

**Please do not upload this copyright pdf document to any other website. Breach of copyright may result in a criminal conviction.**

This pdf document was generated by me Colin Hinson from a Crown copyright document held at R.A.F. Henlow Signals Museum. It is presented here (for free) under the Open Government Licence (O.G.L.) and this pdf version of the document is my copyright (along with the Crown Copyright) in much the same way as a photograph would be.

The document should have been downloaded from my website <https://blunham.com/Radar>, or any mirror site named on that site. If you downloaded it from elsewhere, please let me know (particularly if you were charged for it). You can contact me via my Genuki email page: <https://www.genuki.org.uk/big/eng/YKS/various?recipient=colin>

**You may not copy the file for onward transmission of the data nor attempt to make monetary gain by the use of these files. If you want someone else to have a copy of the file, point them at the website. (<https://blunham.com/Radar>). Please do not point them at the file itself as it may move or the site may be updated.**

It should be noted that most of the pages are identifiable as having been processed by me.

---

I put a lot of time into producing these files which is why you are met with this page when you open the file.

In order to generate this file, I need to scan the pages, split the double pages and remove any edge marks such as punch holes, clean up the pages, set the relevant pages to be all the same size and alignment. I then run Omnipage (OCR) to generate the searchable text and then generate the pdf file.

Hopefully after all that, I end up with a presentable file. If you find missing pages, pages in the wrong order, anything else wrong with the file or simply want to make a comment, please drop me a line (see above).

It is my hope that you find the file of use to you personally – I know that I would have liked to have found some of these files years ago – they would have saved me a lot of time !

Colin Hinson

In the village of Blunham, Bedfordshire.

S J. Pow



**AP 116E-1741-16**

October 1978

# **ANTENNA CONIFAN (MARCONI 5050 SERIES)**

**TECHNICAL AND REPAIR MANUAL**

BY COMMAND OF THE DEFENCE COUNCIL

Ministry of Defence

Sponsored for use in the

**ROYAL AIR FORCE by D SIGS (Air)**

Prepared by Datascript Ltd Bishop's Stortford Herts

Publications authority ATP/MOD (PE)

Service users should send their comments through  
the channel prescribed for the purpose in:-

Naval Aircraft Maintenance Manual(RN)

AP 100B-01 Order 0504

Page (i)/(ii)

## CONTENTS

Preliminary material

Title page  
Amendment record sheet  
Contents (this list)  
Warnings  
Note to readers

SECTION 1 TECHNICAL DESCRIPTION

## Chapters

- 1 Introduction and data summary
- 2 Technical description

SECTION 2 ERECTION INSTRUCTIONS

## Chapter

- 1 Types RA-5056-01 and RA5053-02 erection (UK/FRC 629)

SECTION 3 ASSOCIATED MATCHING TRANSFORMERS

## Chapters

- \* 1 High power wideband matching transformer H1424
- \* 2 Lowpower matching transformer L392/12
- \* 3 Matching transformer MINNS XDX01A
- \* 4 Matching transformer SDC 01A

\* to be issued later

# HAZARD WARNING NOTICE



## TOXIC MATERIAL BERYLLIUM / BERYLLIA

THE EQUIPMENT COVERED BY THIS PUBLICATION CONTAINS COMPONENTS INCORPORATING THE HIGHLY TOXIC MATERIAL BERYLLIUM AND/OR ITS OXIDE BERYLLIA. THESE MATERIALS ARE ESPECIALLY HAZARDOUS IF:

- (1) BERYLLIUM MATERIALS ARE ABSORBED INTO THE BODY TISSUES THROUGH THE SKIN, MOUTH OR A WOUND.
- (2) THE DUST CREATED BY BREAKAGE OF BERYLLIA IS INHALED.
- (3) TOXIC FUMES ARE INHALED FROM BERYLLIUM/BERYLLIA INVOLVED IN A FIRE.

FURTHER INFORMATION ON THE HANDLING OF BERYLLIUM/BERYLLIA IS GIVEN IN:

NAVAL AIRCRAFT MAINTENANCE MANUAL (NAMM)  
EMER GENERAL K 050  
AP 3158 VOL 2 OR AP 100B-01

LETHAL WARNING

HIGH VOLTAGE

Voltage in excess of 30 volts RMS or 50 volts d.c. can be lethal. When working on units requiring exposure to terminals carrying voltage of a higher value, a second person must always be in attendance.

WARNING

1. PERSONNEL MUST NOT APPROACH WITHIN THE STAY RADIUS OF THE ANTENNA UNLESS IT IS ISOLATED AT THE ANTENNAE EXCHANGE FOR TRANSMISSION.
2. STAY TENSIONS OF THESE ANTENNAE ARE PECULIAR TO THE STATIONS AT WHICH THEY ARE FITTED.

## NOTE TO READERS

The subject matter of this publication may be affected by Air Ministry Orders, or by servicing schedules (Topic 4/5), or 'general orders and modifications' leaflets in this A.P., in the associated publications, or even in some others. If possible, Amendments are issued to correct this publication accordingly but it is not always practicable to do so. When an order, servicing schedule, or leaflet contradicts any portion of this publication, the order, servicing schedule, or leaflet is to be taken as the overriding authority.

The inclusion of reference to items of equipment does not constitute authority for demanding the items.

Each leaf bears the date of issue and except for the initial issue, the amendment number with which it was issued. New or amended material will be indicated by black triangles positioned in the text in this manner ▶-----◀ to show the extent of the amended text. When a chapter is reissued in a completely revised form the triangles will not appear.

**SECTION 1**

**TECHNICAL DESCRIPTION**

Chapter 1

INTRODUCTION AND DATA SUMMARY

CONTENTS

Para.

- 1 Introduction
- 4 Purpose
- 5 Brief description
- 6 Data summary

Table

1	Electrical data summary	...	...	...	...	...	...
2	Mechanical data summary	...	...	...	...	...	...

Page

3
4

Fig.

