TH4-190

hy-gain antenna products

NE Highway 6 at Stevens Creek Lincoln, Nebraska

ANTENNA INSTRUCTION MANUAL

MODEL TH4-190 THUNDERBIRD

GENERAL DESCRIPTION: The famous Hy-Gain TH-4 Thunderbird is a four element full sized beam, designed with trap circuits and three working elements for 10, 15 and 20 meters.

THEORY OF OPERATION: Parallel resonant solid state "slim line" traps isolate various elements to accomplish three band operation with maximum efficiency. The HY-GAIN "Beta Match" offers a perfect antenna terminal impedance of 52 ohms on all three bands, with only one coaxial feed line.

CONSTRUCTION: The TH-4 utilizes a 2" boom, 16' in length. A massive mast to boom bracket for strength and rigidity. All hardware is iridite treated for maximum corrosion resistance. Telescoping elements with new type compression tubing clamps reduce droop, increase element strength and durability.

TRANSMISSION LINE: Designed for a 52 ohm coaxial. RG58/U may be used when runs are short and power levels do not exceed 100 watts. RG8/U, polyfoam type, is highly recommended for its lower loss and higher power capabilities.

INSTALLATION: All Hy-Gain Communication antennas are designed to fit a 1⅝" outside diameter mast.

Surrounding objects and height above ground can seriously affect the performance of any antenna system. Mount the TH-4 at least 40' off the ground, 20' from any roof top and completely clear of any surrounding objects, which may detune the antenna system. Guy wires should be broken every 5' with egg insulators.

The antenna will perform within 10% of its electrical specifications if installed as recommended above.

No attempt should be made to alter element dimensions for CW on one band and phone on others.

MECHANICAL SPECIFICATIONS

Boom Length	16'
Boom Material	2" OD Aluminum
Longest Element	31'10"
Element Diameters	1¼" to ¾"
Net Weight	38 lbs.
Turning Radius	17'10"
Wind Surface	7.5 sq. ft.
Wind Load (100 mph)	22.5 lbs.

ELECTRICAL SPECIFICATIONS

	10M	15M	20M
DB Gain over ½ wave dipole	8.9	8.5	8
Front to Back Ratio	(25-30DB)		
SWR at Resonance	1.2:1	1.3:1	1.1:1
Nominal Impedance	52	52	52
Maximum Power Input PEP	2KW	2KW	2KW
Maximum power input (100% Mod. AM) (CW)	1KW	1KW	1KW

*Driven Element at DC ground for lightning protection.

ASSEMBLY Check the parts package for a special sized open end wrench. This is used in securing the bolts on the driven element insulators to the boom.

Before proceeding, you should carefully examine the boom to be sure that the 2" end caps are attached and that on the end tubing of each element, a ¾ inch end cap is installed.

Please note that the boom is labeled with printed tape director, driven element, R2 and R1.

*The boom should be arranged so that the 3 holes for mounting the beta match to the boom are placed on the bottom side before proceeding with installation.

*Refer to Figures 1 through 9 and familiarize yourself with the entire antenna make-up, then proceed with assembly.

STEP BY STEP ASSEMBLY INSTRUCTIONS FOR TH4-190

☐ *Boom.* Couple the two boom sections together with the mast bracket, Figure 6. Secure with two 5/16" x 3" bolts through the bracket.

☐ Insert 10, 1¼" x ¾" bolts through the bracket flanges. Note: Leave all bolts slightly loose until the bracket is mounted on the 1⅝ OD mast, then secure.

☐ Be sure the three beta match insulator and grounding clip holes are on the bottom side of the boom. *Driven Element.* Element placement is marked by printed tape on the boom. Related parts are bundled together with tape. Choose the operating frequency range from Figure 2 and proceed.

☐ Position both halves of the driven element, DE1 and DE2, (assembled at the factory) sections to the boom. Be sure the two holes for attaching the *beta match* and *coaxial cable* are on the *bottom* side.

☐ Work through the two formed ¼" x 4" stud bolts. They are placed on the top side of the boom, see Figure 7.

