

Installation & Maintenance
Instructions
for
Model 1942 RT
with
Illustrated Parts List



Installation & Maintenance Instructions

For

Model 1942 RT

With

Illustrated Parts List

Including Optional Sled Kit

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Safety Summary

The following **CAUTION** appears in the text of the manual and is repeated here for emphasis.

CAUTION

The 1942RT Antenna is designed to operate in the 2 to 30 MHz range and should be used and operated in that frequency range only. The antenna should not be used for operation in any other region.

Power Lines

The antenna should not be installed under or near any power lines. This is both safety and operational reasons.

Power Off

Before attempting to make any adjustments to this system, all power leading to the antenna should be shut off.

Occupational Safety and Health Act

This system is designed to meet applicable OSHA standards.

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CHAPTER 1

GENERAL INSTRUCTIONS

General Description and Specification Data

Scope

This manual covers the description and operative instructions, maintenance instructions, preventative maintenance service, organizational maintenance, field maintenance, and illustrated parts breakdown for the 1942RT NVIS Antenna.

Description of Major Parts

The 1942RT Antenna consists of four (4) antenna elements, ground radials, antenna guy assembly, balun, termination loads, upper mast assembly, and common metal mast assemblies. The system is designed for quick and easy assembly, erection and deployment. Refer to Table 1-1 for reference data.

Antenna Assembly

The antenna assembly consists of four 38 foot wire elements and termination loads. They are connected to an element cross arm support mounted on top of the 20' mast then unrolled and connected to four roof sleds.

Ground Radials

Four ground radials connect to the end of the elements, and back to the mast sled. These complete the radiating system.

Mast Assembly

The mast assembly consists of easily detachable, mechanically interchangeable sections of such dimensions as to adequately support the antenna at its fully extended height of 20 feet, and a base plate.

Balun

This transformer matches the 50 ohm unbalanced coax of the transmission line to the 450 ohm balanced feed of the antenna

Top Mast Assembly

This mast section is used as a mounting point for the balun, and the anchor for the upper points of the four elements.

Termination Loads

These resistive loads are installed at the end of each radiating element to provide proper electrical radiation of the system.

Guy Support Assembly/Jaw & Jaw Turnbuckle Assembly

There are four (4) of these. They are at the end of each element and guy wire. They provide the tension to properly keep the system anchored and upright. They are easily independently adjustable to keep the right amount of tension on each element or guy wire.

Roof Sleds

There are five (5) roof sleds purchased separately. There is a Center Mast sled and four guy anchor sleds. Each should be used with a rubber pad underneath to prevent damage to the roof surface.

Ballast

Ballast is purchased locally at the time of installation. The Center Mast Sled requires 150 pounds of ballast; the four guy sleds require 300 pounds of ballast. The easiest and most economical ballast to use is CMUs (concrete masonry units). There are a variety of sizes and shapes that easily fit into the roof sled frames.

Guy Cable Assembly

The guy assembly consists of four polyurethane Kevlar® rope guy lines, tensioning devices and mast mounting hardware sufficient to maintain the antenna upright in a 60 mph wind when in its fully extended position.

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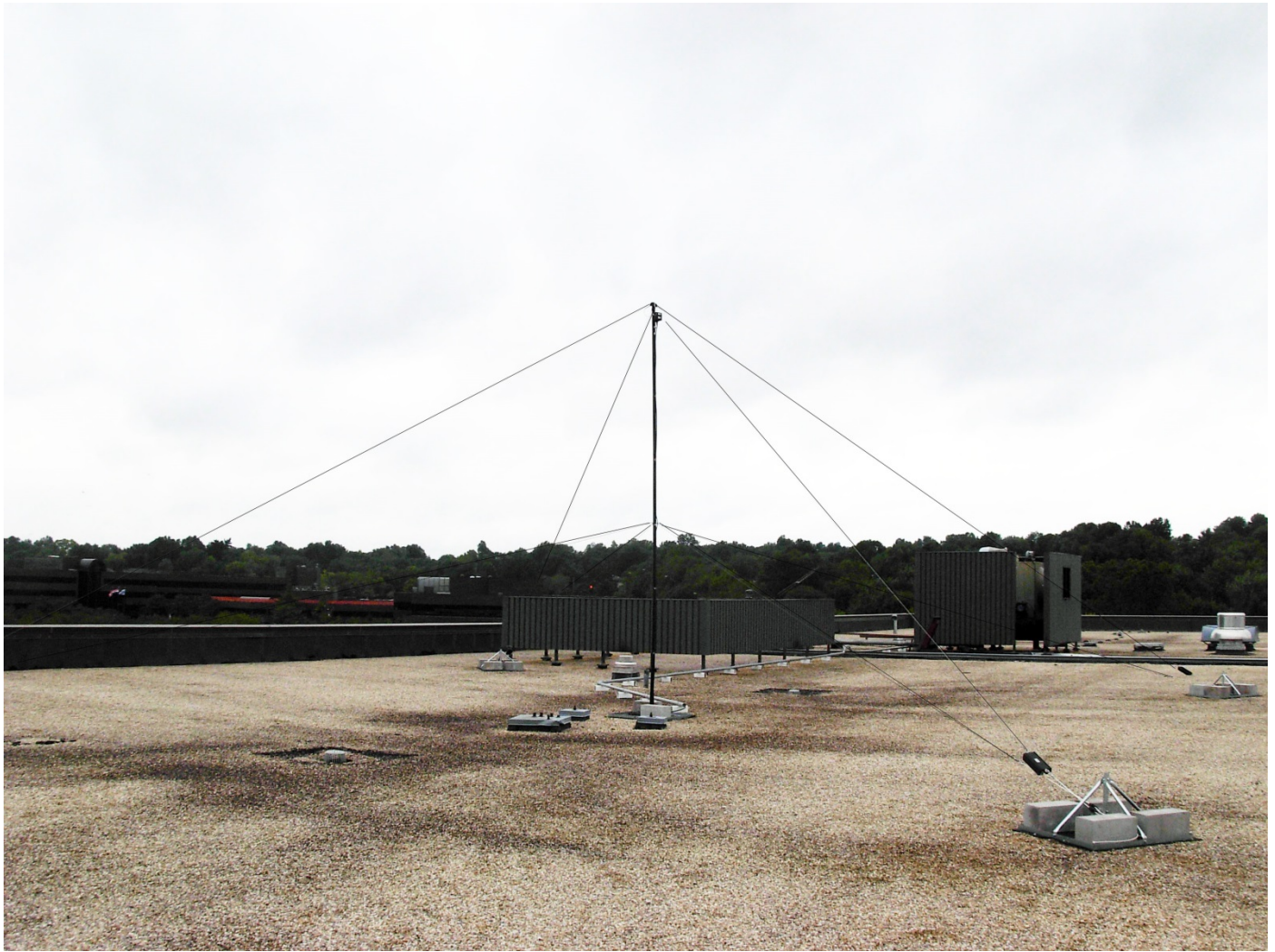


