TEMPORARY OPERATING INSTRUCTIONS

AND

PRELIMINARY MAINTENANCE INSTRUCTIONS

FOR

ANTENNA EQUIPMENT RC-81-A
AND ASSOCIATED COAXIAL CABLE EQUIPMENT

Manufactured By

BENDIX RADIO

DIVISION OF BENDIX AVIATION CORPORATION

RESTRICTED

PUBLISHED BY AUTHORITY
OF
THE CHIEF SIGNAL OFFICER

ORDER NUMBERS 1082-SCL-42 2406-SCL-42 11960-SCL-42 3-SCGDL-42 1658-SCGDL-42 1659-SCGDL-42

Destruction of Abandoned Materiel in the Combat Zone

In case it should become necessary to prevent the capture of this equipment, and when ordered to do so,

DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

MEANS:

- 1. Explosives, when provided.
- 2. Hammers, axes, sledges, or whatever heavy object is readily available.
- 3. Burning by means of incendiaries such as gasoline, oil, paper, or wood.
- 4. Grenades and shots from available arms.

PROCEDURE:-

- 1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
- 2. Demolish all panels, castings, switch- and instrument-boards.
- 3. Destroy all controls, switches, relays, connecting means and meters.
- 4. Rip out all wiring in electrical equipment. Smash gas, oil, and water cooling systems in gasengine generators, etc.
- 5. Smash every electrical or mechanical part whether rotating, moving or fixed.
- 6. Break up all operating instruments such as keys, phones, microphones, etc.
- 7. Destroy all classes of carrying cases, straps, containers, etc.

DISPOSAL:-

Where possible, and time permits, bury all debris or dispose of it in streams or other bodies of water.

TEMPORARY OPERATING INSTRUCTIONS

AND

PRELIMINARY MAINTENANCE INSTRUCTIONS

FOR

ANTENNA EQUIPMENT RC-81-A AND ASSOCIATED COAXIAL CABLE EQUIPMENT

Manufactured By

BENDIX RADIO

DIVISION OF BENDIX AVIATION CORPORATION

RESTRICTED

This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U.S.C., 31 and 32, as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

The information contained in restricted documents and the essential characteristics of restricted material will not be communicated to the public or to the press, but may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work. (AR 380-5)

PUBLISHED BY AUTHORITY
OF
THE CHIEF SIGNAL OFFICER

ORDER NUMBERS 1082-SCL-42 2406-SCL-42 11960-SCL-42 3-SCGDL-42 1658-SCGDL-42 1659-SCGDL-42

TABLE OF CONTENTS

| Par. | | | Pag |
|------|---|---|-----|
| | SECTION 1DESCRIPTION AND OPERATION | | |
| 1. | Description | | 1 |
| 2. | Preparation for Use | | 2 |
| | SECTION IISERVICE AND REPAIR | | |
| 3. | Disassembly and Trouble Analysis | | 3 |
| 4. | Test Procedure | | 3 |
| 5. | Maintenance of Coaxial Cables | • | 3 |
| 6. | Routine Inspection and Overhaul | • | 6 |
| 7. | Parts List for Antenna RC-81-A | ٠ | 7 |
| 8. | Parts List for Coaxial Cable Equipment | • | 8 |
| 9. | Addresses of Manufacturers | | 9 |
| | LIST OF ILLUSTRATIONS | | |
| | Fig. 1 - Antenna Equipment RC-81-A, Cut-Away View | | |
| | Fig. 2 - Antenna Equipment RC-81-A and Coaxial Cables, Assembly | | |
| | Fig. 3 - Antenna Equipment RC-81-A, Installation | | |
| | Fig. 4 - Antenna Tubing and Dipole Assembly | | |

Fig. 5 - Assembling Procedure

Fig. 6 - Coaxial Cable, Assembly

TEMPORARY OPERATING INSTRUCTIONS

and

PRELIMINARY MAINTENANCE INSTRUCTIONS

for

ANTENNA EQUIPMENT RC-81-A

and

ASSOCIATED COAXIAL CABLE EQUIPMENT

SECTION 1 -- DESCRIPTION AND OPERATION

1. DESCRIPTION

a. General

Antenna Equipment RC-81-A consists of a dipole antenna and a stub for matching an unbalanced transmission line, such as a coaxial cable, to a balanced antenna system. The antenna dipoles are mounted at the end of, and at right angles to, a round bakelite housing. See Figure 1. The other end of the housing is provided with a connector so that it may be connected to the coaxial transmission line and fastened to the crossarm bracket which supports the antenna. The antenna dipole rods are screwed into the stubs at the bakelite housing and each equipment is provided with 3 sets of dipole rods, each set of different length, to provide complete frequency range coverage from 100 to 156 megacycles.

The three sets of dipole rods provide antennas with overall lengths of 49", 43", and 38 1/2" to cover frequency ranges of 100-125, 116-140, and 133-156 megacycles, respectively.

The matching stub for the antenna is located in the bakelite housing which supports the dipoles. The matching system consists of a folded half-wave line which forms

a quarter-wave stub. See Figure 1. The open end of this stub is connected to the center of the half-wave dipole antenna. This balances the voltage on the two halves of the antenna. As shown in the diagram, the end of the coaxial transmission line connects directly to the center of the system of the folded stub, and the center conductor is brought up to the end through one side of the stub, the tubing serving as the outer conductor. The center conductor is brought out of the end of this tube and is soldered to the other end of the stub.

The bakelite housing fastens to a bracket on the end of the cable, securing it to the antenna crossarm and makes connections at this point with a 200-foot length of flexible coaxial cable, the characteristic impedance of which is approximately 72 ohms. The other end of this cable connects to a short length of coaxial cable inside the station through the coaxial cable junction box.

The coaxial cable from Antenna Equipment RC-81-A runs along the side of the mast and is held in place by clamps. See Figure 3. Inside the station, short lengths of coaxial cable connect the lines from the antennas to the output connectors on the three Radio Transmitters BC-640-A.