☐ Insert the two 1¼ inch x 4 inch bolts through the insulators and boom.

☐ Tighten all bolts secure with special open end wrench.

☐ Attach a 1¼" compression clamp to each end of DE2. Do not secure until DE3 (1" x 21⅜") has been telescoped into DE2 and dimension "C" is measured. Then tighten the clamp.

IMPORTANT NOTE: *Compression clamps will indent both mated tubings so be sure the proper measurement is made before securing.* (See clamp illustration by figure 4).

☐ Refer to Figure 2.

☐ Attach a 1⅛" compression clamp to each end of DE3. Apply Electroseal to both ends of 10R, insert the 10R trap so that the stamped identification end faces the boom. To double check the correct end, be sure the end with the closest drain hole faces the boom with all drain holes on the bottom. *All traps are installed in this same manner.*

☐ Measure off dimensions "D" and secure traps 10R to DE3 by tightening tubing clamps.

☐ To each end of both DE5 tubing sections, attach a 1" compression clamp. Measure for dimension "E" and tighten tubing clamp.

☐ Apply Electroseal to a 15R and insert into DE5, (1" x 13 1/16"). Check dimension "F" for accuracy and then measure for dimension "G", and secure tubing clamp.

☐ Slip a ⅞" compression clamp over the end of each 15R.

☐ Apply electroseal to DE7 (¾" x 30 9/16") and insert into 15R.

☐ Measure for dimension "K" and secure clamp.

DIRECTOR ELEMENT: These elements are also bundled together. The director is spaced 87 inches center to center from the driven element (Plus or minus an inch). See Figure 3.

☐ Attach (D1-D2), assembled at the factory, to the boom with a blue plastic element to boom bracket, an element back plate, two 5/16" x 3½" bolts, two 5/16" lockwashers and two 5/16" nuts. Line up with driven element and secure. (See Figure 8).

☐ Attach a 1⅛" compression clamp on both sides to D2. Apply electroseal to both D3, measure for dimension "C" and tighten clamps.

☐ Attach a 1" compression clamp on both sides to D3.

☐ Apply Electroseal to a 10R, oriented the same as in the driven element. Measure dimension "D" and secure clamps.

☐ Take both D5 tubing and attach a 1" compression clamp to each end on both sides.

☐ Electroseal both 10R and 15R, measure for dimension "E" and tighten clamp. Orient as previously directed and insert a 15R into "D5."

☐ Measure dimension "G" and tighten clamp.

☐ Attach a ⅞" clamp to both 15R, apply Electroseal to both D7, insert into 15R, measure for dimension "K" and tighten clamp.

10 Meter Reflector. Bundle together and tape as R2. See Figure 4.

☐ Mount R1 (⅞" x 76") on boom at R2 position 51" center to center from the driven element.

☐ Attach by using one blue plastic insulator bracket, one element to boom back plate, one element back plate, two 5/16" x 3" bolts, two 5/16" lockwashers and two 5/16" nuts.

☐ Line up parallel with driven element and director, and secure.

☐ Attach a ⅞" compression clamp on each end of R1.

☐ Apply Electroseal on both R2 sections, insert into R1, measure off for dimension "A" and tighten the clamps.

10-20 Meter Reflector. All tubing bundled together and marked (R1). See Figure 1.

☐ Place R3 (1¼" x 144") on end of boom marked by tape R1.

