

EE110-JC-OMI-010/W110-AS2537CSR

TECHNICAL MANUAL
OPERATIONS AND
MAINTENANCE
INSTRUCTIONS

AS-2537C/SR
35 FOOT WHIP ANTENNA

VALCOM LTD
N00039-83-C-0214



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PUBLISHED BY DIRECTION OF COMMANDER, SPACE AND NAVAL WARFARE SYSTEMS COMMAND

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22 JANUARY 1986

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Original... 0 ... 22 January 1986.

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Figure 1-1. Antenna AS-2537C/SR

CHAPTER 1

GENERAL INFORMATION AND SAFETY PRECAUTIONS

1-1 Safety Precautions Cross
References. Paragraph 4-8d
indicates a WARNING when using the insulation test set to measure the insulation resistance of the antenna. Paragraph 4-9.1c indicates a CAUTION when applying torque to the feedpoint bolt on the antenna. Paragraph 4-9.2f indicates a CAUTION when cleaning the interior of the antenna. Personnel should not scrap the interior wall. Paragraph 4-9.2g indicates a CAUTION. When touching up the antenna, lead base paints are not to be used and new O-rings installed when antenna has being disassembled. Paragraph 8-5 indicates a WARNING to check the underside of the deck at a new antenna installation for electric cables and obstructions prior to drilling.

1-2 Introduction. This chapter describes the electrical, mechanical properties and characteristics of the AS-2537C/SR fiberglass whip antenna.

1-3 Equipment Description. This manual applies to the fiberglass AS-2537C/SR whip antenna for shipboard use. The equipment consists of the whip antenna, installation kit and manual. The AS-2537C/SR antenna replaces and is interchangeable with the AS-2537/SR, AS-2537A/SR, AS-2537B/SR whip antennas. Top and bottom sections are serialized and are not to be interchanged except under extreme circumstances.

Table 1-1. Reference Data

Antenna Characteristics	Description
Nameplate Data	<p>AS-2537C/SR ANTENNA 5 KW (Average) 2-30 Mhz Serial No.</p> <p>Manufactured for Space and Naval Warfare Systems Command by Contractor Valcom Limited, Guelph, Ontario Canada Contract: N00039-83-C-0214</p>
Mechanical Properties Material	Copper-beryllium tapes embedded in fiberglass and a thermo-setting epoxy resin.
Length (uncrated) Top section Bottom section Asembled length Conductor length	<p>18 feet, 6 inch \pm 2 inch, overall</p> <p>18 feet, \pm 2 inch, overall</p> <p>36 feet, \pm 2 inch, overall</p> <p>35 feet</p>
Weight (uncrated)	155 pounds average, 176 pounds maximum.
Temperature range	<p>Storage: -80°F to $+167^{\circ}\text{F}$ (-62°C to $+75^{\circ}\text{C}$)</p> <p>Working: -65°F to $+149^{\circ}\text{F}$ (-54°C to $+65^{\circ}\text{C}$)</p>
Windload	<p>Normal: up to 75 mph relative to ship.</p> <p>Safe maximum: up to 120 mph relative to ship.</p>
Nuclear air blast	Meets requirements of MIL-E-16400G(NAVY)

Table 1-1. Reference Data - CONT

Antenna Characteristics	Description
Mounting position	Horizontal or vertical, and at 45 angles above or below the horizontal.
Static Sag	In horizontal position, tip (corona shield) not more than 18 inches below centre of base.
Ultimate flexural strength	100,000 to 125,000 p.s.i.
Water absorption	After 24 hours immersed: 0.2% After 48 hours immersed: 0.6% After 168 hours immersed: 2.0%
Packaging	<p>The base and drip shield of the bottom section is wrapped in crepe paper. The top ferrule of the bottom section is wrapped in corrugated paper. The main body of the section is then enclosed in a polyethylene sleeve, covered by a fiberboard tube. The base and drip shield is protected by a larger fiberboard stapled to plywood supports bolted to the base itself.</p> <p>The top section is enclosed in a polyethylene sleeve and fiberboard tube. The ends of both sections are plugged with plywood disc and both sections are banded together with metal banding.</p> <p>The tie-down hardware, strap wrench and manual are contained inside the bottom of the base section.</p>
Crated dimensions and	Approximately 14 inches in diameter at widest point. Approximately 19 feet overall length. Average weight when packed : 175 pounds.