2. PREPARATION FOR USE

The Antenna Equipment RC-81-A is attached to the coaxial cable terminal, and this is bolted in turn to the antenna crossarm. These two operations must be performed on the ground before the erection of the mast on which the equipment is to be used. Determine the frequency on which the equipment is to operate, select the proper set of dipoles, slip tubing lock washer over threaded end of dipole rods, and screw them in their receptacles on the end of the antenna mast. When the rods are tight, bend one ear of tubing lock up, and the other down to prevent the dipole from becoming

loose in usage.

NOTE: For maximum efficiency, the proper set of dipoles should be selected for the frequency in use. See Paragraph 1. However, if the frequency has not been determined and if the mast must be erected, to save time, the SHORTEST set of dipole rods can be used with slightly impaired efficiency on the lower frequencies.

Be certain that the coaxial cable is securely clipped to the mast. For full details of raising the mast, refer to the temporary instructions for the particular mast with which the equipment is to be used.

3. DISASSEMBLY AND TROUBLE ANALYSIS

NOTE: A screwdriver, a pair of long-nose pliers, and a soldering iron are the only tools needed to disassemble the Antenna Equipment RC-81-A.

- a. To check the wiring at the dipole end of bakelite housing:
 - (1) Unscrew the dipole rods.
 - (2) Unscrew the four screws on the insulated cap which covers this end of the bakelite housing. This cap prevents moisture and dirt from entering the equipment.
 - (3) Break the cement to remove this cap.
 - (4) Check the wire connection between the two tubes.
 - (5) Resolder the connection if it is broken.
- b. To check the internal wiring of the equipment unscrew the four screws on the connector plug of the housing. Break the cement and remove the body plug. The connector, Figure 1, is supported by an insulating washer and is soldered to the end of transmission wire. Check this connection. If both plugs are off, the wire may be stretched to make certain there are no breaks in it within the pipe.

NOTE: For the complete assembly procedure for Antenna Equipment RC-81-A, see Figure 5.

c. Should the dipole be broken off in the socket, a screw extractor must be used to remove the broken screw.

4. TEST PROCEDURE

The following procedure is an easy and relatively efficient way to check Antenna Equipment RC-81-A.

- a. Connect one end of the short coaxial stub, which is included with each station, to a Radio Transmitter BC-640-A known to be in good operating condition and the other end to the antenna equipment.
- b. Operate Radio Transmitter BC-640-A.
- c. Bring a fluorescent bulb near the antenna dipoles. If the dipoles are in good operating condition, the bulb will glow. If the light bulb fails to glow the antenna equipment is at fault.

5. MAINTENANCE OF COAXIAL CABLE

The coaxial cable supplied with Antenna Equipment RC-81-A is provided with female terminals at each end.

The antenna end of each coaxial cable is provided with a special bronze bracket for attaching the cable to the end of the antenna crossarm. The bakelite section of Antenna Equipment RC-81-A must be fastened to the end of the coaxial cable with the four special #10-32 screws before the bronze mounting bracket is bolted to the end of the mast crossarm. If this is not done, the screws in the cable terminal are inaccessible. Except for this bracket, the ends of the cable are identical.

It is necessary to remove the cable terminals before passing the cable and cable stubs through the coaxial cable entrance box, through small holes in some installations, and to replace terminals rendered useless by stripped threads. A special wrench, provided with the equipment, makes this simple and speedy.

The procedure is as follows:

Loosen the four #10-32 screws until the end-cover plate can be removed. DO NOT TAKE THESE SCREWS ALL THE WAY OUT, since this is not necessary and they might get lost. The main body of the terminal is held in place by a threaded collar having a slotted top. This collar surrounds the center electrode and can be seen as soon as the end-cover plate is removed.

Insert the special wrench in the slots in the end of the collar and turn it counterclockwise, holding the main body of the terminal firmly in the other hand. When reassembling the terminals, be certain that the thin rubber gasket is in place between the center and outer portions of the terminal. This jacket keeps out water and dirt.

The coaxial cable supplied with this station consists of a stranded inner conductor surrounded by a solid dielectric of flexible white plastic material resembling rubber. This is surrounded by a braided shield which forms the outer electrical conductor. The whole is coated with a black plastic material.

COAXIAL CABLE MUST NOT BE BENT SHARPLY, under any circumstances on a radius of less than six inches, nor is it to be crushed by walking on it, driving trucks over it, or slamming doors and windows on it. This may not only damage the insulation, but may also break the inner conductor or alter the spacing between the inner and outer conductors, introducing impedance changes and losses.

Coaxial cable is not to be cut, and repair in the field is difficult. If the full length of the cable is not required, the excess is to be coiled neatly and placed out of the way in a protected place, When not in use, coaxial cable is to be kept on the cable reels provided with the station.

In the event that repair of the cables is necessary in the field, the following procedure describes the attachment of the cable terminals to the cable.

Assuming that the cable has been cut near a terminal, the terminal must first be disassembled and cleaned, if necessary. Figure 6 will indicate the various parts of the terminals and their assembly.

Remove item 5, which is the outer body of the terminal, with the special wrench provided, as follows: Loosen the four #10-32 screws until the end-cover plate can be removed. DO NOT TAKE THESE SCREWS ALL THE WAY OUT. This is not necessary, and they might get lost. The main body of the terminal is held in place by a threaded collar having a slotted top. This collar surrounds the center electrode and can be seen as soon as the end-cover plate is removed. With a sharp instrument, or a small screwdriver, pry out item 2, which is a circular retaining ring at the contact end of the assembly. Unscrew item 10 and back it along the cable out of the way.

Apply a large soldering iron to item 3, the center contact. When the solder melts, item 3 can be pulled straight out. Item 9, a small collar can now be screwed out of item 8, a large ferrule threaded on the inside. The small collar, item 9, will be found securely soldered all around to the outer conductor braid of the cable. Unsolder the remains of the braid, and remove all old strands of braid and excessive solder which might interfere with threading the collar back into item 8 in reassembly.

Next prepare the end of the cable for

reattachment to the terminal. Cut the end off square, and make all measurements from the end of the stranded inner conductor. Make all cuts at right angles to the inner conductor, and try to keep the cuts square. This is important, for keeping the cable and terminals clean and dry depends on a neat fit throughout.