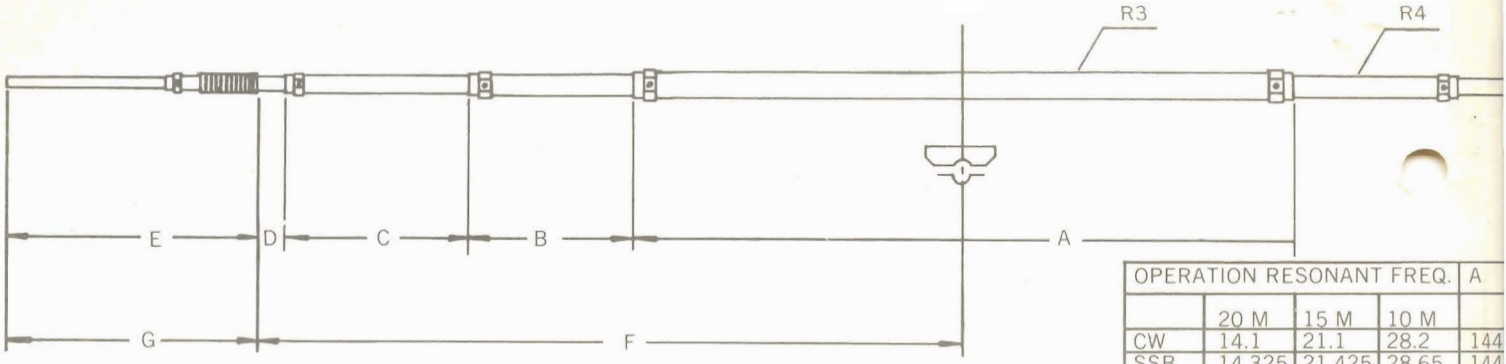
☐ Attach by using one plastic insulator bracket, one element to boom back plate, one element back plate, two 5/16" x 3½" bolts, two 5/16" lockwasher and two 5/16" nuts.

☐ Line up parallel with all other elements, and secure.

☐ Attach a 1¼" compression clamp to each end of R3.

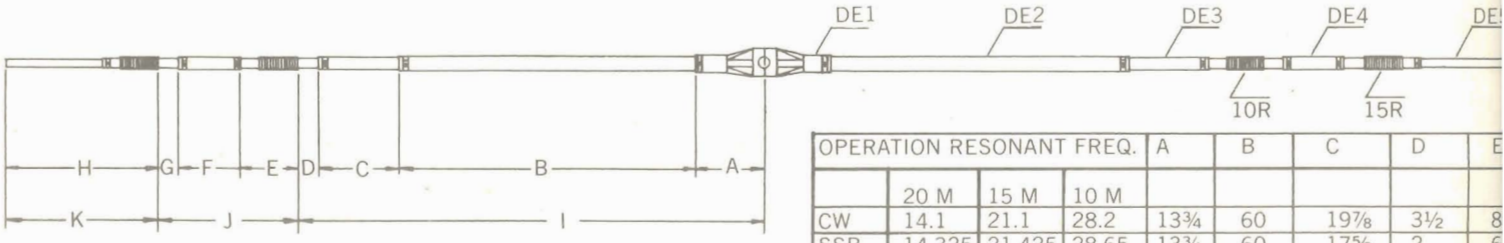
☐ Apply Electroseal to both R4 sections, insert into R3, measure off for dimension "B", and secure.

☐ Attach a 1⅛" tubing clamp to end of each R4.



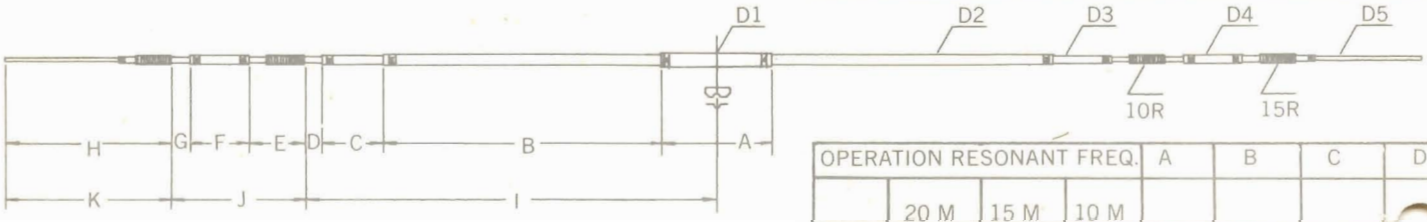
OPERATION RESONANT FREQ.				A
	20 M	15 M	10 M	
CW	14.1	21.1	28.2	144
SSB	14.325	21.425	28.65	144
AM-1	14.25	21.35	29.0	144
AM-2	14.25	21.35	28.7	144