Figure 1-1
Overall View of 1942RT Antenna System

Table 1-1 Specifications	
<i>Electrical</i>	
Frequency Range	2-30 MHz
Power Handling Capabilities	1000 Watts Avg./2000 Watts P.E.P./ Continuous
Polarization	Horizontal
Input Impedance	50 ohms unbalanced
FR Connector	Type N
Coaxial Cable	Not Supplied
<i>Mechanical</i>	
Mast Height	20 ft. / 6 m.
Construction.....	Aluminum Support/ Stainless Steel Elements and Ground Radials
Deployment	Roof Top
Deployment Length	50 ft. square/ 4.65 m. square

Table 1-2 Equipment Supplied		
Part No.	Description	Qty
870362	Common Mast	6
879984	Cross Arm Support	1
877798	Balun with Hardware	1
879998	Element with Termination Load	4
879994	Guy Rope Assembly	1
877551	Ground Radial Assembly	4
822215	Guy Support Assembly	4
812215	Jaw & Jaw Turnbuckle Assembly	4
N/A	Element Attachment Kit	4
N/A	Center Sled Attachment Hardware	1

Table 1-3 Optional Equipment		
Part No.	Description	Qty
891942	Center (Mast) Sled	1
891943	Guy Anchor Sled	4
N/A	Rubber Mats	4
N/A	Ballast (Generally Purchased Locally)	A/R*
*A/R- As Required		

Preparation for Use

Handling

Do not use hooks or other sharp items to handle the equipment; otherwise no special equipment is needed when handling the antenna system. When unloading, do not drop the antenna system.

Unpacking

Carefully remove the various assemblies from the shipping box(es).

Installation Procedure

Carefully select the installation site for the antenna. The site should be relatively flat, and free from closely surrounding objects, such as air handlers, metal penthouses, other antennas or power lines of any sort.

NOTE: Close proximity to power lines and large metal structures will degrade the performance of the antenna.

WARNING: *Contact with power lines of any sort will cause serious injury or death to personnel.*

Locating and Assembling Sleds

The antenna system is shipped complete and requires no special tools or equipment for its assembly or installation. Check parts shown in Table 1-2.

Place the mast sled at the selected antenna location and assemble the sled on a rubber pad as shown in Figure 1-2. **DO NOT FULLY TIGHTEN HARDWARE AT THIS POINT.**

Refer to the plot plan (Figure 1-3) and locate four (4) antenna guy sleds at points 90° apart around the base plate at a radius of 34 feet from the base anchors. The guy sleds should form a square approximately 49 feet. **NOTE:** A square pattern is ideal, but not 100% essential. There may be obstructions that will cause you to shift a guy sled by a few feet.

Place rubber mats at the locations for the guy sleds. Assemble guy sleds as shown in Figure 1-4. The guy sleds should be positioned so that a flat surface is facing the mast sled. The eyebolts on the guy sled mast should be facing the mast sled. **DO NOT FULLY TIGHTEN ANY HARDWARE AT THIS POINT.** Install bottom Common Mast on mast sled. Tighten two (2) bolts on clamp to hold mast firmly in place. Let mast rest on roof.

Radiation Patterns

While any antenna of this type is omnidirectional, there is some directionality when operating at the lower end of the frequency spectrum (below 10 MHz).

If you wish to take advantage of this characteristic the antenna can be oriented when planning the installation.

For best operation under these conditions, plan the orientation of the mast sled so that the Cross Arm Support is perpendicular to the direction you will be transmitting at low frequencies.

See Figure 1-5 for a pictorial example.

This orientation is not essential to proper antenna operation, but is noted as a guide.



Figure 1-2
Mast Sled Installation

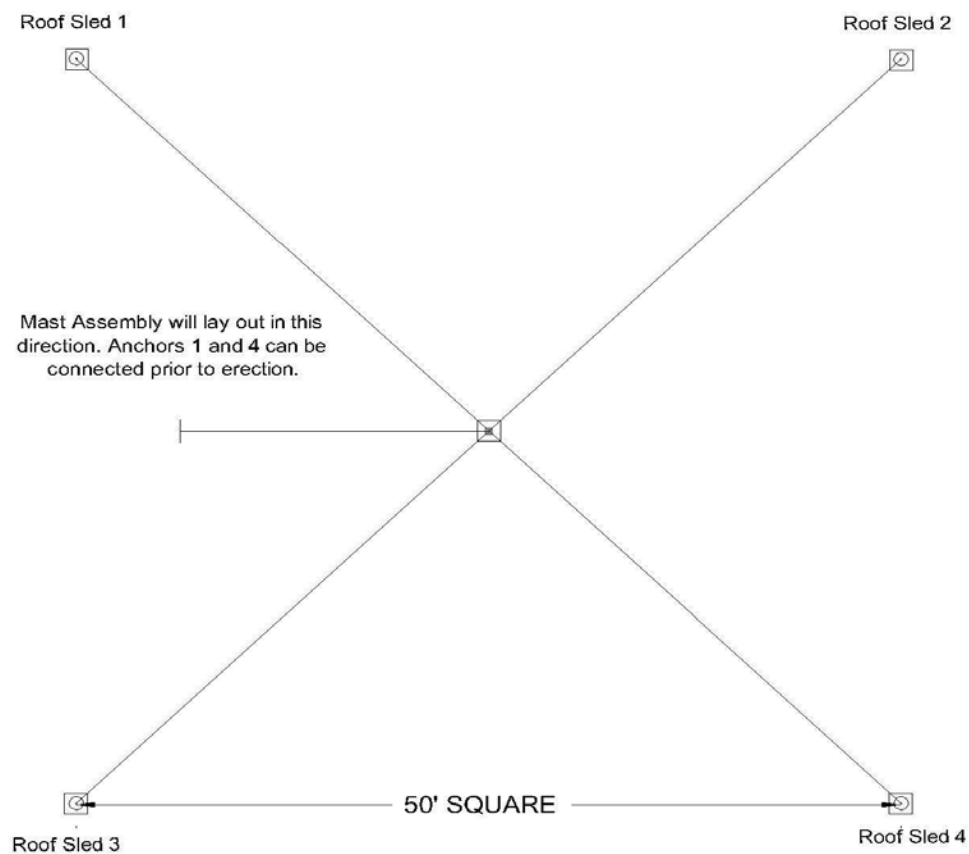


Figure 1-3
Layout Plan
NOTE: A square pattern is ideal, but not 100% essential.