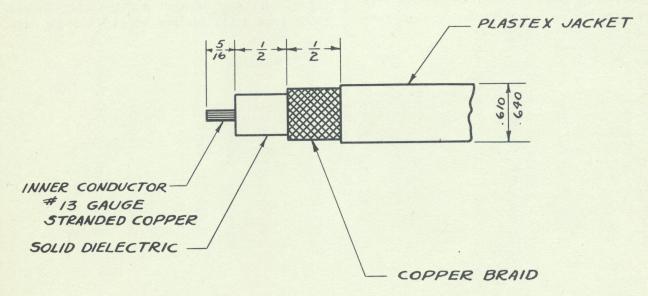
Measure 1 5/16", and remove that length of the black outer insulation, exposing the braided shield. Measure 13/16" from the cable end, and cut the shield, removing the severed portion. 1/2" of shield should now show. Measure off 5/16" and remove the white, rubber-like solid dielectric, exposing the stranded inner conductor. As a final check, the exposed layers of the cable should measure as follows (see accompanying sketch):

Inner conductor 5/16"

Solid dielectric 1/2"

Braided shield 1/2"

Throughly clean and tin the exposed portion of the inner conductor, being careful to wipe off all excess solder. Carefully spread the braid (bell it) slightly, and slip item 9, the small threaded collar, over the white dielectric material. Force the collar under the tinned braid and solder the braid to the collar firmly around the entire circumference. Screw the collar tightly into item 8. Note from Figure 6 that the center conductor was cut to allow very slight clearance between the end of the conductor and the end of the hole in item 3. In the side of item 3 is a small hole, leading to the hole into which the center conductor was inserted. Heat item 3 with the soldering iron and run solder into the hole in the side of item 3. Several large holes are provided in the wall of item 8; through these it is possible to view the end of item 3 where it bears against the white cable dielectric. This should be a tight joint, and no solder should be allowed to leak past the end of item 3. Should a drop or two pass, it is possible to pick



If item 10 was removed for any reason, replace it before commencing the reassembly procedure below.

it out through the holes. Remove all excess solder, in order that the two conductors of the coaxial cable may not be short-

circuited. When the solder has cooled, replace item 2, the circular ring which holds the bakelite insulating washer in place. See Figure 6.

Wind a small amount of tarred packing, similar to that used by plumbers, around the cable adjacent to the end of item 8. Item 10 holds the packing in place, and forms a water-tight seal between item 10 and the outer covering of the cable. Screw item 10 securely to item 8. See Figure 6.

Place the thin rubber gasket, item 7, in place on item 8 and push the entire assembly through item 5, the main body of the terminal. Lock the assembly together by applying item 1, the retaining collar with a slot across the end, using the special wrench provided. REPLACE THE END CAP, ITEM 4, IF THE CABLE IS NOT TO BE PLACED IN IMMEDIATE SERVICE. See Figure 6.

Minor scars and cuts in the outer insulation can be repaired and sealed by the application of heat. A hot soldering iron can be used to melt and spread enough rubber or rubber substitute from the surrounding surface to seal an ordinary cut. BE SURE THAT THE BRAID, DIELECTRIC, AND INNER CONDUCTOR HAVE NOT BEEN DAMAGED BEFORE SEALING CUTS IN THE OUTER COVERING.

NOTE: Check the coaxial cable with a 40-watt light bulb before attempting any disassembly of the dipole unit. Check the light intensity of the bulb used on the cable in question against the light intensity of the same bulb when operated through a coaxial cable known to be in good condition.

6. ROUTINE INSPECTION AND OVERHAUL

Dismantle the dipoles for periodic inspection and cleaning. Remove any corrosion that might be on the dipoles. Remove dirt from the insulation. Check the end plugs; make certain they are waterproof. If the antenna equipment has been disassembled, check the interior for good clean connections and for any water that may have entered the housing. Check the coaxial cables. If they are damaged, bind the damaged portion with insulating tape until further repairs can be made.

PARTS LIST FOR ANTENNA EQUIPMENT RC-81-A

| Part | Description | Nfgr. | Bendix |
|-----------|---|--------------------|---------|
| Pin | Contact pin for transmission line, brass-rod | Bendix | A103779 |
| Cap | Dipole cap, natural lam. phenolic, 3" diameter, 1" thick | ., | A103781 |
| Bead | Steatite, Ceramic-Alsimag #196 unglazed spacing beads for transmission line | | A103783 |
| Plug | Steatite, Ceramic-Alsimag #196 | • | A103785 |
| Sealing | Bedlast X114703 | H.B. Fred Kuhls | A106547 |
| Rod | Dipole, copper tubing with diameter .500, wall thickness .036, - 3 different lengths of brass tubing provided. 16 23/32", 19 15/32", 22 15/32". | Bendix | 059028 |
| Connector | 5/8" of thread at 3/8-32 thds., used on dipole rod C59028 | • | A106563 |
| Plug | Used on dipole rod C59028, brass | | A106564 |
| Lock | Tubing lock, half hard-copper, silver-plated | | A106565 |
| Socket | Dipole tip socket, brass Aex. bar 3/8-32 tap. 3/4" deep, counterbore 13/32 dia. x 1/8 deep. | • | A107439 |
| Case | Dipole, tubing case natural laminated phenolic 2 1/4" dia., 1/4" wall thickness | Bendix | C58065 |
| Plug | Cover Plug, not to be removed until the equipment is required for assembly, painted olive drab. | • | C58064 |
| Plug | Liner plug for dipole, Olive drab on outside surfaces | | C58063 |

