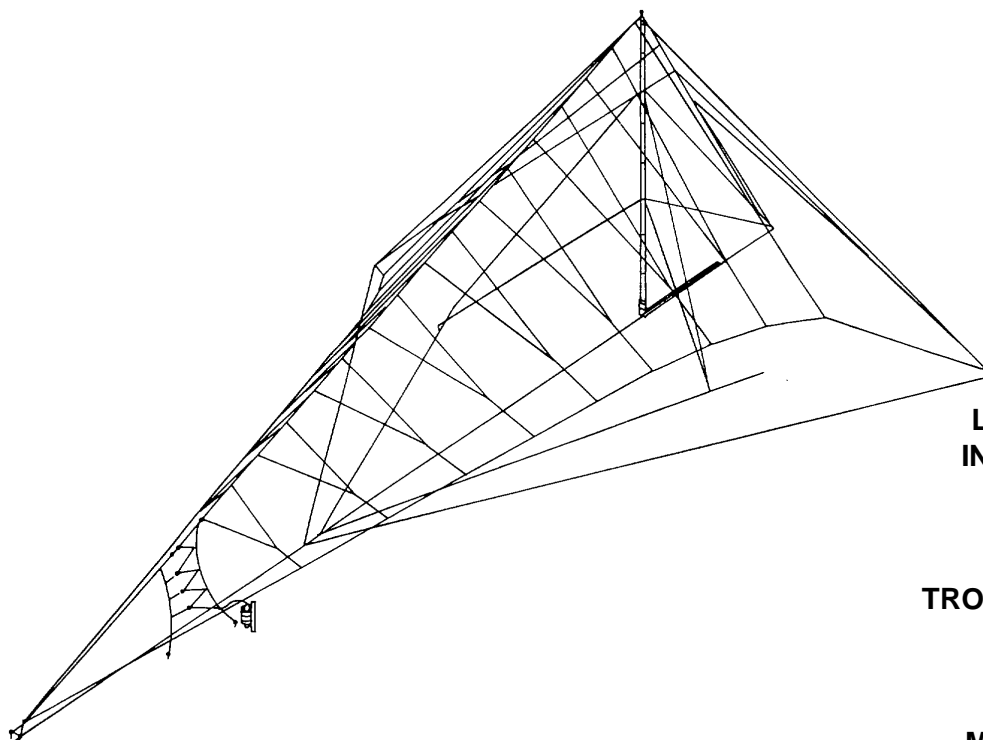


This copy is a reprint which includes
current pages from Change 1.

**OPERATOR'S ORGANIZATIONAL
AND DIRECT SUPPORT
MAINTENANCE MANUAL**

**EQUIPMENT
DESCRIPTION
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PROCEDURES
PAGE 3-4**

**ANTENNA GROUP
OE-317/TSC-99
(NSN 5895-01-095-6206)**

HEADQUARTER, DEPARTMENT OF THE ARMY

15 SEPTEMBER 1982

WARNING

Read and be familiar with TB 291.

Do not work alone, always have someone present who knows first aid and resuscitation.

Do not work on or In close proximity to the antenna when Transmitter power is ON. Contact with high RF voltages can be fatal, and electromagnetic radiation can cause severe or fatal Internal burns. Particularly dangerous areas are In the vicinity of the antenna coupler and rear radiator ground anchors.

Lower the tower for any detailed inspections or maintenance. Do not climb tower or gin pole, as they are not designed to be climbed. Climbing the tower may cause It to fall resulting In destruction of the tower and serious Injury or death to operator/crew.

WIND WARNING

Do not erect/lower antenna or rotate antenna curtain in winds higher than 20mph (32 km/h). Antenna damage and/or personnel injury may result.

For Artificial Respiration, refer to FM 21-11.

CHANGE

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 5 March 1985

**OPERATOR'S, ORGANIZATIONAL
AND DIRECT SUPPORT MAINTENANCE MANUAL
ANTENNA GROUP OE-317/TSC-99
(NSN 5895-01-095-6206)**

TM 11-5985-362-13, 15 September 1982, is changed as follows:

1. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a pointing hand on the illustration pages.

2. Remove old pages and insert new pages as indicated below:

<i>Remove pages</i>	<i>Insert pages</i>
1-1 through 1-4	1-1 through 1-4
2-23 through 2-26	2-23 through 2-26
2-33 and 2-34	2-33 and 2-34
2-43 and 2-44	2-43 and 2-44
2-61 and 2-62	2-61 and 2-62
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3. File this change sheet in the front of the publication.

By Order of the Secretary of the Army:

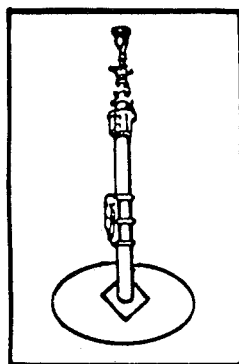
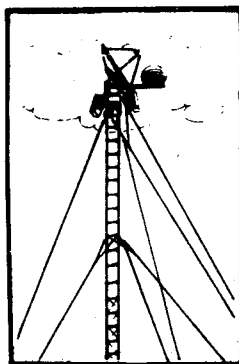
Official:

JOHN A. WICKHAM JR.
General, United States Army
Chief of Staff

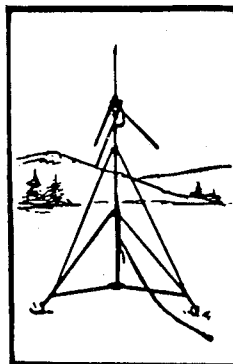
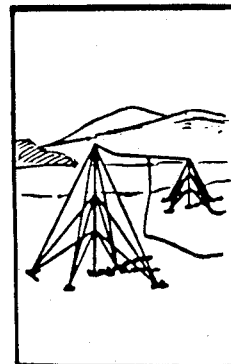
DONALD J. DELANDRO
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-51, Operator's; Organizational and Direct and General Support Maintenance requirements for AN/TSC-26.

FIXED OPERATION WITH LONG RANGE ANTENNAS WARNINGTELESCOPING ANTENNA
MAST

TYPICAL TOWER

EXTENDED RANGE
ANTENNA

DOUBLET ANTENNA

NEVER ERECT THESE LONG RANGE ANTENNAS DIRECTLY UNDER POWER LINES.

IF YOU MUST ERECT THESE LONG RANGE ANTENNAS NEAR POWERLINES, POWERLINE POLES OR TOWERS, OR BUILDINGS WITH OVERHEAD POWERLINE CONNECTIONS, NEVER PUT THE ANTENNA CLOSER THAN TWO TIMES THE ANTENNA HEIGHT FROM THE BASE OF THE POWERLINE, POLE, TOWER OR BUILDINGS. 100 FEET AWAY IS A GOOD SAFE ROUND NUMBER TO REMEMBER.

NEVER ATTEMPT TO ERECT ANY LONG RANGE ANTENNA WITHOUT A FULL TEAM.

BEFORE ERECTING ANY LONG RANGE ANTENNA, INSPECT ALL THE PARTS MAKING UP THE ANTENNA KIT. DO NOT ERECT THE ANTENNA IF ANY PARTS ARE MISSING OR DAMAGED.

DO AS MUCH OF THE ASSEMBLY WORK AS POSSIBLE ON THE GROUND.

WHEN ERECTING THE ANTENNA, ALLOW ONLY TEAM PERSONNEL IN THE ERECTION AREA.

MAKE SURE THAT THE AREA FOR THE ANCHORS IS FIRM IF THE GROUND IS MARSHY OR SANDY, GET SPECIFIC INSTRUCTIONS FROM YOUR CREW CHIEF OR SUPERVISOR ON HOW TO REINFORCE THE ANCHORS.

WHEN SELECTING LOCATIONS FOR ANCHORS, AVOID TRAVELED AREAS AND ROADS IF YOU CANNOT AVOID THESE AREAS, GET SPECIFIC INSTRUCTIONS FROM YOUR SUPERVISOR AS TO WHAT CLEARANCE YOUR GUY WIRES AND ROPES MUST HAVE OVER THE TRAVELED AREAS AND ROAD.

CLEARLY MARK ALL GUY WIRES AND ROPES WITH THE WARNING FLAGS OR SIGNS SUPPLIED BY YOUR UNIT. IN AN EMERGENCY, USE STRIPS OF WHITE CLOTH AS WARNING STREAMERS.

IF YOU SUSPECT THAT POWERLINES HAVE MADE ACCIDENTAL CONTACT WITH YOUR ANTENNA, STOP OPERATING, ROPE OFF THE ANTENNA AREA, AND NOTIFY YOUR SUPERIORS.

IF THE WEATHER IN YOUR AREA CAN CAUSE ICE TO FORM ON YOUR LONG RANGE ANTENNA AND ITS GUY WIRES AND ROPES, ADD EXTRA GUYS TO SUPPORT THE SYSTEM. ROPE OFF THE AREA AND POST IT WITH WARNING SIGNS LIKE BEWARE OF FALLING ICE.

DO NOT TRY TO ERECT ANY ANTENNA DURING AN ELECTRICAL STORM.

KEEP A SHARP EYE ON YOUR ANCHORS AND GUYS. CHECK THEM DAILY AND IMMEDIATELY BEFORE AND AFTER BAD WEATHER.



5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1 DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2 IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3 IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL

4 SEND FOR HELP AS SOON AS POSSIBLE

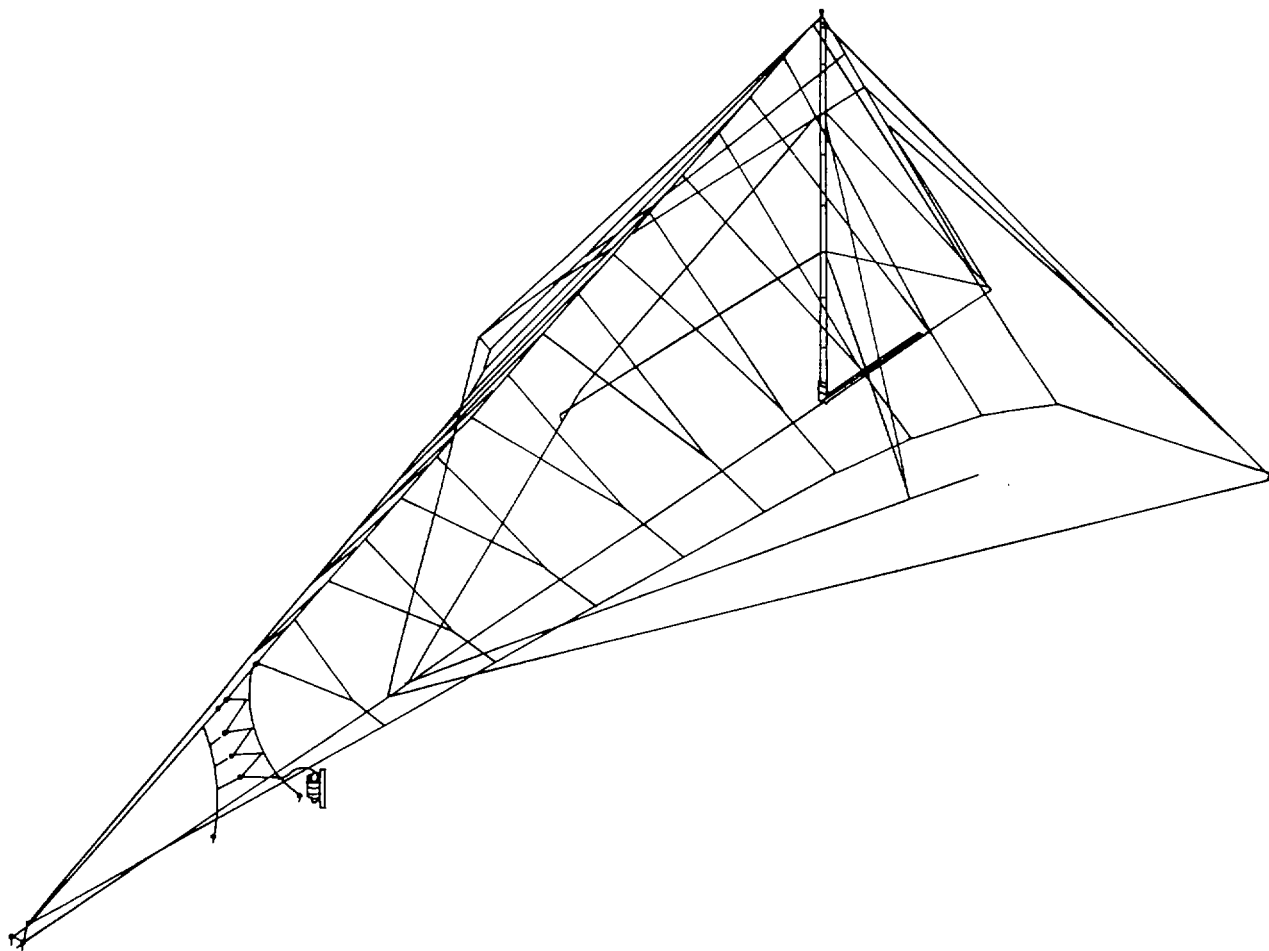
5 AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

Operator's, Organizational and Direct Support
Maintenance Manual
ANTENNA GROUP OE-317/TSC-99
(NSN 5895-01-095-6206)

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 back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. A reply will be furnished to you.

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ANTENNA GROUP OE-317/ITSC-99

**CHAPTER 1
INTRODUCTION**

Hand Receipt	1-3	Purpose, Capabilities, and Features	1-3
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Maintenance Forms, Records and Reports	1-1	Recommendations (EIR's)	1-1
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Section I. GENERAL INFORMATION

1-1. SCOPE

- a. This manual covers the procedures for site selection and preparation and the installation, rotation and removal of Antenna Group OE-317/TSC-99 by a crew of six. Both preventive and corrective maintenance to be performed by the operator with or without crew support is also covered.
- b. The Preventive Maintenance Checks and Services (PMCS) assigned to the operator and crew are extremely important to the overall life of the antenna group and its performance in the operational environment. Repair of the antenna group will be performed by direct support maintenance units.

1-2. MAINTENANCE FORMS AND RECORDS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update.

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR's)

If your antenna 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 the antenna. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail directly to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. We'll send you a reply.

1-4. WARRANTY INFORMATION

The Antenna Group OE-317/TSC-99 is warranted by Technology for Communications International for ninety (90) days from date of delivery to the Government. It starts on the date, found in block 23, DA Form 2408-9, in the logbook. Report all defects in material or workmanship to your supervisor, who will take appropriate action through your organizational maintenance shop.

This warranty does not apply to the antenna group or any of its components if: (a) the item has been repaired, worked upon, disassembled or altered by persons not authorized by the Army in such a manner as to injure the stability or reliability of the item, (b) the item has been subjected to misuse, negligence or accident, (c) the item has not been connected, installed, used or adjusted in accordance with the procedures of this manual, (d) the serial number of the item has been altered, defaced or removed, or (e) problem is caused by normal wear and tear from usage.

1.5. NOMENCLATURE CROSS-REFERENCE, ABBREVIATIONS AND ACRONYMS LIST

Official nomenclature must be used when completing report forms.

A. NOMENCLATURE CROSS REFERENCE

COMMON NAME	OFFICIAL NOMENCLATURE
Connector Adapter	Adapter, Connector UG-1531/U
30" Anchor	Anchor, Guy, 30" Screw-In
66" Anchor	Anchor, Guy, 66" Screw-In
Antenna	Antenna AS-3442/TSC-99
Antenna Group	Antenna Group OE-317/TSC-99
Antenna Coupler Bar	Bar, Matching Unit
Tower Winch Assembly	Base Assembly, Winch
Pound-In Anchor	Bolt, Eye
Base Pin	Bolt, Machine
Antenna Case or Transit Case	Case, Antenna CY-7865/TSC-99
Antenna Coupler Case or Transit Case	Case, Antenna Coupler CY-7867/TSC-99
Mast Case or Transit Case	Case, Mast CY-7866/TSC-99
Cable Clamp	Clamp, Rope
Radio Terminal or Transmitter	Communications Central AN/TSC-99
Antenna Coupler	Coupler, Antenna CU-2273/TSC-99
Hammer	Hammer, Hand
Light Assembly	Lighting Assembly
Center Layout Wire	Marker Assembly, Wire
Side Layout Wire	Marker Assembly, Wire
Back Layout Wire	Marker Assembly, Wire
Winch Assembly Base Pin	Pin, Base
Hinge Pin	Pin, Straight Headed
Reel No. 1	Reel Assembly No. 1
Reel No. 2	Reel Assembly No. 2
Reel No. 3	Reel Assembly No. 3
Reel No. 4	Reel Assembly No. 4
Reel No. 5	Reel Assembly No. 5
Tower Sections	Tower Assembly AB-1282/TSC-99
Feedline Winch Assembly	Winch Assembly
Cable Clamp Wrench	Wrench, Box and Open
Wrench	Wrench, Box and Open

B. ABBREVIATIONS

cm	centimeter
cu	cubic
dB	decibel
dBi	decibel (direction gain)
kg	kilogram
km/h	kilometer/hours
kw	kilowatt
MHz	megahertz
m	meter
mph	miles per hour
RF	radio frequency

C. ACRONYMS

EIA	Electronic Industries Association
PEP	Peak Envelope Power
VSWR	Voltage Standing Wave Ratio

Paragraph 1-6 deleted.

Section II. EQUIPMENT DESCRIPTION

1-7. PURPOSE, CAPABILITIES, AND FEATURES

- Antenna Group OE-317/TSC-99 is a horizontally polarized log-periodic antenna for use with the AN/TSC-99 Radio Set and is:
- Designed for operation in a frequency range of 2 to 30 MHz in any environment ranging from arctic to desert conditions.
- Contained within three reusable transit cases.
- Self-contained in that transit cases contain tools necessary for assembly and installation. The RL-31 (*) reeling machine and RL-27 (*) axle must be procured from normal supply channels.
- Highly transportable in a light truck.
- Easily assembled, raised, lowered, and repacked by a crew of six.
- Capable of manually being rotated to any direction of transmission without lowering and complete disassembly/reassembly.

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

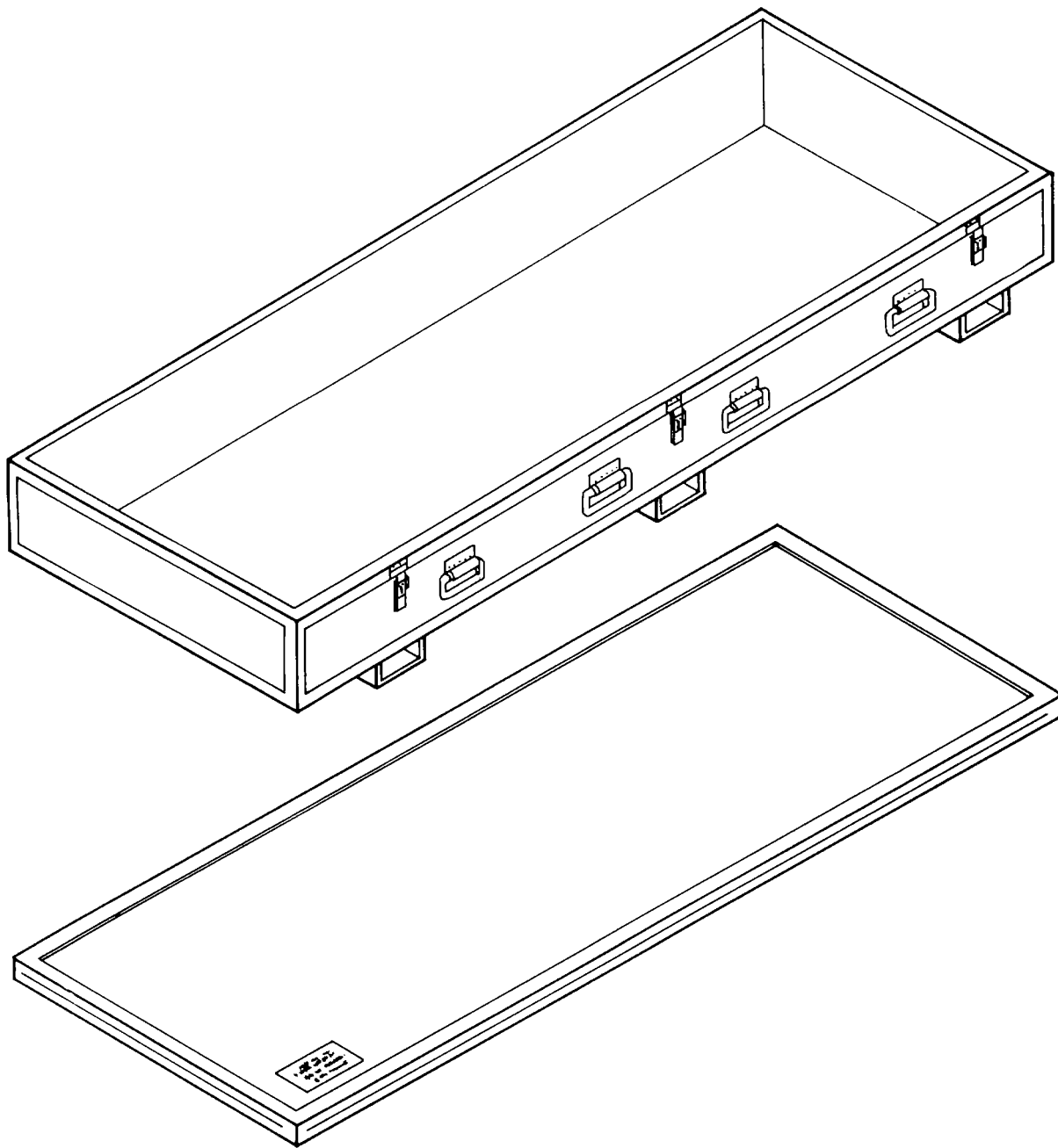
a. PACKED FOR STORAGE OR SHIPMENT

When packed for storage or shipment, the antenna group is contained in three transit cases.

The three transit cases are made of light-weight material with handles for equal distribution of weight to allow ease of handling by the crew. Each transit case is fitted with a weather-proof cover retained by captive clamps. Removal of the top cover of each transit case allows easy access to contents as listed in Appendix B, Components of End Item and Basic Issue Items Lists.

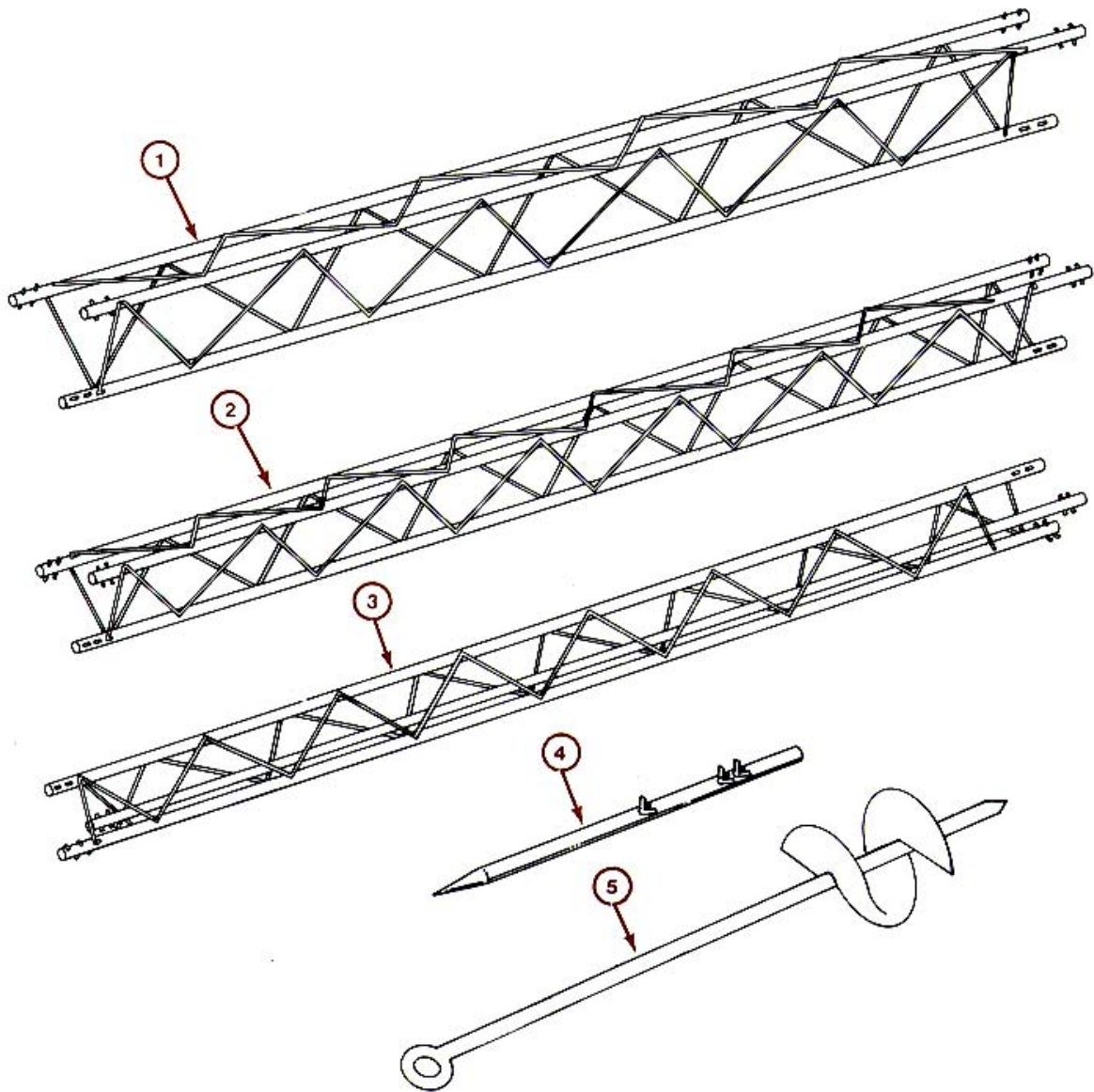
Change 1 1-3

CASE, MAST CY-78661TSC-99. Contains large, medium and small tower sections making up the antenna tower and the gin pole. Also includes 8-66" anchors and 2-antenna coupler bars.

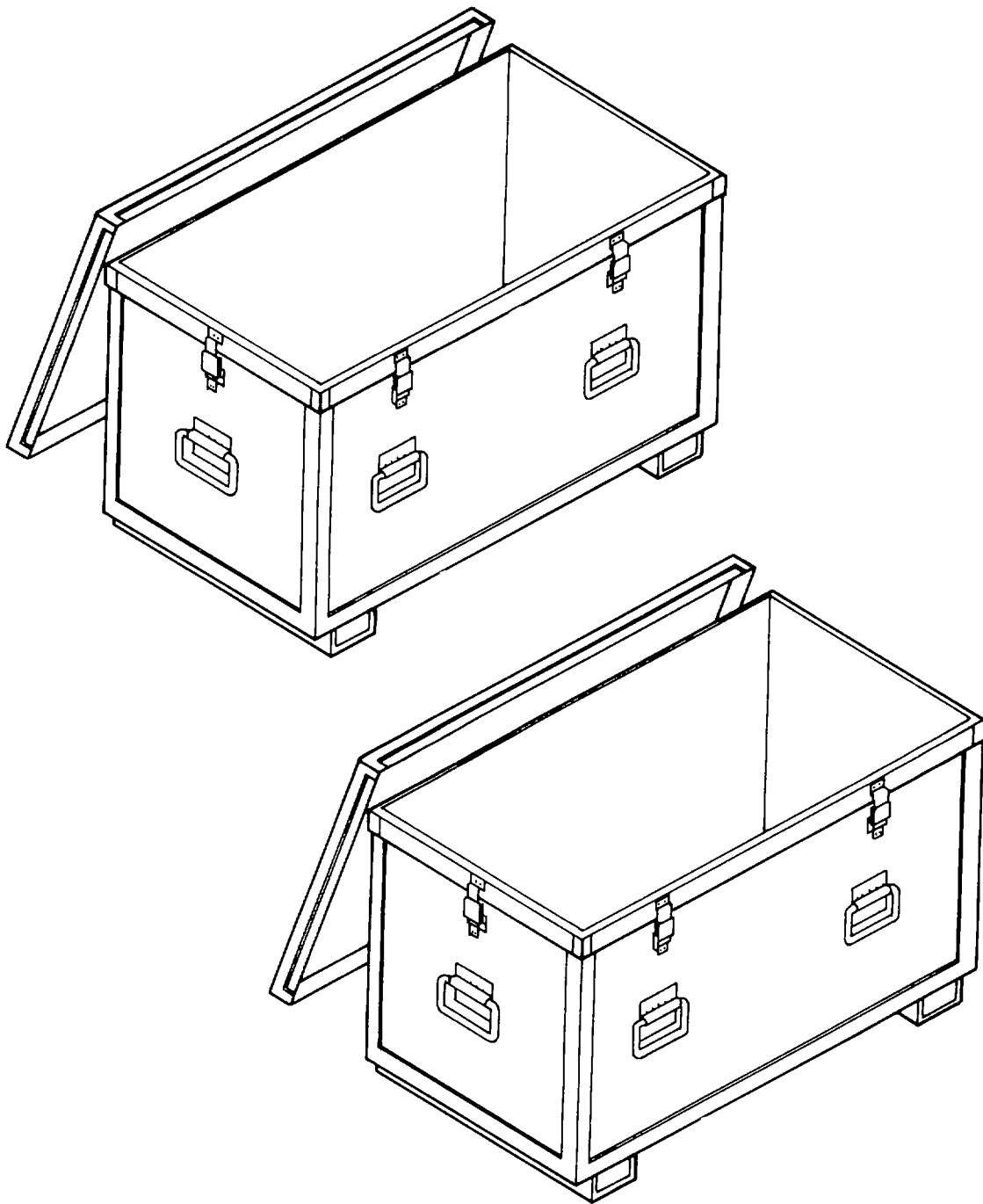


The mast case contains the following items:

- (1) 4 - Large tower sections
- (2) 4 - Medium tower sections
- (3) 2 - Small tower sections (gin pole)
- (4) 2 - Antenna coupler bars
- (5) 8 - 66 inch anchors

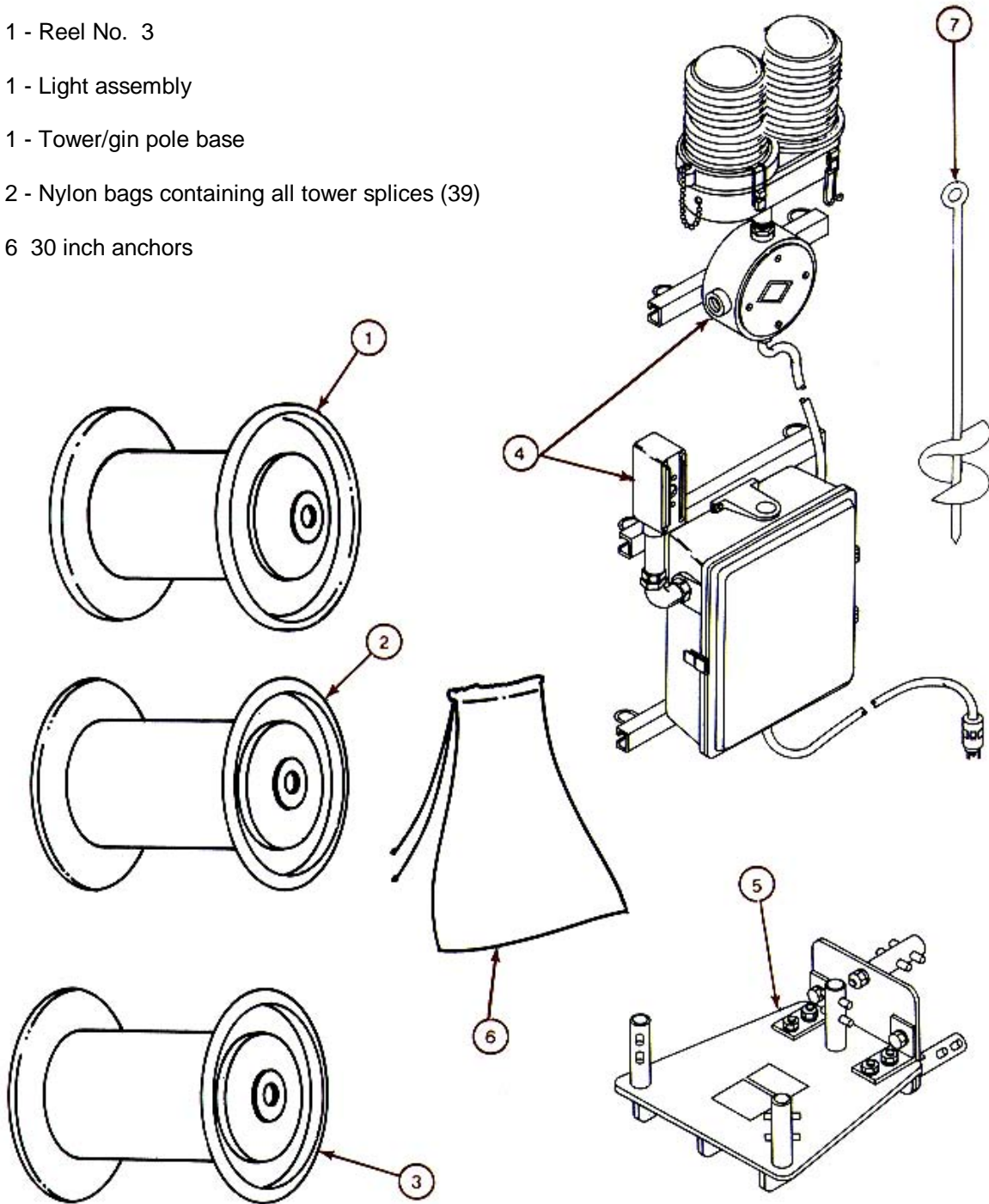


CASE, ANTENNA CY-78651TSC-99. These two transit cases together contain all other components of the Antenna Group as well as tools necessary for installation.



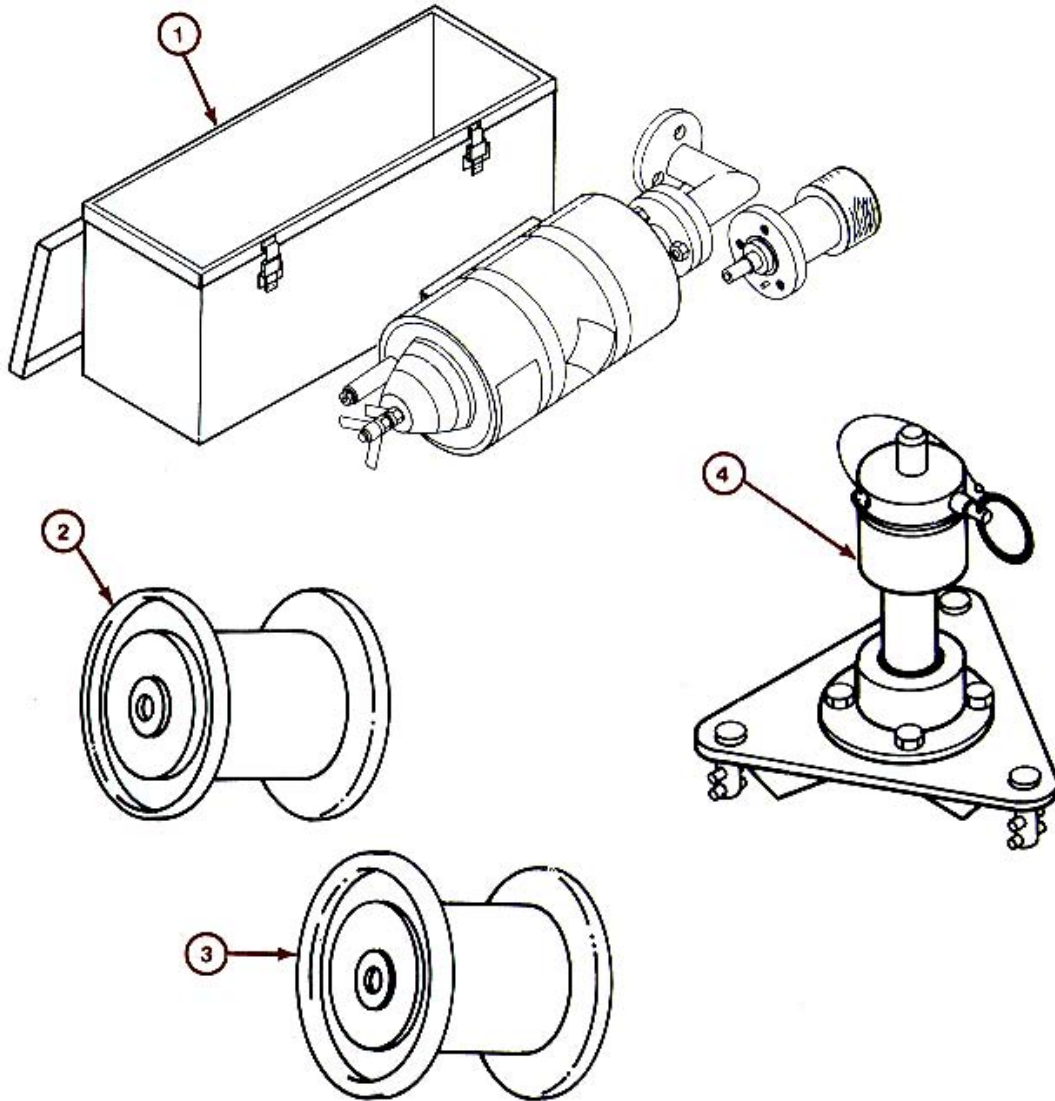
There are two antenna cases. One case contains the following:

- (1) 1 - Reel No. 1
- (2) 1 - Reel No. 2
- (3) 1 - Reel No. 3
- (4) 1 - Light assembly
- (5) 1 - Tower/gin pole base
- (6) 2 - Nylon bags containing all tower splices (39)
- (7) 6 30 inch anchors

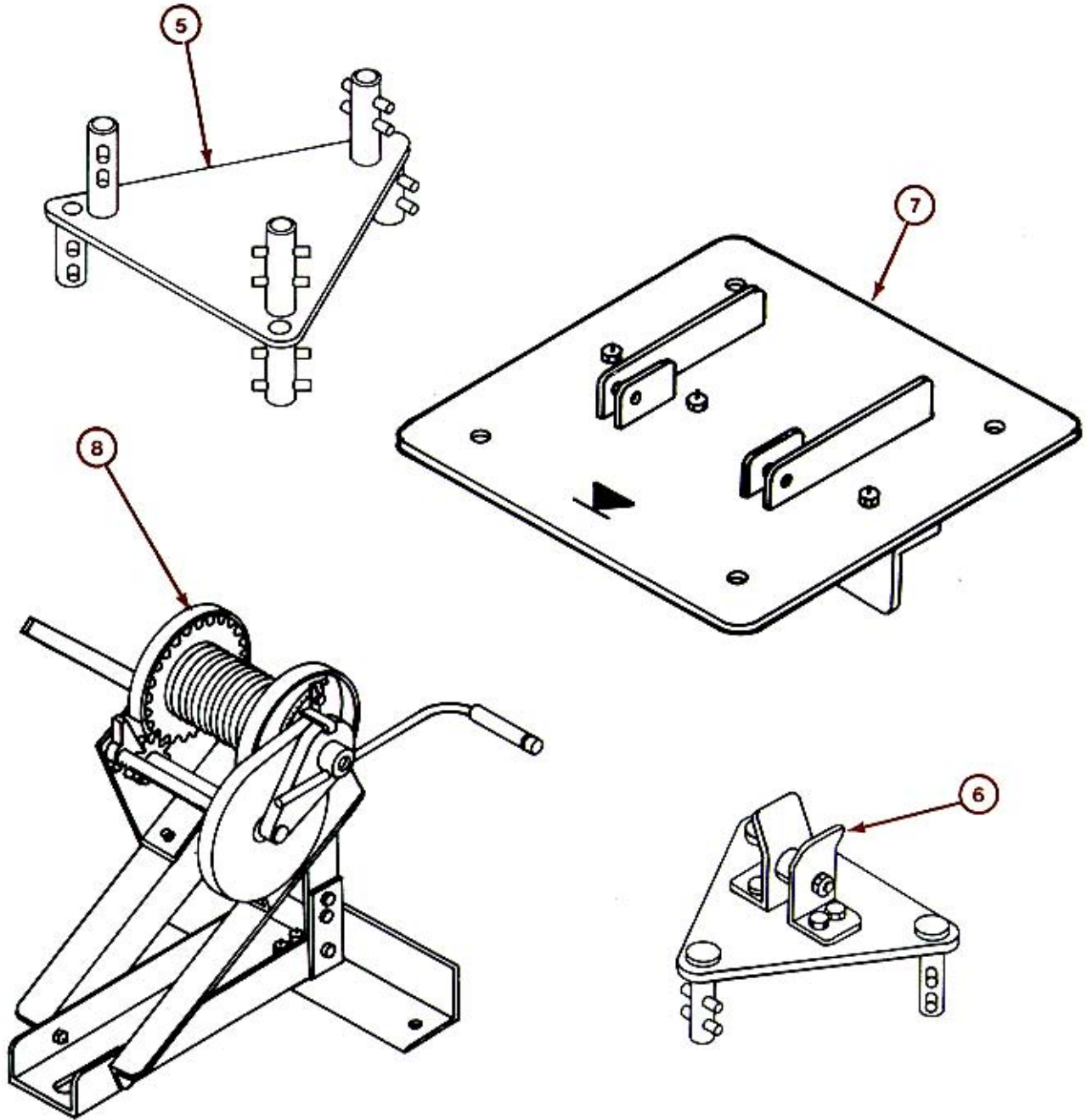


The other case contains the following:

