

TELEX *hy-gain*

TELEX COMMUNICATIONS, INC.



technical data report

FOR COMMERCIAL, INDUSTRIAL AND MILITARY APPLICATION

DUAL TOWER SYSTEM MODEL T-3002DA

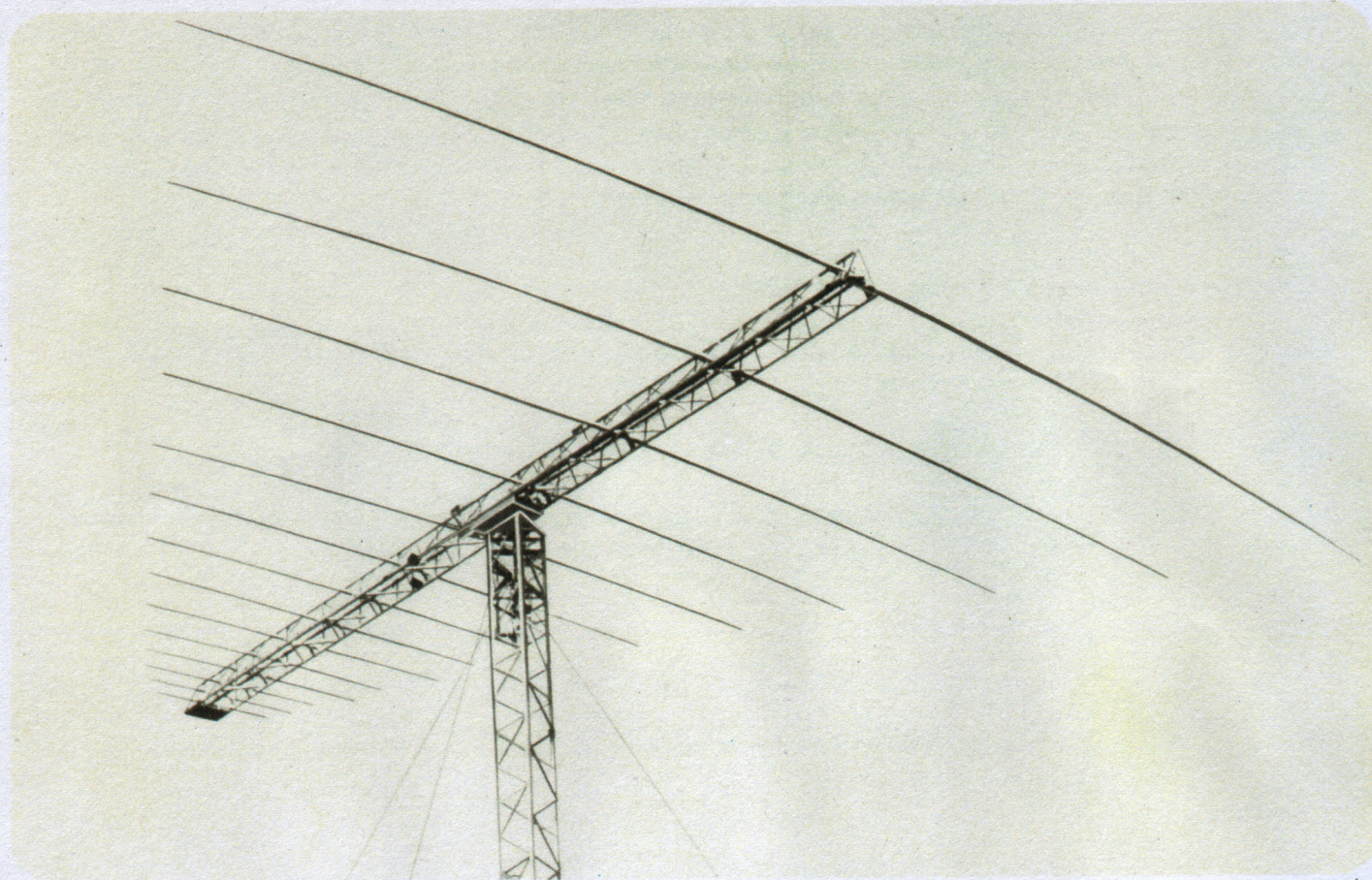
The Model T-3002DA dual tower and rotator system is the ultimate support for large HF log periodic antennas. The T-3002DA is specifically designed to support the Hy-Gain antennas Models, LP-1001, LP-1002 or the 3 to 30 MHz, LP-1005.

The system consists of two 80 foot steel knockdown support towers, a base rotator supported on pivotal yokes between the towers, a 100 foot rotating mast with a 1½ inch pressurized feedline installed inside, a 25 kW rotary joint and all guys, anchors and hardware needed for installation. The rotator used is the heavy duty Model R-3503, equipped with the DRC-1, two-wire Control Unit.

The rotating mast and ground level rotator design places the vertical load of the antenna at the base of the tower rather than at the top. This provides increased system stability and greater wind load survivability. Rotator maintenance can be performed without climbing the tower and the antenna can be quickly raised and lowered without the use of a crane.

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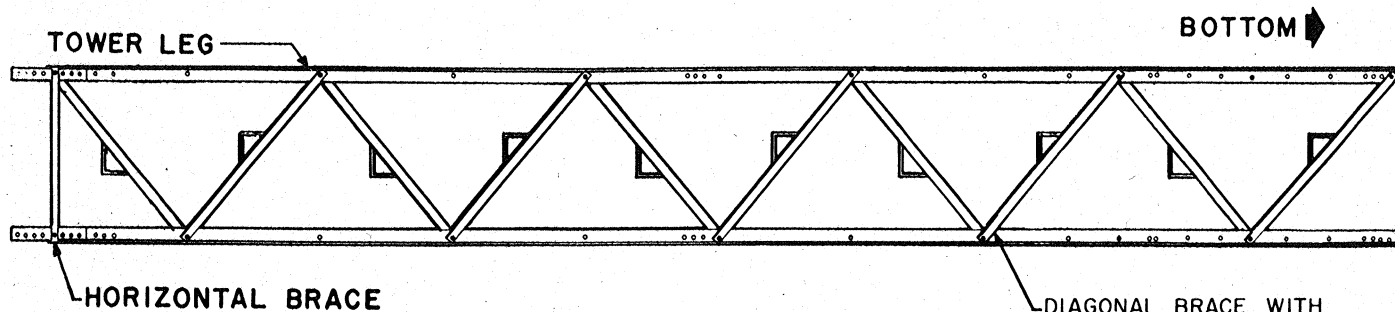
technical data report

FOR COMMERCIAL, INDUSTRIAL AND MILITARY APPLICATIONS

LP-1001/LP-1002 and LP-1005 LOG PERIODIC ANTENNAS

The LP-1001, LP-1002 and LP-1005 antenna heads are designed for medium and long range high frequency applications. These antennas provide high reliability coupled with high efficiency while exhibiting low VSWR, high effective radiated power and flexibility of use. These antennas may be mounted on a tower for fixed azimuth/path applications or mounted on a rotator where multiple azimuths can be selected. The LP-1001 and LP-1005 are log periodic dipole arrays consisting of linear dipoles from 6 through 30 MHz and inductively taper-loaded dipoles from 3-30 MHz for the LP-1005 and 4-30 MHz for the LP-1001. The LP-1002 is a log periodic consisting of linear dipoles from 6-40 MHz. These antennas are all capable of 25 kW Avg./ 50 kW PEP power. The design of these antennas results in antennas of minimum physical size, while providing a high efficiency antenna. They are designed to withstand the rigors of extreme environmental conditions.

PHYSICAL DATA



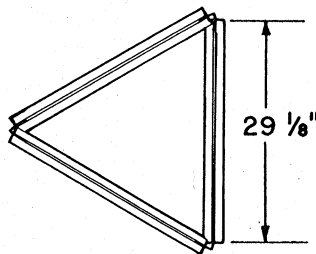
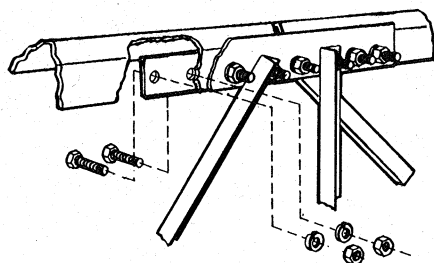
TOWER LEG SIZE: $2\frac{1}{2}" \times 2\frac{1}{2}" \times \frac{3}{16}" \times 20'$ L
 HORIZONTAL BRACE: $1\frac{1}{4}" \times 1\frac{1}{4}" \times \frac{3}{16}" \times 29\frac{1}{8}"$ L
 DIAGONAL BRACE: $1\frac{1}{4}" \times 1\frac{1}{4}" \times \frac{3}{16}" \times 37\frac{7}{8}"$ L

DIAGONAL BRACE WITH STEP ASSEMBLY:

Ten assemblies are required per 20 ft. (6.096m) section. Other sides use diagonal braces. Twenty (20) braces are required in each 20ft. section.

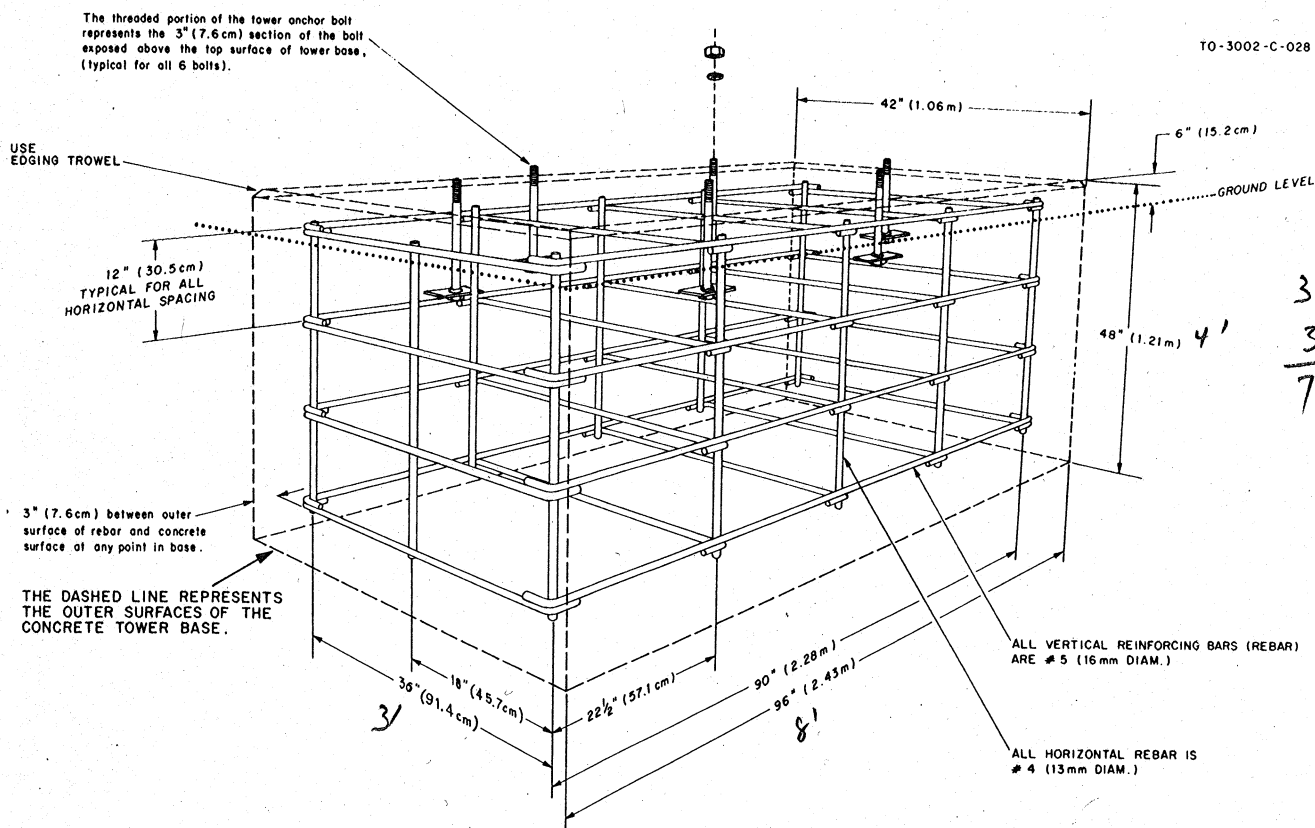
For a "NO-STEP" tower section, all three (3) sides use diagonal braces. Thirty (30) braces are required in each 20ft. section.

TYPICAL BRACE CONNECTION



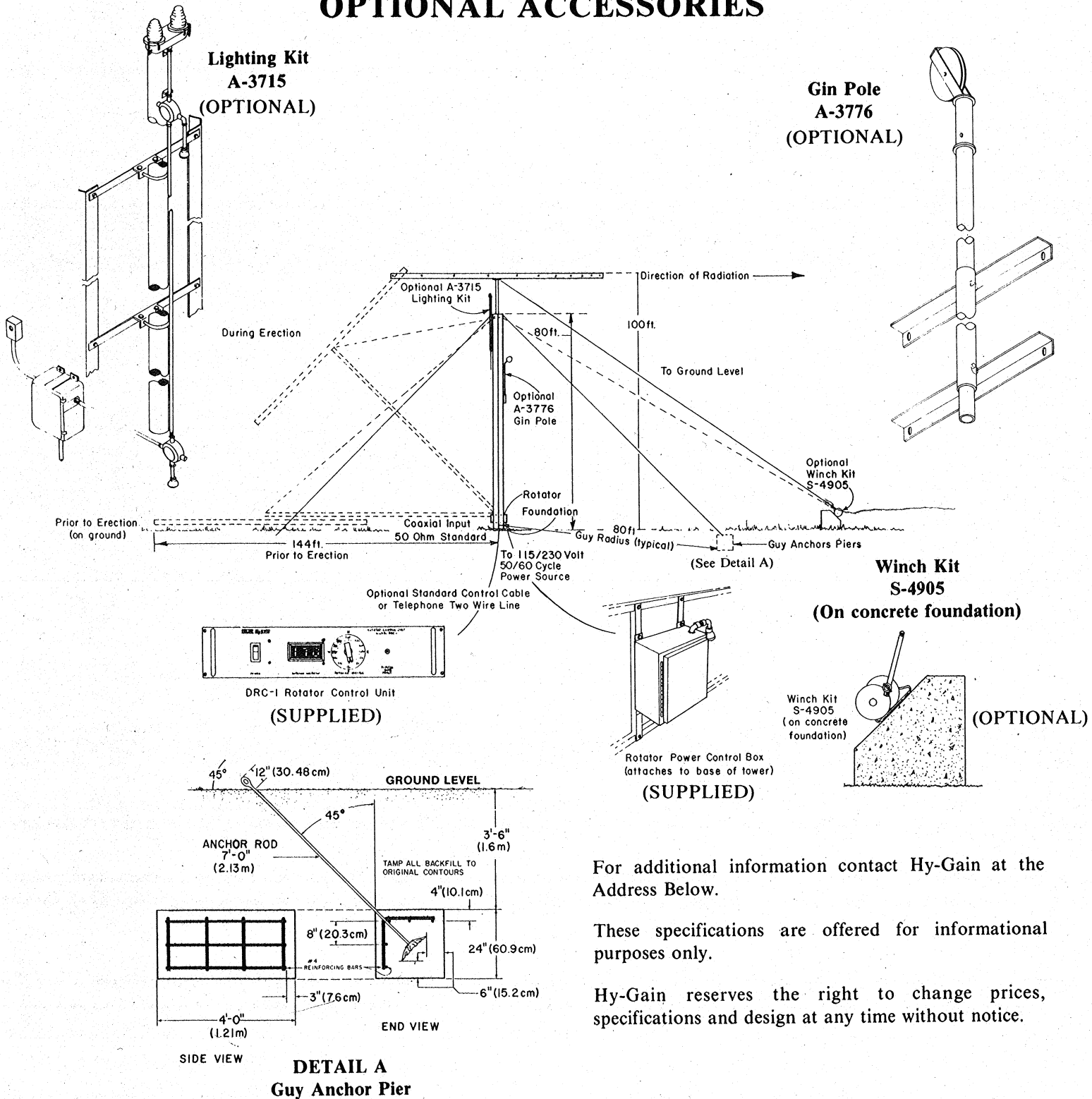
END VIEW

FOUNDATION REQUIREMENTS



3.56 cu
 3.56
 7.12 cu
 yd.

TYPICAL INSTALLATION AND OPTIONAL ACCESSORIES



For additional information contact Hy-Gain at the Address Below.

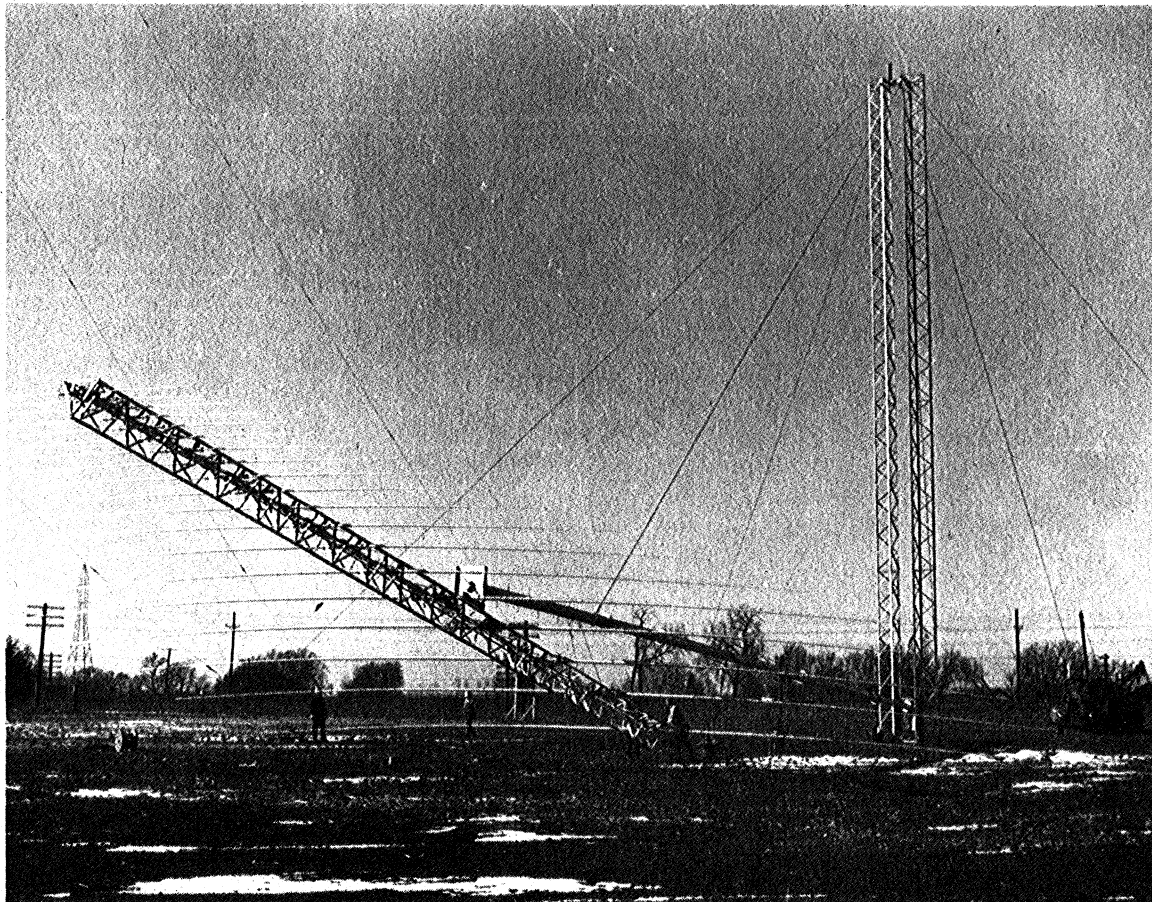
These specifications are offered for informational purposes only.

