

**THREE AND FIVE ELEMENT**

**YAGI AERIALS**

**FOR**

**TELEVISION BANDS I & III**

**NEW ZEALAND  
BROADCASTING CORPORATION.  
ENGINEERING DIVISION WELLINGTON**

NZBC YAGI AERIALS

Three and Five Element  
Yagis for Television  
Bands I and III

Report F 8464/A  
1970

Television Aerial Group  
H O E

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## INTRODUCTION

Twelve broad-band Yagi aeriels have been developed for the nine New Zealand V.H.F. television channels. This handbook contains the specifications for three and five element Band I Yagi aeriels and for five element Band III Yagi aeriels.

The aeriels are matched by their associated baluns and stubs to 50 Ohm co-axial cable. The resultant S.W.R. of the Band I Yagi aeriels should not vary by more than 0.07 to 0.10 from the NZBC S.W.R. specification for transmitting aeriels and the Band III aeriels should be within the specification.

The gain of the five element Yagi aeriels is  $5\frac{1}{2}$  -  $6\frac{1}{2}$  db with respect to an ideal thin half wave dipole (approximately  $8 - 8\frac{1}{2}$  db with respect to an isotropic source) and the gain of the three element aeriels is  $4 - 4\frac{1}{2}$  db with respect to a half wave dipole (i.e.  $6 - 6\frac{1}{2}$  db with respect to an isotropic source).

All the aeriels described in this handbook may be used for receiving purposes. If the drawings and instructions are followed with special care both in construction and mounting, a single Band III 5 element Yagi aerial may be used for transmitting with no further tests.

### MECHANICAL CONSTRUCTION OF THE AERIAL

Refer Drawing A3 9826 for Band I or A3 9827 for Band III.

#### Materials and Hardware

The boom is 1" O.D. 11 gauge aluminium tube.

The elements, including the dipole halves are made from  $\frac{1}{2}$ " O.D. 17 gauge aluminium tube. Material for the elements and boom is available on requisition to H.O. Stores, but should be obtained locally unless it can be collected from the Titahi Bay No.2 Store as it is stocked only in 16 ft lengths.

The element mounting kit, which is obtainable under stock number 579-50, contains all the items necessary to mount a director or a reflector on the boom (see Note 1 on the drawings).

The dipole mounting kits (BI S/L No.579-54, BIII S/L No.579-48) contain all items necessary to mount a dipole on a 1" diameter boom (see Note 2 on the drawings).

The amount of material required for any one of the Band III Yagis has been specified. The material required for a Band I Yagi will depend on the type and channel and must be found from the dimensions.

#### Note:

Care should be taken when buying the aluminium tube to obtain accurate dimensions ( $\pm .005$ "). Commercially available tube may be up to .015" oversize; this would entail a considerable amount of filing of the element clamps before they would fit firmly onto both the boom and the elements.

#### Tools:

Essential: Vice  
6" steel ruler  
steel tape measure  
Hacksaw or pipe cutters  
two 6" adjustable spanners  
large screwdriver  
centre punch  
portable drill (a drill press is better)  
reamer or round file (to enlarge the holes in the boom for the directors)  
a device to aid bending the dipole halves  
(a hardwood cylinder which may be clamped in a vice, is useful;  $3\frac{1}{8}$ " dia. for Band I  $1\frac{3}{4}$ " dia. for Band III).

Useful: a 2 B.A. Spintight  
a  $\frac{1}{4}$ " Whit Spintight.

Correct dipole dimensions and construction are the major factor in ensuring the proper operation of these aerials. The construction of the feed points is particularly critical for the matching of the aerial.

The method of construction is as follows:

- (1) Take the lengths of  $\frac{1}{2}$ " aluminium tube. Each length required is D inches but 4 or 6 inches more is often useful.
- (2) Bend the tube in the centre around a semicircle of radius,  $1 \frac{9}{16}$ " for Band I, or  $\frac{7}{8}$ " for Band III. This gives an INSIDE spacing of  $3\frac{1}{8}$ " for Band I or  $1\frac{3}{4}$ " for Band III.
- (3) Trim the ends of each dipole half in line at DH" from the outside of the U-bend. This results in the correct overall dipole dimension.
- (4) Score along the length of the aluminium rod ( $\frac{3}{8}$ " d x 1") which is used to strengthen the aluminium tube at the feed point. The best method is to lay the rod along the partly opened jaws of a vice and strike sharply with a hammer. The burrs formed by this should make the rod fit firmly in the tube. Before inserting the rod squeeze some Silastic around the outside of the rod. This should ensure that the rod forms a water-proof plug in the tube.  
IMPORTANT: the rod must be exactly flush with the end of the tube.
- (5) Drill the feed point hole exactly  $\frac{1}{2}$ " from one of the ends of the dipole half. Drill the clamp mounting hole  $27/32$ " from the other end. The position of the feed point hole determines the spacing across the feed point and is very critical. The tolerance is  $\pm 1/32$ ". Take care to drill the holes in the right directions and exactly through the centre of the rod.
- (6) Check the polythene insulator: the nominal  $\frac{1}{2}$ " diameter holes should be  $2\frac{1}{2}$ " deep and  $\frac{1}{2}$ " in diameter. It may be necessary to clear these holes with a  $\frac{1}{2}$ " drill.
- (7) Insert the two  $\frac{1}{4}$ " stainless steel bolts in the tongued clamp and insert the tongue into the insulator. Fasten with  $\frac{3}{4}$ " x  $3/16$ " dia. stainless steel machine screw and nut.
- (8) For Band I aerials drill the  $\frac{3}{8}$ " D x 3ft strengthening rods  $27/32$ " from one end. Score both ends of the rods (see (4) ) so that they do not move during assembly, and insert into the dipole halves.

/.....

### Dipole Construction (Cont'd)

- (9) Insert the dipole halves into the insulator (a little oil or vaseline may be helpful). Align the feed point holes and fix with the  $1\frac{1}{2}$ " x  $3/16$ " stainless steel machine screws. (See dipole Section AA in Drawings A3 9826, A3 9827; also A4 10307). Do not get any polythene swarf trapped under screwhead etc.
- (10) Assemble the aluminium clamp and then check that the overall length of the dipole is D inches  $\pm 1/16$ ". Note that when the clamp is assembled onto the Band I dipole the inside spacing will vary from  $3\frac{1}{8}$ " near the ends to  $2\frac{7}{8}$ " near the centre.
- (11) If the aerial is to be used vertically polarised, drill a  $\frac{1}{8}$ " drain hole at the lowest point of the dipole.

### Passive Elements and Boom

The 5-element Yagis have three directors, with lengths  $D_1$ ,  $D_2$  and  $D_3$ . The 3-element Yagis have one director ( $D_1$ ).

The boom is drilled  $\frac{1}{2}$ " clearance for the directors. Take care to drill all the holes parallel. This is easier if a director is assembled in the first hole that is drilled. The elements must slide easily in the holes. Any tendency to bind on the sides of the hole may cause sudden jamming during assembly.

The boom of the Band III Yagi is not drilled for the reflector (or dipole) because it is usual to support the Yagi behind the reflector and a hole would weaken the boom considerably. With the Band I aeriels the boom should be drilled for the reflector.

### Assembly of Elements

Place the elements on the boom at the required spacings. If the tube diameters are outside tolerance it will be necessary to file the clamps so that the elements and the boom are tightly held. In extreme cases it may be necessary to use a 1" x 1" x 24 g. aluminium shim on the 1" boom to ensure tightness.

CONSTRUCTION OF THE BALUN AND STUB

Refer Drawing A3 9762/1 for Band I or A3 9762/2 for Band III.

Great care is necessary when manufacturing a balun and stub for a Band III Yagi aerial so that the aerial will remain within the NZBC Transmitting Aerial Specification. The small physical size of the transitions and the small variation in capacitance to earth ( $\frac{1}{2}$  pf) which would put the aerial outside the Specification mean that all dimensions are critical.

Materials:

The major components of the balun (and stub) are the coaxial cable assembly, which carries out the electrical balancing and matching, and the balun block assembly, which is the mechanical support.

The coaxial cable assembly is made from RG213/U 50 ohm cable (stock list number 221-09). The perspex balun block (stock list number 579-52) is made to drawing number A4/8150.

The remaining materials are listed on the drawing and may be obtained from stock.

Tools:

Essential: 6" steel ruler  
steel tape measure  
sharp knife (e.g. Stanley 199)  
flat file  
soldering iron  
two 6" adjustable spanners

Useful: file card  
Eclipse junior hacksaw  
7" linesman pliers



### Coaxial Cable Components

- (1) Cut the three pieces of coaxial cable to the length required for the channel (lengths p" f" and s" ). An Eclipse junior hacksaw is useful for this.

### (2) Phasing Line

- (i) Trim the black PVC cover and the braid back  $2\frac{3}{4}$ " for Band I ( $2\frac{1}{4}$ " for Band III) at each end. Ring the white dielectric next to the PVC with a sharp knife; take care not to reach the inner conductor. Free the dielectric by bending at the slit. It may be necessary to use the knife carefully to help the tearing. Once the length of dielectric is free remove by gripping and pulling. Allow the dielectric to twist so that it follows the lay of the inner conductor while coming off.
- (ii) Adjust the inner conductor , if necessary, so that the lay is the same as in the undisturbed cable and lightly tin the final  $\frac{1}{8}$ " at each end. Do not allow the solder to flow back along the lead, as this may cause it to fracture when in service. For the same reason it is important not to work harden the inner by unnecessary twisting or bending.
- (iii) Next trim  $\frac{1}{8}$ " of PVC and braid off each end. Note the  $1/32$ " tolerance here.
- (iv) Trim the PVC carefully off the next  $\frac{1}{8}$ " of braid at each end. Take care not to nick the braid, and do not unravel it. Lightly tin the exposed braid. The phasing line is now ready for assembly.

### (3) Balun Feed

- (i) Prepare one end of the cable as follows: Remove 1" of PVC, braid and dielectric as in (2) (i) above and twist inner one full turn clockwise. Trim the PVC and braid as in (2) (iii). Trim the PVC and tin the braid as in (2) (iv).
- (ii) Terminate the other end in an N male connector as follows. First remove  $9/16$ " of PVC taking care not to nick the braid. NOTE: The dimensions that are given ensure correct electrical and mechanical assembly.

- (vi) Brush PVC solvent on both the cable and the inside of the cable cap. The solvent must be obtained at PVC Pipe Suppliers under the trade name Novacem A. Fit the cap onto the cable.
- (vii) Terminate the other end in an N male elbow connector as follows: First remove  $9/32$ " of the PVC outer.
- (viii) Brush the braid out and bend back over the cable. Then remove  $\frac{1}{8}$ " of dielectric.
- (ix) Fit the pin and solder. Remove excess solder from the pin with a sharp knife. Brush the braid forward over the pin.
- (x) Fit the back nut, washer, rubber ring, and clamping ring. (Insert the clamping ring with the V edge towards the back nut).
- (xi) Trim the braid to approximately  $3/16$ " in length.
- (xii) Fit the connector body and tighten back nut firmly. This completes the short circuit stub.

(5) Coaxial Cable Assembly

- (i) Bind the two ends of the phasing line and one end of the balun feed together with P.I.B. tape about an inch or so from the ends of the cable jackets. Ensure that the dielectric surfaces are level.
- (ii) Wrap four or five turns of 26g tinned copper wire around the tinned braid. Now solder into the joint but ensure that the dielectric is not distorted by overheating.
- (iii) Bend the balun feed inner between the phasing line inners so that it lies flat on the dielectric surfaces. Bend it round the right hand phasing line inner as shown in Drawings A3 9762/1 or A3 9762/2. Trim excess strands and solder carefully.

Complete Balun Assembly

- (1) Insert the leads into the balun block. Position by gripping both leads and move the block until 2" ( $1\frac{1}{2}$ " for Band III) of lead protrudes each side of the block.
- (2) Seal the holes with a smear of Silastic prior to potting. Set up a jig to hold the coaxial leads so that they emerge from the block perpendicular to its face.
- (3) Mix  $\frac{1}{2}$  of each of the two tubes of Araldite adhesive. Warm the mixture slightly in front of a heater so that it flows more easily, and pour into the balun block down one side of the hole. (This prevents the formation of major bubbles). Warming in front of a fan heater promotes setting in 2 - 3 hours.
- (4) Soldering of the Collet lugs on the leads completes the balun. Do not let the solder run back along the leads as this will reduce the flexibility, and they may fracture eventually.

ASSEMBLY AND MOUNTING - BAND I

Refer to drawings A3 9762/1, A3 10039/1, A3 10039/2, A3 10039/3 and A3 10039/4.

Balun Mounting on Boom

The balun block is clamped onto the boom in contact with the dipole as shown in A3 9762/1. The leads should be run as shown in the drawing to give the correct impedance.

At this stage check that the balun is mounted on the side of the dipole shown in the mounting drawing for the particular aerial you are making.

Seal the assembly with Silastic, coating both the terminals and the wire generously to prevent loosening of the nuts and corrosion. The heads of the feed point screws and the entry of the tube into the insulator must also be sealed.

Assembly on Mounting Pipe

Before mounting the aerial on its pole, fit the Yagi, its stays and Kee Klamps onto the mounting pipe while still on the ground.

Note that the folded dipole is orientated so that the fed side is away from the stays and their clamps.

For the three element vertical Yagis wrap a number of turns of P.I.B. tape around the reflector at its end to form a lump. This prevents metallic contact which would cause flashing on the picture should wind vibration make the reflector hit the mounting pipe.

Fasten the phasing line and other cable to the boom with plastic cable ties. The cable may be run along metallic stays and fastened with plastic cable ties, but must not be run along non-conducting stays as this would cause a change in impedance. The cable is fastened to the wooden pole with copper "P" clips and brass wood screws.

Mounting on Hardwood Pole

1. All Yagis

First cut flats on the pole to take the feet of the Kee Klamps or aluminium braces. Drill out the holes in the feet of the Kee Klamps (70-8) to  $\frac{3}{8}$ " clearance - paint the bare steel with zinc loaded paint, e.g., "Galvafroid". Hoist the assembly up the pole and lash in position while drilling and fitting coach screws. Drill these holes  $9/32$ " for the full 3" depth and counterbore with a  $\frac{3}{8}$ " drill to a depth of  $1\frac{1}{4}$ ". If the wood is very hard, use a very small amount of Vaseline on the screw.

2. Band I - 5 Element Yagi, Vertically Polarized

Drawing A3 10039/4. Note that the braces (Item 16) for the Channel 1 Yagi are fitted in front of the pole, whereas they are behind the pole for Channels 2 and 3.

Items 17 are nominally 8 ft. long, but the excess length should be cut off when installed. (11 inch excess with Ch.1, but an amount dependent on pole diameter with Ch.2 and Ch.3).

Mounting on Concrete Pole, Tower or Other Structure

Refer to TV Aerial Group, H.O.E.

ASSEMBLY AND MOUNTING - BAND III

Refer to drawings A3 9762/2 and A3 9850.

Balun Mounting on Boom

The balun block is clamped onto the boom in contact with the dipole as shown in A3 9762/2. The leads should be run as shown in the drawing to give the correct impedance.

Seal the assembly with Silastic; coat both the terminals and the wire liberally to prevent corrosion and to keep the nuts from coming loose. Seal also the feed point screw heads and the tube entry into the insulator. Fasten the phasing line, the balun feed and short circuit stub to the boom with plastic cable ties.

Assembly on Mounting Pipe

Fasten the PVC stays to the boom as shown in views A and B in drawing A3 9850. The positions of the clamps and stays have an effect on the aerial impedance and should not be altered. The clamps should be as far from the active side of the dipole as possible.

If the aerial is to be used for a vertically polarized signal, the whole unit comprising the aerial and the stays should be rotated in the boom clamp through 90 degrees from the position shown in the drawing.

For other notes, see under Band I.

Mounting on Pole

As for Band I.

AERIALS FOR RECEIVING

Many variations of mounting are permissible when the aerial is used for receiving. A useful variation is to mount the aerial with the water pipe at its centre of gravity. This may remove the need for stays and changes the impedance by about 10% which is acceptable for reception. This mounting is not recommended for vertical polarization. If 300 Ohm ribbon is attached directly to the aerial, (without a balun) the match will be degraded to give a VSWR of about 2 to 1 and a  $\frac{1}{2}$  db mismatch loss. This method of feeding the aerial is not recommended except for short feeder lengths and when used for monitoring only.

## LIGHTNING PROTECTION AND WEATHERPROOFING

### Lightning Protection

If an aerial is to be mounted in an exposed location it is essential to have adequate lightning protection. There are three parts to lightning protection:

1. The lightning spike, which should be the highest object, will afford protection for the majority of discharges (including all large discharges) in a cone whose surface is 45 degrees from the horizontal.
2. The discharge path which should be of low resistance with low inductance (no sharp bends) and should run to earth in the shortest distance.
3. The earth which should consist of a vertical and a horizontal member, both well buried in the ground.

A typical installation on a hardwood pole would consist of a lightning spike (S/L No. 360-09) fastened to the  $1\frac{1}{2}$ " water pipe, with a Kee Klamp 78 - 8 (S/L No. 360-05). The discharge path would be down the pipe and then to a  $\frac{3}{4}$ " x  $\frac{1}{8}$ " galvanised steel flat strap (S/L No. 360-10). Fasten the strap to the pipe with the two stainless steel bolts (S/L No. 360-22) and nuts (S/L No. 360-41). The holes in the pipe and strap should be coated with a zinc rich paint (e.g. Dry Galvanising). To ensure good conductivity there should be no paint between the strap and the pipe. It is necessary to fasten the strap firmly on to a rigid surface:  $1\frac{1}{2}$ " x  $\frac{1}{4}$ " galvanized coach screws (S/L No. 360-60) are convenient for this.

At any joins the lengths of strap should be overlapped by about 2 inches and securely fastened.

An adequate earth in damp ground may be obtained by driving an earth spike (5' of  $1\frac{1}{4}$ " x  $1\frac{1}{4}$ " galvanised steel angle) as close underneath the lightning spike as is possible. The strap is bolted to the spike and then continued horizontally for about four feet at about 12" below the surface of the ground.

It should be remembered that the braid on the co-axial cable is usually earthed through the translator or receiver. This would then provide an undesirable alternative path for the lightning discharge. In addition a high voltage could be induced in a nearby conductor by the current in the earth strap and so it is worthwhile to run the feeder well away from the lightning conductor.



### Weather Proofing

There are three main types of weather proofing used:-

1. Silastic 732 R.T.V. Silicone rubber (Stock No.230-72) is used to seal exposed leads, terminals and around the polythene insulator. This material should not be confused with Seelastik which is a different compound.
2. Nickel, cadmium or zinc electroplated steel or unplated steel must be given at least one coat of zinc rich paint (for example Dry Galv.) plus a top coat of aluminium paint or Seachrome. The clamping screws in the Kee Klamps are, in general, not plated. Hot dip galvanized steel needs no further protection.
3. Cable connectors should be covered with two layers of polyisobutylene (PIB) self amalgamating tape (Stock List No. 068-15). The tape cover should be extended for an inch or so along the cable to prevent water penetration. Two precautions are necessary.
  - a) All sharp edges on connectors (for example on the N-male elbow connectors) should be filed round because the tape will tend to creep over a sharp edge.
  - b) Abrasion between a covered connector and another object (for example an element clamp) must be prevented. The tape will wear if continually abraded and if a metal-metal contact is formed this will cause flashing on the received picture. Any intermittent metal-metal contact will generally cause flashing on the picture and should be avoided. If it is unavoidable to have a connector lying across any sharp edge, then slip a short length of PVC hose, slit down one side, over the taped up connector. Tape securely in position.