| Part | Description | Nfgr. | Bendix Dug. Humber |
|------------------------------|---|---------------|-----------------------|
| Plug | Body plug, brass casting, Olive Drab on outside surfaces | • | C58066 |
| Tubing | .500 dia., .036 wall thickness, #20 S.W.G., copper tubing | • | L72853 |
| 8. PARTS LIST | PARTS LIST FOR COAXIAL CABLE EQUIPMENT | | |
| Collar | Threaded brass, slotted, special | Bendix | A104182 |
| Retaining spring | Hard brass .80" dia., special | ٠ | A104178 |
| Socket mold- ing assembly | Silver-plated brass female terminal, molded in mica-filled bakelite, special | • | 058385 |
| Plug | Liner, female, brass casting, machined, special | • | C58346 |
| Screw | #10-32 stainless steel, 19/32" long, passivate BM-86 finish, special | 6 | A104551 |
| Washer | 1/16" thick, 1 9/64" I.D. 1 1/2" O.D., fabric base black rubber | | A104544 |
| Ferrule | Machined brass, special | • | A108572 |
| Collar | Machined brass, cadmium plated, special | | A108570 |
| Nut | Cadmium-plated steel, Catalog No. 4312-A2, supplied with packing material 10459N | Crouse-Hinds | A108619 |
| Washer | 1/32" thick, .067" I.D., 7/8" 0.D., black fibre, Catalog No. N-705 | • | A108618 |
| Cable | Coaxial, 200' long. Inner conductor #13, 7 strands #21, not tinned, .460" dia. special low-loss solid insulation, #34 untinned close copper braid. 4/64" wall plastex jacket, Minimum 0.D610", Maximum 0.D640". | G.E., Simplex | A107145 |