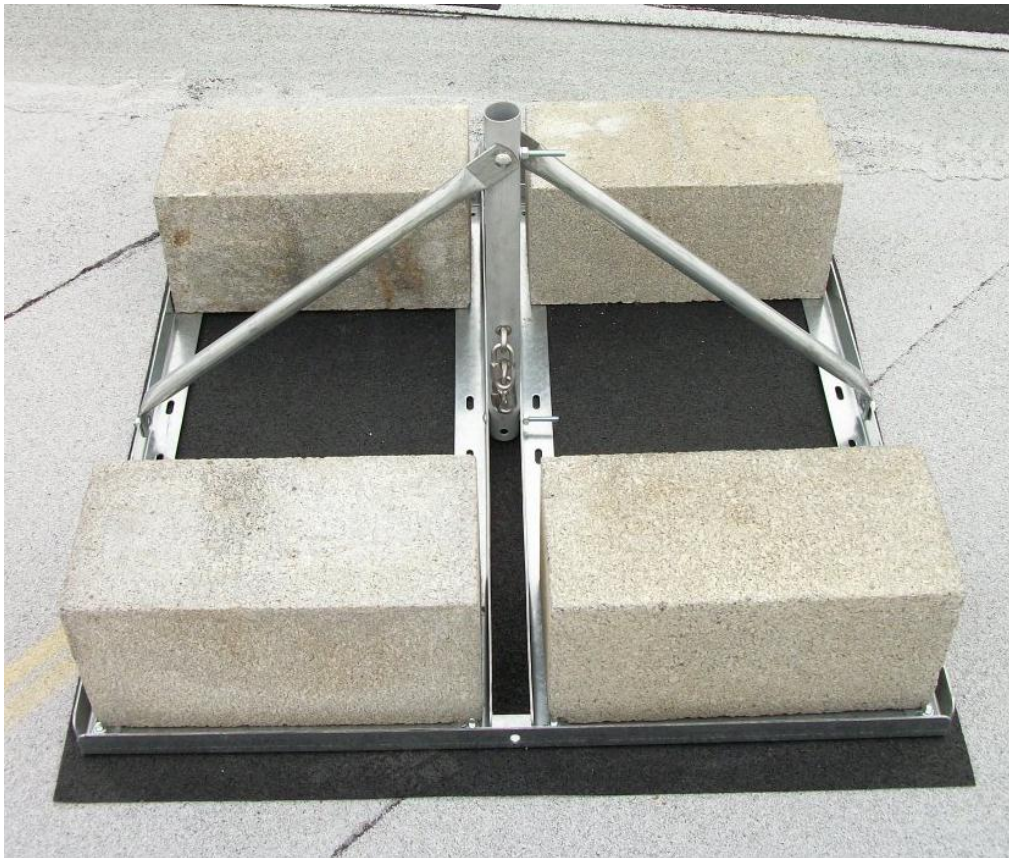


Figure 1-4
Guy Sled Installation (with Ballast)