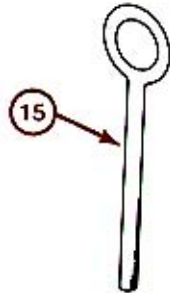
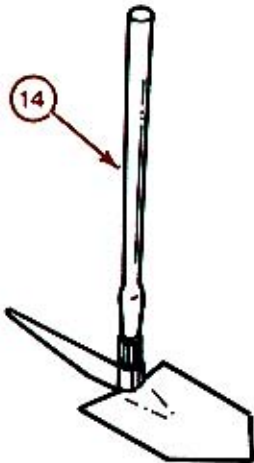
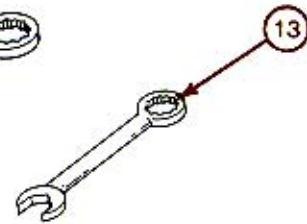
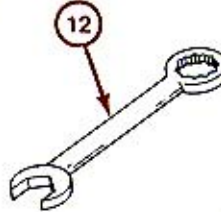
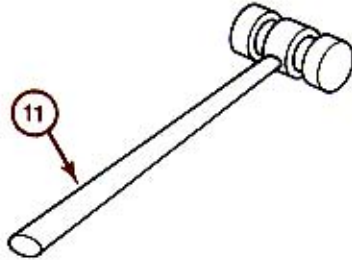
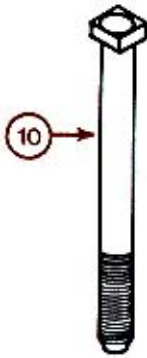
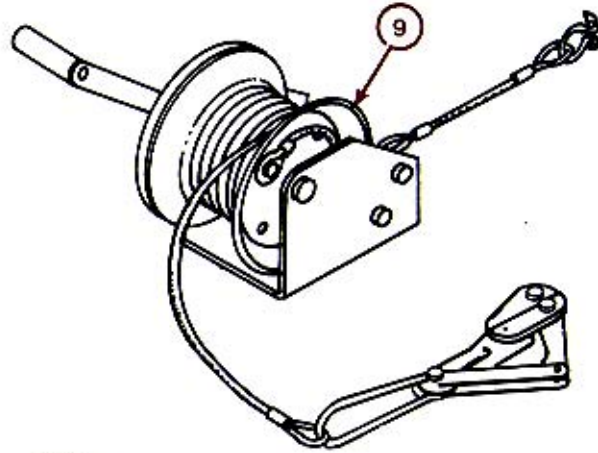
- (1) 1 - Antenna coupler case (which contains antenna coupler and the connector adapter)
- (2) 1 - Reel No. 4
- (3) 1 - Reel No. 5
- (4) 1 - Tower top plate



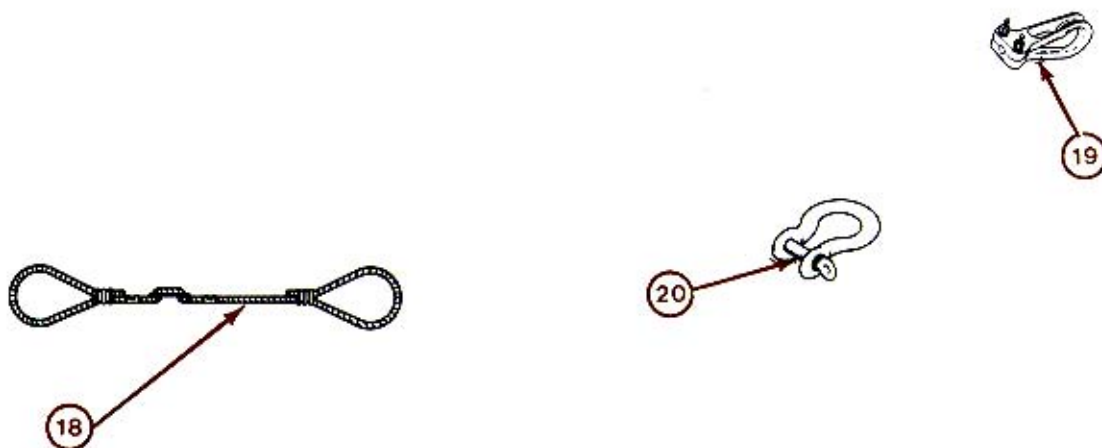
- (5) 1 - Tower transition plate
- (5) 1 - Gin pole top plate
- (7) 1 - Tower base
- (8) 1 - Tower winch assembly



- (9) 2 - Feedline winch assemblies
- (10) 6 - Tower base pins
- (11) 2 - Hammers
- (12) 2 - Wrenches (large)
- (13) 2 - Wrenches (small)
- (14) 1 - Shovel/pick
- (15) 4- Pound-in anchors
- (16) 2 - Straight-headed pins
- (17) 2 - Cotter pins

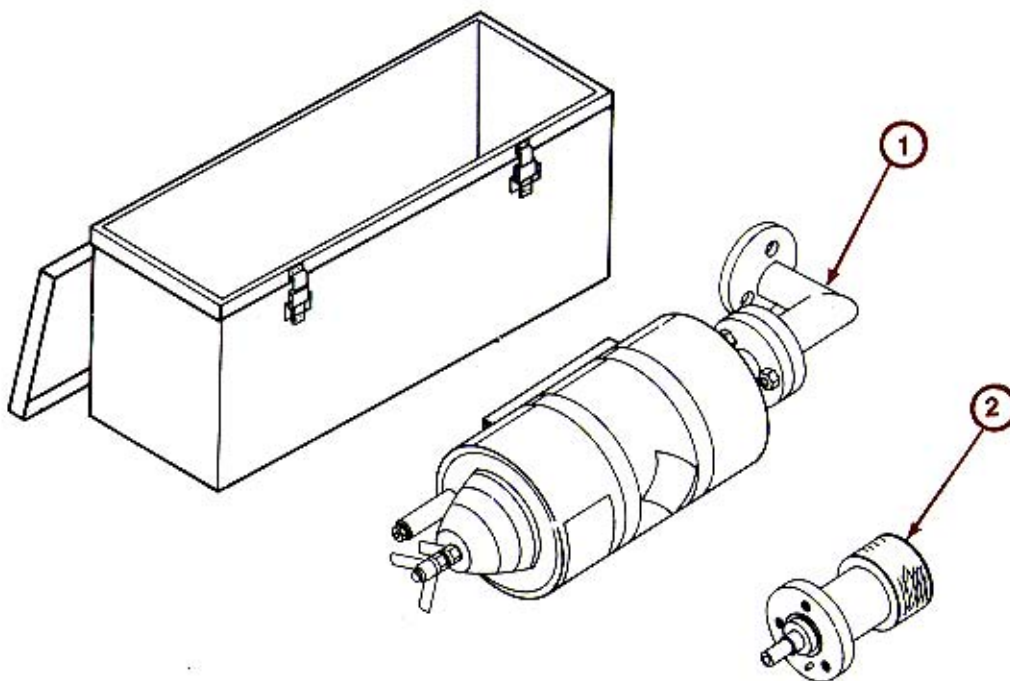


- (18) 2 - Bridle assemblies
- (19) 3 - Cable Clamp
- (20) 18- Shackles



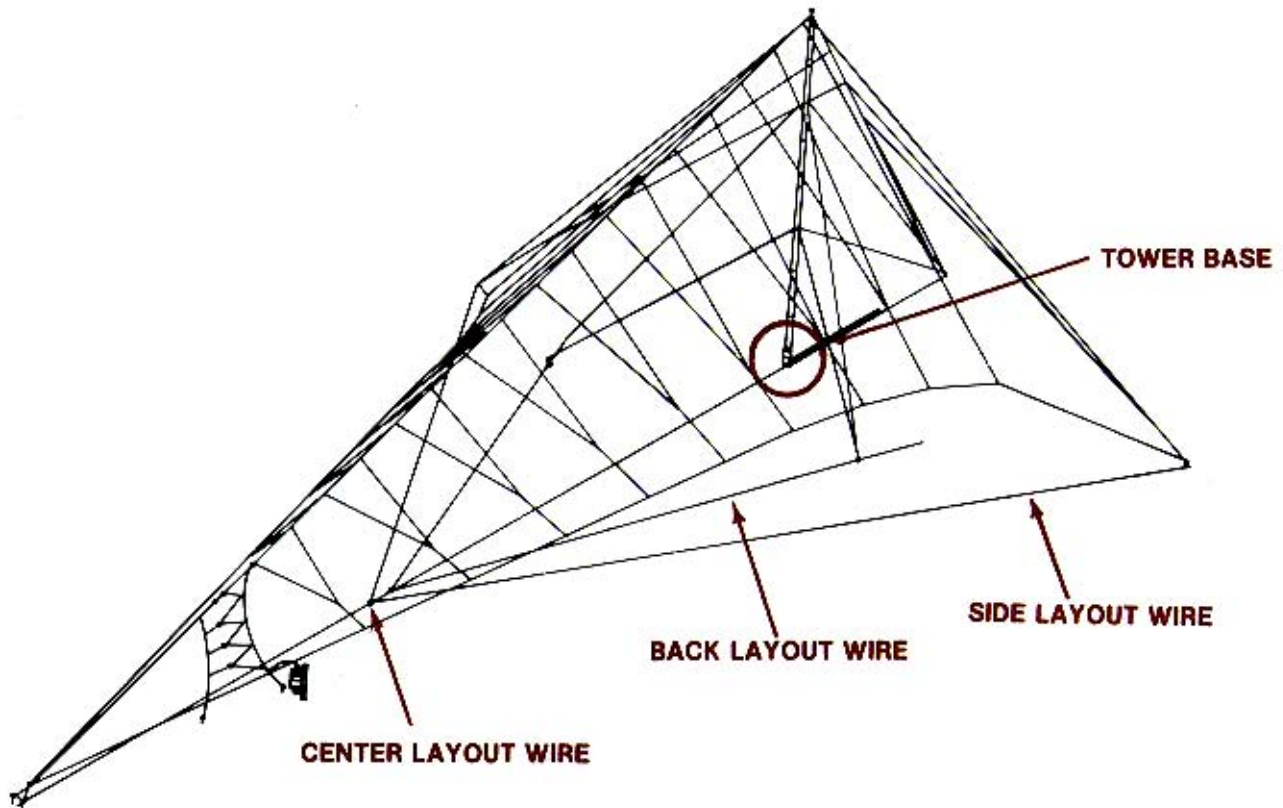
CASE, ANTENNA COUPLER CY-7867. Contains antenna coupler and connector adapter. (Packs inside one of the antenna cases).

- (1) 1 - Antenna Coupler
- (2) 1 - Connector Adapter



b. INSTALLED

The antenna is a relatively simple equipment item with major components illustrated and discussed below:

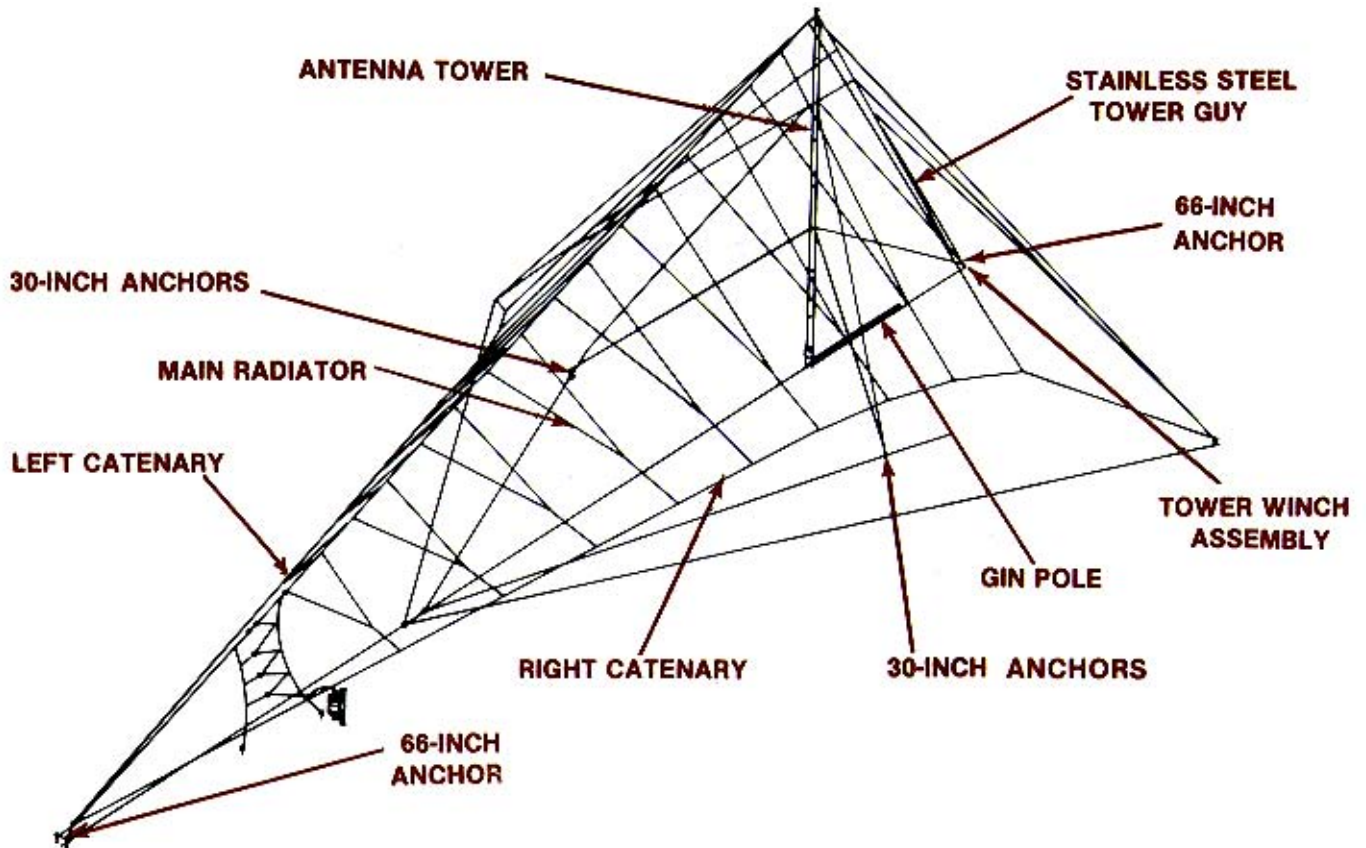


CENTER LAYOUT WIRE. 1/16-inch diameter bronze wire for positioning in the desired direction of radiation with three markers to directly designate the location of the front and back 66-inch anchors and the tower base, and when rotated about the tower base, the location of the anchors for the right and left tower guys.

SIDE LAYOUT WIRE. 1/16-inch diameter bronze wire used in conjunction with the back layout wire to locate positions for 30-inch anchors for right and left back radiator guys.

BACK LAYOUT WIRE. 1/16-inch diameter bronze wire used in conjunction with center layout wire to locate positions for 30-inch anchors for right and left tower guys.

TOWER BASE. Secured to the ground with four pound-in base pins to serve as an anchor point for the tower/gin pole assemblies.



LEFT AND RIGHT CATENARY. Rope with electrically insulated drop wires for attachment to main radiator. When tensioned after tower erection, the right and left catenaries hold main radiator in spread-out position.

66-INCH ANCHORS.. Attachment points for main feedline and one end of right and left catenaries.

30-INCH ANCHORS. Attachment points for right and left tower guys, back radiator guys, and catenaries.

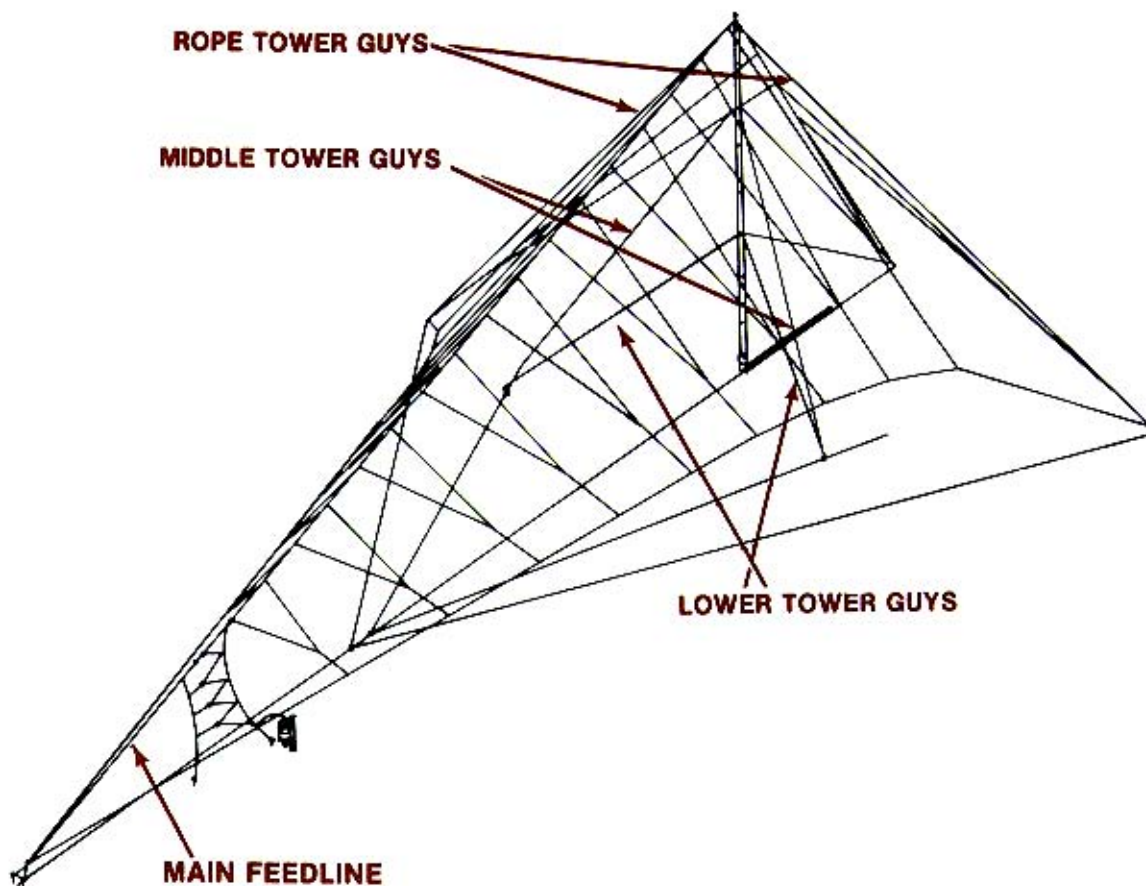
ANTENNA TOWER. 80-foot overall length made up with four each 10-foot long large and medium tower sections interconnected with tower splices at each joint, a tower transition plate where the tower sections change size from large to medium, and a tower top plate at the end of the last medium tower section.

GIN POLE. 20-foot overall length made up with two 10-foot long small tower sections interconnected with tower splices and topped with the gin pole top plate. The gin pole is used only for erection and lowering of the antenna.

STAINLESS STEEL TOWER GUY. 3/16-inch diameter cable running from the middle of the medium sections of the tower over the top of the gin pole and to the tower winch. This cable is used for raising the tower.

TOWER WINCH ASSEMBLY. Stand anchored to ground with 66-inch anchor containing hand-crank winch for tower erection.

MAIN RADIATOR. Varying diameter bronze wire connected to main feedline and strung between right and left catenaries and back radiator guys to form antenna curtain.

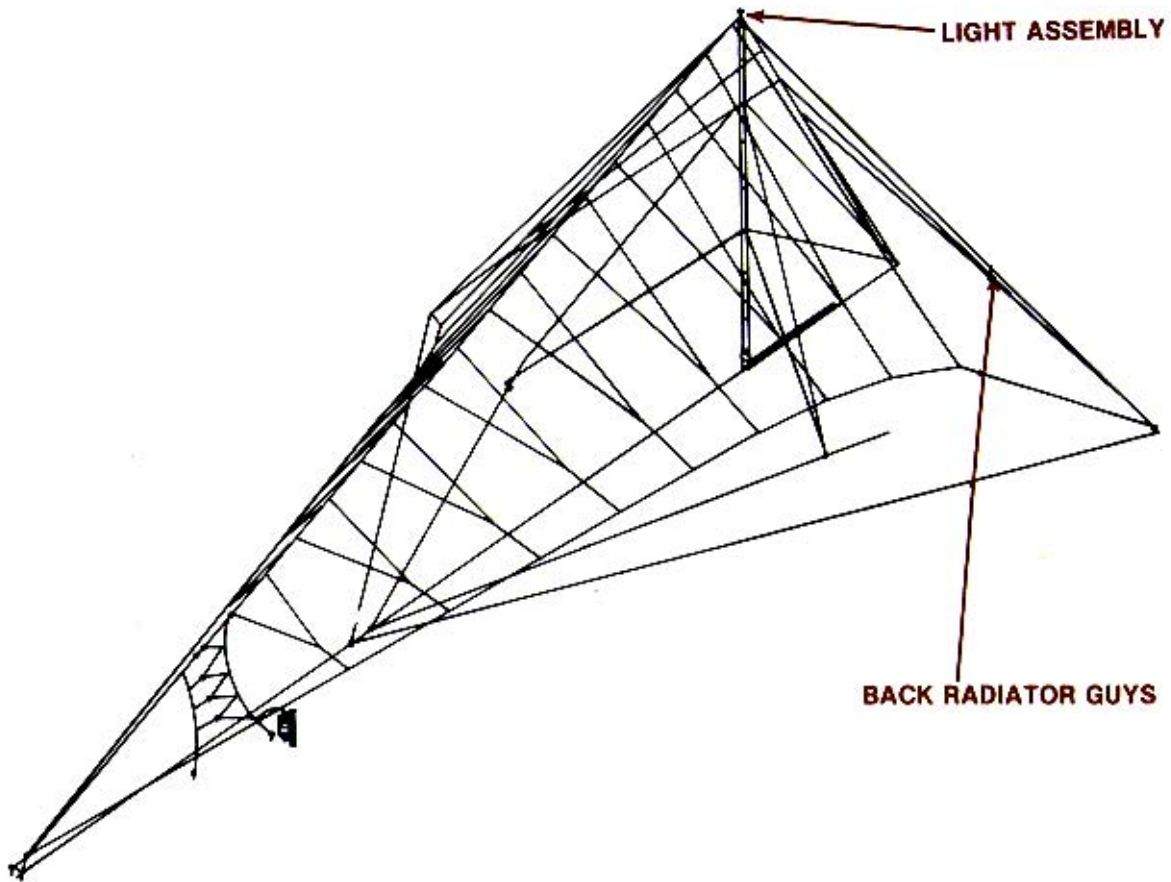


ROPE TOWER GUYS. 1/4-inch diameter rope guys attached to top of tower and terminated at right and left guy anchors.

MIDDLE TOWER GUYS. 3/32-inch diameter steel cables with 1/4-inch diameter rope ends for applying tension to middle portion of tower after erection.

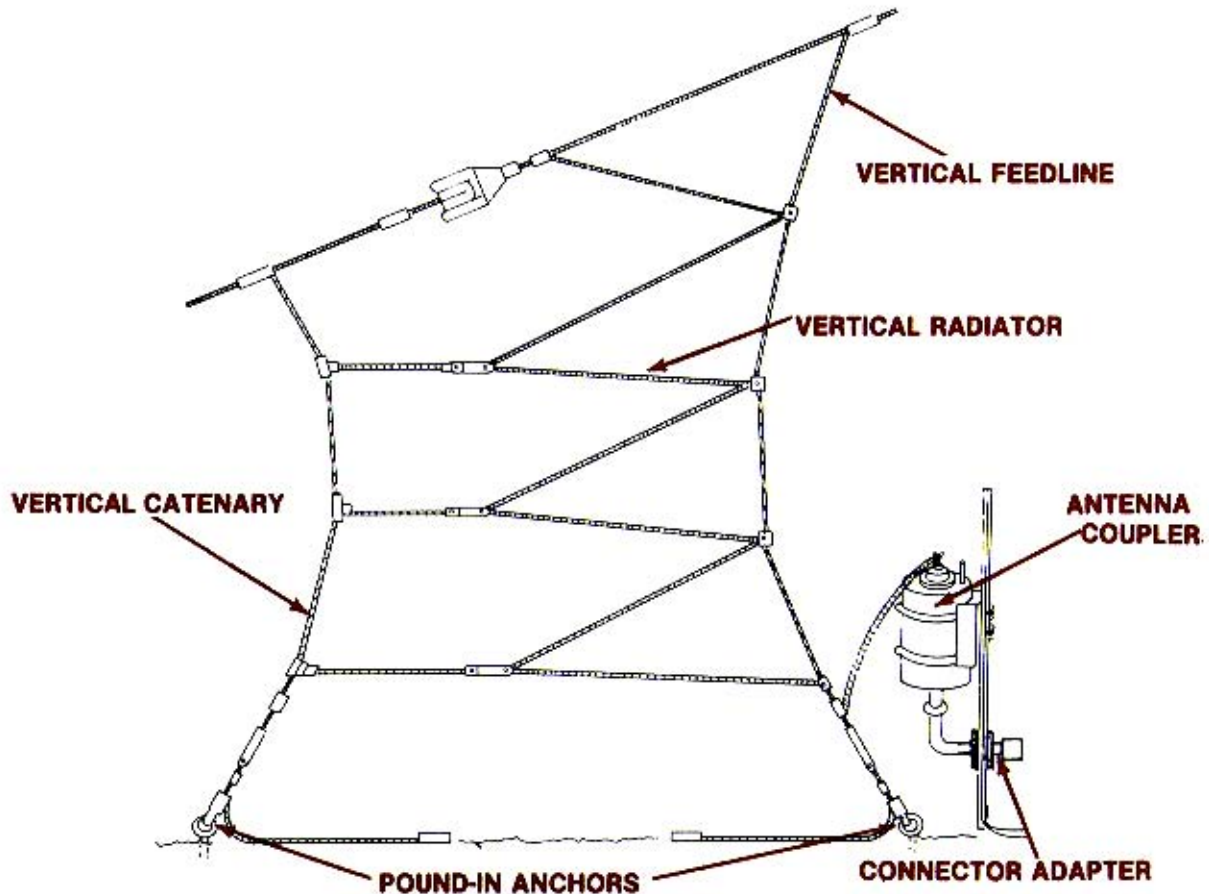
LOWER TOWER GUYS. 3/32-inch diameter steel cables with 1/4-inch diameter rope ends for applying tension to lower portion of tower after erection.

MAIN FEEDLINE. 3/16-inch stainless steel cable running from ground level at the front of the antenna, over the top of the tower, and back to ground level at the rear of the antenna. Supplies the RF signal to each element of the main radiator. Also serves as front and back guy of antenna tower.



BACK RADIATOR GUYS. Electrically insulated ropes for positioning of the back elements of the main radiator in the same fashion as the right and left catenaries.

LIGHT ASSEMBLY. Consists of a 150-foot long source power cable feeding a control box which is in-turn connected to a dual hazard warning light via a three-conductor cable. The tower light assembly is attached to the antenna tower after tower assembly.



VERTICAL FEEDLINE. Small diameter stainless steel wire and rope assembly between main feedline and pound-in anchor in ground. Connects antenna coupler to main feedline and provides RF signal to vertical radiator.

VERTICAL RADIATOR. Small diameter bronze cable connected between the vertical feedline and vertical catenary for RF transmission at the high end of the operating frequency range.

VERTICAL CATENARY. Rope from pound-in anchor at ground to main feedline with electrically insulated drop wires for connection to, and positioning of, vertical radiator.

POUND-IN ANCHORS. For securing and tensioning point of ends of vertical radiator and catenary to ground.

COUPLER, ANTENNA CU-22731TSC-99. Unbalanced matching transformer providing compatibility between nominal 272 ohm impedance of antenna with nominal 50 ohm characteristic of AN/TSC-99 transmitter.

CONNECTOR ADAPTER. Adapts 7/8-inch Electronic Industries Association (EIA) connector of antenna coupler for direct connection to RF output cable of Communications Central AN/TSC-99.

EQUIPMENT DATA

1-9 PERFORMANCE

Frequency Range	2-30 MHz
Polarization	Horizontal
Directive gain over perfect earth	6 dBi at 2 MHz 6 dBi at 3 MHz 8 dBi at 4 MHz 10 dBi at 30 MHz
Azimuthal beamwidth between half-power points	Circular at 2 MHz 110° nominal at 4 MHz 80° nominal at 14 MHz 70° nominal at 30 MHz
Front-to-back ratio (nominal)	5 dB at 4 MHz 11 dB at 30 MHz
Input impedance (unbalanced)	50 ohms nominal
Voltage Standing Wave Ratio (VSWR)	2.0:1 nominal 2.5:1 maximum
RF power rating	3 kW average, 3 kW PEP
Installation Time	
Installation	Crew of 6 in 4 hours
Rotation	Crew of 6 in 1 hour

1-10. WEIGHTS AND DIMENSIONS

READY FOR TRANSIT	MAST CASE	ANTENNA CASE #1	ANTENNA CASE #2
Weight, lbs. (kg)	350 (158.7)	200(90.7)	250 (113.4)
Length, in (cm)	120.8 (306.7)	36.5 (92.6)	36.5 (92.6)
Width, in (cm)	39.5 (100.2)	25.0 (63.4)	25.0 (63.4)
Height, in (cm)	15.8 (40.1)	20.9 (53.0)	20.9 (53.0)
Volume, cu ft (m ³)	30.7 (.87)	9.8 (.28)	9.8 (.28)
INSTALLED			
Length, ft (m)	280 (85.35)		
Width, ft (m)	325 (99.06)		
Height, ft (m)	81 (24.69)		
Terrain Level of mast base	±3 ft (1 m) from level		

**CHAPTER 2
OPERATING INSTRUCTIONS**

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NOTE

Once the antenna has been installed (connected to a transmitter or receiver and supplied with 115 VAC for the tower light assembly,) it becomes a completely passive equipment item from the standpoint of the operator. Once operational, operator interface with the equipment will be restricted to the performance of PMCS tasks addressed in Section II of this chapter.

Section I. DESCRIPTION OF CONTROLS AND INDICATORS AND USE OF INSTALLATION WINCH ASSEMBLIES, ROPE TENSIONERS, AND CABLE CLAMPS

2-1. OPERATOR'S CONTROLS AND INDICATORS

There are no controls, adjustments, or indicators in Antenna Group OE-317/TSC-99.

2-2. INSTALLATION WINCH ASSEMBLIES

Raising the antenna requires the use of three winch assemblies. These three winch assemblies are furnished with the antenna and are described and to be used as follows:

a. TOWER WINCH ASSEMBLY

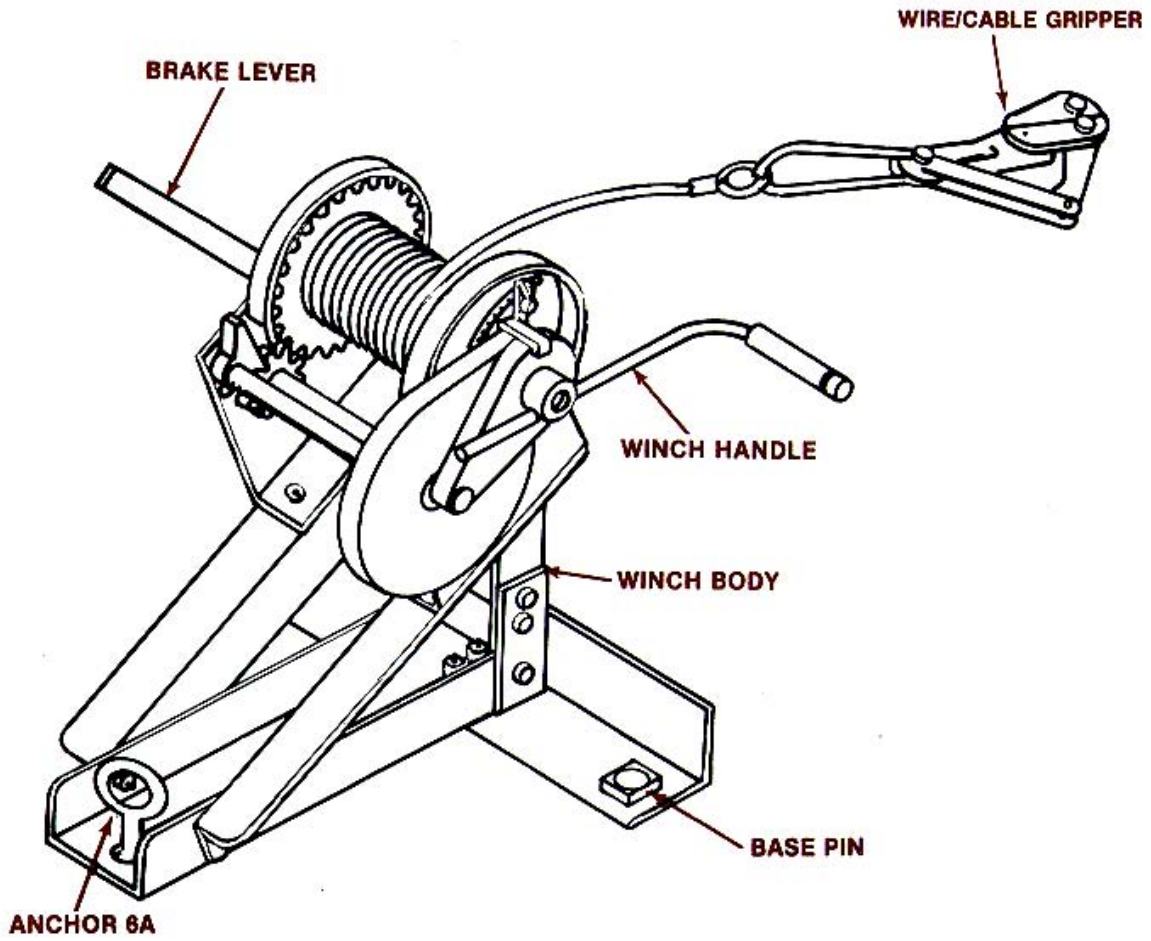
The single tower winch (Winch, Spur Gear 2000 lb.) is attached to a winch stand which is secured to the ground by the eye of a 66-inch anchor (ANCHOR 6A). Operator interface with the winch involves the use of a winch handle for feedout and takeup of the winch cable, a ratchet engage/disengage lever, a hand brake lever which is activated only when pulled and held in position, and a wire/cable gripper on the end of the winch cable for attachment to the stainless steel lifting cable of the antenna.

TO USE

- Take a kneeling position on the crank handle side.
- Move the ratchet lever to disengage the ratchet.
- With another crewmember applying tension to the winch cable, turn winch handle counter-clockwise until enough cable is extended to make wire/cable gripper connection to the lifting cable attached to the antenna.
- Move the ratchet lever to engage the ratchet and turn winch handle clockwise to take up slack in the winch and antenna lifting cables.

NOTE

Refer to paragraph 2-6j for procedure for antenna raising using the tower winch.

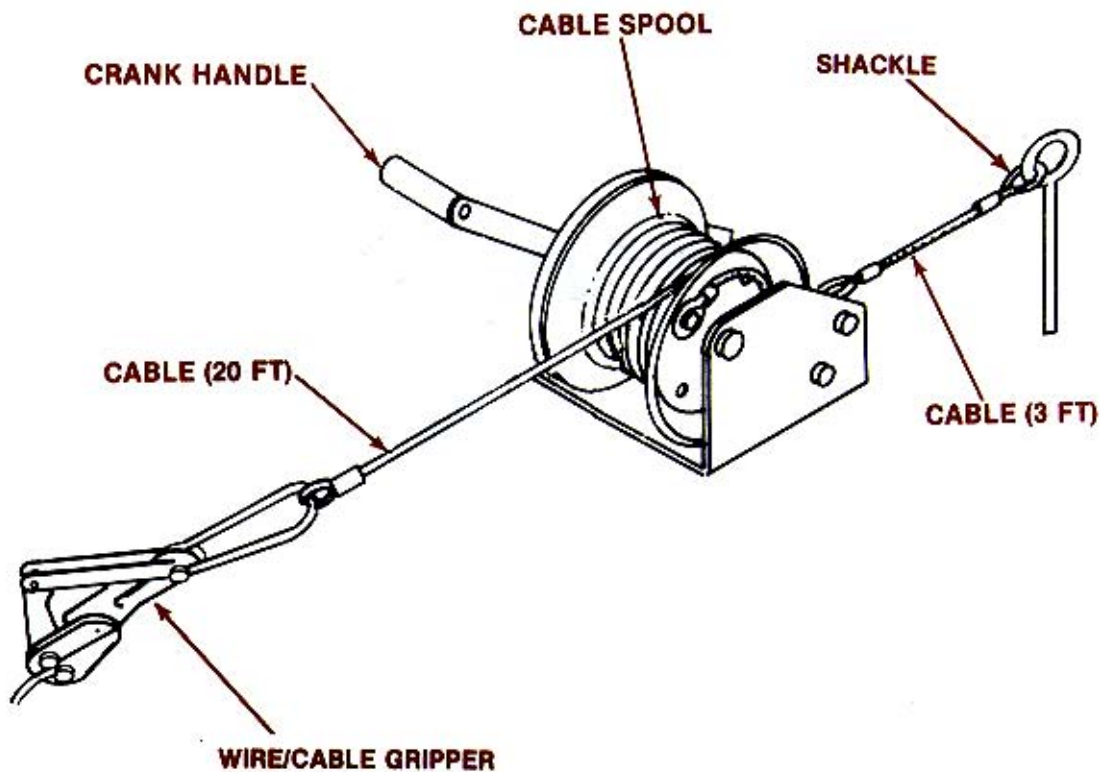


b. MAIN FEEDLINE WINCH ASSEMBLIES

A winch assembly is used at the back end of the main feedline for bringing the tower to its final vertical position and at the front end for final tensioning of the feedline. These two winch assemblies are identical. They are made up of a 3-foot cable attached to the winch body terminated with a shackle for connection to an anchor eye. The winch body itself contains a crank handle and cable spool with a 20-foot long cable terminated with a wire/cable gripper.

TO USE

- Attach the shackle from the winch body to its respective anchor.
- With another crewmember applying tension to the winch cable turn crank handle counterclockwise until enough cable is pulled out to make wire/cable gripper connection to the main feedline.
- Slowly turn the crank handle clockwise to take up slack in the cable and apply tension to the main feedline.



c. WIRE/CABLE GRIPPERS

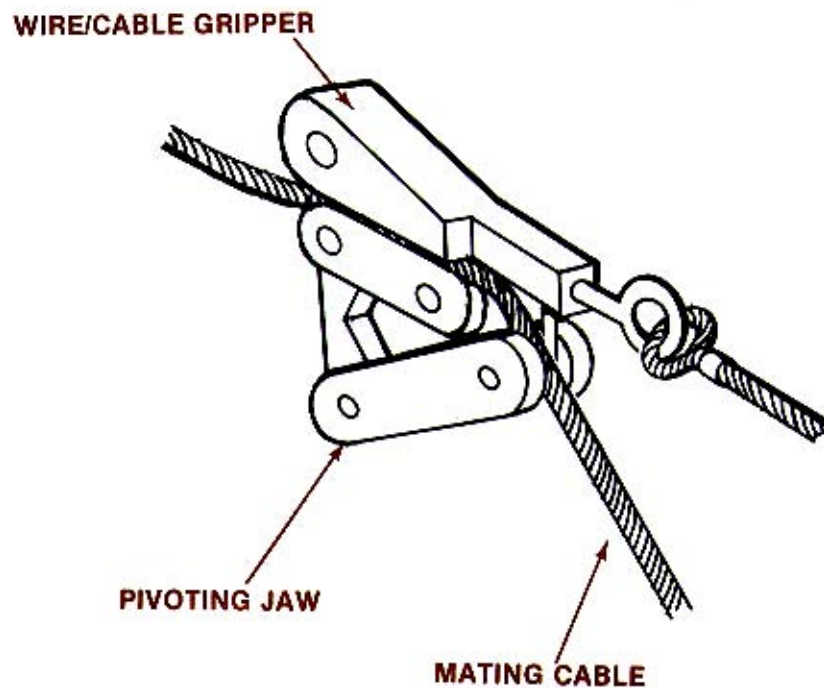
The cables of all three winch assemblies are terminated with the same type wire/cable gripper. The grippers contain jaws which physically clamp onto a mating cable with increased force as tension is applied.

TO USE

- Pull back pivoting jaw and insert mating cable in between pivoting and fixed jaw.
- Allow pivoting jaw to clamp down on mating cable.
- Apply slight tension to mating cable to cause jaws to securely grip mating cable.

NOTE

Refer to paragraph 2-6J for antenna raising procedure using the wire/cable grippers.



d. ROPE TENSIONERS

Tower guys are rope or a combination of steel and rope with the rope end securing to the ground anchor. Each guy has a self-locking rope tensioner at the end for connection to an anchor using a shackle.

TO USE

- Hook the rope tensioner into the shackle.
- Pull the free end of the guy through the rope tensioner until enough tension is achieved in the tower guy.
- Release the free end of the guy.