Hy-Gain reserves the right to change prices, specifications and design at any time without notice.

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TELEX COMMUNICATIONS, INC.

8601 Northeast Highway Six, Lincoln, NE 68505 U.S.A. Telephone: 402-467-5321, telex: 48-4324



SPECIFICATION SUMMARY

Hy-Gain Model No.....	T-3002DA
Overall Height.....	100 ft. (30.48 m)
Voltage required	115V or 230V 50/60 Hz, 1 Phase
Installation area required	0.31 Acre (1254 sq. m)
Transportability	Can be shipped by any mode of transportation in factory crating
Feedline	50 ohm pressurized feedline
Input connector	1 5/8" EIA coaxial flange
Wind and Ice Loading:	
Wind with no ice	130 mph (209.2 km/h)
Wind with 1/2" radial ice	105 mph (168.9 km/h)
Azimuth rotation speed	1 rpm

The boom support structure is manufactured of 6061-T6 aluminum extruded members secured with high strength stainless steel, galvanized steel and corrosion resistant hardware. The transmission line connecting the dipole elements is composed of a unique, balanced to unbalanced feedline terminating in a standard EIA coaxial line. The coaxial portion is air dielectric with Teflon® spacers separating the center conductor and outer conductor at specified intervals. It is recommended the transmission line be pressurized with dry air or SF-6 for high power applications. The extreme ends of all coaxial transmission lines are terminated with a 15 PSI relief valve allowing automatic line purging simply by increasing line pressure to beyond 15 PSI. All radiating elements are structurally tapered telescoping aluminum tube sections providing minimum weight consistent with maximum strength and minimum drag. The longest four elements on the LP-1001 and LP-1005 are base inductively loaded with helical copper coils connected to their respective transmission line and elements at stainless steel terminals. All element center insulators are composed of compressed laminant fiberglass for high electrical, as well as mechanical strength.

The following optional accessories are available:

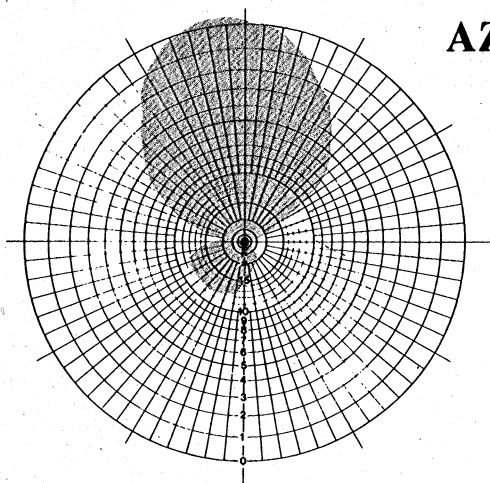
- Model R-3502 - Heavy Duty Rotator with remote control unit (DRC-1) and 1½" EIA 50 ohm rotary joint.
- Model T-3023 - Heavy Duty Single Tower - Support Structure - 100 feet.
- Model T-3002 - Heavy Duty Dual 80 Foot Tower Structure with ground level rotator with remote control unit (DRC-1), a 100 foot rotating mast.

Specification Summary LP-1001/LP1002 and LP-1005

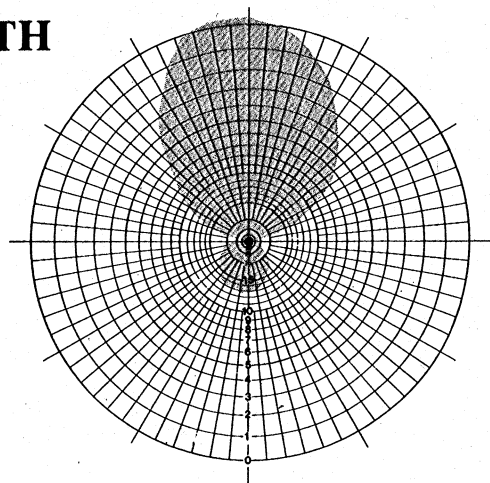
	LP-1005	LP-1001	LP-1002
Hy-Gain Model No.			
Military Nomenclature:			
National Stock Number			
Electrical:			
Frequency Range, MHz	3.0-30.0	4.0-30.0	6.0-40.0
Power Handling Capability: PEP/Average (in kW)	50/25	50/25	50/25
Polarization	Horizontal	Horizontal	Horizontal
Cross Polarization (in dB, down)	20	20	20
Forward Gain over Average Soil Conditions at 100' (30.5 m) height (in dBi)	10-13.5	10-13.5	10-13.5
Front-to-Back Ratio (in dB, nominal)	14	14	14
Maximum VSWR (with respect to 50 ohms)	3:1 (3-4 MHz) 2:1 (4-30 MHz)	2:1	2:1
Input Impedance (in ohms)	50	50	50
Input Connector	1½" EIA	1½" EIA	1½" EIA
Azimuth Half Power Beam Width Average	70°	70°	64°
Vertical Angle of Max. Radiation: 4 MHz/30 MHz	32°/5°	32°/5°	23°/3°
Structural:			
Boom Length	72 ft./21.95 m	72 ft./21.95 m	64 ft./19.66 m
Longest Element	104.16 ft./31.75	87 ft./26.65 m	81 ft./24.69 m
Turning Radius	63.5 ft./19.35 m	54 ft./16.46 m	51 ft./14.94 m
Total Number of Elements	19	19	14
Wind Loading Capability:			
No Ice (in mph/kph)	120/193.08	140/224	140/225
Radial Ice 0.25" (6.3 mm) (in mph/kph)	80/128.7	100/161	100/161
Net Weight: (in lbs/kg)	2100/955	1695/700.45	1400/636.36
Shipping Weight (in lbs/kg)	3,650/1,659	3,408/1,546	2,102/955.45
Shipping Volume (in cu. ft./cu. m)	242.0/6.85	280.4/7.94	121.9/3.45
Wind Surface Area (in sq. ft./sq. m)	120 Sq. ft. (11.15 Sq. m)	108 Sq. ft. (10.03 Sq. m)	88 Sq. ft. (8.18 Sq. m)

TYPICAL RADIATION PATTERNS

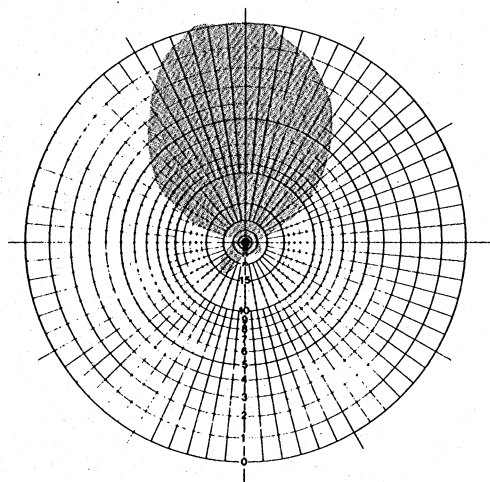
AZIMUTH



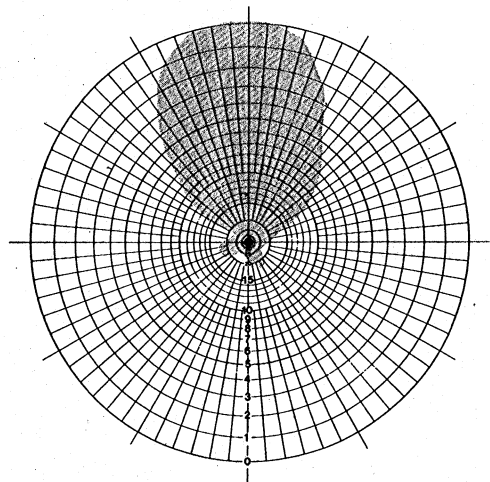
Frequency 4.0 MHz/72° HP Beamwidth



Frequency 6.0 MHz/71° HP Beamwidth

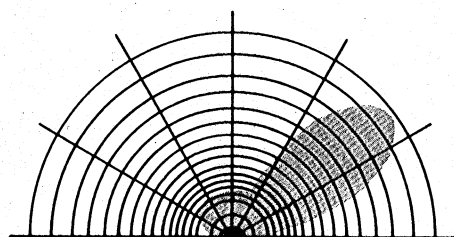


Frequency 15 MHz/73° HP Beamwidth

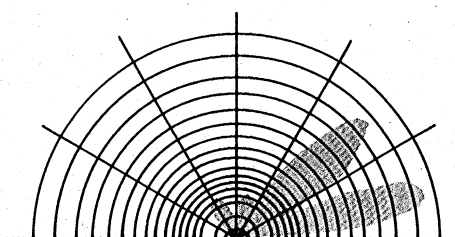


Frequency 30 MHz/65° HP Beamwidth

ELEVATION

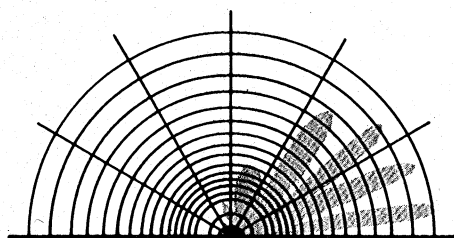


4 MHz Typical

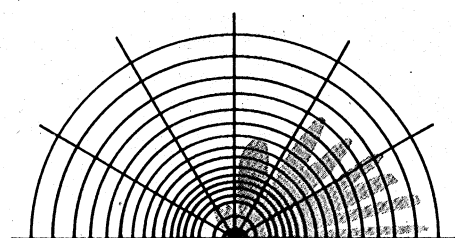


10 MHz Typical

HEIGHT OVER PERFECT EARTH
FOR ANTENNA INSTALLED AT 100 FT.



20 MHz Typical



30 MHz Typical

VSWR CHARTS

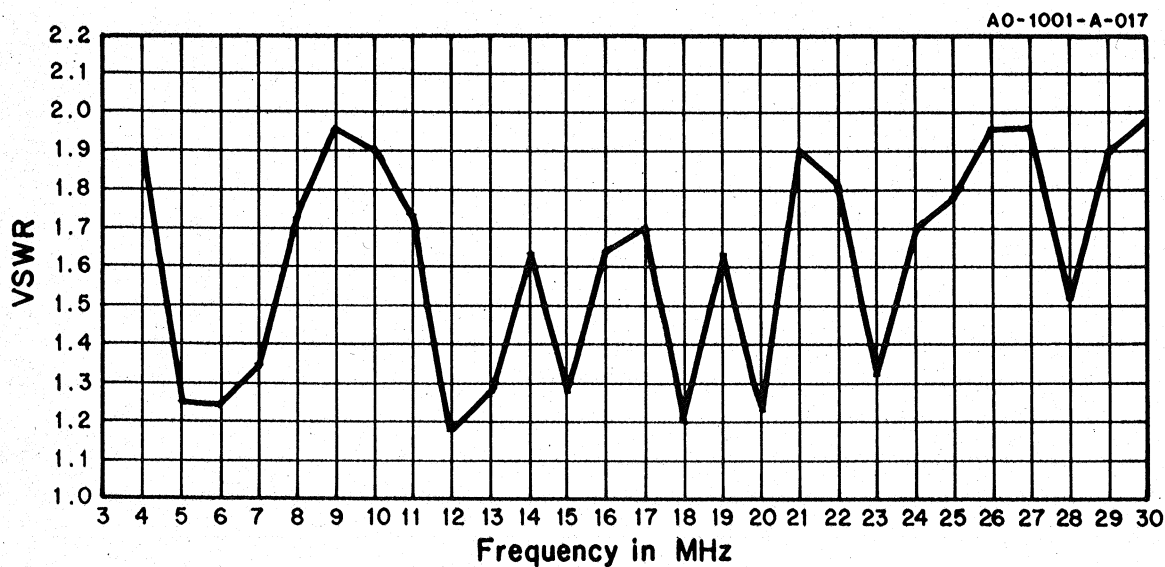


Chart 1. Typical VSWR for LP-1001 and LP-1005

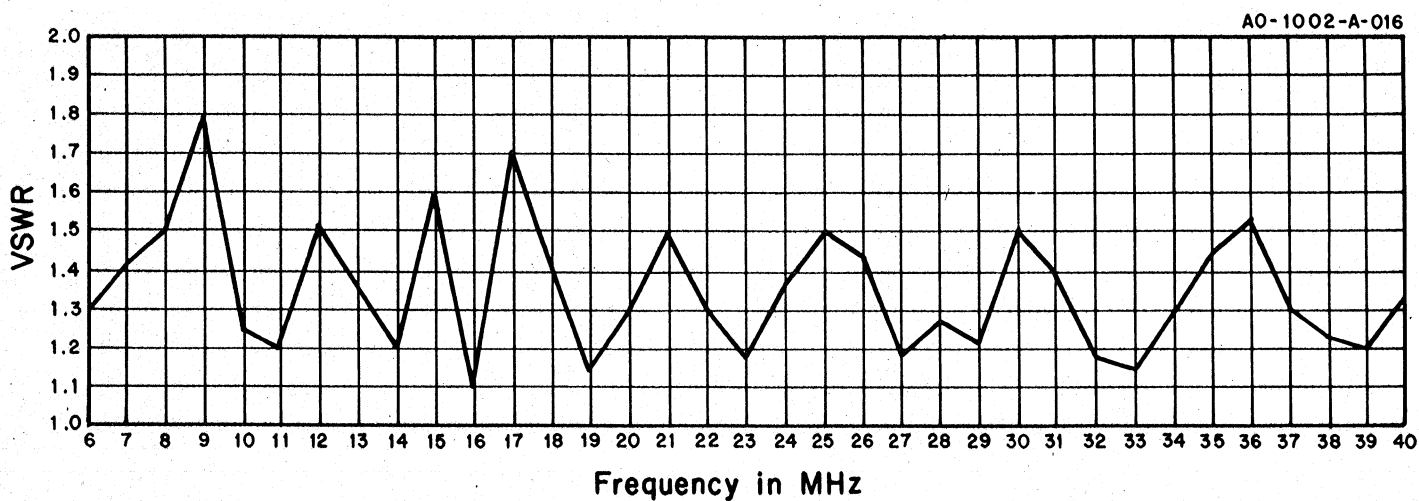


Chart 2. Typical VSWR for LP1002

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TELEX COMMUNICATIONS, INC.

8601 Northeast Highway Six, Lincoln, NE 68505 U.S.A., Telephone: 402-467-5321, telex: 48-4324

Model 3002FA

Dual Tower Series

**Installation and Maintenance
Manual**



**UNITED
STATES
ANTENNA
PRODUCTS, LLC.**

®

Model 3002 FA

Dual Tower Series

Installation and Maintenance Manual

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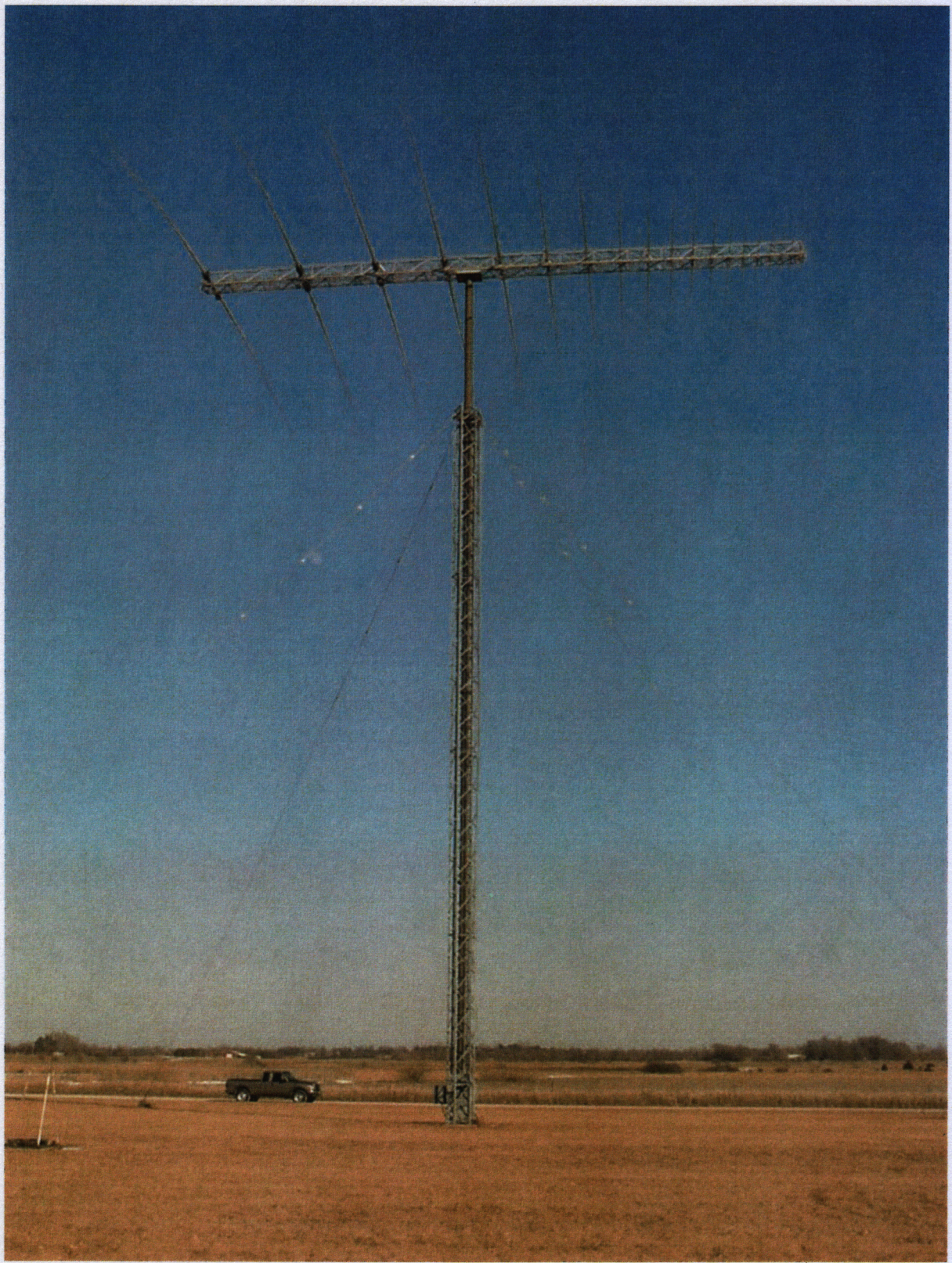


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CHAPTER 1 - GENERAL INSTRUCTIONS

Section I.