PERFORMANCE OF THE BAND I YAGIS

The 3 element and 5 element Band I Yagi aeriels maintain their performance across the specified 7 MHz wide channel.

The 3 element Yagi aeriels have gains of 4 to  $4\frac{1}{2}$  db over an ideal, thin half wave dipole (approximately 6 to  $6\frac{1}{2}$  db over an isotropic aerial). The half power beamwidths are 72 degrees (E plane) and 130 degrees (H plane). The plane containing the elements is the E plane.

The 5 element Yagi aerial have gains of  $5\frac{1}{2}$  to 6 db over an ideal thin halfwave dipole (approximately  $7\frac{1}{2}$  to 8 db over isotropic). The half power beamwidths are 65 degrees (E plane) and 95 degrees (H plane).

Typical S.W.R. plots and radiation patterns are included with the other drawings. The S.W.R. of an aerial mounted for horizontal polarization will be very close to these curves when mounted more than about 16 feet above the nearest horizontal conductor. For receiving use a higher S.W.R. is acceptable, so mounting about 6 ft. above a horizontal conductor is satisfactory.

The S.W.R. of a 3 element aerial mounted for vertical polarization as in A3 10039/3 will lie well between the shaded zones of A4 10038/1, if there are no other vertical conductors within about one wavelength (measured in a horizontal direction).

It is mechanically difficult to firmly support a 5 element vertically polarized aerial from behind the reflector as for the 3 element Yagi. In any other position the feeder, lightning strap or mounting pole acts as another element, affecting both S.W.R. and radiation pattern. This effect is most severe when the mounting pole is amongst the elements. The mounting shown in A3 10039/4 produces an acceptable mismatch and change in pattern, with the S.W.R. still remaining within the shaded area of A4 10038/2 and the pattern being offset as shown on A4 10037/4.

The mechanical variations which individually produce a 1% impedance change are given below. Critical dimensions are marked with asterisks. Dimensions containing  $D_2$  or  $D_3$  do not apply to 3 element aeriels.

<u>DIMENSION</u>	<u>VARIATION</u> for 1% impedance change
R	$\frac{3}{8}"$
* D	$\frac{1}{8}"$
* $D_1$	$\frac{1}{8}"$
$D_2$	$\frac{1}{4}"$
$D_3$	$\frac{1}{4}"$
Reflector to pipe support (3 element vertical only)	1"
RD	$\frac{3}{8}"$
* $DD_1$	$\frac{1}{8}"$
* $D_1 D_2$	$\frac{1}{8}"$
$D_2 D_3$	$\frac{1}{4}"$
** X	1/16"
* p	$\frac{1}{8}"$
* f	$\frac{1}{8}"$
* s	$\frac{1}{8}"$
* balun pigtail length	$\frac{1}{8}"$

In the balun  $\frac{1}{8}"$  of polythene dielectric protrudes beyond the common end of the braids. If this distance is varied by 1/16" a 1% impedance change results.

PERFORMANCE OF THE BAND III YAGIS

The 5 element Band III Yagi aeriels have bandwidths greater than 7 MHz and gains of 6 to  $6\frac{1}{2}$  db over an ideal thin half wave dipole (approx. 8 to  $8\frac{1}{2}$  db over an isotropic aerial). The half power beamwidths are 60 degrees (E plane) and 73 degrees (H plane). The plane containing the elements is the E plane.

Typical S.W.R. plots and radiation patterns are included with the other drawings; these apply when the Yagis are mounted as shown on A3 9850.

The mechanical variations which individually produce a 1% impedance change are given below. Critical dimensions are marked with asterisks.

<u>DIMENSION</u>	<u>VARIATION</u> for 1% impedance change
R	$\frac{1}{8}"$
* D	$\frac{1}{16}"$
* $D_1$	$\frac{1}{16}"$
$D_2$	$\frac{1}{8}"$
$D_3$	$\frac{1}{8}"$
Reflector to pipe support	1"
RD	$\frac{1}{8}"$
* $DD_1$	$\frac{1}{16}"$
* $D_1 D_2$	$\frac{1}{16}"$
* $D_2 D_3$	$\frac{1}{16}"$
** X	$\frac{1}{32}"$
* p	$\frac{1}{16}"$
* f	$\frac{1}{16}"$
* s	$\frac{1}{16}"$
* balun pigtail length	$\frac{1}{16}"$

In the balun  $\frac{1}{8}"$  of polythene protrudes beyond the common end of the braids. If this distance is varied by  $\frac{1}{16}"$  a 1% impedance change results.

While an impedance change of 1% (and the resulting SWR variation of up to 0.01) is insignificant, a number of these may add up to degrade the performance of the aerial.

Channel	BAND 1					
	3 ELEMENT			5 ELEMENT		
	1	2	3	1	2	3
R	11'6"			10'6"	9'0"	
D	9'9"			9'1½"	7'7"	
D <sub>1</sub>	8'6"			9'0"	7'4"	
D <sub>2</sub>	-	-	-	8'10½"	7'3"	
D <sub>3</sub>	-	-	-	8'9"	7'1"	
DR	54"			51"	45"	
DD <sub>1</sub>	30"			38"	11"	
D <sub>1</sub> D <sub>2</sub>	-	-	-	38"	28"	
D <sub>2</sub> D <sub>3</sub>	-	-	-	38"	28"	
a	8'2½"			34"	88½"	
b	34½"			16" oc	24½"	
1	7'3"	5'11"	5'3"	7'3"	5'11"	5'3"

1. FOR CONSTRUCTION NOTES REFER AS 8465
2. Place a short-circuit clamp across the folded dipole 24" from the feed points.
3.  $n = \frac{31}{8}$
4. Use as an open-circuit stub.

BAND 1 THREE & FIVE ELEMENT YAGIS



NEW ZEALAND  
BROADCASTING  
CORPORATION

ORIGIN	H. MIDDLETON
DRAWN	
TRACED	
SIZE	STATION
A4	8005

DISPOSITIONAL

1

2

3

4

5

6

7

8

9

10

11

12

Not to scale.

Note: In the three element Yagi the boom ends one inch beyond D<sub>1</sub>

All clamps should be a tight fit on both the element and the boom. File clamp if necessary.

Shorten if necessary on installation.

Reflector

Dipole

Director 1

Director 2

Director 3

Boom

R.D.

D.D<sub>1</sub>

D<sub>1</sub> D<sub>2</sub>

D<sub>2</sub> D<sub>3</sub>

R

D

D<sub>1</sub>

D<sub>2</sub> D<sub>3</sub>

ELEMENT LENGTHS & SPACINGS						
CHAN	3 ELEMENT			5 ELEMENT		
	1	2	3	1	2	3
R	135"	112"	98"	133"	112"	100"
RD <sub>1</sub>	84"	67"	63"	80"	69"	65"
D	116"	97"	87"	115"	95"	85"
DH	57 1/4"	47 3/4"	42 3/4"	56 3/4"	46 3/4"	41 3/4"
D <sub>1</sub>	102"	86 1/2"	77 1/2"	102"	86 1/2"	77 1/2"
D <sub>2</sub>	-	-	-	102"	85"	76"
D <sub>3</sub>	-	-	-	102"	85"	76"
RD	54"	45"	44"	54"	45"	44"
D.D <sub>1</sub>	30"	22"	19"	26"	24"	21"
D <sub>1</sub> D <sub>2</sub>	-	-	-	41"	34"	30"
D <sub>2</sub> D <sub>3</sub>	-	-	-	47"	39"	35"
B	8'	8'	8'	15'	13'	12'

MECHANICAL ASSEMBLY

1"  $\phi$  11g AL tube

RD<sub>1</sub>

Drill 1/2" clearance for Directors and Reflector. All holes must be parallel.

D<sub>1</sub> D<sub>2</sub> D<sub>2</sub> D<sub>3</sub> 1"

B

5 ELEMENT YAGI BOOM

1"  $\phi$  11g AL tube

RD<sub>1</sub>

Drill 1/2" Clearance for Director & Reflector. All holes must be parallel.

B

3 ELEMENT YAGI BOOM

DIPOLE SECTION A A (See text)

1 1/4"

Drill 5/16"

Drill 13/64"

3/8"  $\phi$  x 1" solid AL rod

Silastic after assembly

Dipole element 1/2" x 17g AL tube

1/4" AL spacer

3/16" SS flat washer

2BA Collet Lug

Note 2

3/16"  $\phi$  x 1 1/2" SS machine screw with 3 SS nuts

DIPOLE (See text)

X = 1 1/2"  $\pm$  1/32"

1/2"  $\phi$  17g AL tubing

1 1/16" r

3 1/8"

Note 2

3' 0"

3/8"  $\phi$  AL rod

Drill 13/64"

Drill 17/64"

27/32"

DH

3/16"  $\phi$  SS screw nut & two flat washers

REFLECTOR & DIRECTORS

Additional Dwg.

Balun & stub A3 9762/1

Horiz. Mtg. Details 3el. A3 - 10039/1

5el. A3 - 10039/2

Vert. Mtg. Details 3el. A3 - 10039/3

5el. A3 - 10039/4

AMENDMENTS		
ORIGIN	BY	DATE
J.V.R.	S.M.S.	28-7-70
J.D.I.	J.F.	5-5-71

ORIGIN M. POWNALL

DRAWN J. BARGH

CHKD G. A. C.

APPD B. D. H. Given

DATE 12-9-69

16-1-70

19-2-70

STATION No.

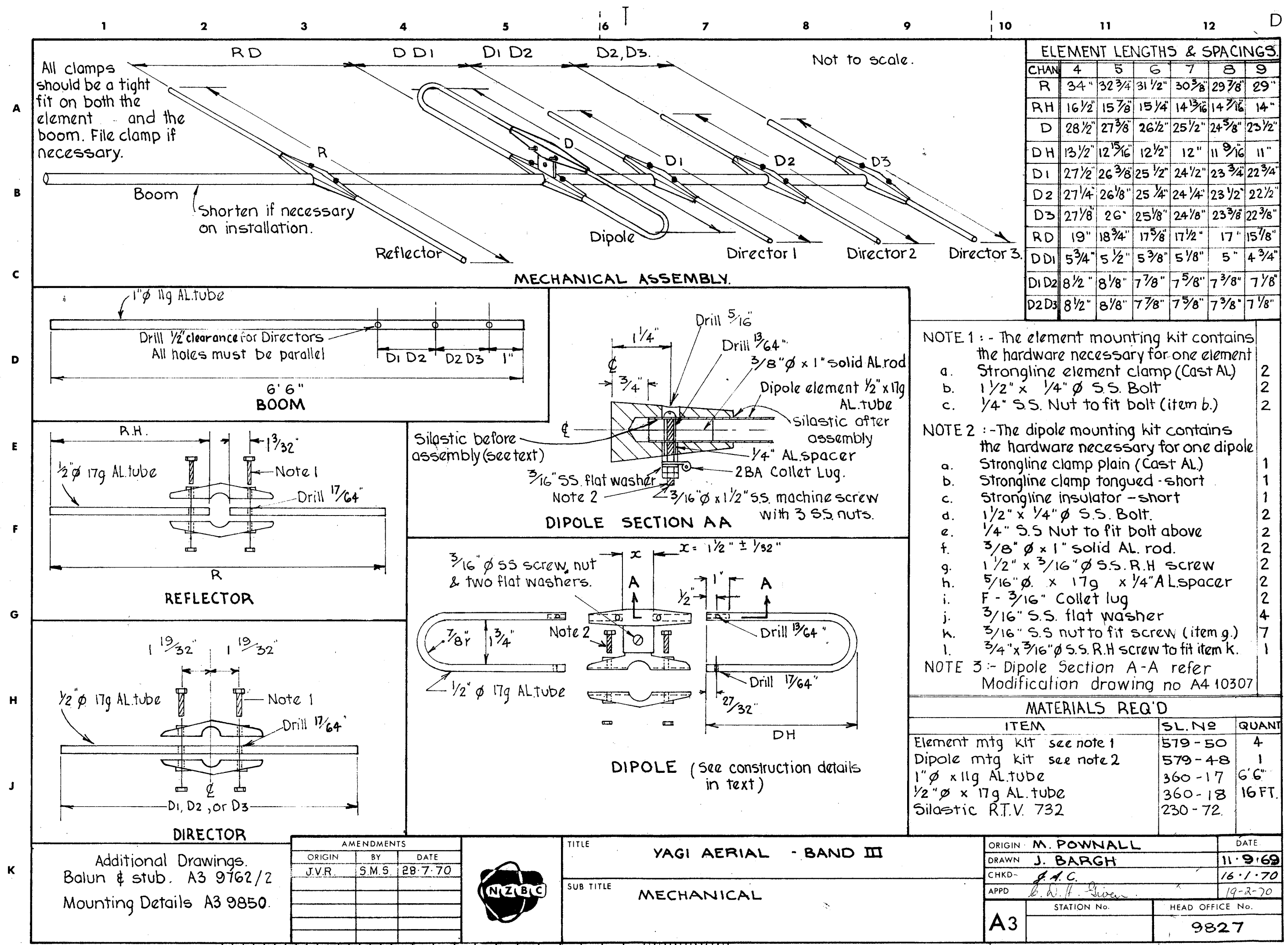
HEAD OFFICE No.

9826

ITEM	SL NO	QUANT
3/8" $\phi$ solid AL rod	360-19	
Element mtg kit see note 1	579-50	2 or 4
1" $\phi$ x 11g. AL tube	360-17	B FT
1/2" $\phi$ x 17g AL tube	360-18	
Dipole mtg kit see note 2	579-54	1
Silastic Sealant R.T.V. 732	230-72	







All clamps should be a tight fit on both the element and the boom. File clamp if necessary.

Shorten if necessary on installation.

Not to scale.

Drill 1/2" clearance for Directors  
All holes must be parallel

6'6" BOOM

Note 1

Note 1

DIPOLE SECTION AA

DIPOLE (See construction details in text)

NOTE 1 :- The element mounting kit contains the hardware necessary for one element

- a. Strongline element clamp (Cast AL) 2
- b. 1 1/2" x 1/4"  $\phi$  S.S. Bolt 2
- c. 1/4" S.S. Nut to fit bolt (item b.) 2

NOTE 2 :- The dipole mounting kit contains the hardware necessary for one dipole

- a. Strongline clamp plain (Cast AL) 1
- b. Strongline clamp tongued-short 1
- c. Strongline insulator-short 1
- d. 1 1/2" x 1/4"  $\phi$  S.S. Bolt. 2
- e. 1/4" S.S. Nut to fit bolt above 2
- f. 3/8"  $\phi$  x 1" solid AL rod. 2
- g. 1 1/2" x 3/16"  $\phi$  S.S. R.H screw 2
- h. 5/16"  $\phi$  x 17g x 1/4" AL spacer 2
- i. F- 3/16" Collet lug 2
- j. 3/16" S.S. flat washer 4
- k. 3/16" S.S. nut to fit screw (item g.) 7
- l. 3/4" x 3/16"  $\phi$  S.S. R.H screw to fit item k. 1

NOTE 3 :- Dipole Section A-A refer Modification drawing no A4 10307

Additional Drawings.  
Balun & stub. A3 9762/2  
Mounting Details A3 9850.

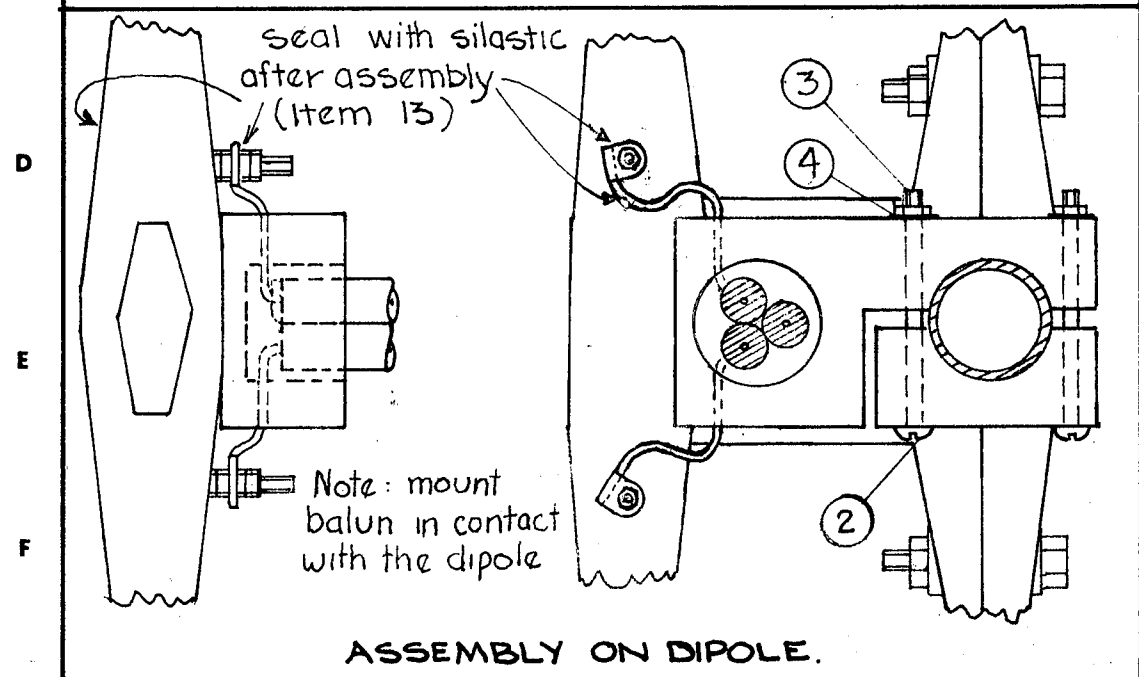
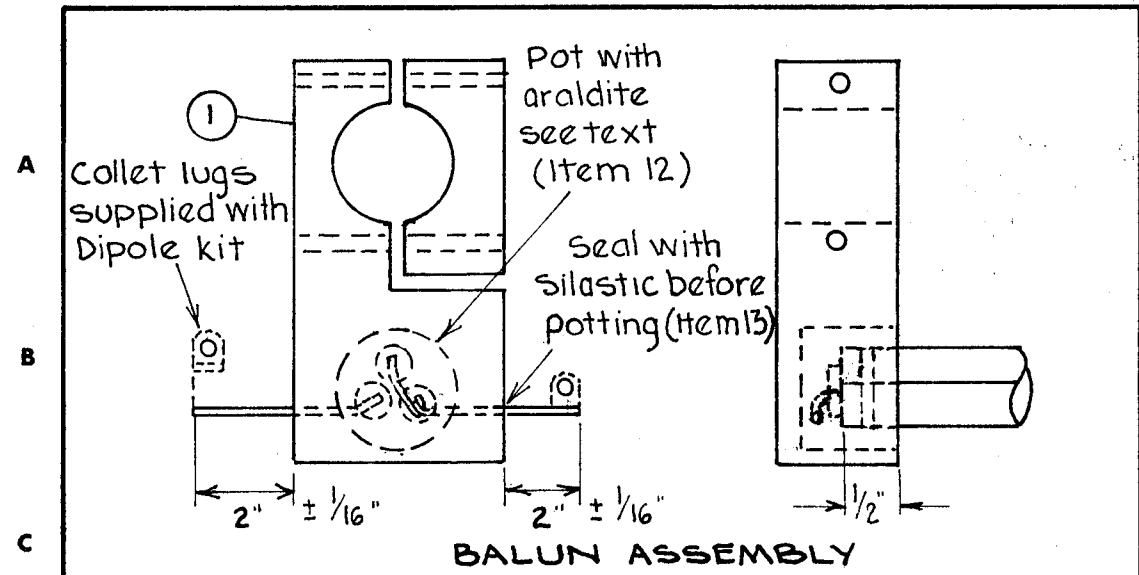
AMENDMENTS		
ORIGIN	BY	DATE
J.V.R.	S.M.S.	28.7.70