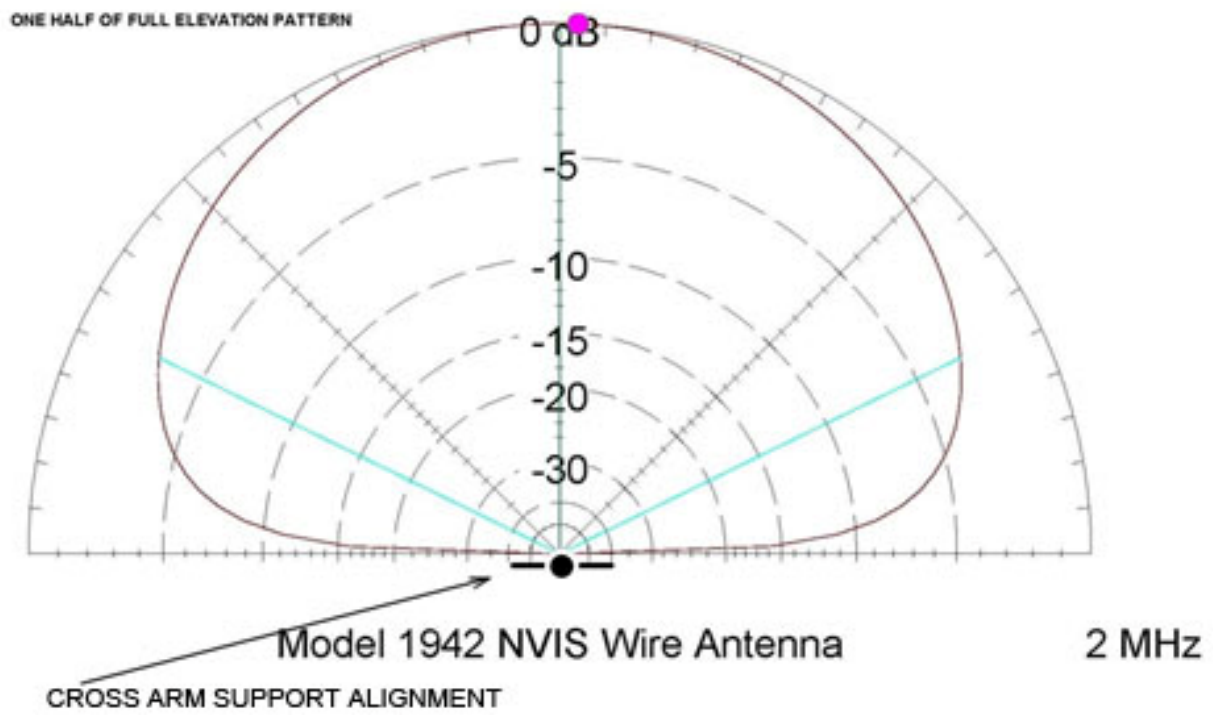


Figure 1-5
Optional Orientation for
Optimum Operation at Low Frequencies



Figure 1-6
Guy Ring Installation

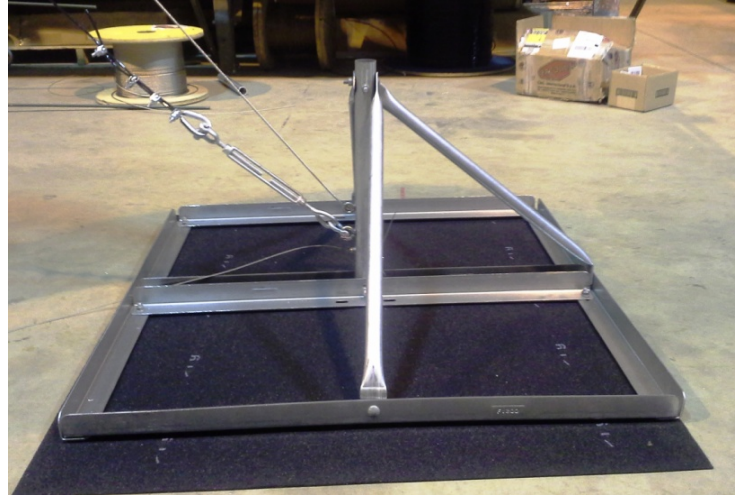
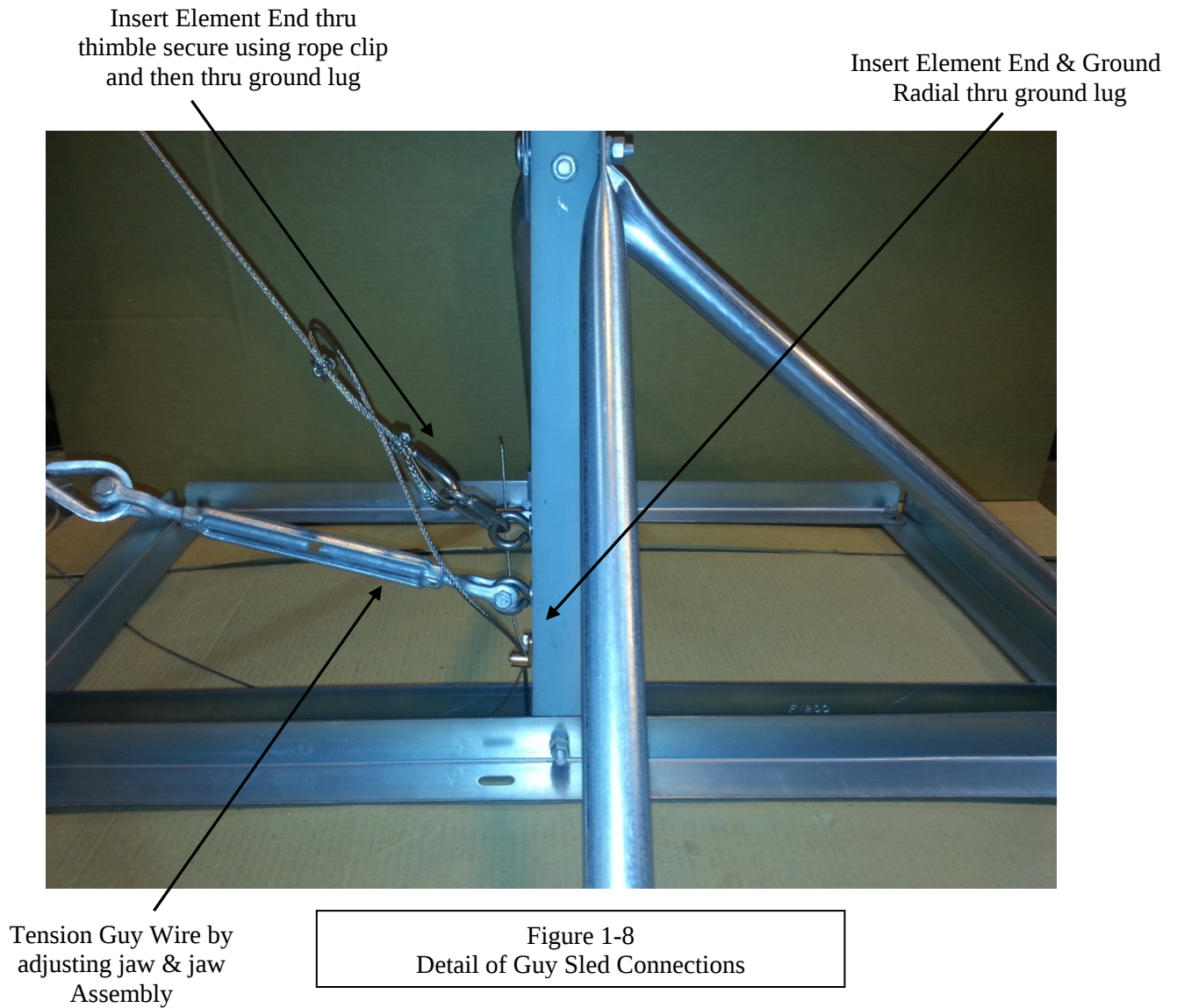


Figure 1-7
Guy Support Assembly

Assemble the common metal mast assemblies by inserting the tapered end into the bottom of the next tube. Rotate until the notch seats and the lock buttons snap through the locking holes. Install the guy ring over the **third metal mast section from the base**. Refer to Figures 1-6 and 1-9. *If guy ropes are not attached directly to ring, use supplied oval rings to connect as shown in Figure 1-6.*



NOTE: Check to make sure all sections are locked- See assembly instructions in back of manual.



Unfurl the guy ropes and connect the guys to the lower eye bolt on roof sleds 1 and 4 using Guy Tensioners. NOTE: Make sure the guy ropes are not twisted.

Connect Tensioner Assemblies to the Guy Ropes for Anchors 2 and 3 at this time (See Figures 1-7 and 1-8). Lay them out on the ground toward their respective anchors. They will be connected to the anchors after the mast is raised.

NOTE: The Guy Rope is coated Kevlar®, and is capable of being cut with sharp edges. Ensure guy rope is not exposed to knives or other sharp objects.