1	Typical conifan antenna	...	...	...	...	...	...
---	-------------------------	-----	-----	-----	-----	-----	-----

Page

1
---

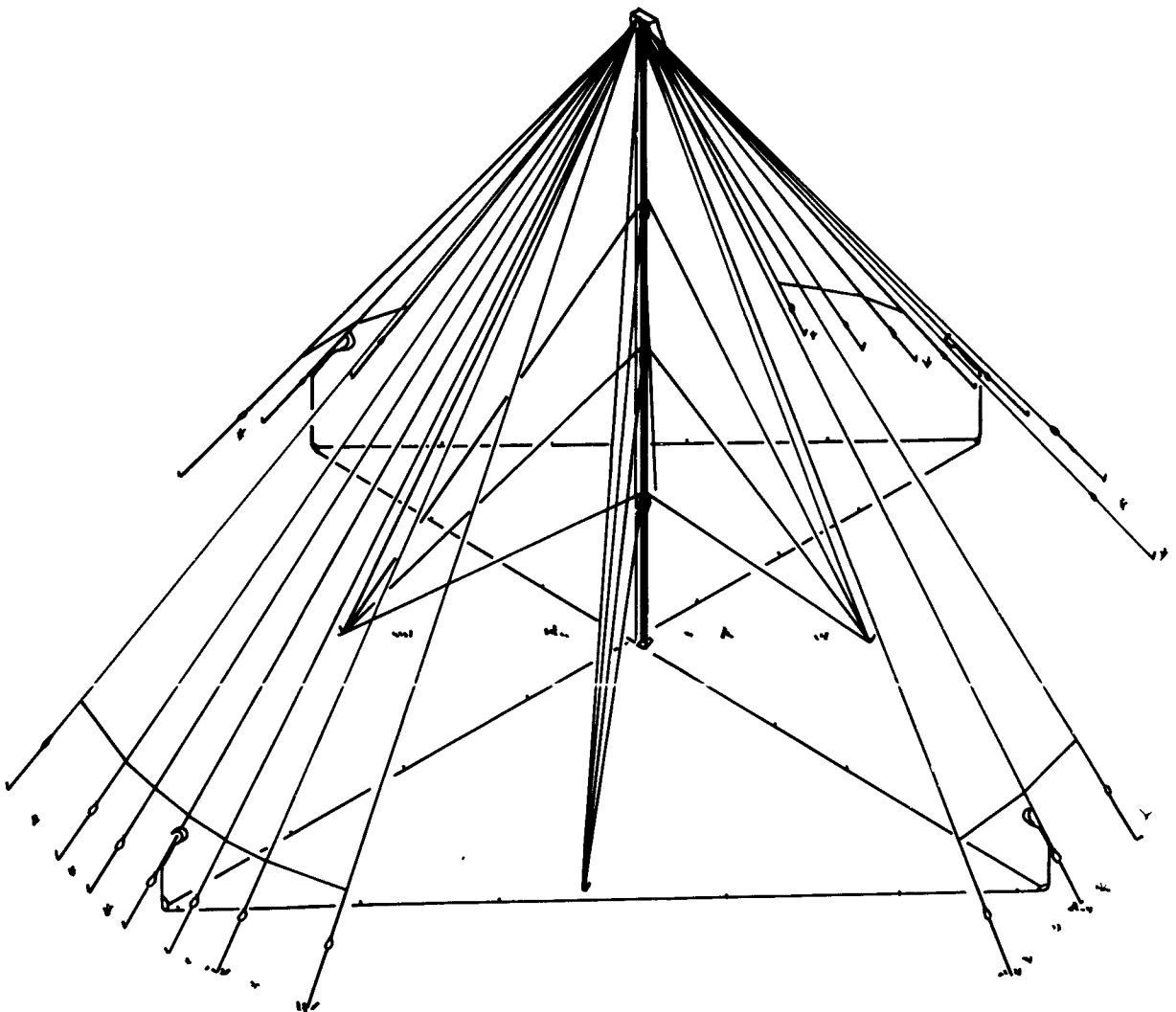


Fig. 1 Typical conifan antenna



INTRODUCTION

1. This publication describes the 'Conifan' (Marconi) series of antenna (5050 series). There are two main types, the transmitting types (5050, 5051, 5053, 5054, 5058 and 5059) and the receiving types (5055 and 5056).
2. Four main types are described, the others being very similar. These four main types are listed below:
  - 2.1 Transmitting antenna 5050 (transportable)
  - 2.2 Receiving antenna 5058 (transportable)
  - 2.3 Transmitting antenna 5053 (fixed)
  - 2.4 Receiving antenna 5056 (fixed).
3. Different types of matching transformers can be used, the main types are described in section 3.

PURPOSE

4. The antennas are used to provide omni-directional short to medium range (400/600 Km) coverage in the bands detailed in Table 1.

BRIEF DESCRIPTION

5. Conifan antennas are an improved form of terminated dipole giving a consistent radiation pattern and good impedance match over a wide frequency range without the need for resistive or inductive compensation. The antenna consists, simply, of four arrays two 7-wire and two 3-wire at 90° intervals in a conical formation.

DATA SUMMARY

6. The electrical data summary of antennas is contained in Table 1 and the mechanical data summary is contained in Table 2.

TABLE 1  
ELECTRICAL DATA SUMMARY

Antenna Type	Transportable (T) or Fixed (F)	Frequency range MHz	Power handling capacity (mean) KW	Input Impedance $\Omega$	Output Impedance $\Omega$	
<b>Tx</b>						
R5050-01	T	1.5-12	3	50	-	Directional gain Generally better than 5 dB relative to isotropic radiator, at beam maximum  Vertical radiation pattern High angle.  Horizontal radiation pattern omnidirectional within $\pm 1$ dB  V.S.W.R. Better than 2:1
R5050-02	T	1.7-14	3	50	-	
R5050-03	T	2.3-18	3	50	-	
R5050-04	T	3.5-30	3	50	-	
R5051-01	F	1.5-12	3	50	-	
R5051-02	F	1.7-14	3	50	-	
R5051-03	F	2.3-18	3	50	-	
R5051-04	F	3.5-30	3	50	-	
R5053-02	F	1.8-10	10	50	-	
R5053-03	F	<del>1.8-10</del> 2-12	10	50	-	
R5054-02	F	2-12	10	600	-	
R5058-01	T	1.5-15	1	50	-	
R5058-02	T	4.5-22	1	50	-	
R5059-01	F	1.5-15	1	50	-	
R5059-02	F	4.5-22	1	50	-	
<b>Rx</b>						
R5055-01	T	1.5-30	-	-	50 or 75*	* Output impedance to be specified at time of order.
R5055-02	T	2.0-30	-	-	50 or 75	
R5055-03	T	3.0-30	-	-	50 or 75	
R5056-01	F	1.5-30	-	-	50 or 75	
R5056-02	F	2.0-30	-	-	50 or 75	
R5056-03	F	3.0-30	-	-	50 or 75	

TABLE 2  
MECHANICAL DATA SUMMARY

	Mast Height m	Mast stay radius m	Fan radius m	Wind Load no ice km/h	$\frac{1}{2}$ radial ice km/h	Temp. range	Feeder connection
R5050-01	22.8	11.4	22.8	160	125	-20°C to +50°C	$\frac{7}{8}$ in EIA flange
R5050-02	18.3	9.15	18.3	160	125	-20°C to +50°C	$\frac{7}{8}$ in EIA flange
R5050-03	13.8	6.85	13.8	160	125	-20°C to +50°C	$\frac{7}{8}$ in EIA flange
R5050-04	9.15	4.57	9.15	160	125	-20°C to +50°C	$\frac{7}{8}$ in EIA flange
R5051-01	22.8	11.4	22.8	190	125	-20°C to +50°C	$\frac{7}{8}$ in EIA flange
R5051-02	18.3	9.15	18.3	190	160	-20°C to +50°C	$\frac{7}{8}$ in EIA flange
R5051-03	13.8	6.85	13.8	190	160	-20°C to +50°C	$\frac{7}{8}$ in EIA flange
R5051-04	9.15	4.57	9.15	190	160	-20°C to +50°C	$\frac{7}{8}$ in EIA flange
R5053-02	18.3	9.15	18.3	190	160	-20°C to +50°C	$1\frac{5}{8}$ in EIA flange
R5053-03	13.8	6.85	12.5	190	160	-20°C to +50°C	$1\frac{1}{8}$ in EIA flange
R5054-02	13.8	6.85	13.8	190	160	-20°C to +50°C	Twin-wire
R5055-01	18.3	9.15	18.3	160	125	-20°C to +50°C	Type 'N' connector
R5055-02	13.8	6.85	13.8	160	125	-20°C to +50°C	Type 'N' connector
R5055-03	9.15	4.57	9.15	160	125	-20°C to +50°C	Type 'N' connector
R5056-01	18.3	9.15	18.3	190	160	-20°C to +50°C	Type 'N' connector
R5056-02	13.8	6.85	13.8	190	160	-20°C to +50°C	Type 'N' connector
R5056-03	9.15	4.57	9.15	190	160	-20°C to +50°C	Type 'N' connector
R5058-01	13.8	6.85	13.8	160	125	-20°C to +50°C	Type 'N' connector
R5058-02	9.15	4.57	9.15	160	125	-20°C to +50°C	Type 'N' connector
R5059-01	13.8	6.85	13.8	190	160	-20°C to +50°C	Type 'N' connector
R5059-02	9.15	4.37	9.15	190	160	-20°C to +50°C	Type 'N' connector