FIGURE 1 15 & 20 METER REFLECTOR



OPERATION RESONANT FREQ.				A	B	C	D	E
	20 M	15 M	10 M					
CW	14.1	21.1	28.2	13¾	60	19⅞	3½	8
SSB	14.325	21.425	28.65	13¾	60	17⅝	2	6
AM-1	14.25	21.35	29.0	13¾	60	14⅝	2	7
AM-2	14.25	21.35	28.7	13¾	60	17½	2	6

FIGURE 2 DRIVEN ELEMENT



OPERATION RESONANT FREQ.				A	B	C	D	E
	20 M	15 M	10 M					
CW	14.1	21.1	28.2	24	60	13		8
SSB	14.325	21.425	28.65	24	60	10	2	6
AM-1	14.25	31.35	29.0	24	60	7½	2	8
AM-2	14.25	21.35	28.7	24	60	9½	2	7

FIGURE 3 DIRECTOR

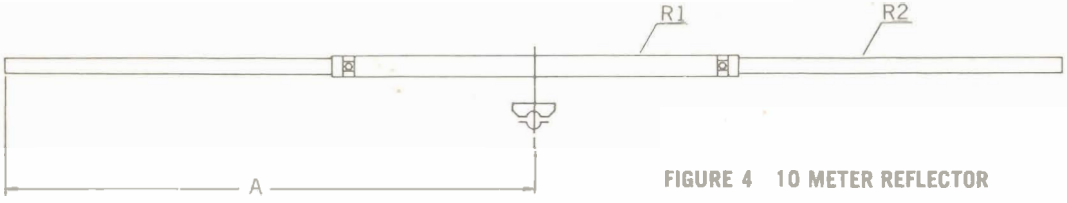
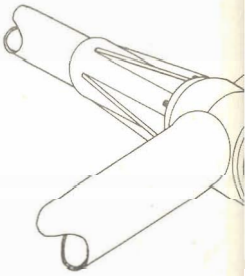
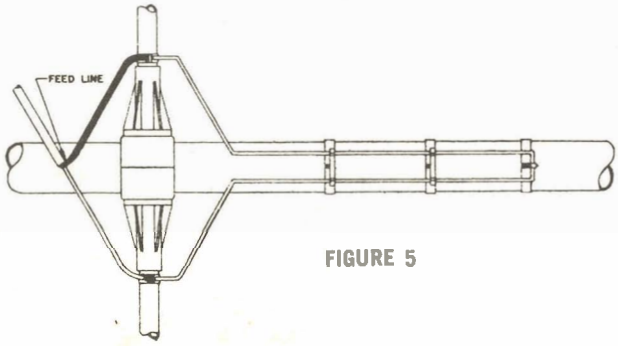


FIGURE 4 10 METER REFLECTOR


Clamp



OPERATION RESONANT FREQ.				
	20 M	15 M	10 M	A
CW	14.1	21.1	28.2	107
SSB	14.325	21.425	28.65	104.5
AM-1	14.25	21.35	29.0	102
AM-2	14.25	21.35	28.7	104



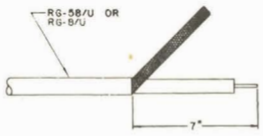
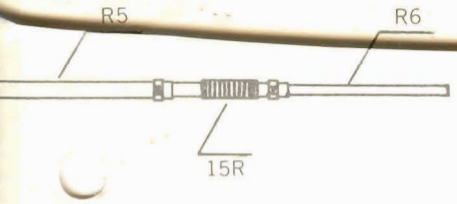


FIGURE 5



A	B	C	D	E	F	G
144	33	36½	2	47½	143½	47½
144	33	33	2	46¼	140	46¼
144	33	34	2	47	141	47
144	33	34	2	47	141	47

E	F	G	H	I	J	K
8	13 1/16	3 7/16	35½	97⅛	24½	35½
6 13/16	13 1/16	1⅝	35½	93⅜	21½	35½
7 9/16	13 1/16	3⅜	35¾	90⅜	24	35¾
6 13/16	13 1/16	3⅜	36	93¼	23¼	36