Page 8

9. LIST OF MANUFACTURERS

Name

Bendix Radio Division of Bendix Aviation Corporation

Crouse-Hinds

G. E. Simplex

H. B. Fred Kuhls

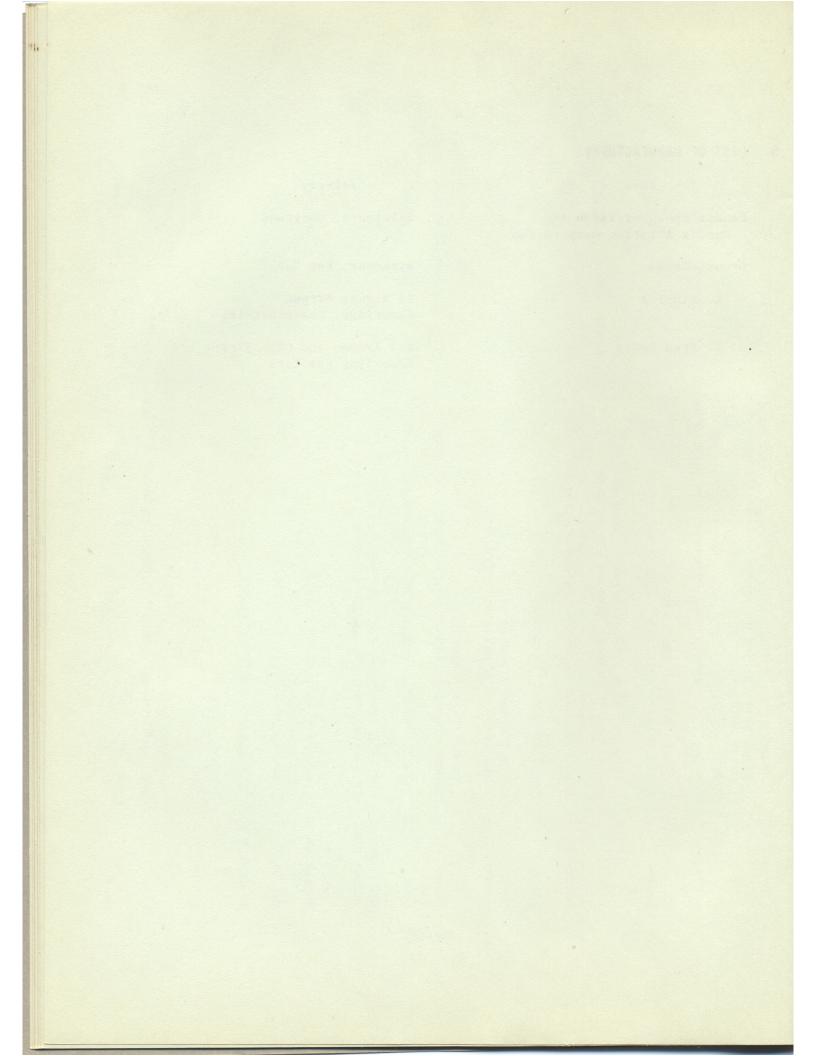
Address

Baltimore, Maryland

Syracuse, New York

79 Sidney Street Cambridge, Massachusetts

3rd Avenue and 65th Street Brooklyn, New York



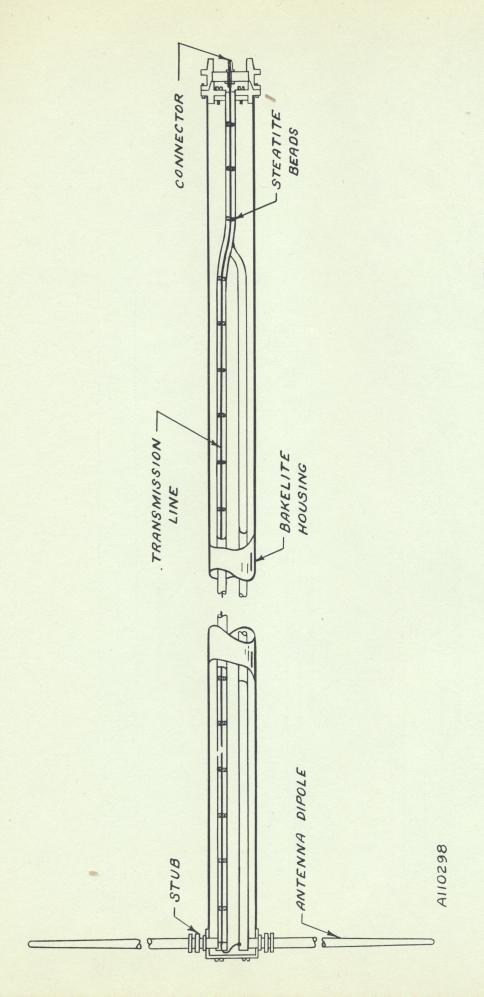
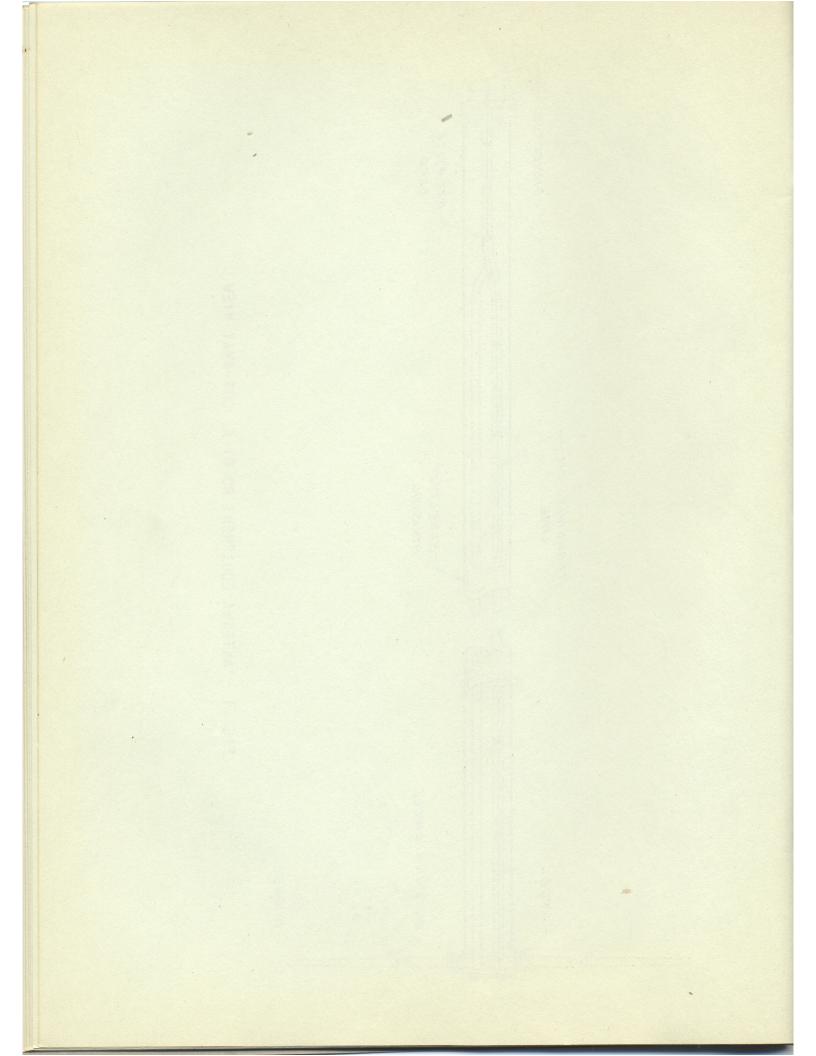
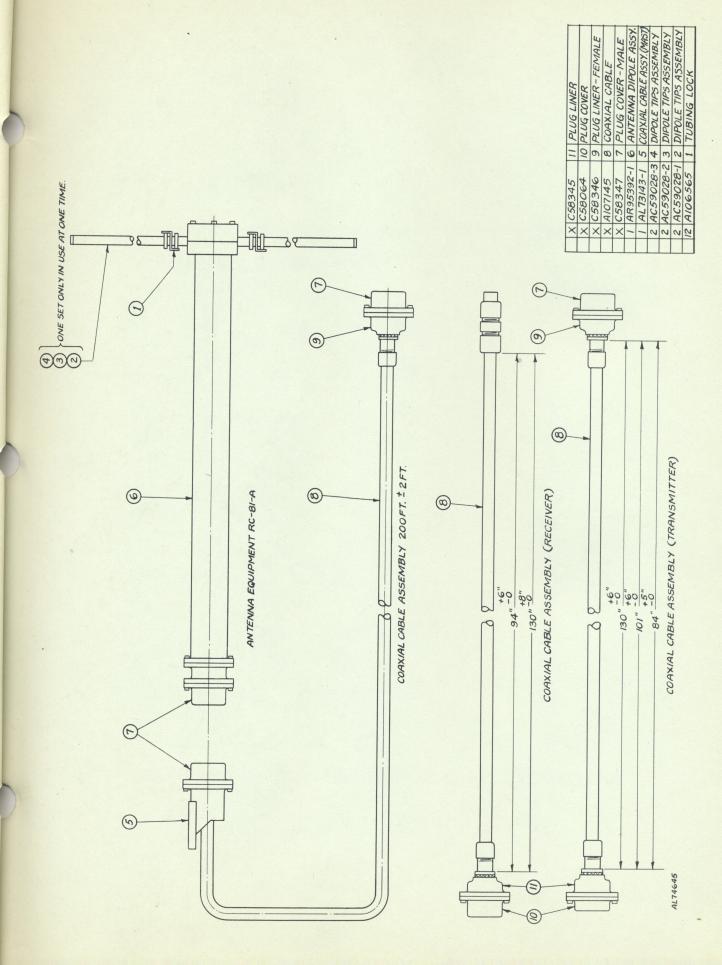
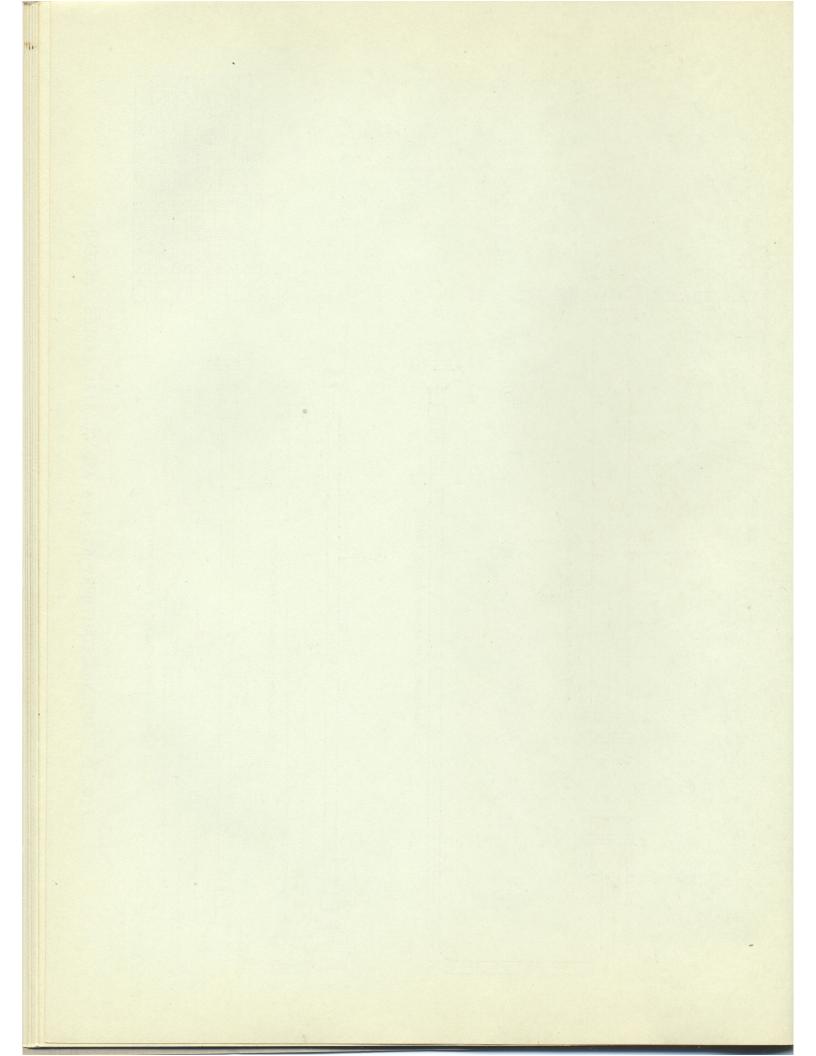