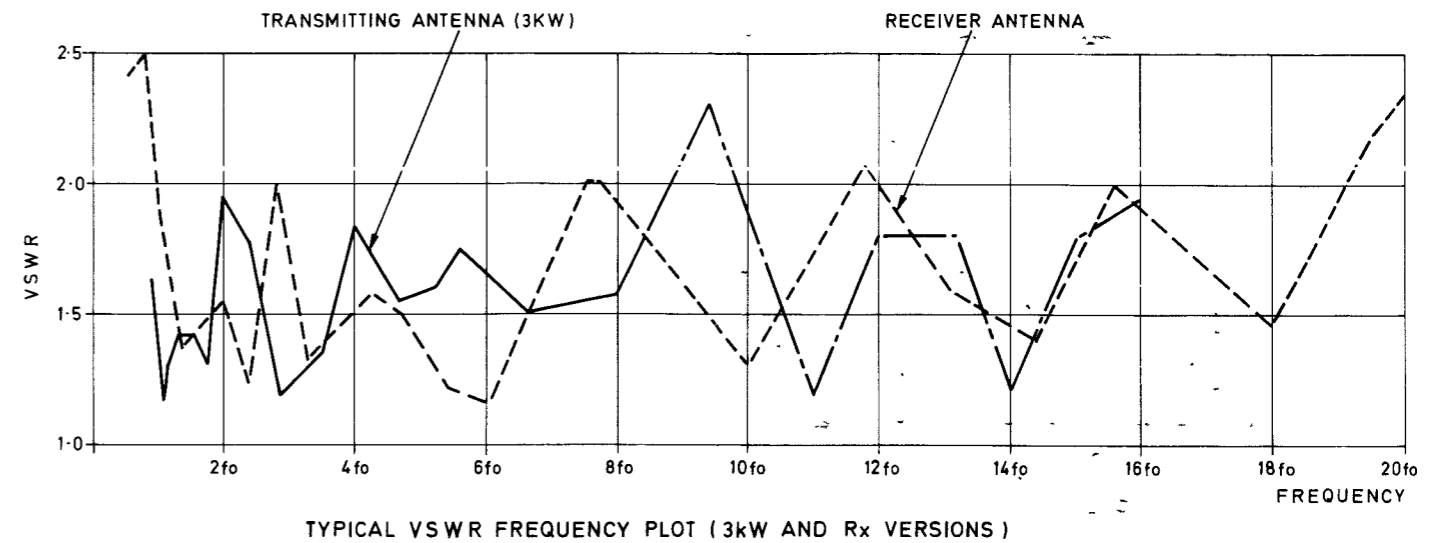
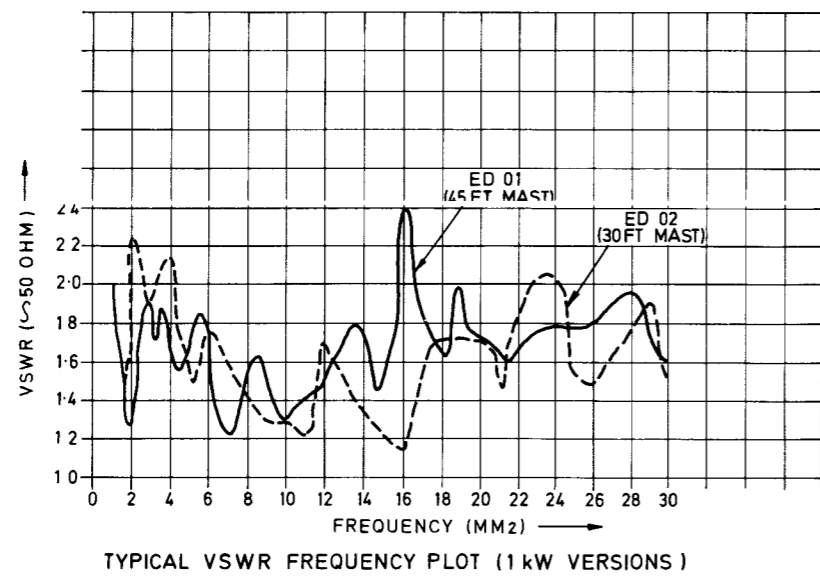
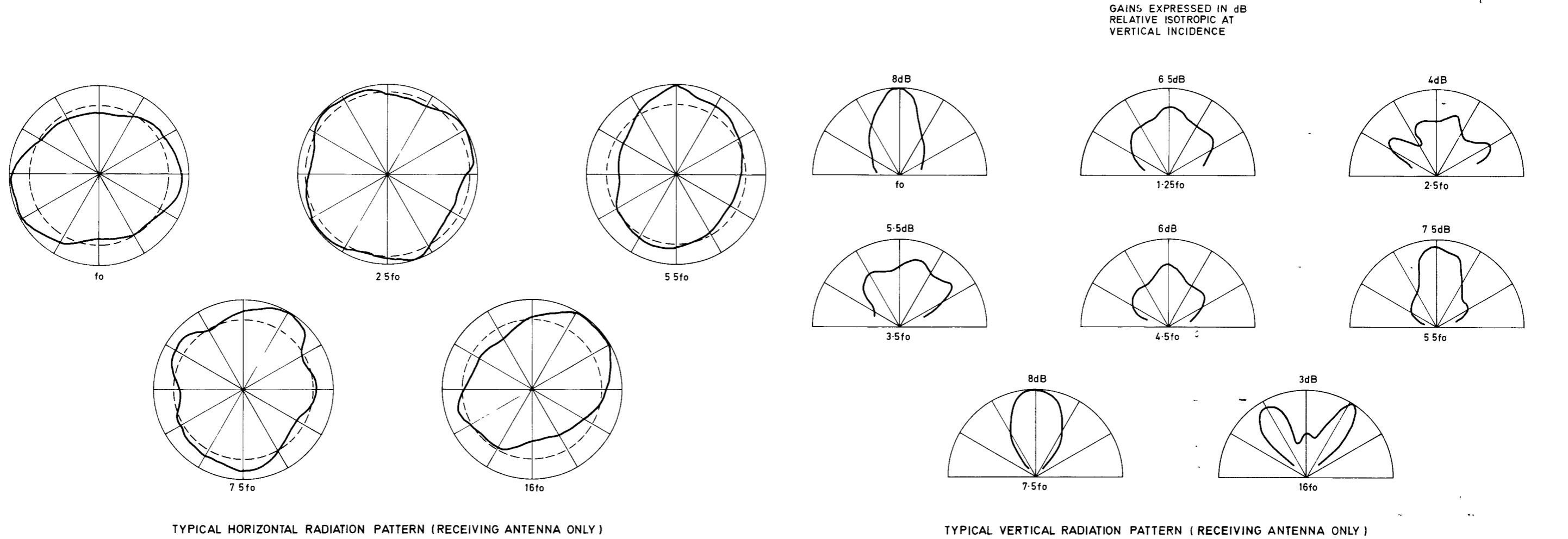


Fig 1

Receiving antenna radiation patterns and vswr / frequency plots

Fig.1

Chapter 2

TECHNICAL DESCRIPTION

CONTENTS

Para.