TITLE  
**YAGI AERIAL - BAND III**

SUB TITLE  
**MECHANICAL**

ORIGIN	M. POWNALL	DATE	
DRAWN	J. BARGH		11.9.69
CHKD-	J.A.C.		16.1.70
APPD	B.W.H. Given		19-2-70
STATION No.		HEAD OFFICE No.	
A3		9827	

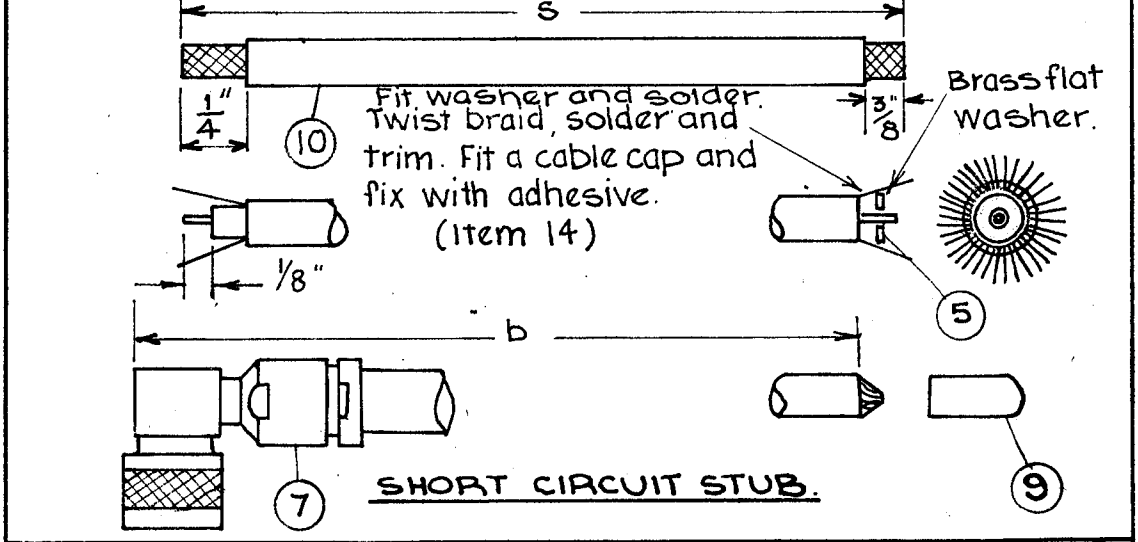
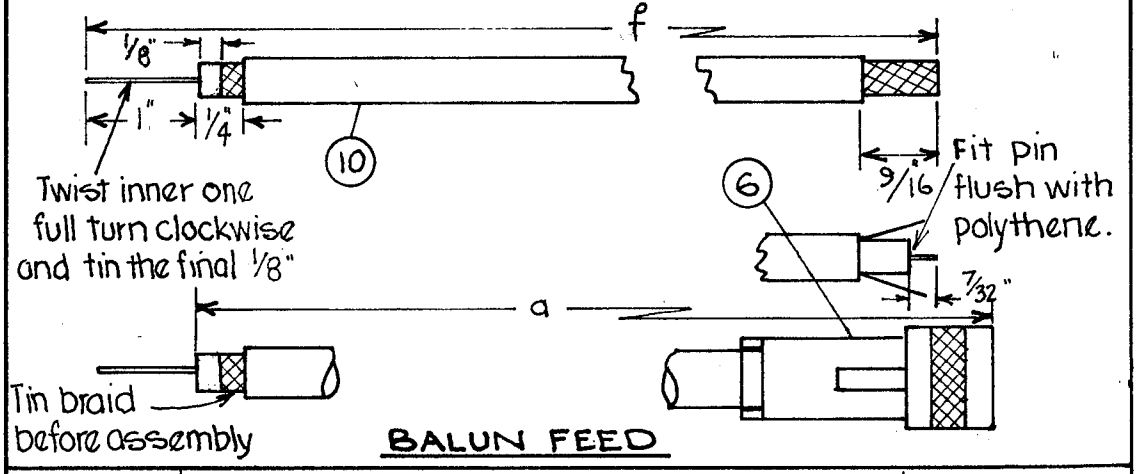
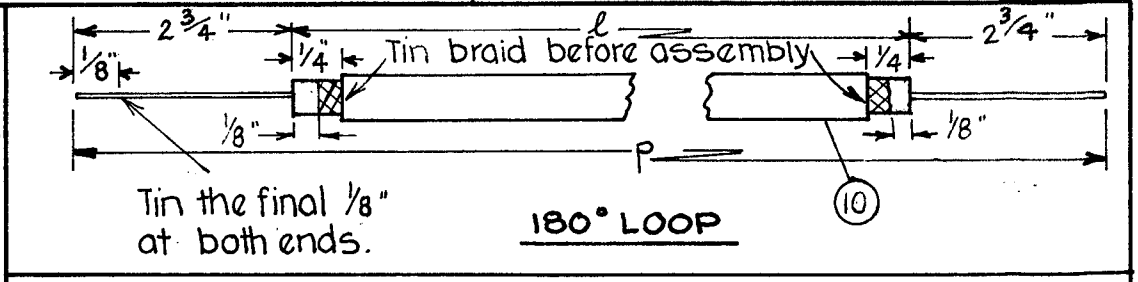
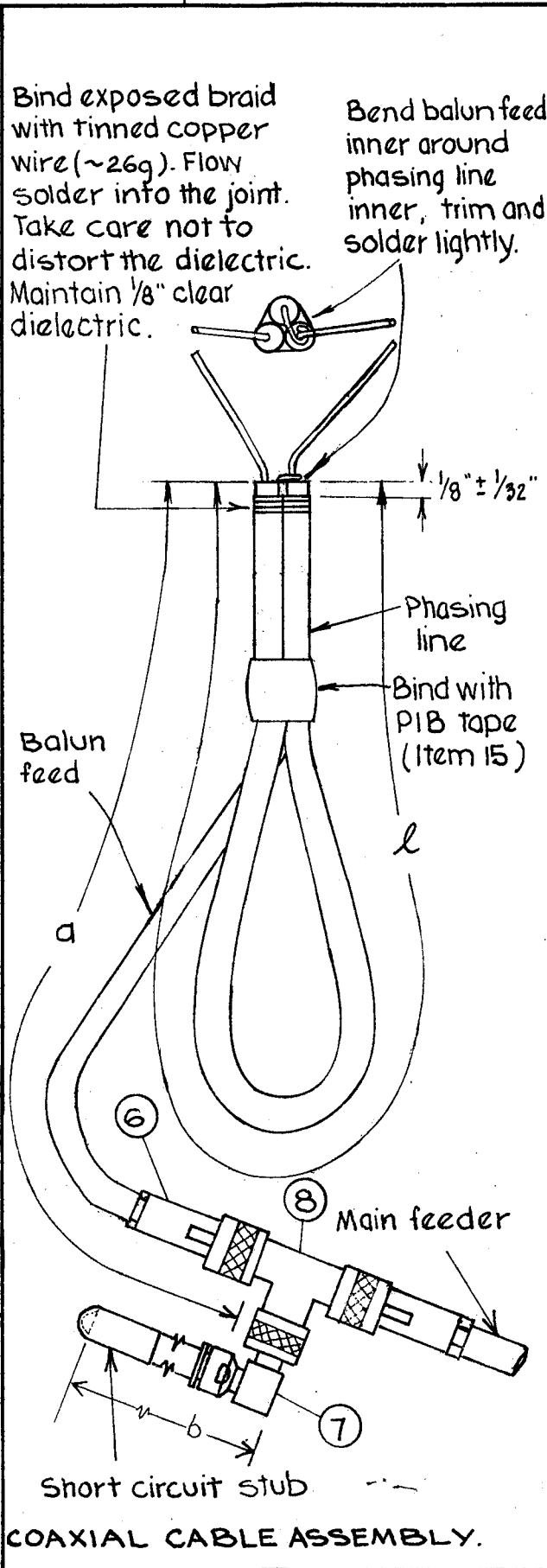


MATERIALS REQUIRED			
Nº	DESCRIPTION	S/L Nº	REQ'D
1	Perspex Balun Block	579-52	1
2	2"x 3/16" Ø S.S. R.H. screw	360-21	2
3	3/16" Ø S.S. nut to fit H.2.	360-40	2
4	3/16" id S.S. Washer radial split	336-41	2
5	4BA Brass flat washer	336-05	1
6	N-male straight connector	032-25	1
7	N-male elbow connector	032-01	1
8	N-FFF T Connector	034-44	1
9	Coaxial cable cap	230-33	1
10	RG213/U coaxial cable	221-09	
11	26g. tinned copper wire	226-09	
12	Araldite for potting	230-09	
13	Silastic R.T.V. 732	230-72	
14	PVC Solvent: Novacem A		
15	PIB Tape	068-15	

**Tolerances**  
All dimensions which are not toleranced in the drawing should be within  $\pm 1/32"$  of stated value

**Additional Dwg.**  
Mechanical Details A3-9826  
Balun Block A4-8150  
3el Horiz. Mtg. A3-10039/1  
5el Horiz. Mtg. A3-10039/2  
3el Vertical Mtg. A3-10039/3  
5el Vertical Mtg. A3-10039/4

AMENDMENTS		
ORIGIN	BY	DATE



**COAXIAL CABLE COMPONENTS**

**MEASUREMENTS FOR MANUFACTURE, CHECKING & IDENTIFICATION.**  
Measurements p, f, s, are to be used for manufacture  
Measurements a, b, l allow checking & identification of a balun and should be within  $1/8"$  of stated values.

IDENTIFICATION							MANUFACTURE						
CHAN	3 ELEMENT			5 ELEMENT			CHAN	3 ELEMENT			5 ELEMENT		
	1	2	3	1	2	3		1	2	3	1	2	3
c	83"	68½"	60⅞"	83"	68½"	60⅞"	P	88½"	74"	66⅜"	88½"	74"	66⅜"
a	101½"	83⅛"	75¾"	98½"	82⅛"	73⅝"	f	102"	83⅝"	76¼"	99"	82⅝"	73⅜"
b	32⅟16"	27⅜"	25¼"	34⅜"	28⅝"	25¾"	s	32⅟16"	27"	24⅞"	33⅜"	27⅟16"	25⅜"



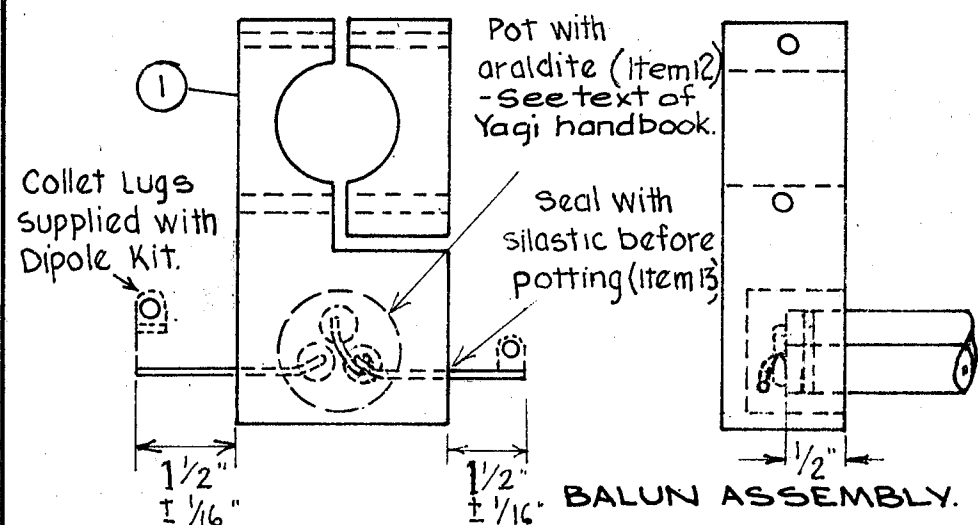
**TITLE**  
YAGI AERIAL - BAND I

**SUB TITLE**  
BALUN AND STUB.

ORIGIN	M. POWNALL	DATE	14-8-69
DRAWN	J. BARGH	CHKD	A.C.
APPD	B.D.H. Given	DATE	16-1-70
STATION No.		HEAD OFFICE No.	19-2-70
A3			9762 / 1



A



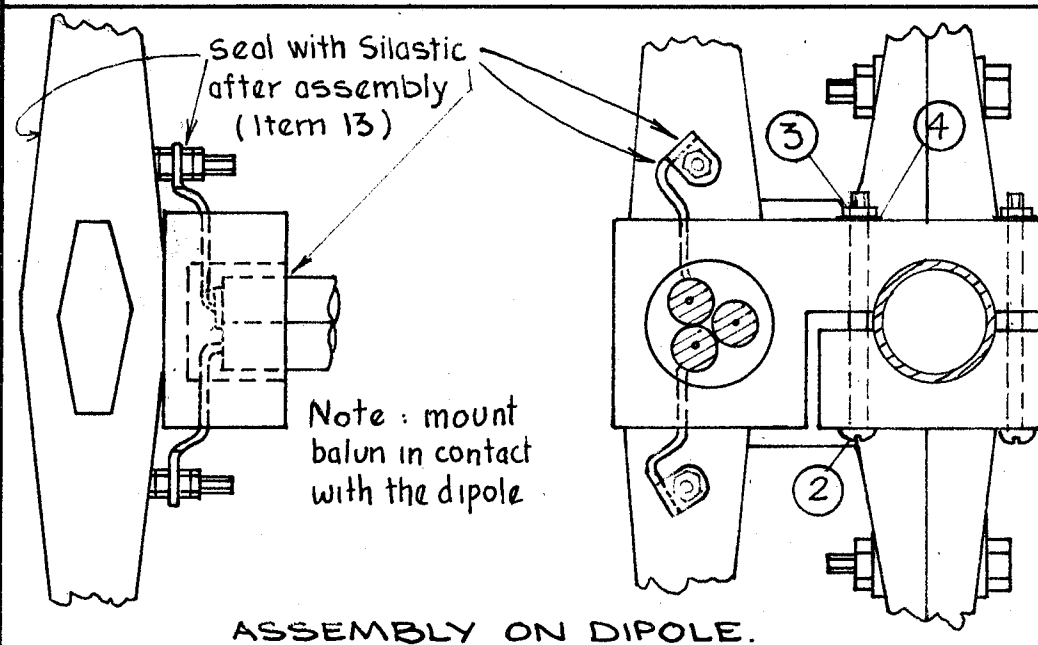
B

C

D

E

F



G

## MATERIALS REQUIRED

Nº	DESCRIPTION	S/L Nº	REQ'D
1	Perspex Balun Block	579-52	1
2	2"x 3/16" Ø S.S. R.H. screw	360-21	2
3	3/16" Ø S.S. nut to fit IT. 2	360-40	2
4	3/16" id. S.S. Washer radial split	336-41	2
5	4BA Brass flat washer	336-05	1
6	N-male straight connector	032-25	1
7	N-male elbow connector	032-01	1
8	N-FFF T connector	034-44	1
9	Coaxial cable cap	230-33	1
10	RG 213/U Coaxial cable	221-09	
11	26g. Tinned copper wire	226-09	
12	Araldite for potting	230-09	
13	Silastic R.T.V. 732	230-72	
14	PVC Solvent: Novacem A		
15	P1B Tape	068-15	

H

J

K

## Tolerances.

All dimensions which are not toleranced in the drawing should be within  $\pm 1/32"$  of stated values.