Table 1-1. Reference Data - CONT

Antenna Characteristics	Description		
Electrical properties	at 60 Hz	at 10 kHz	at 1 MHz
Dielectric constant	5.3	5.0	4.8
Power factor	0.0028	0.0044	0.032
Loss factor	0.011	0.018	0.12
Impedance	Within limits given in Table 1-2 and Table 1-3.		

Table 1-2. Nominal Impedance vs Frequency (2.0 to 5.0 Mhz)
with Allowable Tolerance.

Frequency (Mhz)	Resistance R (ohms)	R Tolerance (ohms)	Reactance X (ohms)	X Tolerance (ohms)
2.0	2.50	+0.75 -0.25	-j500	+j100 -j30
3.0	4.00	+0.50	-j250	+j20
4.0	8.00	+0.50	-j145	+j20
5.0	23.00	+0.50	-j80	+j20

Table 1-3. Nominal Impedance (6 to 30 Mhz)

Frequency (Mhz)	VSWR (50 ohm system)
6	3:1 or less
7	5:1
8	9:1
9	9:1
10	12:1
12	18:1
14	20:1
16	14:1
18	5:1
20	7:1
22	9:1
24	11:1
26	10:1
28	10:1
30	6:1

NOTE: Measured on Valcom's 112 feet radius ground plane.

Table 1-4. Equipment Supplied

Quantity	Item Name	Notes
1	Antenna top section	
1	Antenna bottom section	
1	Technical manual	
1	Strap wrench	
1	Hex key : 3/16 inch	
2	Silicone Sealant	
3	Set screw: 1/4 - 20 x 3/8 inch (spare)	
1	O-Ring	
1	3/8 - 24 x 1/2 inch capscrew	
1	3/8 inch ID lockwasher	
8	5/8-11 x 4 inch bolt	
8	5/8 flatwasher	
8	5/8-11 hexagon nut	
8	5/8 split lockwasher	

Table 1-5. Equipment Required But Not Supplied

Quantity	Item Name
1	Digital Voltmeter
1	50 Amp Source
1	Megger, 500V 100Mohm SCAT 4452 (Insulation Tester)
1	Adjustable Wrench
1	Torque Wrench

Table 1-6. Field Changes and Factory Changes

Change number	Nomenclature	Description

CHAPTER 2

OPERATION

2-1 Introduction. The antenna is designed to operate over the 2 MHz to 30 MHz frequency range. It is intended to operate in conjunction with a coupler system. The two sections of the antenna are joined and the full antenna is mounted on the deck. The antenna is connected to the coupler at the feedpoint just above the drip shield. Transmission without the coupler is possible only at the antenna resonant frequencies. When the antenna is used in the receiving mode, the antenna is normally connected to a receive multicoupler, tuner, or filter which in turn is connected to associated receivers.

2-2 Controls and Indicators. The antenna is a self supporting unit. It does not have any indicators on it.

2-3 Operating Procedures. For the antenna to be operational, the antenna must be connected from the feedpoint to an antenna coupling device, which in turn is connected to the transmitter or receiver.

2-4 Maintenance Instructions. Scheduled maintenance of the AS-2537C/SR fiberglass whip antenna can be found in Chapter 4.

CHAPTER 3

FUNCTIONAL DESCRIPTION

3-1 Overall Level. The antenna is part of an overall communications system which consists of a transmitter or receiver, coupler and antenna.