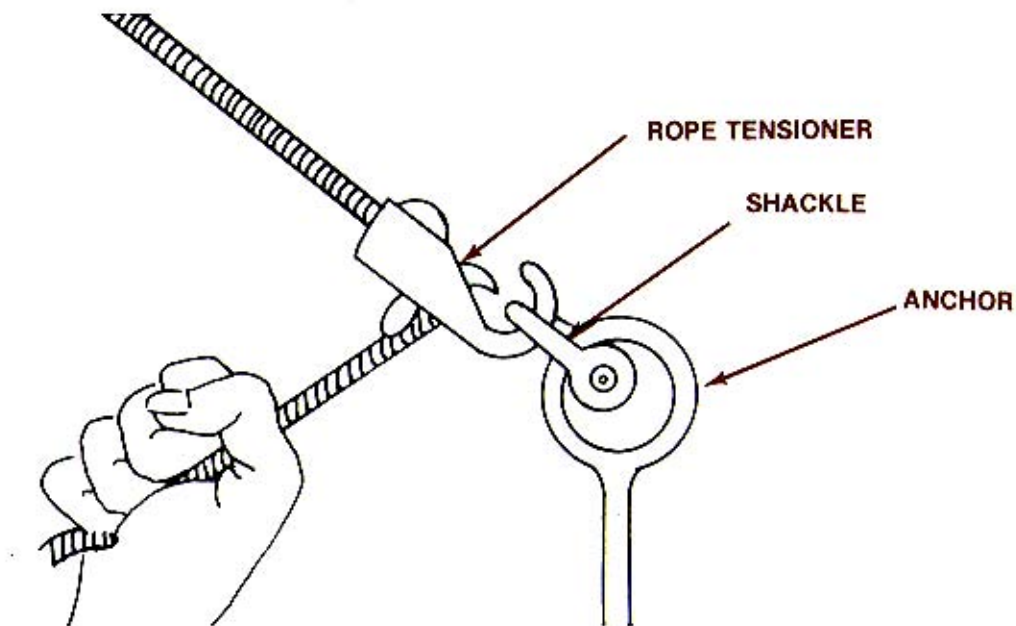
NOTE

The tension in the guy (in combination with friction of the rope riding on a pivot jaw in the body of the rope tensioner) locks the jaws of the rope tensioner.

Jaw design is such that the greater the tension in the guy, the more the jaws grip the rope.

TO DISENGAGE

- Apply tension to free end of rope and lift pivot jaw away from rope passing through the jaw zone.
- Hold the pivot jaw in this position and move rope through the rope tensioner.

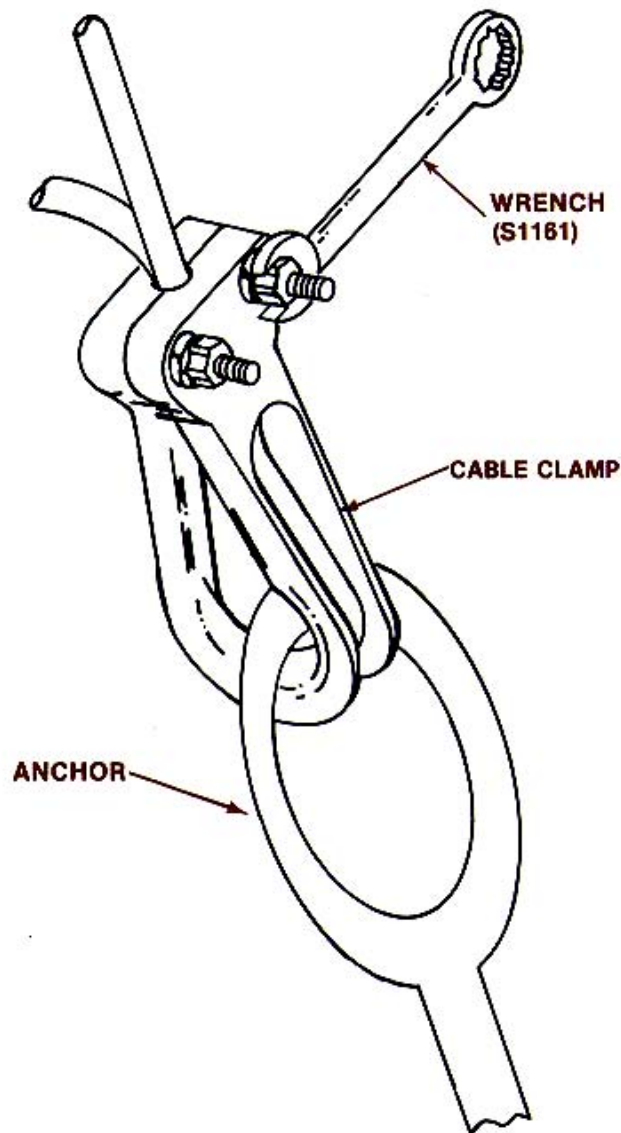


e. CABLE CLAMP

The stainless steel tower guy and both ends of the main feedline are attached to their respective anchors using the cable clamps.

TO USE

- Loosen two nuts on clamp with wrench provided.
- Use the winches to tension the guy and both ends of the main feedline.
- Run free end of guy or feedline through open clamp jaw, around thimble placed in eye of anchor and back through clamp jaw.
- Apply tension to free end of guy or feedline cable.
- Tighten two nuts on clamp to secure cable.



Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES**2-3. ROUTINE CHECKS****GENERAL**

- a. Before you operate, always keep in mind the CAUTIONS and WARNINGS. Perform your before (B) PMCS.
- b. While you operate, always keep in mind the CAUTIONS and WARNINGS. Perform your during (D) PMCS.
- c. After you operate, be sure to perform your after (A) PMCS.

WARNING

Shut down all transmitters and tag "WORKING ON ANTENNA".

Do not work on or in close proximity to the antenna when transmitter power is on. Contact with high RF voltages can be fatal, and electromagnetic radiation can cause severe or fatal internal burns. Particularly dangerous areas are in the vicinity of the antenna coupler and rear radiator ground anchors.

Lower the tower for any detailed inspections or maintenance. Do not climb tower or gin pole, as they are not designed to be climbed. Climbing the tower may cause it to fall resulting in destruction of the tower and serious injury or death to operator/crew.

- d. If it is suspected that the antenna is not operating correctly, visually inspect the antenna for signs of damage. Report any damage or deficiencies using the proper forms, see TM 38-750.

2-4. PREVENTIVE MAINTENANCE**NOTE**

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

Table 2-1. OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES										
B-BEFORE INSTALLATION D-DAILY DURING OPERATION			W-WEEKLY DURING OPERATION M-MONTHLY DURING OPERATION				S-SEMIANNUALLY A-AFTER REMOVAL			
ITEM NO.	INTERVAL						ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/AVAILABLE IF:	
	B	D	A	W	M	S				
1	•	•					Tower Light Assy	Visually check operation each night. Schedule maintenance when and if one of the two bulbs are out.	One or more broken insulations.	
2				•			Tower Guys and Catenaries	Verify for correct tension. tower vertical, Guys TAUT. Retension is required.		
3	•		•	•			Insulators	Visually inspect for broken condition. Schedule maintenance if required.		
WARNING Transmitter must be shut down and tagged "Out of Service"										
4	•		•	•			Antenna Coupler	Visually check weekly and immediately after electrical storm for signs of arcing damage. Clean with a soft cloth if required.		
5	•		•			•	Tower Winch	Apply four to five drops VV-0-526 light weight machine oil in crank shaft "oil" hole. Apply MIL-G-25760 general purpose light grease to face of all gear teeth. Verify ease of cranking. Always clean and lubricate before packing in transit case for relocation or storage.		Inoperable
6	•		•				Antenna Group	After lowering and disassembly of the antenna, inspect all components for signs of wear or damage prior to packing in transit cases. Replace damaged or worn components as required.	Damaged or missing components	

Section III. OPERATION UNDER USUAL CONDITIONS

2-5. GENERAL

Operation, for this section, is defined as including any of the following:

- Site selection and layout for a planned direction of radiation (beam).
- Anchor placement, assembly and erection of the antenna by a crew of six.
- Daily checks performed by the operator on an installed antenna.
- Site layout for a secondary direction of radiation (beam).
- Secondary anchor placement and antenna curtain rotation by a crew of six.
- Temporary lowering and erection of the antenna for required maintenance actions by a crew of six.
- Lowering, disassembly, recovery of anchors, and packaging of the antenna in transit
- cases by a crew of six for relocating or returning the antenna to storage.

In the performance of all procedures contained within this section, the operator and crew must be familiar with and adhere to all listed WARNINGS and CAUTIONS.

2-6. ASSEMBLY AND PREPARATION FOR USE

NOTE

Steps for site layout, anchor installation, mast and curtain assembly, and erection of the antenna are presented in a serial fashion. Since the crew consists of six including the crew chief, a number of these steps can be performed at the same time (directed by the crew chief).

a. SITING AND INSTALLATION

The antenna is made to be installed over various types of terrain. In general, the level of all anchors should be within ± 3 ft (1 m) of the level of the mast base (the flatter the site, the better). Installation is easier if the terrain does not contain obstructions such as large rocks, trees or large bushes, etc. In selecting the site, comply with the following:

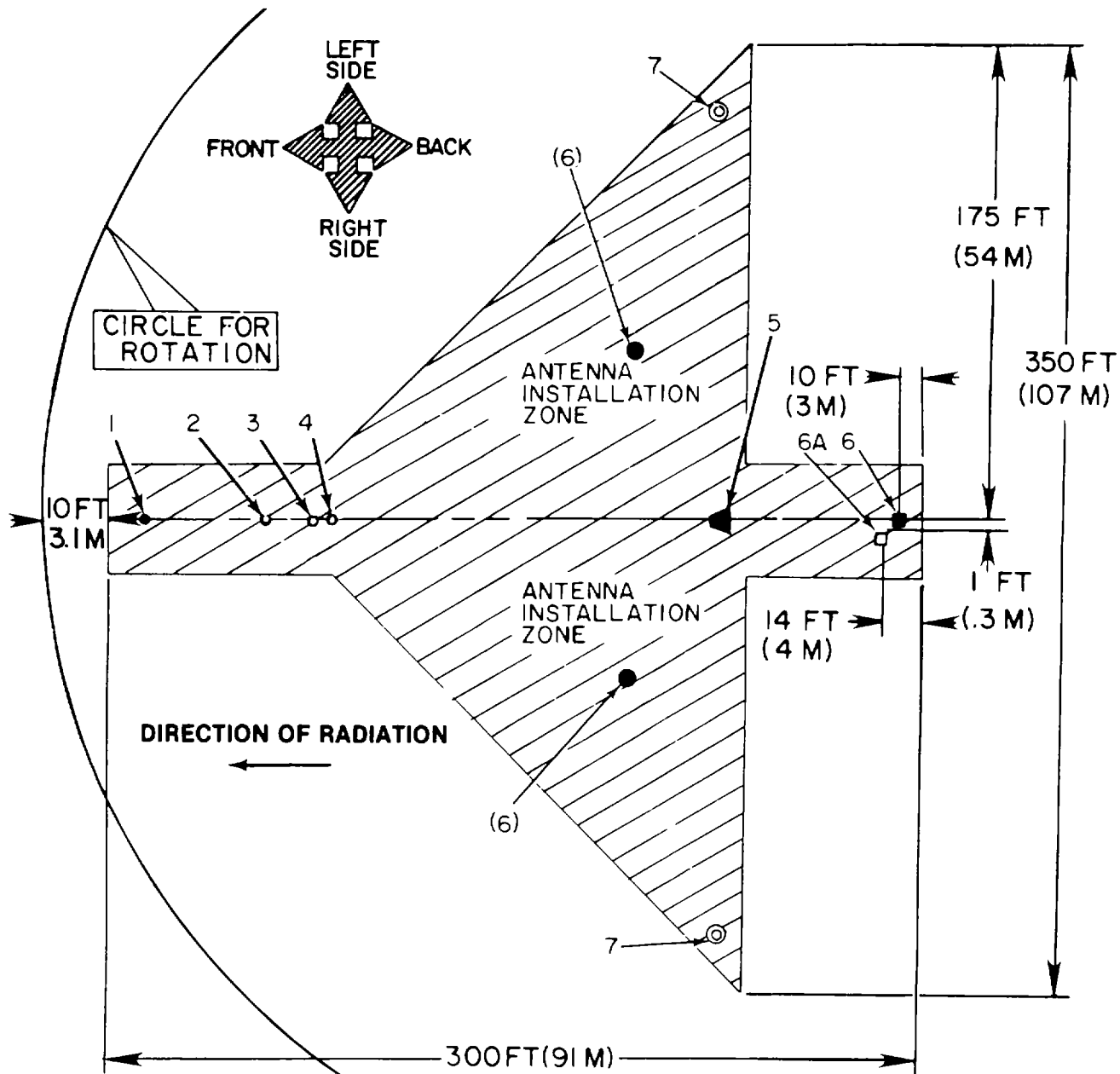
- Co-located antennas should be at least 500 ft (152.40 m) apart measured from the mast bases.
- Adjacent antennas should not directly face into each other's direction of radiation (beam), or radiation characteristics will be highly distorted.
- Nearby horizontal wires (power lines, etc.) running 20 ft (6.10 m) in length and 8 ft (2.44 m) or more above ground level should be at least 325 ft (99.06 m) away from the front end (anchor 1) of the antenna structure.

b. SITE SELECTION AND PREPARATION

NOTE

All references in this manual to right and left, or right side and left side, assume that you are standing at the front of the antenna (ANCHOR 1) looking toward the back (ANCHOR 6).

- 1 66-INCH ANCHOR
- 2 REFERENCE POINT
- 3 CLAMP ON CENTER LAYOUT WIRE
- 4 CLAMP ON CENTER LAYOUT WIRE
- ◀ 5 TOWER BASE
- 6 66-INCH ANCHOR
- 6A 66-INCH ANCHOR (TWR WINCH)
- (6) INSIDE 30-INCH ANCHORS
- ⊙ 7 OUTSIDE 30-INCH ANCHORS



Antenna installation time can be reduced if the crew of six undertakes tasks during the site layout phase as follows:

- (1) crew chief aided by two crew members for anchor locations using the layout wires.
- (2) two crew members for anchor placement.
- (3) one crew member for moving antenna components from transit cases to their location of use on the antenna site.

Select and prepare site as follows

- Step off an installation site measuring a minimum of 300 ft (91 m) long (parallel to direction of radiation by 350 ft (107 m) wide.

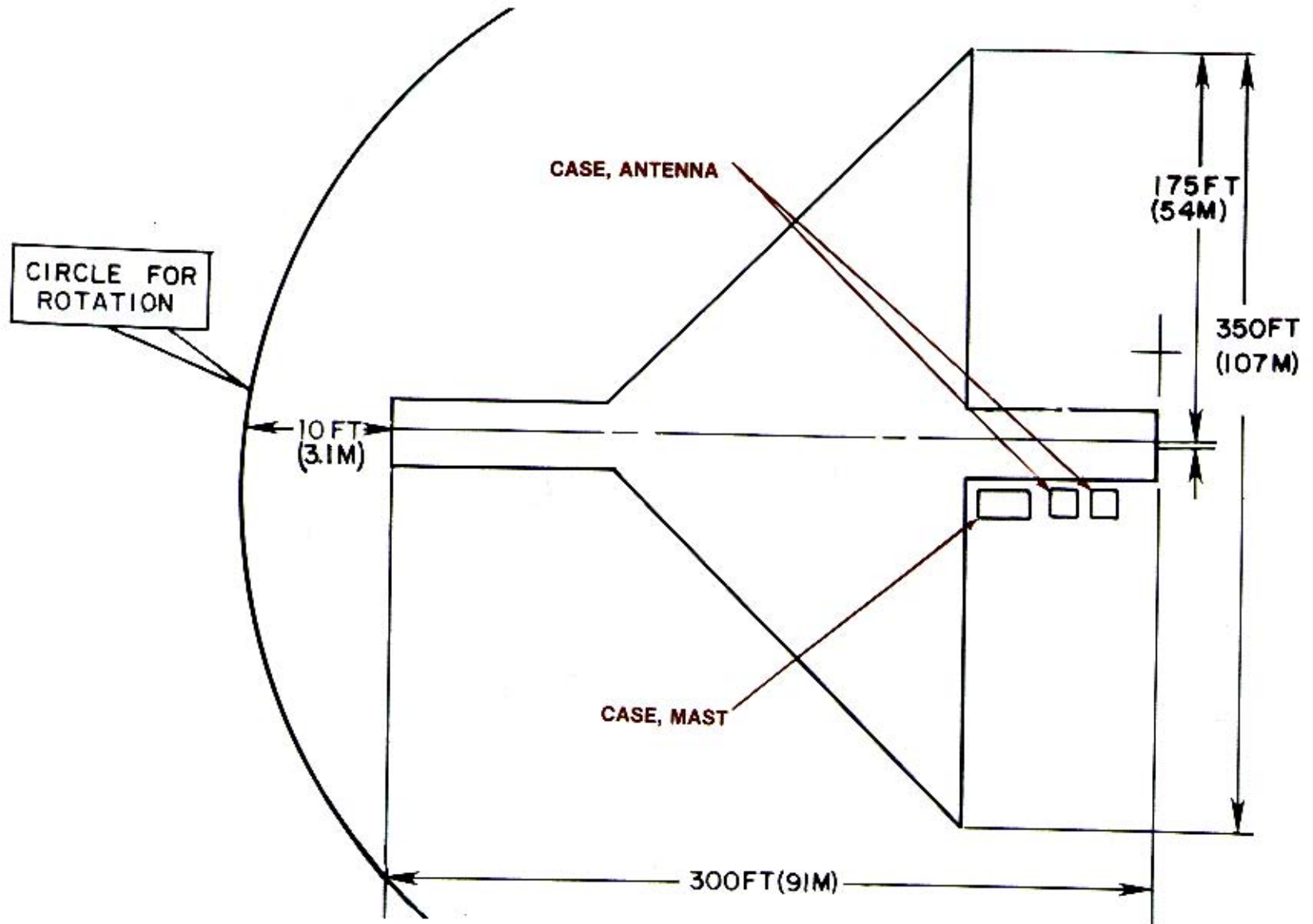
NOTE

(If changes in the direction of radiation (beam) can be expected, increase size of site to allow for a minimum 210 ft (64 m) radius for rotation of the antenna curtain around the mast base).

- Clear site of small trees and brush to that extent possible with available equipment.
- Place unopened transit cases outside of the antenna installation zone, half way between expected location of mast base and ANCHOR 6.
- Select and mark location for installation of back anchor (ANCHOR 6).
- From anchor location 6, mark a second anchor location point four feet (1.2 m) towards the front of antenna installation zone and one foot (.3 m) on the right side. Designate this anchor location point 6A.

NOTE

The three transit cases contain items necessary for erection and operation of the antenna. Inspect all items for damage as they are removed from their respective transit cases. The RL-31 (*) reeling machine and RL-27(*) removable axle must be procured from normal supply channels.

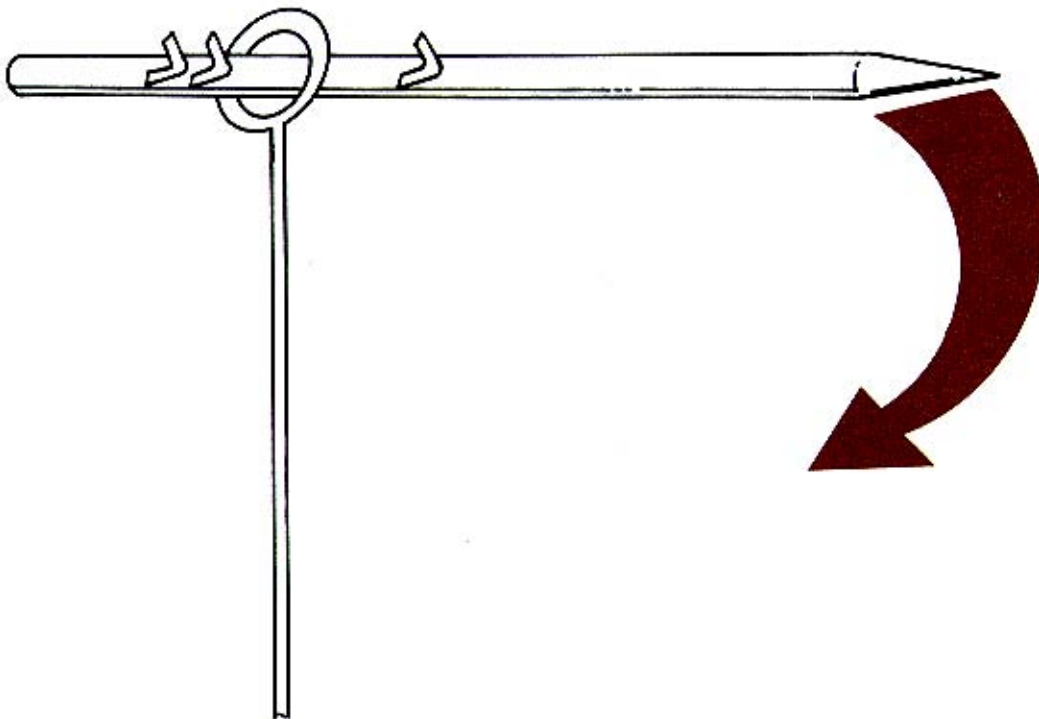


- Remove covers from transit cases and select two 66 inch anchors, one antenna coupler bar and shovel/pick. Carry to location selected for installation of ANCHOR 6.
- At the chosen location dig a starter hole 12 to 18 inches (30.48 to 45.72 cm) deep with the shovel/pick and place one of the 66 inch anchors in the hole.

CAUTION

When installing anchor, use extreme care not to bend antenna coupler bar.

- Place antenna coupler bar through anchor eye. Using two crewmembers exert a downward pressure on the bar and rotate clockwise until anchor eye is a maximum of 1.5 feet (.46 m) above ground level.



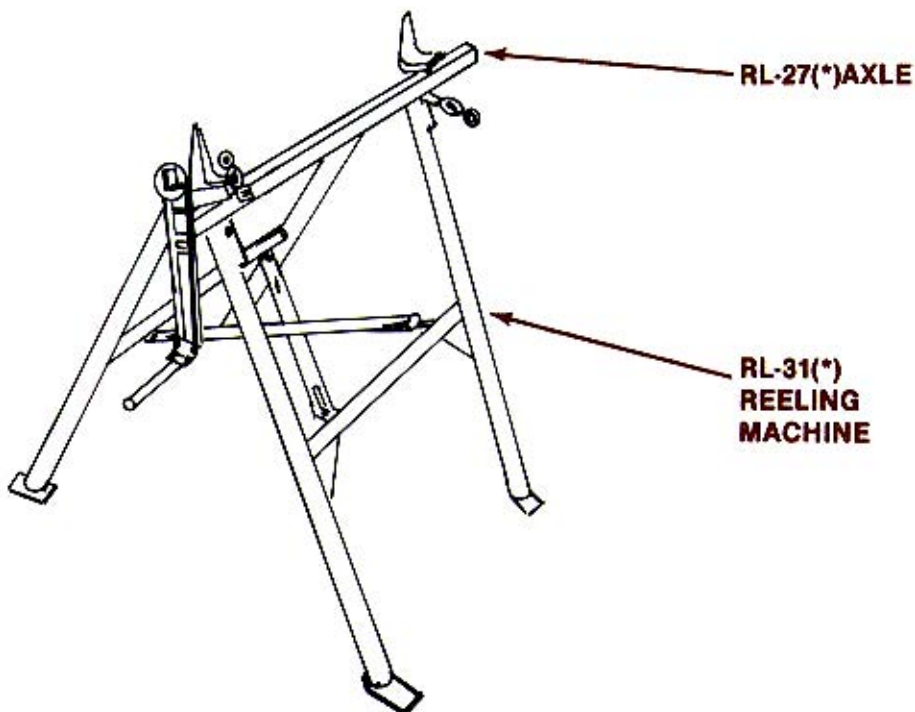
- Move to anchor location 6A and install second 66 inch anchor using the method described above, until anchor eye is a maximum of two inches above ground level.
- Return shovel/pick to transit case.

c. LOCATING ANCHOR POSITIONS AND TOWER BASE

Locating the positions for the single front anchor (ANCHOR 1), two anchors (ANCHOR (6) and 7) on each side and tower base is done by using the CENTER, BACK and SIDE LAYOUT WIRES contained on REEL NO. 4. Unreeling of the center and back layout wires is done by using a RL-31-(*) reeling machine with removable axle RL-27-(*). Positioning of the side layout wire requires the axle to be removed from the reeling machine and hand carried by two crewmembers with the wire unreeled as you walk from point to point.

NOTE

The RL-31-(*) reeling machine and RL-27-(*) axle must be procured from normal supply channels.



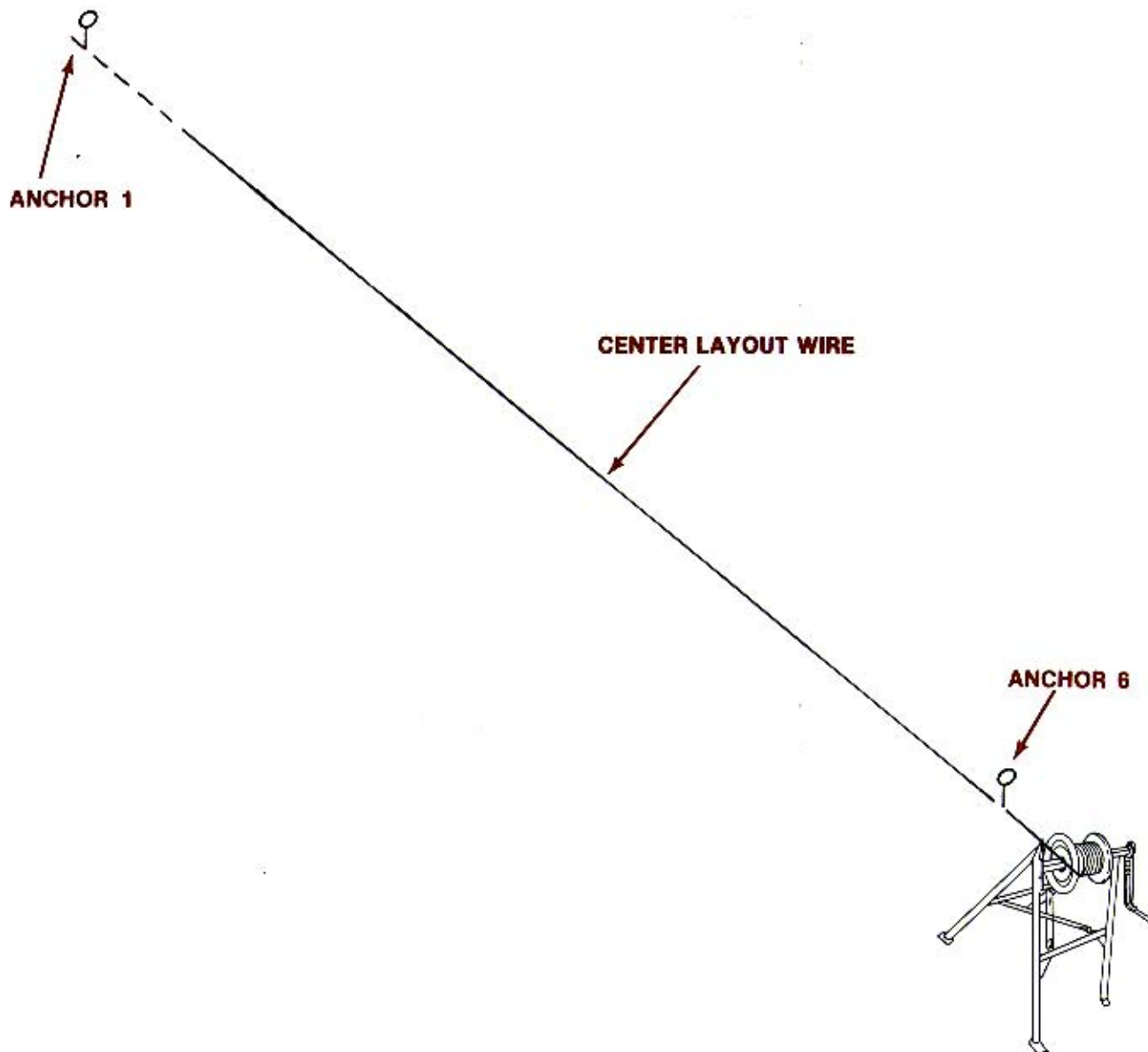
(1) ANCHOR 1 AND TOWER BASE.

Use CENTER LAYOUT WIRE to locate ANCHOR 1 and TOWER BASE as follows:

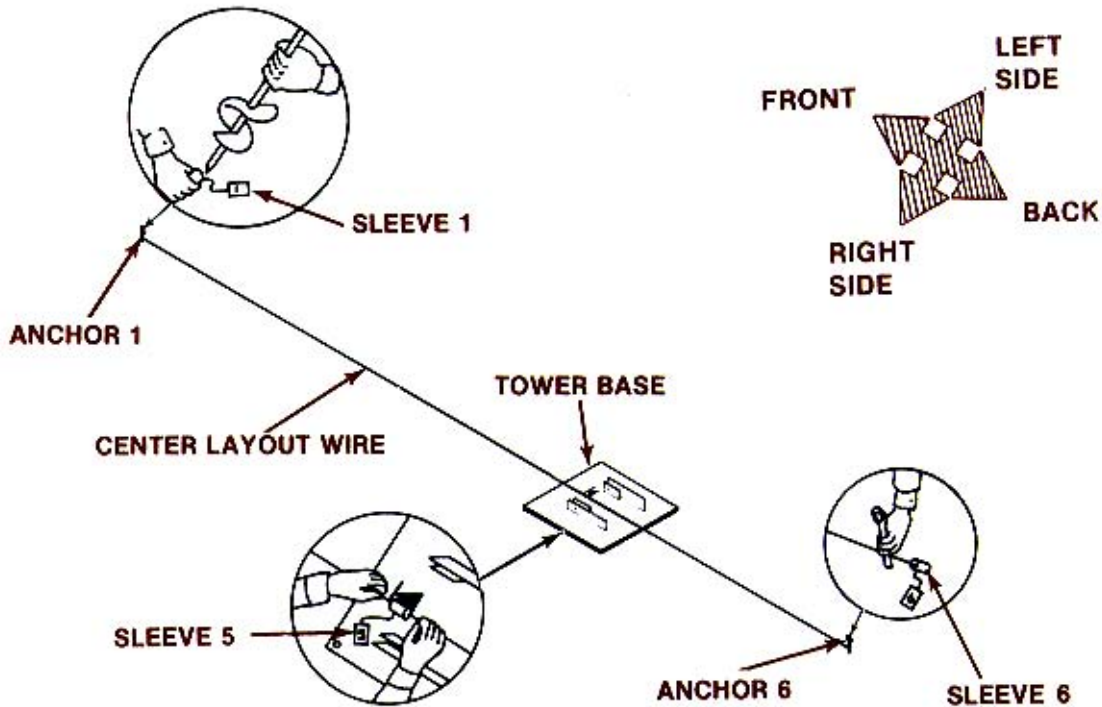
NOTE

When unreeling center layout wire, carry one 66 inch anchor with you to use point of anchor to mark anchor location for crewmembers assigned to anchor installation.

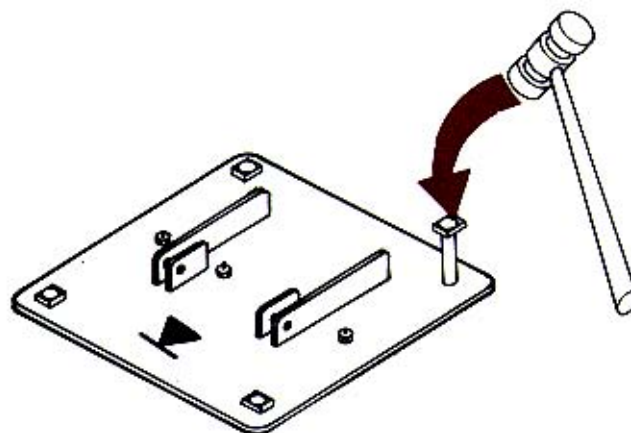
- Remove REEL NO. 4 from antenna transit case and with reel on ground, insert AXLE RL-27-(*) through hub of reel.
- Position reeling machine 6 ft. (2 m) behind ANCHOR 6. Place axle with REEL NO. 4 on machine.
- Unreel CENTER LAYOUT WIRE in the planned direction of radiation (toward the front) of the antenna until completely off reel.



- Hand tension the center LAYOUT WIRE from ANCHOR 6 to anchor position 1 with one crewmember at each end (holding SLEEVES with marker tags 6 and 1).
- At SLEEVE with marker tag 1, insert point of 66 inch anchor into ground for follow-up installation by assigned crewmembers.
- Two crewmembers hold tension on CENTER LAYOUT WIRE.
- Third crewmember positions the TOWER BASE, aligning SLEEVE (with marker tag 5) on CENTER LAYOUT WIRE with line and arrowhead on base.



- Using hammer drive four TOWER BASE PINS into the ground until all four pin heads are securely against the top of tower base.



(2) ANCHOR POSITION 7 (RIGHT AND LEFT SIDES)

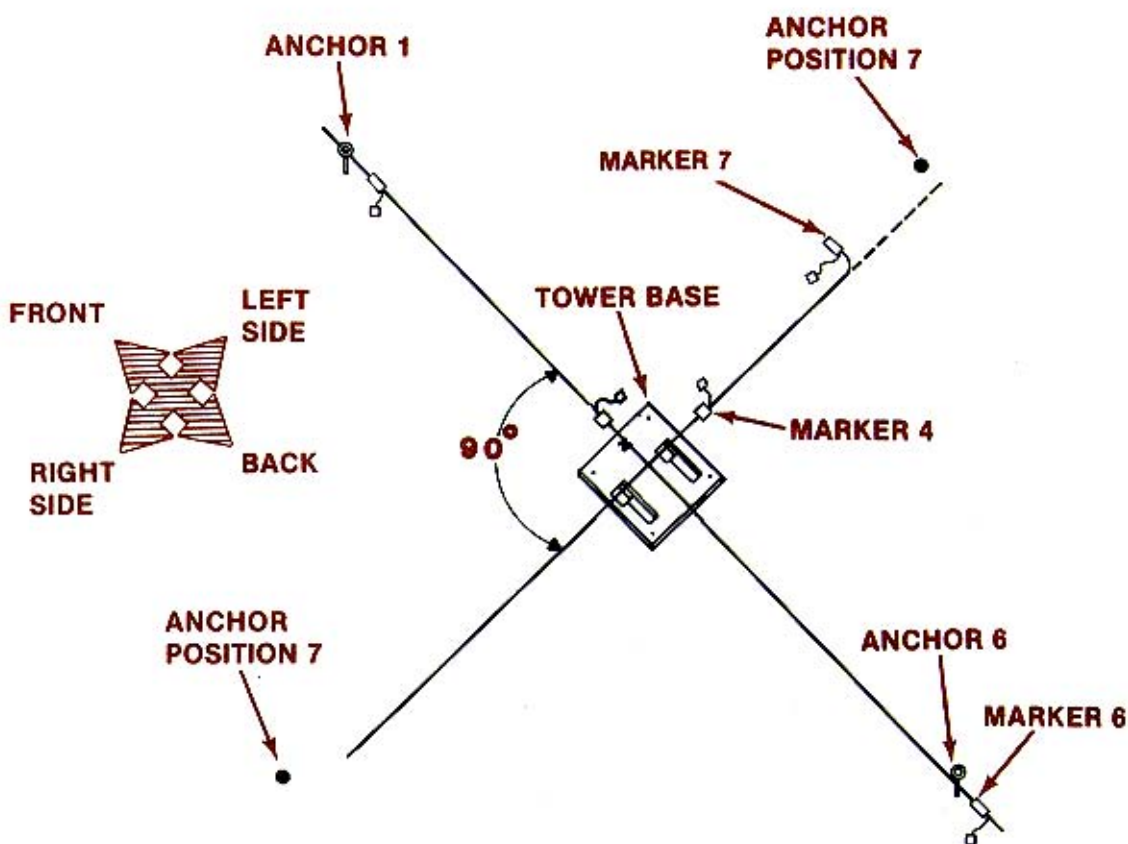
To locate position for right and left anchors using the BACK LAYOUT WIRE and SIDE LAYOUT WIRE (next two wires on REEL NO. 4) proceed as follows:

- Two crewmembers move reeling machine with REEL NO. 4 from behind ANCHOR 6 to RIGHT ANCHOR POSITION 7.

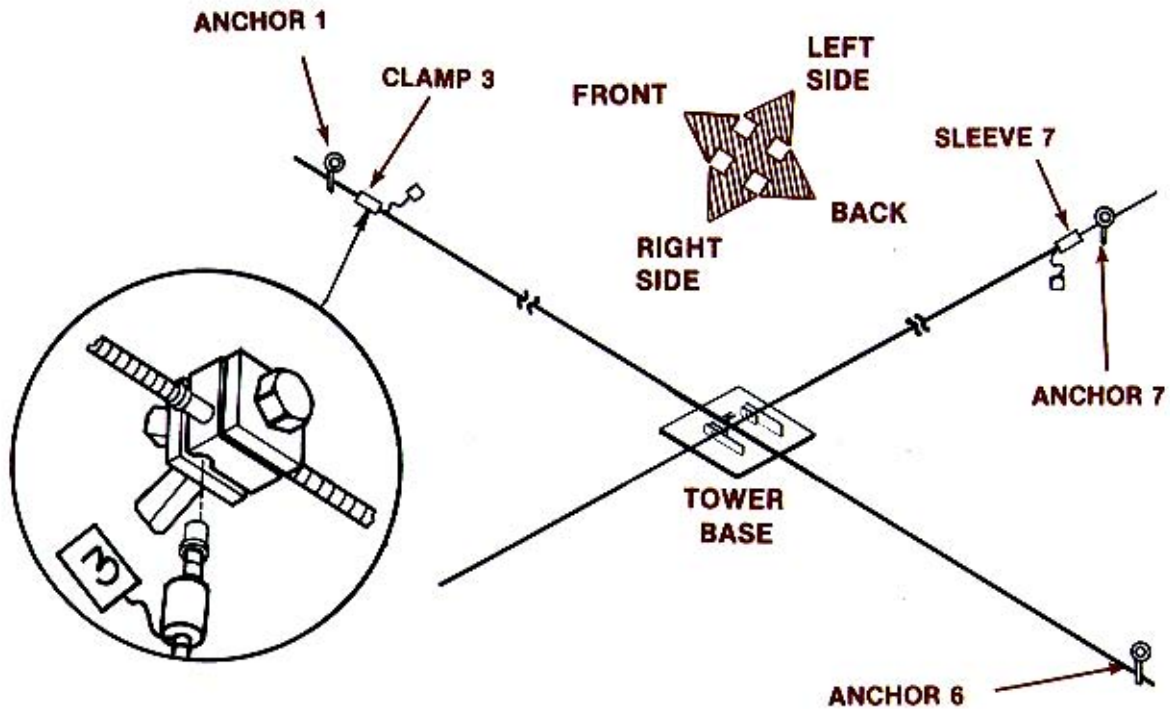
NOTE

RIGHT and LEFT ANCHOR POSITIONS are approximately 90 degrees and 175 feet (54 m) from the tower base.

- With one crewmember remaining at reeling machine, take the SLEEVE with marker tag 7 and walk directly toward the TOWER BASE.
- Walk 175 feet (54 m) past the TOWER BASE until the BACK LAYOUT WIRE is free of reel.
- With third crewmember at TOWER BASE, other two crewmembers move the BACK LAYOUT WIRE side to side until SLEEVE with marker tag 4 lines up with TOWER BASE centerline.



- Once alined, leave wire on the ground and return to reeling machine. Attending crewmember at reeling machine holds SLEEVE with marker tag 7.
- Two crewmembers remove axle with REEL NO. 4 and walk toward clamp 3 on the CENTER LAYOUT WIRE until SLEEVE with marker tag 3 is free of reel.