E	F	G	H	I	J	K
8	13	2	36	87	23	36
6	13	1	36½	84	20	36½
8	13	2	35½	81½	23	35½
7	13	1	36½	83½	21	36½

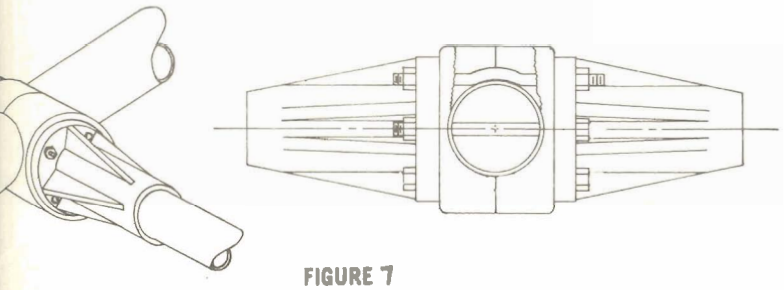


FIGURE 7

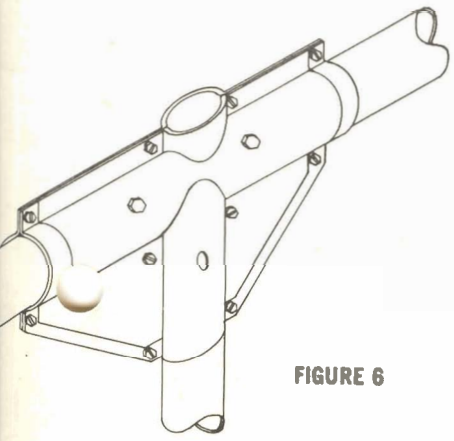


FIGURE 6

DESCRIPTION	QUANTITY	PART NO.	COST
15R Trap	6	190 24	$ 6.00
10R Trap	4	190 25	6.00
*TH-4 Insulator Assembly	2	190 175	11.14
DE-2 1⅛" x 058 x 72"	1	190 3916	5.20
Tube 1¼" x 058 x 12"	1	190 3955	3.30
Cup DePunch 5⅝ dia. 16 ga	1	190 4651	.50
Screw ¼-20 x ¾ inch	2	190 6325	.05
Screw 10-24 x ⅝"	1	190 6475	.05
Nut ¼"–20 Hex	2	190 6960	.02
Lockwasher ¼"	2	190 7110	.02
Insulator 1¼" I.D. Fiberglas	1	190 8906	2.00
*Tube Assembly Director	1	190 176	11.75
Director–Reflector 1⅛" x 058 x 144'	1	190 3917	7.90
Tube 1¼" x 058 x 24"	1	190 8732	3.85
*Tube Assembly Reflector	1	190 177	13.65
Tube 1¼" x 058 x 144"	1	190 8733	9.35
Tube 1⅛" x 058 x 48"	1	190 8734	4.30
*TH-4 Parts Package	1	190 178	3.25
Electroseal	1	190 80	.50
Shorting Strap	1	190 170	.25
Back Plate ⅞" x 4"	3	190 3335	.10
Element to boom Strap 1" x 4½"	3	190 4490	.30
Screw 5/16" x 3½"	4	190 6230	.15
Screw 5/16" x 3"	4	190 6235	.15
Screw ¼"–20 x 4½"	2	190 6280	.20
Screw ¼"–20 x 4½"	2	190 6280	.20
Screw ¼"–20 x 4"	2	190 6285	.20
Screw ¼"–20 x ¾"	1	190 6325	.10
Screw 10-24 x ⅝"	2	190 6475	.10
Nut 5/16	8	190 6945	.05
Nut ¼"–20	16	190 6960	.05
Lockwasher 5/16"	8	190 7075	.02
Lockwasher ¼"	16	190 7110	.02
Washer No. 10, Flat	2	190 7130	.02
Compression Clamp 1¼"	2	190 8680	.20
Compression Clamp 1⅛"	6	190 8681	.20
Compression Clamp 1"	14	190 8682	.20
Compression Clamp ⅞"	8	190 8683	.20
Screw ¼"–20 x ½"	30	190 8684	.06
Nut ¼"–20	30	190 8685	.06
Screw No. 8 x ⅜"	3	190 9386	.02
Caplug ¾"	8	190 5640	.10
Tube ¾" x 035 x 72"	2	190 2860	3.00
Tube 1⅛" x 058 x 36"	2	190 2628	3.85
Tube ¾ x 035 x 30½"	2	190 2603	2.00
Boom to Mast Bracket	2	190 4645	2.50
Insulator 2" to "V"	3	190 5435	1.00
Insulator ⅛" rod support	2	190 5470	.20
Caplug 2"	2	190 5625	.20
TH-4 Boom 1 2" x 049 x 101½"	1	190 8721	8.20
TH-4 Boom 2 2" x 049 x 90½"	1	190 8722	8.20
Tube ⅞" x 049 x 76"	1	190 8723	4.10
Tube 1" x 058 x 39½"	2	190 2563	3.08
Tube ¾" x 035 x ⅜"	2	190 2607	2.25
Tube 1" x 058 x 21⅜"	2	190 2564	2.72
Tube 1" x 058 x 16"	2	190 2566	2.36
Tube 1" x 058 x 13"	4	190 2567	2.25
Tube ¾" x 035 x 29"	2	190 2608	2.00
Rod Hairpin ⅛" x 98¾" Formed	1	190 8730	3.50
TH-4 Manual	1	190 8731	1.00
Tube ⅞ x 049 x 76"	1	190 2662	3.08