1	Introduction
4	Mechanical details
11	Transit packaging
13	Technical description
13	Principle of operation
17	Fan assemblies
19	Mast assembly
21	Maintenance

Fig.

Page

1	Receiving antenna radiation patterns and v.s.w.r./frequency plots ... ..	5/6
---	--	-----

INTRODUCTION

1 The CONIFAN design consists basically of a multiple fan arrangement suspended from a single mast. The 3kW and 10kW 50Ω transmitting versions are fed at the top via a balanced line from a matching transformer at the base of the mast. The 600Ω 10kW design (Type R5054) has an extended 600Ω transmission line for connection to the feeder system. However in the case of the 1kW and receiving versions the smaller matching unit can be fitted at the mast head and the coaxial feed taken to near ground level terminating in a Type N socket.

2 Various frequency ranges are possible depending on the height of the support mast and details of the many versions and editions are given in the data summary (Chap 1). No dissipative terminating components are used in the antenna. The broadband properties characteristic of the 'conifan' design enable a very high radiation efficiency to be maintained with a good v.s.w.r. (better than 2:1) throughout a very wide frequency range (see fig. 1).

3 For many applications, the antenna can be operated outside this basic range, where a v.s.w.r. within about 2.5:1 is acceptable. Additionally, the receiving Types R5055 and R5056 can be used below the fundamental design frequency of their transmitting counterparts, so that editions 03, based on a 30 ft. (9.15m) mast, would have an acceptable match (within a v.s.w.r. of 3:1) down to a lower frequency of 2MHz.

MECHANICAL DETAILS

4 The tubular support mast is formed from a high-quality aluminium alloy selected for high-strength properties compatible with good corrosion resistance.

5 The mast sections are 2.25m (7ft 5ins) in length, with an outer diameter of 75mm (3 in). The special mast tube couplers, base and mast head fittings, which are machined from aluminium alloy castings, permit very simple and rapid assembly.

6 Erection is by falling derrick and as there are four stays in plan, the initial setting out and making off of stay ropes to the ground anchor can be completed in a minimum of time. Insulated stays (7mm dia.) of prestretched Terylene are attached at 4.5m (15ft) intervals, i.e. at every second joint. Each stay rope is equipped with a stay arrestor permitting rapid setting up and adjustment.

7 Widespread use is made of stainless steel and other highly corrosion resistant fittings. All materials such as alumina insulators are chosen for high mechanical performance under adverse environmental conditions. In order to meet the need for ease of handling and repacking, the antenna fan-assemblies are prefabricated from phosphor bronze and stainless steel wire.

8 For a fixed installation, the same antenna system can be supplied with a lightweight hot-dip-galvanised lattice steel mast. These models are specified as Type R5051, R5053, R5054 and R5059 (transmitting) or Type R5056 (receiving only).

9 Various anchor systems exist to suit different site and operational conditions. Typically, for average ground, screw type anchors are supplied for the mast stays with lightweight pickets for anchoring the fan assemblies. Alternatively, the anchors can be set in concrete at a permanent or semi-permanent site. Once the four anchors have been placed for the mast stays, the complete antenna with 23m (75 ft) mast can be assembled and erected in less than one hour with a team of four men.

10 Where difficult ground conditions are encountered (e.g. desert sand, rock, scrub, etc.) the balanced mechanical distribution of the antenna allows a simple arrangement to be improvised using sandbag-deadman anchors.

#### TRANSIT PACKAGING

11 Alternative packaging arrangements are possible, depending on the system requirements. The special transit pack provides for the mast sections and associated stays, anchors and fittings to be stowed in a fitted case, permitting rapid location and replacement of the component parts. The antenna assemblies are wound on lightweight drums to simplify handling of the individual fans.

12 With the fixed station design, however, or where the transportable design is to be used in a non-transportable role, the standard export pack is normally supplied.

#### TECHNICAL DESCRIPTION

##### Principle of operation

13 The principle of operation is best described if a transmitting version of the antenna is considered. The 50-ohm unbalanced input is transformed via the matching transformer to a balanced feed to the apex of each 7-wire fan assembly. A 50-ohm coaxial line is taken from the ground end of each 7-wire

fan to the ground end of an adjacent 3-wire fan. The two 3-wire fans are left as an open circuit at the apex of the mast head. Therefore, in plan the 3-wire and 7-wire fans are mutually at right angles.

14 At low frequencies energy fed to the 7-wire fans is partly radiated and the remainder passed to the 3-wire fans where it is then radiated. As the frequency increases a greater proportion of the energy is radiated from the 7-wire fans and correspondingly less from the 3-wire fans.

15 With regard to the radiation pattern, at low frequencies the elements behave as a horizontal dipole a short distance above the ground, giving a broad beam of radiation vertically upwards. At higher frequencies the 7-wire elements behave as a terminated-vee dipole directing a beam vertically downwards. This is reflected by the ground, again resulting in a broad beam of radiation upwards. However, in the case of the 3-wire elements at the higher frequencies the main radiation is directly upwards. Radiation patterns for a receiving antenna are provided at fig. 1.

16 Since the two sets of elements are mutually at right angles there is no mutual impedance between them, so that resonances are avoided and the impedances add without interacting. Additionally, the radiation patterns of the two sets do not interfere with each other as their polarizations are orthogonal.

#### Fan assemblies

17 Each fan assembly consists of either seven or three phosphor bronze wires connected together at the apex to an alumina insulator, the other end of the insulator having a short synthetic rope tail with thimble and stainless steel shackle. Approximately 12in. from the apex of each fan is a spreader to which each wire of the fan is attached by line taps. The purpose of the spreader is to position correctly the individual wires.

18 The wires are cross-connected at the base of the fan by flexible stainless steel wire ties which, except in the case of the middle wire of each fan, are ferruled to alumina strain insulators. The middle wire of each fan is connected to a moulded coaxial junction unit fitted with a type N coaxial socket. Each of the strain insulators and coaxial junctions are fitted with a length of terylene rope and taken to a ground anchor.

#### Mast assembly

19 The mast consists of tubular alloy sections coupled together by means of special alloy castings. Four sections are used with the 30 ft. mast and 6 sections with the 45 ft. mast along with 2 sections for the derrick assembly. The centre joint casting and stay point casting are used alternately, a set of 4 terylene rope stays being taken to each stay point casting. The upper stay point casting is coupled to a short (8 in.) mast section into which the 4-way aerial attachment casting fits. A further component, the base casting, links the tubular mast to the composite base assembly.

20 No bolts or screws are used in the assembly of the mast sections, positive location being assured by means of the spring clip assemblies within each casting.