3-2 Major Level. The antenna is either at the front end of a receiving system or is the final apparatus of a transmitting system.

3-3 Circuit Level: Mechanical Description.

3-3.1 Top Section. This is a hollow tapered cylinder made of circular and longitudinal layers of fiberglass and thermosetting epoxy resin. Embedded in the fiberglass are six copper - beryllium strips laid in a two-turn spiral and secured at the top end to a hemispherical corona shield and at the bottom to the threaded female coupling into which the base section is inserted. The diameter expands from about two inches near the corona shield to 3-7/8 inches at the coupling. The surface is smoothed, primed, and painted in accordance with MIL-E-16400.

3-3.2 Bottom Section. The construction and finish are the same as for the top section except that the diameter expands from 3-7/8 inches at the coupling to 5-1/2 inches at the feedpoint. The coupling is threaded to fit into the top section and carries an O-ring to ensure water tightness. The six paralleled conductors are connected to the coupling at the top and to a ring

at the bottom. The bolt which secures the feedline from the transmitter or transceiver is located just above the drip shield and connects to the internal ring joining the six conducting strips. Below the drip shield, the fiberglass structure expands onto a base which can be installed onto a mounting pad which has 8 holes of 0.687 inch diameter equally spaced on a 10.750 diameter bolt circle. The base will withstand dry flashover voltages over 35 kilovolts rms.

CHAPTER 4

SCHEDULED MAINTENANCE

4-1 Introduction. The purpose of the scheduled maintenance is to ensure the antenna is physically and electrically functional.

The maintenance schedule contains the instructions for cleaning, inspecting and electrical testing of the AS-2537C/SR antenna.

The maintenance data reflects the detailed maintenance requirements of the Maintenance Requirement Cards.

The personnel required to perform the maintenance would be persons who are assigned to perform the tasks.

4-2 Scheduled Maintenance Action Index. Table 4-1 lists all scheduled maintenance required for the AS-2537C/SR whip antenna.

4-3 Safety Precautions. The following safety precautions shall be adhered.

1. Forces afloat comply with Navy Safety Precautions for Forces Afloat, OPNAVINST 5100 Series.

2. Avoid prolonged contact with, or inhalation of, cleaning solvents. Avoid use near heat or open flame and provide adequate ventilation.

3. Dangerous voltages are present at insulation test set terminals when handcrank is operated. Do not work alone.

4-4 Test Equipment.

1. Megger, 500V 100Mohm (SCAT 4452)

2. Multimeter, AC/DC, 20KVDC (SCAT 4245)

4-5 Materials.

1. Detergent, general purpose, FEDSPEC P-D-1747, Spray, Hazardous Material, Group 3.
2. Rags, wiping.
3. Tag, safety.
4. Silicon compound, Part No. DC-5, FSCM 71984, Hazardous Material, Group 1.
5. Pail, utility, plastic, 12 qt.
6. Pencil, gen. writing.
7. Paper, graph.

4-5.1 Tools.

1. Wrench, torque, 1" sq. drive 0 to 1000 ft-lb.
2. Wrench, adjustable, 10" heavy duty, 1.135" jaw open.
3. Wrench, strap (2 each).
4. Hex key, 3/8"

4-5.2 Miscellaneous.

1. Harness, safety, industrial (2).
2. Strap, grounding with clips or bolt holes each end.

4-6 Preliminary Procedure

a. Turn off and tag associated transmitter power switches.

b. Comply with ship's regulations for working aloft.

c. Connect ground strap between antenna feed bolt and ground.

4-7 Inspection of Antenna Procedures.