## Additional Drawings

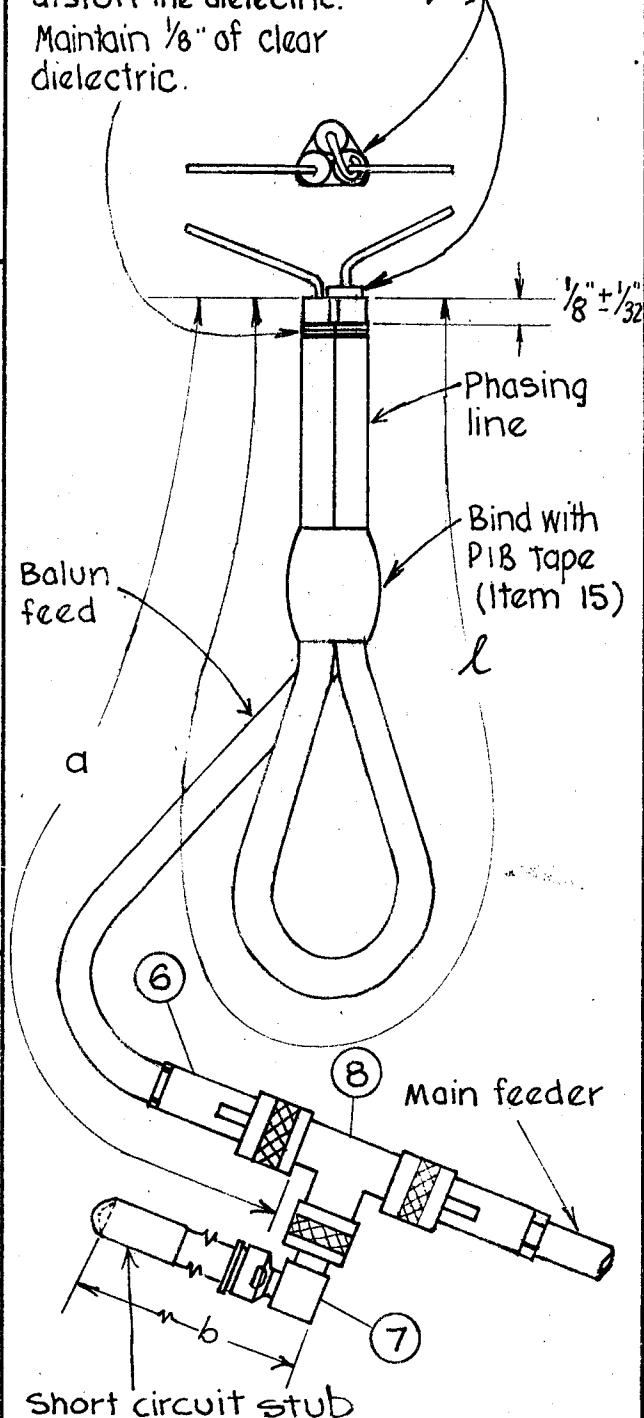
Balun Block A4. 8150

## AMENDMENTS

ORIGIN	BY	DATE
J. Caird	E.H.D.	24.4.70

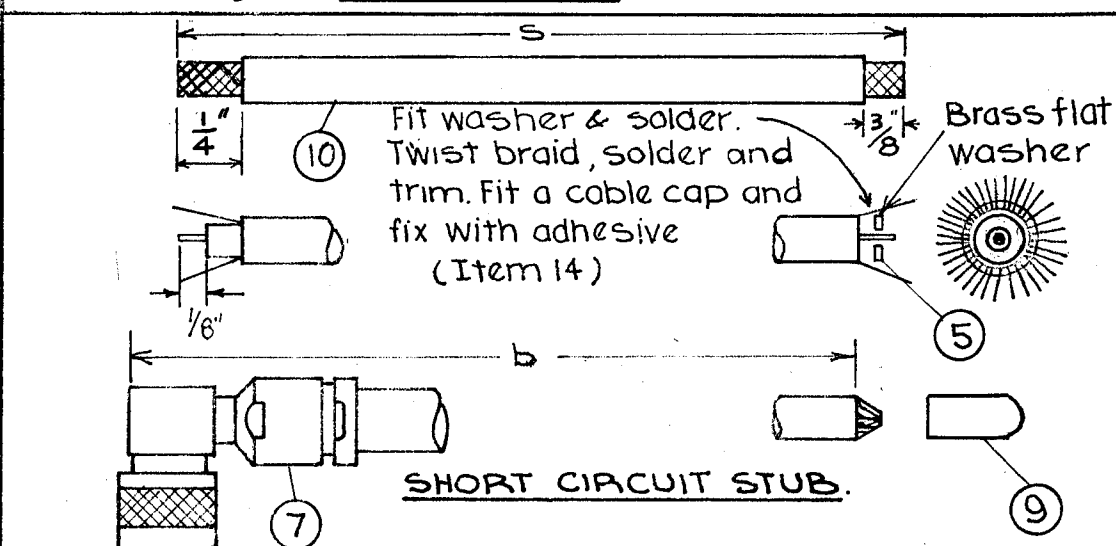
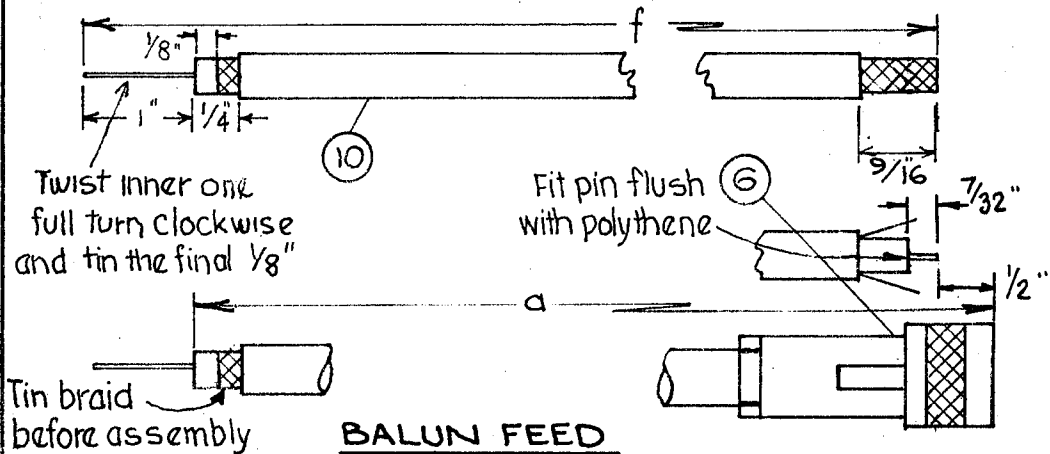
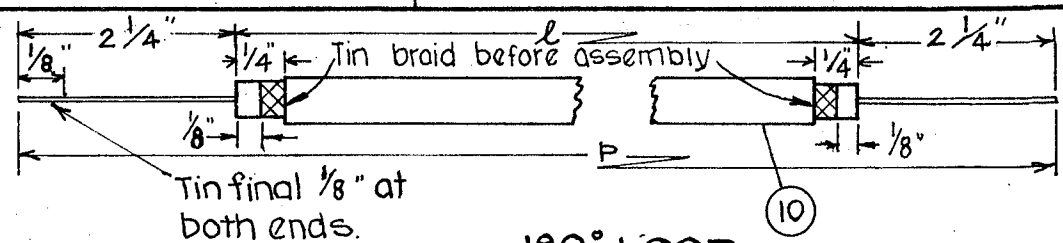
Bind exposed braid with tinned copper wire (~26g). Flow solder into the joint. Take care not to distort the dielectric. Maintain  $1/8"$  of clear dielectric.

Bend balun feed inner around phasing line inner, trim & solder lightly.



## COAXIAL CABLE ASSEMBLY.

8



## COAXIAL CABLE COMPONENTS.

MEASUREMENTS FOR MANUFACTURE, CHECKING, & IDENTIFICATION. Measurements p, f, s are to be used for manufacture. Measurements a, b, l allow checking & identification of a balun and should be within  $1/16"$  of stated values.

IDENTIFICATION							MANUFACTURE						
CHAN	4	5	6	7	8	9	CHAN	4	5	6	7	8	9
l	22 3/8	21 5/8	20 3/4	20"	19 1/4	18 3/4	p	26 7/8	26 1/8	25 1/4	24 1/2	23 3/4	23 1/4
a	22 1/4	21 7/16	20 1/4	19 5/16	19 1/4	18 3/8	f	22 3/4	21 5/16	20 3/4	20 7/16	19 3/4	18 7/8
b	7 7/16	7 1/8	7 1/8	6 13/16	6 9/16	5 13/16	s	7 1/16	6 3/4	6 3/4	6 7/16	6 3/16	5 7/16

TITLE

YAGI AERIAL BAND III

SUB TITLE

BALUN &amp; STUB.

ORIGIN M. POWNALL

DRAWN J. BARGH

CHKD J.A.C.

APPD C.D.H. GIVEN

STATION No.

A3

HEAD OFFICE No.

9762/2

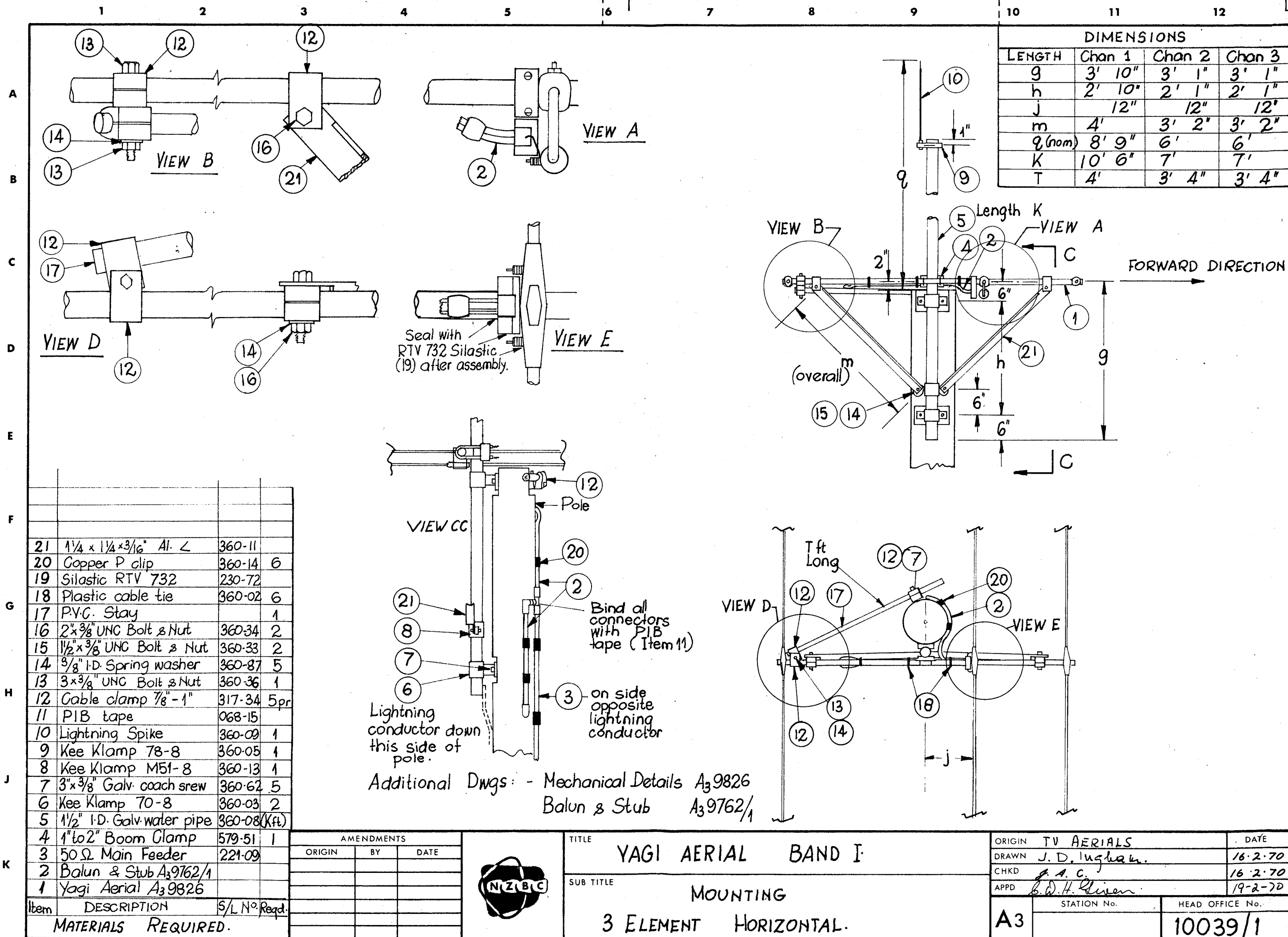
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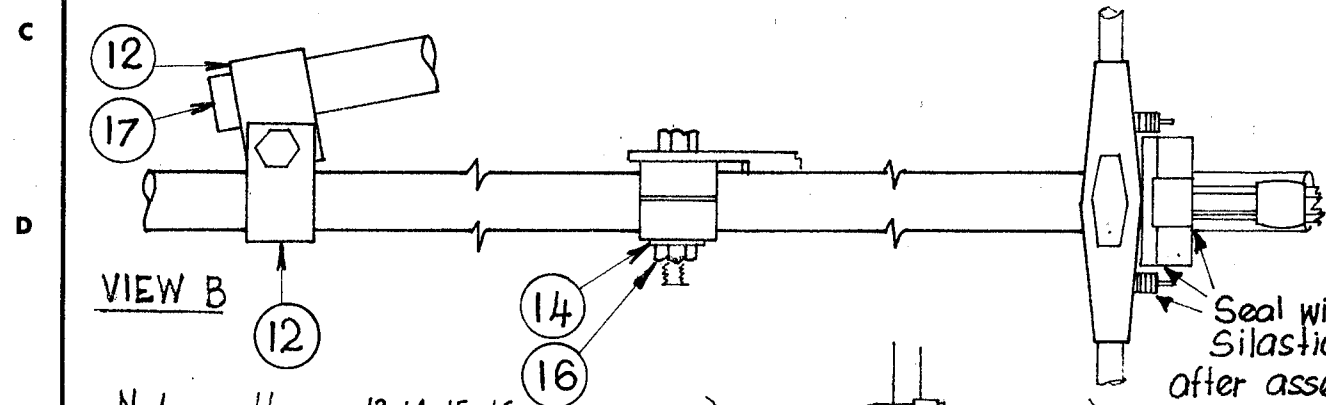
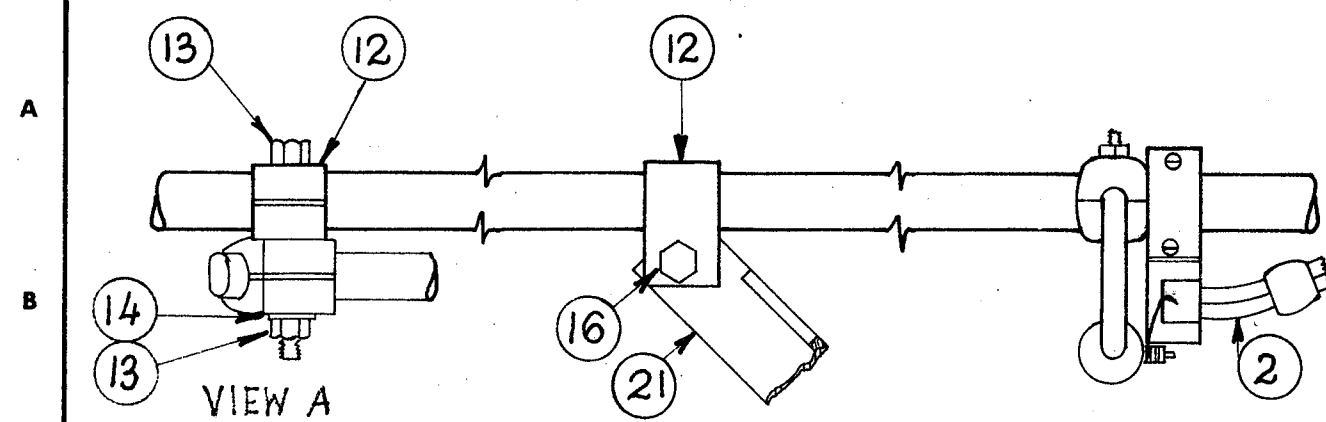
13.8.69

16.1.70

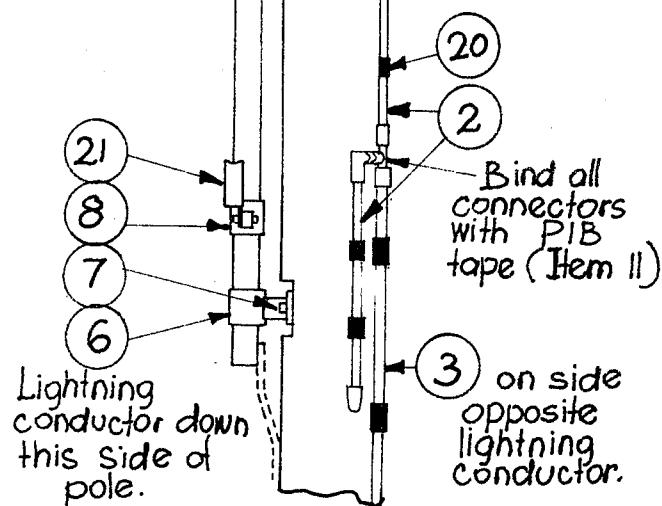
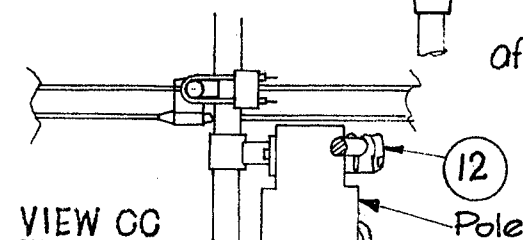
19.2.70







Note:- Items 13, 14, 15, 16  
are plated and should be  
zinc painted when  
installed



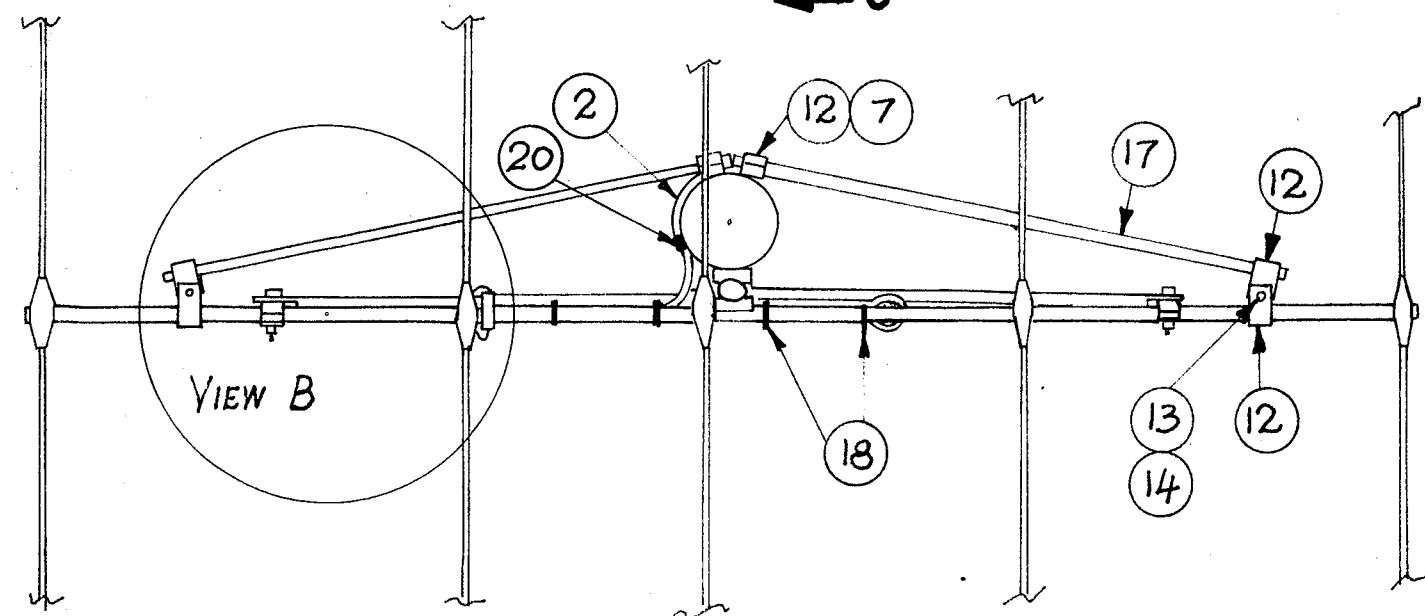
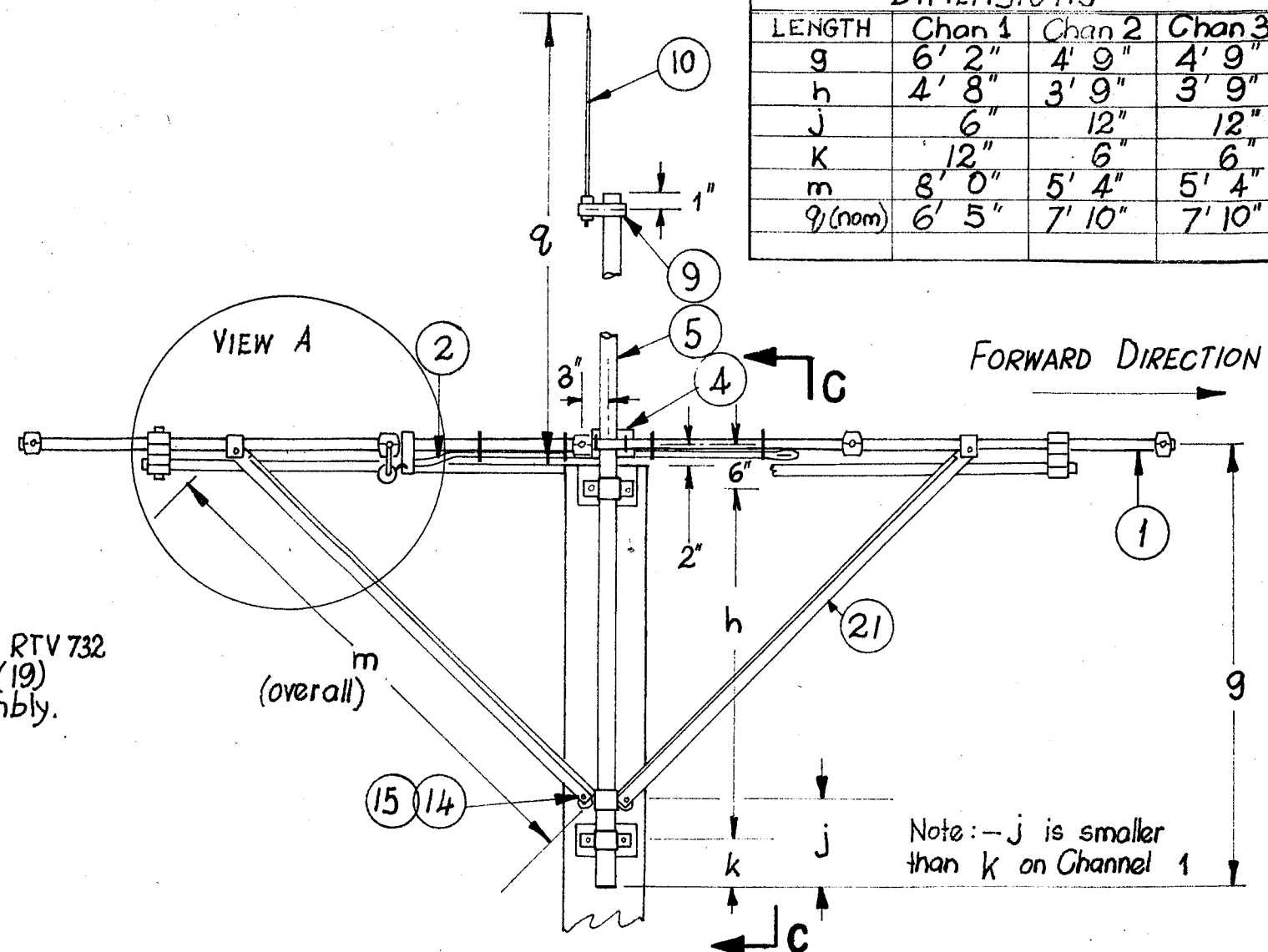
Additional Dwg.s. :  
Mechanical Details A3 9826  
Balun & stub. A3 9762/1

21	1/4 x 1/4 x 3/16" Al. L	360-11	
20	Copper P clip	360-14	6
19	Silastic RTV 732	230-72	
18	Plastic cable tie	360-02	6
17	P.Y.C. Stay 5'		2
16	2" x 3/8" UNC Bolt & Nut	360-34	2
15	1 1/2" x 3/8" UNC Bolt & Nut	360-33	2
14	3/8 I.D. spring washer	360-87	6
13	3" x 3/8" UNC Bolt & Nut	360-36	2
12	Cable Clamp 7/8"-1"	317-34	8 pr.
11	PIB Tape	068-15	
10	Lightning spike	360-09	1
9	Kee Klamp 78-8	360-05	1
8	Kee Klamp M51-8	360-13	1
7	3" x 3/8" Galv. coach screw	360-62	6
6	Kee Klamp 70-8	360-03	2
5	1 1/2" I.D. Galv. water pipe	360-08	10' 6"
4	1" to 2" Boom Clamp	579-51	1
3	50Ω main feeder	221-09	
2	Balun & stub A3 9762/1		1
1	Yagi aerial A3 9826		1
Item	Description	S/L No.	Reqd
Materials Required.			