MAINTENANCE

21 Maintenance of the antenna system can be confined to a regular inspection of all ropes, wires and anchorages. Generally this can be done without lowering the mast or interrupting traffic services.

WARNING ...

WHERE A TRANSMITTER IS CONNECTED TO AN ANTENNA AN ELECTRICAL HAZARD MAY EXIST AND EXTREME CARE MUST BE EXERCISED IN CARRYING OUT ANY INSPECTION OR ADJUSTMENT. IF IN DOUBT, SWITCH OFF THE TRANSMITTER.

22 To carry out the inspection proceed as detailed below:

22.1 All coaxial lines and feeders should be examined for cuts and other damage, and connectors checked to ensure that there is a good electrical and watertight connection.

22.2 All other electrical connections should be examined for broken or loose wires and any damage made good.

22.3 Where sites are subject to atmospheric or other pollution, the insulators should be wiped clean.

CAUTION ...

Do not use any abrasive cleaners or harsh detergents for cleaning insulators.



**SECTION 2**

**ERECTION INSTRUCTIONS**

Chapter 1

TYPES RA-5056-01 AND RA-5053-02 ERECTION (UK/FRC 629)

CONTENTS

Para.	
1	INTRODUCTION
1	Brief description
4	Transmit antenna
5	Receive antenna
6	General
7	Associated publications
9	Manpower
10	Safety precautions
12	Foundation works
13	Equipment
16	ASSEMBLY AND ERECTION
16	Assembly of mast
26	Assembly and attachment of stays
30	Assembly of derrick
38	Erection of derrick
45	Assembly of transmit antenna to mast (RA-5053-02)
52	Assembly of receive antenna to mast (RA-5056-01)
60	Erection of mast and antenna
65	Transfer of stays and straightening of mast
71	Ground installation of antenna
78	Receive antenna RA-5056-01
81	Transmit antenna RA-5053-02
86	Installation of antenna to an erected mast
91	Transmit antenna RA-5053-02
95	Receive antenna RA-5056-01
99	Transmit and receive antennas
102	LOWERING AND DISMANTLING
102	Removal of an antenna from an erected mast
103	Transmit antenna RA-5053-02
105	Receive and transmit antennas
107	Transmit antenna RA-5053-02
111	Receive antenna RA-5056-01
112	Transmit and receive antennas
115	Receive antenna RA-5056-01
117	Transmit and receive antennas
119	Lowering the mast

CONTENTS (Continued)

Table		Page
1	Item list for fig 1 (SCSHQ 137740 or 137741) ... ..	3
2	Tools list ... ..	5
3	Item list for fig 3 (SCSHQ 137723/137740/137741) ... ..	7
4	Item list for fig 4 (SCSHQ 137723) ... ..	8
5	Item list for fig 5 (SCSHQ 134854) ... ..	10
6	Item list for fig 6 (SCSHQ 134854) ... ..	11
7	Item list for fig 7 (SCSHQ 137741) ... ..	12
8	Item list for fig 8 (SCSHQ 137740) ... ..	13
9	Item list for fig 11 (SCSHQ 137740 or 137741) ... ..	17
10	Item list for fig 12 (SCSHQ 137740 or 137741) ... ..	17
11	Item list for fig 13 (SCSHQ 137741/137723) ... ..	18
12	Item list for fig 14 (SCSHQ 137740/137723) ... ..	19

Fig.		Page
1	Conifan antenna ... ..	27/28
2	Antenna anchorage ... ..	29/30
3	Mast assembly ... ..	31/32
4	Stay attachment details ... ..	33/34
5	Derrick assembly ... ..	35/36
6	Derrick erected with side stays attached ... ..	37/38
7	Headcap - transmitter antenna ... ..	39/40
8	Headcap - receiver antenna ... ..	41/42
9	Stage 1 - erection ... ..	43/44
10	Stage 2 - erection ... ..	45/46
11	Ground fixing of elements ... ..	47/48
12	Antenna co-axial terminations ... ..	49/50
13	Mast base : transmitter antenna ... ..	51/52
14	Mast base : receiver antenna ... ..	53/54

- ▶ Annex
  - A Method for straightening a mast using two theodolites ◀

INTRODUCTION

BRIEF DESCRIPTION

1 The Conifan antenna is a broadband omni directional fixed station hf antenna, operating over short to medium ranges. The antenna, which has a vswr better than 2:1 may be used on the transmit or receive role.

2 The general construction of both transmit and receive installations is shown in Fig 1 and consists of an 18.5m high stayed tubular steel mast on top of which a pair of 7-wire and a pair of 3-wire fan assemblies are attached. These four radiating fans are concentrically pegged out on a radius of 16.8m from the mast datum at ground level as shown on Fig. 1, and to the dimensions shown on the ground plan in Fig. 2. A site area of 34m diameter, and level to within three degrees, is required for this installation.

3 Four insulated wire links act as an earth return and are connected to the mast base. Two of the wires are also connected to the outer screen of the co-axial feeder at the three wire fan assemblies.

TABLE 1 ITEM LIST FOR FIG 1 (SCSHQ 137740 OR 137741)

Item	Drg No	Description	Qty	Remarks
4	Marconi Supply	Co-axial line	2	SCSHQ 137741 only
5	Marconi Supply	Earth Kit	1	
9	Marconi Supply	Antenna Anchor	1	
11	Marconi Supply	Round Wire Peg	62	
13	Patt No 95-Galv	'D' Shackle swl 5cwt	1	
35	10B/9444464	Anchor Picket	1	

Transmit Antenna

4 The Transmit Antenna, RA 5053-02, has a frequency range of 1.8 MHz to 10MHz, a power handling capacity of 10kW, and an input impedance of 50 ohms. The antenna is fed by a transformer line via a matching transformer mounted at the mast base.

Receive Antenna

5 The Receive Antenna, RA 5056-01, covers a frequency range of 1.5 MHz to 30 Mhz with an input impedance of 50 ohms. Connection to the antenna is made via a matching transformer mounted at the head of the mast.

General

6 The Support Structure, and consequently the support structure erection instructions are common to both transmit and receive antenna installations. Where the instructions for assembly and erection of receive and transmit antennas diverge, the differences will be detailed as they occur.

Associated Publications

7 This procedure is to be read in conjunction with the following Air Publications and the relevant RAFSEE drawings from the list below. In addition, the site drawings relevant to the particular site, are to be consulted. For site requirements see relevant station drawings.

7.1 AP 119K-0001-1 Lifting Tackle Standards and Practices

7.2 AP 119K-0304-15F Safety Suspension Chair

7.3 AP 119K-0611-16A Winch Tirfor Type T7 and Winch Tirfor TU8

- 7.4 AP 119K-0614-16A Tirfor Winch T13
- 7.5 SCSHQ 116319 Painting of Galvanized Steel
- 7.6 SCSHQ 137522 Works Service Details for 18.5m  
C & S Mast-RA5053 Conifan
- 7.7 SCSHQ 137521 Works Service Details for 18.5m  
C & S Mast-RA5056 Conifan
- 7.8 SCSHQ 137723 Mast Support Structure-18.5m modified  
C & S RH Mast
- 7.9 SCSHQ 137740 Antenna General Arrangement  
Marconi Conifan RA-5056-01
- 7.10 SCSHQ 137741 Antenna General Arrangement  
Marconi Conifan RA-5053-02
- 7.11 SCSHQ 134854 Erector Gear for 18.5m modified  
C & S RH Mast

8 These instructions and drawings listed in paragraph 7 are to be carefully read before leaving for site. If not fully understood, all points are to be clarified by DES MECH 5 at RAFSEE. Any problems arising during construction must be referred to DES MECH 5 at RAFSEE for clarification before proceeding.