NOTE

Ensure whip antennas installed in vicinity of ship's stacks are inspected very thoroughly.

a. Inspect antenna and hardware. Look for:

1. Loose joints and connections.
2. Flaking or blistering of paint.
3. Corrosion or rust on mounting hardware.
4. Cracks.
5. Defective or missing ground straps on coupler-tuners.
6. Deteriorated weather-proof.

b. Vigorously shake the sectionalize AS-2537C/SR whip antenna to determine if the sections are loose.

c. If results of steps a and b indicate that the whip sections are loose, or painting and weatherproofing is necessary, proceed to clean and perform maintenance on the antenna.

d. Inspect and clean the antenna drain hole using thin wire. Ensure there is nothing plugging the drain hole such as silicon, salt, paint, or other foreign matter.

4-8 Measuring Antenna Insulation Resistance Procedures.

a. Ensure all transmitters radiating into nearby antennas are secured.

b. At the transmitting whip, disconnect the leads to the coupler-tuner.

c. At the receiving whip, disconnect the matching network box, and disconnect the protective device or static drain resistor from ground if applicable.

d. Connect the insulation test set positive lead to the line removed from the coupler-tuner, matching network, or protective device as applicable; connect negative (ground) lead to ship's hull.

WARNING

Dangerous voltages are present at insulation test set terminals when handcrank is operated.

g. Rotate test set handcrank; observe and record the test set meter indication. Meter should indicate 100 megohms or greater. If indication is less than 100 megohms, tag the antenna for internal cleaning.(see para. 4-9.21).

h. Disconnect test leads when measurements are complete. Reconnect the antenna to the matching network box and protective device.

4-9 Clean and Preserve Antenna Procedures.

4-9.1 Preliminary.

a. Turn off and tag any associated transmitter power switches.

b. Comply with ship's regulations for working aloft.

c. Connect grounding wire or strap between the antenna feedbolt and ground.

CAUTION

Avoid excessive torque when attaching or removing the RF lead to the connection bolt on the antenna.

4-9.2 Procedures.

a. Ensure all transmitters radiating into nearby antennas are secured.

b. At the transmitting whip, disconnect the leads to the coupler tuner.

c. At the receiving whip, disconnect the matching network box, and disconnect the protective device or static drain resistor from ground if applicable.

d. Remove the antenna from the mounting base and lower the antenna to the deck using care to avoid damage to the antenna.

e. Remove bolts from coupler - tuner grounding straps. Clean bolts and grounding area thoroughly using wire brush; sandpaper surfaces for best grounding area.

f. Replace missing or damaged grounding strap; apply antiseize compound to bolt threads.

g. Reinstall grounding strap.

h. Disassemble the antenna completely by first removing the hex socket cap screws with the hex key, then using the strap wrench loosen the two sections.

i. Inspect the antenna sections and all parts for cracks and corrosion.

j. If flaking and blistering of paint occurs, remove using sandpaper.

k. Remove any rust spots on the feedpoint or ferrules with sandpaper until metal surface is bright.

l. Clean the antenna interior and exterior using soap and water and wiping with a rag. Rinse thoroughly and dry the antenna with clean rags.

m. Clean antenna and associated parts with a rag dampened with soap.

CAUTION

Do not scrape the interior. Scraping of the interior wall will remove the conformal coating which is lining the wall.

j. The AS-2537C/SR normally does not require painting. If repainting or touch-ups is required, use Epoxy polyamide exterior top coat, haze gray formula 151 Type 1 per MIL-P-24441/2A, Epoxy polyamide exterior, dark gray formula 155-R0-6 Type 1 per MIL-P-24441/6A, and Epoxy polyamide green primer formula 150 Type 1 per MIL-P-24441/1A.

CAUTION

Do not use lead base paints when repainting or when touch ups are required.

A new O-ring shall be fitted before re-assembly.

k. To reassemble and install the AS-2537C/SR antenna, follow the installation procedures in Chapter 8.