General Description Specification Data

Scope

This manual covers installation and operating instructions and maintenance procedures for the USAP Model 3002FA Dual Tower System. Refer to the appropriate manuals for optional items that may be included for your contractual requirements.

Physical Description

The Model 3002 is a Dual Tower System, complete with mast, feedline, rotator, power and control box with a remote control unit, and guy system. The tower assembly consists of two 80-foot tower sections coupled at the bottom with a trunnion assembly and coupled at the top with a bearing assembly. The tower assembly is set on a concrete foundation, and is guyed at the top of the towers for a rigid installation.

The rotator assembly installed at the base between the two towers, rotates the antenna continuously in either clockwise or counterclockwise direction. The mast is supported by the rotator assembly and extends approximately 16 feet above the dual towers. A bearing assembly secures the mast at the top of the towers.

The yokes of the trunnion plate assembly allow the rotator and mast to be tilted 90 degrees. This permits assembly of the mast section to the rotator assembly at ground level, after which the antenna such as the USAP LP1001 and LP1005 is attached to the mast. Use a winch truck or winch kit to erect the complete mast/antenna assembly and secure it to the top bearing assembly.

A pressurized coaxial transmission line installed within the mast provides RF feed for the antenna. This transmission line uses a rotary joint installed under the rotator assembly.

Other items may be included with your system, depending on special contractual Requirements. Refer to the appropriate manuals for complete description of these items.

Ten percent (10%) extra hardware is supplied to compensate for any lost hardware.

Overall Height	100 feet (30.48m)
Voltage Required	115 or 230 VAC 50/60 Hz 1 phase
Installation Area Required	0.31 acre (0.125 ha) 230' x 115'
Transportability	Can be shipped by any mode of transportation in factory cartons
Storage Conditions	Protect from moisture
Cabling Requirements	See Figure 3-5 and page 3-7

Table 1-1
Logistical Data

Feedline	50 ohm pressurized rigid cable
Input Connector	1 5/8" EIA coaxial flange
Wind and Ice Loading	
Wind w/no ice	130 mph (209.2 km/h)
Wind w/1/2" radial ice	105 mph (168.9 km/h)
Azimuth Rotation Speed	User definable via DRC 3

Table 1-2
Capabilities and Limitations

Installation Equipment

This system is supplied complete with all necessary components needed. The Parts List in Chapter 6 lists the individual parts and assemblies furnished.

The system includes a 25 kW Rotary Joint and Transmission Line Kit. Refer to the 3701 Parts list (pages 5-2 and 5-3) for a list of equipment supplied with the 25 kW kit.

Table 1-3 lists equipment not supplied as a part of the system. This equipment is needed for installation, operation and maintenance purposes. A spud handle wrench and a T-handled reamer are a necessary part of installation tools. Build-up of plating in holes on galvanized assemblies is normal and must be cleaned out before bolts are passed through.

Qty	Description	Use
1	Standard Box of Hand Tools	Tower Assembly
1	Measuring Tape, 100'	Site Layout
1	Set of Excavation tools	Foundation
1	Lumber as required	Foundation
1	Hand Level	Foundation
Lot	Reinforcement Rod, as required	Foundation
1	Plywood Tower Bolt, Location Templates	Foundation
1	Assortment of Standard Masonry Tools	Foundation
1	Crane, 50' working height or Gin Pole Kit	Tower Erection
1	5/8" Stranded Cable, 300'	Mast Erection
1	Winch 6000 pounds working load	Mast Erection
2	4" x 4" x 5' Wood Timbers	Tower Assembly
2	Tag Lines	Erection
2	Tensionmeters	Guy Wire Tension
2	Transits	Tower Plumb
4	Barrels 55 gallon, empty	Mast Assembly
1	Tank of dry (water pumped) Nitrogen with regulator, fittings and hose	Transmission Line Pressure Test
1	Chain or Nylon Ratchet Hoist	Mast Installation
1	Torque Wrench 200 ft-lb (275Nm) capacity	Mast Assembly
1	Spud Handle wrench	Hole Alignment and Assembly
1	T-Handle Reamer	Hole Clean Out

Table 1-3
Equipment Required But Not Supplied

Winch Usage

The antenna and mast may be raised with a winch truck, an electric winch, or a hand operated winch. Operation of a winch truck, when used for raising the system varies with the style and size of the winch unit.

The basic requirements for winch truck use are limited to positioning the winch truck unit at least 90 feet (2.4 m) from the tower base, 180 degrees from the antenna and mast, and directly in line with them.

CAUTION

The antenna, the tower and winch truck must be aligned accurately. Damage to your system will result if this condition is not met.

If the winch truck is located on one side or another of the antenna and mast external force will develop on the tower which may damage the system. The winch truck should be manned by a qualified operator.

If a hand operated winch, or an electric winch (USAP Model 4906) is used, a concrete foundation will be required. Refer to the appropriate winch manual for complete plans for constructing this foundation. The location of the winch should be 90 feet (27.4 m) from the base of the antenna.

CHAPTER 2 - INSTALLATION

Introduction

This chapter contains the information needed to site and install the USAP Dual Tower System. "this chapter has four sections. Section I contains data for effective installation planning. Section II provides logistical data. Section III contains installation instructions. Section IV explains how to prepare the equipment for reshipment,

Site surveys and familiarization training of the installation crew should be performed prior to installation.

Section I.

Installation Planning

Site Selection

The tower system requires approximately an area 230'x 115' (70.1 m x 35.05 m) for proper installation. Among the factors to be evaluated in selecting an antenna site are the type of soil at the installation area, the nearness of any obstructions which might affect the radiation pattern and the choice of level terrain.

Be sure the site is free of long horizontal metallic objects such as power lines, especially when they are in the order of a quarter wavelength and its multiples.

Construction Data

Access road and turnaround. The access road and turnaround should be all-weather construction with gravel surface. It should be at least ten feet (3.048 m) wide.

Soil conditions. Soil conditions around the tower foundation should allow access to the tower system during all weather conditions.

Foundation. The concrete foundation should be cured a minimum of seven (7) days. (This depends on climate and temperature, check with your supplier to be sure.) The "Tower Foundation" section lists instructions for constructing the concrete base. The design of this foundation is based on normal soil conditions of 4,100 pounds (1814.37 kg) per square foot.

Guy Anchors. The guy anchors must be encased in concrete if the soil is not well drained or cannot meet a 4,000 pound (1814.37 kg) per square foot holding power requirement. This concrete must be cured at least 7 days before installing the guy wires. (This depends on climate and temperature. Check with your supplier to be sure.)

Section II

Logistics

General

This section contains the following information: receiving data, material handling, coaxial cable requirements, and specification requirements for building and other supporting structures.

Receiving Data

Inspect the shipping containers for physical damage and check the contents of each against the master packing list.

Use standard warehouse equipment for handling the crates. Care must be taken to not mishandle the crates. The crate length and components require prudent handling. USAP cannot be responsible for damage caused by mishandling or improper storage of antenna components prior to or during construction.

RF Transmission Cable

Coaxial Cable. A radio-frequency transmission line connects the associated radio equipment to the rotator base by using a 1 5/8" coaxial rotary joint.

General Requirements for Storage

The crates should be stored where they will be protected from moisture.

Section III.

Installation Procedures

General

This section contains the instructions for installing the 3002 Dual Tower system. The installation procedure will include the following nine basic steps:

- Tower foundation and guy anchor installation.
- Assembly of the two 80-foot towers.
- Erection and guying of the towers.
- Installation of rotator.
- Assembly of mast sections.
- Assembly and installation of transmission line.
- Assembly of the antenna.
- Raising the antenna
- Electrical installation

Foundation Designs

Designs for the tower and guy anchors are provided in the following pages. These designs are for "ideal" conditions, and are provided as a starting point for your engineering. **THE DESIGNS ARE NOT A SUBSTITUTE FOR ENGINEERING FOR YOUR TOWER INSTALLATION.** You must complete testing and design at your specific site using qualified personnel. United States Antenna Products, LLC takes no responsibility for the use of the foundation designs provided in this section.

Construction Requirements

Use a crane with a minimum height of 50 feet (15.24 m) or a gin pole kit to set the tower on the base. Use a winch (6,000 lbs [2721.54 kg] working load) to raise the mast.

Tag lines should also be used during the mast erection.

For safe and efficient assembly, use at least three people plus a crane or winch operator

Tower foundation and Guy Anchor Installation

Tower Foundation: Figure 2-1A shows a concrete foundation that will support the system in well drained soil of 4,000 pounds per square foot or greater. Inferior soils may require modification of this design.

To construct the foundation proceed as follows:

- Assemble rebar as per recommended dimensions in Figure 2-1A
- 2-2
- Dig a hole for the tower foundation pier to allow for 3 inch space between outer surface of rebar and concrete surface at any point in foundation.
 - Build a form for the top portion of the foundation pier.

NOTE: Before pouring the concrete, refer to the procedures on establishing the location of the tower leg mounting bolts.

- Pour the concrete. Vibrate the concrete during the pouring to eliminate voids.

Establishing Locations and Installing Tower Mounting Bolts. Refer to figures 2-1A and 2-1B.

A suggested method would be to use a $3/4$ " x 42" x 96" piece of plywood as a base on which to mount the six (6) tower leg anchor assemblies.

Draw vertical and horizontal center-lines (see Figure 2-1B) on the plywood panel. THESE CENTER-LINES MUST BE 90 DEGREES TO EACH OTHER. This divides the board into four (4) quadrants which are labeled "Upper Half", "Lower Half", "Left Half", and "Right Half".

Using a carpenter's square with 18" and 24" limbs, place the long limb of the square along the horizontal center-line with $16 \frac{27}{32}$ " at the intersection of the two center-lines. Proceed along the short limb of the square (which is the upper, left half) and place a mark at $13 \frac{5}{16}$ " from the horizontal center-line. This will be point A. Flip the square over into the lower, left half, align, and again place a mark at $13 \frac{5}{16}$ " from the horizontal center-line. This will be Point B. Repeat this procedure in the upper right and lower right quadrants, establishing Points D and F. The distance between Point A and D, and B and F, must be $33 \frac{11}{16}$ "

Measure from the intersection of the two center-lines, along the horizontal center-line in the left half, a distance of $39 \frac{29}{32}$ " and mark; this will be Point C. Repeat this measurement in the right half and mark their point E.

Points A, B and C represent the three locations for the left set of tower leg anchor assemblies. Points D, E and F represent the right set of tower leg anchor assemblies.

Points G and H represents the centers of the triangles formed by the two towers.

Recheck all measurements (Figure 2-1B) prior to drilling the holes for the anchor assemblies.

Refer to Figure 2-1B, Detail A for the suggested tower leg anchor assembly installation. Drill one-inch (1") holes in the plywood at Points A, B, C, D, E, and F. Place a 1"-8 hex nut on each of the six (6) anchor assemblies. Insert the ends of the bolts, from the bottom of the plywood panel to the top, and secure by another hex nut at each anchor assembly.

Cut holes in the plywood template to allow easy access to concrete around bolts. Trim all corners of the template to allow an easier pour.

After the concrete base is partially poured, the plywood panel (with the six anchor assemblies attached) can be placed over the top of the base. Level the plywood and secure by cribbing.

Note that the bottom hex nut is not buried in the concrete. The hex nut is approximately 1" thick, which will permit a $3/4$ " thick board to slide beneath the plywood for smoothing the concrete.

After the concrete is "set up" sufficiently, the hex nuts and plywood panel can be removed.

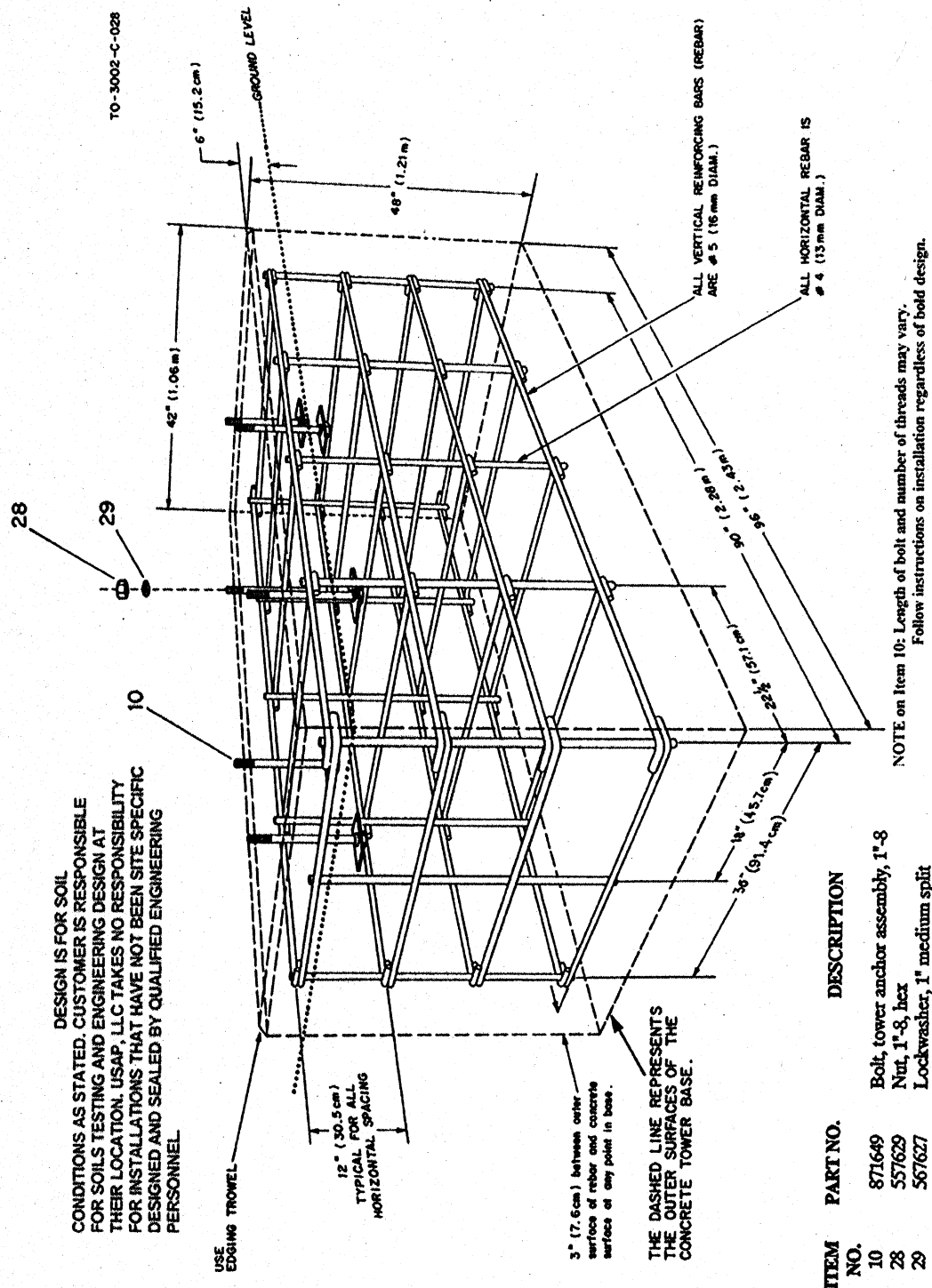
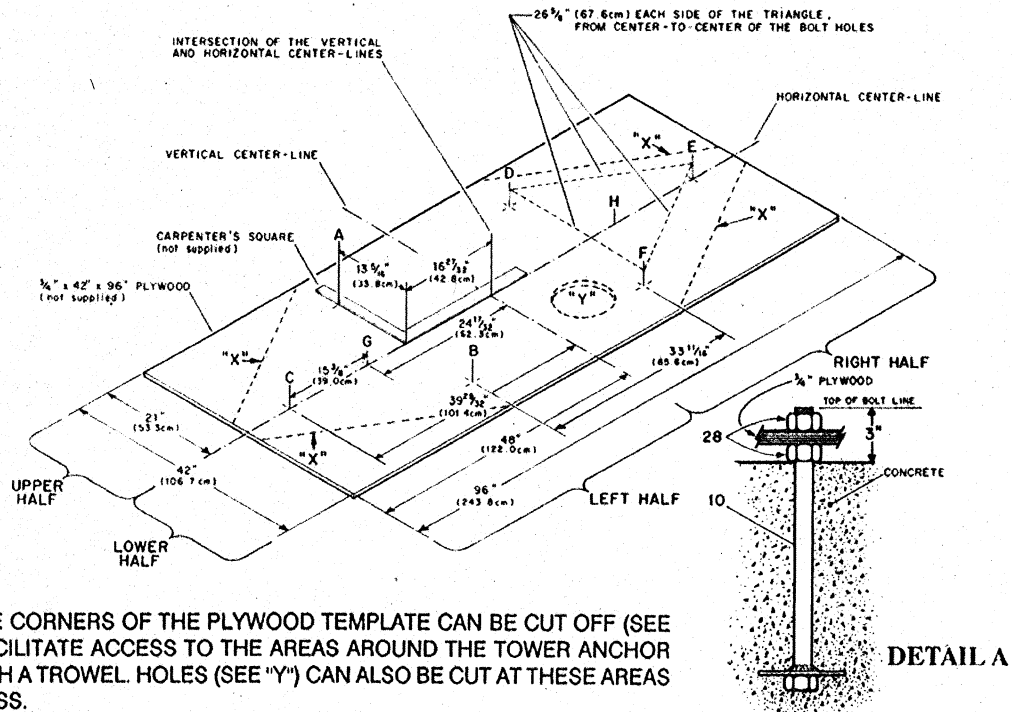


FIGURE 2-1A
THREE QUARTER VIEW OF TOWER BASE



NOTE: THE CORNERS OF THE PLYWOOD TEMPLATE CAN BE CUT OFF (SEE "X") TO FACILITATE ACCESS TO THE AREAS AROUND THE TOWER ANCHOR BOLTS WITH A TROWEL. HOLES (SEE "Y") CAN ALSO BE CUT AT THESE AREAS FOR ACCESS.

ITEM NO.	PART NO.	DESCRIPTION
10	871649	Bolt, tower anchor assembly, 1"-8
28	557629	Nut, 1"-8, hex

NOTE on Item 10: Length of bolt and number of threads may vary.
Follow instructions on installation regardless of bolt design.