#### Manpower

9 A supervisor and six men will be required to assemble and erect the mast and antenna. If already erected, a supervisor and six men will be required to lower the system. Note, a man being lifted or lowered in a suspension chair is to be hauled up or lowered by a team of eight men and a supervisor, AP 119K-0304-15F refers.

#### Safety Precautions

10 All safety precautions are to be taken during the erection and lowering and must not be compromised in any way. Safety precautions as laid down in RAF Support Command Engineering Staff Instructions Volume 1 Part 3 Section 2 are to be strictly adhered to. Care must be taken when handling items weighing more than five kilogrammes.

11 Check on local weather conditions and if an electrical storm or wind speed of 10 knots or over is forecast no erection or lowering is to take place until weather conditions improve.

#### Foundation Works (fig. 2)

12 Check that the mast foundation and stay anchor blocks have been provided in accordance with Drawing SCSHQ 137522 in the case of the Transmit Antenna, and SCSHQ 137521 where the Receive Antenna is being installed. Ensure that there is sufficient space to lay the 18.5 metre mast along the ground from the centre block, and away from the haul-down/stay anchor block.

Equipment

13 Check that all equipment required for mast erection is on site as detailed in Drawing SCSHQ 134854 and table 2. All erector gear is to be registered and checked for good condition before use.

TABLE 2 TOOLS LIST

Sec. Ref.	Item	Qty	Remarks
1.	Tensiometer (Parafil)	1	Fulmer 03C or suitable alternative
2. 10AF 1121409	Theodolite Surveying	2	
▶ 3. 4L 4253400	Safety Suspension Chair	1	AP 119K-0304-15F
a. 4L 9424233	Snatch Block	1 )	
▶ b. 28Y 5209744	Shackle Bow	1 )	Associated with
c. 28Y 9444566	Shackle Pin	1 )	item 3
4. 29E 9440183	Pin Cotter Split	50	$\frac{1}{8}$ " diam x $1\frac{1}{4}$ " lg
▶ 5. 5E 4131982	Wire Copper Hd	10m	100 lbs/mile
6. 32A 9331561	Rope Polyester Fibre	40m	8mm diam
▶ 7. 32B 6337642	Denso Tape GD LT	2 rolls	50mm x 36m
8. 32B 1255315	Polythene Bags	20	
9. 32B 1255277	Tape Weatherproof	1 roll	
10. 10B 9331564	Wire Grip	5	$\frac{3}{4}$ " circ
11. 10B 6330325	Grip Cable	2	
12. 34D 2201049	Grease XG 264	1 tin	
13. 34B 9100479	Protective PX1	1 gall	
14. 34D 9100494	Protective PX11	1 can	
▶ 15. 34D 2246769	Oil OMD 75	25 litres	
or			
34D 2253822	Oil OMD 80	25 litres	
16.	Oil Shell Diala BX	1 litre	RH Minns Balums Ltd Ewell Surrey
17.	Spanners to cover the range: $\frac{3}{8}$ " to $\frac{1}{2}$ " BSW; $\frac{1}{4}$ " UNF; OBA; M24 to M6		
18.	Tommy Bar		
19.	Screw Drivers		
20.	Crow Bar		
21.	Sledge Hammer		
22.	Wire Brush		
23.	Paint and Brushes	Paint to Spec 90G116319	
24.	Wooden Blocks		

14 The PSA area works office is to be informed in writing a minimum of seven days in advance of the dates of erection so that an observer may be present if PSA wishes.

15 The mast and stays are the responsibility of PSA (DOE) and after handover are only to be adjusted with PSA permission. The mast structure is to be handed over to the station PSA who are to be requested to issue a 'condition' certificate as soon as the antenna is completed in case minor adjustments to the antenna are required at a later date. After completion of erection the installation consisting of antenna and support structure is to be handed over to the station senior electronics officer.

### ASSEMBLY AND ERECTION

#### ASSEMBLY OF MAST

16 The item numbers quoted in the following paragraphs refer to Drawing SCSHQ 137723 unless otherwise stated. Other drawings referred to are SCSHQ 137741 and 137522 for a transmit antenna, and SCSHQ 137740 and 137521 for a receive antenna. See fig. 3.

17 At the mast foundation block on Drawing SCSHQ 137722 or SCSHQ 137721, as appropriate, remove the four nuts and washers from the studs and retain for use later. Thoroughly clean the studs with a wire brush and lightly oil to ensure the nuts are free. Remove dirt and loose particles from the surface of the block.

18 Position the mast base (item 10) over the studs such that the holes in the lugs are at right angles to the hauldown block/stay anchor, add the four tags (item 15 on SCSHQ 137740 or SCSHQ 137741), secure with nuts and washers retained in accordance with paragraph 17, and ensure that the base plate is firmly and evenly seated. See figs 13 or 14.

19 Insert the heel plug (item 9) in between the lugs of the base plate (item 10) and secure using the heel bolt, washer and nut (item 11), greasing the bolt with XG 264 before use. Ensure that the heel plug is free to pivot on the axial bolt, and that the heel plug points away from the hauldown/stay anchor block.

20 Insert the bottom end of the lower mast section (item 2) into the heel plug (item 9) and secure with two bolts, washer and nuts (items 4 and 5). Support the lower mast assembly on suitable timber packing to maintain it in a horizontal plane.

21 Continue assembling the remaining mast sections (item 1) using the bolts, washers and nuts (items 3 and 4) for securing, while maintaining the assembly in a horizontal plane with suitable timber.

22 Fit the mast head cap (item 18) to the mast top section. Ensure that the three lugs are in line with the stay anchor blocks when the mast is erected.

23 Fit the pole steps (item 23) to the mast tube in a position 0.7 metres below the top of the mast, with the steps horizontal.

24 To the mast tube fit quantity one 3-piece mast band (items 6 and 7) complete with three link plates (item 8) in each mast band. This mast band

is to be fitted to the mast at 8.7 metres above the surface of the mast foundation block, and located with the link plate in line with the head cap lugs.

TABLE 3 ITEM LIST FOR FIG 3 (SCSHQ 137723/137740/137741)

Item	Drg No	Description	Qty	Remarks
1	PSA Supply	Mast Section 16'-3" lg x 7 $\frac{5}{8}$ " o/d	3	Galv
2	"	Mast Section 12'-0" lg x 7 $\frac{5}{8}$ " o/d	1	Galv
3	"	Bolt and Nut for mast joint	9	Sheradised
4	"	Shaped Washer	22	Brass
5	"	Bolt & Nut for Bottom Joint	2	
6	"	Mast Band 3 Piece	1	Galv
7	"	Bolt & Nut $\frac{3}{4}$ " dia	3	Sheradised
8	"	Link Plate	3	Galv
9	"	Mast Heel Plug	1	Galv
10	"	Mast Base Plate	1	Galv
11	"	Mast Heel Bolt & Nut	1	Sheradised
18	"	Mast Head Cap	1	Galv
23	"	Double Pole Step Assy	2	Including Nuts & Bolts
15	SCSHQ 134779	Tag	8	
21		Bolt Hex Hd M12 x 30 lg	7	ST ZN Plate
24		Nut M12	7	ST ZN Plate
27		Washer M12	7	ST ZN Plate
42	SCSHQ 137711	King Post	1	
34	SCSHQ 137711	King Post	1	
35	SCSHQ 137709	Cross Arm	1	
36		Bolt Hex HD M12 x 30 lg	11	ST ZN Plate
37		Nut M12	11	ST ZN Plate
38		S/Washer $\emptyset$ 12	11	ST ZN Plate



25 Secure the mast band, (items 6 and 7) complete with one link plate (item 8) to the mast section immediately below the fixing bolts of the mast section and heel plug, ensuring that the lug is in line with the standing line pulley. See fig. 13 or 14.