Table 4-1. Scheduled Maintenance

Periodicity	Maintenance Required Description	Reference
S-1	1. Inspect Antenna	Para. 4-7
S-1	2. Measure Antenna Insulation Resistance.	Para. 4-8
Unscheduled	3. Clean and Preserve Antenna	Para. 4-9

CHAPTER 5

TROUBLESHOOTING

5-1 Faultfinding. The following shall be checked when inaccuracies in transmission or receiving system occur. The antenna is only a radiating element so no diagrams are necessary.

a. Examine the antenna for any physical damages.

b. Ensure there are proper set screws used in locking the sections together and the sections are secure.

c. Check the connection at the antenna feedpoint. Ensure there is no damage to the capscrow; ensure there is no paint over the feedpoint and ensure there is a solid metal to metal contact.

d. Check the connections to the transmitter or transceiver to ensure they are tight.

e. Check the continuity of the conductors to ensure there are no open circuits in any of the conductors.

5-2 Continuity Test. Figure 5-1 shows the test set up for the antenna continuity test.

a. Disassemble the antenna per paragraph 4-9.2e.

b. Connect the continuity tester to the base section between the feedpoint and the ferrule at the top of the base section and apply 50 amps AC.

c. Measure the voltage drop across the bottom section and record.

d. Connect the continuity tester to the top section of the antenna.

e. Apply 50 amps AC and measure the voltage drop across the section and record.

f. Table 5-1 shows typical voltage drops corresponding to the number of conductors open circuited.

g. If two or more of the conductors are open, the antenna must be replaced. The antenna will perform adequately with one open conductor.