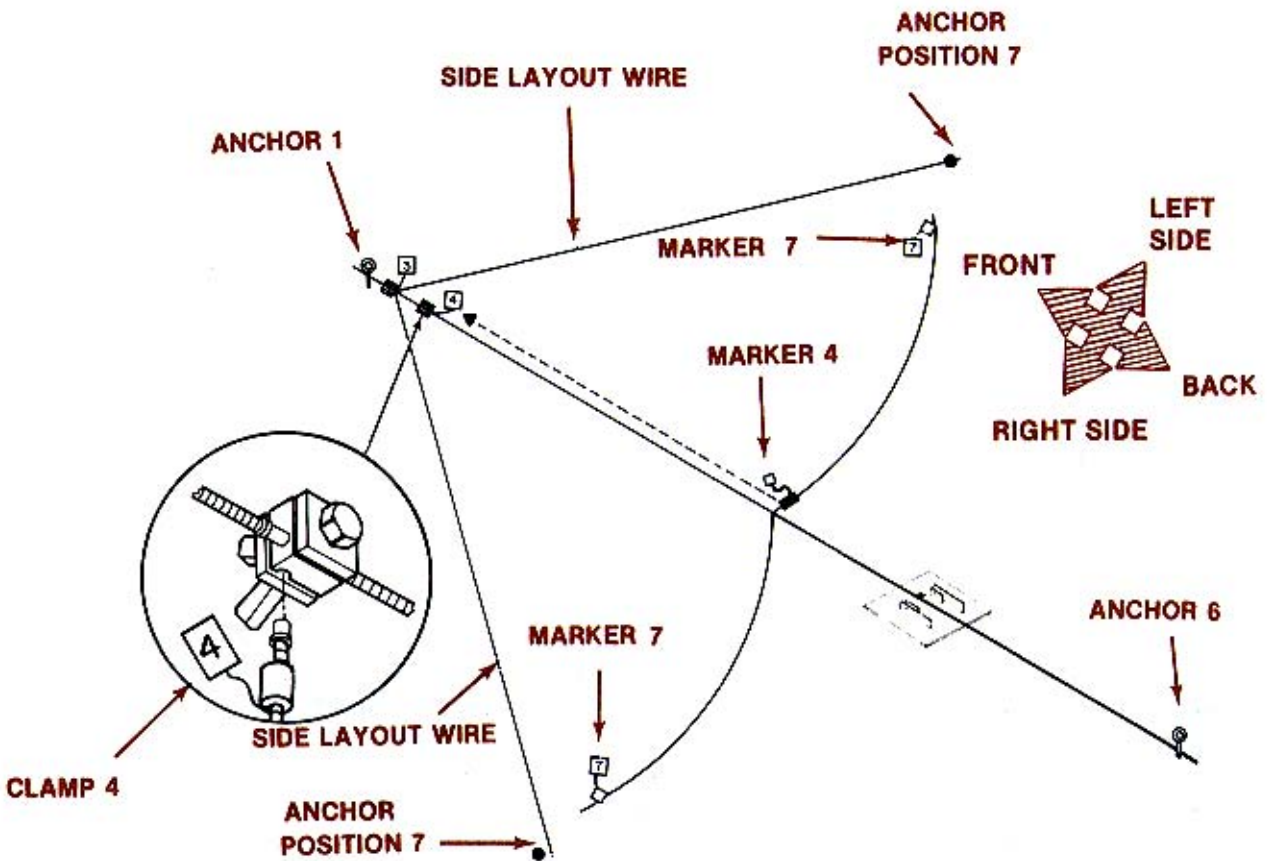


- Insert SLEEVE with marker tag 3 into CLAMP 3. Tighten clamp wingnut securely.
- Crewmember from reeling machine moves to CLAMP 3 on CENTER LAYOUT WIRE and holds it in position.
- Two crewmembers with axle walk to SLEEVE with marker tag 7 at left end of BACK LAYOUT WIRE until SIDE LAYOUT WIRE is free of reel.
- Return empty REEL NO. 4 to antenna transit case and obtain two 30 inch anchors.
- Position one crewmember at CLAMP 3, and one at the TOWER BASE to hold wires in position.
- Apply tension to left side ends of the SIDE and BACK LAYOUT WIRES to form a triangle.
- With one 30 inch anchor mark point where the ends (SIDE and BACK LAYOUT WIRES) with marker tag 7 meet. Leave anchor for later installation (LEFT SIDE ANCHOR 7).
- Proceed to right side ends (SLEEVE with marker tag 7) of SIDE and BACK LAYOUT WIRES and mark point with other 30 inch anchor for later installation (RIGHT SIDE ANCHOR 7).

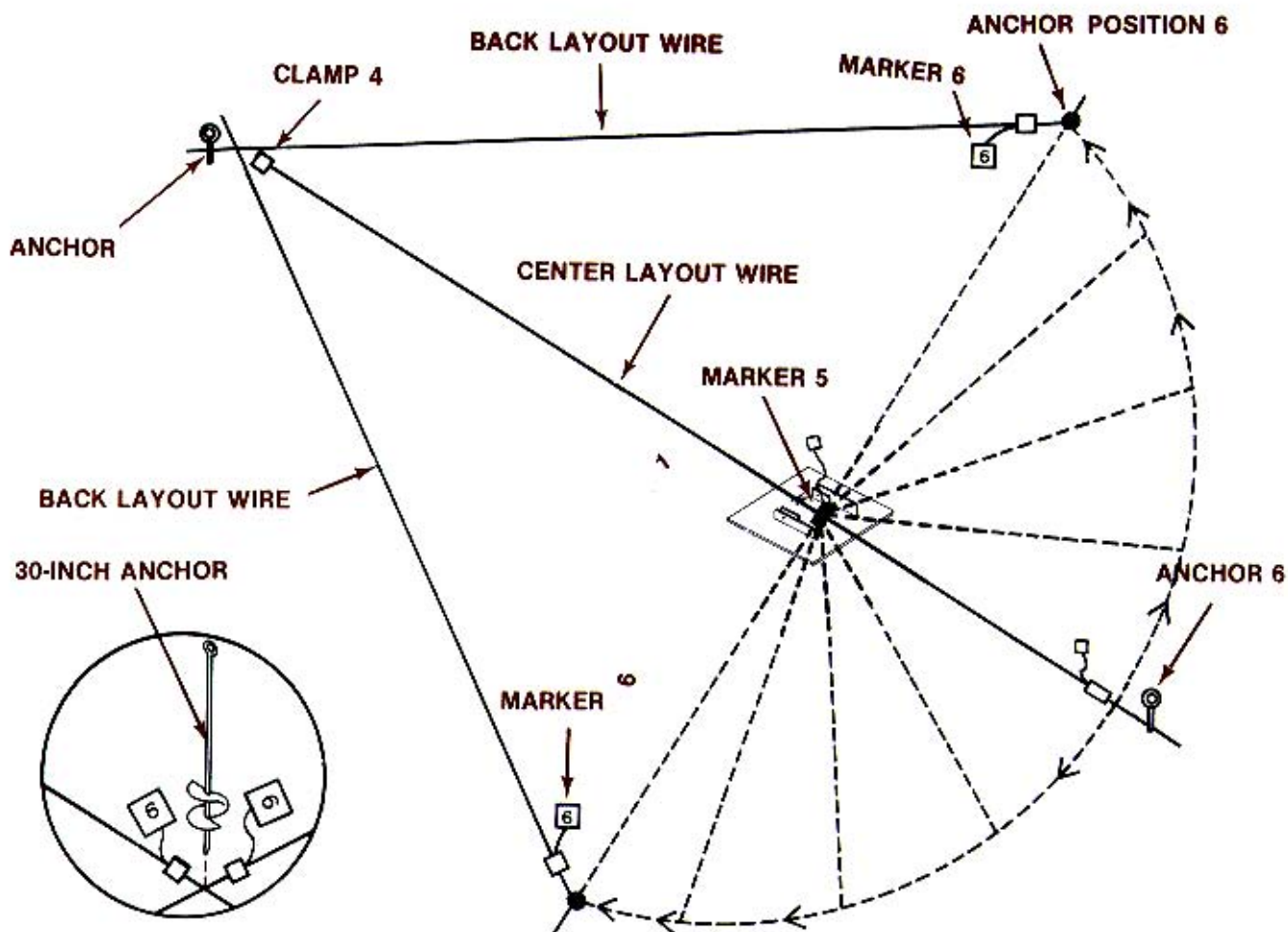
(3) ANCHOR (6) (RIGHT AND LEFT SIDES)

To locate position for right and left anchors using the BACK and CENTER LAYOUT WIRES proceed as follows:

- With a crewmember at each end of the BACK LAYOUT WIRES (marker tag 7), third crewmember picks up SLEEVE with marker tag 4.
- Walk toward ANCHOR 1 (allowing the BACK LAYOUT WIRE to form a "V") until CLAMP NO. 4 is reached on CENTER LAYOUT WIRE.
- Insert SLEEVE with marker tag 4 into CLAMP NO. 4.
- Tighten CLAMP wingnut securely.



- One crewmember remains at CLAMP NO. 4 to hold wire in place.
- Second crewmember proceeds to TOWER BASE to hold SLEEVE with marker tag 5 on arrowhead as pivot point.
- Third crewmember obtains two 30 inch anchors from transit case and proceeds to ANCHOR 6.



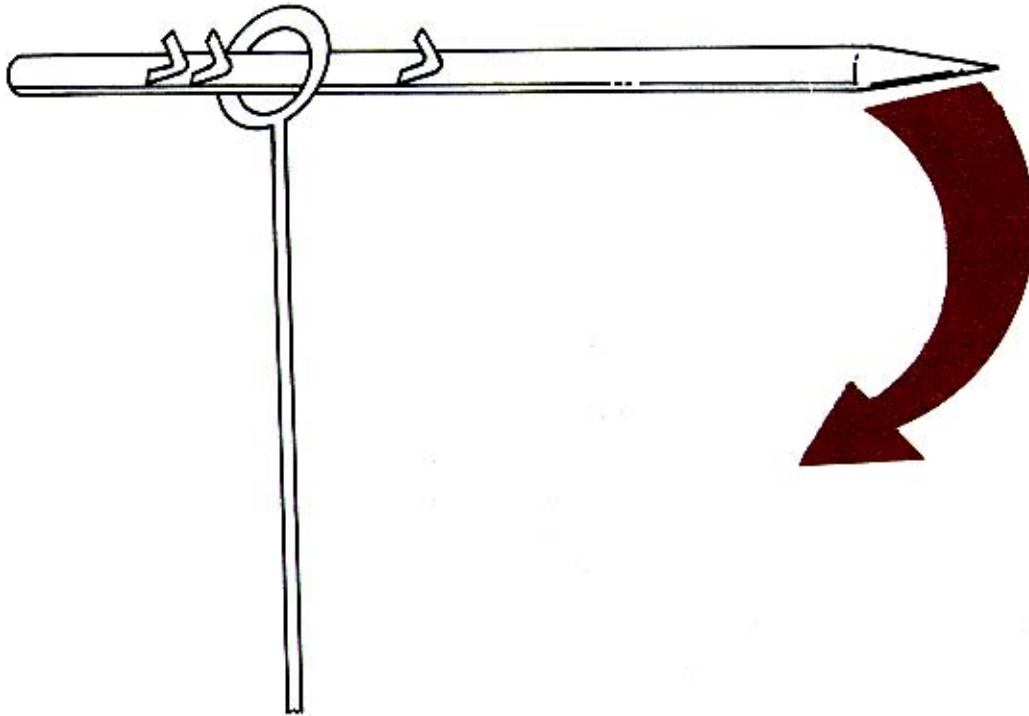
- Third crewmember takes the end of CENTER LAYOUT WIRE (at SLEEVE with marker tag 6), one 30 inch anchor and walks counterclockwise to SLEEVE with marker tag 6 on BACK LAYOUT WIRE.
- Holding both SLEEVES together, hand tension wires to form a triangle.
- Insert point of anchor (at intersection of SLEEVES) into ground to mark location for LEFT SIDE ANCHOR (6).
- Leave 30 inch anchor, proceed clockwise with end of CENTER LAYOUT WIRE (SLEEVE with marker tag 6) and pick up other 30 inch anchor.
- Walk to SLEEVE with marker tag 6 on BACK LAYOUT WIRE.
- Holding both SLEEVES together, hand tension wires to form a triangle.
- Insert point of anchor (at intersection of SLEEVES) into ground to mark location for RIGHT SIDE ANCHOR (6).
- Leave 30 inch anchor, return CENTER LAYOUT WIRE to its original position (straight line between ANCHOR 1 and 6).
- Obtain shovel/pick and antenna coupler bar from antenna transit cases and install the four 30 inch anchors as follows:

- Using the hole made by the point of the anchor implanted during layout, dig a starter hole 4 inches (10.2 cm) to 8 inches (20.3 cm) deep with the shovel/pick and place one of the 30 inch anchors in the hole.

CAUTION

When installing anchor, use extreme care not to bend antenna coupler bar.

- Place antenna coupler bar through anchor eye. Using two crewmembers exert a downward pressure on the bar and rotate clockwise until anchor eye is a maximum of 1 ft. (.3 m) above ground level.

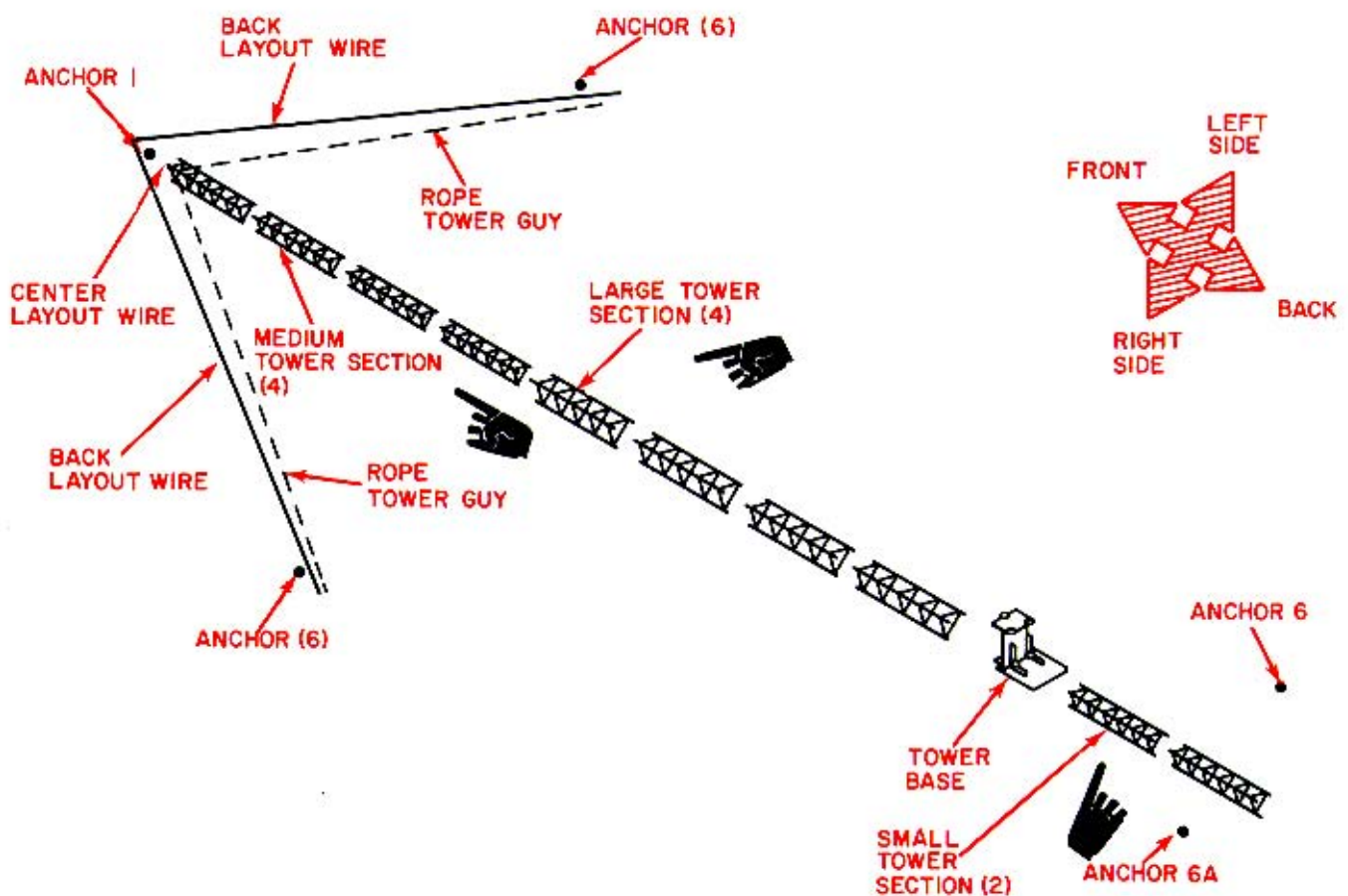


d. PREPARATION FOR ASSEMBLY OF SECTIONS

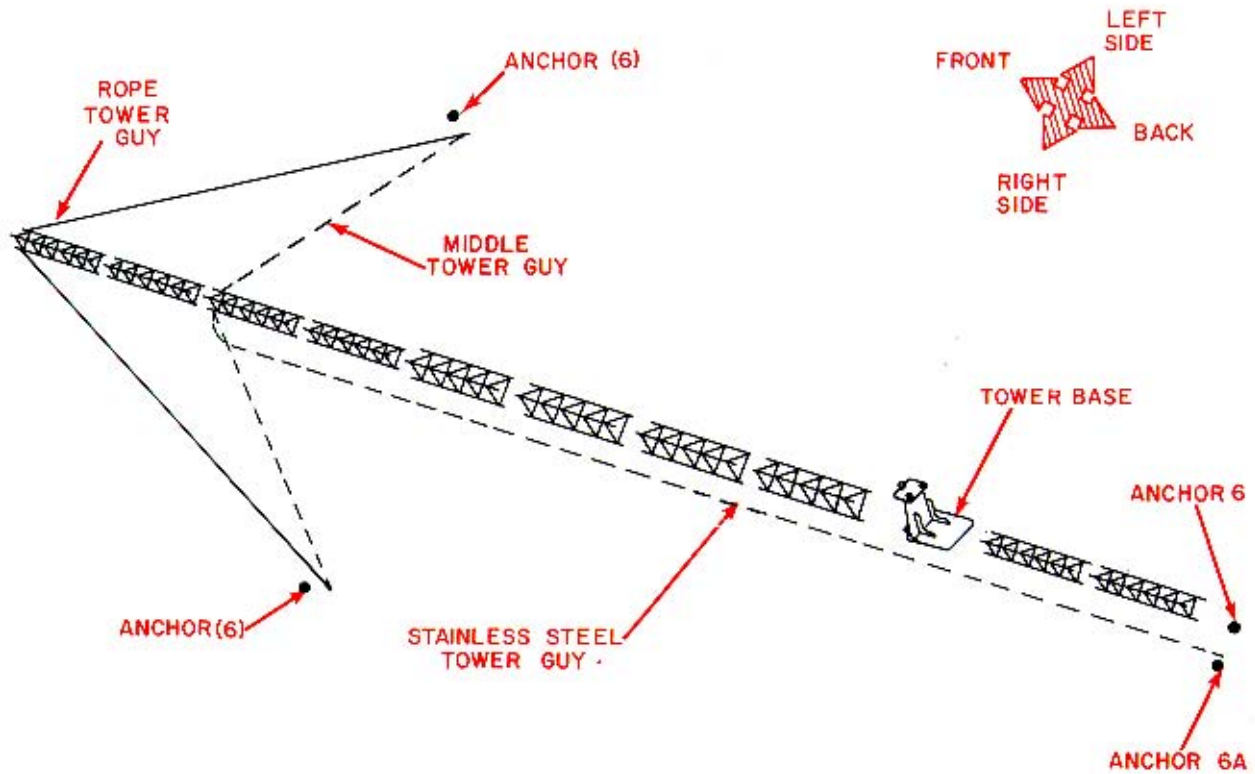
Assembly of both the TOWER and GIN POLE is done by two crewmembers working together. Since all tower and gin pole section legs are the same size, standard TOWER SPLICES are used for the assembly. Proceed as follows:

- From mast transit case, remove the four LARGE TOWER SECTIONS and place end to end alongside CENTER LAYOUT WIRE from TOWER BASE towards ANCHOR 1.
- From mast transit case, remove the four MEDIUM TOWER SECTIONS and place end to end alongside CENTER LAYOUT WIRE from end of last LARGE TOWER SECTION towards ANCHOR 1.
- From mast transit case, remove the two SMALL TOWER SECTIONS and place end to end alongside CENTER LAYOUT WIRE from TOWER BASE towards ANCHOR 6.
- From antenna transit case, remove TOWER/GIN POLE BASE, two HINGE PINS, two RETAINING PINS and carry to TOWER BASE.
- With legs on the TOWER/GIN POLE BASE facing toward ANCHOR 1 align holes in base with holes in TOWER BASE, insert both HINGE PINS from inside to outside.

- From antenna transit case obtain GIN POLE TOP PLATE, TOWER TRANSITION PLATE, TOWER TOP PLATE, and 12 TOWER SPLICES. Distribute selected items by placing on ground next to section joints as follows:
 - a. GIN POLE TOP PLATE and three TOWER SPLICES at end of second SMALL TOWER SECTION nearest ANCHOR POSITION 6.
 - b. TOWER TRANSITION PLATE and six TOWER SPLICES between last LARGE TOWER SECTION and first MEDIUM TOWER SECTION.
 - c. TOWER TOP PLATE and three TOWER SPLICES at end of fourth MEDIUM TOWER SECTION nearest ANCHOR POSITION 1.
- From antenna transit case obtain the remaining 27 TOWER SPLICES, place three at each tower section joint and six at the TOWER BASE.
- From antenna transit case, remove REEL NO. 1. With reel on ground, insert axle RL-27-(*).
- Position reeling machine at end of the lost MEDIUM TOWER SECTION nearest ANCHOR 1 in direction of right side ANCHOR (6). Place axle with REEL NO. 1 on reeling machine.
- With one crewmember attending reeling machine other crewmember carries end of top ROPE TOWER GUY (right side) towards ANCHOR (6) until completely off reel.
- Rotate reeling machine 120 degrees counterclockwise in direction of left side ANCHOR (6) and repeat above step for left side ROPE TOWER GUY.

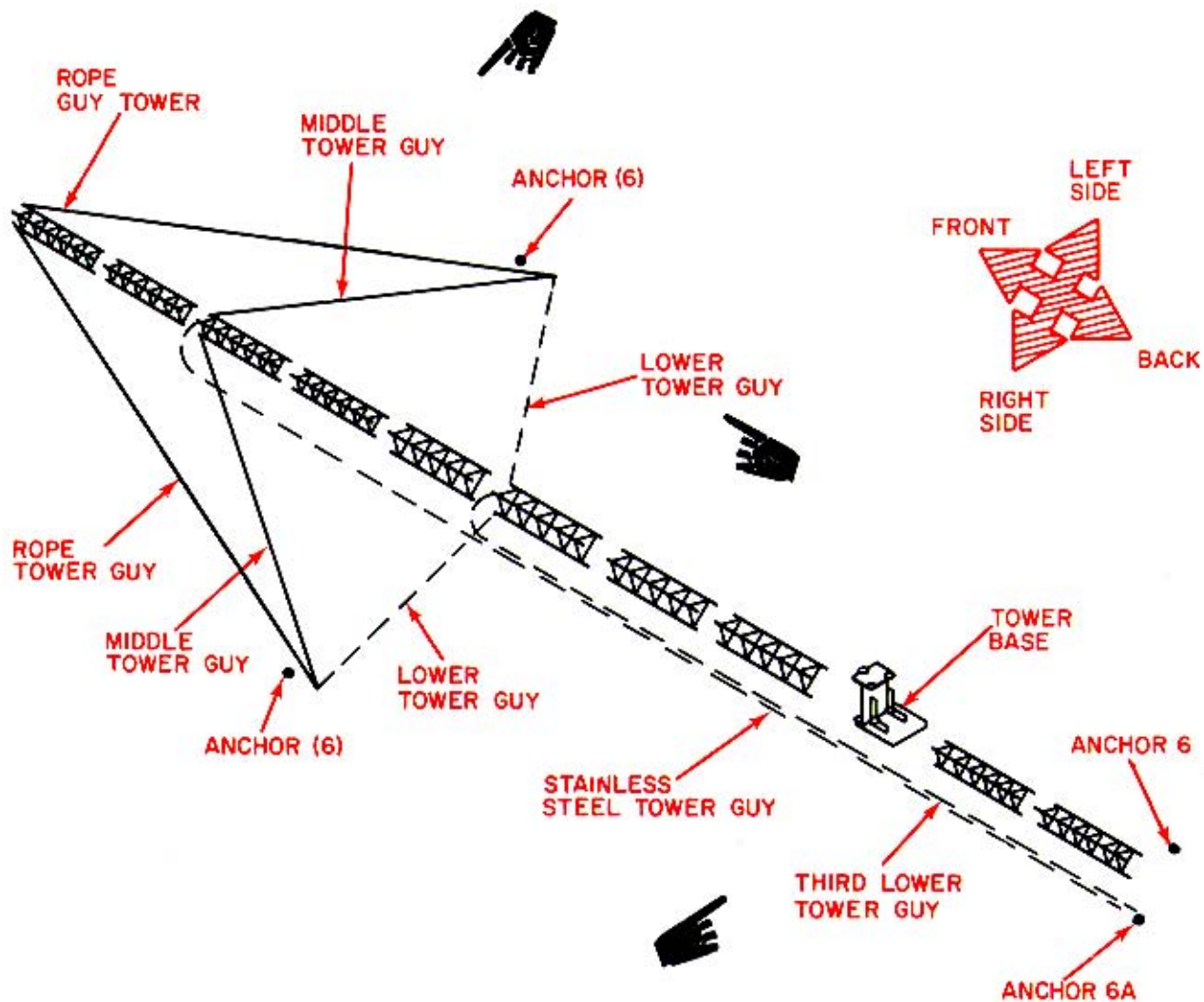


- Move reeling machine two tower sections toward TOWER CASE. Position machine facing right side ANCHOR (6). Repeat above two steps to unreel right and left side steel/rope MIDDLE TOWER GUYS.
- Face reeling machine toward ANCHOR 6 (rear of antenna). Completely unreel STAINLESS STEEL TOWER GUY. Aline guy one foot to the right side of CENTER LAYOUT WIRE to prevent interference with assembly of tower sections.



Change 1 2-24

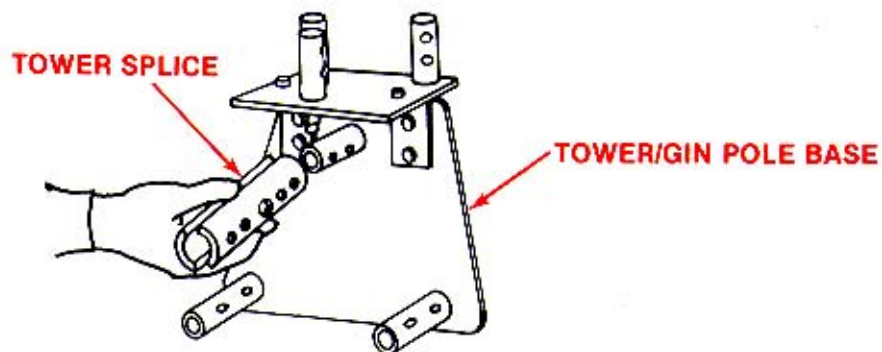
- Move reeling machine three tower sections toward TOWER BASE. Position reeling machine facing right side ANCHOR (6). Repeat above two steps to unreel right and left side steel/rope LOWER TOWER GUYS.
- Face reeling machine toward ANCHOR 6 (rear of antenna). Completely unreel third steel/rope LOWER TOWER GUY. Aline guy one foot to the right side of CENTER LAYOUT WIRE to prevent interference with assembly of tower sections.
- Move reeling machine to ANCHOR 6. Remove empty REEL NO. 1 from axle and return to antenna transit case.



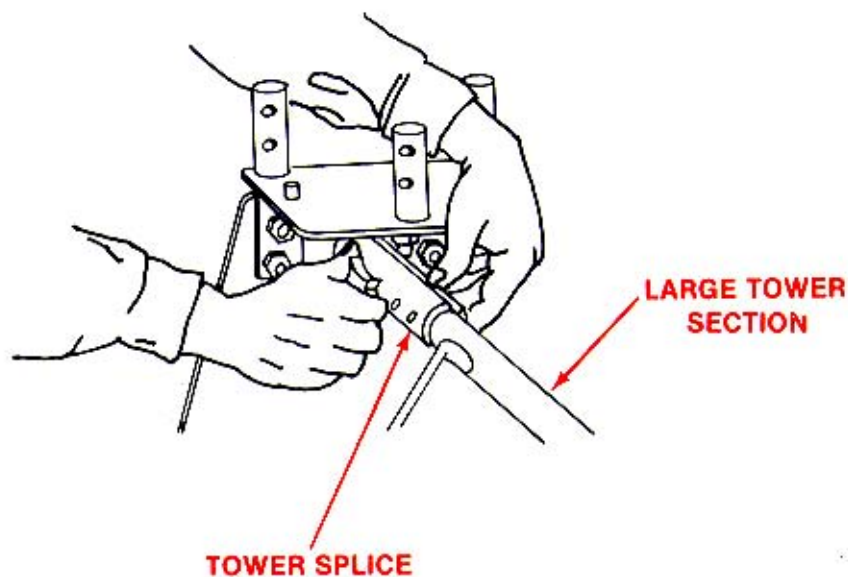
e. TOWER ASSEMBLY

With two crew members working as a pair starting at the TOWER BASE and moving forward from joint to joint, perform tower attachment to TOWER/GIN POLE BASE and assemble tower sections as follows:

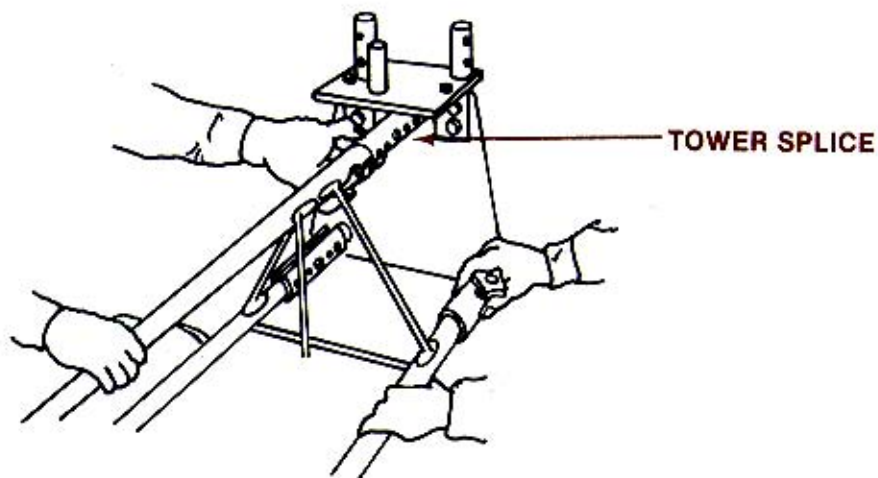
(1) Turn knob fully counterclockwise on the three TOWER SPLICES for the first LARGE TOWER SECTION. Using thumb and forefinger, spread TOWER SPLICES apart and position one TOWER SPLICE on each tower leg of the TOWER/GIN POLE BASE.



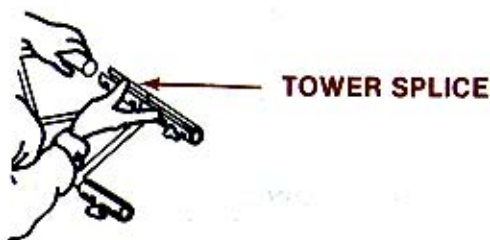
(2) Hold TOWER SPLICES open and insert legs of first LARGE TOWER SECTION into opposite end of TOWER SPLICE.



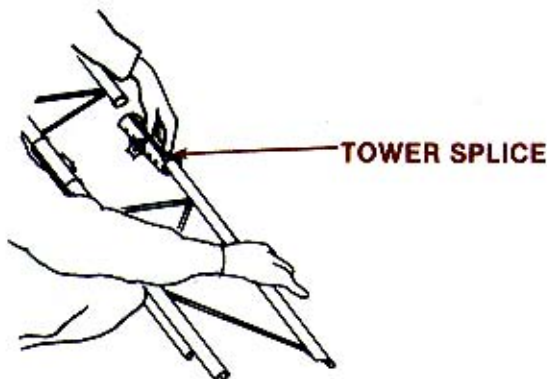
- (3) Using two hands on each TOWER SPLICE adjust splice and tower section until pins in mating legs are aligned with holes in TOWER SPLICE. Turn splice knob fully clockwise until securely fastened. When all three splices are fully tightened, advance to next tower joint.



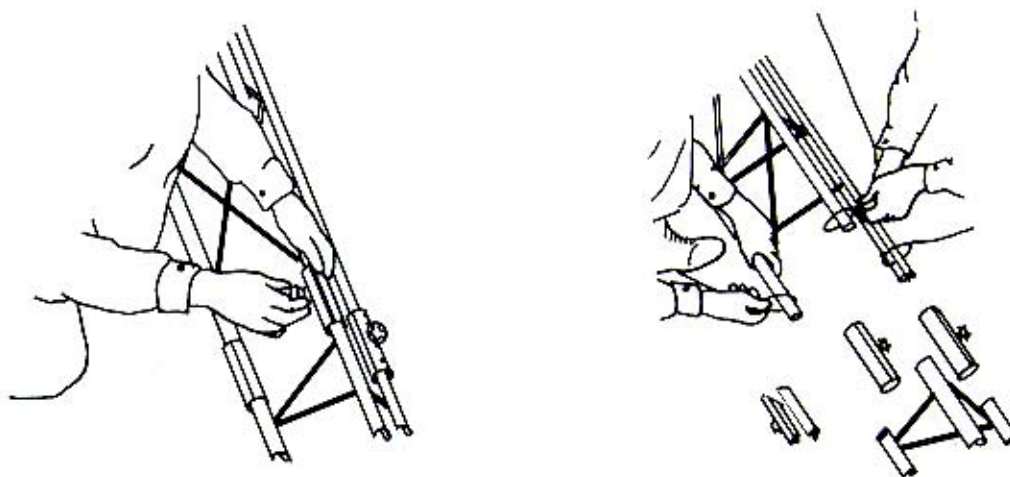
- (4) Turn knob fully counterclockwise on each of the three TOWER SPLICES. Using thumb and forefinger, spread splices apart and position one splice on each leg of the installed LARGE TOWER SECTION.



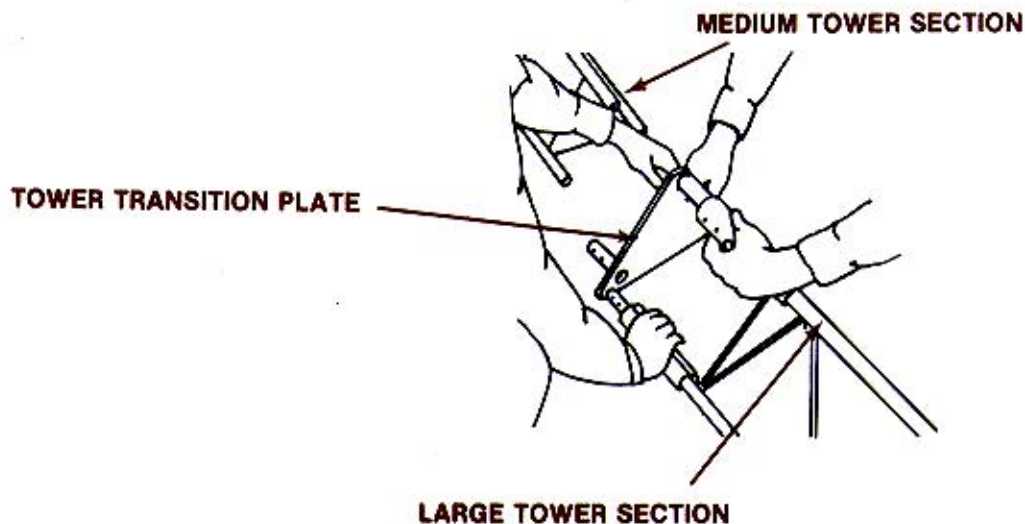
- (5) Hold TOWER SPLICES open and insert legs of second LARGE TOWER SECTION into opposite end of tower splice.



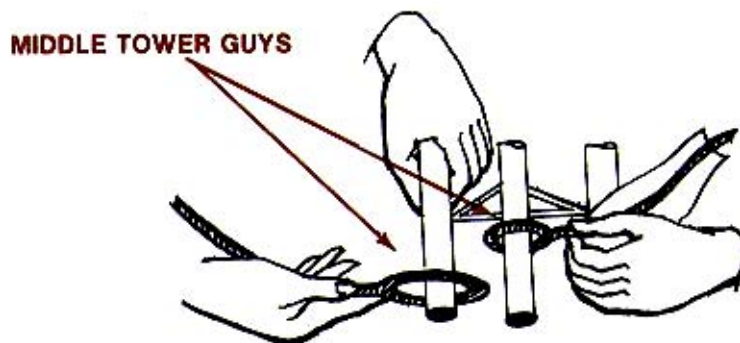
- (6) Using two hands on each TOWER SPLICE adjust splice and tower section until pins in mating legs are aligned with holes in TOWER SPLICE. Turn splice knob fully clockwise until securely fastened. When all three splices are fully tightened, advance to next tower joint.



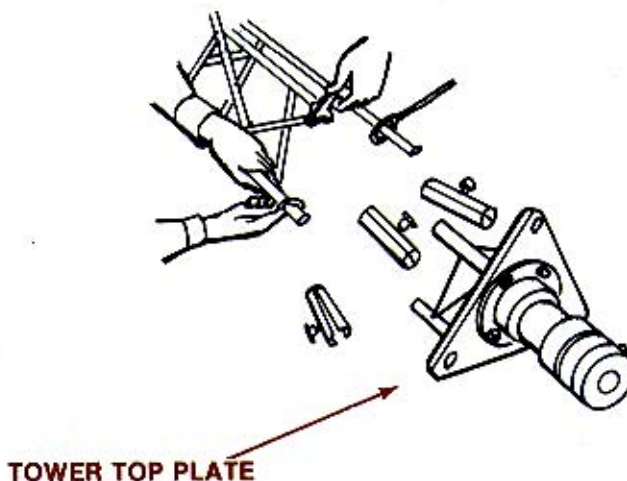
- (7) Repeat steps (4), (5) and (6) to complete attachment of the third LARGE TOWER SECTION. When complete, move to next joint.
- (8) This tower joint is the attachment point for the three steel/rope LOWER TOWER GUYS. Note direction of guys and place loop end of right and left side guys over their appropriate legs of the LARGE TOWER SECTION. Place loop of rear guy over top leg of section, complete joint assembly by repeating steps (4), (5) and (6) after loop ends of guy are positioned. When complete, move to next joint.
- (9) This joint requires the TOWER TRANSITION PLATE to go from LARGE to MEDIUM TOWER SECTIONS. Attach TOWER TRANSITION PLATE to LARGE TOWER SECTION by repeating steps (4), (5) and (6). Complete joint assembly by attaching MEDIUM TOWER SECTION to TOWER TRANSITION PLATE following the same steps. When complete, move to next joint.



- (10) Repeat steps (4), (5) and (6) to complete attachment of the first to second MEDIUM TOWER SECTIONS. When complete, move to next joint.
- (11) This joint (between the second and third MEDIUM TOWER SECTIONS) is the attachment point for the steel/rope MIDDLE TOWER GUYS and STAINLESS STEEL TOWER GUY. Note direction of steel/rope guys and place loop end of right and left side guys over the appropriate legs of the MEDIUM TOWER SECTION. Place loop of STAINLESS STEEL TOWER GUY over top leg of section. Complete joint assembly by repeating steps (4), (5) and (6) after loop ends of guys are positioned. When complete, move to next joint.

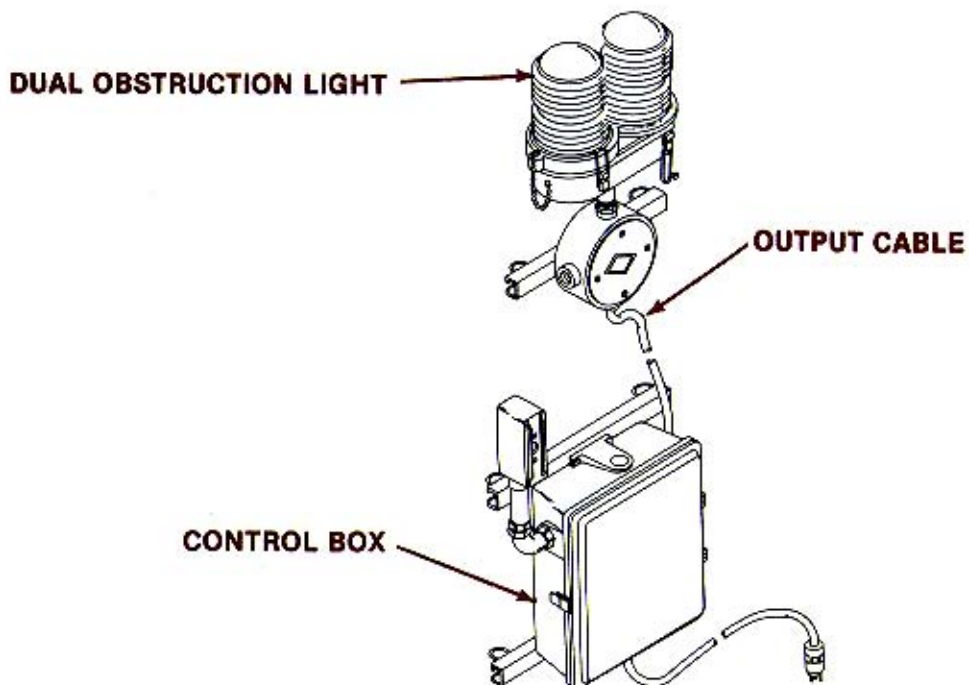


- (12) Repeat steps (4), (5) and (6) to complete the next joint of the MEDIUM TOWER SECTIONS. When complete, move to top of the tower.
- (13) The bottom legs (two on ground) of the last MEDIUM TOWER SECTION is the attachment point for the two ROPE TOWER GUYS. Note direction of these two guys and loop end of right and left guy over their appropriate leg of the MEDIUM TOWER SECTION. Repeat steps (4), (5) and (6) to complete attachment of the TOWER TOP PLATE to last tower section.