[illegible]

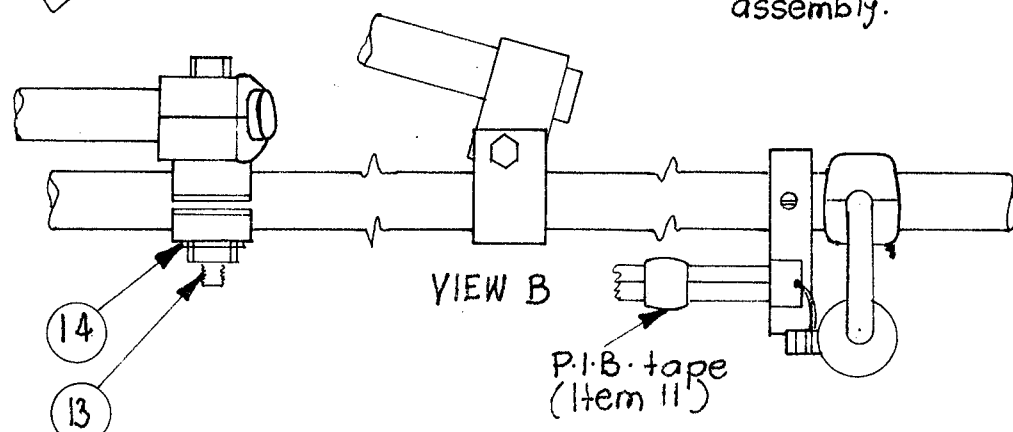
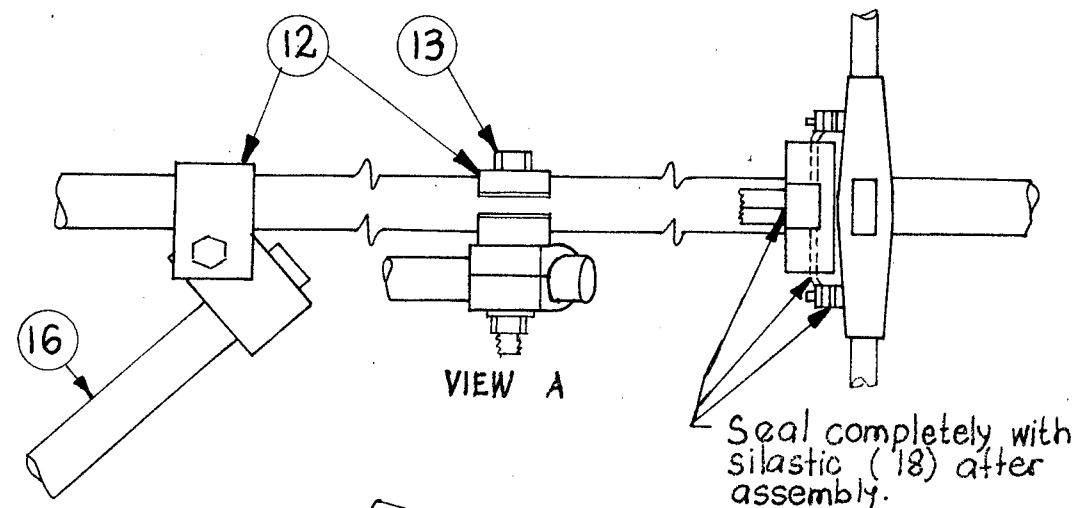
TITLE	YAGI AERIAL - BAND I.
SUB TITLE	MOUNTING 5 ELEMENT HORIZONTAL

DIMENSIONS			
LENGTH	Chan 1	Chan 2	Chan 3
g	6' 2"	4' 9"	4' 9"
h	4' 8"	3' 9"	3' 9"
j	6"	12"	12"
k	12"	6"	6"
m	8' 0"	5' 4"	5' 4"
q (nom)	6' 5"	7' 10"	7' 10"

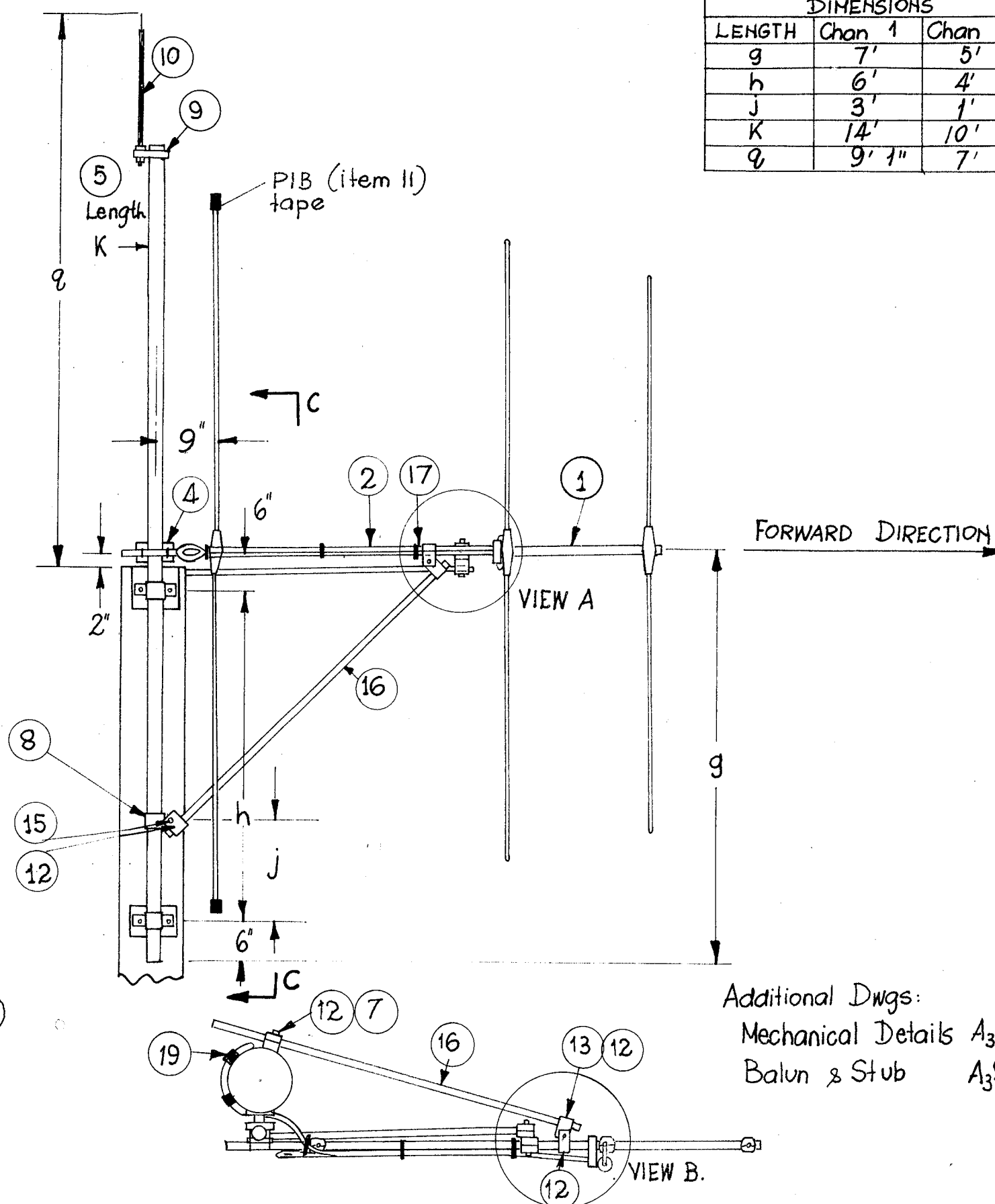
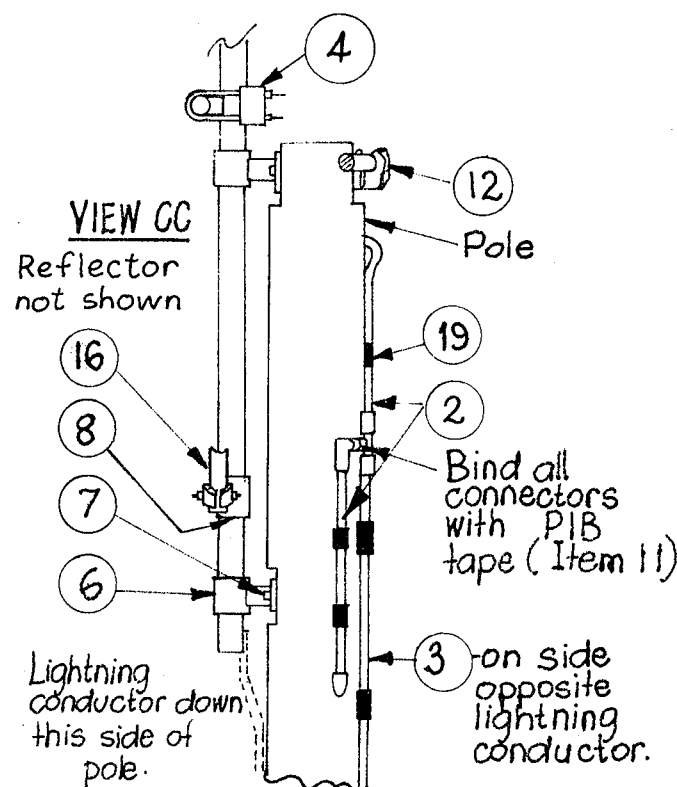


ORIGIN	T.V. AERIALS		DATE
DRAWN	J.D. INGHAM		16-2-70
CHKD	J.A.C.		16-2-70
APPD	B.D.H. Quinn		19-2-70
A3	STATION No.	HEAD OFFICE No.	
		10039/2	

DIMENSIONS		
LENGTH	Chan 1	Chan 2 & 3
g	7'	5' 3"
h	6'	4' 3"
j	3'	1' 3"
K	14'	10' 6"
q	9' 1"	7' 4"



NOTE: Items 13, 14, 15 are plated & should be zinc painted after installation.



Additional Dwg:  
Mechanical Details A<sub>3</sub>9826  
Balun & Stub A<sub>3</sub>9762/1

Item	DESCRIPTION	S/L No	Reqd
19	Copper Pclips	360-14	6
18	Silastic RTV 732	230-72	
17	Plastic cable tie	360-02	6
16	PVC Stay (5ft)		2
15	2"x3/8" UNC Bolt & Nut	360-34	1
14	3/8" I.D. Spring Washer	360-87	3
13	3"x3/8" UNC Bolt & Nut	360-36	2
12	Cable Clamp 7/8"-1"	317-34	6 pr.
11	PIB tape	068-15	
10	Lightning Spike	360-09	1
9	Kee Klamp 78-8	360-05	1
8	Kee Klamp M50-8	360-04	1
7	3"x3/8 Galv. coach screw	360-62	5
6	Kee Klamp 70-8	360-03	2
5	1 1/2" I.D. Galv. water pipe	360-08 (K ft)	
4	1' to 2" Boom Clamp	579-51	1
3	50Ω main feeder	221-09	
2	Balun & Stub A <sub>3</sub> 9762/1		
1	Yagi Aerial A <sub>3</sub> 9826		

MATERIALS REQUIRED.

AMENDMENTS		
ORIGIN	BY	DATE



TITLE  
**YAGI AERIAL - BAND 1.**

SUB TITLE  
**MOUNTING  
3 ELEMENT VERTICAL.**

ORIGIN	TV. AERIALS	DATE	
DRAWN	J.D. INGHAM.	16.2.70	
CHKD	A. C.	16.2.70	
APPD	B.D.H. Given.	19.2.70.	
STATION No.		HEAD OFFICE No.	
A3		10039/3	

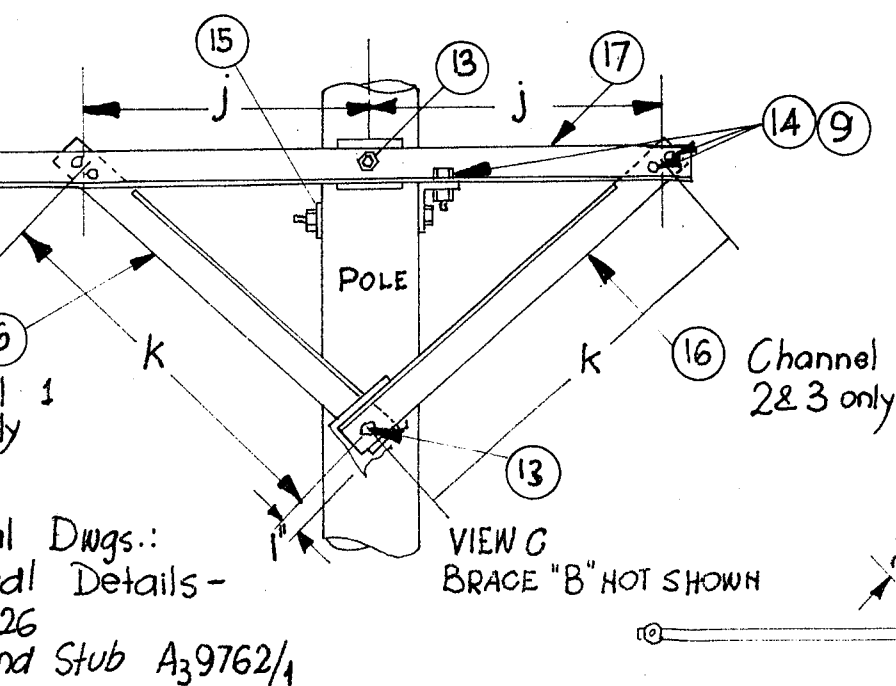
A

1. Choose length of service bolt (13)  
1" to 1 1/2" longer than pole diameter  
at this height.


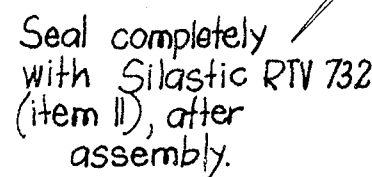
2. Items 8, 9, 14, 15 are plated and should be zinc painted when installed.

H

**K**



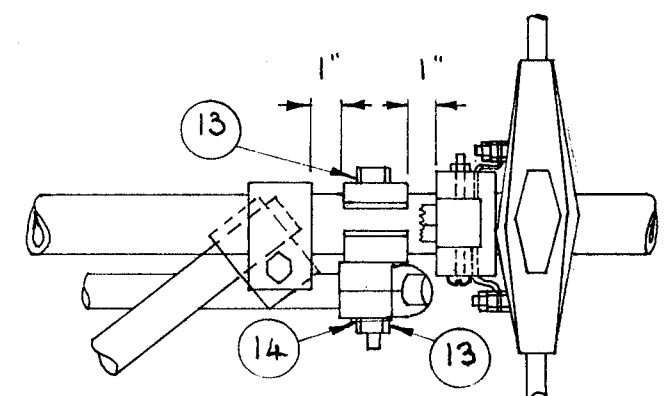
Additional Dwg.:  
Mechanical Details -  
- A3 9826  
Balun and Stub A3 9762/1



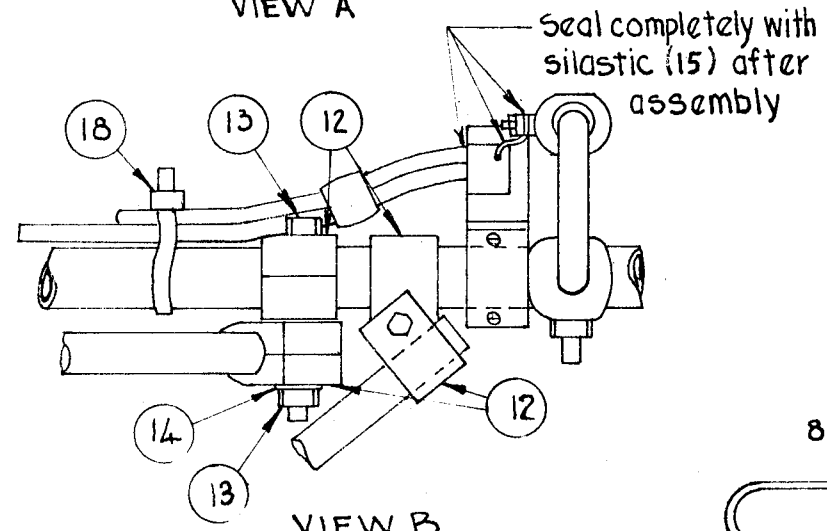
ORIGIN	T.V. AERIALS		DATE
DRAWN	J.D. INGHAM.		16-2-70
CHKD	J. A. C.		16-2-70
APPD	B. D. H. Givier.		19-2-70
A3	STATION No.	HEAD OFFICE No.	
		10039/4	