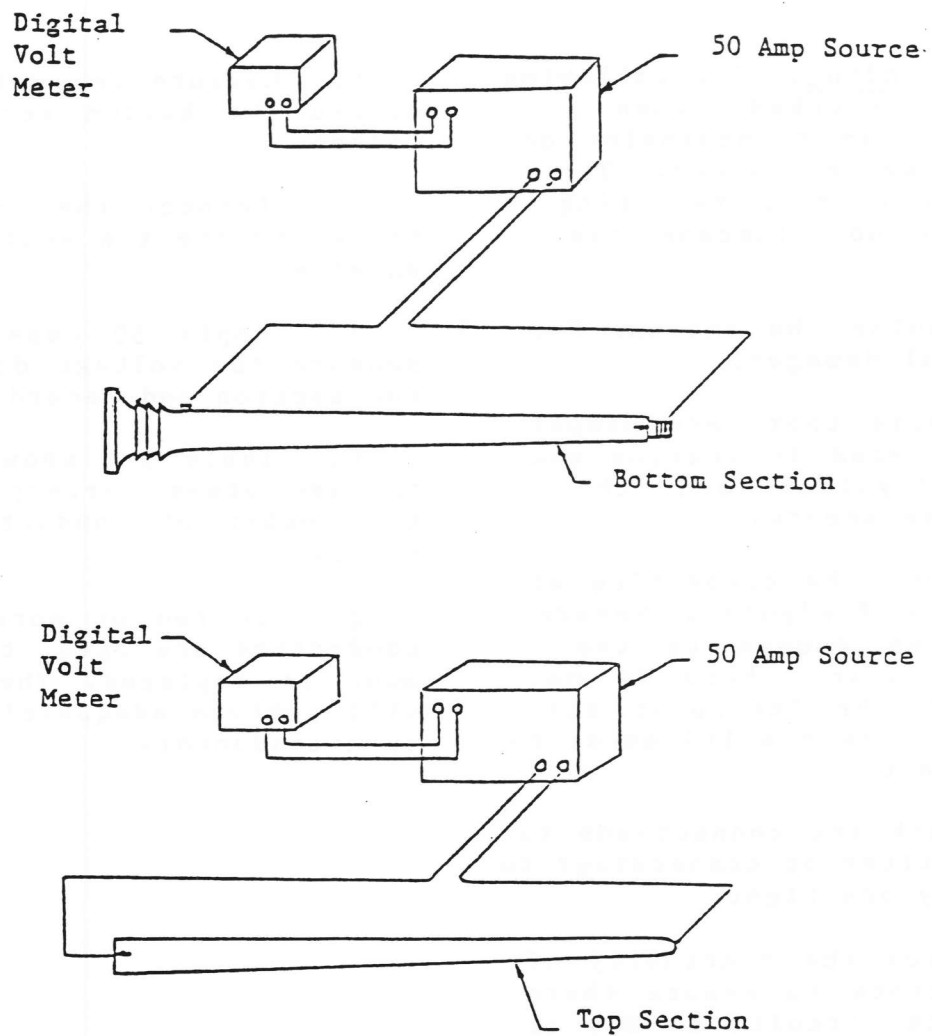


Figure 5-1. Continuity Test Set Up for AS-2537C/SR

Table 5-1. Typical Voltage Drops Across Antenna Conductors
(Includes 0.79VAC drop from test leads)

Bottom section		Top section	
No. conductors opened	Voltage drop (V)	No. conductors opened	Voltage drop (V)
0	1.98	0	3.37
1	2.24	1	3.56
2	2.54	2	4.02
3	3.14	3	4.58
4	3.37	4	5.14
5	7.98	5	8.01

CHAPTER 6

CORRECTIVE MAINTENANCE

6-1 Introduction. Generally no corrective maintenance is possible or required. Base workshops having experience in handling fiberglass structures assembled with the use of thermosetting epoxy resins may attempt the repair of minor surface cracks and scratches.

CHAPTER 7

PARTS LIST

7-1 Introduction. The list of parts shipped with the AS-2537C/SR antenna is given in Table 7-1. The Federal Supply Code for the manufacturer is 35736 and his name and address are as follows:

Valcom Limited
P.O. Box 603
Guelph, Ontario, Canada
N1H 6L3

Figure 7-1 shows the location in which the parts are to be assembled.