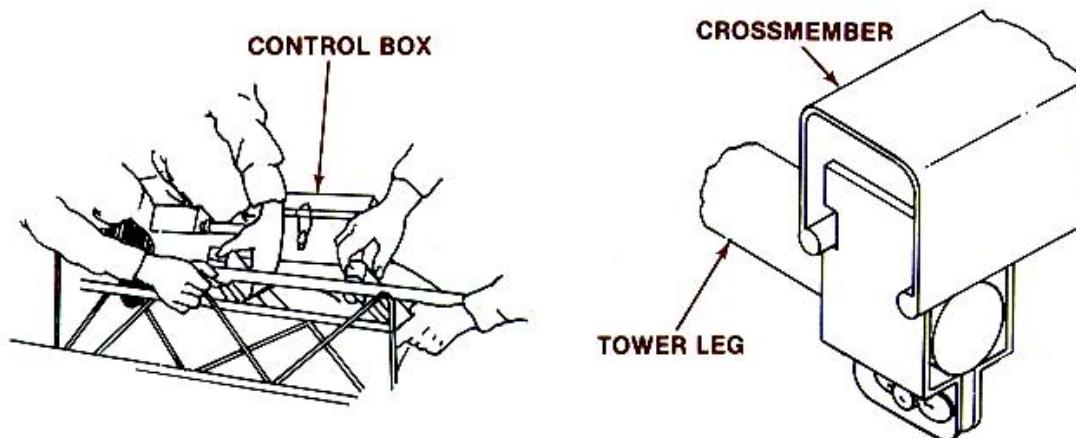


f. LIGHT ASSEMBLY

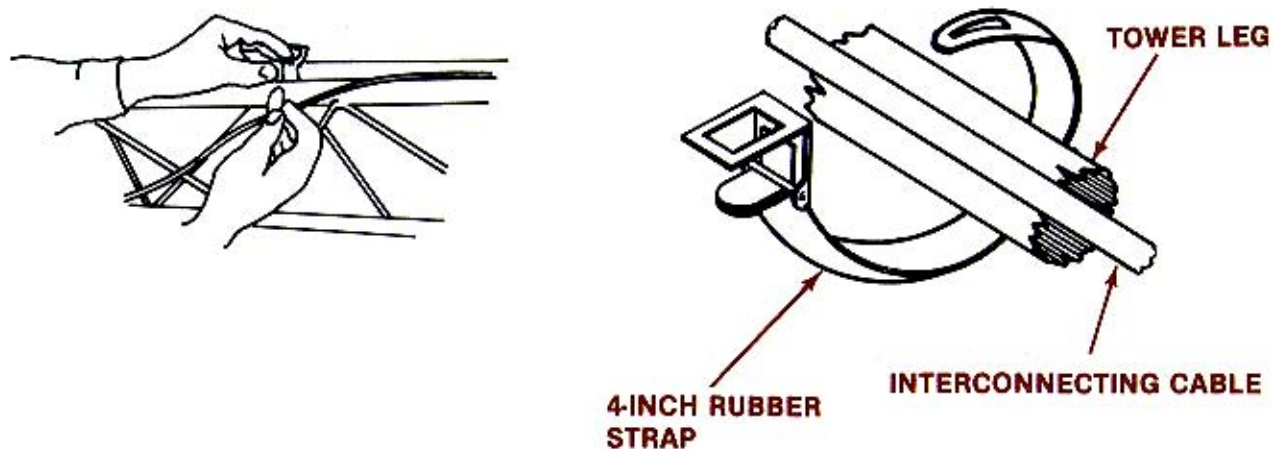
Light assembly consists of a control box with a 150 foot input power cable and a 70 foot output cable interconnected to a dual obstruction light. This assembly is attached to the two legs on the left side of the fully assembled tower.



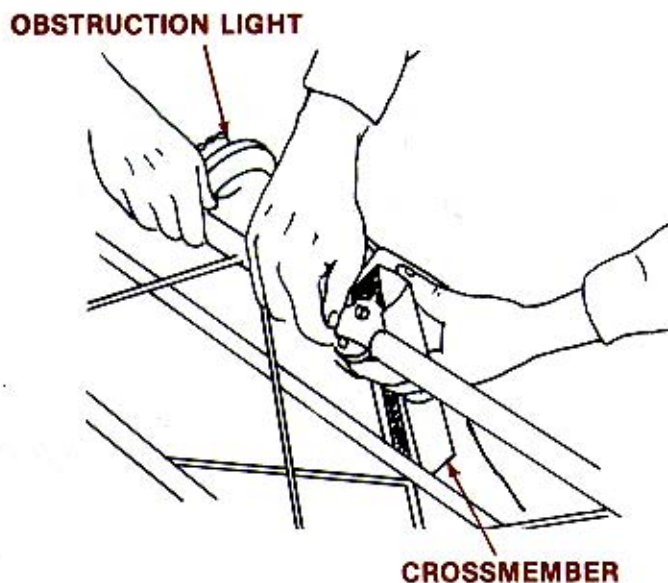
- (1) From the antenna transit case, obtain the LIGHT ASSEMBLY and place it on the ground on the left side of the first LARGE TOWER SECTION 4 feet from the TOWER BASE. Remove the reusable straps retaining the INTERCONNECTING CABLE and store with the assembly by attaching the straps around the conduit between the JUNCTION BOX and the OBSTRUCTION LIGHT.
- (2) Keeping on the left side of the tower, carry the OBSTRUCTION LIGHT forward to the tower top uncoiling the INTERCONNECTING CABLE while you walk. Exert a slight tension on the cable to make it as straight as possible and place OBSTRUCTION LIGHT on the ground next to tower. Return to the CONTROL BOX at TOWER BASE.
- (3) With one crewmember holding the CONTROL BOX crossmembers right against the two antenna legs, place clips (two on each side) over tower legs and engage crossmembers. Tighten wingnuts on all four clips to secure CONTROL BOX in place.



- (4) With the CONTROL BOX secured, use 4 inch rubber straps provided to attach INTERCONNECTING CABLE to tower leg between control box and obstruction light. First and last strap should be 4 feet from the CONTROL BOX and OBSTRUCTION LIGHT with the remaining straps spaced evenly in between.

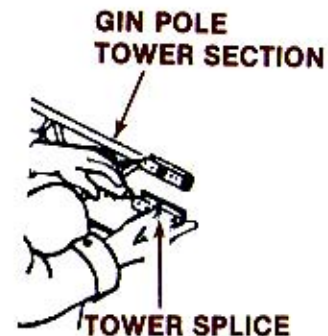


- (5) When OBSTRUCTION LIGHT is reached, attach to tower legs (12 inches from tower top). With one crewmember holding the crossmember against the two tower legs, place clips over tower legs and engage crossmember. Tighten wingnuts on both clips to secure OBSTRUCTION LIGHT in place.

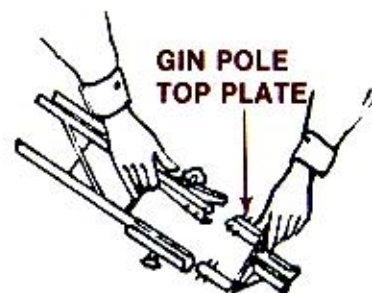


f. GIN POLE ASSEMBLY

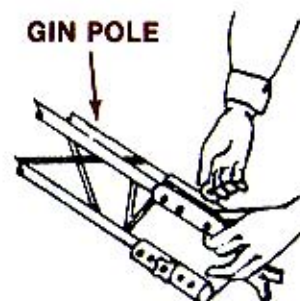
- (1) On each of the three TOWER SPLICES, turn knob fully counterclockwise. Using thumb and forefinger, spread splices apart and position one splice on each leg of the GIN POLE TOWER SECTION.



- (2) Hold TOWER SPLICES open and insert legs of GIN POLE TOP PLATE into opposite end of splices.



- (3) Using two hands on each splice, adjust splice and GIN POLE TOP PLATE until pins in mating legs are aligned with holes in SPLICE. Turn knob on SPLICE fully clockwise until SPLICE is securely tightened. When installation of all three SPLICES is completed, move to center joint of GIN POLE and perform STEP 4.

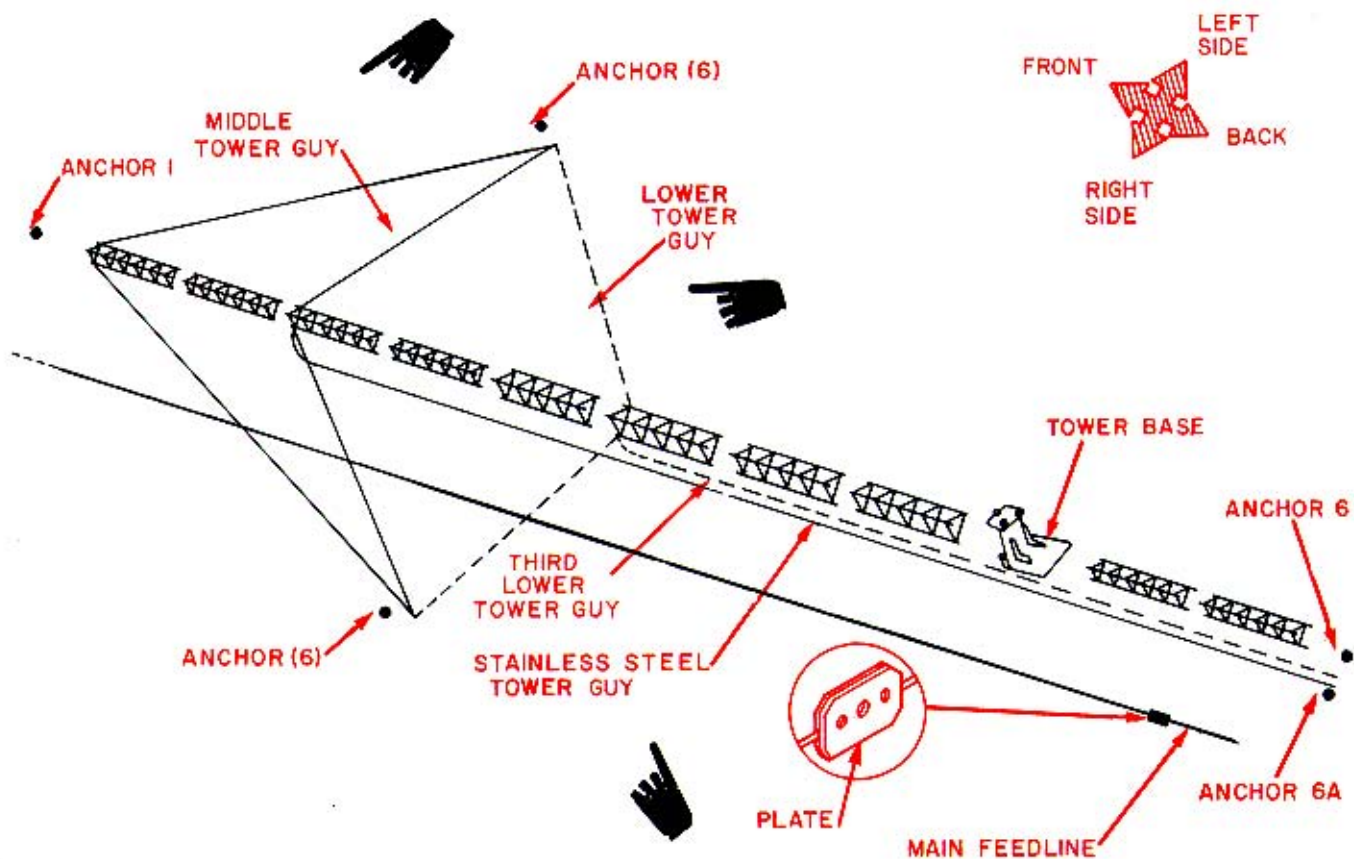


h. UNREELING MAIN FEEDLINE, BACK RADIATOR GUYS AND CATENARIES

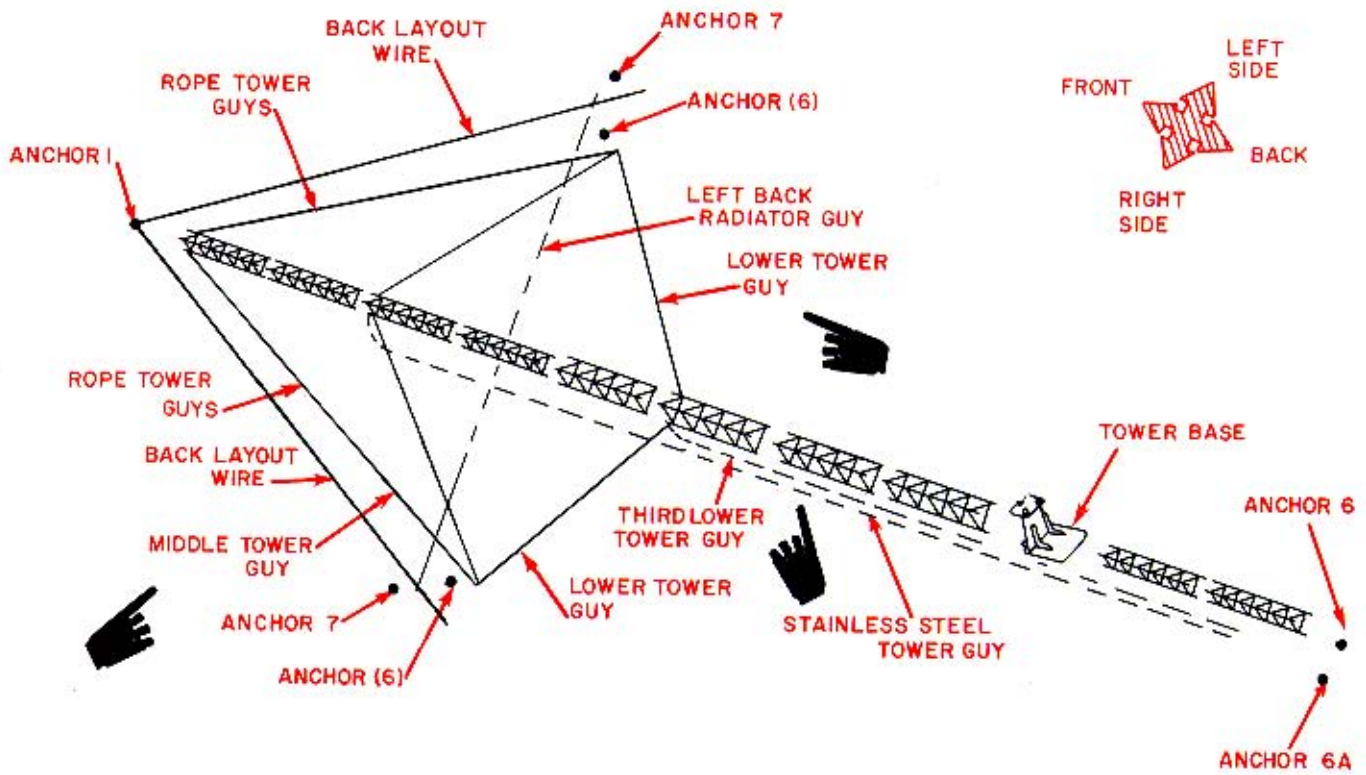
CAUTION

Do not unreele MAIN FEEDLINE until all TOWER GUYS have been unreeled and attached to tower legs during tower assembly. MAIN FEEDLINE must be unreeled on top of TOWER GUY to prevent interference during erection of ANTENNA TOWER.

- From antenna transit case, obtain REEL NO. 3 and mount on RL-27-(*) axle. Carry axle with reel and attach to reeling machine.
- Position reeling machine 6 feet behind and on the right side of ANCHOR 6.
- With one crewmember attending reeling machine, another to wait for PLATE in the feedline, (attaches to TOWER TOP PLATE) two other crewmembers carry end of MAIN FEEDLINE toward ANCHOR 1. When the PLATE appears, second crewmember will carry it and with two crewmembers carrying end of MAIN FEEDLINE continue to walk to ANCHOR 1 until crewmember with PLATE reaches top of TOWER.
- With second crewmember left to attach MAIN FEEDLINE (with PLATE) to TOWER TOP PLATE as described in paragraph 2-6i, return to reeling machine and unreele any MAIN FEEDLINE left.
- Return empty REEL NO. 3 (Place in antenna transit case for storage) and place reeling machine next to transit case.



- From antenna transit case, obtain REEL NO. 5 and mount on RL-27-(*) axle. Mount axle on reeling machine and position machine at RIGHT SIDE ANCHOR 7 facing towards LEFT SIDE ANCHOR 7.
- With one crewmember attending reeling machine, carry end of RIGHT BACK RADIATOR GUY toward LEFT SIDE ANCHOR 7 until completely off reel.
- Position reeling machine at LEFT SIDE ANCHOR 7 facing towards RIGHT SIDE ANCHOR 7.
- Repeat above step until LEFT BACK RADIATOR GUY is completely off reel.
- Return reeling machine next to transit case. Remove empty reel NO. 5 and store in antenna transit case.



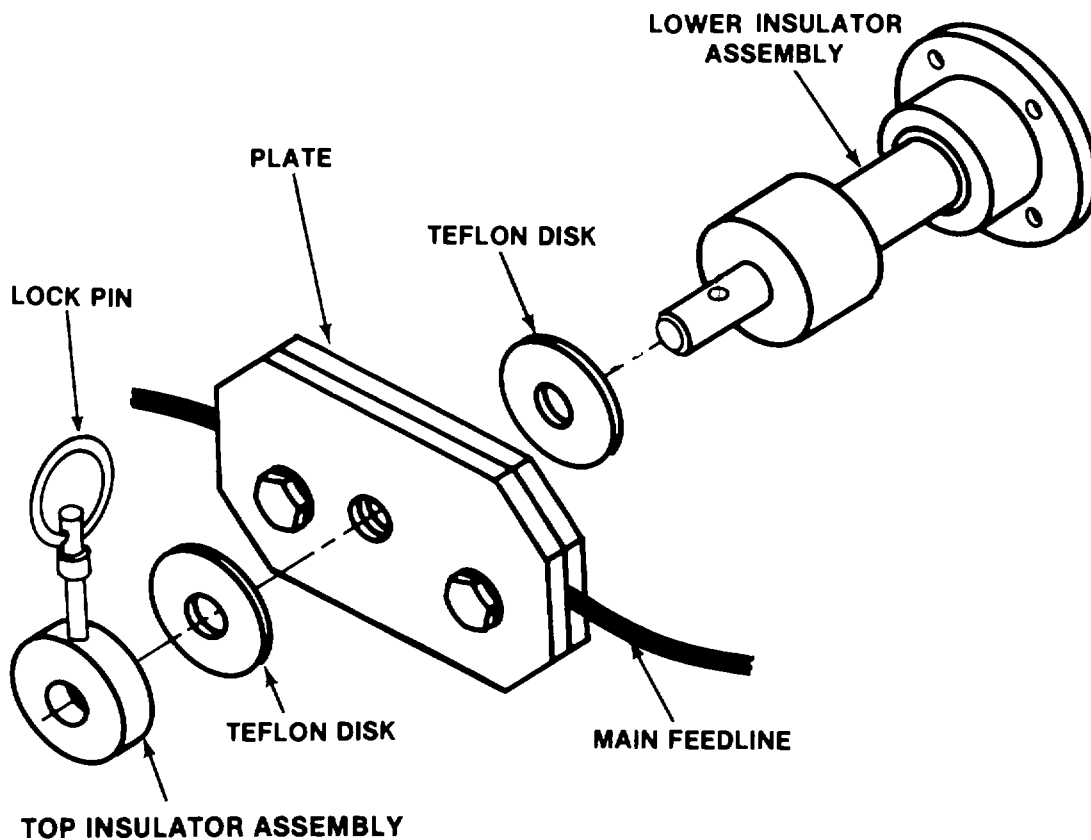
Change 1 2-34

- From antenna transit case, obtain REEL NO. 2 and mount on RL-27-(*) axle. Mount axle on reeling machine and position machine at RIGHT SIDE ANCHOR 7 facing ANCHOR 1.
- With one crewmember at the reeling machine carry end of RIGHT CATENARY toward ANCHOR 1. Attach end to ANCHOR 1 and return along catenary to reeling machine. During return, disconnect drop wire from RIGHT CATENARY and position facing MAIN FEEDLINE. Position RIGHT CATENARY in curved position until completely off reel.
- Position reeling machine at LEFT SIDE ANCHOR 7 facing ANCHOR 1. Repeat above step to unreel and position LEFT CATENARY. When finished, return reeling machine next to transit case and store empty REEL NO. 2 in antenna transit case.

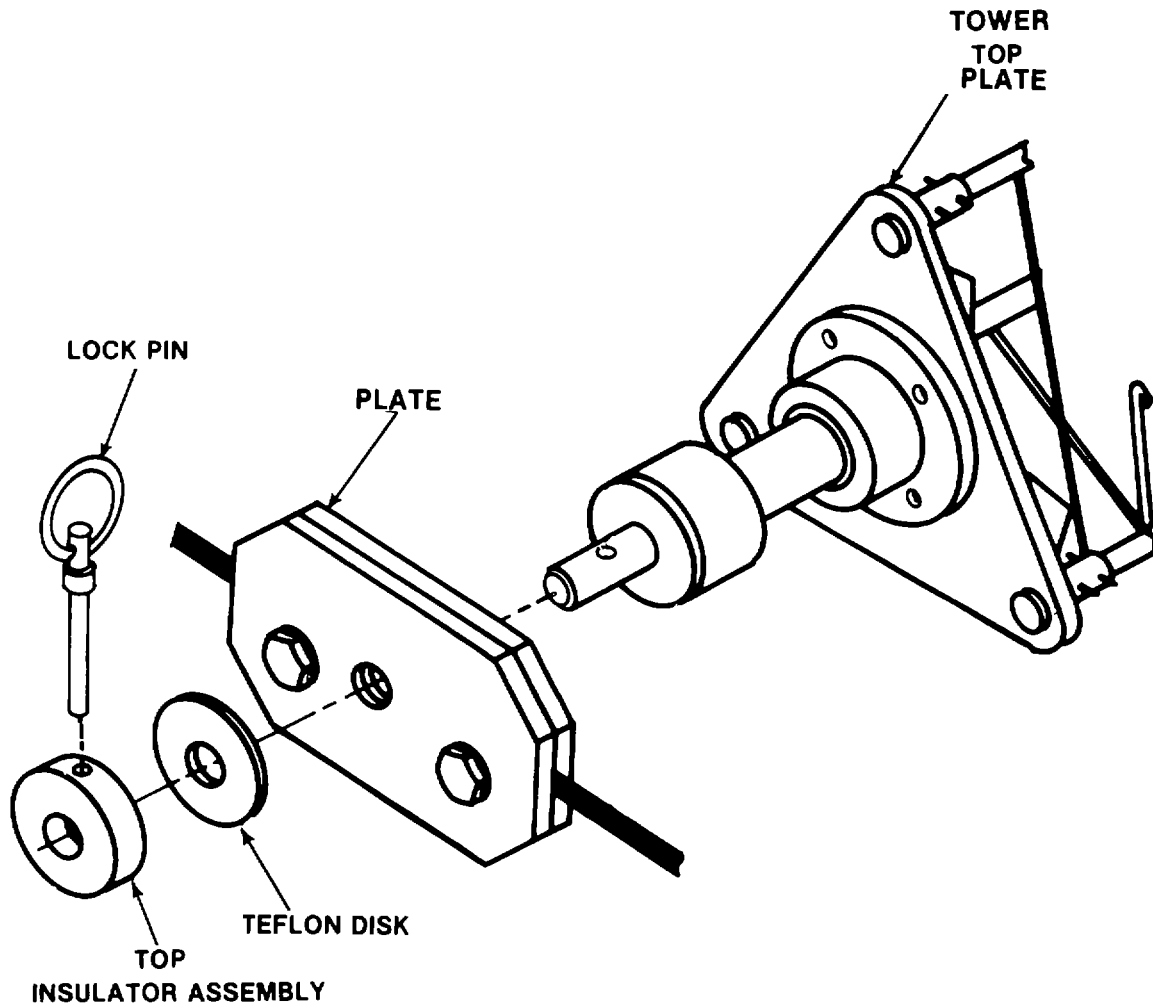
i. ATTACHMENT OF MAIN FEEDLINE TO TOWER TOP PLATE

The PLATE in the MAIN FEEDLINE attaches to the INSULATOR ASSEMBLY on the TOWER TOP PLATE. The INSULATOR ASSEMBLY contains two teflon disks (mounted each side of PLATE in MAIN FEEDLINE) to allow movement of the MAIN FEEDLINE during erection. Attach PLATE in MAIN FEEDLINE to TOWER TOP PLATE as follows:

- At top of insulator, press button on end of LOCK PIN and pull out of assembly. Lift off top of assembly and remove one teflon disk.



- Verify that second teflon disk is in place on the INSULATOR ASSEMBLY and slip PLATE in MAIN FEEDLINE over large shaft of INSULATOR ASSEMBLY.
- Replace teflon disk (which was removed in first step) over PLATE in MAIN FEEDLINE.
- Replace top of INSULATOR ASSEMBLY aligning LOCK PIN hole with hole in large shaft.
- Depress button on end of LOCK PIN and insert fully into aligned holes. Verify that pin is holding position when button is released.

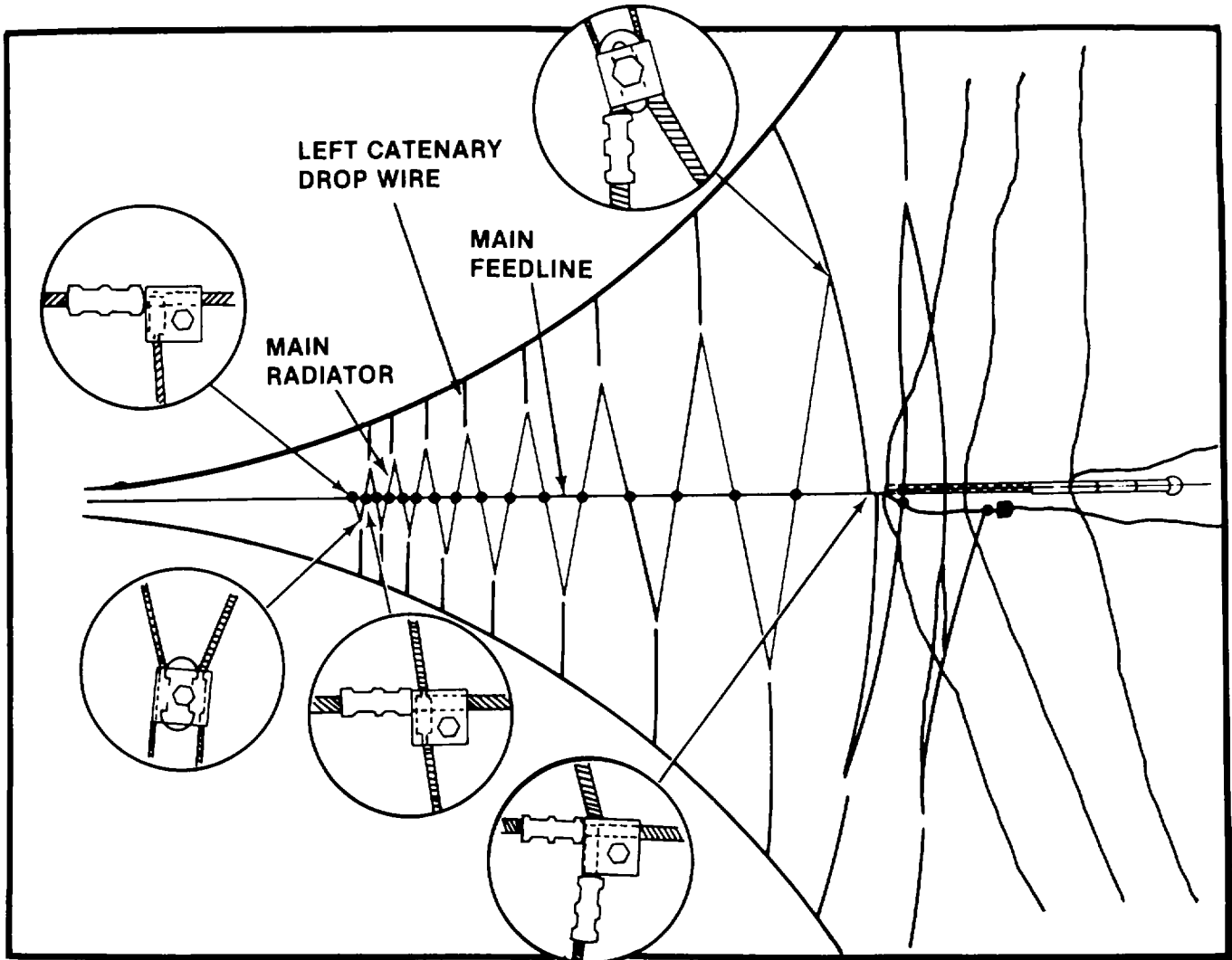


j. UNREELING AND CONNECTING THE MAIN RADIATOR

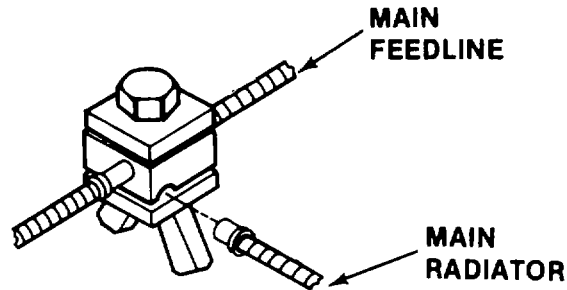
CAUTION

The MAIN RADIATOR is a continuous assembly consisting of single or double SLEEVES (two SLEEVES 1/8 inch apart) swaged to the MAIN RADIATOR wire. When interconnected (with the MAIN FEEDLINE and insulators on the end of the drop wire from the RIGHT, LEFT CATENARIES and the insulators on the two BACK RADIATOR GUYS) all SLEEVES must be at the specific connection point shown for each step.

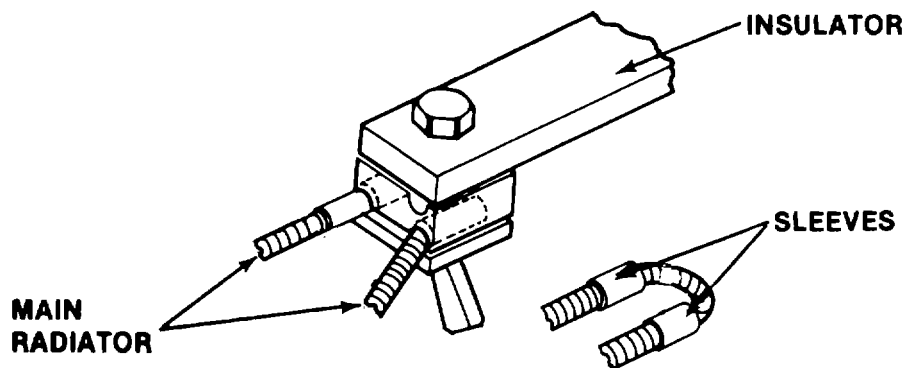
- From antenna transit case obtain REEL NO. 4 and mount on RL-27-(*) axle.



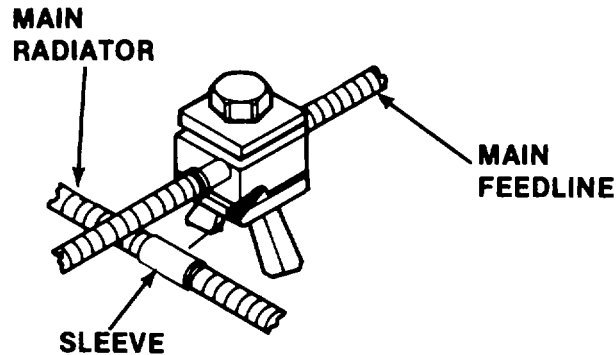
- Carry axle with REEL NO. 4 along MAIN FEEDLINE toward ANCHOR 1 until CLAMP 2 is reached on MAIN FEEDLINE. Insert SLEEVE with marker tag 2 (of MAIN RADIATOR) into CLAMP 2 of MAIN FEEDLINE. Tighten CLAMP 2 wingnut securely.



- Walk REEL NO. 4 toward the first drop wire tip on the RIGHT CATENARY until the first pair of SLEEVES on the MAIN RADIATOR are free from reel. Connect MAIN RADIATOR to insulator at end of drop wire.
- If insulators are wrapped in paper discard paper/packing before installation.



- Walk REEL NO. 4 back toward the next clamp on the MAIN FEEDLINE. When the next single SLEEVE is reached on the MAIN RADIATOR clamp it in the next empty CLAMP on the MAIN FEEDLINE.



- Continue to walk REEL NO. 4 from the MAIN FEEDLINE toward the first drop wire tip on the LEFT CATENARY. When the next closely spaced pair of SLEEVES (on MAIN RADIATOR) is reached clamp them to drop wire as in step 3.
- Continue walking REEL NO. 4 toward the next CLAMP on MAIN FEEDLINE. Clamp the next SLEEVE on the MAIN RADIATOR as shown in step 5.
- Continue this criss-cross unreeling and connection of the MAIN RADIATOR until the last drop wire tip on the LEFT CATENARY is reached. At this connection point, the size of the MAIN RADIATOR changes.
- Continue unreeling the MAIN RADIATOR toward the MAIN FEEDLINE attachment at the top of the tower. Make this connection at the next SLEEVE where the MAIN RADIATOR again changes size.
- Continue to unreel and connect the remainder of the MAIN RADIATOR (making connections with the last drop wire tip on the RIGHT CATENARY and the tips of both BACK RADIATOR GUYS). Make the two cross-over connections to the MAIN FEEDLINE and the final connection to the MAIN FEEDLINE with the end of the MAIN RADIATOR as shown in detail on page 2-37.
- When the complete MAIN RADIATOR is layed out and clamped in place, recheck all CLAMPS to insure tight connection.

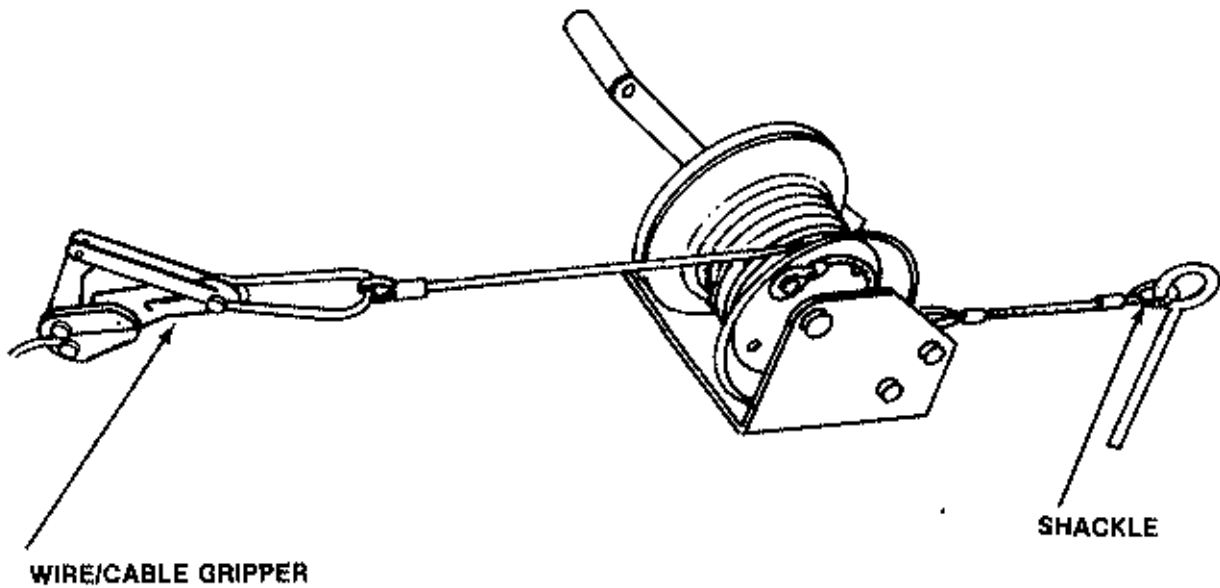
k. RAISING THE ANTENNA**WARNING**

Do not attempt to erect antenna in winds higher than 20 mph (32 km/h).

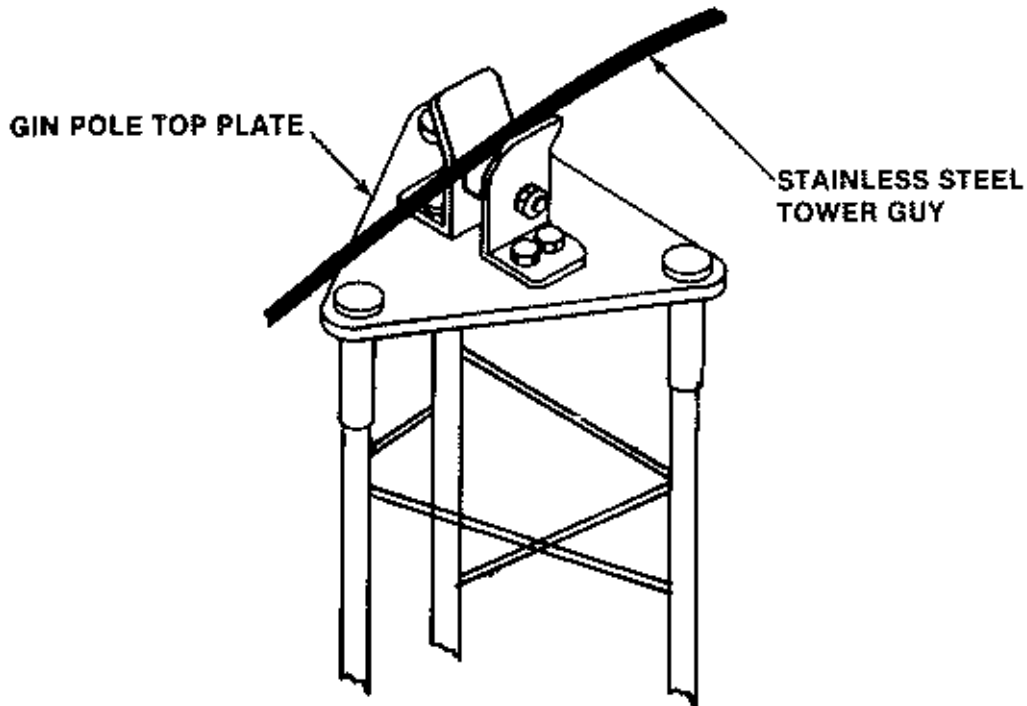
Failure to follow each step in sequence will result in damage to the antenna and / or severe injury to crewmembers. Raising the antenna requires all six crewmembers and should only be done with direct orders from the crew chief.

Prepare antenna for raising as follows:

- Using 3/8 INCH SHACKLE, attach FEEDLINE WINCHES to ANCHOR 1 and ANCHOR 6. DO NOT attach WIRE/CABLE GRIPPER to MAIN FEEDLINE at this time.



- Uncoil STAINLESS STEEL TOWER GUY toward ANCHOR 6 placing it in the notch on the GIN POLE TOP PLATE as shown.



WARNING

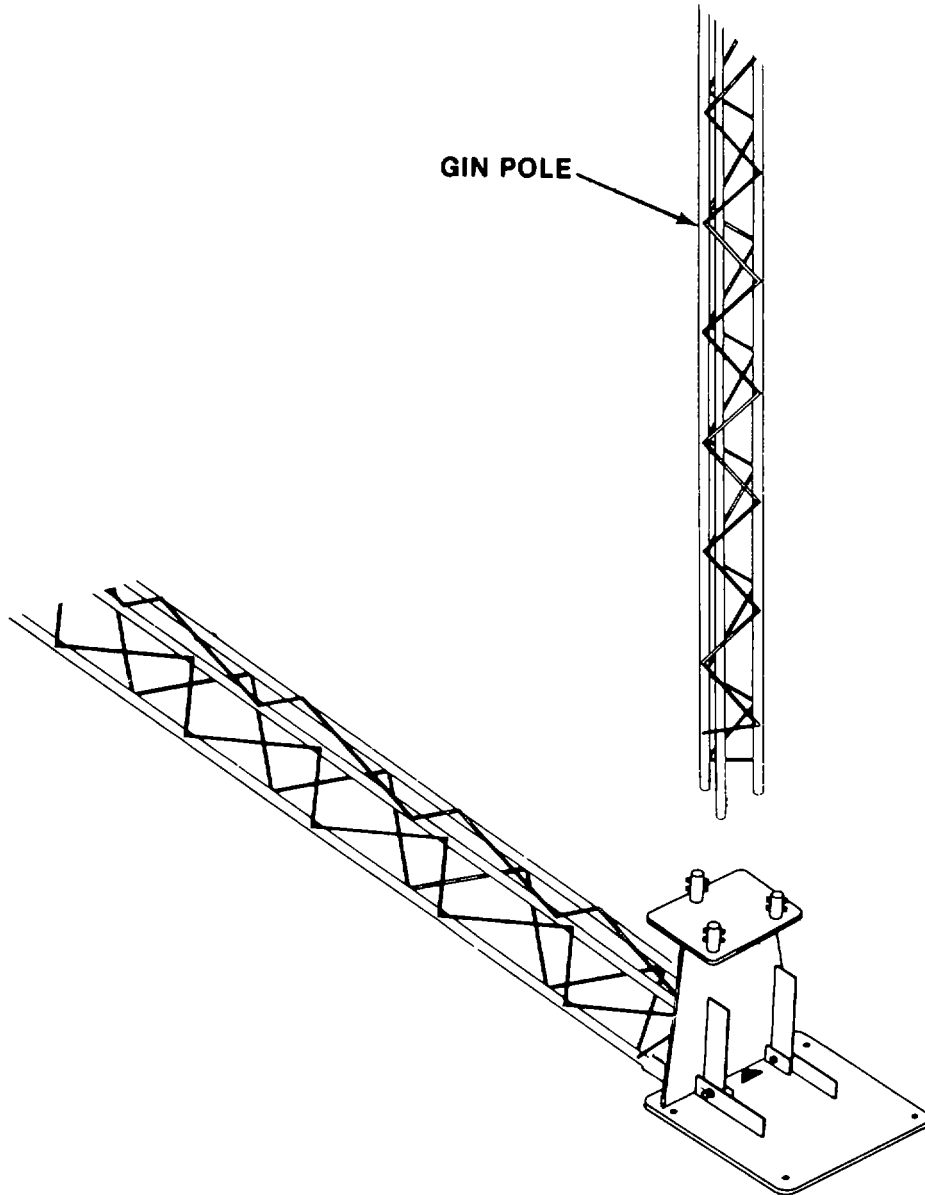
It takes three crewmembers to attach GIN POLE to TOWER/GIN POLE BASE as the assembled GIN POLE is 20 feet (6.10 m) long and must be raised to a vertical position for attachment. Handling by less than three crewmembers could result in damage to the gin pole and/or injury to personnel.