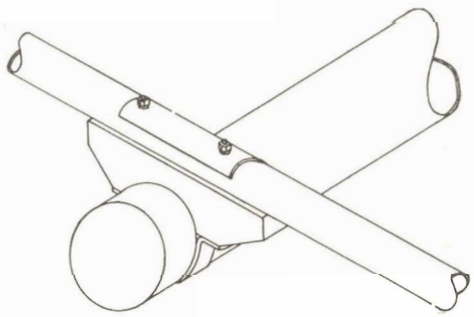


FIGURE 8

☐ Apply Electroseal to both ends of R5, insert into R4, measure for dimension "C", and secure.

☐ Attach a 1" compression clamp to each end of R5.

☐ Apply Electroseal to both remaining 15R, orient in same manner as other traps and insert into R5.

☐ Measure dimension "D" and secure clamp.

☐ Attach a ⅞" compression clamp to ends of the 15R's.

☐ Apply Electroseal to one end of each R7 (¾ x 38") insert into 15R.

☐ Measure for dimension "E" and secure.

All element assemblies completed, double check to make sure these elements are all parallel and in the same plane. If not, loosen any brackets necessary, readjust and secure.

BETA MATCH: Refer to Figures 9 and 5. This is an assembled unit, using two standoff insulators to maintain spacing and give support. Attaches to the bottom side of the boom as previously mentioned. Just in case there is an error in assembly, it will still function properly even if mounted on the top of the boom. The closed end of this hairpin faces the director.

☐ Position the beta match so that the standoff insulators can be attached to the boom. Two sheet metal screws through the insulators and into the boom will secure the unit.

☐ Remove the small bolt and nut from the shorting clamp assembly, slip over the curved end of the hairpin.

☐ Line up the hole in the shorting clamp to the associated hole in the boom. Apply some Electroseal on boom surface, then secure strap with a sheet metal screw.

☐ Apply Electroseal to joint of hairpin and clamp. Insert bolt and nut, orient and tighten.

☐ Apply Electroseal to the driven element tubing where the hairpin looped ends make contact.

COAXIAL CABLE ATTACHMENT. See Figure 5.

☐ Strip back the coaxial cable so the center conductor and braid are 7½" long.

☐ Attach solder lugs to each of these legs.

☐ Insert the two No. 10 x ½" sheet metal screws through the hairpin looped ends and solder lugs, and attach to the driven element. *Tighten securely.*

Neoprene or some other type of sealant should be used to cover the coaxial cable separation, preventing moisture from collecting and changing your SWR readings. Absorption of moisture will change the characteristic impedance of the transmission line.