Kevlar® is a Registered Trademark of DuPont

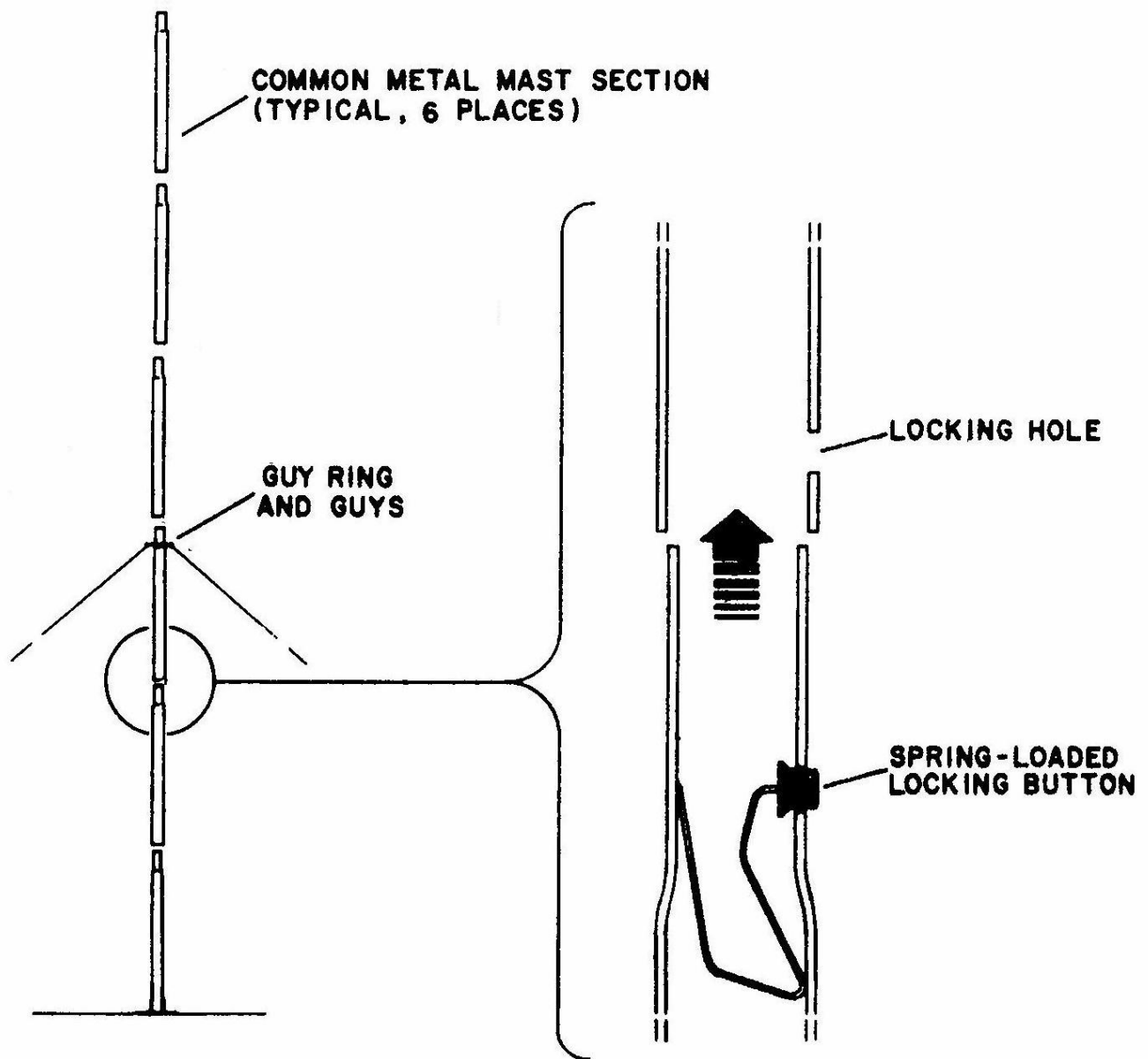


Figure 1-9
Mast Assembly

Refer to Figure 1-10 and attach the support arm boom to the top mast section.

Top Mast Assembly

Connect the top mast assembly into the mast. Using the supplied U-Bolts, clamp the Balun to the top mast section. Tighten the bolt wing nuts securely. Refer to Figure 1-11 for reference.



Figure 1-10
877892 Cross Arm Support



Figure 1-11
Cross Arm Support & Balun Assembly



Figure 1-12
Connected Elements

Connecting the Elements

Take the four (4) elements, and using oval rings, attach to Fiberglass hangers on the Cross Arm Assembly. Refer to Figure 1-10 and attach the shackles to the cross arm supports as shown. Unroll each element assembly in opposite directions.

Attach the “pigtailed” of each element assembly to the connections on the balun as shown in Figure 1-12, tighten wing nuts securely.

Connect the bottom end of each element with termination load to sled as shown in Figure 1-13.

Connect the Guy Tensioners to Anchors 1 and 4. Lay out Elements 2 and 3 next to the guys for anchors 2 and 3.

Connect the RF power cable secure cable to mast. It is recommended that the RF cable running down the mast be a jumper rather than being one piece all the way to the radio. This will assist in any maintenance.

Lay out the element assemblies so they do not tangle, and prepare to raise the antenna mast to the vertical position.

Raising the Antenna

CAUTION: *It is important that one person does not attempt to raise the mast without assistance.*

Proper procedure to raise the mast is to use at least two people. One person should stand at the base of the mast holding the mast. The second person should lift the top of the mast, just below the antenna assembly, and walk toward the base, raising the mast to the vertical position.

The first person should then attach the element and guy tensioners to the remaining guy anchor posts. Readjust the tensioners for vertical and straight alignment of the mast.

Check the mast again and make adjustments with the tensioners as necessary to insure that the mast stands straight and vertical.

Connect the coaxial cable (which has a Type N connector attached) to the transceiver.

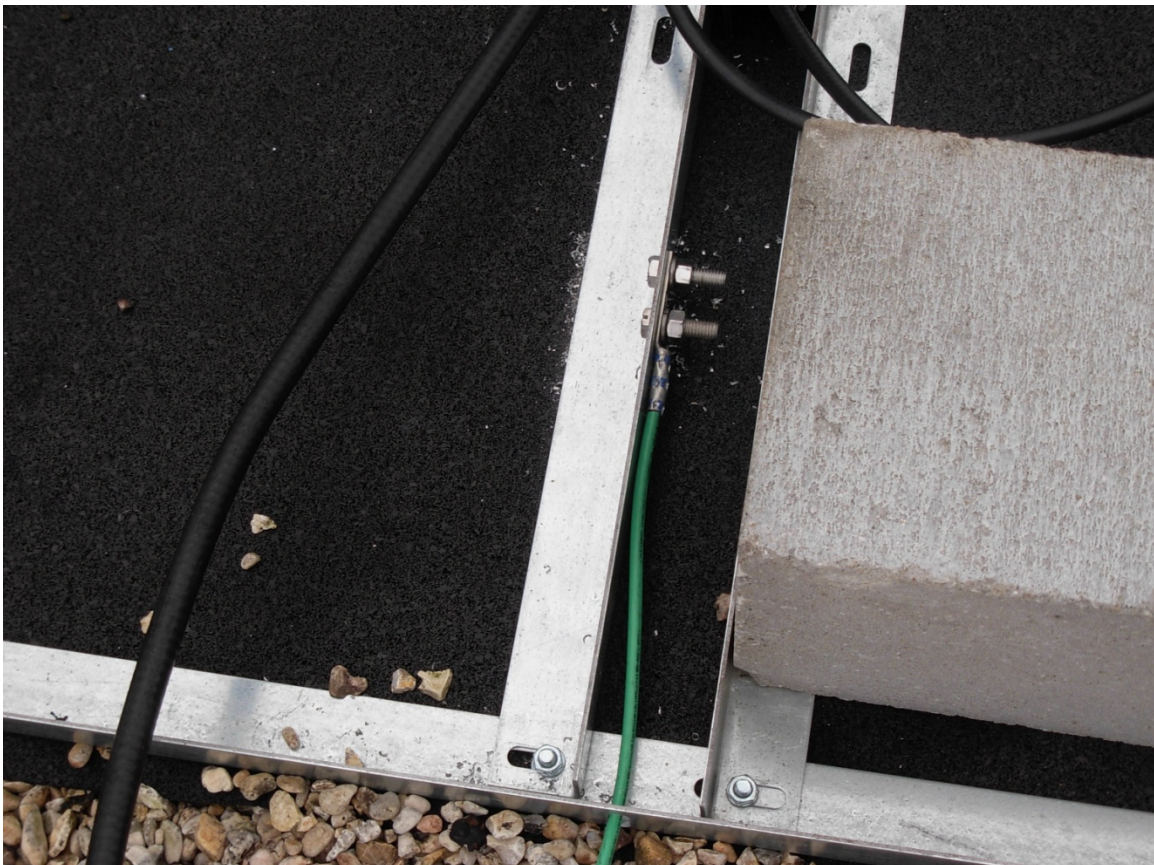
Tighten the bottom bolt on the black mast clamp.

Grounding the Antenna System

Connect any one (1) of the five (5) sleds (preferably the mast sled) to a building ground. The recommended ground wire is a #2 Green THHN wire. Use a wire lug at the sled for best results. See Figure 1-14 for proper installation technique.