CAUTION

When attaching GIN POLE to TOWER/GIN POLE BASE, insure that GIN POLE TOP PLATE guide is parallel to direction of antenna TOWER. Tower cannot be erected with guide misaligned.

- Insure that GIN POLE TOP PLATE guide is aligned correctly. (parallel to direction of antenna tower). With one crewmember on each side of GIN POLE, keeping enough tension on the STAINLESS STEEL TOWER GUY to hold it in guide, raise it to a vertical position and rest it on the ground next to TOWER BASE.

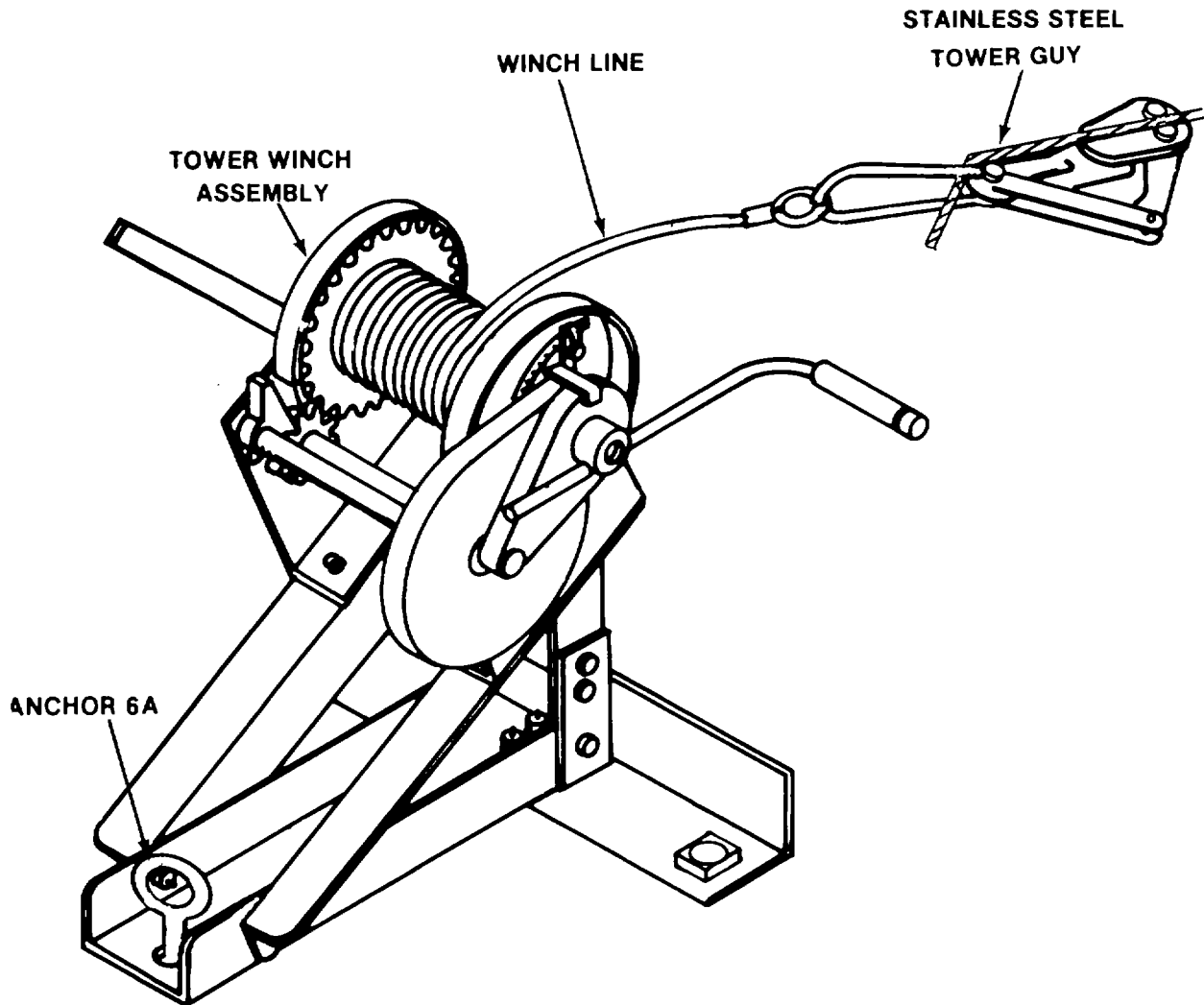
- When vertical, carefully lift GIN POLE (without rotating it) and align the three legs with the legs of the TOWER/GIN POLE BASE as shown.
- With the GIN POLE held in this position by two crewmembers, third crewmember attaches the legs of the GIN POLE to the base using three TOWER SPLICES.



- After attachment of GIN POLE, back off from pole and visually verify that GIN POLE TOP PLATE guide is properly aligned. If misalignment has occurred, detach GIN POLE, rotate till properly aligned and reattach.

From antenna transit case, obtain TOWER WINCH ASSEMBLY, hammer and two TOWER BASE PINS, and carry to ANCHOR 6A. Position winch base slot over anchor eye. Rotate winch to directly face antenna tower with anchor eye crosswise 90 degrees to the slot.

Using hammer, drive two TOWER BASE PINS into the ground until pin heads are securely against the top of base.



- Refer to page 2-4 on use of WIRE/CABLE GRIPPERS. Unwind enough cable from the winch to attach the WIRE/CABLE GRIPPER to the STAINLESS STEEL TOWER;GUY just on the tower side of the marker sleeve on the guy. Crank winch handle clockwise to remove slack in the STAINLESS STEEL TOWER GUY.
- Station three crewmembers as follows:
 - (a) One at TOWER WINCH-ASSEMBLY
 - (b) One at end of LEFT MIDDLE TOWER GUY
 - (c) One at end of RIGHT.MIDDLE TOWER GUY
- With the remaining three crewmembers, slowly raise the TOWER by hand until tower top is 3 feet (1 m).above the ground. Support TOWER by taking slack of STAINLESS STEEL TOWER GUY up on TOWER WINCH.
- With tower held by TOWER WINCH ASSEMBLY, recheck placement of TOWER GUYS and MAIN FEEDLINE attachment to TOWER TOP PLATE.
- Raise tower slowly by cranking TOWER WINCH ASSEMBLY. Tower side to side movement is to be controlled by crewmembers on MIDDLE TOWER GUYS (RIGHT and LEFT SIDE) applying slack or tension as required, directed by crewmember at winch.

Change 1 2-44

- Remaining crewmembers continuously monitor curtain to prevent snagging on ground obstructions and/or TOWER during raising.
- Stop cranking TOWER WINCH when TOWER reaches a 45 degree angle.
- Visually insure that MAIN RADIATOR wires are not twisted at connections to CATENARY drop wires and that TOWER GUYS are not entangled.
- Verify by movement that MAIN FEEDLINE is not entangled at TOWER TOP PLATE or under/around cross-bar attaching TOWER LIGHT ASSEMBLY.

WARNING

Do NOT raise tower to full vertical position with TOWER WINCH. Failure to stop cranking before tower is fully vertical can result in tower pivoting beyond top dead center and falling in the direction of ANCHOR 6 with resulting tower destruction and/or severe injury to crewmembers.

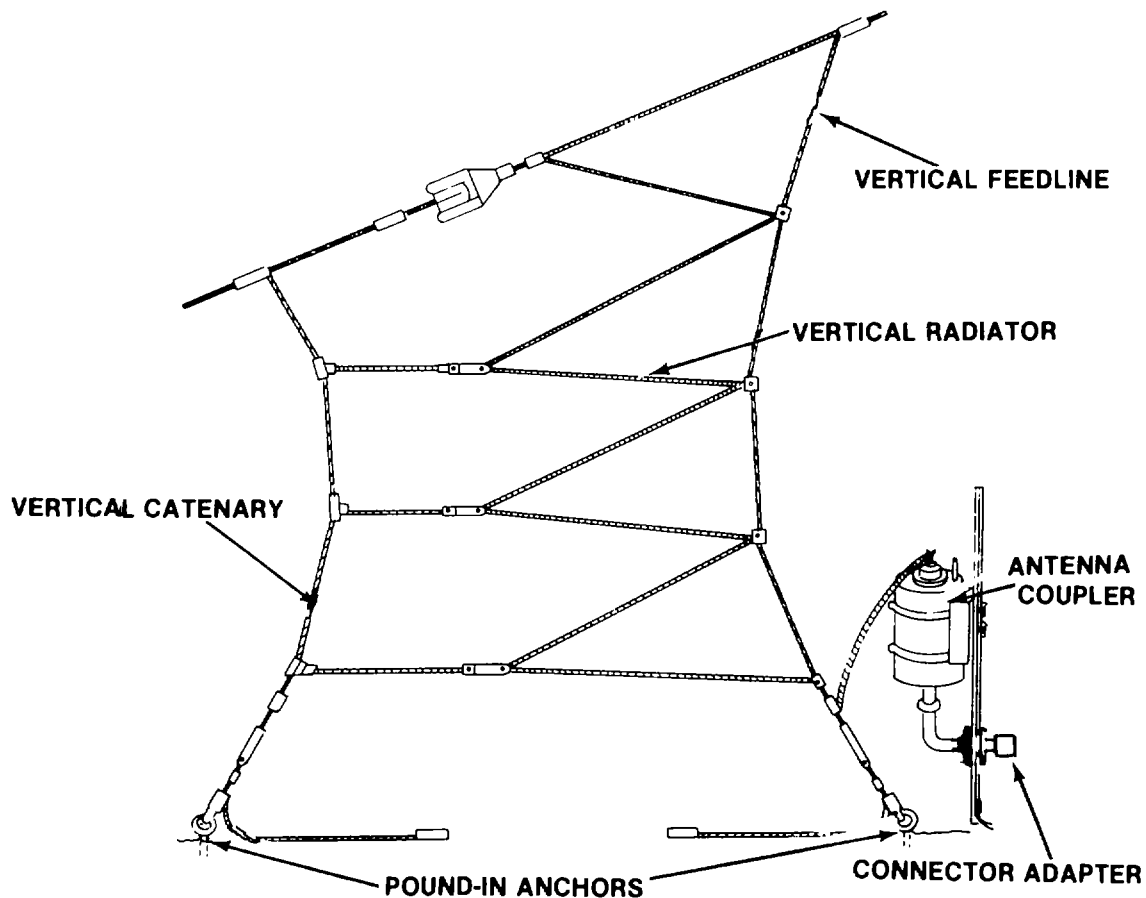
- Using the TOWER WINCH, continue cranking the TOWER toward the vertical position until it is slightly below full vertical.
- As TOWER approaches full vertical, apply tension to MIDDLE TOWER GUYS (RIGHT and LEFT SIDE) to prevent the TOWER from being pulled past full vertical.
- Attach ROPE TENSIONERS (at the ends of the RIGHT and LEFT SIDE MIDDLE TOWER GUYS) to their respective anchors (RIGHT and LEFT ANCHOR (6)) and tension them so that the TOWER is vertical up to that elevation.
- Attach ROPE TENSIONERS of remaining guys (RIGHT and LEFT ROPE TOWER GUYS, RIGHT and LEFT LOWER TOWER GUYS), to their respective ANCHOR (6) but do not apply full tension at this time.

- Pull the rear portion of MAIN FEEDLINE toward ANCHOR 6 and attach to WIRE/CABLE GRIPPER of MAIN FEEDLINE WINCH (Refer to page 2-4 for instructions on WIRE/CABLE GRIPPER use).
- Crank MAIN FEEDLINE WINCH until TOWER becomes fully vertical.
- Pull the front portion of MAIN FEEDLINE toward ANCHOR 1 and attach to WIRE/CABLE GRIPPER of MAIN FEEDLINE WINCH.

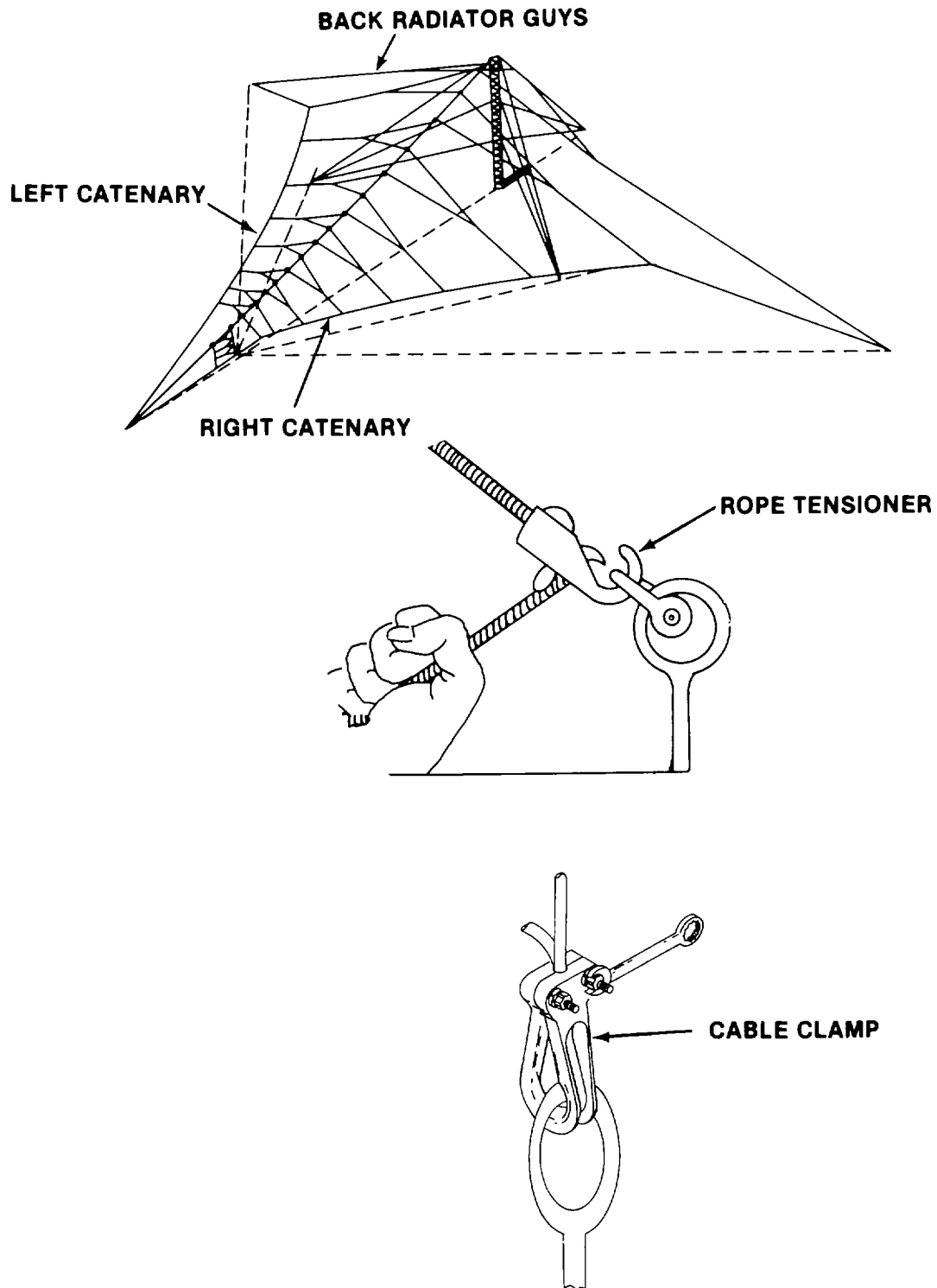
NOTE

When making connection to winch, do not run out over 3/4 of winch line (15 feet).

- Tension all tower guys so that tower is as vertical as possible (sighting by eye).
- From antenna transit case, obtain REEL NO. 4 and proceed to just in front of the first attachment point of the MAIN FEEDLINE and the MAIN RADIATOR.
- Uncoil the VERTICAL FEEDLINE and VERTICAL CATENARY away from the MAIN FEEDLINE. Attach the VERTICAL RADIATOR as shown with SLEEVE with marker tag 1 attached to CLAMP 1 of MAIN FEEDLINE.
- Continue to tension the MAIN FEEDLINE with the winch at ANCHOR 1. Keep tower vertical by tensioning the MAIN FEEDLINE with winch at ANCHOR 6. Tension the MAIN FEEDLINE with winch at ANCHOR 1 until the VERTICAL FEEDLINE attachment to the MAIN FEEDLINE is 13 feet (4 M) above ground level.



- Attach ROPE TENSIONERS of RIGHT and LEFT CATENARIES at ANCHORS 1 and 7. Tension each until all MAIN RADIATOR wires are equally tensioned.
- Attach ROPE TENSIONERS of BACK RADIATOR guys to their respective anchors and tension to spread the BACK RADIATOR.

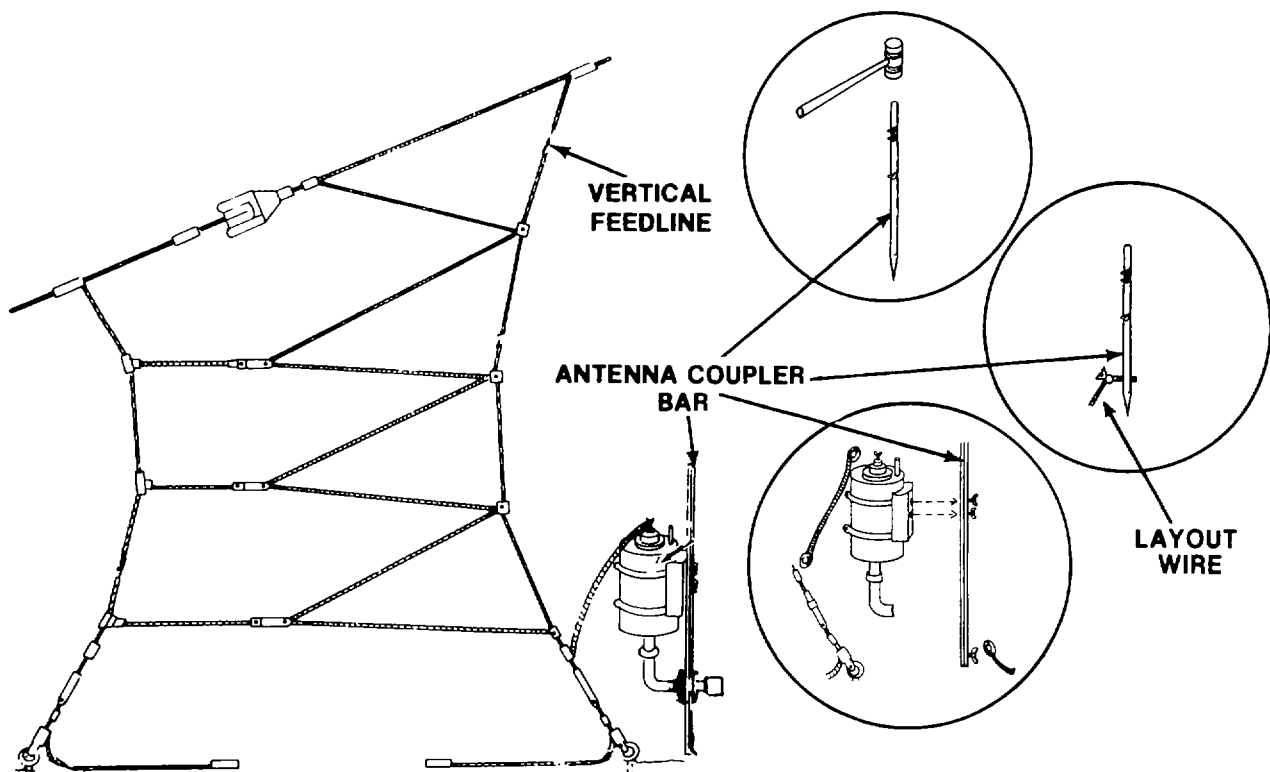


- Refer to page 2-6 and use CABLE CLAMPS to attach ends of MAIN FEEDLINE and STAINLESS STEEL TOWER GUY. When they are securely clamped, remove all winches and return to antenna transit cases for storage.
- Adjust tension in TOWER GUYS, MAIN FEEDLINE and CATENARIES so that TOWER remains as vertical as possible.
- Locate the VERTICAL FEEDLINE and the VERTICAL CATENARY directly under the MAIN FEEDLINE. Anchor both with POUND-IN ANCHORS so that tension is in the VERTICAL RADIATOR.

CAUTION

DO NOT mount ANTENNA COUPLER to ANTENNA COUPLER BAR prior to installation of the bar. Pounding on the bar with coupler attached will break the coupler.

- Using hammer, drive ANTENNA COUPLER BAR into the ground.
- Mount the ANTENNA COUPLER onto the ANTENNA COUPLER BAR as shown.
- Connect the VERTICAL FEEDLINE to the coupler.
- Connect the CENTER LAYOUT WIRE to the bar with the loop of wire between CLAMP 3 and CLAMP 4.
- Tighten wingnuts securely at the ANTENNA COUPLER and CENTER LAYOUT WIRE.



- Connect coaxial cable from radio transmitter to ANTENNA COUPLER connection.
- Return all tools to antenna transit cases for storage.

THIS COMPLETES ANTENNA INSTALLATION

2-7. CHANGING DIRECTION OF RADIATION (ANTENNA CURTAIN ROTATION)

The direction of radiation can be changed by rotating the antenna curtain with the TOWER maintained in its present position. Rotation of the curtain requires a crew of six (includes a designated crew chief). Perform curtain rotation as follows:

WARNING

DEATH ON CONTACT

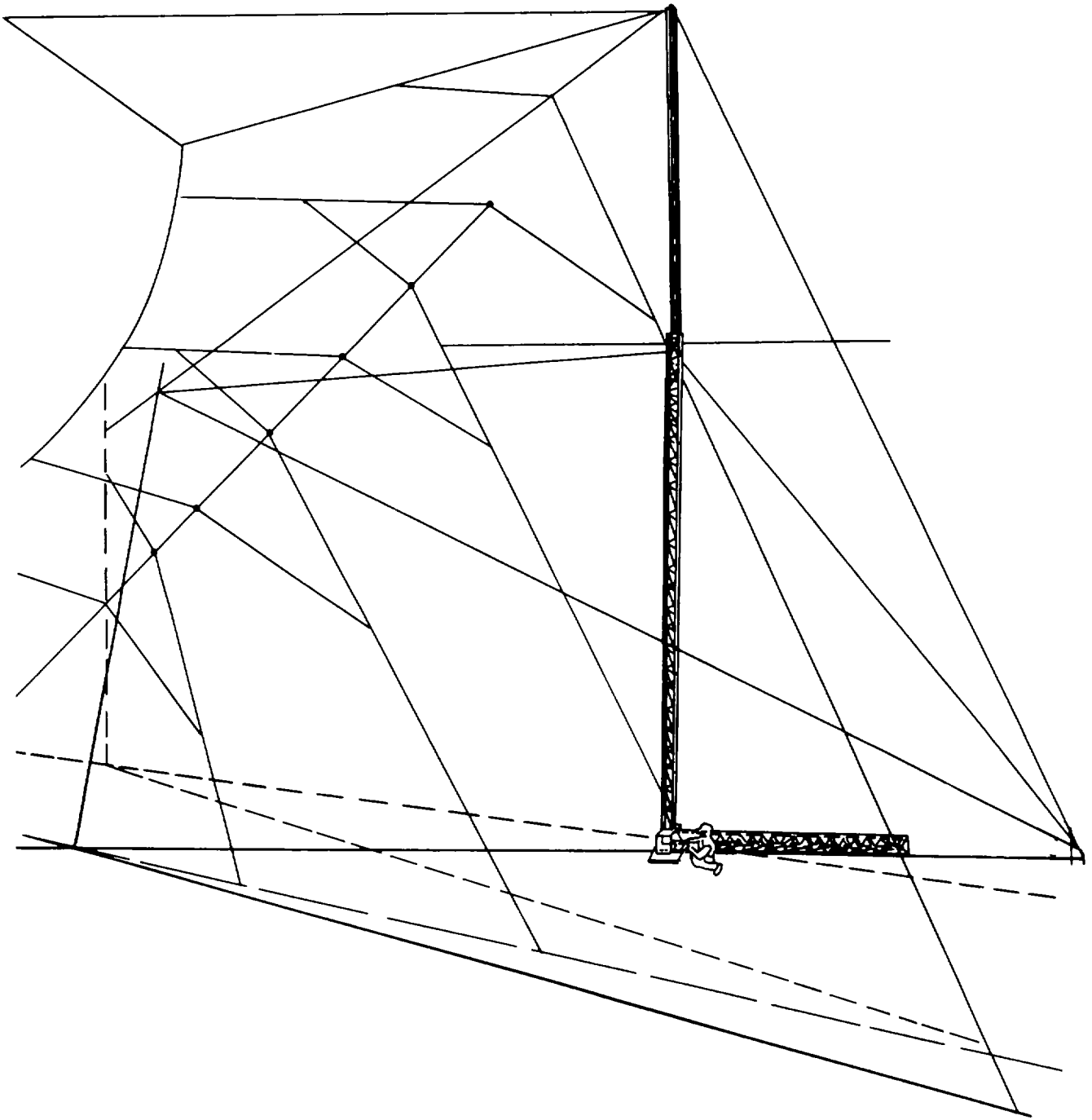
Transmitter must be shut down and tagged "Out of Service" before rotating antenna curtain. Contact with high RF voltages can be fatal, and electromagnetic radiation can cause severe or fatal internal burns.

Antenna curtain must NOT be rotated in winds higher than 20 MPH (32 KMH). Antenna damage and/or personnel injury could result.

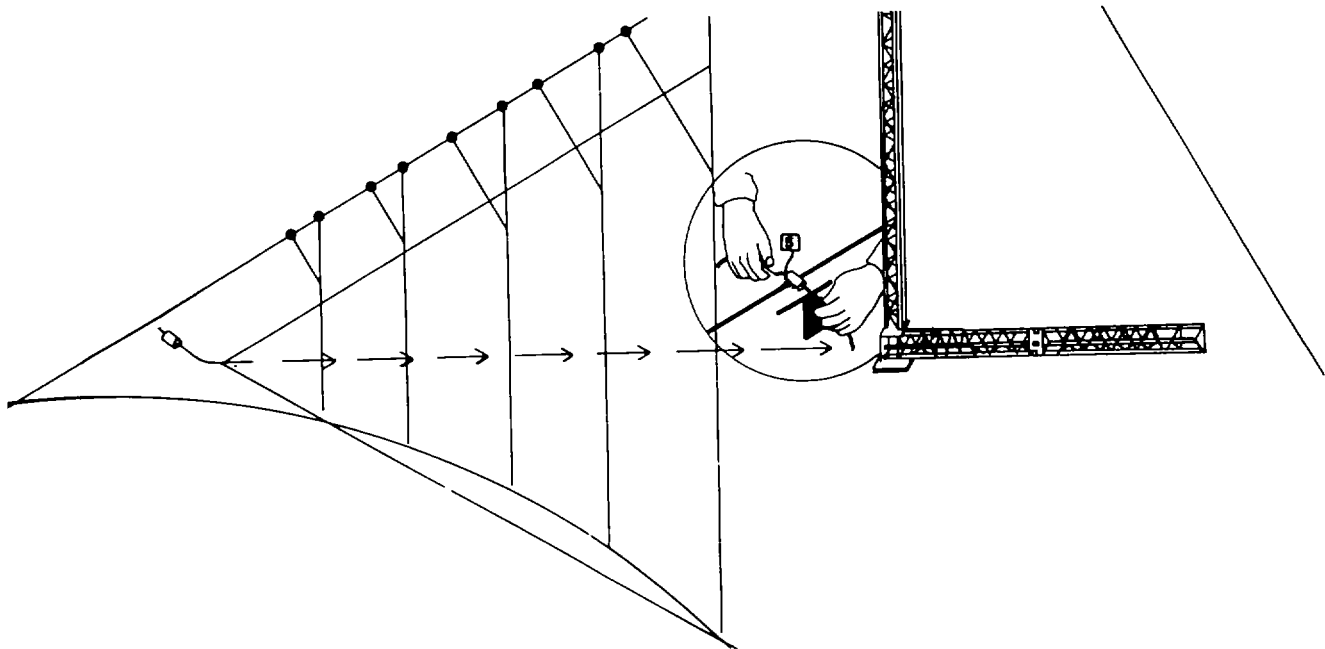
NOTE

The ANTENNA GROUP contains extra ANCHORS (screw-in and pound-in) for use in establishing a second direction of radiation (beam) to eliminate the need for removal of existing primary anchors. The following procedures assume that these anchors are available for use. If all anchors, including spares are in use, remove unused anchors from their current locations for use during curtain rotation.

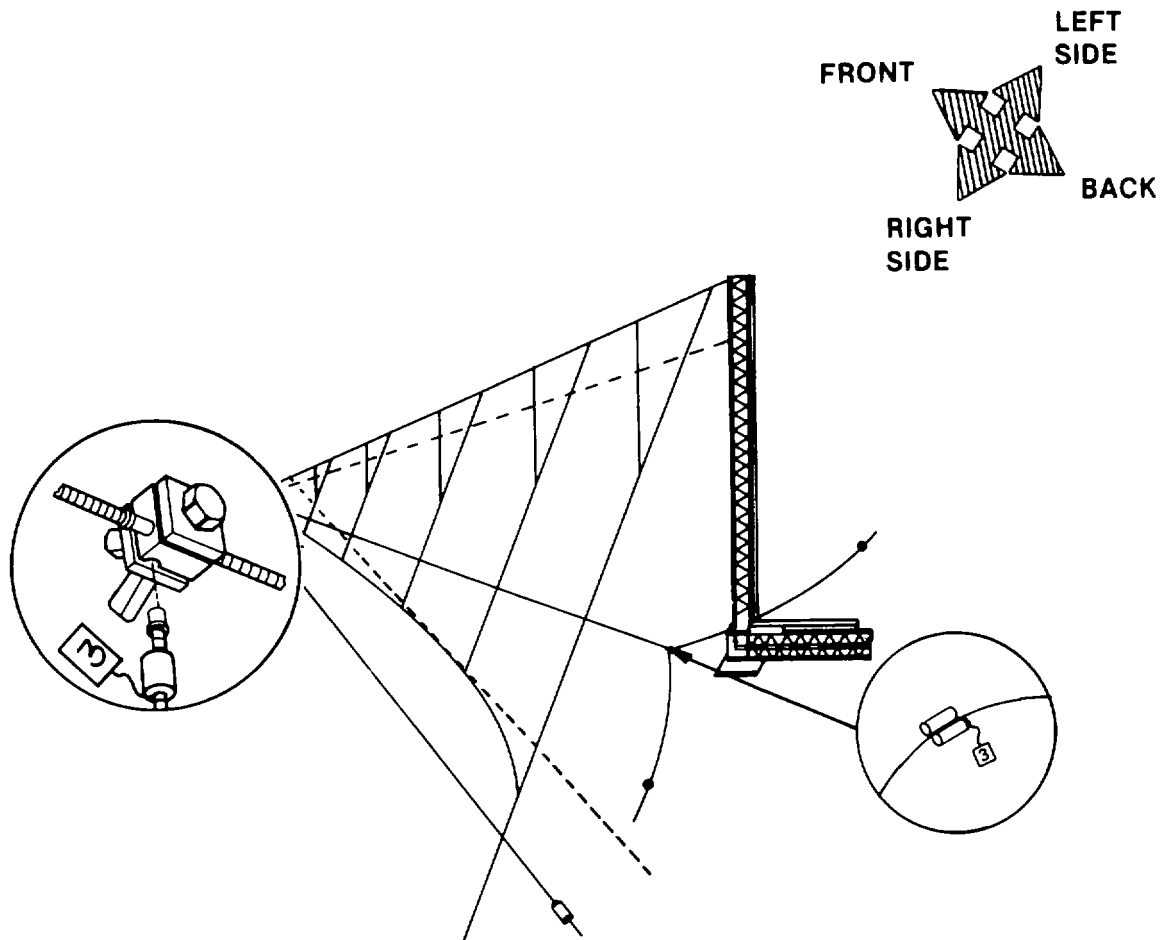
- Shut down transmitter and tag transmitter "Out of Service".
- Disconnect transmitter coaxial cable from ANTENNA COUPLER connection.
- Disconnect the VERTICAL FEEDLINE and CENTER LAYOUT WIRE from ANTENNA COUPLER.
- Disconnect BACK and SIDE LAYOUT WIRES at CLAMP 3 and 4 on CENTER LAYOUT WIRE.



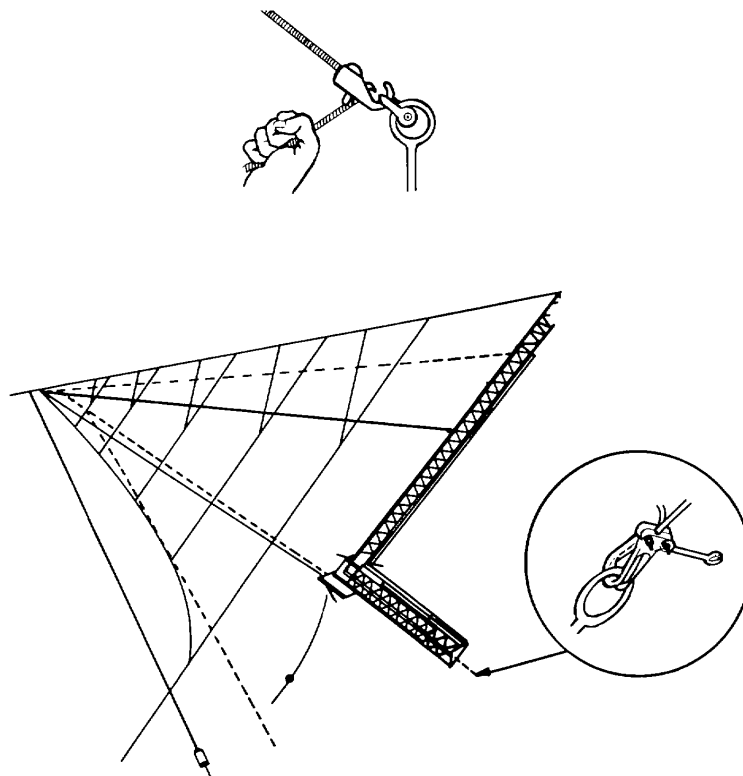
- Stand at the TOWER BASE and by sighting determine new direction of radiation (beam).
- Hold CENTER LAYOUT WIRE at SLEEVE with marker tag 5 on arrowhead of TOWER BASE.
- Rotate the front end of CENTER LAYOUT WIRE (hold at SLEEVE with marker tag 1) to new direction of radiation (beam).
- Rotate back of CENTER LAYOUT WIRE (hold at SLEEVE with marker 6) so wire is again in a straight line.
- Install new 66 inch ANCHORS at CENTER LAYOUT WIRE SLEEVES with marker tags 1 and 6. (Refer to page 2-13 for ANCHOR installation procedures.) Move Sleeve with marker tag 4 on the BACK LAYOUT WIRE to SLEEVE with marker tag 5 on the CENTER LAYOUT WIRE (at TOWER BASE).
- Holding SLEEVES with marker tags 4 and 5 together at the TOWER BASE, stretch out the BACK LAYOUT WIRE so that it is 90° to the CENTER LAYOUT WIRE.



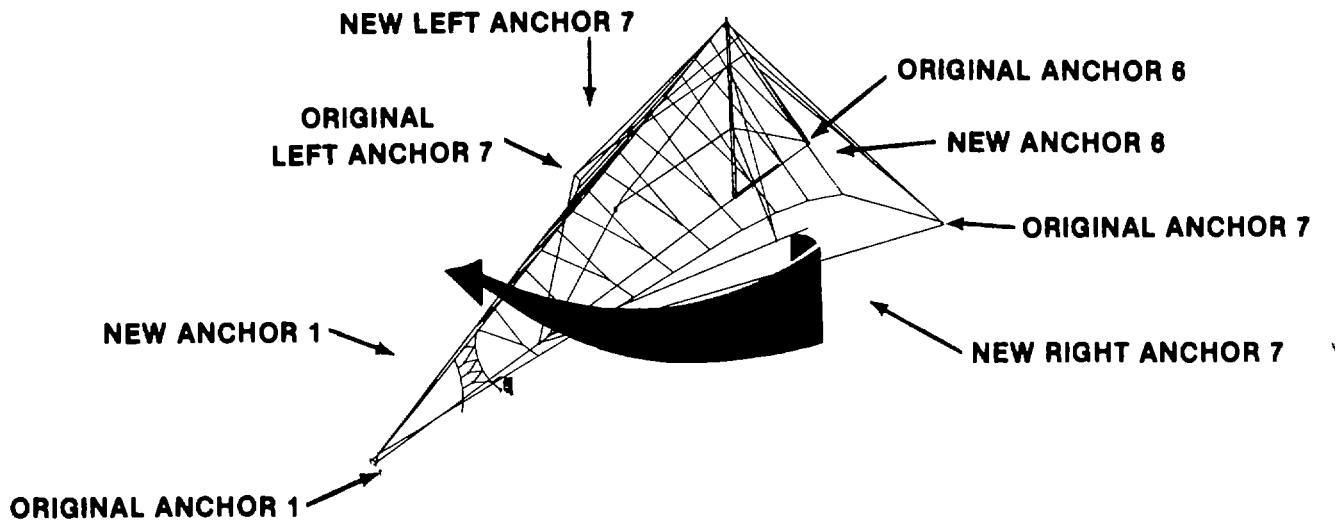
- Move SLEEVE with marker tag 3 on the SIDE LAYOUT WIRE to CLAMP 3 on the CENTER LAYOUT WIRE and clamp together.
- Holding CLAMP 3 in position, pull SLEEVES (with marker tag 7) of RIGHT SIDE LAYOUT WIRE and BACK LAYOUT WIRE together and locate position for right ANCHOR 7.
- Repeat procedure with LEFT SIDE LAYOUT WIRE and BACK LAYOUT WIRE to locate position for left ANCHOR 7.
- Install new 30 inch anchors at these two points (Refer to page 2-21 for ANCHOR installation.)



- Two crewmembers proceed to antenna transit case and each obtain a MAIN FEEDLINE WINCH and cable clamp WRENCH.
- One crewmember proceeds to original ANCHOR 1, the other to original ANCHOR 6.
- Attach MAIN FEEDLINE WINCHES to original ANCHORS 1 and 6 .
- Attach wire/cable grippers of MAIN FEEDLINE WINCHES at ANCHORS 1 and 6 to MAIN FEEDLINE.
- Apply enough tension (by cranking winches) to MAIN FEEDLINE to allow removal of cable clamps.
- Using wrenches, remove CABLE CLAMPS on MAIN FEEDLINE at ANCHORS 1 and 6.
- (Refer to page 2-6 for procedure.) Disconnect the VERTICAL FEEDLINE and VERTICAL CATENARY from their pound-in anchors.
- Remove tension completely from the MAIN FEEDLINE with MAIN FEEDLINE WINCHES.
- Disconnect MAIN FEEDLINE WINCHES at original ANCHORS 1 and 6. Relocate and attach to new ANCHORS 1 and 6.
- With one crewmember at each original ANCHOR 7 (RIGHT and LEFT SIDE), disengage the rope tensioners of BACK RADIATOR GUYS AND CATENARIES from their anchors. (Refer to page 2-5 for operation.)
- Keep a slight tension on the RADIATOR GUYS and CATENARIES.