FIGURE 2-1B
ORIENTATION OF TOWER LEG MOUNTING BOLT ASSEMBLIES

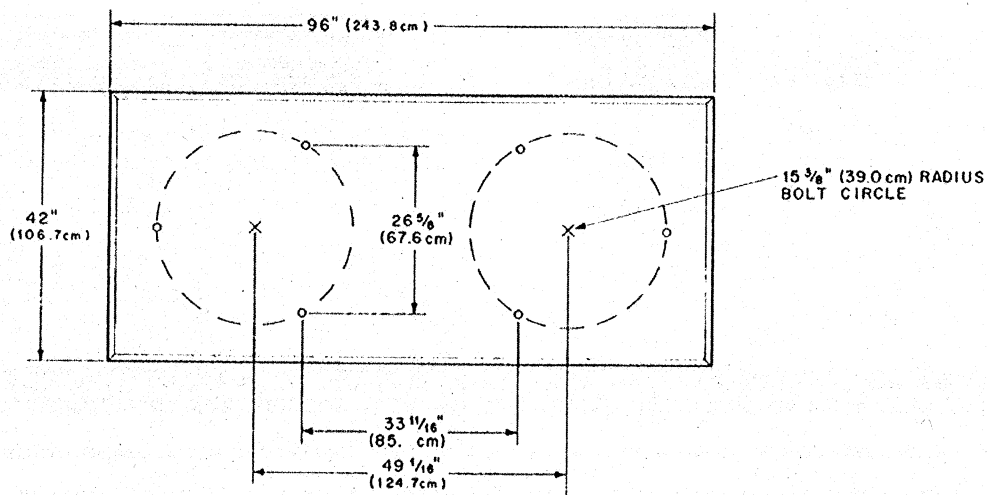
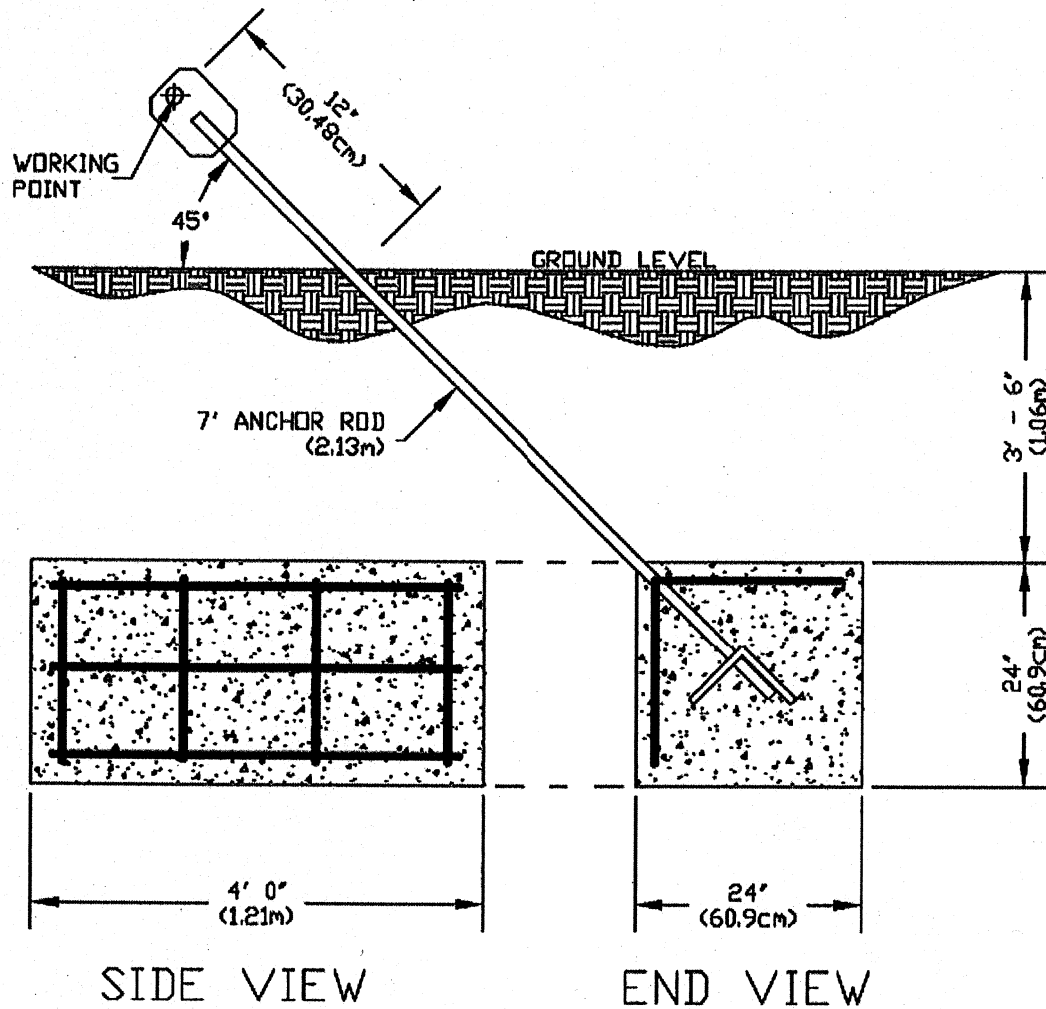


FIGURE 2-1 C
TOP VIEW OF TOWER BASE

The four guy anchors are as follows:



Foundation designs are given for reference only, and should be verified by a professional engineer licensed for the area where the installation is being performed.
USAP can assume no liability for use of this foundation design without proper verification of local conditions.

3002 Tower Guy Anchor Foundation

Figure 2-3

GUY ANCHOR DETAILS ARE DESIGNED FOR SOIL CONDITIONS AS STATED. CUSTOMER IS RESPONSIBLE FOR SOILS TESTING AND ENGINEERING DESIGN AT THEIR LOCATION. USAP, LLC TAKES NO RESPONSIBILITY FOR INSTALLATIONS THAT HAVE NOT BEEN ENGINEERED FOR THE SPECIFIC SITE.

Assembly of the Two 80-Foot Towers

The towers are shipped unassembled. If the towers are to be erected with a crane, assemble it on the ground in two 80-foot (24.38 m) sections. After the tower sections are assembled, hoist each tower into position. For gin pole erection assemble only the 20-foot (6.10 m) sections on the ground.

NOTE: When assembling the tower, use 3/8"-16 x 1 1/4" bolts (Item 18) to attach one or two items to the tower leg. When attaching three or more items to the tower leg use 3/8"-16 x 1 1/2" bolts (Item 35). Install all bolts from the inside of the tower leg to the outside; the lockwasher and nuts should be on the outside.

The left 80-foot tower, side B has steps, the right tower has no steps. Refer to Figure 2-5.

NOTE: Refer to Figure 2-5 (Tower Components and Identification) and become familiar with the layout of the towers before starting your assembly.

To assemble the tower, proceed as follows:

- **IMPORTANT:** Each 24-foot tower section should be assembled on 4" x 4" timbers, (one on each end of the sections, or side, to be assembled and one in the center), the tops of which are level and in the same plane. The tower legs should rest on the timbers. This is to insure that the sections will be straight individually before the bolts are torqued and the sections are connected together.
- To determine which end of the side, or section, under construction will be "UP", measure from the end of the leg to a point 12 1/2" along the tower leg; if there are seven (7) bolt holes in that distance, that is the end to be "UP". If there are five (5) bolt holes in the 12 1/2", that is end to be "DOWN". Be sure to arrange all 3 legs of each section with the same configuration of holes at the same end.

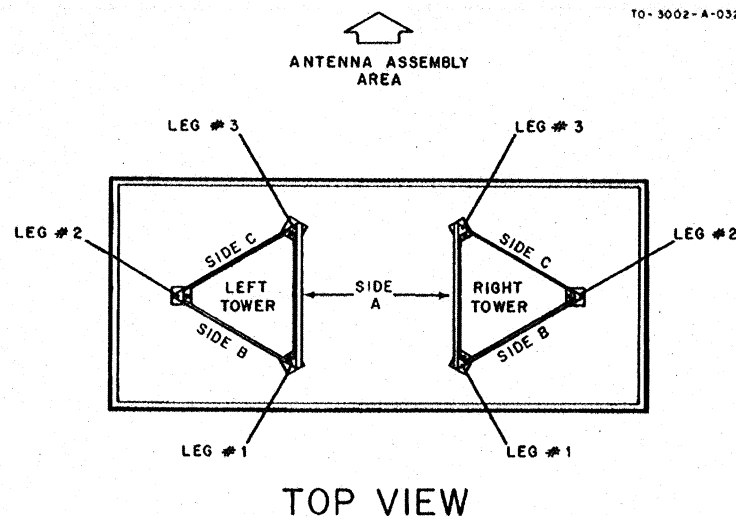
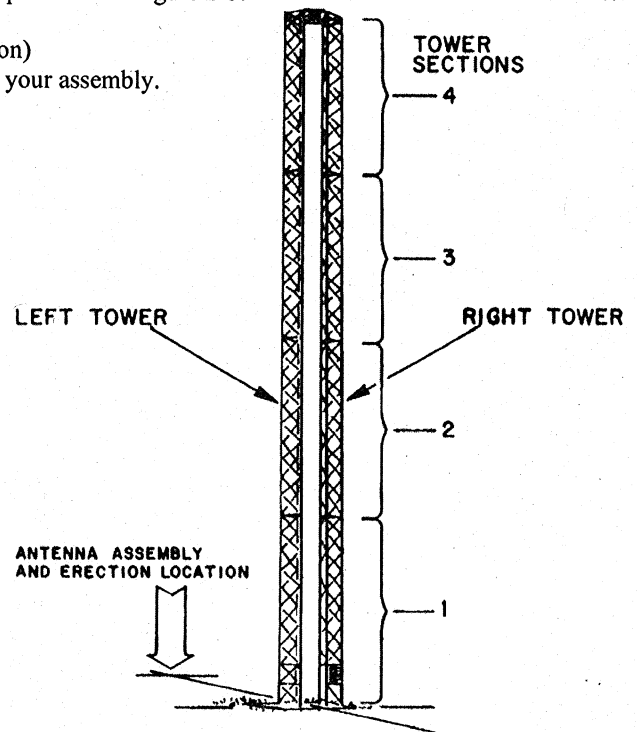


FIGURE 2-5
TOWER COMPONENTS AND IDENTIFICATION

NOTE: Make certain all diagonal braces with steps (Item 49) are on the left tower, Side B, for all four sections. Refer to Figure 2-7.

- The two Trunnion Plate Assemblies, Figure 2-12, Item 48, can be assembled at this time, or they can be assembled after Item 48 is attached to Side A of Section 1.
- From past experience the assembly of the tower sections is best accomplished with four people working together on one section. Lay out two of the tower legs on the timbers and have all the horizontal and diagonal braces, and the necessary bolts, lockwashers, and nuts readily available. Construct Section 1, Side C (Refer to Figure 2-7) with the tower legs flat on the timbers. After Side C is assembled, have two people hold a tower leg in position to construct the two remaining sides, with the other two people attaching the horizontal and several diagonal braces to establish the three sides of the section. Refer to Figures 2-6 and 2-7.

When installing the bolts, lockwashers and nuts, make the nuts snug, but the final torquing will come later. Check for alignment and such as the horizontal braces being ninety degrees to the tower legs as assembly proceeds.

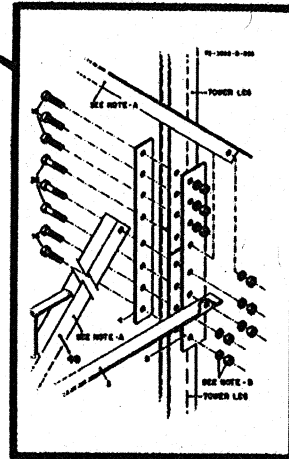
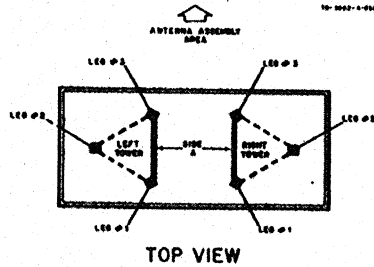
- If the towers are to be erected in 20-foot increments (each section is 20 Ft. long) by using a gin pole, final torque all bolts within that section to 30 foot-pounds (40.68 Nm) prior to the section being lifted into position. If the towers are going to be connected, then erected by using a crane, align all tower sections and connect Section 4 of both towers before the bolts are torqued to 30 foot-pound (40.68 Nm). After all bolts are properly torqued, erection may proceed.

- After Section 1 of both towers have been assembled, continue with the same sequence of construction for the remaining sections; construct Side A, lay it on the timbers and assemble Sides B and C to Side A. Refer to Figure 2-8.

- Prior to assembly of the top sections (Section 4) and if crane is heavy enough to raise both towers together, study Figures 2-8B, Details A and B, and Figure 2-9. Familiarize yourself with the assembly of the different components. When assembling Section 4, Side A of both towers, refer to Figure 2-8A, Detail B, and Figure 2-9 for assistance when installing the guy wire saddle (Item 6) and the upper horizontal channel assemblies (Item 51). Note that when the uppermost diagonal brace (Item 2) of Side A is secured to the tower leg and the upper horizontal channel assembly, a 3/8"-16 x 2" bolt (Item 34) is required. The upper strap channel (Item 57), top bearing assemblies (Item 61), and the upper strap channel with pulley (Item 45) must be installed prior to tower erection, then the upper strap channel and one of the bearing assemblies will be removed after the tower is erected, and prior to the point where the mast is approaching the vertical. After the mast is in position, these items must be re-installed.

TOP

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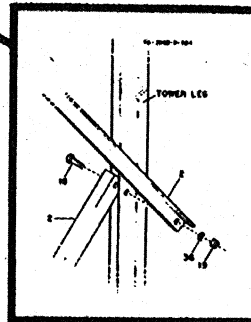
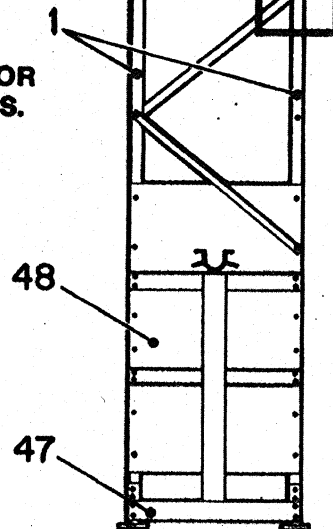


ITEM NO.	PART NO.	DESCRIPTION
1	351077	Tower Leg
2	381078	Diagonal Brace
3	381079	Horizontal Brace
4	381089	Inside Splice
5	381088	Outside Splice
18	501050	Bolt, 3/8" - 16 x 1 1/4", hex head
19	551048	Nut, 3/8" - 16, hex
36	561016	Lockwasher, 3/8", split
47	882046	Lower Horizontal Channel Assembly
48	882047	Transition Plate Assembly
49	882048	Diagonal Brace w/Stop Assembly

NOTE A
THE DIAGONAL BRACES WILL NORMALLY BE ITEM NO.2 (381078), EXCEPT FOR THE LEFT TOWER, SIDE B, ALL FOUR SECTIONS, THE DIAGONAL BRACES WILL HAVE STEPS, ITEM NO. 49 (882048).

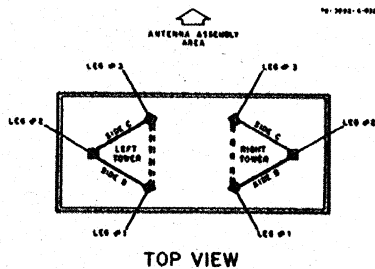
NOTE B
ALL SPLIT LOCKWASHERS AND HEX NUTS SHOWN ON THIS ILLUSTRATION ARE AS FOLLOWS:
ITEM 36 - SPLIT LOCKWASHER
ITEM 19 - HEX NUTS

ITEM 1; TYPICAL FOR ALL TOWER SECTIONS.



BASE

FIGURE 2-6
TOWER ASSEMBLY
BOTH TOWER ASSEMBLIES OF SIDE A
(SECTION 1)



ITEM NO.	PART NO.	DESCRIPTION
1	351077	Tower Leg
2	381078	Diagonal Brace
3	381079	Horizontal Brace
4	381069	Inside Splice
5	381068	Outside Splice
19	551048	Nut, 3/8"-16, hex
35	501049	Bolt, 3/8"-16 x 1 1/2", hex
36	561047	Lockwasher, 3/8", split
49	882048	Diagonal Brace w/Stop Assembly
50	882049	Base Shoe Assembly
56	381170	Horizontal Brace, clipped

*SEE FIGURE 2-6, DETAIL A

ITEM 56 (CLIPPED HORIZONTAL BRACE) IS USED ON THE LEFT TOWER, SECTION 1, SIDES B AND C, AND ON THE RIGHT TOWER SECTION 1, SIDE C. ITEMS 56 ARE INSTALLED AT 24 3/4" AND 48 9/16" FROM THE BASE END OF THE TOWER LEGS. SEVEN (7) OF ITEM 56 ARE SUPPLIED, BUT ONLY SIX (6) ARE USED.

NOTE: SIDE C IS IDENTICAL TO THIS EXCEPT ITEM 49 IS REPLACED BY ITEM 2. THIS WOULD ALSO APPLY TO THE RIGHT TOWER, SECTION 1, SIDE C.