A  
B  
C  
D  
E  
F  
G  
H  
J  
K

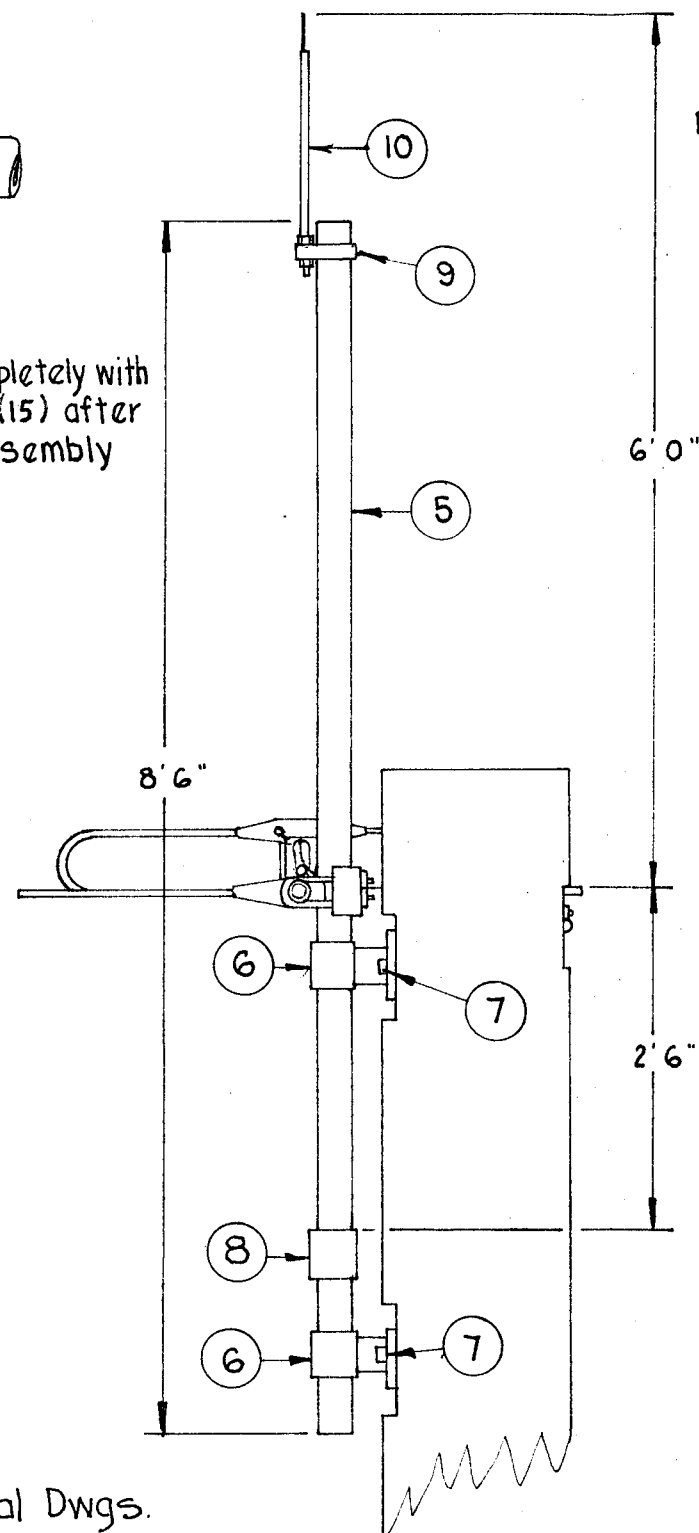
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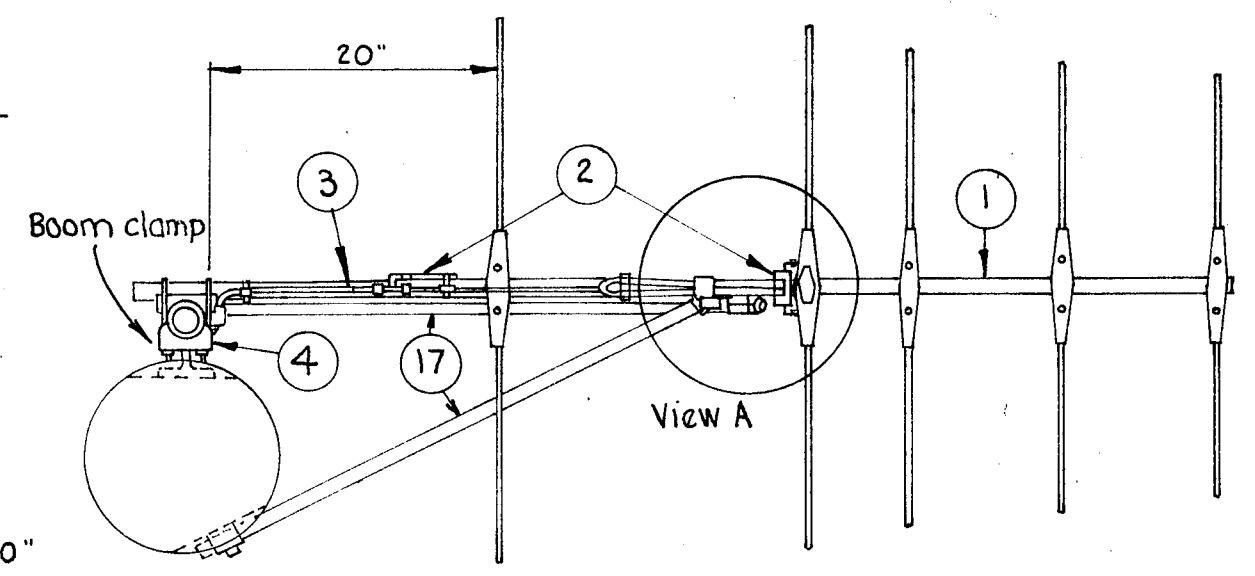
VIEW A



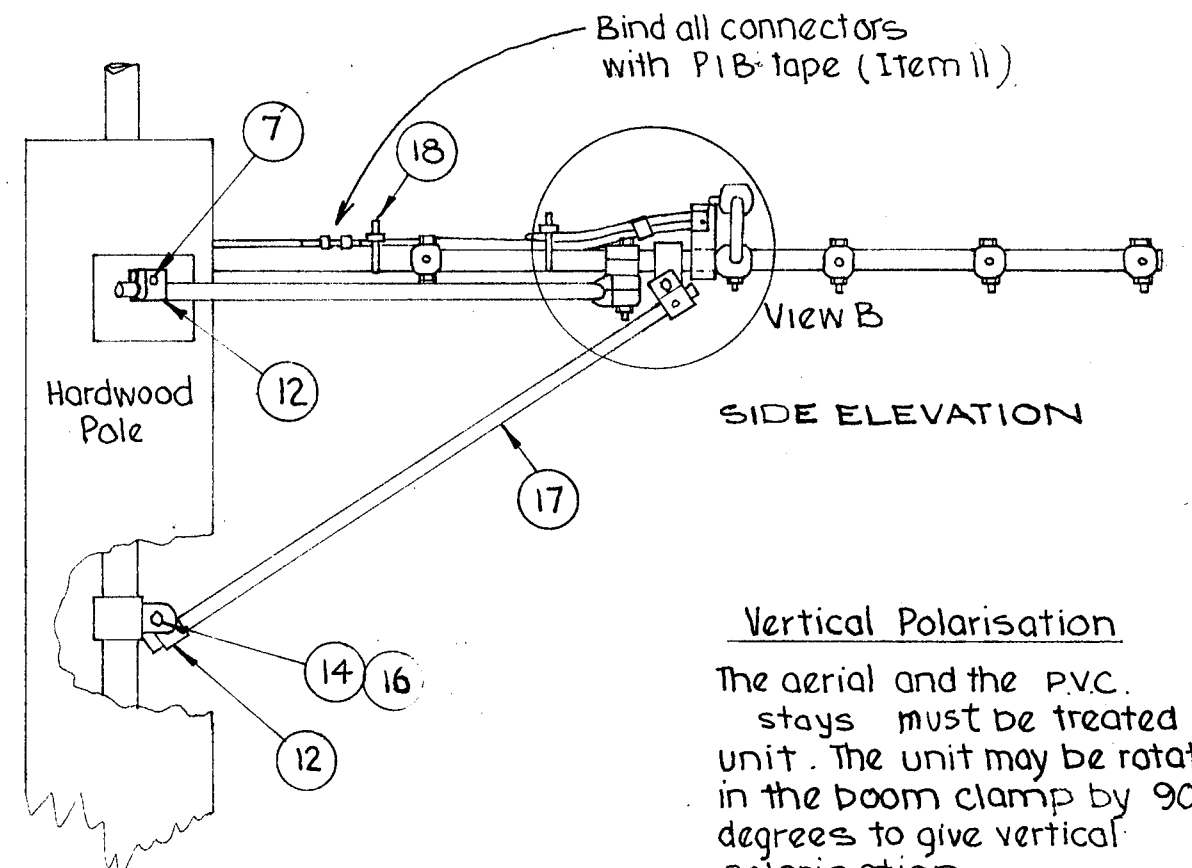
VIEW B



REAR ELEVATION



PLAN  
Horizontal Polarisation.



SIDE ELEVATION

Vertical Polarisation

The aerial and the P.V.C. stays must be treated as a unit. The unit may be rotated in the boom clamp by 90 degrees to give vertical polarisation.

Lightning Protection  
See text for details of protection required.

Additional Dwgs.  
Mechanical Details A3-9827  
Balun Stub A3 9762/2.

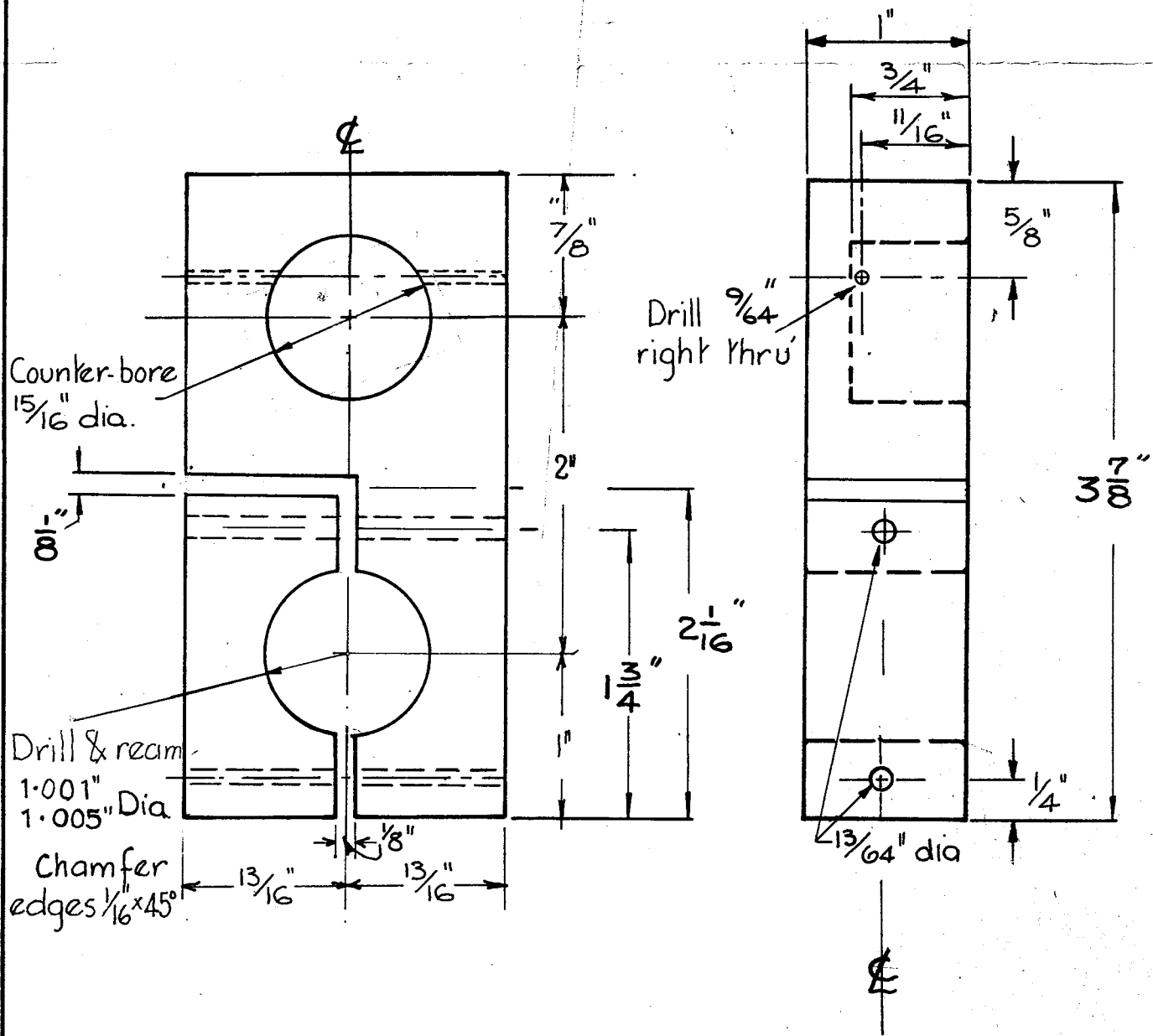
No	Description	S/L N°	Reqd
19	Silastic RTV 732	230-72	
18	Plastic cable tie	360-02	12
17	P.V.C. Stay		2
16	2"x 3/8" UNC BOLT & NUT	360-34	1
15	Silastic sealant	230-72	
14	3/8" i.d. ss. washer	360-81	3
13	3"x 3/8" UNC BOLT & NUT	360-36	2
12	Cable clamp 7/8"-1"	317-34	6 pr
11	PIB Tape	068-15	
10	Lightning spike	360-09	1
9	Kee klamp 78-8	360-05	1
8	Kee klamp m50-8	360-04	1
7	3"x 3/8" Galv. coach screw	360-62	5
6	Kee klamp 70-8	360-03	2
5	1 1/2" i.d. galv. water pipe	360-08	8'6"
4	1"-2" Boom clamp	579-51	1
3	50Ω Main feeder	221-09	1
2	Balun & stub A3-9762/2		1
1	Yagi aerial A3-9827		1
No	Description	S/L N°	Reqd
Materials Required			

AMENDMENTS		
ORIGIN	BY	DATE



TITLE	YAGI AERIAL BAND III
SUB TITLE	MOUNTING

ORIGIN	M. J. POWNALL	DATE	
DRAWN	J. BARGH	30.9.69	
CHKD	G. A. C.	16.1.70	
APPD	G. S. H. Given	19.2.70	
A3	STATION No.	HEAD OFFICE No.	
		9850	



# NOTES

MATERIAL : 1" Thick perspex.

FINISH : Natural. Lightly chamfer all corners & edges.

SCALE : Full size

## BALUN BLOCK

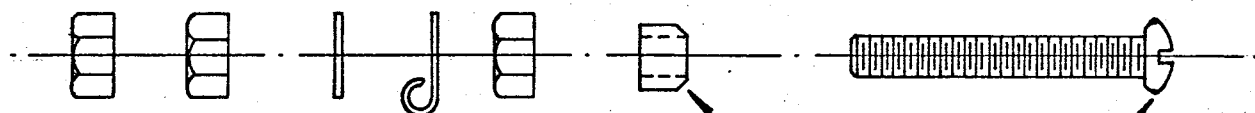


NEW ZEALAND  
BROADCASTING  
CORPORATION

ORIGIN	R. B. VERNALL	CHKD	R. B. VERNALL
DRAWN	"	APPVD	B. D. P. Lisen
TRACED	J. F. S.	DATE	20/12/66
SIZE	STATION No.	HEAD OFFICE No.	
A 4		8150	

Amended 10-11-69 E.H.D.  
Amended 5-3-69 E.D.B.  
Amended 9-8-68 P.J.R.  
Amended 4-7-67 E.H.D.





Radius these edges to approx.  
 $\frac{1}{32}$ " radius if not done so on  
 parts when received.

Note correct orientation of  
 spacer before assembly.

Feed point bolt assembly as shown in dipole

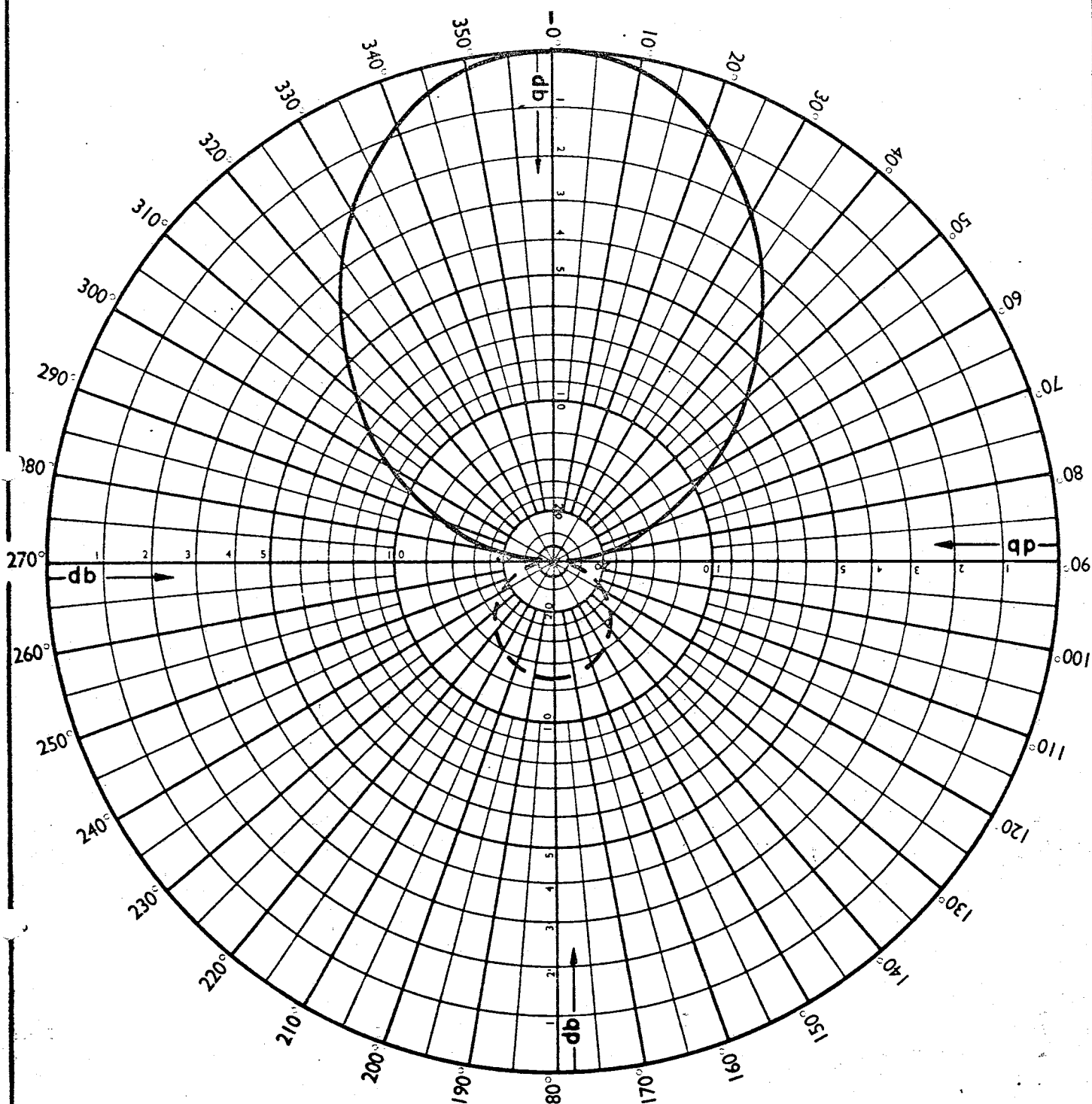
Section A-A drawing No A3 9826 (Band I)

A3 9827 (Band III)

TITLE <b>YAGI AERIAL BAND I &amp; III</b>	ORIGIN J. V. RICHARDS		DATE
SUB TITLE <b>MODIFICATION TO FEED          POINT ASSEMBLY</b>	DRAWN J. V. R. / S. M. SMITH		29.6.70
	CHKD J. D. I.		"
	APPVD J. A. C.		"
A4	STATION No.	HEAD OFFICE No. <b>10307</b>	