Run the four (4) ground radials from the guy sleds to a convenient point on the mast sled. Drill a hole for each ground radial and using the supplied hardware, cut the radial to length, install a crimp, and attach the radial to the sled. See Figure 1-15 for proper installation technique. See Figure 1-16 to see a connection of all ground radials to center sled.

Figure 1-13
Ground Wire Attachment to Center Mast Sled



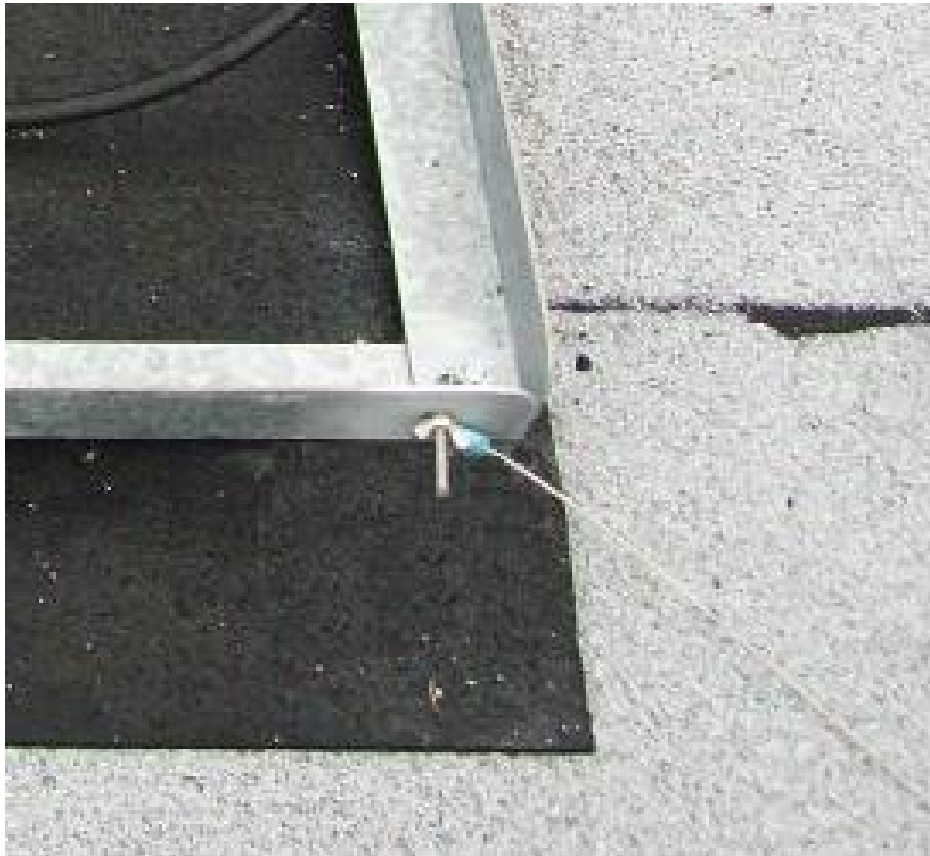


Figure 1-14
Detail of Ground Radial Attachment to Mast Sled



Figure 1-15
Center Mast Sled showing 4 ground radials and
system ground.

Ballast

After all ground radials are installed check the tension on all elements and guy wires. When everything is at proper tension the ballast can be added to the sleds.

Place some ballast on the sleds making sure that the blocks fit properly in the frame. After the first layer of blocks is set, all the hardware on the sleds can be tightened.

Place a total of 300 pounds of ballast on the corner sleds, and 150 pounds of ballast on the mast sled.

Alternative Mounting Methods

The systems and installation techniques described in this manual assumes that a USAP 1942RT-SK (Sled Kit) has been purchased.

The factory sled kit is a convenient system for the installation of the system, but is not required.

All that is required is that the general installation, guying, connection and grounding instructions described in this manual be followed.

Using an alternative mounting system will not void the warranty unless it is found that the alternative system caused the actual damage to the antenna.

Chapter 2

Operating Instruction

Theory of Operation

Electrical Theory

The 1942RT antenna is a broadband terminated center fed NVIS. It was designed using advanced computer modeling and computed performance was verified by extensive measurements on full size antennas. The combination of wire dimensions, balun, and termination impedances has been optimized to produce efficiency of typically 30% from 4-30 MHz and 15% from 2-4 MHz. The radiation pattern is near vertical up to approximately 10 MHz, which is ideal for reliable communications within 300-500 miles. Lower angles of radiation at 10-30 MHz also allow communication over much greater distances.

The design of the termination assembly allows continuous operation at the rated power. The termination assembly is comprised of high power film resistors mounted on a well-designed and mechanically rugged heat sink. The termination and balun were designed to allow continuous operation at rated power in all specified operating environments.

Mechanical Theory

The 1942 is a rugged, lightweight antenna designed for long term use under various environmental conditions.

Weight is kept to a minimum by the use of durable aluminum mast and boom sections. Strong, lightweight stainless steel wire is used for the radiating and ground elements to maintain high efficiency and ease of installation. The weight of the termination assemblies have been minimized by the use of highly efficient and rugged heat sinks. The resistors in the heat sinks are potted to increase resistance to weather and corrosion.

Service Requirements

Service upon Receipt of Equipment

The 1942 antenna is shipped complete and required no service instruction or duties that the operator needs to perform prior to installation.

Inspection

A visual check should be made to make certain all components are supplied. Refer to page 1-3 for a list of equipment supplied.

Lubrication

This equipment does not require lubrication.

Service Requirement Prior to, during, and after Operation

To insure that the equipment is ready for operation at all times, it must be inspected systematically before, during, and after operation so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventative maintenance services should be performed on a scheduled basis. Defects discovered during operation of the unit should be noted for future correction, to be made as operation has ceased. Stop operation immediately if a malfunction is noted, to prevent damage to the radio equipment if operation was continued. Perform routine maintenance at intervals based on the normal operations of the equipment. Reduce the intervals to compensate for harsh conditions. Defects or unsatisfactory operation beyond the maintenance level of the operator must be reported at the earliest opportunity to organizational maintenance. The following table contains inspection procedures which the operator should follow.

Table 2-1 Operator's Monthly Maintenance Schedule			
Intervals			Procedure
Before Operation	During Operation	After Operation	
X		X	Elements: Inspect the elements. See that the elements are not kinked or broken.
X			RF Cable: Inspect the RF cable for broken connections or broken cover. Repair if necessary.
X	X		Visual Inspection: Inspect all guy assemblies and base assemblies for secure mounting.

Controls and Instructions

Location of Controls

There are no controls for the 1942 Antenna.

Operation under Specific Conditions

Operating the 1942 Antenna under specific conditions is performed in the same manner as operating under normal conditions.

Hazards and Operation under Normal Conditions

Personnel should not be allowed within the installation area of the system during transmission operations. The ground radials also present a trip hazard. It is recommended that warning signs be placed around the antenna for these hazards. The antenna system has no indicators. The operator needs to be familiar only with the operating procedures for the transceiver he will use with the system.