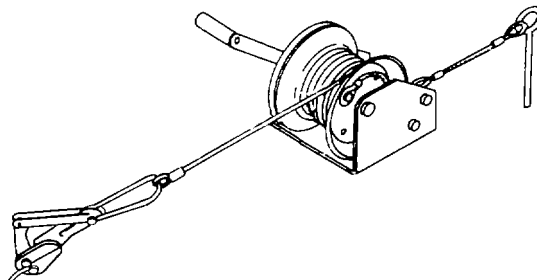
- With two crewmembers at original ANCHOR 1 disengage the ROPE TENSIONERS of the RIGHT and LEFT CATENARIES maintaining a small amount of tension on the MAIN FEEDLINE.
- To rotate the antenna curtain position the crew as follows:
 - (1) One crewmember at each original ANCHOR 7, holding the CATENARY and BACK RADIATOR GUY.
 - (2) Two crewmembers at original ANCHOR 1; one holding a single CATENARY, the other holding the other CATENARY and MAIN FEEDLINE.
 - (3) One crewmember at original ANCHOR 6 holding the MAIN FEEDLINE.
- With all crewmembers working together, begin to rotate the antenna curtain in the shortest route to its new location.



NOTE

Care should be taken to keep the curtain in its installed form and to be sure that curtain wires do not become entangled on ground obstructions, tower, or tower guys.

- When new curtain position is reached, attach wire/cable grippers of MAIN FEEDLINE WINCHES to front and rear of MAIN FEEDLINE.



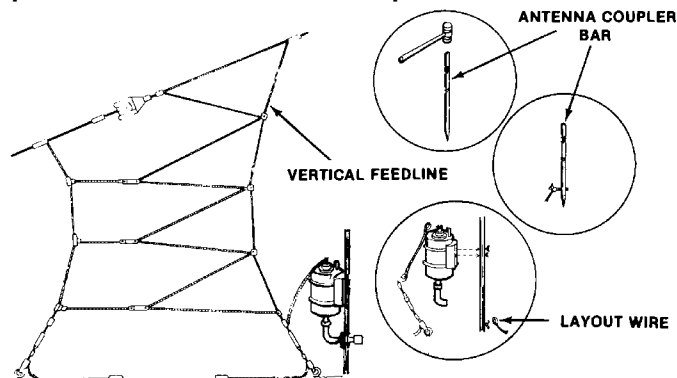
- Attach front ROPE TENSIONERS of RIGHT and LEFT CATENARIES to new ANCHOR 1.
- Attach rear ROPE TENSIONERS of RIGHT and LEFT CATENARIES to their respective new ANCHOR 7.
- Attach ROPE TENSIONERS of BACK RADIATOR GUYS to their respective new ANCHOR 7.
- Fully tension MAIN FEEDLINE with MAIN FEEDLINE WINCHES, making sure TOWER IS kept vertical.
- Tension ROPE TENSIONERS of RIGHT and LEFT CATENARIES and BACK RADIATOR GUYS to remove any slack in MAIN RADIATOR.
- Using cable clamp WRENCH, clamp and tighten the MAIN FEEDLINE (front and rear) to new ANCHOR 1 and 6.



- Remove MAIN FEEDLINE WINCHES and return to antenna transit case for storage.
- Position and anchor VERTICAL FEEDLINE and VERTICAL CATENARY using extra pound-in ANCHORS. (Refer to page 2-46 for installation procedure).
- Tighten VERTICAL FEEDLINE and VERTICAL CATENARY at ANCHORS so that tension is applied to VERTICAL RADIATOR.
- At old location remove ANTENNA COUPLER from ANTENNA COUPLER BAR.
- Remove ANTENNA COUPLER BAR from ground and relocate to new VERTICAL FEEDLINE location.

CAUTION

Do NOT mount ANTENNA COUPLER BAR prior to installation of the bar. Pounding on the bar with coupler attached will break the coupler.



- Obtain hammer from transit case and drive ANTENNA COUPLER BAR into ground.
- Mount the ANTENNA COUPLER to the bar using wingnuts and tighten securely.
- Connect the VERTICAL FEEDLINE to the top of the coupler with wingnut and tighten securely.
- Connect the CENTER LAYOUT WIRE (loop of wire between clamp 3 and 4) to the ANTENNA COUPLER BAR with wingnut and tighten securely.

NOTE

Some repositioning of the CENTER LAYOUT WIRE is permitted to make this connection.

- Move the BACK LAYOUT WIRE, by taking SLEEVE with marker tag 4 from TOWER BASE to CLAMP 4 (towards front of antenna) on CENTER LAYOUT WIRE, and connect in CLAMP 4.
- Hold CLAMP 4 and stretch out BACK LAYOUT WIRE (forming a "V" with both ends) between CENTER LAYOUT WIRE. and RIGHT and LEFT SIDE LAYOUT WIRES.
- Visually check the two top ROPE TOWER GUYS to see if they touch the antenna curtain. (If they do, release tension in the rope tensioner of the affected guy until there is no contact or disconnect guy at its respective anchor (6) and attach, under slight tension, to the base of the TOWER).
- Remove unused original ANCHOR 1, 6, and 7 and store in antenna transit case.
- Reconnect transmitter coaxial cable to ANTENNA COUPLER.
- Remove "Out of Service" tag from transmitter.

THIS COMPLETES ANTENNA CURTAIN ROTATION.

2-8. LOWERING AND DISASSEMBLY

Lowering and disassembly of the antenna requires a crew of six (includes a designated crew chief). Perform lowering and disassembly as follows:

WARNING DEATH ON CONTACT

Transmitter must be shut down and tagged "Out of Service" before lowering antenna. Contact with high RF voltages can be fatal, and electromagnetic radiation can cause severe or fatal internal burns, Antenna must NOT be lowered or rotated in winds higher than 20 MPH (32 km/h). Antenna damage and/or personnel injury could result.

If the antenna curtain has been rotated to a new direction of radiation (beam), it MUST be returned to its originally installed direction before lowering. Antenna damage and/or personnel injury could result.

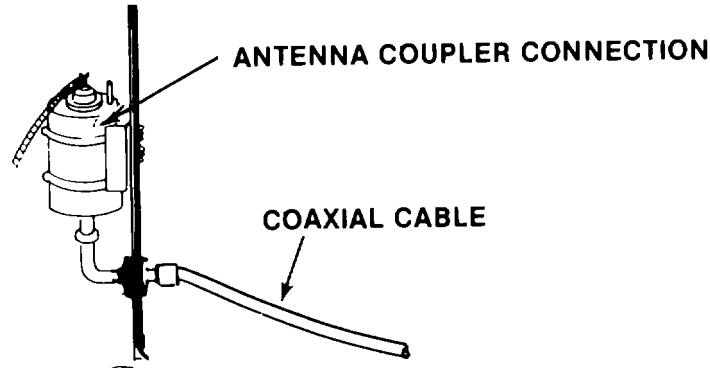
a. ROTATION BEFORE LOWERING ANTENNA

To rotate the antenna curtain back to its original position prior to lowering and disassembly proceed as follows:

NOTE

If antenna curtain must be rotated solely for the purpose of lowering and disassembly, the ROPE TENSIONERS of the RIGHT and LEFT CATENARIES, RIGHT and LEFT BACK RADIATOR GUYS and the CABLE CLAMPS of the MAIN FEEDLINE do not have to be reconnected to their anchors .

- Shut down transmitter and tag transmitter "Out of Service".
- Disconnect transmitter coaxial cable from ANTENNA COUPLER connection.

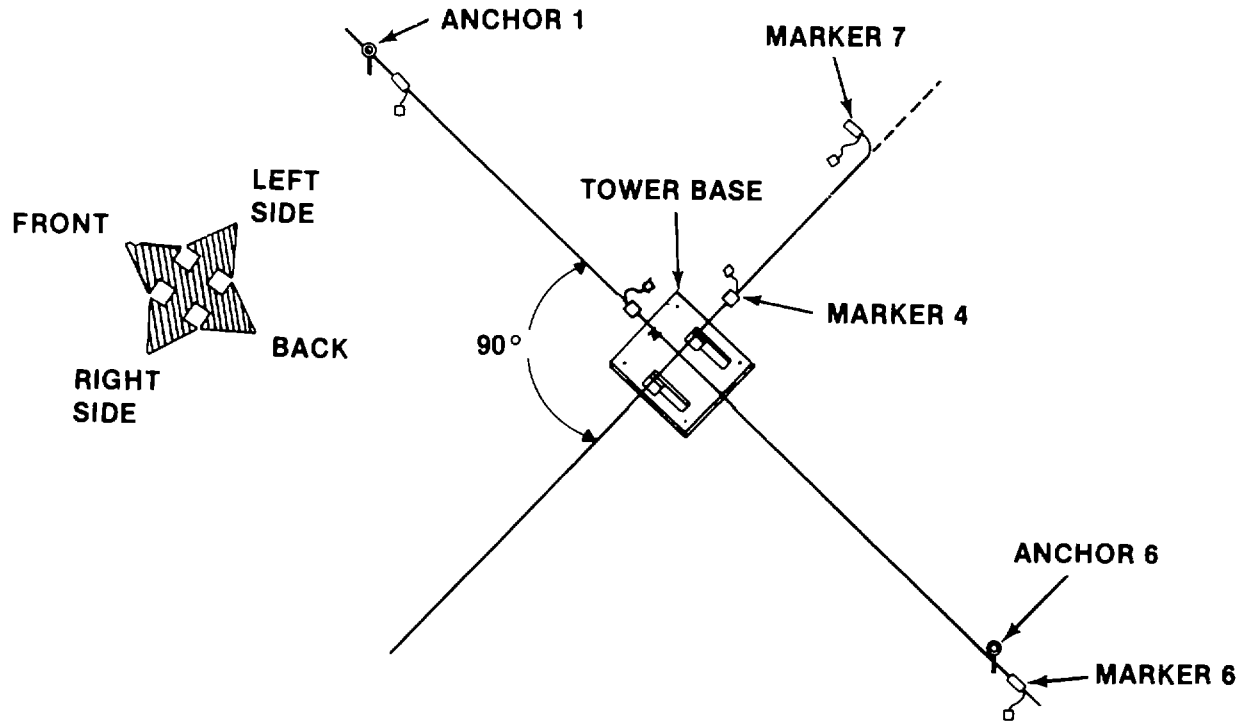


- Visually check that the two top ROPE TOWER GUYS are connected to their respective ANCHOR (6) and with no slack.
 - (1) If they are slack, apply tension on ROPE TENSIONERS until taut.
 - (2) If they are not connected, reconnect the ROPE TENSIONERS to their respective ANCHOR (6) and tension until taut.

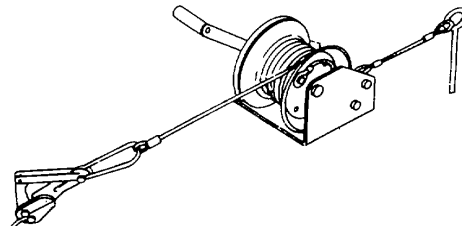
NOTE

Touching of the antenna curtain by the ROPE TOWER GUYS during connection or tensioning is permitted.

- Remove SLEEVE with marker tag 4 of BACK LAYOUT WIRE from CLAMP 4 of CENTER LAYOUT WIRE.
- Hold SLEEVE with marker tag 4 and move BACK LAYOUT WIRE to arrowhead line on TOWER BASE.
- Holding SLEEVE with marker tag 4 at TOWER BASE, two other crewmembers stretch out ends (SLEEVES with marker tag 7) of BACK LAYOUT WIRE so that wire lines up with arrowhead line on TOWER BASE (900 to TOWER BASE).



- Disconnect SLEEVE with marker tag 3 of SIDE LAYOUT WIRE from CLAMP 3 of CENTER LAYOUT WIRE.
- Disconnect the CENTER LAYOUT WIRE from ANTENNA COUPLER MOUNTING BAR.
- Disconnect the VERTICAL FEEDLINE from the top of ANTENNA COUPLER.
- Loosen and disconnect the VERTICAL FEEDLINE and VERTICAL CATENARY from their pound-in ANCHORS.
- With one crewmember at each end (SLEEVES with marker tag 1 and 6) of CENTER LAYOUT WIRE, rotate wire back to its original position (parallel to TOWER BASE).
- Remove ANTENNA COUPLER, ANTENNA COUPLER BAR and pound-in ANCHORS from VERTICAL CATENARY, FEEDLINE and store in antenna transit case.
- From antenna transit case, two crewmembers each obtain 1 MAIN FEEDLINE WINCH and 1 cable clamp WRENCH and proceed to ANCHOR 1 and 6.
- Attach wire/cable grippers of MAIN FEEDLINE WINCHES at ANCHORS 1 and 6 to MAIN FEEDLINE.



- Apply tension (by cranking winches) to MAIN FEEDLINE to allow removal of CABLE CLAMPS.

- Using wrenches, remove CABLE CLAMPS on MAIN FEEDLINE at ANCHORS 1 and 6 (Refer to page 2-6 for procedure).



- Remove tension completely from the MAIN FEEDLINE with MAIN FEEDLINE WINCHES and disconnect winches from ANCHOR 1 and 6.
- With one crewmember at each ANCHOR 7 (RIGHT and LEFT SIDE), disengage the ROPE TENSIONERS of the BACK RADIATOR GUYS and CATENARIES from their anchors.
- Keep a slight tension on the RADIATOR GUYS and CATENARIES.
- With two crewmembers at ANCHOR 1, disengage the ROPE TENSIONERS of the RIGHT and LEFT CATENARIES maintaining a small amount of tension on the MAIN FEEDLINE.
- To rotate the antenna curtain position the crew as follows:
 - (1) One crewmember at each ANCHOR 7, holding the CATENARY and BACK RADIATOR GUY.
 - (2) Two crewmembers at ANCHOR 1; one holding a single CATENARY, the other holding the other CATENARY and MAIN FEEDLINE.
 - (3) One crewmember at ANCHOR 6, holding the MAIN FEEDLINE.
- With all crewmembers working together, begin to rotate the antenna curtain in the shortest route to its original position.
- When original antenna curtain position is reached, let go of all guys, catenaries and main feedline.
- Return MAIN FEEDLINE WINCHES to antenna transit case.

ANTENNA IS NOW READY TO BE LOWERED.

b. LOWERING ANTENNA

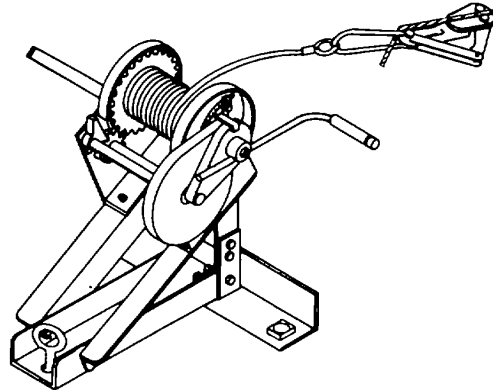
When the antenna is in its originally installed direction, proceed as follows:

When positioned TOWER WINCH ASSEMBLY must be secured by anchor eye 900 cross-wise in slot of base and two TOWER BASE pins driven in ground through winch base. If not secured properly, antenna damage and/or personnel injury could result.

NOTE

If the antenna curtain was rotated to its original position some of the following steps will already have been done.

- Shutdown transmitter and tag transmitter "Out of Service".
- Disconnect transmitter coaxial cable from ANTENNA COUPLER.
- From antenna transit case, obtain TOWER WINCH ASSEMBLY, hammer and two TOWER BASE PINS and carry to ANCHOR 6A. Position winch base slot over anchor eye. Rotate winch to directly face antenna tower with anchor eye cross-wise 90 to slot.



- Using hammer, drive two TOWER BASE PINS into the ground until pin heads are securely against the top of base.
- Attach wire/cable gripper of TOWER WINCH to STAINLESS STEEL TOWER GUY. (attach just above MARKER SLEEVE on guy).
- Tension STAINLESS STEEL TOWER GUY and remove CABLE CLAMP from ANCHOR 6.
- Disconnect the VERTICAL FEEDLINE from the top of ANTENNA COUPLER.
- Loosen and disconnect the VERTICAL FEEDLINE and VERTICAL CATENARY from their pound-in ANCHORS.
- Disconnect the CENTER LAYOUT WIRE from ANTENNA COUPLER MOUNTING BAR.
- Remove ANTENNA COUPLER, ANTENNA COUPLER BAR and pound-in ANCHORS of VERTICAL CATENARY, FEEDLINE.
- At antenna transit case, obtain empty REEL NO. 4 and return to VERTICAL RADIATOR.
- Disconnect VERTICAL RADIATOR from MAIN FEEDLINE and wind onto REEL NO. 4.
- Move REEL NO. 4 behind ANCHOR 6.
- If removed since installation, attach GIN POLE to TOWER/GIN POLE BASE using three TOWER SPLICES.
- Disconnect top right and left ROPE TOWER GUYS from their respective ANCHOR (6).
- Disconnect right and left LOWER TOWER GUYS from their respective ANCHOR (6).
- Station three crewmembers as follows:
 - (a) One at TOWER WINCH ASSEMBLY
 - (b) One at end of LEFT MIDDLE TOWER GUY
 - (c) One at end of RIGHT MIDDLE TOWER GUY
- Disconnect RIGHT and LEFT MIDDLE TOWER GUYS from their ANCHOR (6) and hand tension to maintain TOWER in a vertical position.

WARNING

Failure to engage STAINLESS STEEL TOWER GUY in GIN POLE TOP PLATE guide during lowering will result in antenna damage and/or personnel injury. Under NO circumstances must the STAINLESS STEEL TOWER GUY be permitted to miss the GIN POLE TOP PLATE guide and fall below the top of the GIN POLE.

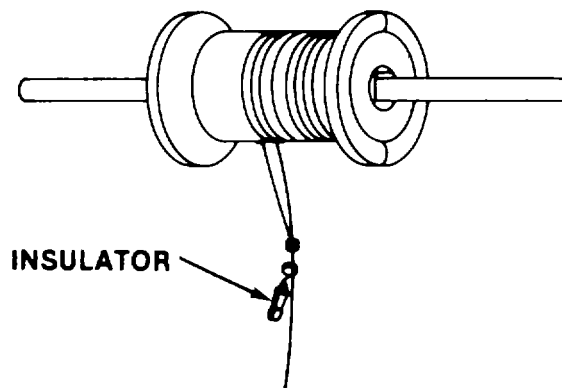
- Lower TOWER slowly by cranking TOWER WINCH. Tower side to side movement is to be controlled by crewmembers on MIDDLE TOWER GUYS (RIGHT and LEFT SIDE) applying slack or tension as required to keep TOWER straight, directed by crewmember at TOWER WINCH.
- Continue to lower TOWER until the STAINLESS STEEL TOWER GUY nears the guide on the GIN POLE TOP PLATE.
- The STAINLESS STEEL TOWER GUY must be positioned so that it lowers into the guide on the GIN POLE TOP PLATE.
- With the STAINLESS STEEL TOWER GUY positioned in the guide, continue to lower the TOWER to the ground.

Change 1 2-61

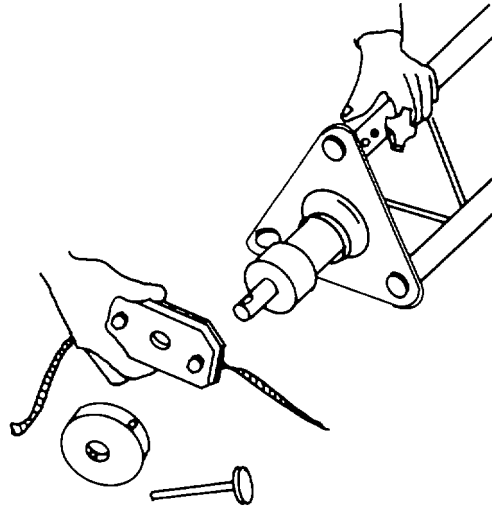
Table 2-2. REEL CONTENT AND ORDER FOR REWINDING ON REEL

REEL NO.	DESCRIPTION	PART NUMBER	ORDER ONTO REEL
1	Steel/Rope Lower Tower Guy (3)	305-GUY-02A	1
	Stainless Steel Tower Guy	206-GUY-01A	2
	Steel/Rope Middle Tower Guy (2)	305-GUY-01A	3
	Rope Tower Guy (2)	202-GUY-37A	4
2	Left Catenary	222-CAT-01A	1
	Right Catenary	221-CAT-01A	2
3	Main Feedline	181-FLA-01A	1
4	Vertical Radiator	278-RAD-01A	1
	Main Radiator	277-RAD-01A	2
	Side Layout Wire	124-WIR-03A	3
	Back Layout Wire	124-WIR-02A	4
	Center Layout Wire	124-WIR-01A	5
5	Back Radiator Guy (2)	182-DRP-02A	1

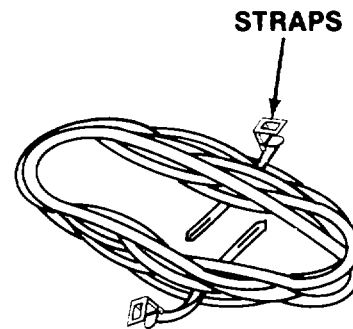
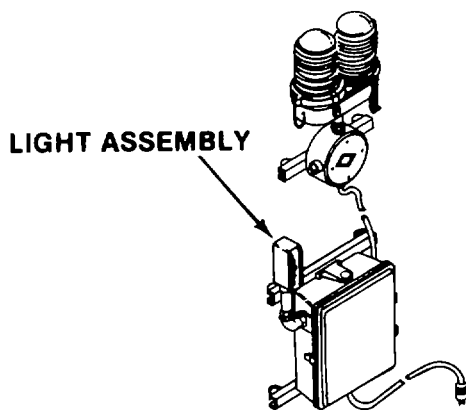
- Obtain REEL NO. 4 at ANCHOR 6. Go from point to point and wind up MAIN RADIATOR. Begin at back of MAIN FEEDLINE. Unclamp the MAIN RADIATOR only as required to wind it on reel. Disconnect the BACK RADIATOR GUYS when they are reached.
- From antenna transit case, obtain empty REEL NO. 2.
- Starting at the front of antenna, wind the LEFT CATENARY onto REEL NO. 2. When drop wires are reached, run the drop wire and CATENARY rope together until the INSULATOR on the drop wire is reached.
- Clamp the INSULATOR to the CATENARY rope.
- Repeat this clamping procedure for each drop wire.



- From antenna transit case, obtain REEL NO. 5.
- Proceed to anchor end and wind the left side BACK RADIATOR GUY onto REEL NO. 5. Repeat procedure for right side BACK RADIATOR GUY.
- From antenna transit case, obtain REEL NO. 3 and carry to TOWER top.
- Remove PLATE in MAIN FEEDLINE from TOWER TOP PLATE and stretch MAIN FEEDLINE out straight .



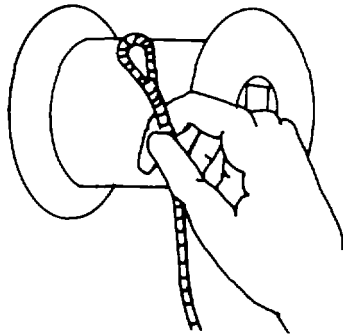
- Wind MAIN FEEDLINE onto REEL NO. 3.
- Remove the LIGHT ASSEMBLY from the TOWER. Coil INTERCONNECT and POWER CABLES for packing using the two 15 inch REUSABLE STRAPS. Retain the 6 inch REUSABLE STRAPS attaching cable to TOWER for future use.



CAUTION

When removing TOWER SPLICES, be careful not to unwind TOWER SPLICE nuts too far. The threads at the end of the bolts have been upset to prevent loss of nuts.

- Remove GIN POLE from TOWER/GIN POLE BASE.
- Remove TOWER TOP PLATE, TOWER TRANSITION PLATE, GIN POLE TOP PLATE and TOWER SPLICES from all TOWER and GIN POLE SECTIONS.
- Remove TOWER/GIN POLE BASE from TOWER BASE.
- Release TOWER BASE from ground by removing four TOWER BASE PINS.
- From transit case, obtain REEL NO. 1 and starting at the loop end of STAINLESS STEEL TOWER GUY, wind it onto reel.
- Starting at the loop end of the two MIDDLE TOWER GUYS, wind them one at a time onto REEL NO. 1.



- Obtain REEL NO. 4 and wind the SIDE LAYOUT WIRE, then BACK LAYOUT WIRE and then CENTER LAYOUT WIRE onto reel.
- Remove all screw-in and pound-in ANCHORS.

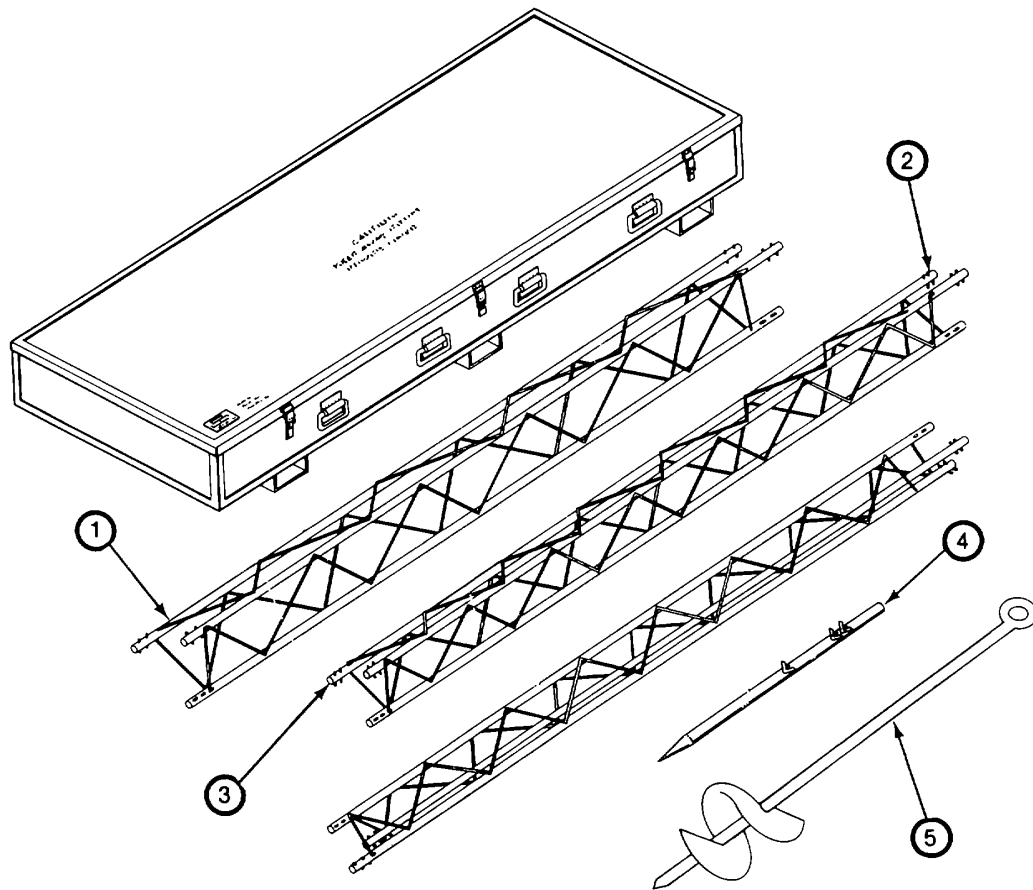
2-9. REPACKING INTO TRANSIT CASES

Clean all antenna components of dirt, mud and foreign material. Place antenna components in their respective transit cases as follows:

a. MAST CASE CY-7866/TSC-99

The mast case contains the following items:

- (1) 4 - Large tower sections
- (2) 4 - Medium tower sections
- (3) 2 - Small tower sections (gin pole)
- (4) 2 - Antenna coupler bars
- (5) 8 - 66 inch anchors



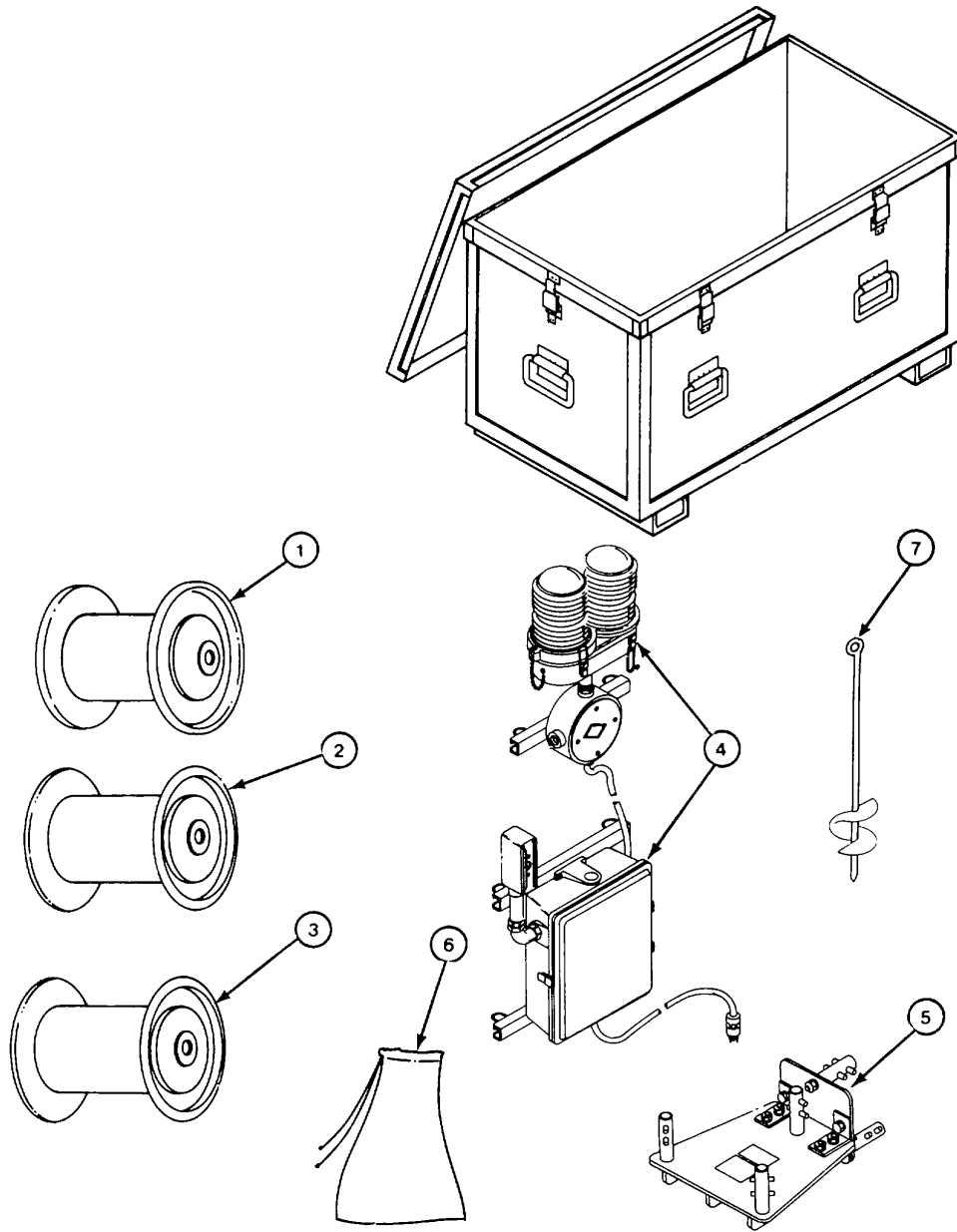
Before packing tower, nest tower sections into four rows as follows:

- 1) One small tower section nests inside a medium tower section, which in turn nests inside a large tower section.
- 2) One medium tower section nests inside a large tower section.
- 3) One medium tower section nests inside a large tower section.

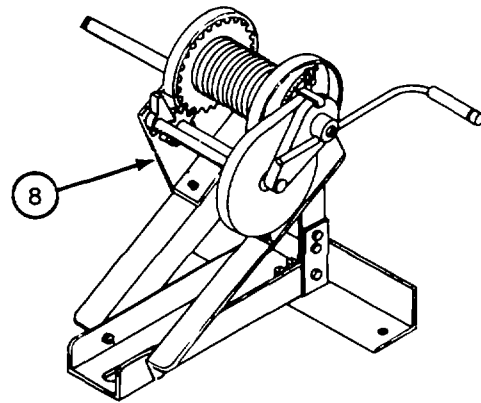
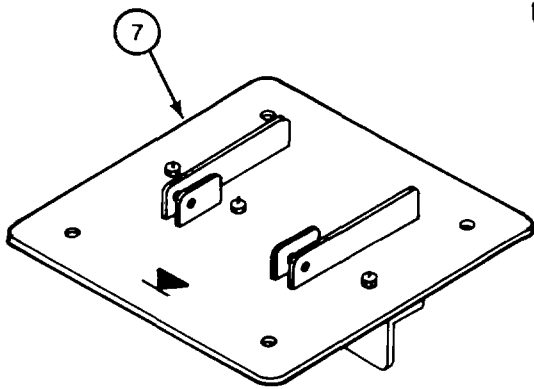
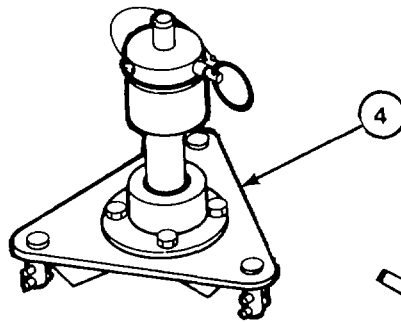
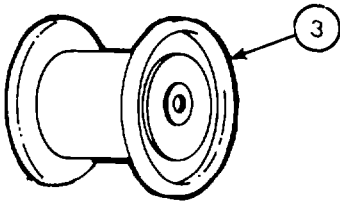
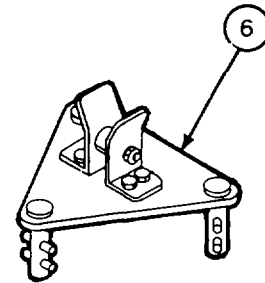
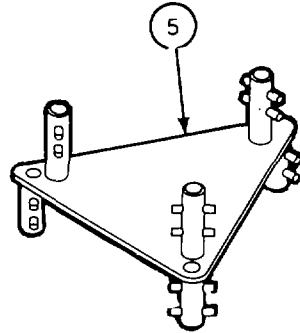
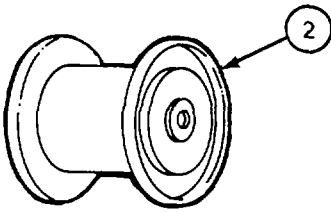
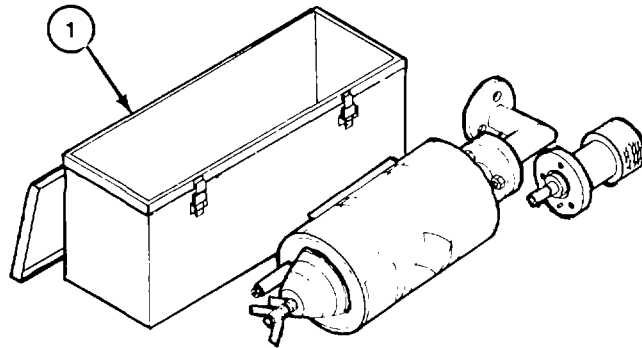
b. ANTENNA CASE CY-7865/TSC-99

There are two antenna cases. One case contains the following:

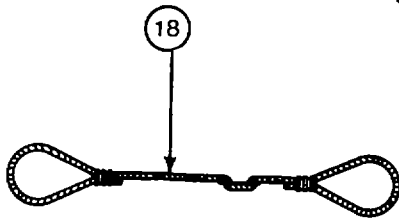
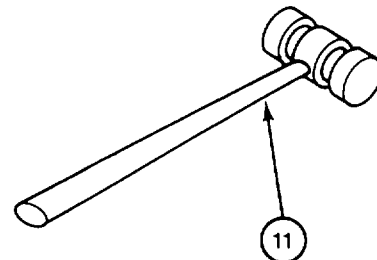
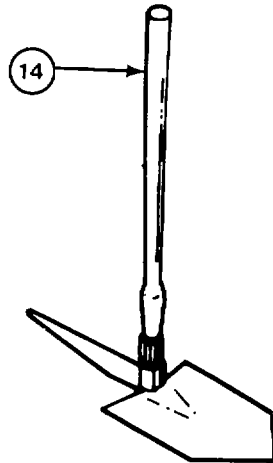
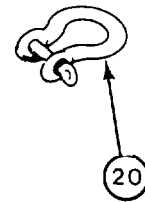
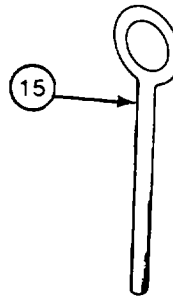
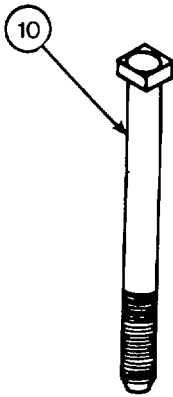
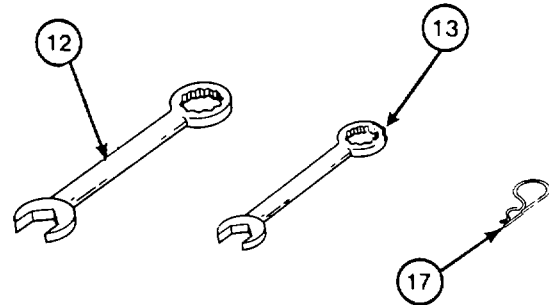
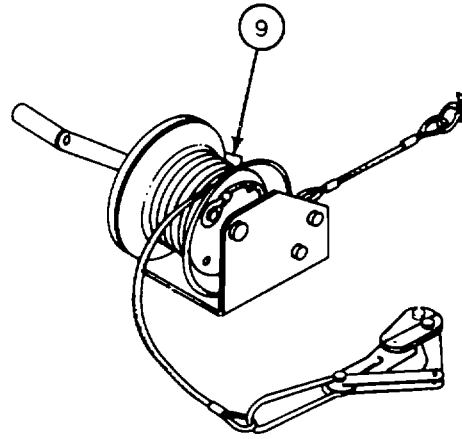
- (1) 1 - Reel No. 1
- (2) 1 - Reel No. 2,
- (3) 1 - Reel No. 3
- (4) 1 - Light assembly
- (5) 1 - Tower/gin pole base
- (6) 2 - Nylon bags containing all tower splices (39)
- (7) 6 - 30-inch anchors



- ① 1 - Antenna coupler case (which contains antenna coupler and the connector adapter)
- ② 1 - Reel No. 4
- ③ 1 - Reel No. 5
- ④ 1 - Tower top plate
- ⑤ 1 - Tower transition plate
- ⑥ 1 - Gin pole top plate
- ⑦ 1 - Tower base
- ⑧ 1 - Tower winch assembly



- ⑨ 2 - Feedline winch assemblies
- ⑩ 6 - Tower base pins
- ⑪ 2 - Hammers
- ⑫ 2 - Wrenches (large)
- ⑬ 2 - Wrenches (small)
- ⑭ 1 - Shovel/pick
- ⑮ 4 - Pound-in anchors
- ⑯ 2 - Straight-headed pins
- ⑰ 2 - Cotter pins
- ⑱ 2 - Bridle assemblies
- ⑲ 3 - Cable Clamp
- ⑳ 18 - Shackles



Section IV. OPERATION UNDER UNUSUAL CONDITIONS**2-10. OPERATION IN UNUSUAL WEATHER****CAUTION**

Before lowering, check that on-site wind is below 20 mph (32km/h), to prevent structural damage to the antenna. Make certain your electrical equipment has been TURNED OFF.

- a. **HIGH WIND CONDITIONS** If winds are predicted with possible gusts in excess of 85 mph (135 km/h) lower the antenna. The antenna must be lowered while on-site winds are still below 20 mph (32 km/h). See paragraph 2-8 for lowering instructions.

If ice build up is more than 1/4" (6 mm) radially, and winds are predicted with possible gusts in excess of 75 mph (120 km/h) lower the antenna. The antenna must be lowered while on-site winds are still below 20 mph (32 km/h). See paragraph 2-8 for lowering instructions.

2-11. EMERGENCY PROCEDURES

Personnel **MUST BE** alert to emergency situations: a. Antenna damage such as broken radiator wires. If this happens in any part of radiating system a high antenna voltage standing wave ratio (VSWR) will result. This can be seen at the transmitter as high reflected power from the antenna. Continued operations will result in damage to ANTENNA COUPLER and or the transmitter.

- b. Check for damage at the low-frequency end of the curtain (long radiators). You may operate at the high frequencies with transmitter power reduced.
- c. Emergency operation may be attempted at low transmitter power. This would allow operator to evaluate reflected power. If reflected power is in acceptable limits operating power may be increased.

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CHAPTER 3

MAINTENANCE INSTRUCTIONS

Checks and Adjustments	3-5	Lubrication	3-1
Cleaning	3-6	Removal and Installation	3-6
Disassembly and Assembly	3-6	Repair	3-6
Inspection	3-4	Troubleshooting	3-2

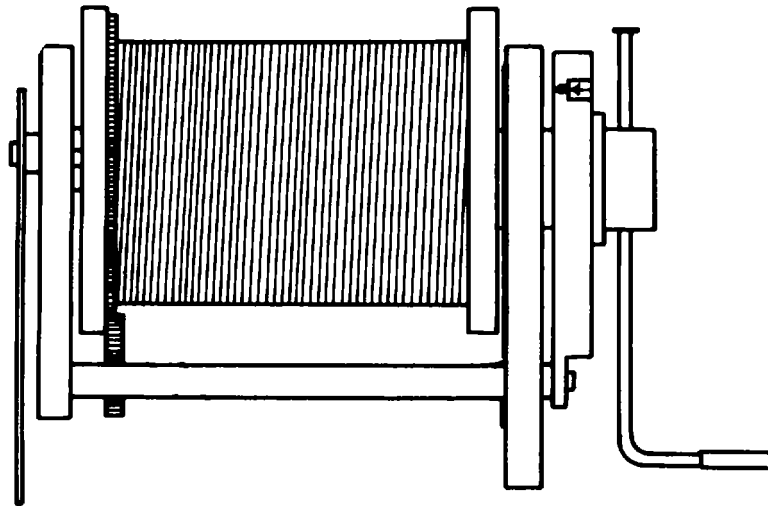
Section I. LUBRICATION INSTRUCTIONS

3-1. LUBRICATION

NOTE

TOWER WINCH is the only item requiring lubrication in the antenna system.