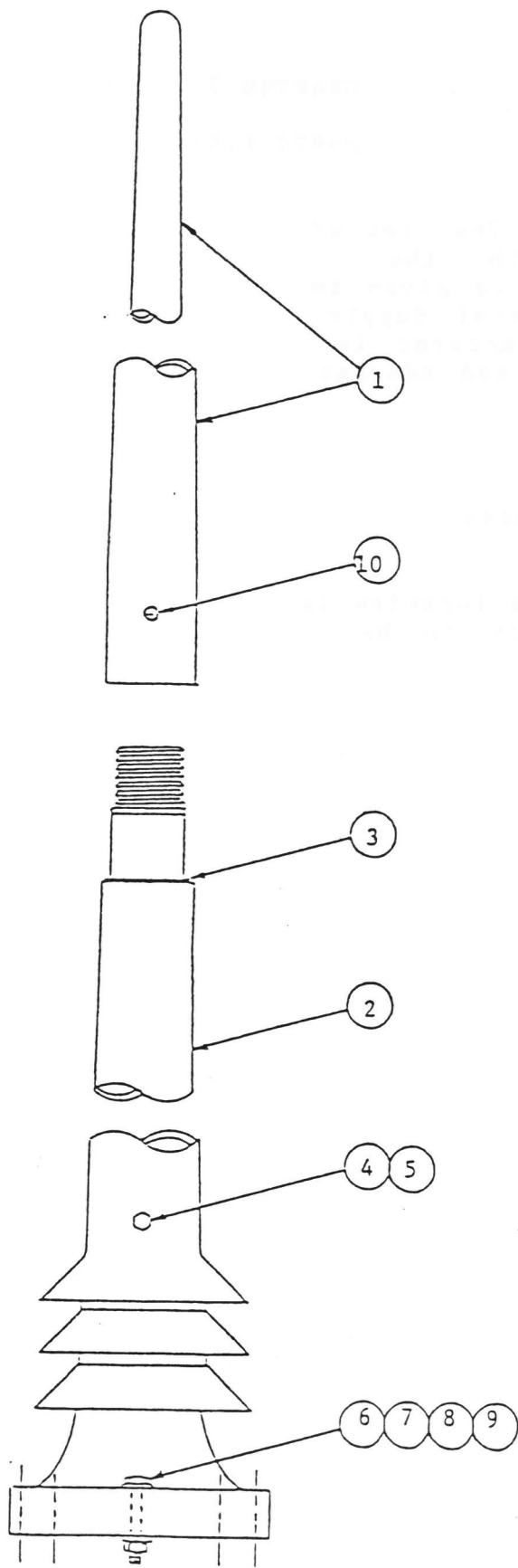


Figure 7-1. Identification of Parts for AS-2537C/SR Whip Antenna

Table 7-1. List of Parts for the AS-2537C/SR Assembly

Reference Designation	Notes	Name and Description	Figure Number (Item)
1		ANTENNA, Radiating element, made in two sections which can be separated; total length is 35 ft; nomenclature AS-2537C/SR; mfr 35736.	
1E1		TOP SECTION: 18 ft. 6 in. long.	7-1(1)
1E2		BOTTOM SECTION: 18 ft. long.	7-1(2)
H1		O-RING: Fits onto the top end of bottom section. MS 9068-236	7-1(3)
H2		CAPSCREW: hex head, phosphor bronze; 1/2 inch long, 3/8 inch diameter, 24 threads per inch. Hardware ordered in accordance with Fed Spec FF-B-575.	7-1(4)
H3		LOCKWASHER: 3/8 inch ID; split type; phosphor bronze, MS 35338-103.	7-1(5)
H4		BOLT: Corrosion resistant steel; 5/8-11x4 MS 35307-472	7-1(6)
H5		FLATWASHER: Corrosion resistant steel; 5/8 inch MS 15795-821	7-1(7)
H6		LOCKWASHER: Corrosion resistant steel; 5/8 inch MS 35338-145	7-1(8)
H7		NUT: Corrosion resistant steel; hexagon; 5/8-11 MS 51971-7	7-1(9)

NOTE : 1E1 and 1E2 are NOT available separately.

Table 7-1. List of Parts for the AS-2537C/SR Assembly - CONT.

Reference Designation	Notes	Name and Description	Figure Number (Item)
H8		SET SCREW: Hex socket, 18-8 stainless steel, 1/4-20x 3/8 inch, Long-Lok Canada for locking sections together: P/N LP54U040J6. National Aerospace Standard P/N NAS1352C4LL6.	7-1(10)

CHAPTER 8

INSTALLATION

8-1 Introduction. This chapter describes the unpacking and assembly instructions for the AS-2537C/SR antenna.

8-2 Unpacking. The AS-2537C/SR antenna assembly, as shipped, consists of the items listed in Table 1-4. Open the shipping container and check that all of the items are present and in good conditions. Ensure the serial numbers on the top and bottom sections correspond to one another.

8-3 Assembly. First obtain four sawhorses or other supports that will hold the complete antenna horizontally at a convenient working height and place them near the assembly area. The assembly area must be a cleared working space approximately 40 feet long and 5 feet wide. Two pipe wrenches of the type in which the gripping action is provided by a canvas strap are required. The wrenches should be about 16 inches in length. Figure 8-1 shows pictorially the assembly of the antenna. For locations of the antenna hardware, see Figure 7-1.

a. Support the base section on two of the sawhorses and tie it in place.

b. Support the top section on the other two sawhorses so that the two sections lie in the same straight line.

c. Make sure the threaded end of the coupling at the bottom of

the top section is clean and free of burrs.

d. Install the O-ring.

e. Make sure the threaded coupling at the bottom of the top section is clean and free of burrs, especially over the surface designed to press against the O-ring.

f. Move the top section toward the bottom section and turn the top section by hand until the coupling is tight. One person shall hold the base of the antenna two others fit the top section to the base section.

g. Use the canvas pipe wrenches to make the coupling fully secure.