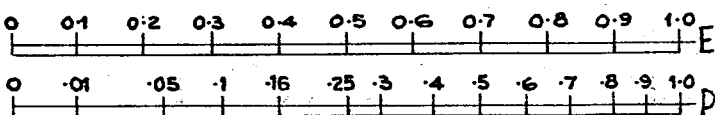


Typical horizontal radiation pattern



NOTES

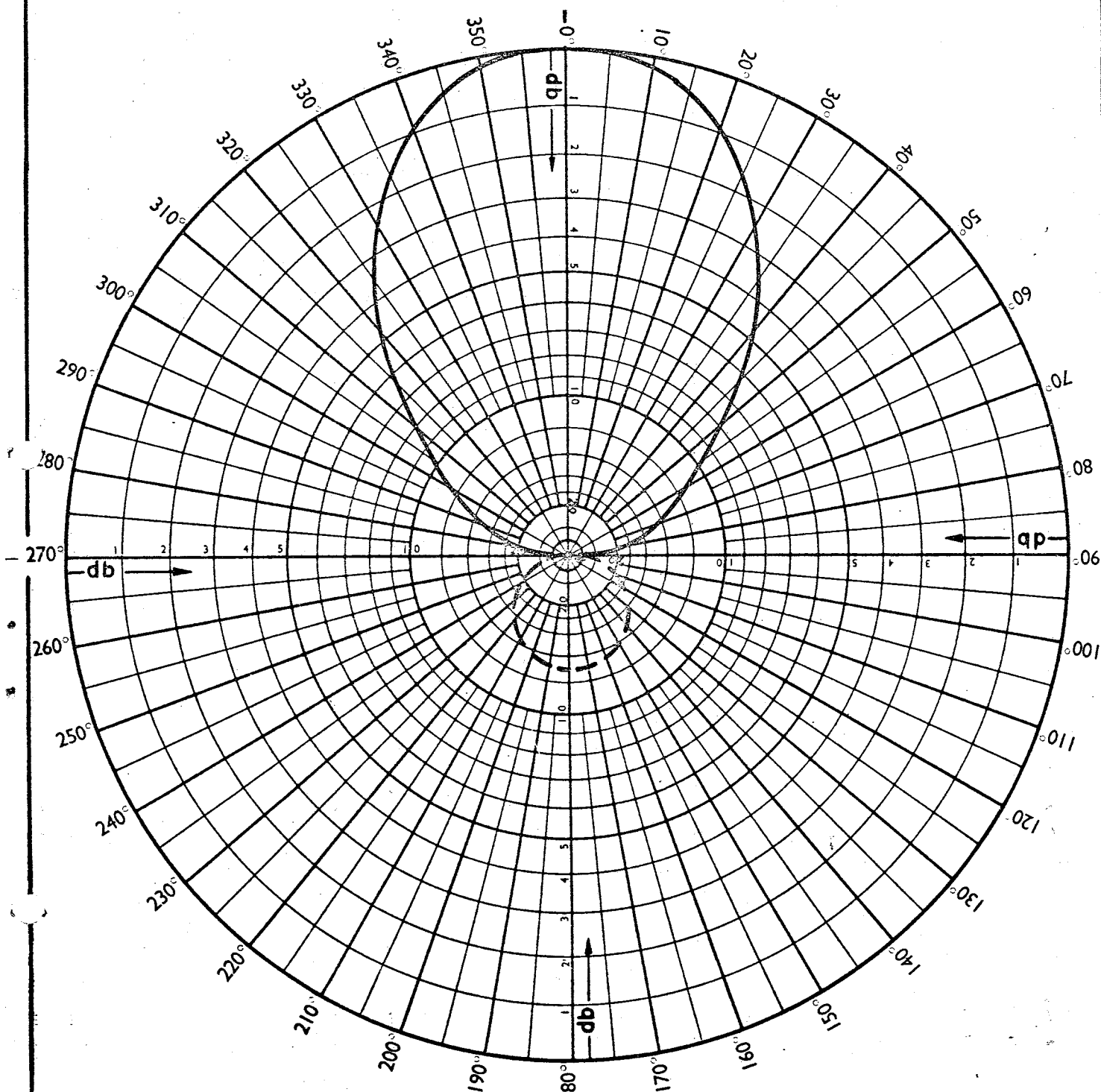
1. GAIN OVER ISOTROPIC SOURCE  $6-6\frac{1}{2}$  dB
2. Half power beamwidth :-  $72^\circ \pm 4^\circ$
3. Back lobe :- as shown  $\pm 2$  dB
4. Minima :-  $90^\circ, 270^\circ$  Deeper than  $-30$  dB.



NEW ZEALAND  
BROADCASTING  
CORPORATION

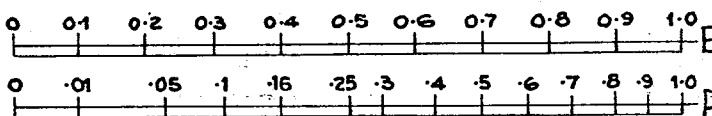
ORIGIN	T.V. AERIAL SECT.	CHKD	J.A.C.
DRAWN	J.D. INGHAM.	APPVD	B.W.H. Owen
TRACED	J.D. INGHAM.	DATE	19-2-70
SIZE	STATION No.	HEAD OFFICE No.	
A 4		10037/1	

Typical horizontal radiation pattern



NOTES

1. GAIN OVER ISOTROPIC SOURCE  $7\frac{1}{2}$ -8dB
2. Half power beamwidth :-  $65^\circ \pm 4^\circ$
3. Back lobe :- as shown  $\pm 3$ dB
4. Minima :-  $90^\circ, 270^\circ$  Deeper than -30dB.

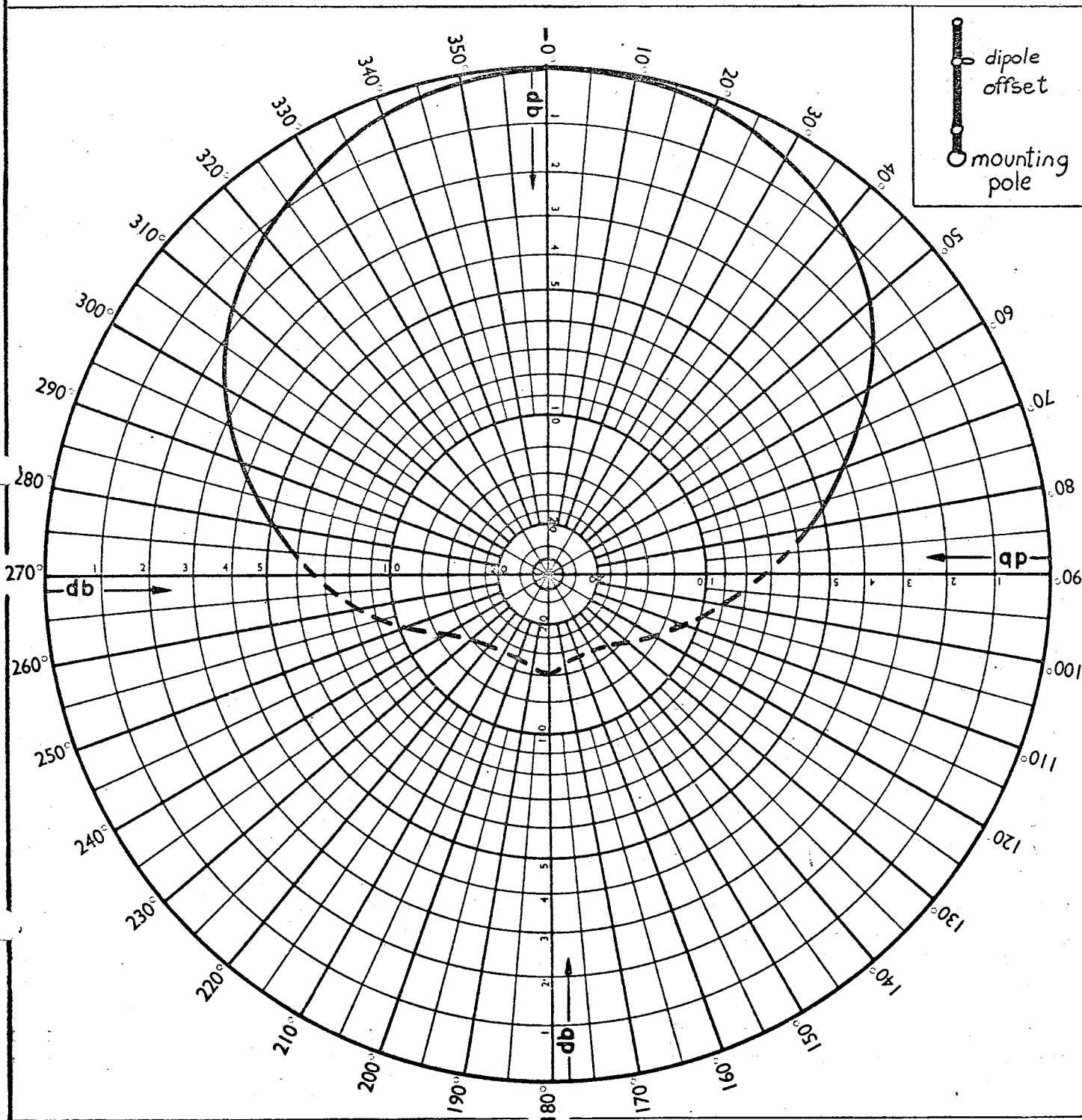


NEW ZEALAND  
BROADCASTING  
CORPORATION

ORIGIN	T.V. AERIAL SECT.	CHKD	J.A.C.
DRAWN	J.D. INGHAM	APPVD	B.D.H. Quinn
TRACED	J.D. INGHAM	DATE	19-2-70
SIZE	STATION No.	HEAD OFFICE No.	
A 4'		100 37/2	

# TITLE :- YAGI AERIAL BAND I 3 ELEMENT VERTICAL POLARISATION

## Typical horizontal radiation pattern



### NOTES

1. GAIN OVER ISOTROPIC SOURCE 6-6.5 dB
2. Half power beamwidth :-  $130^\circ \pm 10^\circ$
3. Back lobe (shown dotted)  $\pm 3$  dB
4. Mounting as shown in A3-10039/3
5. Pattern asymmetry due to dipole offset. See insert above.

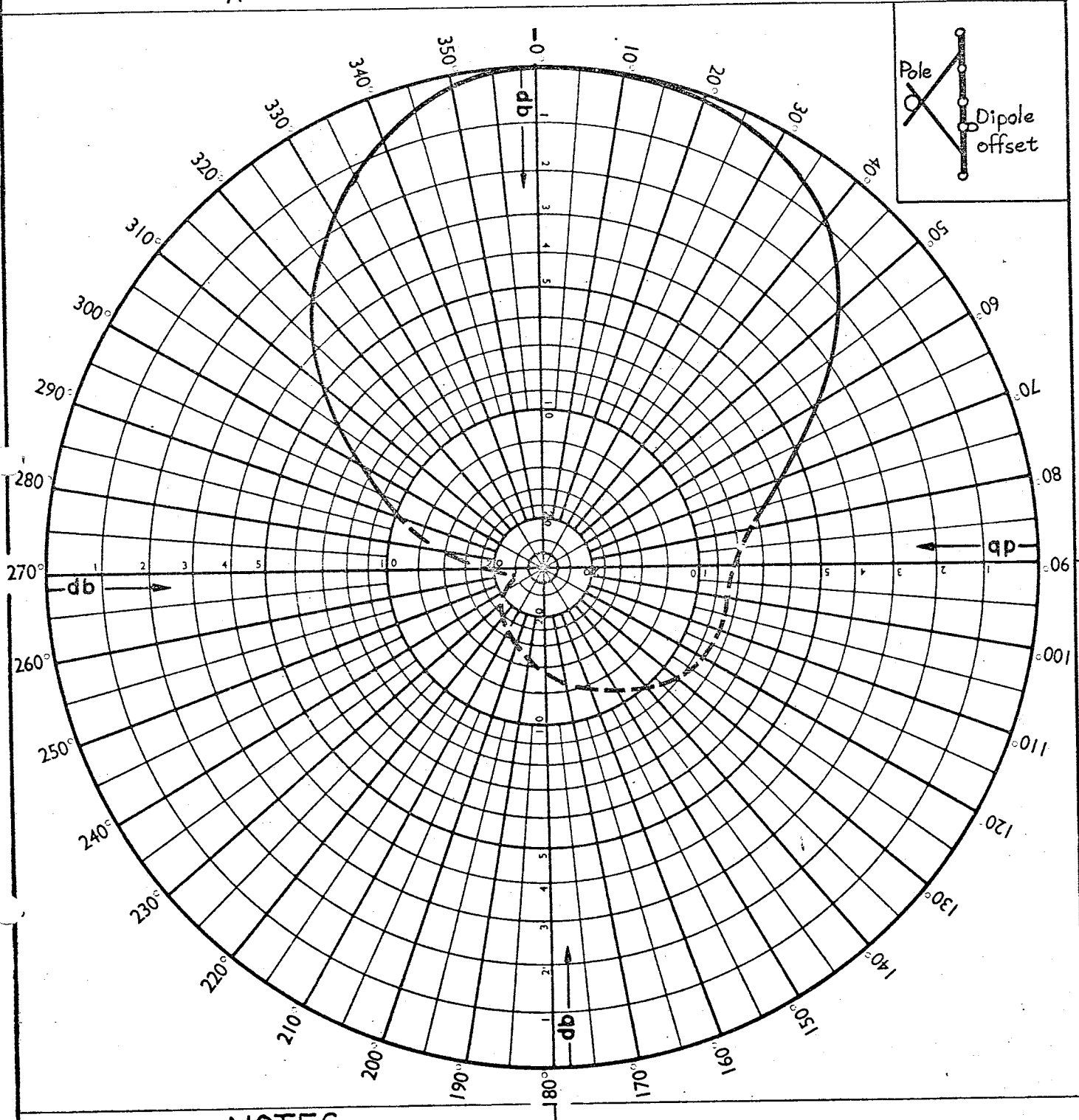


NEW ZEALAND  
BROADCASTING  
CORPORATION

ORIGIN	T.V. AERIAL SECT.	CHKD	J.A.C.
DRAWN	J.D. INGHAM	APPVD	B.D.H. Ewen
TRACED	J.D. INGHAM	DATE	19-2-70
SIZE	STATION No.	HEAD OFFICE No.	
A 4		10037/3	

# TITLE :- YAGI AERIAL BAND I 5 ELEMENT VERTICAL POLARISATION

Typical horizontal radiation pattern.



## NOTES

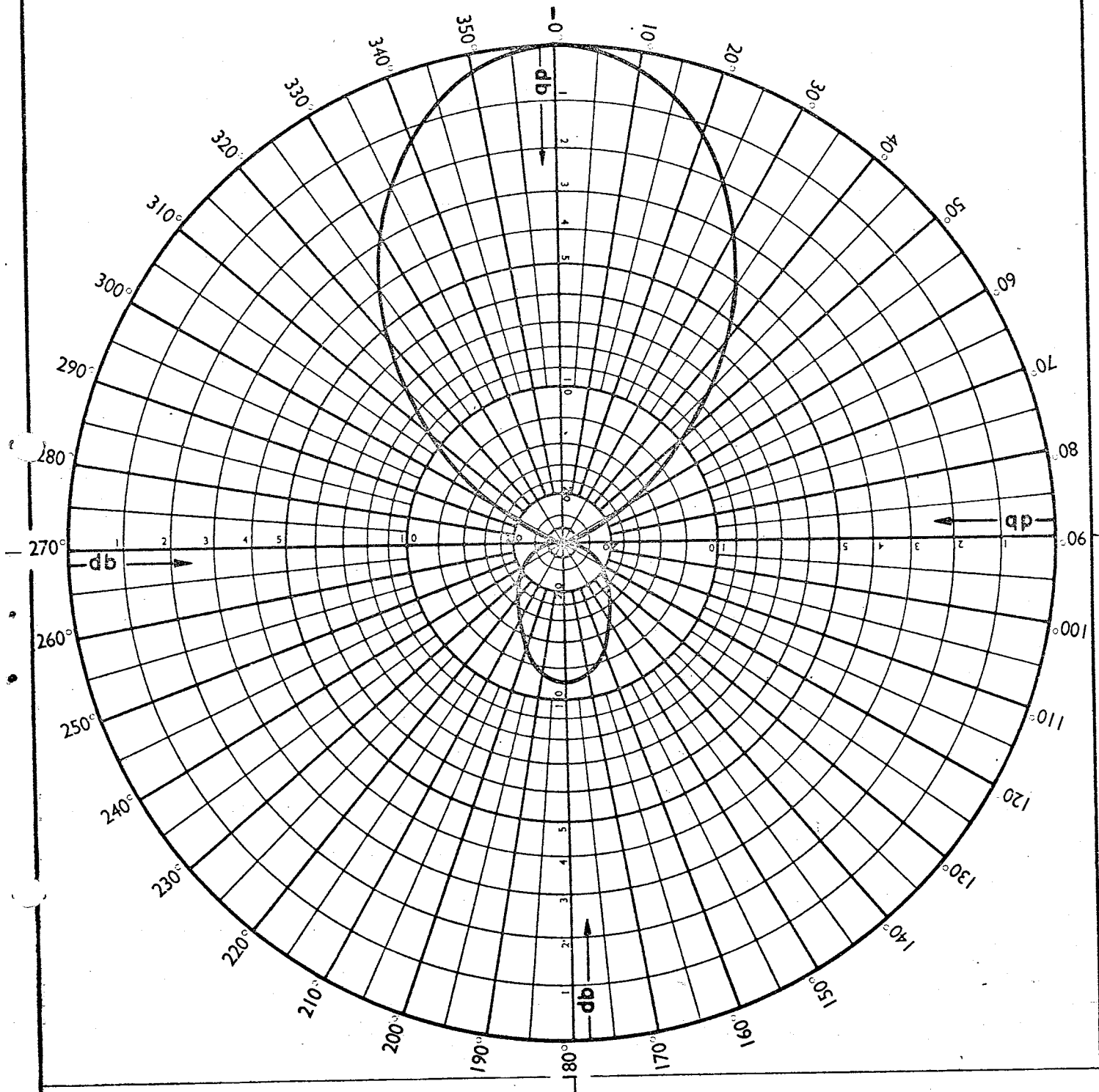
1. GAIN OVER ISOTROPIC SOURCE  $7\frac{1}{2}$ -8dB
2. Half power beamwidth:-  $95^\circ \pm 10^\circ$
3. Back lobe (shown dotted)  $\pm 3$ dB
4. Mounting as shown in A3-10039/4
5. Pattern asymmetry due to offset mounting on pole. See inset.