FIG. I - ANTENNA EQUIPMENT RC-81-A, CUT-AWAY VIEW





- ANTENNA EQUIPMENT RC-81-A AND COAXIAL CABLES, ASSEMBLY 2 FIG.



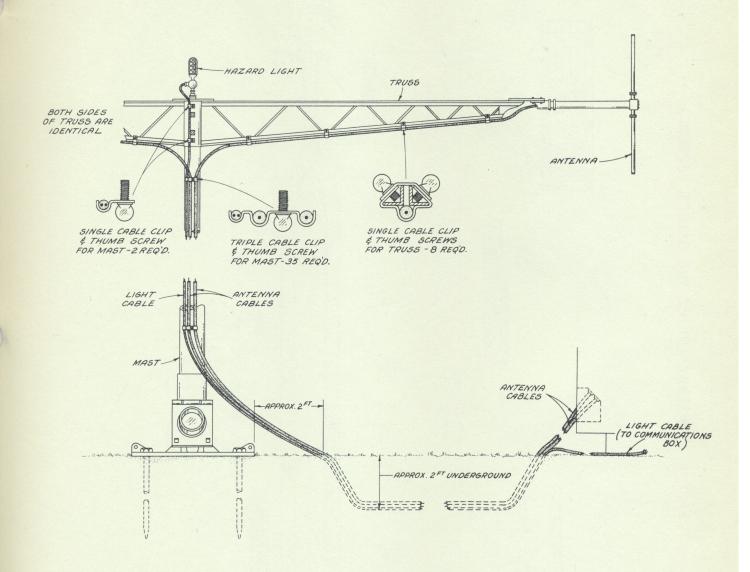
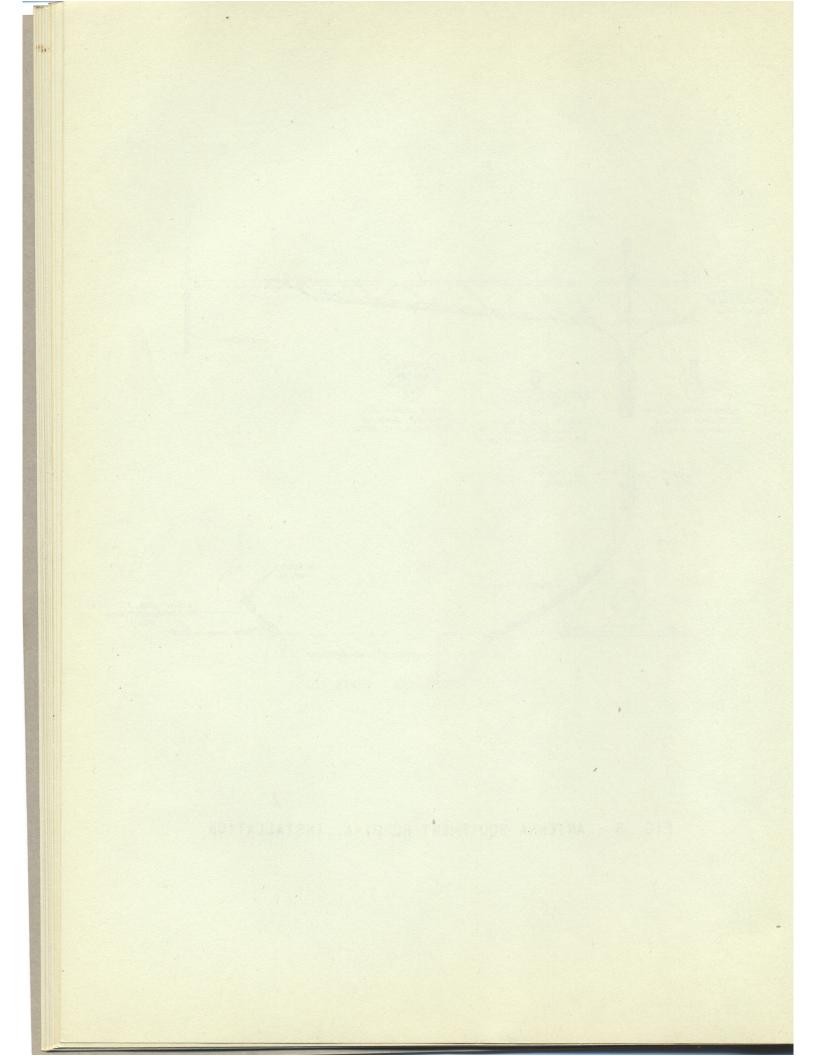