CAUTION

Do not use excessive force at any time. Do not use extenders on the handles of the pipe wrench as to obtain a greater leverage.

h. When this coupling is secure, the two painted arrows should be in alignment. Apply a drop of Loctite to each of the set screws and insert and tighten the screws using the hex key.

i. Apply the sealant to the set screw head and around the antenna joint.

8-4 Installation. The following steps shall be taken to erect the antenna at the installation site. Hardhats shall be worn by personnel involved with the installation of the antenna.

a. The complete antenna may be carried to the installation site by a five or six man working party.

b. Using all reasonable care, erect the antenna and temporarily guy it with non-metallic lines to hold it in place.

c. Put a flat washer on a bolt and place the bolt in one of the holes in the antenna base.

d. Work the antenna as required to enable the bolt to fall through the mounting hole in the deck.

e. Attach a lockwasher and nut to the end of the bolt but do not turn the nut tightly home.

f. In the same manner, insert the other seven bolts with flat washers and attach the corresponding lockwashers and nuts.

g. When all the nuts are finger tight, use an adjustable wrench or a 15/16 box wrench to give each nut a half turn at a time in order around the base until all the nuts are evenly tight.

h. Very carefully secure the lead from the transmitter or transceiver to the antenna by means of the capscrew and lockwasher provided.

i. If the threads inside the

antenna are damaged, a repair by drilling and tapping one size larger may be attempted only once.

j. If this procedure is used a second time, the connection inside the antenna will be unreliable. This in turn means that the antenna will have to be replaced.

k. Using a torque wrench, torque the mounting bolts to 50 ft-lbs and the feedpoint bolt to 10 ft-lbs.

8-5 New Site.

WARNING

Check that the underside of the deck or platform at the site is free of electric cables or other obstructions prior to drilling.

If the AS-2537C/SR antenna is to be installed at a new site, prepare the site by drilling eight holes 11/16 inch in diameter at 45 degree intervals around a circle 10-3/4 inches in diameter.

Input to the antenna depends upon the transmitter or transceiver. It is only necessary to ensure that the feedpoint of the antenna is attached to the coupler.

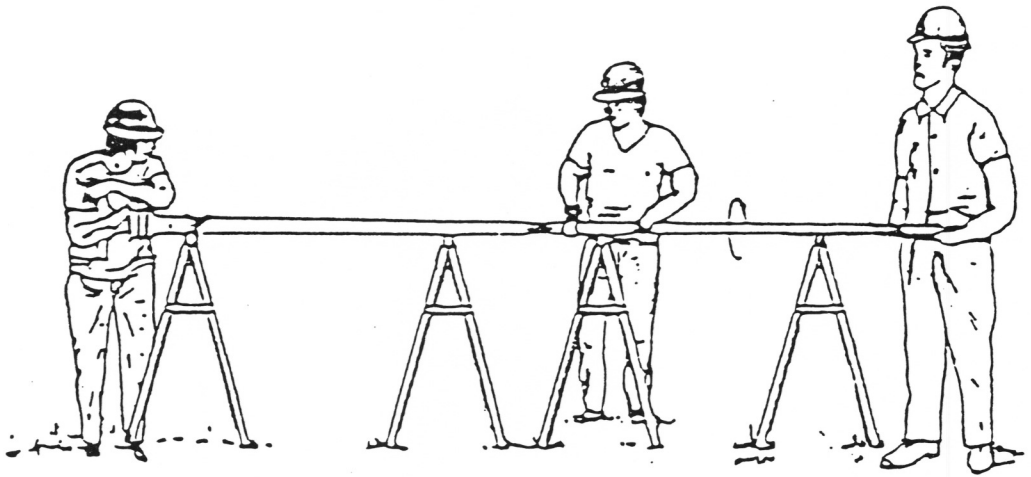


Figure 8-1. Assembly Per Para 8-3

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