Operation under Emergency Conditions

When the antenna is operated under emergency conditions, such as high winds, thunderstorms or lightning, care should be taken not to allow any personnel to walk or stand near the antenna, as this may cause serious injury or even death.

Operation under Unusual Conditions

This antenna system may be operated in areas of extreme cold or heat, high humidity, sand, snow, saltwater areas, high altitude, or other conditions not normally encountered.

Operation of Equipment Used in Conjunction with the Major Item

This system is complete and only needs to be connected to a transceiver that operates in the 2 to 30 MHz range.

Refer to the Operation chapter of the appropriate TM publication for operation procedures of the transceiver you are using with the 1942 Antenna.

CAUTION: The 1942 Antenna is designed to operate in the 2 to 3- MHz range and should be used and operated in that frequency range only. The antenna should not be used for operation in any other region.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Introduction

This chapter will describe the maintenance procedures to be performed on the 1942 Antenna.

Service

When using or carrying the system, keep the unit as clean as possible. This will insure maximum reliability of the equipment.

Adjust

No adjustments other than tightening of loose guy lines are required on this system.

Inspect

Before assembling the antenna, inspect the system carefully. Look for defects such as frayed guys, bent mast sections, broken wires, etc.

Tools and Equipment

Tools are required for repair and replacing parts of the 1942 will be a small box of hand tools. Listed below are the tools of items needed to perform needed repair or replacement of parts of assembly.

Table 3-1		Tools and Items Needed	
Tools and Equipment		Function	
Clean, dry cloth		Antenna upkeep maintenance	
Soft, 1" paint brush		Antenna upkeep maintenance	
WD 40® lubricant spray (or equal)		Antenna upkeep maintenance	
Electrical insulating tape		Antenna upkeep maintenance	
Dow Corning Silicone Compound (or equal)		Antenna upkeep maintenance	
Hand tools		Antenna Repair or assembly, or part replacement	

Preventative Maintenance Services

Preventative Maintenance

Refer to Table 2-1 for monthly maintenance of the 1942RT.

Troubleshooting

This section contains information to aid in finding trouble or malfunction of the 1942RT Antenna. Also refer to the Technical Manual on troubleshooting for the transceivers you are using with the antenna system.

Table 3-2 Troubleshooting Index		
Symptoms	Probable Cause	Correction
(1) When transceiver is in operating order but no signal is received from antenna.	(a) RF Cable is not connected to antenna or Antenna is not connected to the balun.	(a) Lower antenna and tighten cable connector securely to antenna balun. Tighten all connections securely.
	(b) Dirt, debris, or silicone compound in connectors.	(b) Clean connectors thoroughly.
	(c) Break in cable, causing short or open.	(c) Check with OHM meter. IF this check shows a break or short in cable, replace the cable.
	(d) Elements not connected to termination or ground.	(d) Check for proper connections.

Organizational Maintenance

General

This section contains first and second echelon maintenance procedures to be performed on the 1942 Antenna.

Organizational Maintenance of Mechanical Parts

Organizational preventative maintenance shall be limited to the following:

- Cleaning the electrical connectors on the RF cable using a clean, dry cloth or soft brush, and lubricating threads of connectors, using a light spray of WD 40® lubricant.
- Tightening loose cable connectors, using fingers only. Do not use any hand tools.
- Inspection of coaxial cables for torn jackets, abrasions, exposed braid, partially severed cables, or crushed cables.
 - If jacket is severely abraded, but the braid is not exposed, wrap abraded area with a layer of electrical insulating tape and apply a very light coat of **Dow Corning Sealing Compound or equal.
- If braid is exposed but not damaged, wrap the exposed braid plus six inches of cable on both ends of the exposure tightly with electrical insulating tape. Again, apply a light coat of Dow Corning Sealing Compound or equal.
 - NOTE: If operation of the antenna is in area with heavy rainfall, a coating of Silicone Compound should be applied to the exterior of the connectors, making sure that none is applied to the inside of the connectors.
- If the cable is crushed or partially severed, notify technical personnel for replacement.
- Inspect element connections at balun, and if loose, tighten, using hand tools.
- Remove dirt and/or vegetation from joints on mast and antenna element sections using a clean cloth or brush.
- Inspect guys for cuts, breaks, fraying, kinks, or deterioration. If any evidence is found, the item should be replaced.
- Check tension of guys and condition of ground anchors after system is erected.
- All metal parts subject to corrosion should be given a light coat of WD 40® spray or an equal to defer corrosion.

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** A product of Dow Corning Corporation

Replacement of Parts or Assemblies

Extensively Damaged Elements

- Replace the entire damaged element assembly.

Replacement of Connectors on Coaxial Cable

- Install the connectors in accordance with manufacturer's specifications and instructions on coaxial cable preparation.

Guy Rope Tensioner

Treat tensioner using Gold Galvanizing Spray if any corrosion appears.



Figure 3-1
812215
Tensioner Assembly

Replacing Mast Clamp

- Lower the antenna and remove the mast assembly from the mast clamp.
- Remove ¼" x 3" bolt holding the mast clamps to the sled.
- Replace either the damaged mast clamp and reassemble using the ¼" hardware, making sure the 3" bolt is assembled in bottom hole.
- Insert the lower mast section and tighten all hardware securely.

Repair of Coaxial Cables

- Replace severely damaged coaxial cable.

Repair of Damaged Element Assembly

- If ring terminal breaks off trim off the tail and replace with new terminal. Shortening of the tail will not change antenna performance.
- If a thimble falls out it should be replaced. While the element is still functional, wear will damage the element or attachment point.

If the cable breaks or has other major failure, it needs to be replaced.

Repair of Top Mast Section

- Replace the entire damaged section.

Repair of Balun

- Replace the entire damaged balun assembly.

Repair of Ground Radial

- Replace the entire damaged radial assembly.

Repair of Resistor Jumper

- Connection rings can be replaced without changing the operation of the antenna. The tail length does not affect the operation of the antenna as long as it is long enough to reach connection point.

Repair of Cross Arm Support

- Remove the ¼" x 2 ¼" bolt and the #10 x 1 ½" bolt from the assembly to remove the tube support arm from the head adaptor and replace with new tube support arm.
- If the fiberglass insulator is damaged, remove the #10 x 1 ½" bolt from the tube support arm and replace the insulator. Reinsert the #10 bolt.
- If the cross arm support is extensively damaged, replace the entire assembly.

CHAPTER 4

ILLUSTRATED PARTS BREAKDOWN

General Description

The Parts List includes an illustration with Item Numbers, Part Numbers, Descriptions, and Quantities for each system.