NEW ZEALAND  
BROADCASTING  
CORPORATION

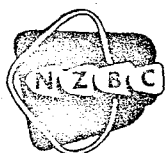
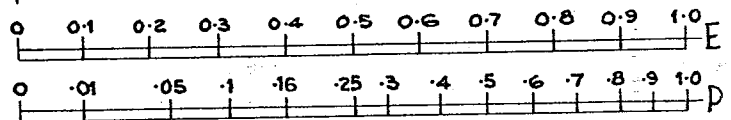
ORIGIN	T.V. AERIAL SECT.	CHKD	J. A. C.
DRAWN	J. D. INGHAM	APPVD	B. D. H. Gieson
TRACED	J. D. INGHAM	DATE	19-2-70
SIZE	STATION No.	HEAD OFFICE No.	
A 4		10037/4	

## Typical Horizontal Radiation Pattern



## NOTES

1. GAIN OVER ISOTROPIC SOURCE :  $8-8\frac{1}{2}$  db.
2. Half power beamwidth :  $60^\circ \pm 5^\circ$
3. Back lobe : as indicated  $\pm 3$  db.
4. Minima :  $90^\circ \pm 5^\circ \geq 33$  db.  
 $270^\circ \pm 5^\circ \geq 33$  db.
5. Mounting as shown in A3-9850

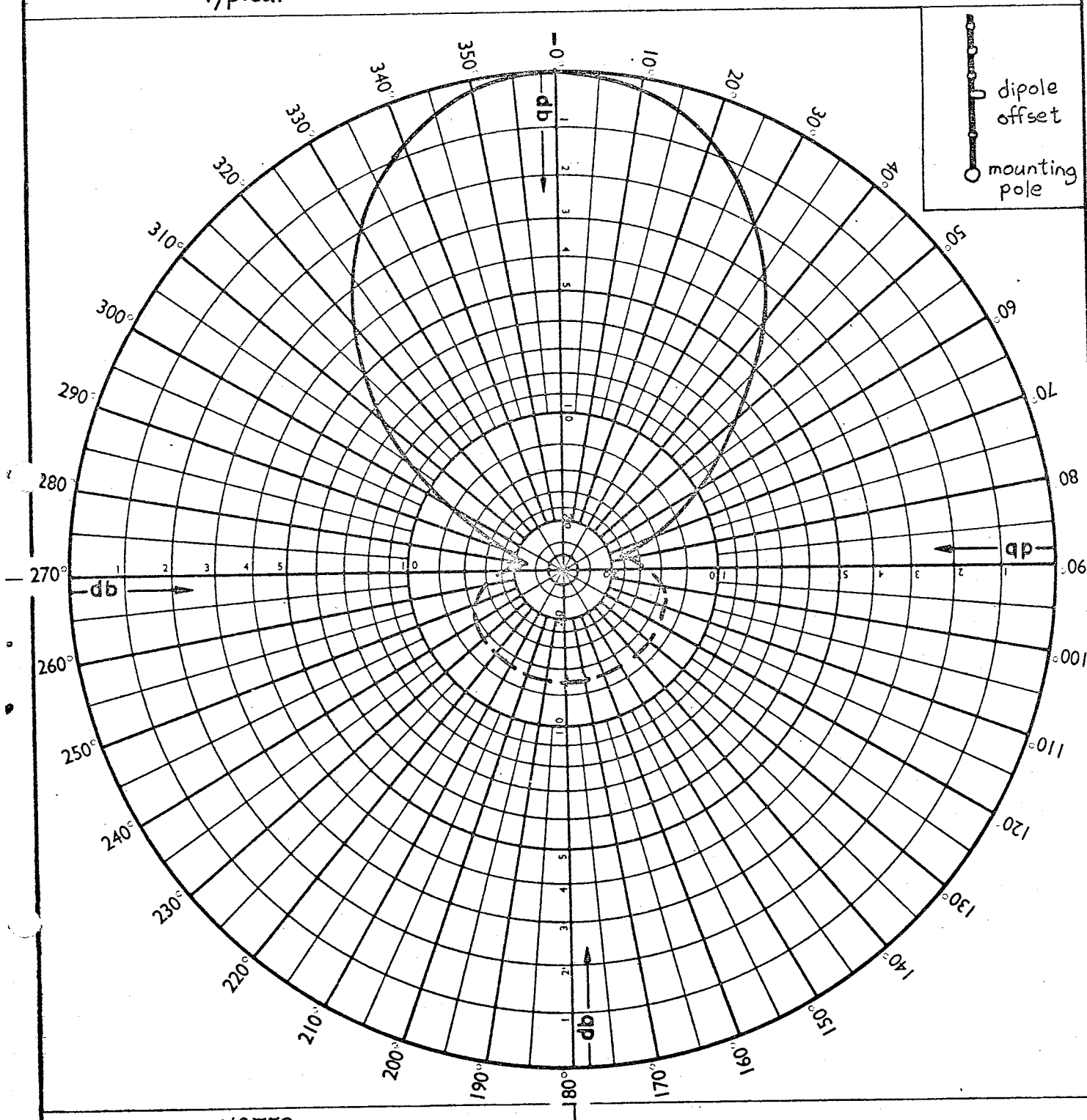


NEW ZEALAND  
BROADCASTING  
CORPORATION

ORIGIN	T.V. AERIAL SECT.	CHKD	J. A. C.
DRAWN	M. J. POWNALL.	APPVD	B. D. H. Gieson.
TRACED	J. D. INGHAM.	DATE	19-2-70
SIZE	STATION No.	HEAD OFFICE No.	
A 4		10037/5	

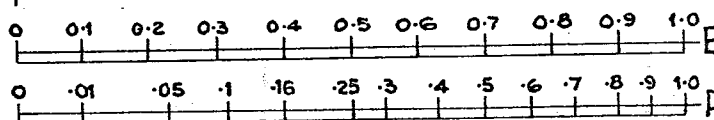
PROVISIONAL

## Typical Horizontal Radiation Pattern

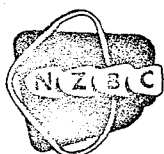


## NOTES

1. GAIN OVER ISOTROPIC SOURCE:  $8-8\frac{1}{2}$  db.
2. Half power beamwidth :  $73^\circ \pm 5^\circ$ .
3. Back lobe : as indicated  $\pm 3$  db.
4. Minima  $75^\circ \pm 5^\circ$  :  $19 \pm 2$  db.  
 $280^\circ \pm 5^\circ$  :  $23 \pm 2$  db.
5. Mounting as shown in A3-9850



6. Pattern asymmetry due to dipole offset.  
See insert above.

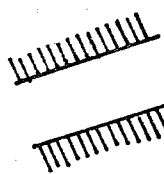
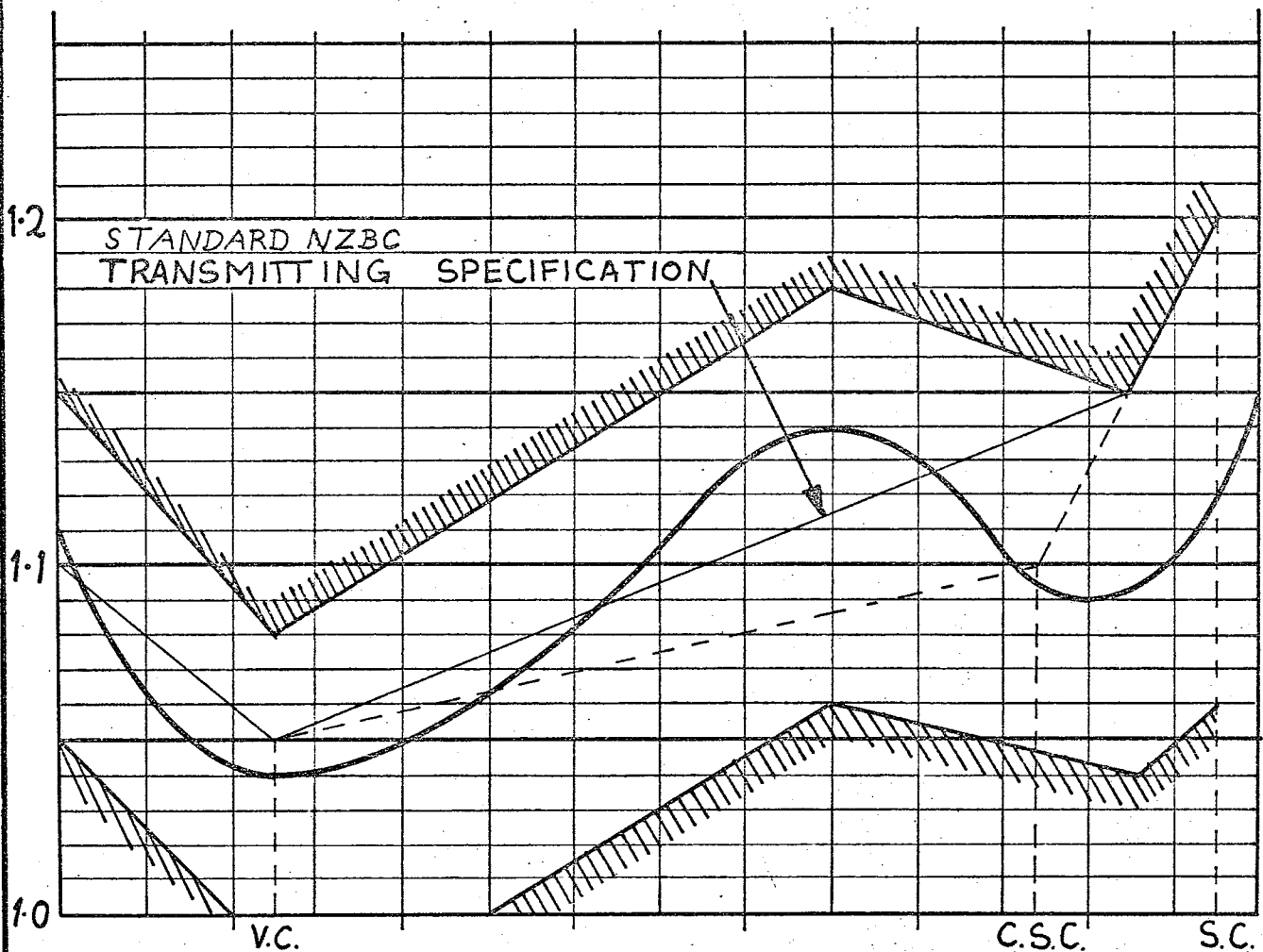


NEW ZEALAND  
BROADCASTING  
CORPORATION

ORIGIN	T.V.AERIAL SECT.	CHKD	J. A. C.
DRAWN	M. J. POWNALL	APPVD	B. D. H. Lison
TRACED	J. D. INGHAM	DATE	19-2-70
SIZE	STATION No.	HEAD OFFICE No.	
A 4		10037/6	

PROVISIONAL

S.W.R.



Maximum expected S.W.R. variation due to manufacturing tolerances and polarisation of mounting.

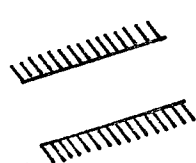
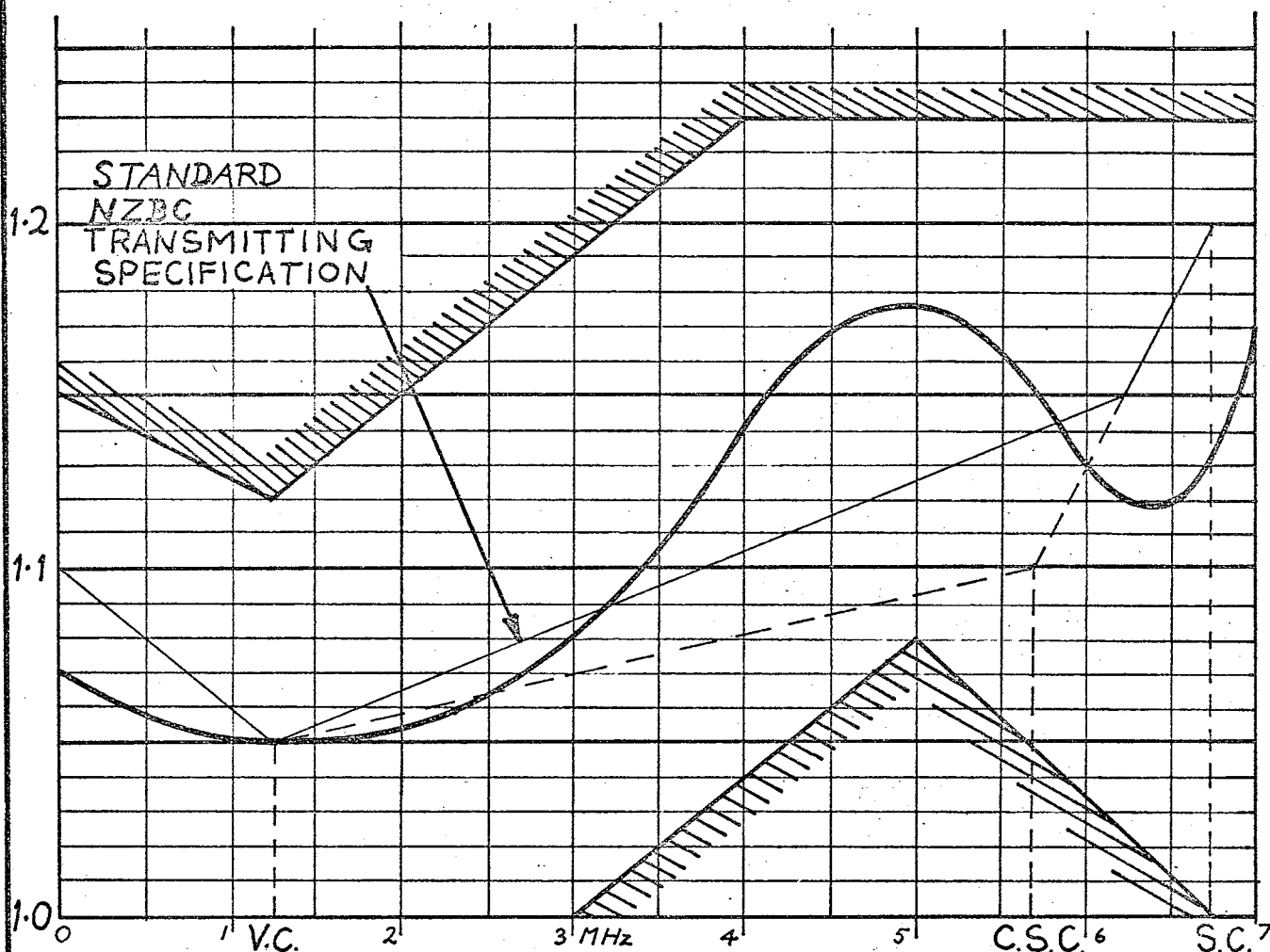


Typical S.W.R.

TITLE	YAGI AERIAL BAND I		ORIGIN	T.V. AERIAL SECTION	DATE
			DRAWN	J.D. INGHAM.	9.2.70
SUB TITLE	TYPICAL S.W.R. OF 3 ELEMENT YAGI		CHKD	E. A.C.	9.2.70
			APPVD	B.W.H. Given	19.2.70
			A4	STATION No.	HEAD OFFICE No.
					10038/1

Z.B.C.

S.W.R.



Maximum expected S.W.R. variation due to manufacturing tolerances and polarisation of mounting.



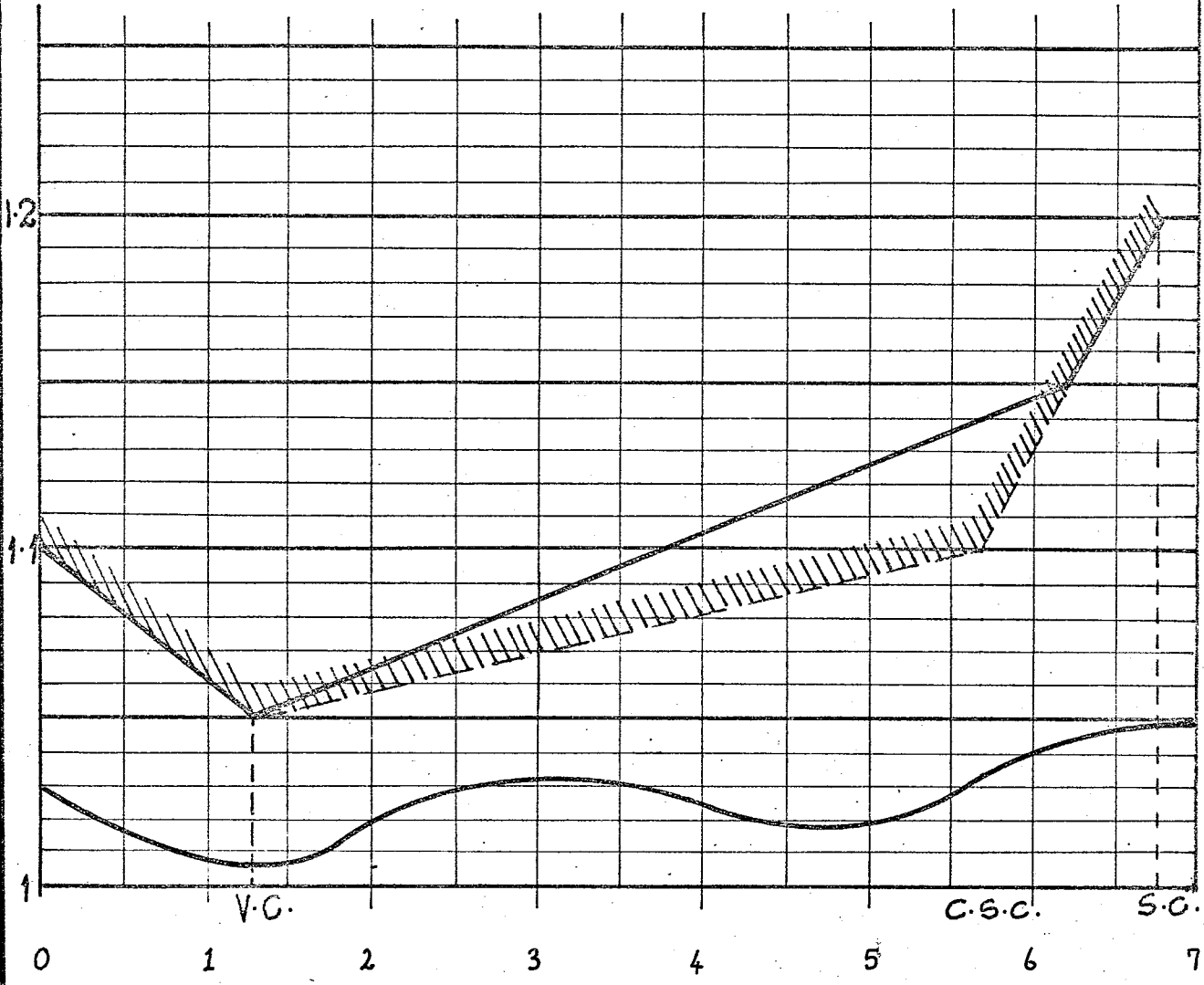
Typical S.W.R.

TITLE <b>YAGI AERIAL BAND I</b>	ORIGIN <b>T.V. AERIAL SECTION</b>	DATE <b>9.2.70</b>
SUB TITLE <b>TYPICAL S.W.R. OF 5 ELEMENT YAGI</b>	DRAWN <b>J.D. INGHAM.</b>	<b>9.2.70</b>
	CHKD <b>A.A.C.</b>	<b>9.2.70</b>
	APPVD <b>B.D.H. Given</b>	<b>19-2-70</b>
	A4 STATION No.	HEAD OFFICE No. <b>10038/2</b>





S.W.R.



MHz. from lower channel limit



Maximum S.W.R.



Typical S.W.R.



Standard NZBC Transmitting Aerial Specification.

TITLE YAGI AERIAL BAND III	ORIGIN T.V. AERIAL SECTION		DATE
	DRAWN M.J. POWNALL		17.12.69
SUB TITLE VSWR OF TYPICAL YAGI	CHKD J.A.C.		9.2.70
	APPVD B.D.H. Green		19.2.70
	A4		
STATION No.		HEAD OFFICE No.	
		10038/3	

PROVISIONAL