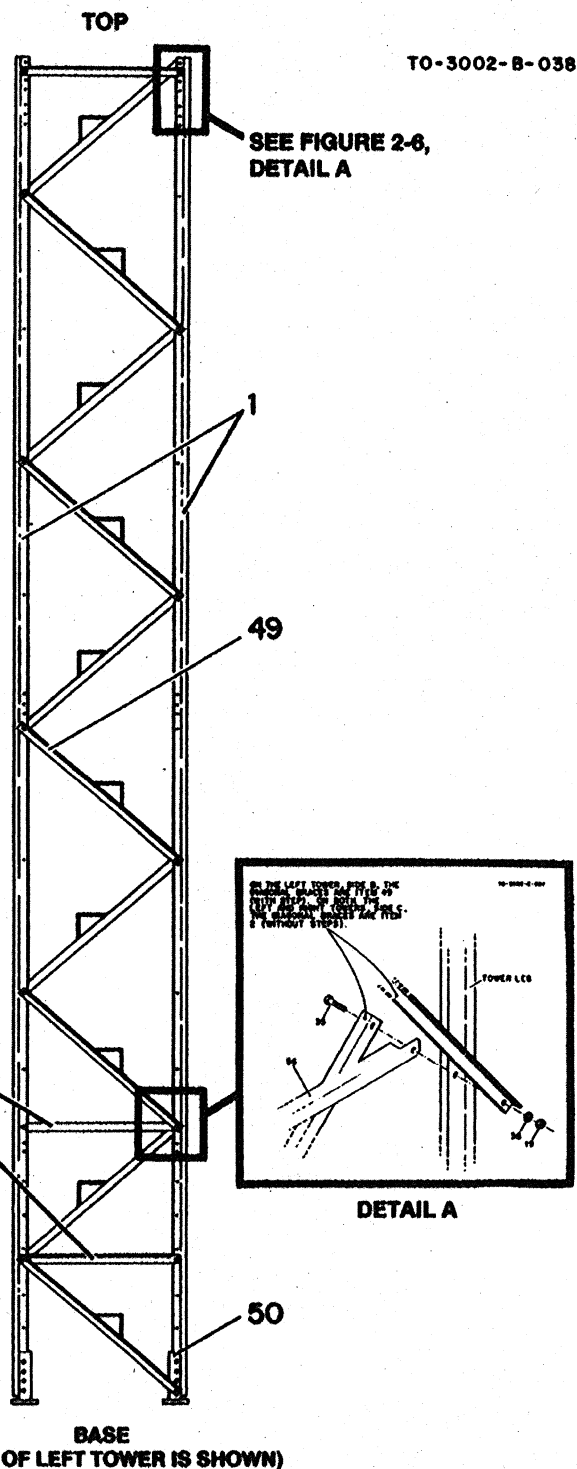


FIGURE 2-7
TOWER ASSEMBLY BOTH TOWERS,
SECTION 1, SIDES B & C

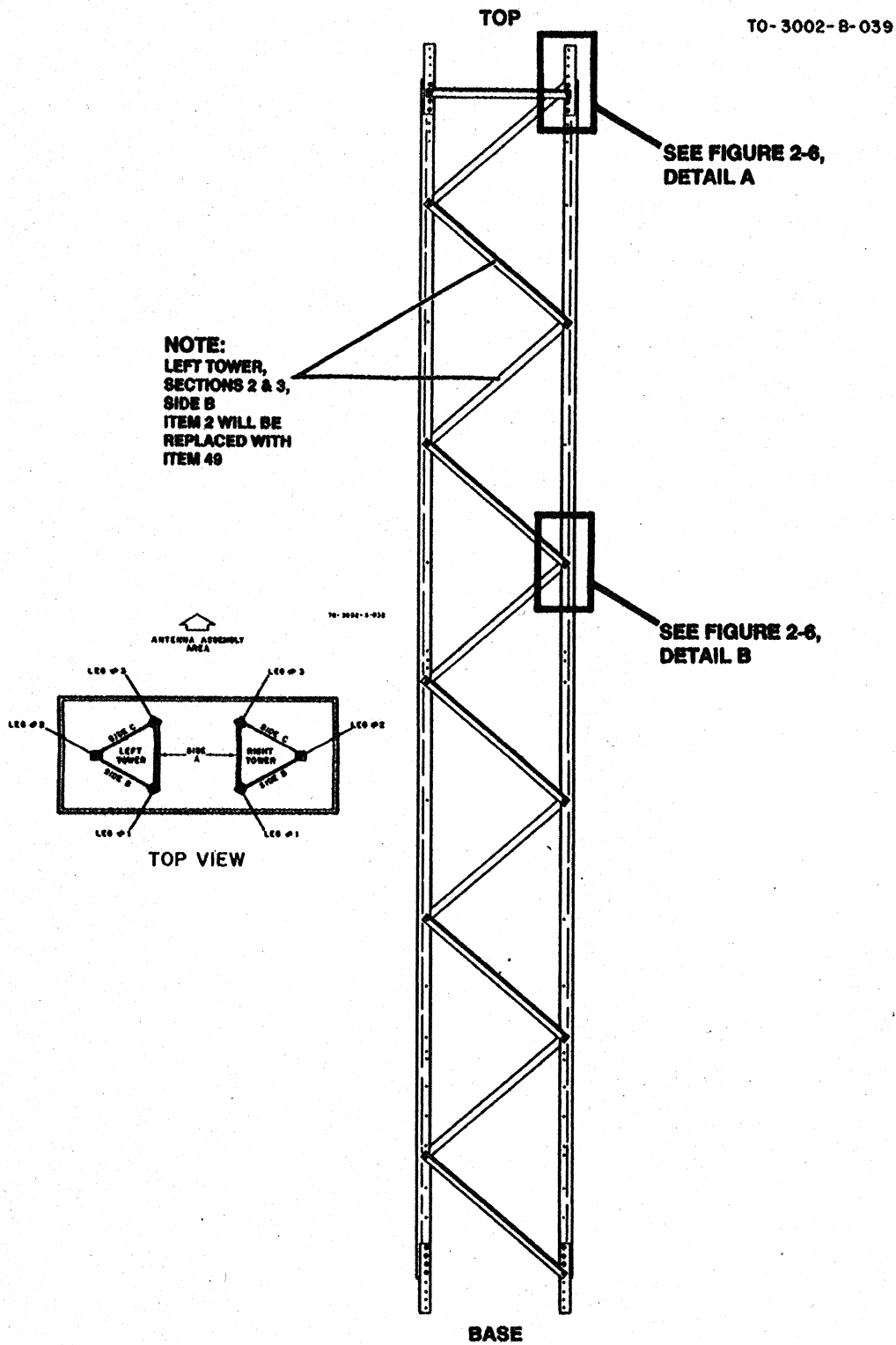
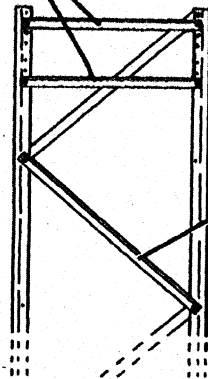


FIGURE 2-3
TOWER ASSEMBLY BOTH TOWERS, SECTIONS 2 & 3,
SIDES A, B, & C

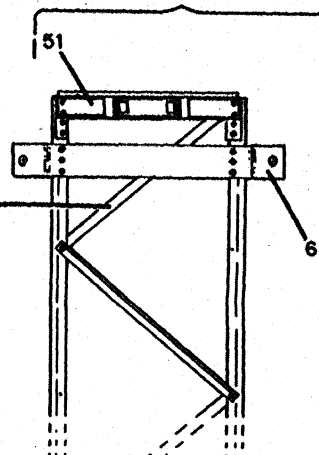
3 - (TYPICAL- SIDES B AND C,
BOTH TOWERS)



DETAIL A

THE DIAGONAL BRACES WILL
BE ITEM NO.2 (381078), EX-
CEPT FOR THE LEFT TOWER,
SIDE B, DIAGONAL BRACES
WILL HAVE STEPS, ITEM
NO. 49 (882048).

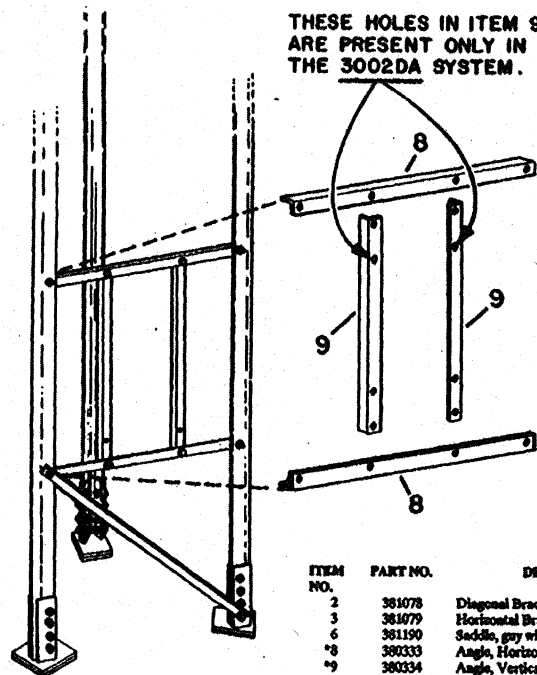
BOTH TOWERS, SIDE A



DETAIL B

FIGURE 2-8A
TOWER ASSEMBLY
SECTION 4, BOTH TOWERS

TO-3002-A-040



THESE HOLES IN ITEM 9
ARE PRESENT ONLY IN
THE 3002DA SYSTEM.

THE TWO HORIZONTAL
MOUNTING ANGLES, ITEM 8,
AND THE TWO VERTICAL
MOUNTING ANGLES, ITEM 9,
AND THE REQUIRED MOUNT-
ING HARDWARE, ARE PACKED
WITH THE ROTATOR POWER
AND CONTROL BOX.

NOTE THE ORIENTATION OF
THE FOUR MOUNTING
ANGLES.

ITEM NO.	PART NO.	DESCRIPTION
2	381078	Diagonal Brace
3	381079	Horizontal Brace
6	381190	Saddle, guy wire
*8	380333	Angle, Horizontal mounting
*9	380334	Angle, Vertical mounting
49	882048	Diagonal Brace w/Step Assembly
51	882068	Channel Assembly, upper horizontal

*Note: Items 8 and 9 are from the Rotator Power and Control Parts List.

FIGURE 2-8B
ROTATOR POWER AND CONTROL BOX
LOCATION AND MOUNTING HARDWARE

Erection and Guy of the Towers

NOTE: Both sections are hoisted into position in the same way. Only one section will be discussed. Repeat the procedure for the second tower. If crane is heavy enough, both towers can be lifted at once.

Install each completed tower assembly on the foundation with the aid of a crane or hoist. If these are not available, use a Gin Pole Kit and the Winch Kit (USAP Model 4906).

Assemble the guy wires and attach them at the proper point at the tower top as shown in Figure 2-9 and 2-10 so that the guy wires may be attached to the anchor points immediately after the tower assemblies are set on the foundation.

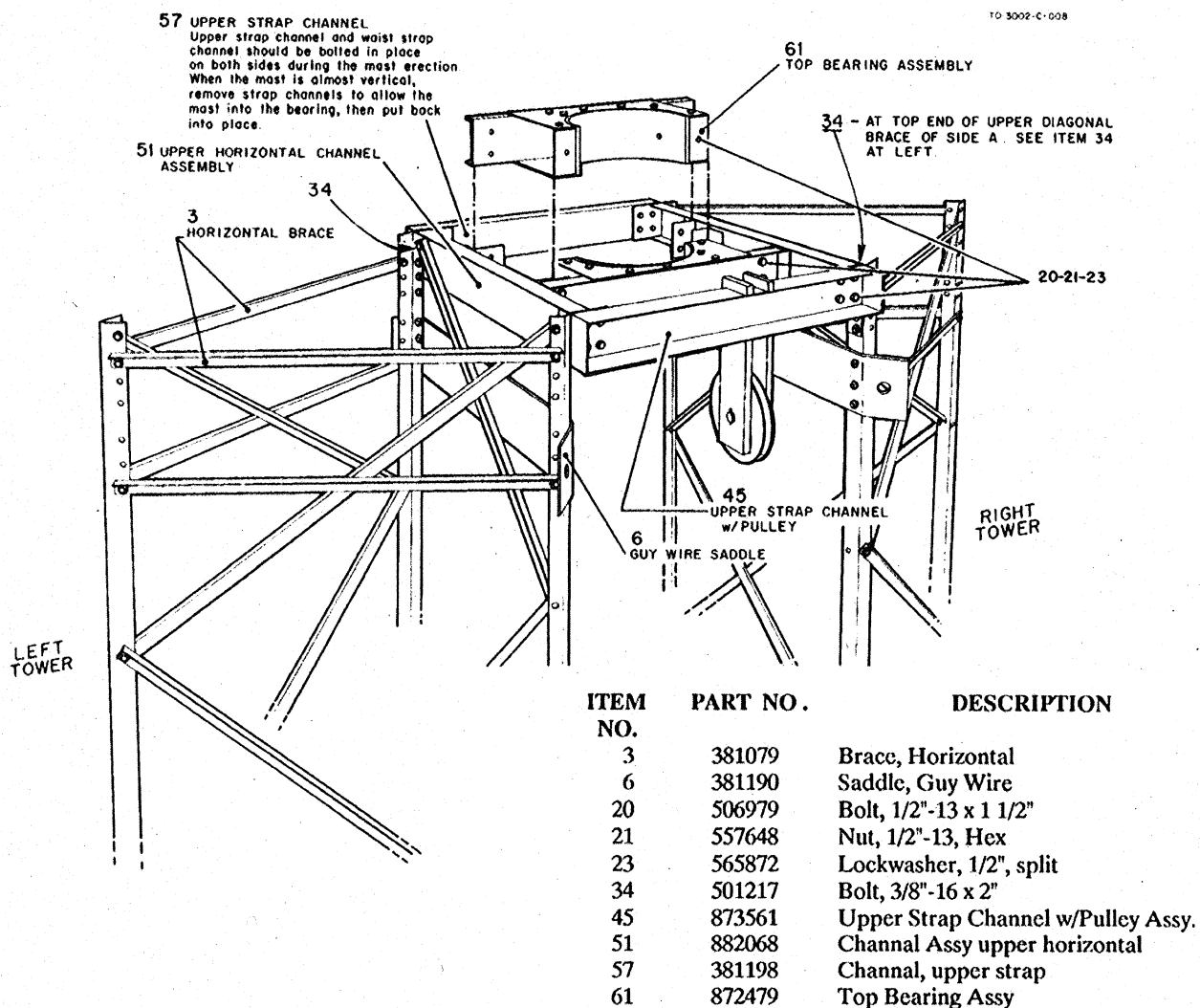
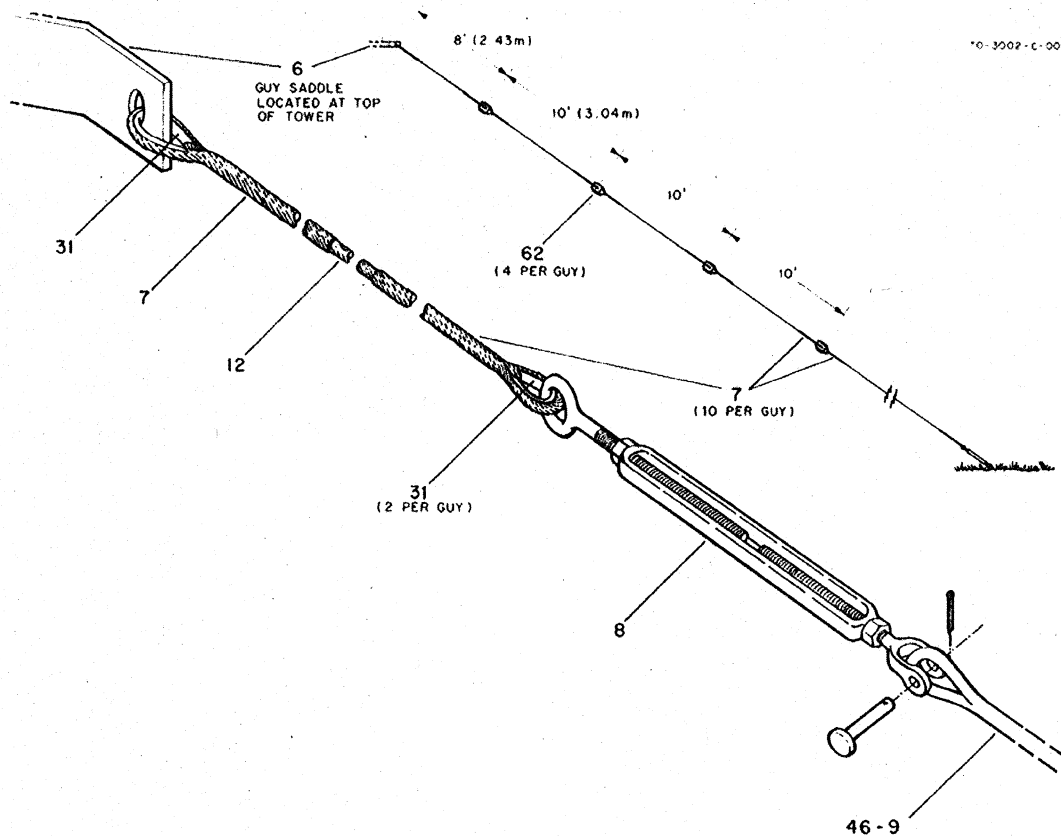


FIGURE 2-9
TOP TOWER ASSEMBLY

Erect and align the tower in the following manner:

- Assemble the guy as illustrated in Figure 2-10 and 2-11.

- Attach the crane's winch to a 12 foot (3.65m), 1/2" (1.27 cm) choker cable, which should be installed on the splice at least 40 feet (12.2 m) from the bottom of the tower. The choker should completely encompass the tower, with the beginning end completely wrapped around the outermost leg and the pulling end through the eye wrapped around the leg.



ITEM NO.	PART NO.	DESCRIPTION
6	381190	Guy Wire Saddle
7	356588	Guy Grip, 1/2"
8	356949	Turnbuckle, 7/8" x 12", jaw & eye
9	359976	Anchor, expanding
12	631585	Guy Cable, 1/2", 500'
31	352612	Thimble, 5/8" wire
46	880109	Anchor rod Assembly, 3/4" x 80"
62	451035	Strain Insulator