The assembly of the TH-4 is now complete.

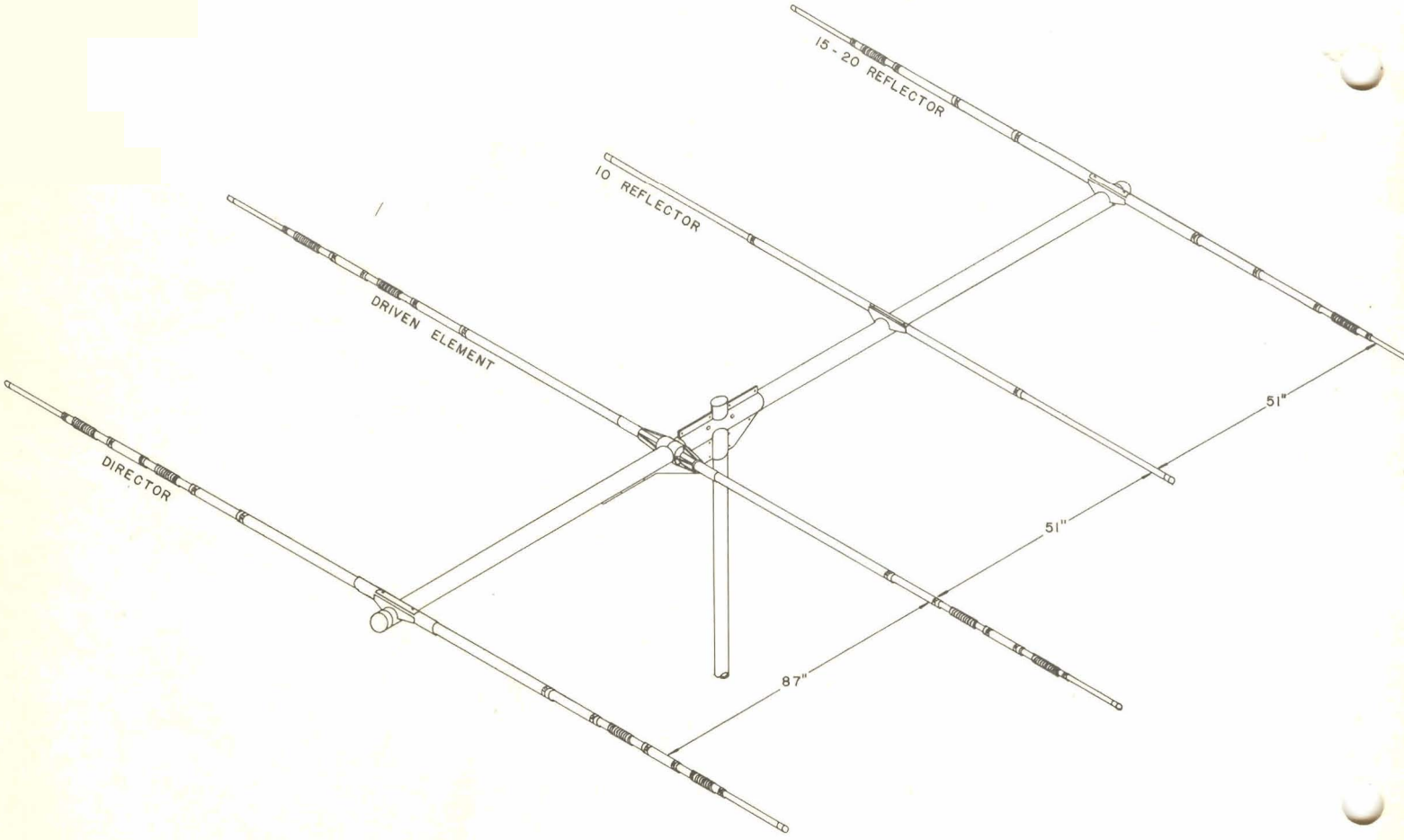


FIGURE 9