ASSEMBLY AND ATTACHMENT OF STAYS

26 Assemble the upper stay as follows:

26.1 Attach one link plate (item 8) to each parafil termination on the stay, (item 15) using the clevis pins with new split pins.

26.2 Connect two shackles (item 25) back to back, and attach to one of the link plates (item 8). To the other link plate (item 8) attach one shackle (item 25) having first reeved the eye of the rigging screw (item 27).

26.3 Attach one end of the chain (item 29) to the forked end of the rigging screw (item 27), and to the other end of the chain attach a shackle (item 25), see fig. 4.

TABLE 4 ITEM LIST FOR FIG 4 (SCSHQ 137723)

Item	Drg No	Description	Qty	Remarks
8	PSA Supply	Link Plate	16	
12	"	Long Link Chain Galv	3	½" x 4'-0" (2T Proof)
13	"	Rigging Screw Galv	3	¾" (2¼T Proof)
14	"	'D' Shackle ¾" Galv	12	2T 4cwt Proof
15	"	Mast Stay Upper - Parafil	3	Ø 17mm x 17.1m lg
16	"	Mast Stay Lower - Parafil	3	Ø 13.4mm x 9.3m lg
25	"	'D' Shackle ¾" Galv	12	4T Proof
27	"	Rigging Screw 24mm Galv	3	4 Tonne Proof
29	"	Long Link Chain Galv	3	¾ x 4'-0" (4½T Proof)

27 Assemble two more stays in a similar manner to para 26.

28 Assemble three lower stays as in para 26, using the following items:

28.1 Link plates (item 8)

28.2 Shackles (item 14)

28.3 Rigging screw (item 13)

28.4 Stays (item 16)

28.5 Chain (item 12)

29 Attach the side stay to the mast as follows:

29.1 Using the 'free' back to back shackle (item 25), attach the three assembled upper stays to the mast head cap lugs (item 18), which are in line with the stay anchor blocks when the mast is erected. See fig. 4.

29.2 The two side stays are to be connected to the third hole up on the relevant anchor block using the shackle (item 25) attached to the chain. The uppermost stay is to be coiled up for later use.

29.3 Using the 'free' back to back shackle, (item 14), attach the three assembled lower stays to the three link plates on the mast band, items 6 7 and 8. The stays are to be coiled up for later use.

#### ASSEMBLY OF DERRICK

30 The item numbers quoted in the following paragraphs refer to Drawing SCSHQ 134854 unless otherwise stated. Refer to fig. 5.

31 With the Derrick (item 1) laying horizontal and approximately 85° to the mast, and the two rigging screws Item 4 at the Derrick head also pointing towards the mast, assemble the erector band (item 11) around the bottom mast section as near the mast heel as possible. Secure with bolt, washer and nut supplied with the erector band; do not tighten. Check that the assembly will rotate on the mast.

▶ 32 Drive four pickets (item 9) into the ground, in the position shown on Fig. 5. To each of these pickets attach a Winch Tirfor type T7 or Winch Tirfor TU8 (item 5) using a shackle (item 10) and reeve the Winch Tirfor type T7 or Winch Tirfor TU8 (item 5) with tirfor T7 ropes (item 6). ◀

33 To the two diametrically opposite single lugs on the Derrick head attach the two inner hooks of the tirfor T7 ropes (item 6) using the shackles (item 3).

34 Reeve the tirfor T13 (item 7) with tirfor T13 rope (item 8). Attach the tirfor T13 (item 7) to the hauldown anchor block hairpin, using the shackle (item 12). Attach the tirfor T13 rope (item 8) to the lug opposite the two rigging screws on the Derrick head using the shackle (item 3).

35 The uppermost stay on the mast band is to be uncoiled and the lower portion labelled and removed at the parafil termination by removing the split and clevis pins, leaving only the parafil portion attached to the mast. The lower stay portion and clevis pin is to be retained for use later.

36 The rigging screw (item 4) at the Derrick head and nearest to the mast is to be adjusted to its mid position and the parafil stay attached to the rigging screw using the parafil termination with the clevis pin and a new split pin.

Note ...

The rigging screw is not to be opened beyond 540mm (21 $\frac{1}{4}$ " ).

37 The uppermost stay on the head cap lug is to be connected to the rigging screw at the top of the Derrick as in paras 35 and 36.

TABLE 5 ITEM LIST FOR FIG 5 (SCSHQ 134854)

Item	Drg No	Description	Qty	Remarks
1		Derrick 4½ dia x 20' lg	1	Item 2-heel Bolt-Attached
3		Shackle L 'D' SWL 1T 10 cwt Galv	5	Solid Swivel Co
4		Rigging Screw ¾" dia Patt No 26	2	Solid Swivel Co
5	4GB/2013244 or 4GB/9780909	Winch Tirfor T7	4	
		Winch Tirfor TU8	4	
6	4GB/5238369	Rope Tirfor T7 - 18.3m lg	4	
7	4GB/2046346	Winch Tirfor T13	1	
8	4GB/5238372	Rope Tirfor T13 12.2m lg	1	
9	10B/9444464	Anchor Picket 2" x 2" x 47" lg	4	
10		Shackle SWL 12 cwt Patt No 95 Galv	4	Solid Swivel Co
11	SCSHQ 136231	Erector Band	1	
12		Shackle L 'D' SWL 3T Galv	1	Solid Swivel Co

ERECTION OF DERRICK

38 To erect the derrick proceed as follows:

38.1 The two side stays on the mast band are to be uncoiled and attached to the two outer tirfor T7 ropes (item 6) using the shackle on the stays.

38.2 Grease all pivoting points on the derrick with XG 264, and ensure that the tirsors and tirfor ropes are well lubricated with oil type OMD 75 or OMD 80 before use. Check that the shackles, rigging screws and heel bolt on the derrick are secure. See fig. 6.

39 Position one man at the hauldown block to operate the tirfor T13. The tirfor rope is to have approximately 100mm slack. Position two men, one at each derrick side stay picket to operate the Winches Tirfor type T7 or Winches Tirfor TU8. Position two men to lift the derrick head.