- Apply 4 to 5 drops VV-0-526 light weight machine oil in crankshaft - "OIL" hole (reference item 2, Appendix D)
- Apply MIL-G-25760 General Purpose light grease to face of all gear teeth. (Reference Item 4, Appendix D). Always clean and lubricate before packing in transit case for relocation or storage.



Section II. TROUBLESHOOTING

3-2. GENERAL

If erected properly and handled with reasonable care, the antenna will require no operator/crew maintenance other than:

1. Visual check that TOWER LIGHT ASSEMBLY is operating,
2. Visual check of ANTENNA COUPLER SPARK GAP after lightning storms,
3. Visual check that GUYS and CATENARIES are adequately tensioned,
4. Visual check for cleanliness and damage,
5. Repair of broken INSULATORS or WIRES detected by visual inspection, and
6. Troubleshooting for fault involving RF propagation.

3-3. TROUBLESHOOTING

Troubleshooting of the antenna shall be performed in accordance with table 3-1. This table lists the common malfunctions which you may find during the operation or maintenance of the ANTENNA or its components. You should perform the tests/inspections and corrective actions in the order listed.

This table cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

WARNING

Do not perform troubleshooting or work on or in close proximity to the antenna when transmitter power is on. Contact with high RF voltages can be fatal, and electromagnetic radiation can cause severe or fatal internal burns. Particularly dangerous areas are in the vicinity of the antenna coupler and rear radiator ground anchors. Do not climb tower as it is not designed to be climbed. Climbing the tower may cause it to fall resulting in destruction of the tower and serious injury or death to personnel.

Table 3-1. Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

1. HIGH VOLTAGE STANDING WAVE RATIO (VSWR) AT TRANSMITTER.

- Step 1. Shutdown transmitter and tag "out of service."
- Step 2. Check to see if connectors of RF line running from transmitter to antenna coupler are loose or if cable shows signs of damage or deterioration.
Re-tighten connectors or remove and replace cable if damaged or deteriorated.
- Step 3. Check to see if antenna coupler shows signs of damage or overheating.
Remove and replace if damage is suspected.
- Step 4. Check to see if connection of vertical feedline to antenna coupler is tight.
Re-tighten if connection is loose.
- Step 5. Check main radiator for broken wire(s) or damaged insulators on catenary or rear guy drop wires.
Notify responsible maintenance unit.

2. ANTENNA COUPLER SPARK GAP SHOWS SIGNS OF ARCING.

- Step 1. Shutdown transmitter and tag "out of service."
- Step 2. Inspect for damage.
Clean carbon traces from conductor and standoff with fine sandpaper (Item 9, Appendix D). Then set spark gap (para 3 - 5 b).

3. TOWER LIGHT ASSEMBLY FAILS TO CYCLE ON AND OFF.

- Step 1. Check to see if power cable to light assembly control box is connected to an active 115 VAC supply.
Re-connect or transfer to active 115 VAC supply.
- Step 2. Shutdown transmitter and tag "out of service."
- Step 3. Check power cable from 115 VAC supply to light assembly control box for signs of damage or deterioration.
Notify responsible maintenance unit.

4. TOWER WINCH DOES NOT OPERATE FREELY.

- Step 1. Inspect for insufficient lubrication.
Lubricate bearings.
- Step 2. Check to see if case or gears are damaged or worn.
Notify responsible maintenance unit.

SECTION III. MAINTENANCE PROCEDURES.**3-4. INSPECTIONS****WARNING**

Do not perform inspections or work on or in close proximity to the antenna when transmitter power is on. Contact with high RF voltages can be fatal, and electromagnetic radiation can cause severe or fatal internal burns. Particularly dangerous areas are in the vicinity of the antenna coupler and rear radiator ground anchors.

Do not climb tower as it is not designed to be climbed. Climbing the tower may cause it to fall resulting in destruction of the tower and serious injury or death to personnel.

Checks and inspection of the installed antenna is limited to that which can be accomplished from ground level. This condition limits detailed checks and inspections requiring hands-on action to ground level components such as the RF and AC CABLES supplying the ANTENNA, the ANTENNA COUPLER and its SPARK GAP, and the lower portion of the VERTICAL FEEDLINE, CATENARY, and RADIATOR. Checks and inspection of all other antenna components are restricted to that which can be accomplished by visual observation only.

a. Ground Level Cables and Connectors

Check all ground level cables for signs of damage or deterioration by moving the cable through your hands while walking along the cable path. Look for surface cracks or wear or damage caused by tracked or wheeled vehicles. CONNECTORS should be physically checked for secure fit and periodically disconnected and inspected for corrosion or cracked insulator material.

b. Ground Level Electrical Connections With Mechanical Hardware

Electrical connections between the ANTENNA COUPLER and VERTICAL FEEDLINE and between the FEEDLINE and VERTICAL RADIATOR are accomplished by a CLAMPING ACTION using a THREADED FASTENER. Check such connections by verifying that WING NUT is tightened as much as possible and that the ELECTRICAL CONDUCTOR does not move within the connecting surface.

c. Above Ground Level Electrical Connections with Mechanical Hardware

Electrical connections between the VERTICAL FEEDLINE and MAIN FEEDLINE and MAIN FEEDLINE and MAIN RADIATOR are out of reach of physical inspection when the antenna is installed. When the antenna is lowered for other maintenance, these connections should be checked in the same manner as for ground level electrical connections with mechanical hardware.

3-5. CHECKS AND ADJUSTMENTS

Checks and adjustments are restricted to re-tensioning of GUYS and CATENARIES and setting of the SPARK GAP on the ANTENNA COUPLER after cleaning off surface of contaminants resulting from arcing.

a. Re-Tensioning of Guys and Catenaries

Re-tensioning of GUYS and CATENARIES is accomplished by applying additional force to the free end of the rope passing through the ROPE TENSIONER.

b. Antenna Coupler Spark Gap Adjustment

WARNING

DEATH ON CONTACT

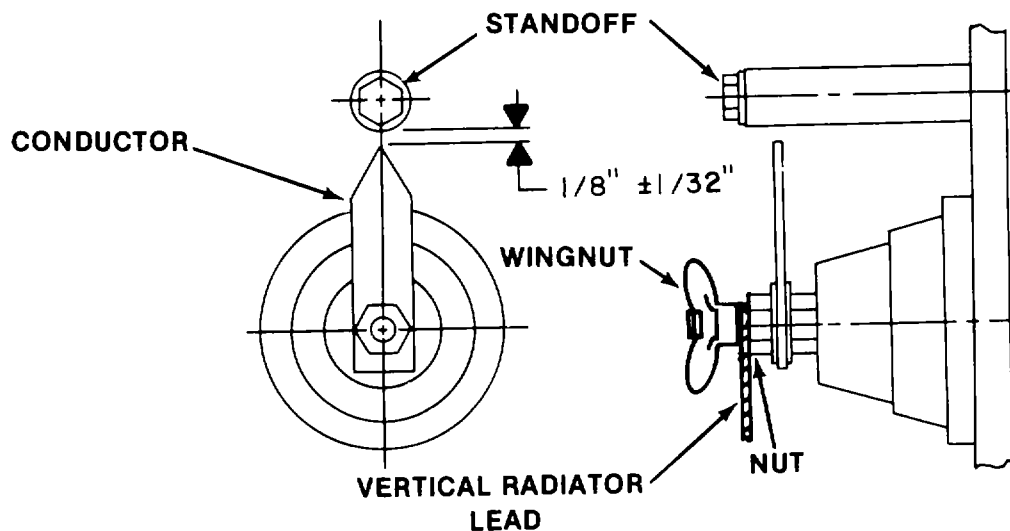
Transmitter must be shut down and tagged "Out of Service" before adjusting spark gap. Contact with high RF voltages can be fatal, and electromagnetic radiation can cause severe or fatal Internal burns.

NOTE

Spark gap adjustment is not normally required unless it is accidentally moved while making electrical connection or is pitted from arcing.

(1) Adjust spark gap as follows:

- a. Disconnect VERTICAL RADIATOR lead by removing WING NUT.
- b. Loosen NUT until CONDUCTOR slides freely.
- c. Position CONDUCTOR such that space between point of CONDUCTOR and STANDOFF is $1/8" \pm 1/32"$. Tighten NUT.
- d. Connect VERTICAL RADIATOR lead and tighten WINGNUT making sure that electrical connection is tight.



3-6. REMOVAL AND INSTALLATION

Refer to Chapter 2 for removal and installation procedures.

3-7. DISASSEMBLY AND ASSEMBLY

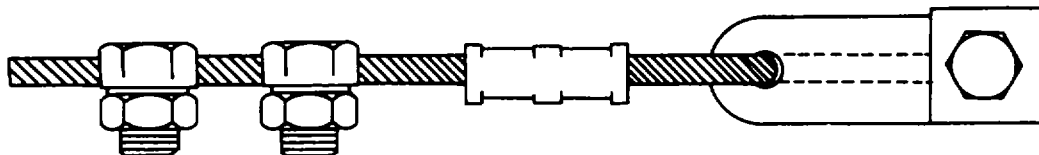
Refer to Chapter 2 for disassembly and assembly procedures.

3-8. REPAIR

Operator and/or crew repair of the antenna is limited to replacement of damaged or defective components such as WIRES or TOWER SECTIONS. Broken CERAMIC INSULATORS on DROP WIRES of the RIGHT, LEFT, and VERTICAL CATENARIES can be repaired by replacement using INSULATOR/WIRE REPAIR ASSEMBLIES 173-WIR-01A or 173-WIR-02A. Repair of LAYOUT WIRES or the MAIN and VERTICAL RADIATORS can be accomplished using WIRE REPAIR PARTS KIT 245-WIR-01T contained as part of start up spares.

Replacement of Broken Insulator on Catenary Dropwires

- a. Identify DROPWIRE size to broken insulator as either 1/16 or 5/32-inch diameter and select appropriate repair assembly.
- b. Extend damaged or broken DROPWIRE-INSULATOR assembly on ground to determine original length.
- c. Place the appropriate REPAIR ASSEMBLY next to damaged DROPWIRE-INSULATOR assembly and clamp REPAIR ASSEMBLY into place with clamps provided maintaining original length within + 1/2-inch (13 mm).
- d. Cut damaged INSULATOR and unnecessary DROPWIRE away.



WIRES and INSULATORS should be as clean as possible for optimum antenna performance. When necessary, clean antenna components with water. If cleaned immediately before packing in transit cases, wipe down ANTENNA COUPLER with clean dry cloth or allow to air dry prior to placement in case.

APPENDIX A REFERENCES

A-1. SCOPE

This appendix lists forms and publications that are referenced in this manual or that contain information applicable to the operation and maintenance of Antenna Group OE-317/TSC-99.

A-2. FORMS

DA Form 2028-2 Recommended Changes to Equipment Technical Publications.

DA Form 2404 Equipment Inspection and Maintenance Worksheet.

SF 368 Quality Deficiency Report

A-3. FIELD MANUALS

FM 21-11 First Aid for Soldiers.

A-4. TECHNICAL MANUALS

TM 750-244-2 Procedures for Destruction of Electronic Materiel to Prevent Enemy Use (Electronics Command).

A-5. MISCELLANEOUS PUBLICATIONS

DA Pam 310-1 Consolidated Index of Army Publications and Blank Forms.

DA Pam 738-750 The Army Maintenance Management System (TAMMS).

SB 38-100 Preservation, Packaging, Packing and Marking Materials, Supplies and Equipment Used by the Army.

TB SIG 291 Safety Measures to be Observed When Installing and Using Whip Antennas, Field-Type Masts, Towers, Antennas and Metal Poles that are Used with Communications, Radar and Direction Finder Equipment.

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APPENDIX B COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I. INTRODUCTION

B-1. SCOPE

This appendix lists components of end item and basic issue items for the OE-317/TSC-99 to help you inventory items required for safe and efficient operation.

B-2. GENERAL

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the item.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the OE-317/TSC-99 in operation, to operate it, and to perform emergency repairs. Although shipped separately, packaged BII must be with the OE-317/TSC-99 during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard to identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

B-3. EXPLANATION OF COLUMNS

The following provides an explanation of columns found in the tabular listings:

a. Column (1) Illustration Number (Illus. Number). This column indicates the number of the illustration in which the item is shown.

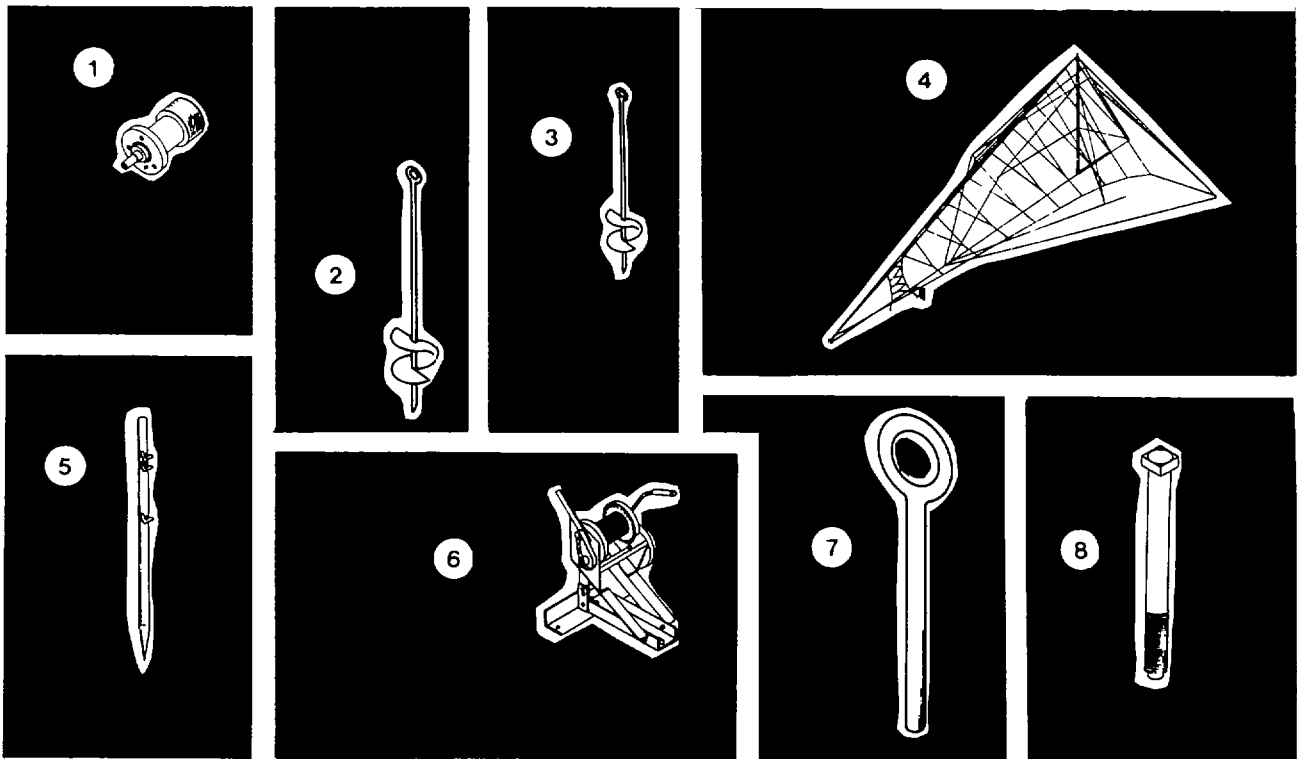
b. Column (2) National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3) Description. Indicates the National item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column (4) Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

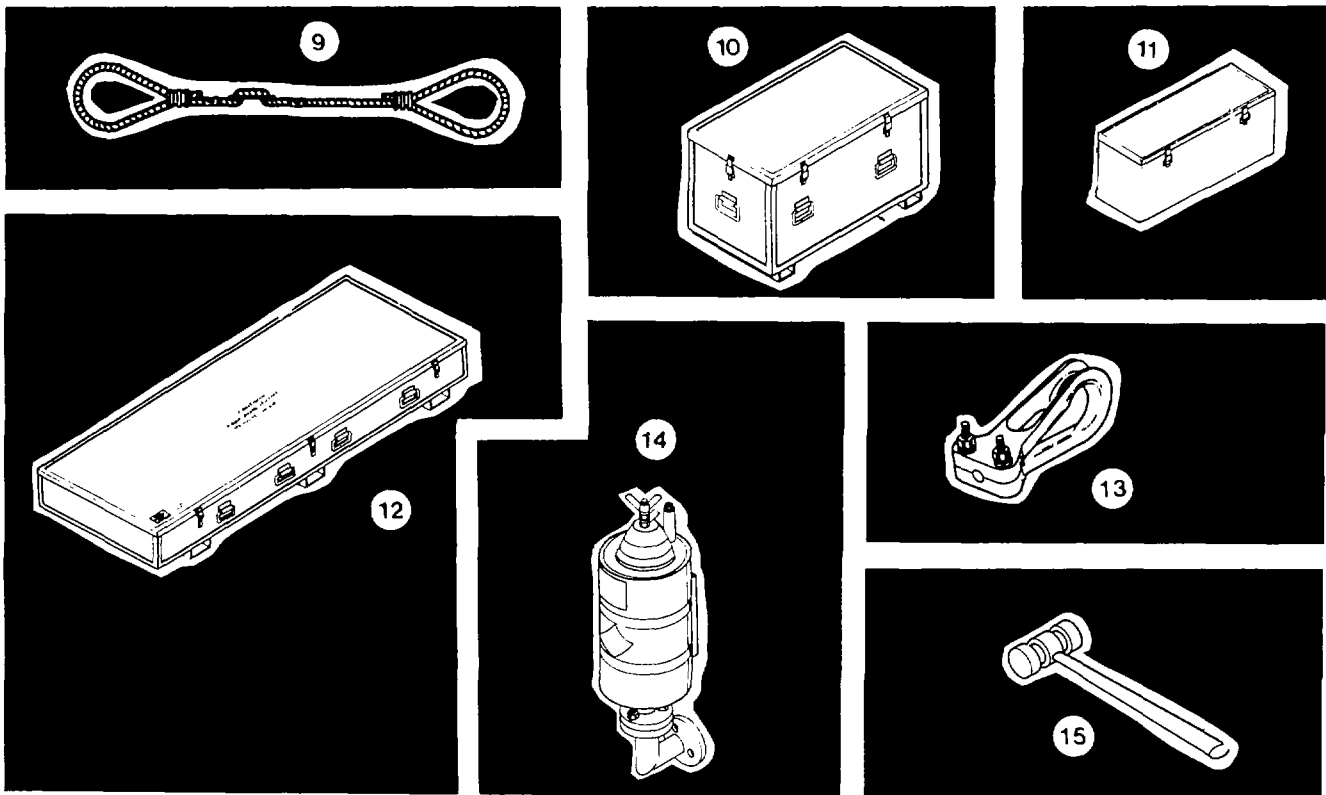
e. Column (5) Quantity required (Qty rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEM



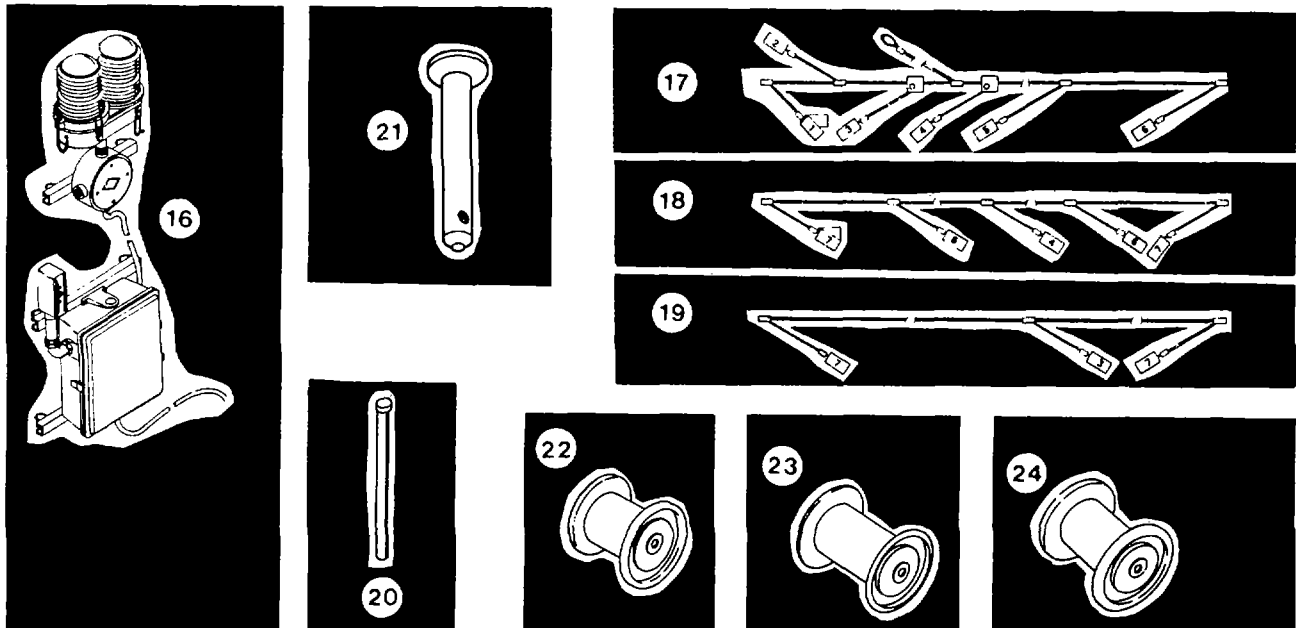
(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION (FSCM) AND PART NUMBER	USABLE ON CODE	(4) U/M	(5) QTY RQD
1		ADAPTER, CONNECTOR (92180) UG-1531/U	ECL	EA	1
2	4030-01-113-3594	ANCHOR, GUY (73569) EA6	ECL	EA	8
3	4030-01-113-1108	ANCHOR, GUY (30103) 030-ANC-02A	ECL	EA	6
4		ANTENNA (80058) AS-3442/TSC-99	ECL	EA	1
5	5895-01-104-1839	BAR, MATCHING UNIT (30103) 038-BAR-01A	ECL	EA	2
6		BASE ASSY, WINCH (30103) 078-BAS-01A	ECL	EA	1
7	5306-00-050-7066	BOLT, EYE (74999) J9312	ECL	EA	4
8		BOLT, MACHINE (30103) 016-BLT-16P	ECL	EA	6

Section II. COMPONENTS OF END ITEM - continued

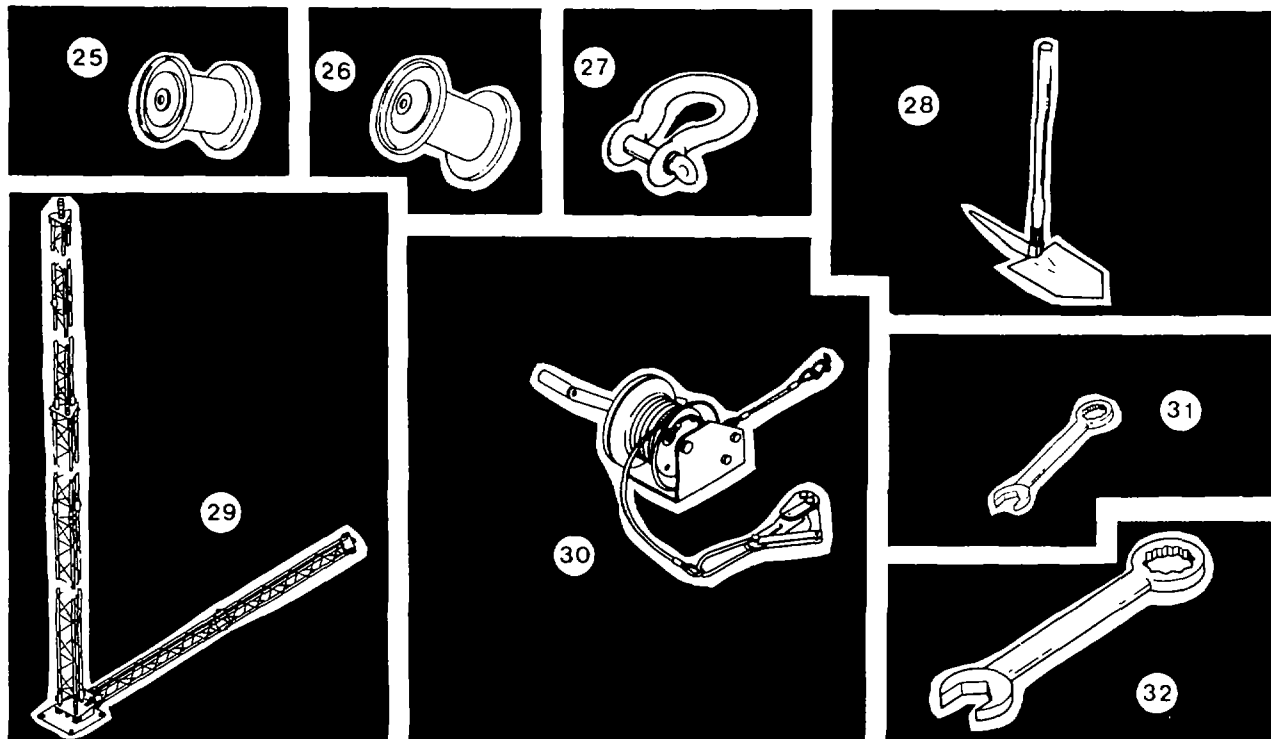


(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION (FSCM) AND PART NUMBER	USABLE ON CODE	(4) U/M	(5) QTY RQD
9	5895-01-111-0459	BRIDLE ASSEMBLY (30103) 056-BDL-01A	ECL	EA	2
10	5895-01-095-1205	CASE, ANTENNA (80058) CY-7865/TSC-99	ECL	EA	2
11	5985-01-095-1206	CASE, ANTENNA COUPLER (80058) CY-7866/TSC-99	ECL	EA	1
12	5895-01-095-1207	CASE, MAST (80058) CY-7866/TSC-99	ECL	EA	1
13	5895-01-104-1840	CLAMP, ROPE (30103) 080-MOD-01A	ECL	EA	3
14	5895-01-097-3400	COUPLER, ANTENNA (80058) CU-2273/TSC-99	ECL	EA	1
15		HAMMER, HAND (08325) 360Z	ECL	EA	2

Section II. COMPONENTS OF END ITEM - continued



(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION (FSCM) AND PART NUMBER	USABLE ON CODE	(4) U/M	(5) QTY RQD
16		LIGHTING ASSY (30103) 470-ASY-01 A	ECL	EA	1
17	5895-01-104-1834	MARKER ASSEMBLY, WIR (30103) 124-WIR-01A	ECL	EA	1
18	5895-01-104-1835	MARKER ASSEMBLY, WIR (30103) 124-WIR-02A	ECL	EA	1
19	5895-01-104-1836	MARKER ASSEMBLY, WIR (30103) 124-WIR-03A	ECL	EA	1
20		PIN, BASE (30103) 014-BAS-01 A	ECL	EA	2
21	5315-01-112-2593	PIN, STRAIGHT, HEADED (96906) MS9468-22	ECL	EA	1
22		REEL ASSY NO. 1 (30103) 007-REL-01A	ECL	EA	1
23		REEL ASSY NO. 2 (30103) 007-REL-02A	ECL	EA	1
24		REEL ASSY NO. 3 (30103) 007-REL-03A	ECL	EA	1



(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION (FSCM) AND PART NUMBER	USABLE ON CODE	(4) U/M	(5) QTY RQD
25		REEL ASSY NO. 4 (30103) 007-REL-04A	ECL	EA	1
26		REEL ASSY NO. 5 (30103) 007-REL-05A	ECL	EA	1
27	4030-00-185-0489	SHACKLE (75535) G209-1/2	ECL	EA	8
28		SHOVEL/PICK (53800) T6KB74002C	ECL	EA	1
29		TOWER ASSY (80058) AB-1282/TSC-99	ECL	EA	1
30	5895-01-104-1837	WINCH ASSEMBLY (30103) 003-WIN-02A	ECL	EA	2
31		WRENCH, BOX AND OPEN (80919)1161	ECL	EA	2
32	5120-00-028-9505	WRENCH, BOX AND OPEN (80919)S1161	ECL	EA	2

Section III. BASIC ISSUE ITEMS

(1) (2) (3) (4) (5)

ILLUS NUMBER	NATIONAL STOCK NUMBER	DESCRIPTION (FSCM) AND PART NUMBER	USABLE ON CODE	U/M	QTY RQD
		WIRE SPLICE KIT (3 SIZES) (30103) 246-WIR-01T	ECL	KIT	1
		CLAMP ASSEMBLY, DROP WIRE, FEEDLINE (30103) 086-CLA-01A	ECL	EA	6
		CLAMP ASSEMBLY, FEEDLINE (30103) 063-CLA-01A	ECL	EA	10
		CLIP, SPLITBOLT, 1/16" (30103) 031-CLP-02P	ECL	EA	4
		CLIP, SPLITBOLT, 1/16" (30103) 031-CLP-03P	ECL	EA	6
		ROPE, 1/4" STABLE BRAID (30103) 044-ROP-01P	ECL	FT	50
		WIRE, 1/16" BRONZE (30103) 031 -WIR-03P	ECL	FT	50
		WIRE, 5/32" BRONZE (30103) 013-WIR-04P	ECL	FT	25

Section III. BASIC ISSUE ITEMS- continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION (FSCM) AND PART NUMBER	USABLE ON CODE	(4) U/M	(5) QTY RQD
		WIRE REPAIR PARTS KIT (3 SIZES)	ECL	KIT	1
		(30103) 245-WIR-01T CRIMPING TOOL 1/16" THRU 5/32"	ECL	EA	1
		(30103) 009-TO L-01 P CRIMPING TOOL 3/16"	ECL	EA	1
		(30103) 009-TOL-02P SLEEVE, 3/32" ALUMINUM	ECL	EA	25
		(30103) 024-SLV-01 P SLEEVE, COPPER, 1/16"	ECL	EA	100
		(30103) 007-SLV-013P SLEEVE, COPPER, 5/32"	ECL	EA	25
		(30103) 007-SLV-04P SLEEVE, COPPER, 3/16"	ECL	EA	25
		(30103) 007-SLV-01 P WIRE, 1/16" BRONZE	ECL	FT	50
		(30103) 013-WIR-03P WIRE, 5/32" BRONZE	ECL	FT	25
		(30103) 013-WIR-04P WIRE, 3/16" CRES.	ECL	FT	25
		(30103) 044-WI R-04P WIRE, 3/32" GALVANIZED	ECL	FT	50
		(30103) 004-WIR-07P			

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**APPENDIX C
ADDITIONAL AUTHORIZATION LIST**

Section I. INTRODUCTION

C-1. SCOPE

This appendix lists additional items you are authorized for the support of the OE-317/TSC-99.

C-2. GENERAL

This list identifies items that do not have to accompany the ANTENNA GROUP 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

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you. If the item you require differs between serial numbers of the same model, effective serial numbers are shown in the last line of the description. If the item required differs for different models of this equipment, the model is shown under the "Usable On" heading in the description.

SECTION II. ADDITIONAL AUTHORIZATION LIST

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION (FSCM) AND PART NUMBER	USABLE ON CODE	(4) U/M	(5) QTY RQD
		(80058) RL.31(*) REELING MACHINE		EA	1
		(80058) RL-27(*) REMOVABLE AXLE		EA	1

C-1/(C-2 blank)

**APPENDIX D
EXPENDABLE SUPPLIES AND MATERIALS LIST**

Section I. INTRODUCTION

D-1. SCOPE

This appendix lists expendable supplies and materials you will need to operate and maintain the OE-317/TSC-99. These items are authorized to you by CTA 50-907, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

D-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 1, app D").

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

C - Operator/Crew

c. Column 3 National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

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

e. Column 5 Unit of Measure (UIM). 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 unit of measure differs from the unit of issue, requisition the lowest unit of issue 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	C		BRASS SHEET (30103) BRSHTO-031THK	SHT
2	C		COMPOUND, PIPE THREAD (30103) 009-SEL-02P	CAN
3	C		COMPOUND, SEAL (94295) PK4997	CAN
4	C		GREASE (92788)48040	CAN
5	C		OIL, CORENA (93508)67113	CAN
6	C		SEALANT (07080) GRADE AA	CAN
7	C		SEALANT (07080) GRADE B	CAN
8	C		SOLDER (41947) A-1473	5 LB.
9	C	5350-00-578-5708	SANDPAPER No. 0000	SHT

APPENDIX E MAINTENANCE ALLOCATION

Section I. INTRODUCTION

E-1. General

This appendix provides a summary of the maintenance operations for the OE-317/TSC-99. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

E-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

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 to 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. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. to adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

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

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) 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.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

E-3. Column Entries

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 noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. 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 that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of task-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 operation 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 maintenance allocation chart. Subcolumns of column 4 are as follows:

- C — Operator/Crew
- O — Organizational
- F — Direct Support
- H — General Support
- D — Depot

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

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

E-4. Tool and Test Equipment Requirements (Sect. III)

a. Tool and Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

c. *Nomenclature.* This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. *Notional/NATO Stock Number.* This column lists the National/NATO stock number of the specific tool or test equipment.

e. *Tool Number.* This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

E-5. Remarks (Sect. IV)

a. *Reference Code.* This code refers to the appropriate item in section II, column 6.

b. *Remarks.* This column provides the required explanatory information necessary to clarify items appearing in section II.

**SECTION II MAINTENANCE ALLOCATION CHART
FOR
ANTENNA GROUP OE-317/TSC-99**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	ANTENNA GROUP OE-317/TSC-99	INSTALL INSPECT TEST SERVICE REPLACE	6.0 0.4 0.1 1.0 3.0					A B C D E	
01	ANTENNA AS-3442/TSC-99	INSPECT REPAIR REPLACE	0.3 4.0 3.0					B J	
02	ANTENNA SUPPORT AB-1282/TSC-99	INSPECT REPAIR REPLACE	0.2 4.0 3.0					B K	
0201	TOP PLATE, MAST (369-PLT-0 1A)	REPAIR			0.5			L	
03	MAST LIGHT ASSEMBLY (470-ASY-01A)	INSPECT TEST	0.1 0.3					B M	
0301	CONTROL BOX (031-CTL-O 1 P)	TEST REPAIR			0.3 0.5		1 1,2	N O	
030101	PRINTED WIRING BD (034-CTL-01P)	TEST REPAIR			0.3 0.5		1 1,2	N P	
0302	REMOTE PHOTOCELL (026-CTL-O 1 P)	TEST REPAIR			0.3 0.5		1 1,2	N P	
04	BASE ASSY, TOWER WINCH (078-BAS- 1A)							Q	
0401	TOWER WINCH ASSY (006-WIN-0 1A)	INSPECT SERVICE REPAIR	0.2 0.5		1.5			B R S	
040101	WINCH, SPUR GEAR 2000 LB. (007-WIN-0 1P)	REPAIR			4.0			T	
05	FEEDLINE WINCH ASSY (003-WIN-02A)	REPAIR			1.0			U	
06	CASE, ANTENNA CY-7865/TSC-99	REPAIR			1.5			V	
07	CASE, MAST CY-7866/TSC-99	REPAIR			2.0			V	
08	CASE, ANTENNA COUPLER CY-7867/TSC-99	REPAIR			1.0			V	

**SECTION II MAINTENANCE ALLOCATION CHART
FOR
ANTENNA GROUP OE-317/TSC-99**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS F	GS H	DEPOT D		
			C	O					
09	ANTENNA COUPLER CU-2273/TSC-99	INSPECT CLEAN REPLACE TEST	0.1 0.2 0.3				1.0	3,4	F G H I

**SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
ANTENNA GROUP OE-317/TSC-99**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL, NATO STOCK NUMBER	TOOL NUMBER
1	F	MULTIMETER, AN/USM-223	6625-00-999-7465	1
2	F	TOOL KIT , ELECT. EQ., TK-105/G	5180-00-610-8177	2
3	D	METER, RF VECTOR IMPEDANCE (HP 4815A)	6625-00-061-0225	3
4	D	RESISTOR, CARBON COMP., 270 OHM, 2 WATT, $\pm 5\%$		4

(Edition of 1 Oct 74 may be used until exhausted)

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SECTION IV. REMARKS

REFERENCE CODE	REMARKS
A	TOTAL ANTENNA INSTALLATION WITH 6-MAN CREW INCLUDING SITE LAYOUT, ANCHOR EMPLACEMENT, ANTENNA ASSEMBLY AND ERECTION.
B	OPERATOR WALKAROUND VISUAL INSPECTION OF TOTAL ANTENNA FOR STRUCTURAL AND PHYSICAL INTEGRITY.
C	OPERATOR VERIFICATION THAT REFLECTED POWER AT TRANSMITTER IS WITHIN LIMITS.
D	OPERATOR/CREW RETENSIONING OF TOWER GUYS AS REQUIRED.
E	SIX-MAN CREW REPLACEMENT OF ANTENNA AT SAME SITE USING EXISTING ANCHORS.
F	OPERATOR VISUAL INSPECTION OF ANTENNA COUPLER SPARK GAP AFTER ELECTRICAL STORM FOR SIGNS OF PITTING OR CARBON TRACE.
G	OPERATOR CLEANING OF ANTENNA COUPLER SPARK GAP IN THE EVENT OF EVIDENCE OF PITTING OR CARBON TRACE RESULTING FROM ARCING DURING ELECTRICAL STORM. TIME INDICATED INCLUDES RE-GAPPING AS NECESSARY.
H	OPERATOR/CREW REPLACEMENT OF ANTENNA COUPLER WITH EQUIVALENT UNIT.
I	USE OF RF VECTOR IMPEDANCE METER (HEWLETT-PACKARD 4815A OR EQUIVALENT) TO MEASURE ANTENNA COUPLER VSWR TO DETERMINE IF IT IS GOOD OR BAD. ANTENNA COUPLER IS NOT REPAIRABLE.
J	OPERATOR/CREW REPAIR OF WIRES OF ANTENNA CURTAIN USING WIRE REPAIR PARTS KIT (245-WIR-01T) OR WIRE SPLICE KIT (246-WIR-01T) CONTAINED IN START-UP SPARES. TIME INDICATED INCLUDES LOWERING AND RAISING OF ANTENNA BY A CREW OF 6 FOR ACCESS.
K	OPERATOR/CREW REPAIR RESTRICTED TO REPLACEMENT OF DEFECTIVE ANTENNA SUPPORT COMPONENTS CONTAINED IN START-UP SPARES, I.E., MAST SPLICES (006-SPL-01A) AND MAST BASE PINS (016-BLT -16P).
L	REPLACEMENT OF MAST INSULATOR (087-INS-01A) ON MAST TOP PLATE FROM TWO-YEAR SPARES KIT.
M	OPERATOR TEST OF MAST LIGHT ASSEMBLY OPERATION BY COVERING AND UNCOVERING REMOTE PHOTOCELL AND VISUALLY VERIFYING OPERATION OF RELAY IN CONTROL BOX AND/OR ON AND OFF CYCLING OF DOUBLE OBSTRUCTION LIGHT ASSEMBLY .

SECTION IV. REMARKS

REFERENCE

REFERENCE CODE	REMARKS
N	ELECTRICAL PERFORMANCE TEST AND TROUBLESHOOTING USING MULTIMETER FOR FAULT ISOLATION TO DEFECTIVE COMPONENT.
O	REPAIR ACCOMPLISHED BY REMOVAL AND REPLACEMENT OF DEFECTIVE SUBASSEMBLY.
P	REPAIR ACCOMPLISHED BY REMOVAL AND REPLACEMENT OF DEFECTIVE COMPONENT PART.
Q	LISTED WITHOUT MAINTENANCE FUNCTIONS SOLELY FOR THE PURPOSE OF HAVING THE GROUP NUMBERS IN THE MAC AND THE REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL) COINCIDE.
R	OPERATOR/CREW LUBRICATION.
S	REPAIR RESTRICTED TO REMOVAL AND REPLACEMENT OF SAFETY BRAKE HANDLE (007-WIN-02P) AND ENTIRE WINCH CABLE ASSEMBLY OR WIRE/CABLE CLAMP ON END OF CABLE ASSEMBLY .
T	REPAIR RESTRICTED TO REPLACEMENT OF WINCH COMPONENTS INCLUDING BEARINGS, DRUM GEAR, BRAKE DRUM, ETC.
U	REPAIR RESTRICTED TO REMOVAL AND REPLACEMENT OF ENTIRE WINCH CABLE ASSEMBLY OR WIRE/CABLE CLAMP ON END OF CABLE ASSEMBLY. WINCH ITSELF IS NOT REPAIRABLE .
V	REPAIR RESTRICTED TO REPLACEMENT OF BROKEN OR MISSING HANDLES, CLAMPS, AND COVER SEAL.

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