Table 4-1		Equipment Supplied
Part No.	Description	Qty
870362	Common Mast	6
879984	Cross Arm Support	1
877798	Balun w/ Hardware	1
879998	Element w/ Termination Load	4
879994	Guy Rope Assembly	4
877551	Ground Radial Assembly	4
822215	Guy Support Assembly	4
812215	Jaw & Jaw Turnbuckle Assembly	4

Table 4-2		Optional Equipment
Part No.	Description	Qty
891942	Center (Mast) Sled	1
891943	Guy Anchor Sled	4
N/A	Ballast	A/R



Figure 4-1
879998
Antenna Element with Termination Load



Figure 4-2
879984- Cross Arm Support
877798- Balun Support



Figure 4-3
870362
Common Mast Assembly (Label only supplied upon
request)



Figure 4-4
877551
Ground Radial

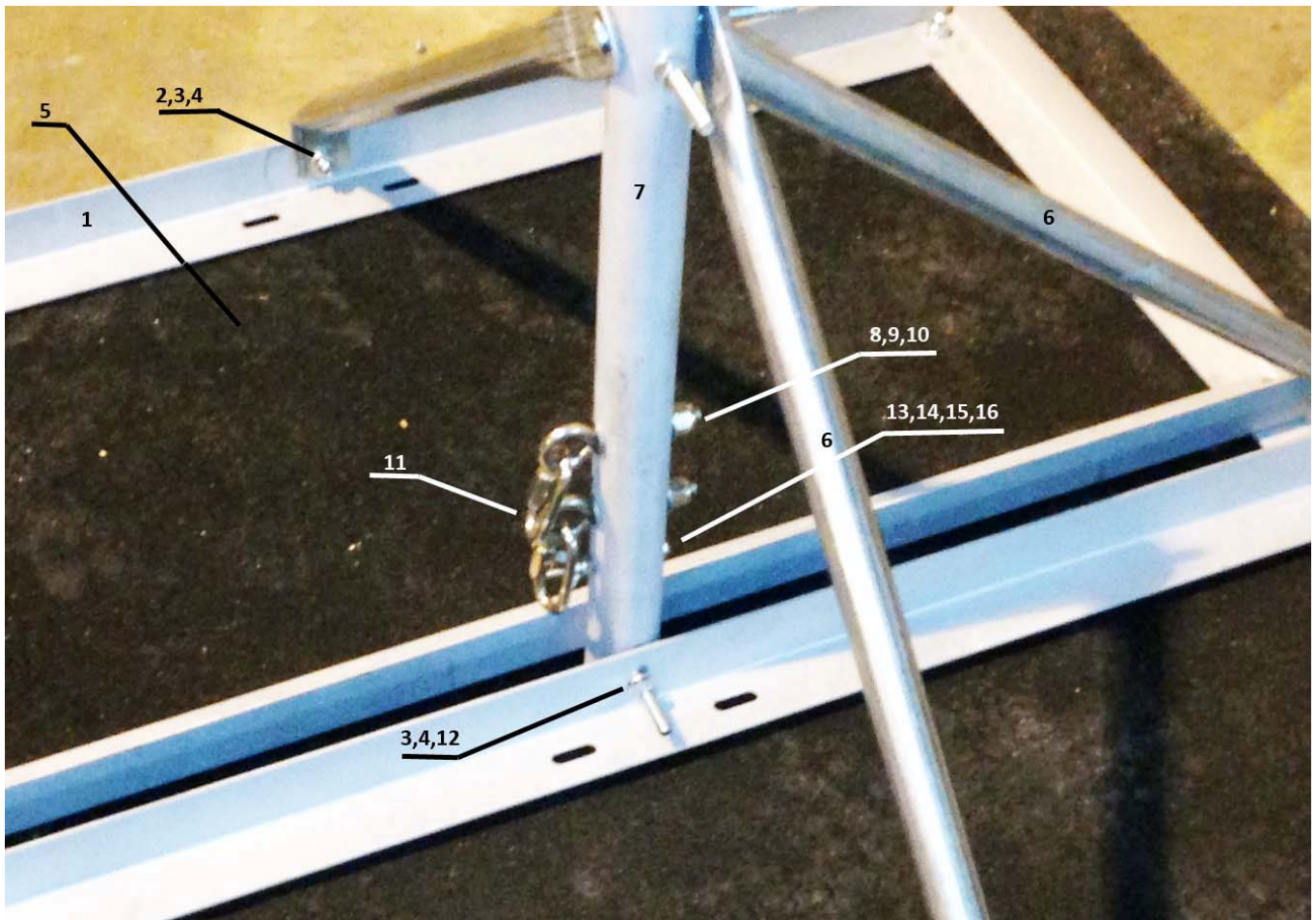


Figure 4-5
891943
Guy Anchor Sled

No.	Part No.	Description	Qty
1	331942	Angle 34.75 x 1.75 x 1.75	6



Figure 4-6
Center (Mast) Sled



Figure 4-7
879994
Guy Rope Assembly

See next page for end assembly procedure.

PHILLYSTRAN® Nonmetallic Tower Guy End Preparation

Wire rope clips are available in two basic designs: U-bolt and fist grip. This procedure will cover the proper installation of the U-bolt style clips.

1. Install all four clips starting with the first clip closest to the thimble eye. Start clip as close to thimble as possible.
2. Tighten all nuts evenly to 10 ft. lb. for HPTG 1200I. Avoid twisting or curling of the end termination by tightening each nut a little at a time.
3. Install and tension guy cable. Retighten nuts to 10 ft. lb. for HPTG 1200I. Rope will stretch and reduce in diameter when initially tensioned.
4. Inspect periodically and retighten to recommended torque as required.

End Caps: In order to maintain the dielectric properties of the Phillystran “HPTG I” products, it is important to install end caps on all exposed ends. Apply silicone adhesive to rope end prior to cap installation to prevent cap from coming dislodged.

CAUTION: *Extreme care must be taken to ensure the U-bolt clips are properly installed and tightened. The “U” section should be in contact with the rope “tail”. Tightening and retightening nuts must be accomplished as required. Wire rope clips may be used only on the new and improved “HPTG I” products. Do not use wire rope clips or any other mechanical termination on the original HPTG products. Such use will cause premature failure.*

<u>Application</u>	<u>Phillystran Part Number</u>	<u>EHS** Equivalent (Diameter)</u>	<u>Approximate Weight (lb. /100 ft.)</u>	<u>Heavy Duty Thimble Size</u>	<u>Wire Clip Size</u>	<u>End Cap P/N</u>
Boom Supports	HPTG 1200I	3/32”	1.1	¼”	3/16”	H166

CAUTION: Break Strength: The breaking strength of a rope is the load at which a new rope will break when tested under laboratory conditions. Break strength should not be mistaken for safe working load. **Safe Working Load:** Because of the wide range of rope use, rope condition and the degree of risk of life or property. It is not possible to make a blanket recommendation for safe working load. It is ultimately dependent on the rope user to determine what percentage of break strength is their own safe working load. **Wear:** Ropes wear out with use; the more severe the usage, the greater the wear. It is often not possible to detect wear on a rope by visible signs alone. Therefore, it is recommended that the rope user determine a retirement criteria for ropes in their application. For assistance in developing safe working load and retirement criteria for each application please call or write Phillystran, Inc.

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(All information was taken from Phillystran Technical Bulletin 355-9/00)

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 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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