FIG. 3 - ANTENNA EQUIPMENT RC-81-A, INSTALLATION



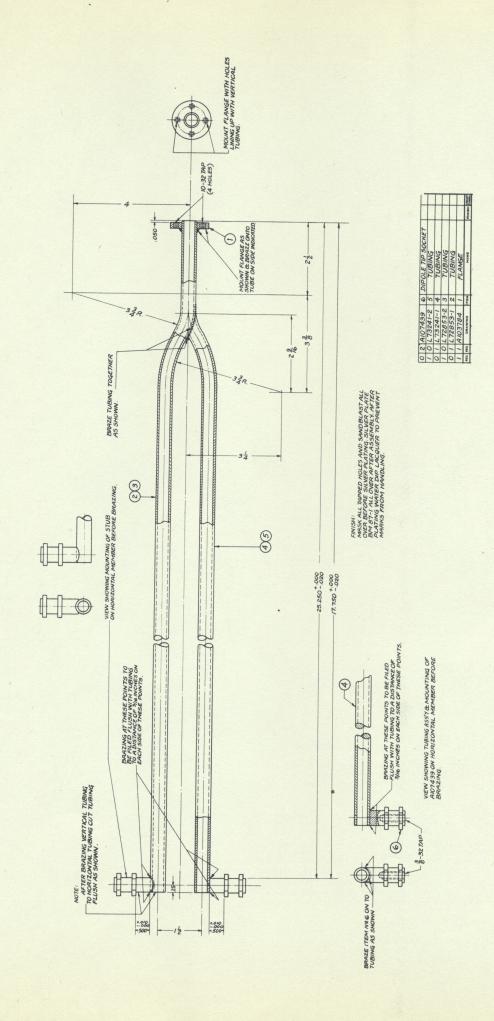
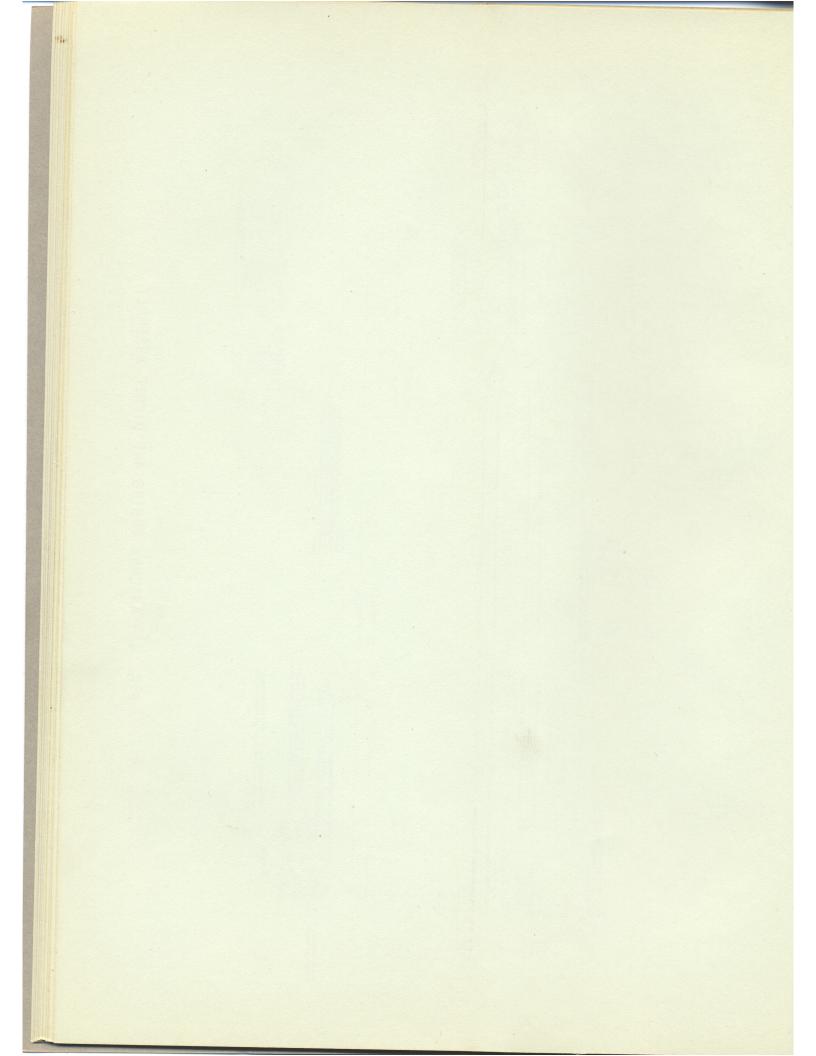
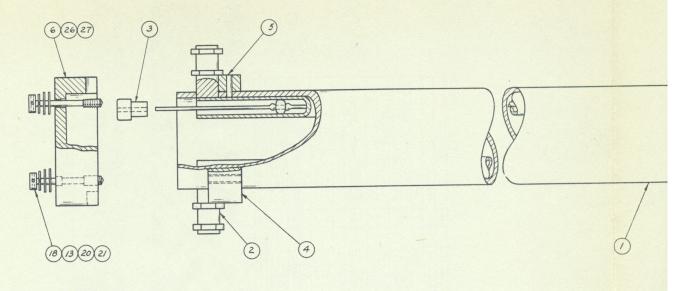
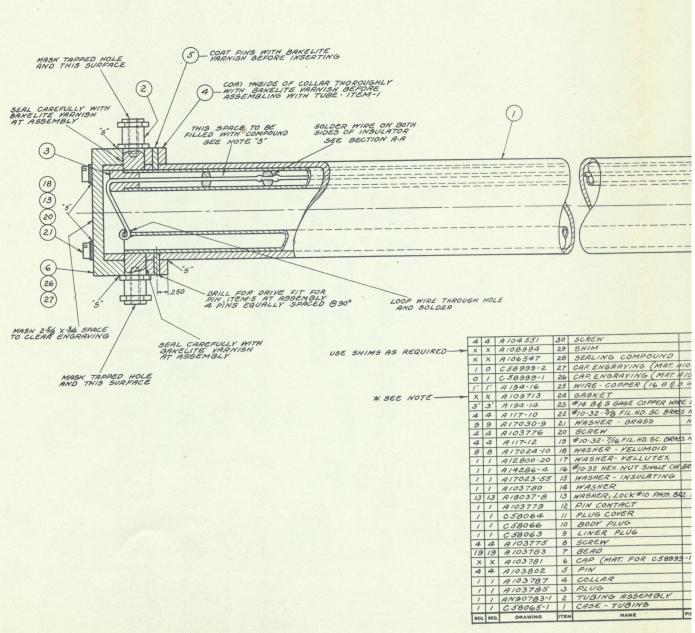
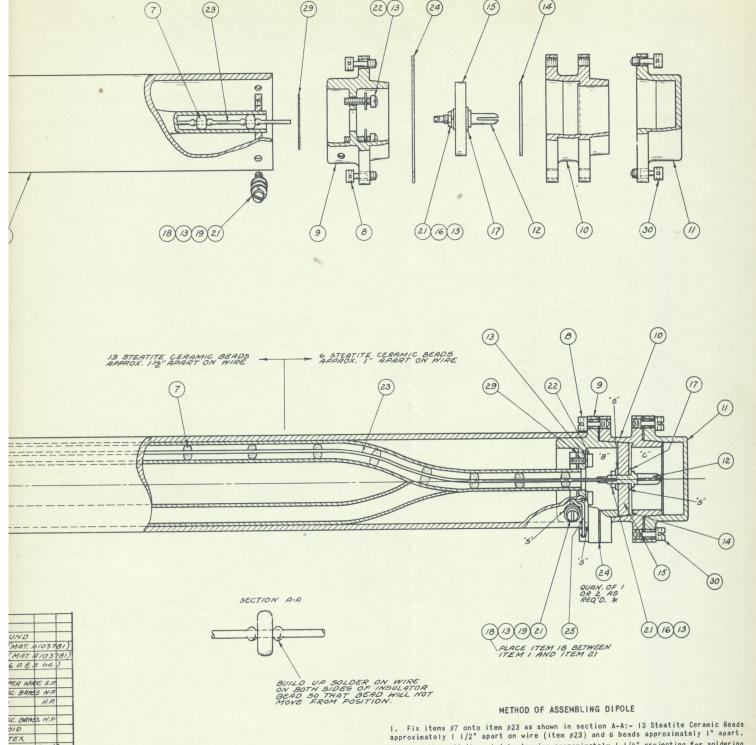