**FIGURE 2-10
GUY ASSEMBLY**

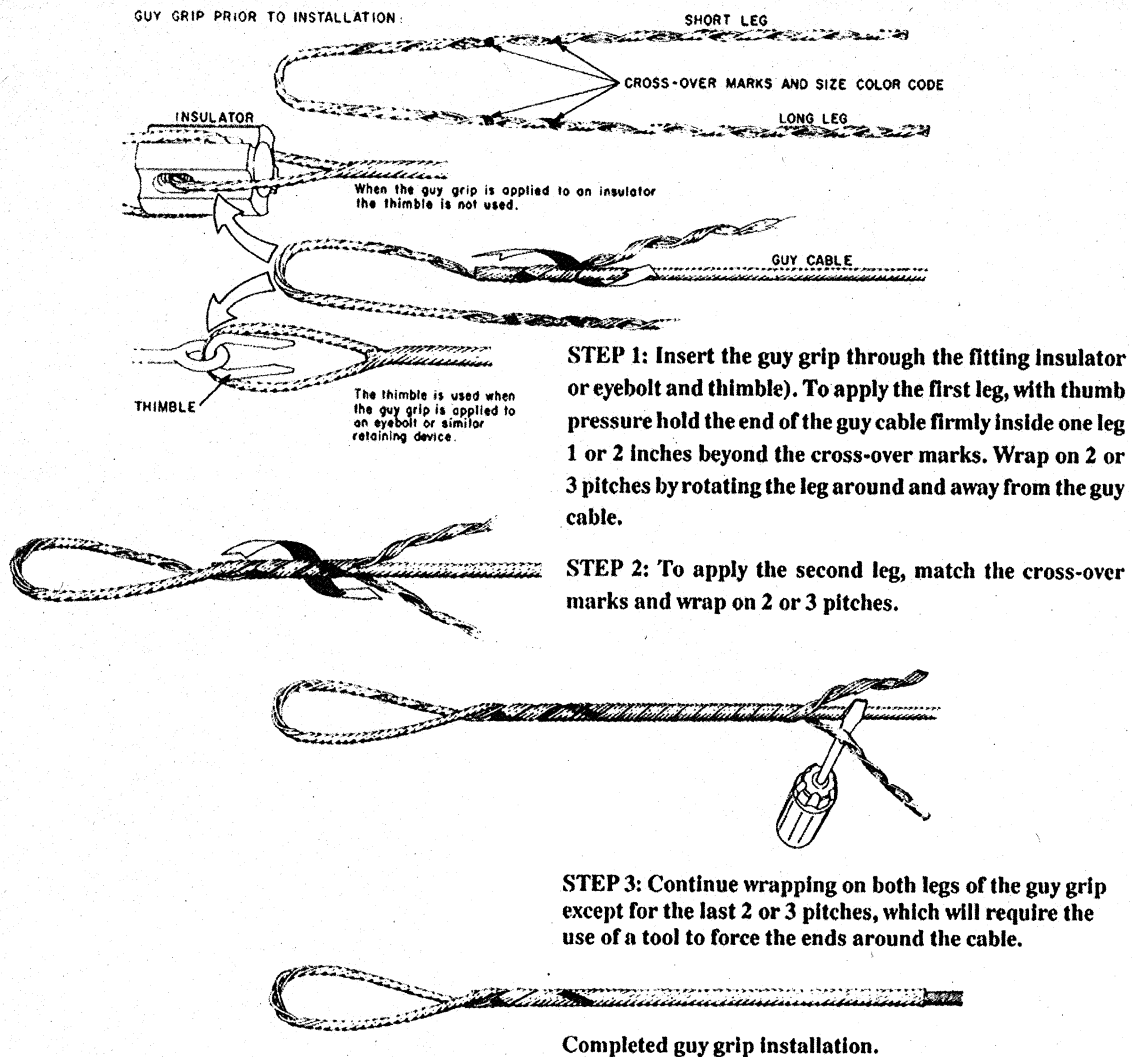


FIGURE 2-11
GUY GRIP INSTALLATION

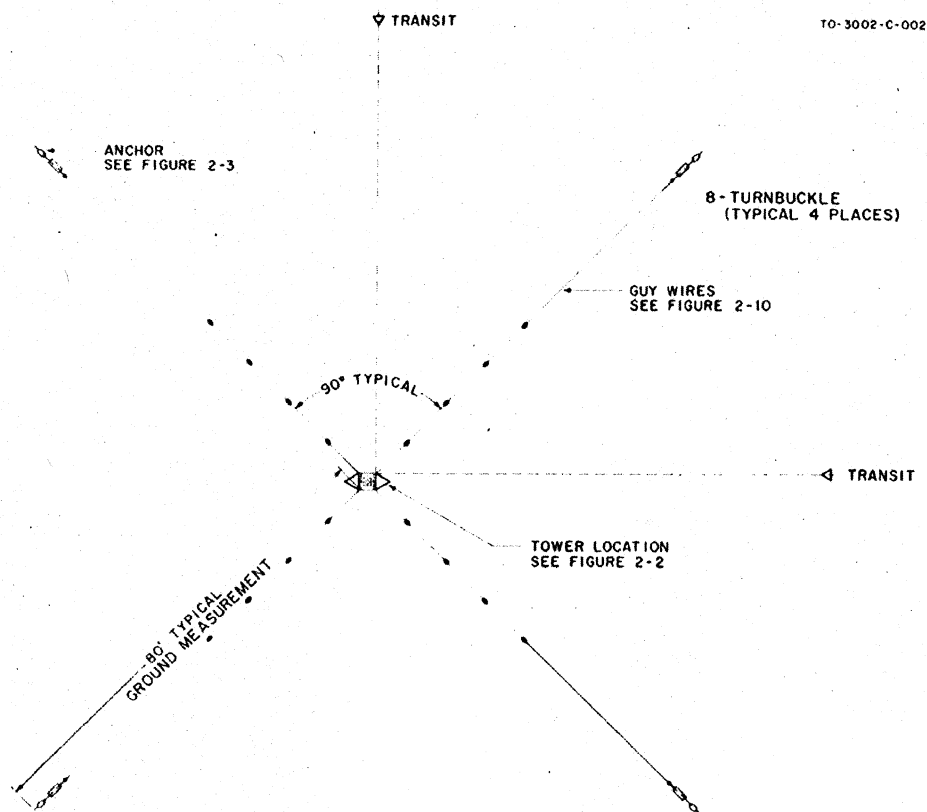
- Lift the tower approximately four feet and install the guys onto the tower guy saddle as indicated in Figure 2-10.
- Place the Flexcell® pad (Item 54) on the tower foundation anchor bolts. See Figure 2-12.

Flexcell® is a registered trademark of Celotex Corp.

- Hold the tower assembly and move it over the foundation. Orient the assembly so that the trunnion plates will be facing each other. Carefully lower the tower assembly onto the tower foundation and slip the base shoe assembly over the foundation anchor bolts. Install the I"-8 hex nuts and lockwashers, but do not tighten at this time. (Repeat operation for other tower assembly.)

- Attach the guy wires to the anchors as shown in Figure 2-10.

- Connect the two tower assemblies at the bottom using the lower horizontal channels (Item 47) and the lower strap channels (item 55) as shown in Figure 2-12.
- Connect the two tower assemblies at the top with the bearing assemblies and upper strap channels, as shown in Figure 2-9. (Be sure pulley is on the same side as the winch.)
- Using two transit levels placed 90 degrees apart and 100 feet from the tower base, as shown in Figure 2-13, check the tower for plumbness while simultaneously tensioning the guys. Adjust each of the guy wires to approximately 1,400 pounds (635.02 kg) as shown in Figure 2-14, while maintaining tower alignment.
- Shim the space (if any) between the tower base shoe assemblies and the foundation at each anchor bolt. Tighten the anchor bolt hex nuts securely.



**FIGURE 2-13
TOWER INSTALLATION LAYOUT**

Installation of the Rotator

The rotator must be installed between the towers in such a manner as to receive the center mast when the rotator is tilted 90 degrees.

Install the rotator as follows:

- Remove rotator panel. Fill both sections of the gear reducer to the oil level plugs with the lubricant specified in Table 4-2 (see also Figure 5-5). Replace the panel.
- With the aid of a crane or hoist, install the rotator in the trunnion assembly. Shim the rotator as necessary to insure that the center of the rotator shaft is in the exact center of the tower.
- Position the rotator in the trunnion assembly to accept the base mast section shown in Figure 2-15.

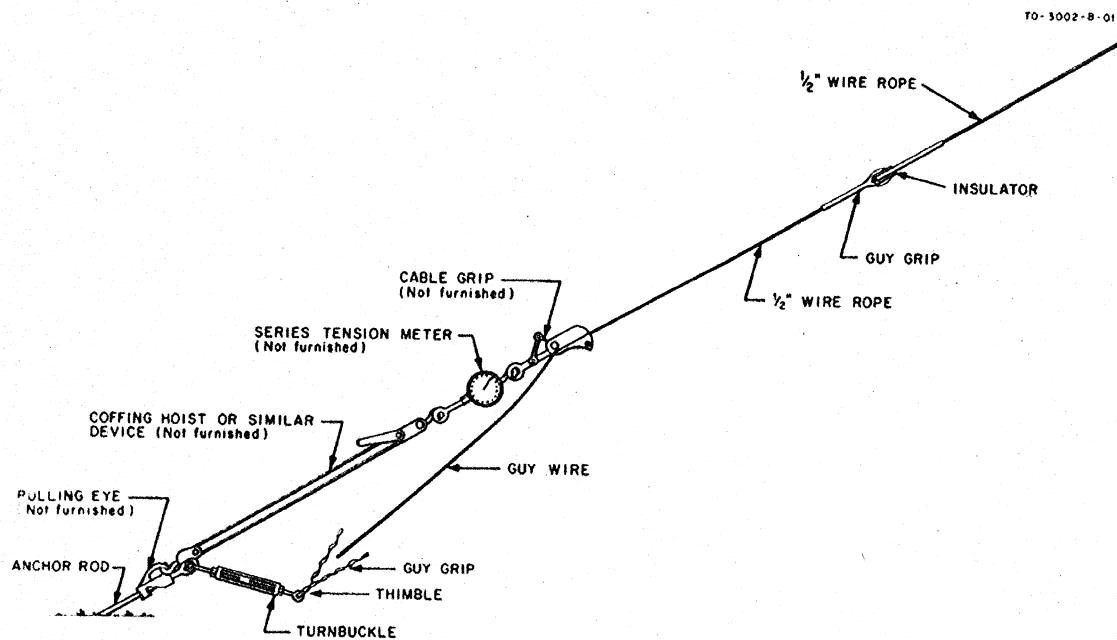


FIGURE 2-14
GUY WIRE TENSION USING A SERIES TENSION METER

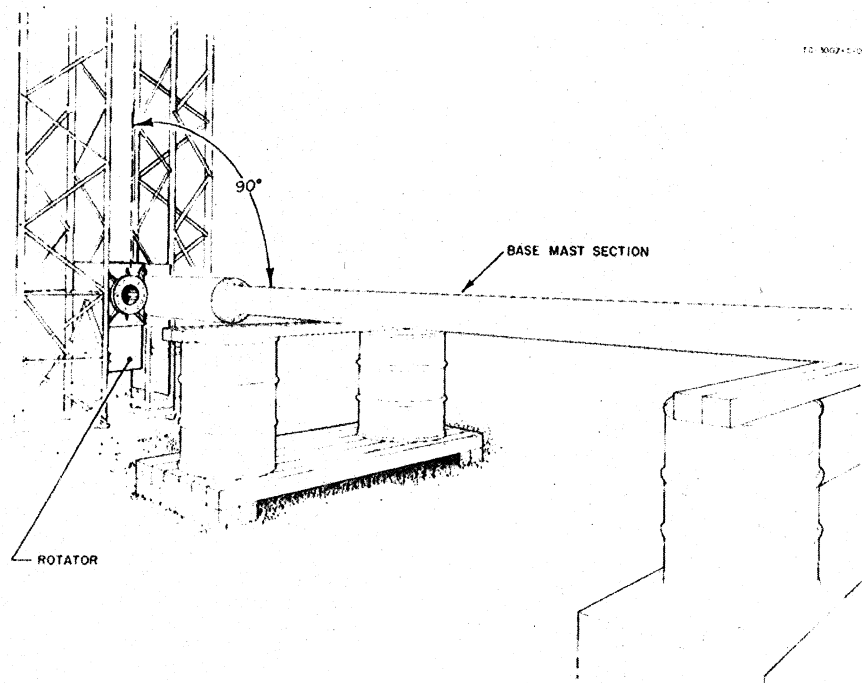


FIGURE 2-15
ALIGNMENT OF ROTATOR AND BASE MOUNT SECTION

Assembly of Mast Sections

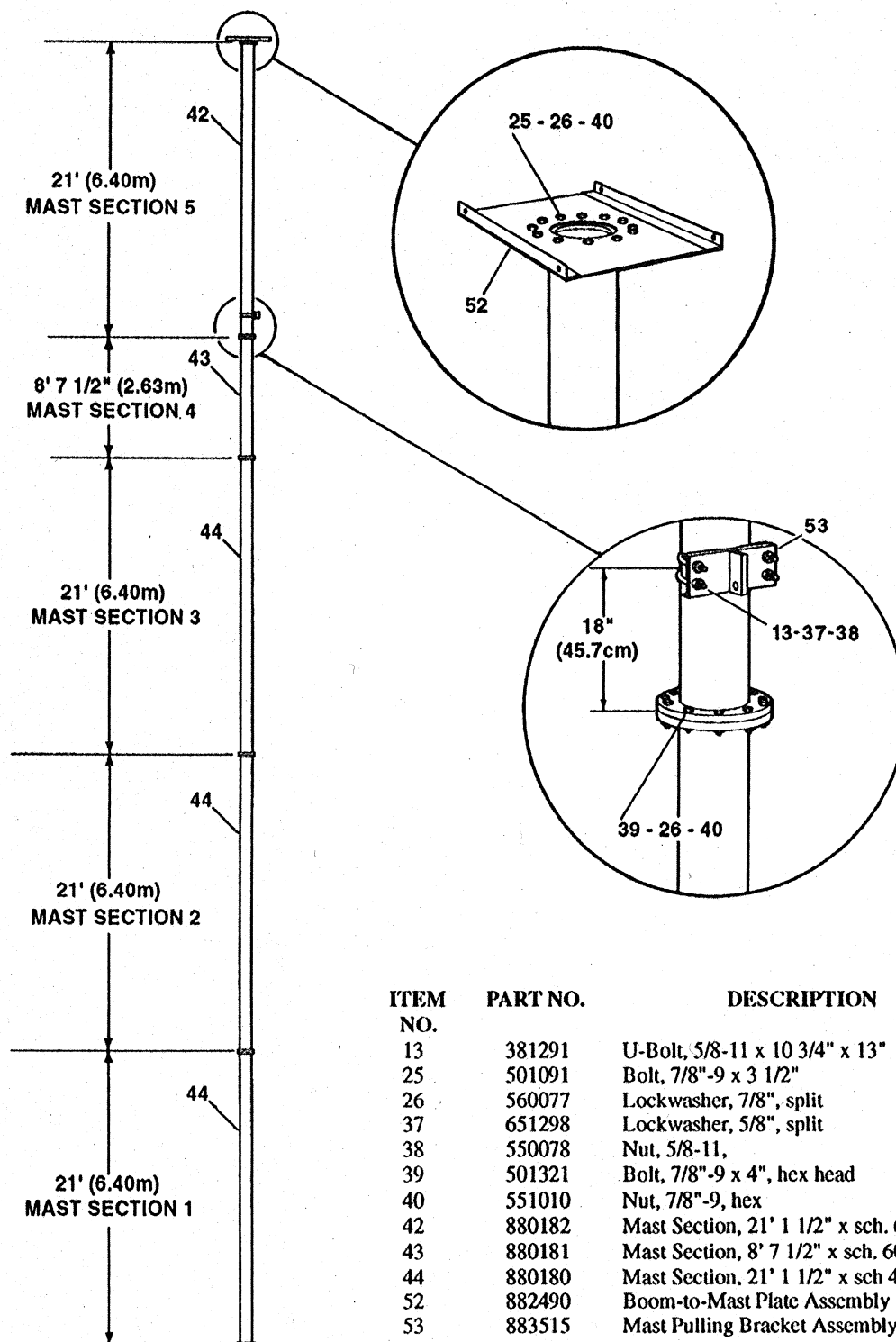
NOTE: If crane is to be used in attachment of the antenna, in order to save crane time, the antenna boom should be prepared for attachment concurrent with assembly of the mast sections.

Figure 2-16 shows the mast sections and how they are assembled. The transmission line will be installed after the entire mast is completely assembled.

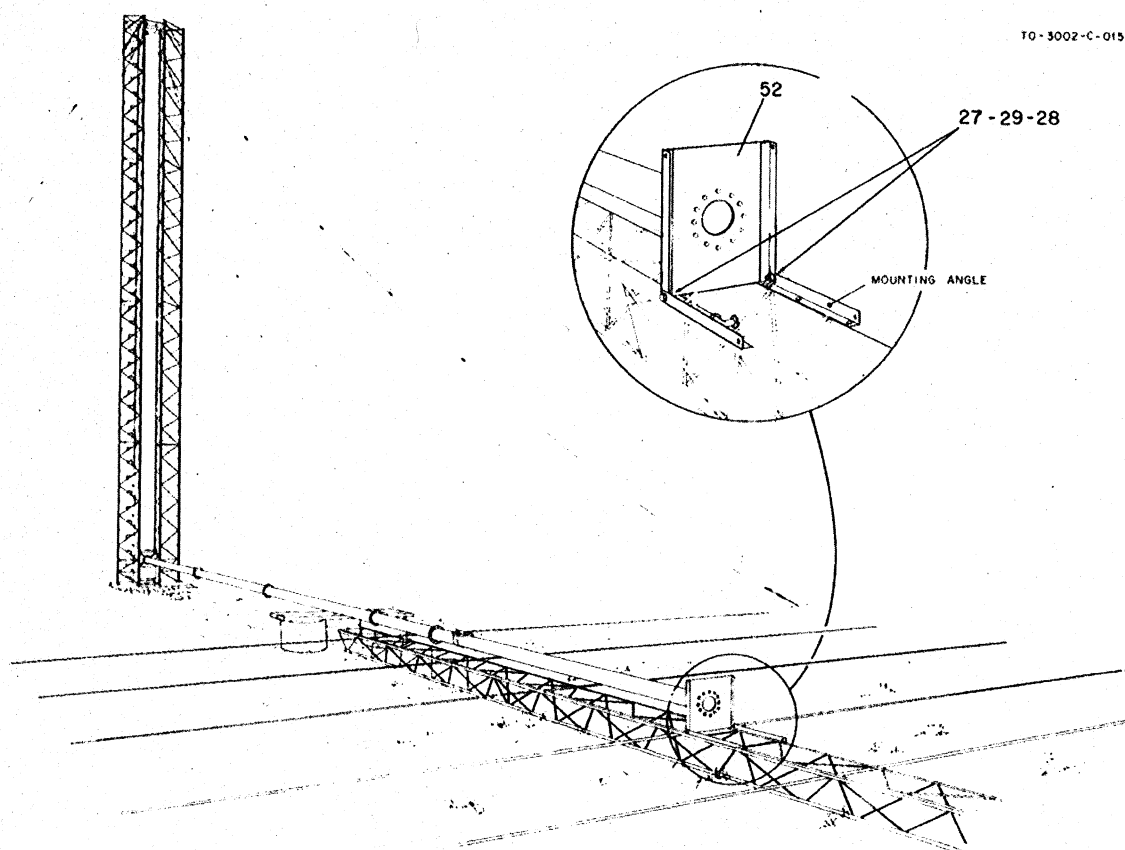
NOTE: To aid in the identification of the mast assemblies, the last three digits of the part number are on the side of the mast tube and the full part number is stenciled on the mast.

Install mast sections 1, 2 and 3 (Item 44) in order. Begin at the rotator using a boom truck or crane to lift them into position and hold them until they are bolted to the bottom mast point. Torque bolts to 200 foot-pounds (271.2 Nm). Rest the attached mast section on a support such as 50-gallon barrels and 4 x 4 timbers. It is necessary to continue to support mast section 3 (section -5 may be supported for convenience of antenna assembly)

Install mast sections 4 and 5 respectively (items 43 and 42) and torque the bolts to 200 foot-pounds. Now install the boom-to-mast plate assembly (Item 52) as shown in Figure 2-16 using bolts (Item 25), nuts and lockwashers (Items 40 and 26)



**FIGURE 2-16
MAST ASSEMBLY**



ITEM NO.	PART NO.	DESCRIPTION
27	508274	Bolt, 1"-8 x 2 1/4", hex head, galvanized
28	557629	Lockwasher, 1", medium split
29	567627	Nut, 1"-8, hex
52	882490	Boom-to-Mast Plate Assembly

FIGURE 2-17
ANTENNA BOOM ATTACHED TO ASSEMBLED MAST

Assembly and Installation of the Transmission Line

To install the transmission line proceed as follows using Figure 2-18, 2-19 and 2-20 as references:

- Install the three-piece transmission line spacer clamp (Item 63) on transmission lines 2/m, 3/m, 4/m, 5/m, and 6/m as shown in Figure 2-1.8.
- Install the two-piece support clamp (Item 64) an section 1/m as shown in Figure 2-18.
- Connect transmission line section 1/m, to 2/m using center conductor connector (Item 86), O-ring (Item 74) and hardware as shown in typical splice detail in Figure 2-18. Tension bolts to 8-10 foot-pounds or 96-120 inch-,pounds (10.85-13.56 Nm).

NOTE: The stainless steel flange of section 1/m will later be connected to the rotary joint, The aluminum flange end of 1/m should connect to 2/m.

CAUTION

The transmission O-rings and center conductor must be properly seated and aligned when the transmission lines are mated. If the center conductor connectors are not properly aligned and the transmission lines are tightened together, damage to the inner conductors can result. The pressurized section of the transmission line must be pressure tested to 15 psi before the mast assembly is erected.

- With the aid of two people distributed along the assembled 1/m and 2/m, slide the assembly into the mast (beginning at the antenna end of the mast) until approximately two feet of the end of section 2/m remains outside the end of the boom-to-mast plate.

- Install section 3/m onto the end of 2/m observing the splice detail shown in Figure 2-18 and 2-19. Two people should hold section 3/m steady while one person connects the two sections together. Following assembly of 3/m to 2/m, continue sliding connected sections into the mast until approximately two feet of section 3/m remains outside of the end of the boom-to-mast cradle.

Continue assembly by the above method and in the order shown in Figure 2-18.

- After section 6/m has been assembled to the transmission line assemblies and pushed into the mast, install the transmission line upper support clamp (Item 65) with the upper mast end approximately 1 10" (3.8 cm) from the end of the transmission line, see Figure 2-18. Now push the transmission line assemblies into the mast until the edge of the clamp is against the boom-to-mast plate platform.

- Now, install the rotary joint to the stainless steel flange of section 1/m protruding from the bottom of the rotator (presently the side). Refer to Figure 2-20.

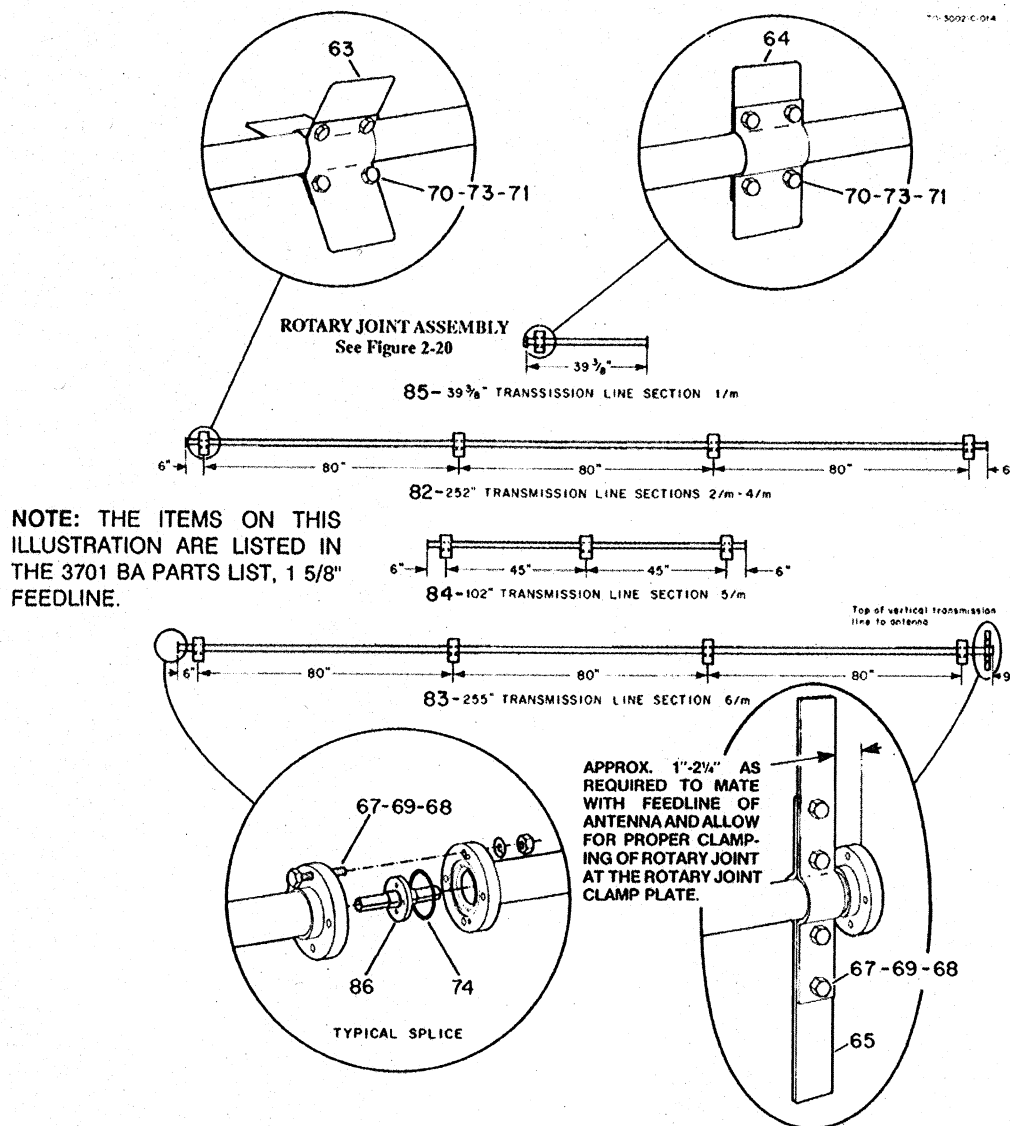
- After the support clamps have been adjusted to where the tips are between the locking bars on both inside walls of the rotator shaft, loosely install the rotary joint clamps. Tighten the clamps after the antenna has been raised.

NOTE: When this rotary joint is being installed as a replacement unit, the bullnose and concave, which form the center conductor portion of the rotary joint, must both be replaced as a set.

The rotary joint must be pressurized with dry air or dry nitrogen for proper operation. Failure to pressurize the unit can result in failure of the rotary joint due to entrance of moisture.

- The entire transmission line must be pressure tested to 15 psi (1.054 kg/cm²) before the mast assembly is erected. If the transmission line leaks, remove the transmission line from the mast assembly and check each joint as it becomes exposed.

Check especially for flange alignment and bolt tension. Repair and reinstall transmission line.



ITEM NO.	PART NO.	DESCRIPTION	ITEM NO.	PART NO.	DESCRIPTION
63	171221	Spacer Clamp, 3 1/8" x 5 15/16"	71	554099	Nut, 1/4"-20, hex
64	171478	Support Clamp, 3 1/8" x 5 7/8"	73	561177	Lockwasher, 1/4", split
65	382607	Transmission Line Support Clamp	74	819417	O-ring
67	509712	Bolt, 5/16"-18 x 1 1/2", hex head	82	873767	Transmission Line Sect., 252"
68	555747	Nut, 5/16"-18, hex	83	873768	Transmission Line Sect., 255"
69	564792	Lockwasher, 5/16", split	84	873769	Transmission Line Sect., 102"
70	505266	Bolt, 1/4"-20 x 3/4", hex head	85	873770	Transmission Line Sect., 39 3/8"
			86	878109	Coupler, center conductor

FIGURE 2-18
TRANSMISSION LINE ASSEMBLY

Assembly of the Antenna

Final antenna assembly may now be completed.

Lift the antenna boom into position as shown in Figure 2-17. The rear of the antenna boom must be toward the twin towers. Install two of the #1-8 x 2 1/4" bolts (Item 27), nuts and lockwashers (Item 28 and 29) which secure the antenna to the end of the assembled mast.

NOTE: It is best to install only the antenna center elements onto the antenna boom prior to installing the antenna on the end of the mast since it: (1) allows the antenna to be more maneuverable during connection to the mast, and (2) reduces the possibility of damage to the antenna elements.

After assembling the mast and boom adjust the 4 x 4 timbers on the barrels until the antenna boom rests on the ground - but with the weight of the mast, section 3, resting primarily on the timbers and barrels. See Figure 2-17. Following the antenna assembly, install the last transmission line elbow, supplied with the antenna, on the end of transmission line section 6/m protruding from the mast. Make certain that the center conductor connector and O-ring are properly seated. Do not tighten flange bolts and nuts at this time.

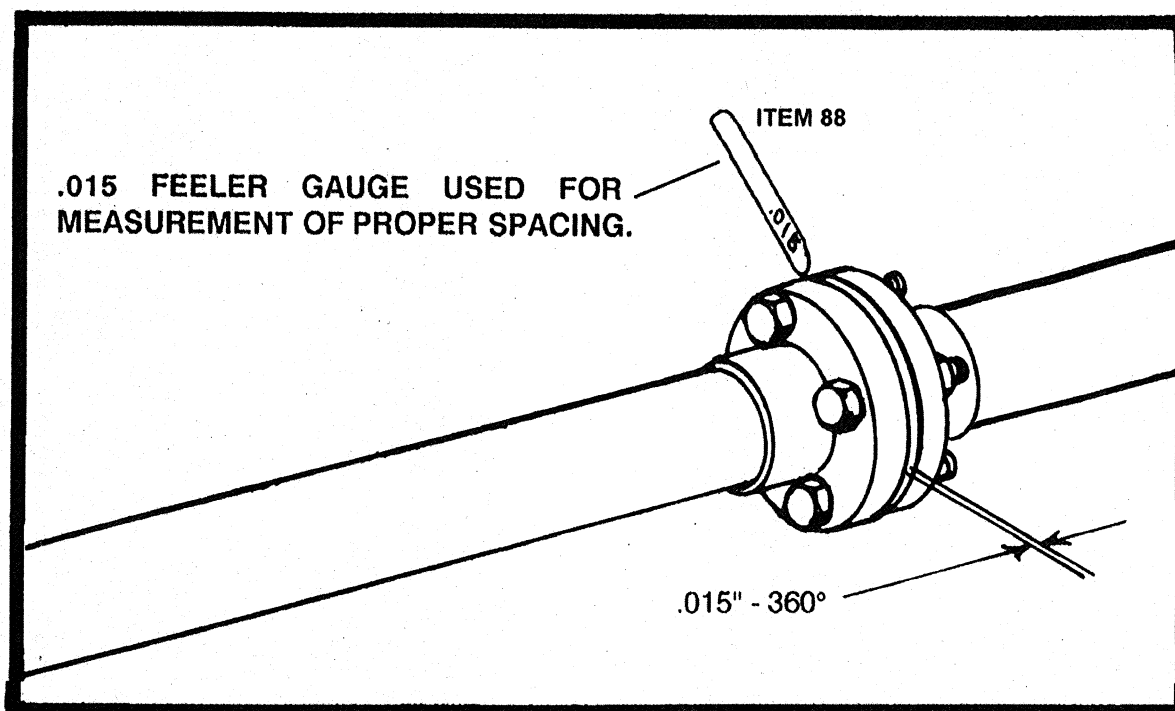
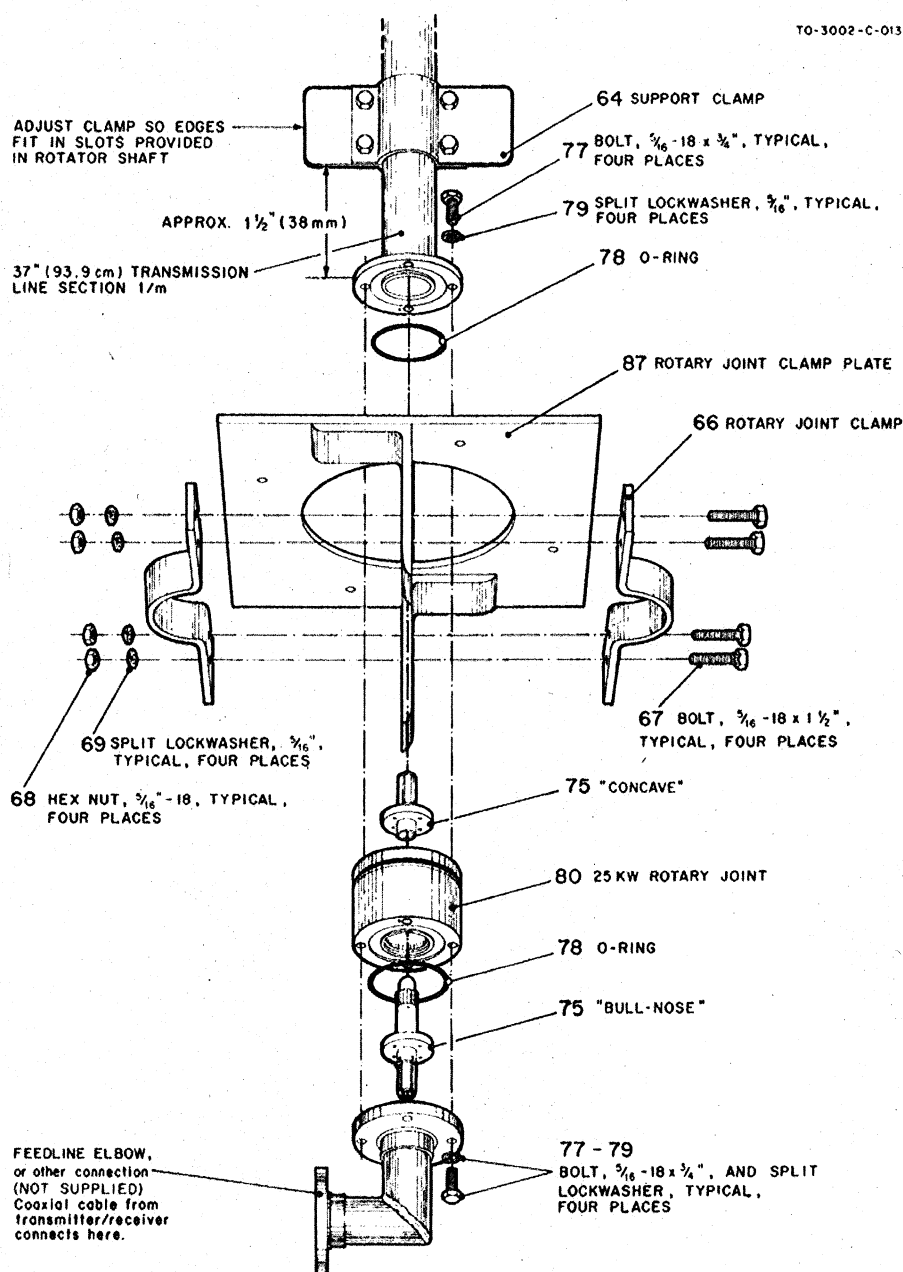


FIGURE 2-19
FLANGE CONNECTION



ITEM NO.	PART NO.	DESCRIPTION	ITEM NO.	PART NO.	DESCRIPTION
64	171478	Support Clamp, 3 1/8" x 5 7/8"	77	505842	Bolt, 5/16"-18 x 3/4", hex head, ss
66	382611	Rotary Joint Clamp	78	819417	O-ring
67	509712	Bolt, 5/16"-18 x 1 1/2", hex head	79	564792	Lockwasher, 5/16", split, ss
68	555747	Nut, 5/16"-18, hex	80	874183	Rotary Joint Assembly, 25 kW
69	564792	Lockwasher, 5/16", split	87	884970	Rotary Joint Clamp Plate
75	878566-1	Matched Set, Bullnose/Concave			

FIGURE 2-20
ATTACHING TRANSMISSION LINE TO ROTARY JOINT

Raising the Antenna

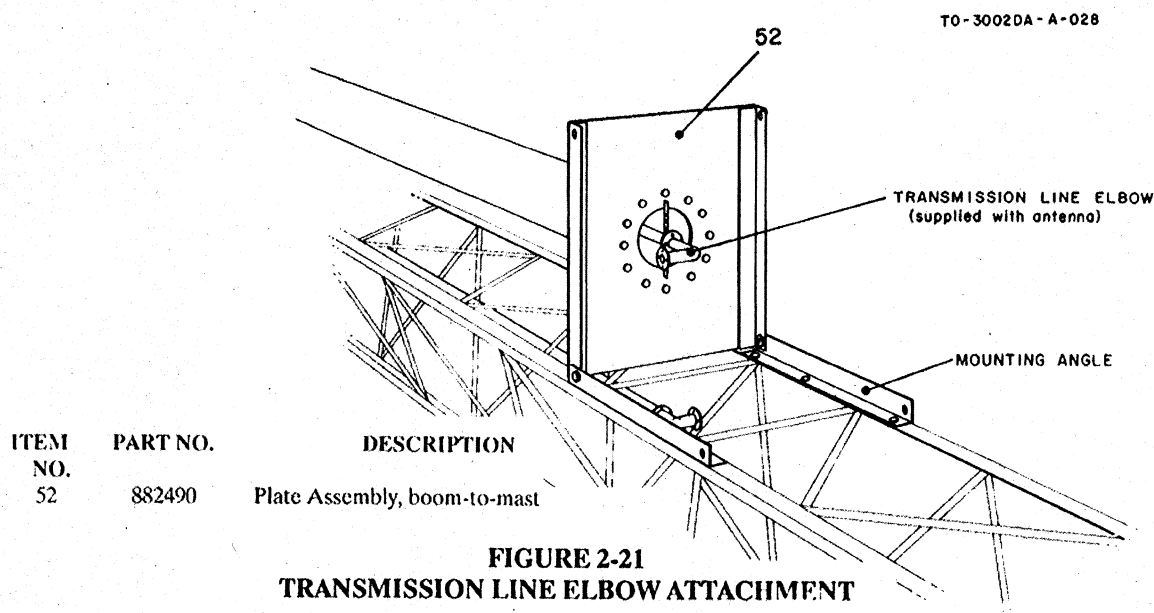
The completed antenna and mast assembly are erected with the aid of a winch truck or winch kit.

CAUTION

The tensile strength of the winch line must be at least 20,000 pounds (9072kg) and should have a maximum diameter of 5/8".

To raise the antenna, proceed as follows:

- Install the pulling bracket assembly and U-bolts on mast section 5. See Figure 2-21



- Route the winch line through the pulley located on the upper channel assembly, as shown in Figure 2-9, and attach the winch line to the mast pulling bracket assembly located on the top mast section. Safety loop the winch cable around the mast.

- Attach tag lines to the mast at the pulling bracket assembly.

CAUTION

Once the next step is initiated, you must complete all steps in this section before leaving the site for the day. Do not attempt to raise the antenna if the wind velocity exceeds approximately 15 mph (24km/h). Exercise extreme care to prevent twisting the towers when raising the antenna. All parts are constructed with a safety factor, but no one should stand in line with the mast assembly, the winch cable or any guy cable while the antenna is being raised.

- Slowly raise the mast assembly while using the tag lines to stabilize it. As the mast is raised, two people should walk the antenna erect. This method prevents the antenna boom and elements from being dragged on the ground and possibly being damaged.
- After the mast assembly has been raised enough to allow the antenna boom to be rotated into the boom-to-mast plate, slowly lower the mast assembly until the rear of the boom contacts the ground or some supporting block.

- Have a person ascend the antenna boom as shown in Figure 2-22 and install the remaining bolts in the mounting angle. Also, splice the elbow previously installed in "Assembly of the Antenna" section on the antenna transmission line long elbow.

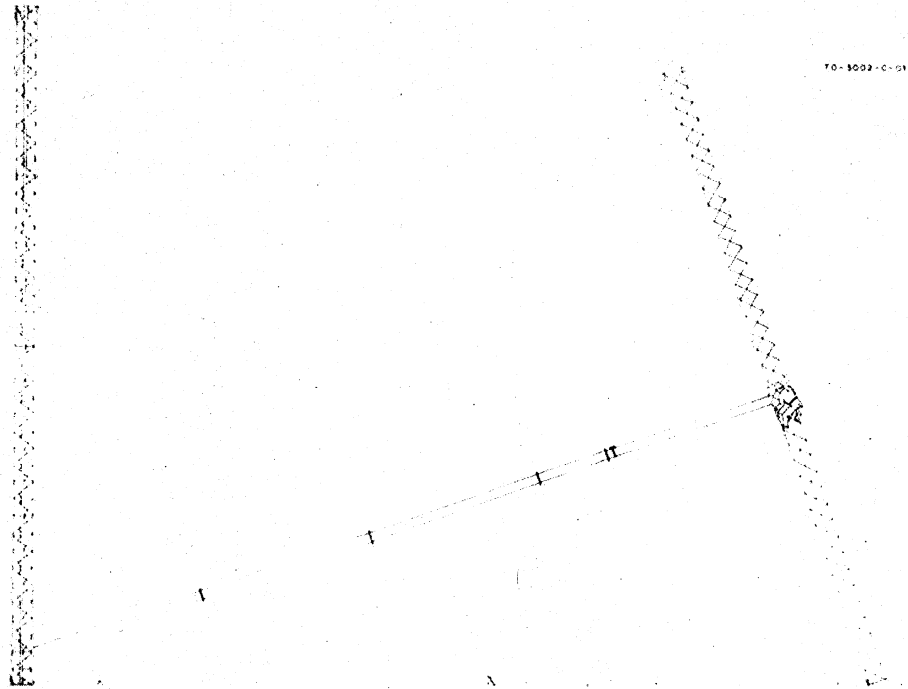


FIGURE 2-22
LOCKING ANTENNA INTO POSITION

IMPORTANT

The transmission line O-ring and center conductor must be properly seated when the pressurized transmission lines are mated. Incorrect seating of center conductors and inner conductors of transmission lines **WILL** damage the inner conductor when the flanged are tightened.