FIG. 4 - ANTENNA TUBING AND DIPOLE ASSEMBLY









BR. N TING

-1 É Z

PHOS. BAZ. N.P.

58999

BLY

- I. Fix items \$7 onto item \$23 as shown in section A-A:- 13 Steatite Ceramic Beads approximately I I/2" apart on wire (item \$23) and 6 beads approximately I" apart. 2. Feed item #23 through tube leaving approximately I 1/8" projecting for soldering to plug pin.
- 3. Tin end of item #23, insert in hole in item #12 and solder securely.
- 4. Make sure that space marked "B" is quite dry. Assemble body of item #10 (body plug), centralize plug pin, and screw up evenly. Thread 12" of #16 (.050 Dia) B & \$ Gage Copper wire item #25 through tie holes in item #8 and twist the ends together. 5. Fill open end of tube up to first bead with approved sealing compound and while this is still in liquid state, force item #3 into tube. Pull item #23 tight, loop through hole in the other tube and bend flat over item #2 as shown.
- 6. IMPORTANT Seal joint between dipole and case with varnish.
- IMPORTANT Apply varnish to inside of item #6 and outside of item #1 and items #20, 13, 21, and 18. Assemble in position and screw tightly.
- 8. Make sure that space C is quite dry. Assemble item #II in position and screw up tightly.
- 9. Seal dipole cap item #6 to collar using sealing compound (Bedlast XII4703) 17 must be watertight. Seal screws item #20 in the same manner.
- 10. After assembly and before painting carefully coat all places indicated by an "S" with bakelite varnish. This is necessary to make the assembly watertight.
- II. Paint all over except masked surfaces per Spec BM-308. NOTE: It is important that item #II not be removed until just before assembly of dipole in serial system.

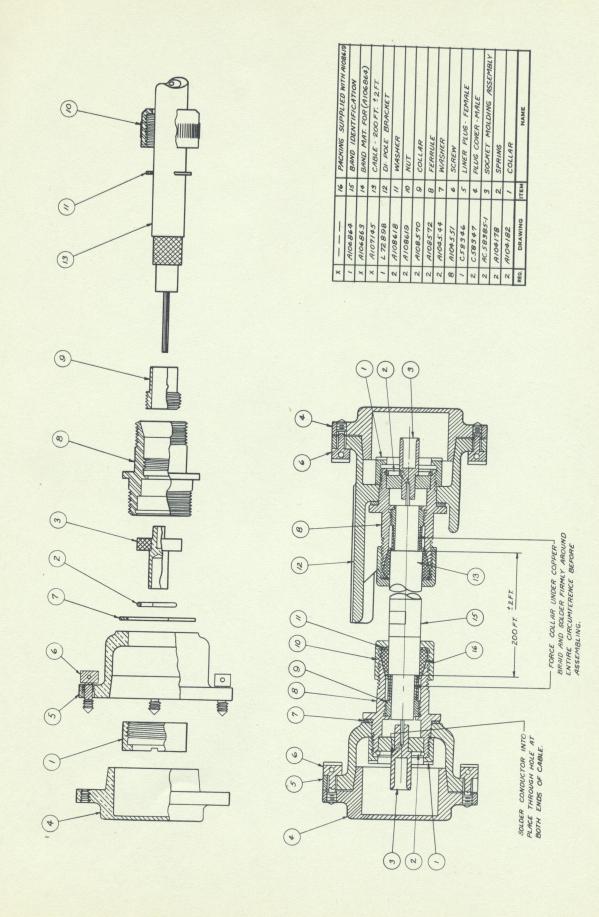


FIG. 6 - COAXIAL CABLE, ASSEMBLY