- The completed transmission line must be pressure tested to 15 psi (1.054 kg/cm²) before the mast assembly is erected. If the previous pressure checks have been satisfactory, the only possible point of pressure leakage is in the antenna transmission line and mast transmission line splice. Refer to Antenna Manual.

Back off five turns on both "mast side" guy anchor turnbuckles. See Figures 2-10 and 2-13. Install a chain or nylon ratchet hoist between the "mast side" tower legs (see Figure 2-23) pull the two legs together, and remove the upper strap channel and the half of the bearing assembly closest to the upper strap channel. Remove the ratchet hoist from between the towers.

CAUTION

When the mast nears the vertical, use the tag lines to guide the mast against the back bearing. No one should be on the tower when the antenna is in motion. See Figure 2-23.

- Slowly raise the mast to its final position. Reattach the ratchet hoist to the top inside tower legs. (See photo inside of front page.)
- With the ratchet hoist between the upper mast-side tower legs, pull the two legs together, and connect the upper strap channel and bearing assembly. Remove the ratchet hoist.

- Take up the 5 turns on the two turnbuckles previously slacked. Final tension and plumb the tower. Wire all the turnbuckles to prevent them from slacking.

Section IV.

Preparation for Reshipment

Introduction

This section contains information for preparation of the Model 3002 for shipment by a standard cargo carrier.

Lowering of Antenna and Mast Assembly

To lower the mast assembly and antenna, reverse the procedures outlined in "Raising the Antenna" section.

NOTE: The rear (large element) end of antenna mast must be pointed in the direction in which the antenna will be lowered.

Disassembly

To disassemble the Model 3002 reverse the procedures outlined in the following sections: "Assembly of the Two 80-Foot Towers", "Erection and Guying of the Tower", "Installation of the Rotator", "Assembly of Mast Sections", "Assembly and Installation of Transmission Line", and "Assembly of the Antenna".

During disassembly, whenever possible, leave all fasteners attached to the unit with which they belong. If this is not possible, group all small hardware used for a single assembly operation and package it in cloth bags. Label all packages clearly with the section in this manual where the contents are used.

Packaging

Whenever possible, use the original shipping containers for packaging. The master packing slip should be used for reference.

If original containers have been lost or destroyed, construct new containers as necessary.

CHAPTER 3 MAINTENANCE

CAUTION

Disconnect all power to tower and rotator before performing any maintenance work.

Introduction

This chapter contains organizational field maintenance requirements and instructions. When performing maintenance refer to Chapter 5 for item part numbers and descriptions. The R3503 Manual shows details of the rotator assembly.

Periodic Maintenance

INITIAL

- + After the first rain, strong wind and/or 30 days after installation, check guy tensions. •

MONTHLY

- + Make a visual inspection of the system. Check the rotator reducer for leaks and if necessary check the oil level.

QUARTERLY

- + Grease bearings, 2 places
- + Grease chain
- + Oil lower bearing
- + Check reducer bolts
- + Check the sprocket-to-mast attachment + Check feedline pressure SEMI-ANNUALLY.
- + Check tower guy tension
- + Check hardware for tightness
- + Check chain tightness in rotator

ANNUALLY:

- + Change oil in rotator reducer.
- + Check the condition of the mast bearing at the top of the tower.
- + Check tower finish
- + Check tower Plumb
- + Check gap in gear bushing

Maintenance Methods

Guy Wire Tensions

Procedure and requirements are outlined in Chapter 2,

Visual Inspection

Anchors, guy cable attachments, hardware, and rotation. Those applicable items in other maintenance sections.

Oil Levels

In Reducer Assembly, refer to R3503 Manual.

Grease Bearings

Above reducer and outside rotator at mast, use Lithium NLGI Grade 2, grease. See R3503 Manual.

Grease Chain

Apply a film of grease on chain to protect it from moisture and rust.

Oil Lower Bearing

Apply oil (30 wt. or heavier) between rotator mast and its lower bearing. See R3503 Manual.

Reducer Bolts

See R3503 Manual. Check tightness of bolts. Should be torqued to 185 in./Lbs (20.4 N-m).

Sprocket to Mast Attachment

The spring pins should be positioned as shown in Figure S-6, flush with the inside of the shaft and the outside of the sprocket hub. Check the tightness of the setscrews.

Feedline Pressure

Feedline pressure may be maintained up to 15 psi. Recommended pressure is 5 to 10 psi.

Fastener Tightness

Check bolts, screws and nuts for tightness. Tighten or replace as required.

Chain Tightness

CAUTION

Keep hands and other objects away from electrical devices and rotating devices. Observe the chain while rotating the shaft. At the point where the chain is the tightest, the side to side play in the chain should not exceed $\pm 3/8$ " from the centerline.

Oil Change

CAUTION:

Both Primary and Secondary Reducers have individual oil reservoirs. Each unit must be filled to and maintained at its individual oil level. To fill to their proper levels the primary unit requires 8 ½ ounces of oil and the secondary unit requires 64 ounces: (2 quarts) of oil.

See R3503 Manual for type of lubricant and Figures for location of the reducer.

Mast Bearing

Check the surface of the bearing for unusual wear. Surface may be greased if needed. Tower Finish Use Anchor Brand Spray-Galv* or equivalent for touch-up of galvanized surfaces.

Tower Plumb

See Installation Instructions in Chapter 2 for details.

Gear Bushing Gap

There should be a gap of 11/16" or more between the two halves of the gear bushing (Item 60) located under the Rotator Gear Assembly (Item 61). Check tightness of bolts which hold collar in place.

*Anchor Brand Spray-Galv is a product of Nasco Inc.

Preventive Maintenance Tasks

HF RLPA Antenna System

	Preventive Maintenance Task	Initials/Results
1	Corrosion control media (cold galvanizing compound, conductive paste, etc.) applied to all antenna and tower components showing signs of corrosion.	
2	Connections and components showing signs of corrosion cleaned.	
3	Tower visually inspected for connection and structural flaws.	
4	Oil changed in both the primary and secondary reducers, using the manufacturer's recommended grade of oil, observing the specifications for the prevailing ambient temperature range.	
5	Rotator oil levels checked and rotor checked for any signs of leakage. Excess quantities of oil removed from the rotator housing.	
6	Tower plumbed using a theodolite transit. Guy tension checked and adjusted as necessary. Tower inspected for bent members or for members which show signs of having been over stressed. Guys inspected for deformed, missing, or corroded grips, clamps, clips, or cotter pins.	
7	Anchors inspected, with attention to the condition of concrete, if visible, and to the point at which the anchor rod enters the ground (and the first few inches below grade) or the concrete. (In most installations, the concrete should not be visible.) Condition and tightness of hardware on the guy clamps, if used, and the safeties checked. Guy grip condition checked, if grips used.	
8	All hardware connections on the tower and the antenna checked. Nuts and bolts spot checked for tightness. Foundation nuts checked.	
9	Azimuth alignment of antenna and control unit checked.	
10	Operation of antenna rotator control (telephone) line checked. Rotated antenna throughout its range of travel using both the local control and remote options.	
11	Tower lighting checked and relamped (if installed).	
12	Grounding of the tower and of the anchors visually inspected. Resistance test of the tower ground performed; results attached.	
13	Rotator bearings and the rotator drive train and chain greased using lithium NLGI grade 2 grease or equivalent. 30-weight or heavier oil applied between the rotator mast and its lower bearing. Tightness of bolts in the reducer gearbox checked. Tightness of all attachment bolts checked. Spring pins properly positioned, flush with the inside of the shaft and the outside of the sprocket hub. Tightness of the setscrews checked. Drive chain checked for side-to-side play not to exceed $\frac{3}{8}$ " from the centerline. Adjusted as necessary.	
14	Mast bearing greased. Mast bearing inspected for signs of scoring, binding, or corrosion. Mast alignment checked. Placement and fastening of any removable members checked.	
15	Any debris or foreign materials introduced by birds, rodents, or other pests removed from the rotator housing and from the mast.	
16	If an attached ladder is used, connections of the ladder to the tower checked. Safety climb device checked, if installed.	
17	Feedline rotary joint inspected. Tightness and rotational freedom of the joint checked. Feedline pressure checked, if applicable; recharged as necessary. Pressure may be maintained at between 3 and 15 psi.	
18	Antenna insulators and elements checked, ensuring correct alignment and proper fit and tightness of parts.	
19	Guy wire insulators inspected for correct installation and for cracks and breaks.	
20	VSWR test of the antenna performed. Results attached.	
	Preventive Maintenance Task	Initials/Results

21	Maintenance log and VSWR plot file created or updated (at the site and in the project manager's permanent files).	
22	Line voltage to the rotor motor measured and recorded while operating and while at rest. Results attached.	
23	Ground fault interrupter (GFI) circuit breakers verified as installed and operational for the service outlet at the tower control panel.	
24	Tower ground resistance	
25	Line voltage to rotor motor while operating:	
26	Line voltage to rotor motor while at rest:	

CHAPTER 4 - PARTS LIST 3002FA SYSTEM

ITEM #	PART NO.	DESCRIPTION	QTY
1	351077	Leg, tower	24
2	381078	Brace, diagonal	196
3	381079	Brace, horizontal	26
4	381069	Splice, inside	36
5	381068	Splice, outside	36
6	381190	Saddle, guy wire	2
7	356588	Grip, guy, 1/2"	44
8	356949	Turnbuckle, 7/8"x12", jaw & eye	4
11	691229	Wire, copper, 10'	1
12	631585	Cable, 1/2" guy, 500'	1
13	381291	U-Bolt, 5/8"-11x10 3/4"x13	2
14	877607-1	Rotator and Control Assembly	1
15	877586	Rotator Control, DRC-2	1
16	*871883-1	Rotator Power/Control Box	1
17	*878170-1	Rotator Assembly	1
		*Has separate Parts Breakdown	
	872217	Parts Pack B, 3002	1
18	501050	Bolt, 3/8"-16x1 1/4", hex head, galvanized	640
19	551048	Nut, 3/8"-16, hex	750
20	506979	Bolt, 1/2"-13x1 1/2", hex head	44
21	557648	Nut, 1/2"-13, hex	44
22		(Not Used)	
23	565872	Lockwasher, 1/2", split	44
24		(Not Used)	
25	501091	Bolt, 7/8"-9x3 1/2", hex head	12
26	560077	Lockwasher, 7/8", split	79
27	508274	Bolt, 1"-8x2 1/4", hex head, galvanized	4
28	557629	Nut, 1"-8, hex	12
29	567627	Lockwasher, 1" medium split	11
	872218	Parts Pack A, 3002	1
30	251071	Clamp, ground rod	2
31	352612	Thimble, 5/8" wire	8
32		(Not Used)	
33		(Not Used)	
34	501217	Bolt, 3/8"-16x2", hex head	3
35	501049	Bolt, 3/8"-16x1 1/2", hex head	106
36	561016	Lockwasher, 3/8", split	450
37	561298	Lockwasher, 5/8", split	4
38	550078	Nut, 5/8"-11, hex	4
39	501321	Bolt, 7/8"-9x4, hex head	67

ITEM #	PART NO.	DESCRIPTION	QTY
40	551010	Nut, 7/8"-9, hex	79
41	250043	Lug, ground	2
42	880182	Mast Section, 21' 1 1/2" x schedule. 60	1
43	880181	Mast Section, 8" 6 1/2" x schedule 60	1
44	880180	Mast Section, 21' 1 1/2" x schedule. 40	3
45	873561	Upper Strap Channel with Pulley Assembly	1
46		(Not Used)	
47	882046	Channel Assembly, lower horizontal	2
48	882047	Trunnion Plate Assembly	2
49	882048	Diagonal Brace Assembly w/Step	40
50	882049	Base Shoe Assembly	6
51	882068	Channel Assembly, upper horizontal	2
52	882490	Plate Assembly, boom-to-mast	1
53	883515	Bracket Assembly, mast pulling	1
54	892801	Pad, Flexcell®, 5"x5"x1/2"	6
55	381162	Channel, lower strap	2
56	381170	Brace, horizontal, clipped	7
57	381198	Channel, upper strap	1
58	381264	Angle, trunnion plate support	8
59	381402	Plate, rotator pivot	2
60	251075	Rod, ground, 5/8"x8"	2
61	872479	Top Bearing Assembly	2
62	451035	Insulator, strain	18

3701BA PARTS LIST 1 5/8" FEEDLINE			
ITEM #	PART NO.	DESCRIPTION	QTY
NO.	PART NO.	DESCRIPTION	QTY
63	171221	Spacer Clamp, 3 1/8"x5 15/16"	63
64	171478	Support clamp, 3 1/8"x5 7/8"	2
65	382607	Transmission Line Support clamp	2
66	382611	Rotary Joint Clamp	2
67	509712	Bolt, 5/16"-18x1 1/2", hex head, stainless steel	14
68	555747	Nut, 5/16"-18, hex, stainless steel	14
69	564792	Lockwasher, 5/16", split, stainless steel	14
70	505266	Bolt, 1/4"-20x3/4", hex head, stainless steel	140
71	554099	Nut, 1/4"-20, hex, stainless steel	140
72	504098	Bolt, 1/4"-20x1 1/2", hex head	4
73	561177	Lockwasher, 1/4", split, stainless steel	144
74	819417	O-Ring	5
75	878566-1	Matched Set, Bullnose/Concave	1
88	350715	Feeler Gauge 0.015" x 6"	2
76	871417	Rotary Joint Parts Pack	1
77	505842	Bolt, 5/16"-18x3/4", hex head, stainless steel	8
78	819417	O-Ring	2
79	564792	Lockwasher, 5/16"	8
80	874183	25 kW Rotary Joint Assembly	1
82	873767	Transmission Line Section, 252"	3
83	873768	Transmission Line Section, 255"	1
84	873769	Transmission Line Section, 102"	1
85	873770	Transmission Line Section, 39 3/8"	1
86	878109	Coupler, center conductor	5
87	884970	Rotary Joint Clamp Plate	1
3737AA PARTS LIST 3002 EMBEDMENT HARDWARE			
ITEM #	PART NO.	DESCRIPTION	QTY
46	880110	Anchor rod assembly, 3/4x80 in.	4
10	871649	Anchor bolt (SEE NOTE)	6
9	359976	Anchor expanding	4
	878586	Parts Pack 3737	1
28	557629	Nut, 1"-8	12
29	567627	Lockwasher, 1"	6

NOTE on PN 871649: Bolt is 1" diameter with 8 threads per inch. Number of threads and length of bolt may vary.

UNITED STATES ANTENNA PRODUCTS, L.L.C.

LIMITED WARRANTY

Subject to the terms and conditions provided below, United States Antenna Products, L.L.C. ("USAP") warrants that equipment manufactured and sold by it, and bearing USAP's model and serial numbers, shall conform to specifications described in any applicable purchase order that has been accepted in writing by USAP and shall be free from defective material and workmanship under normal use and conditions for:

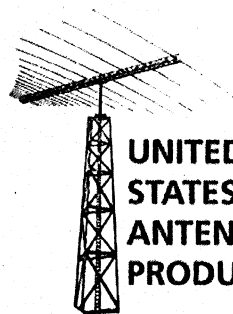
1. With respect to equipment that is installed by USAP or its affiliates, two (2) years from the date of the USAP's invoice; and
2. With respect to any equipment that is not installed by USAP or its affiliates, one (1) year from date of installation, but in no event later than two (2) years from the date of USAP's invoice.

Should equipment subject to this warranty fail in normal service and under normal conditions through no fault of purchaser, purchaser shall notify USAP in writing within the warranty period at the address provided below and obtain a return authorization ("Return Authorization"). Purchaser's request for a Return Authorization must include a detailed description of the claimed defect, the date, place and proof of purchase, and a copy of the sales receipt reflecting purchaser's warranty. Failure to notify USAP in a timely manner and/or to provide such information will result in a delay in processing purchaser's claim or may result in voiding this warranty in its entirety. Upon receipt of a Return Authorization, purchaser shall return the equipment, at purchaser's expense for freight and insurance, to USAP's facility located at 5263 Agro Drive, Frederick, Maryland 21703. If USAP determines that this warranty applies, USAP shall, at USAP's sole discretion, either repair the equipment or furnish a replacement to the purchaser. Any repaired or replacement equipment is warranted (as set forth herein) for sixty (60) days from the date of shipment, or the remaining portion of the original equipment's warranty, whichever is longer.

This warranty is valid only for the ultimate purchaser of the equipment, and only after purchaser secures a Return Authorization from USAP. USAP reserves the right at any time, either before a Return Authorization is issued or after inspection of the equipment, to determine whether a claimed defect is subject to this warranty. This warranty shall not apply, and shall become void, if (i) the equipment at any time has been maintained, modified, altered, repaired, or worked on by anyone other than USAP or a USAP authorized technician, (ii) the equipment is not installed, maintained, operated and used in accordance with instructions or directions furnished by USAP, (iii) the equipment has been subject to damage from misuse, negligence, accident, acts of God or other occurrences not occurring in the normal use and operation, or (iv) the serial number on the equipment is in any way defaced or rendered unidentifiable. This warranty shall not extend to any products or accessories that are manufactured by anyone other than USAP. This warranty shall be governed in all respects by the laws of the State of Maryland, United States of America.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE FOREGOING REMEDIES OF REPAIR OR REPLACEMENT BY USAP CONSTITUTES PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ANY AND ALL OTHER REMEDIES WHICH MAY BE AVAILABLE TO PURCHASER. USAP SHALL NOT BE LIABLE FOR INDIRECT, INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES AND IN NO EVENT SHALL THE LIABILITY OF USAP ARISING IN CONNECTION WITH ANY EQUIPMENT SUBJECT TO THIS WARRANTY EXCEED THE ACTUAL AMOUNT PAID BY PURCHASER TO USAP FOR PRODUCTS DELIVERED.

All claims under this warranty shall be effective upon receipt by USAP and sent by certified mail, return receipt requested, overnight mail or courier to: United States Antenna Products, L.L.C., 5263 Agro Drive, Frederick, Maryland 21703. This warranty embodies the entire understanding of the parties as it relates to the subject matter hereof and supersedes any prior representations, warranties, agreements or understandings made by or behalf of USAP. No amendment or modification to this warranty shall be valid or binding upon USAP unless in writing and signed by an officer of USAP.



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