TABLE 6 ITEM LIST FOR FIG 6 (SCSHQ 134854)

Item	Drg No	Description	Qty	Remarks
1		Derrick 4½ dia x 20' lg	1	
3		Shackle L 'D' SWL 1T 10 cwt	5	
4		Rigging Screw 3/4" dia	2	
5	4GB/2013244 or	Winch Tirfor T7	4	
	4GB/9780909	Winch Tirfor TU8	4	
6	4GB/5238369	Rope Tirfor T7 - 18.3m lg	4	
7	4GB/2046346	Winch Tirfor T13	1	
8	4GB/5238372	Rope Tirfor T13 12.2m lg	1	
9	10B/9444464	Anchor Picket	4	
10		Shackle SWL 12 cwt Patt 95	4	
11	SCSHQ 136231	Erector Band	1	
12		Shackle L 'D' SWL 3T	1	

40 When the supervisor is satisfied that the men are in position the two men at the derrick head are to lift the derrick and walk towards the mast pushing the derrick upright. The two men on the derrick side stays are to assist in erection and ensure that the derrick does not go over the vertical by adjusting the tirfor T7 tensions. The tirfor T13 at the hauldown block is to be kept with minimum slack.

41 Ensure that the derrick is at an angle of approximately 85° to the mast when viewed from the side and vertical when viewed in line with the mast.

42 Operate the tirfor Type 13 at the hauldown block to raise the mast just clear of the support structure. Ensure that the mast head is the first part of the mast to leave the ground.

43 This paragraph has been deleted.

44 Raise the derrick to the vertical and after a final check tighten the nuts and bolts securing the erector band at the mast base.

ASSEMBLY OF TRANSMIT ANTENNA TO MAST (RA-5053-02)

45 The item numbers quoted in the following paragraphs refer to Drawing SCSHQ 137741 unless otherwise stated. Reference to the left and right hand sides assume a view from the mast base towards the mast head. See fig 7 and table 7.

TABLE 7 ITEM LIST FOR FIG 7 (SCSHQ 137741)

Item	Drg No	Description	Qty	Remarks
1	SCSHQ 137723	Mast Support Structure	1	PSA Supply
2	Marconi supply	7-wire fan assy	2	
3	"	3-wire fan assy	2	
6	"	Transformer Line	1	
7	"	Balancing Line	1	
31		Block Swivel Eye Single Sheave Cat No 374	2	Gibbs Ltd Warash
32		Shackle L 'D' SWL 15 cwt BS3032 proof Test Cert Rqd	2	Galv Solid Swivel Co
33	32A/9331559	Rope Terylene $\frac{3}{4}$ " circ	41m	Standing Line
34	SCSHQ 137711	King Post	1	
35	SCSHQ 137709	Cross Arm	1	
36		Bolt hex Hd M12 x 30 lg	7	ST ZN Plate
37		Nut M12	7	ST ZN Plate
38		S/Washer $\emptyset$ 12	7	ST ZN Plate

46 Secure the king post (item 34) to the head cap on the support structure (item 1) using seven bolts, nuts and washers (items 36, 37 and 38) as illustrated in fig 3. Secure the cross arm (item 35) to the king post (item 34) using four bolts, nuts and washers, (items 36, 37 and 38).

47 Attach the transformer line (item 6) to the cross arm (item 35), using the two shackles provided, such that it will be suspended over the foundation block with the two hairpins when the support structure is erect. See fig 13. Attach the balancing line (item 7) to the other end of the cross arm using the two shackles provided.

48 Referring to fig 7 carry out the following:

48.1 Attach the two 3-wire fan assemblies (item 3) to the two lugs on the king post (item 34) directly underneath the cross arm using the shackles provided.

48.2 Attach the two 7-wire fan assemblies (item 2) to the lugs at right angles to the 3-wire fan assemblies, using the shackles provided.

49 Secure the two pulleys (item 31) to the two 'free' lugs at the top of the king post, with shackles (item 32). Reeve one of the pulleys with the standing line (item 33) and knot the two ends to make a continuous loop. Leave the ends at least one metre long. The second pulley is to be secured to the mast with one metre of the terylene rope (item 33).

50 Connect the right hand jumper lead, situated just below the top insulator on the transformer line, to a similar jumper lead on the adjacent 7-wire fan assembly, using a screw and nut (items 21 and 24). Connect the left hand jumper lead to the remaining 7-wire fan in a similar manner.

51 The fan assemblies, together with the transformer and balancing lines, are to be conveniently and neatly laid along the length of the mast, and temporarily secured at approximately 1.5 metres from the base, in such a manner that no damage will take place during erection. Secure the standing line at the same height.

ASSEMBLY OF RECEIVE ANTENNA TO MAST (RA-5056-01)

52 The item numbers quoted in the following paragraphs refer to Drawing SCSHQ 137740. References to the left and right hand side assume a view from the mast base towards the mast head. See fig. 8.

TABLE 8 ITEM LIST FOR FIG 8 (SCSHQ 137740)

Item	Drg No	Description	Qty	Remarks
1	SCSHQ 137723	Mast Support Structure	1	PSA Supply
2	Marconi Supply	7-wire fan assy	2	
3	"	3-wire fan assy	2	
8	"	Matching Transformer	1	
31	"	Co-axial feeder	1	
33	SCSHQ 134774	Support	1	
36	Pt No TY8-S1	Nylon strapping black	37½m	Hellerman
37	Pt No TY8-C1	Standard nylon binding closure black	50	Elec Div
38	5120-99-203-6306	Tyton 800 tool	1	Returnable
		Block swivel eye single sheave cat No 372	2	Gibbs Ltd
40		Shackle L 'D' SWL 15 cwt BS3032 Galv proof load test cert	2	Solid swivel Co
41	32A/9331559	Rope Terylene ¾" circ	41m	Standing Line
42	SCSHQ 137711	King Post	1	

53 Referring to fig 8 carry out the following:

53.1 Secure the king post (item 42) to the head cap on the support structure (item 1) using the seven bolts, nuts and washers (items 21, 24 and 27). As illustrated in fig 3.

53.2 Locate the diametrically opposed lugs situated at the top of the king post and centrally positioned between the four holes in the top flange. Attach the two 3-wire fans, (item 3) one to each lug using the shackles provided.

53.3 Attach the two 7-wire fan assemblies (item 2) to the lugs situated at right angles to the 3-wire fan assemblies using the shackles provided.

54 Secure the two pulleys (item 39) to the two 'free' lugs at the top of the king post with shackles (item 40). Reeve one of the pulleys with the standing line (item 41) and knot the two ends to make a continuous loop. Leave the ends at least one metre long. The second pulley is to be secured to the mast with one metre of the terylene rope (item 41).

55 Attach the transformer (item 8) to the support (item 33) using the nuts and washers supplied with the transformer. Secure the support (item 33) (with the transformer attached) to the mast tube using the 'U' bolt provided. The transformer should be approximately 250mm (10 ins) from the top of the mast, immediately beneath one of the 3-wire fan assemblies, with the co-axial connector pointing towards the base (see fig 8).

56 Connect the right hand jumper lead, located just below the top insulator on the 7-wire fan assembly, to the adjacent stand-off insulator on the transformer. Do not apply undue torque to the insulators (see fig 8). Connect the left hand jumper lead to the adjacent stand-off insulator in a similar manner.

57 Connect the co-axial plug on one end of the co-axial feeder (item 31) to the transformer co-axial connector. Lay the co-axial feeder (item 31) along the mast and secure with black nylon strapping (item 36) and black closures (item 37) at approximately 500mm intervals using the tyton 800 tool (item 38).

58 Attach the bracket (item 34) to the mast tube using the 'U' bolt provided, and position it to suit the length of the co-axial feeder (item 31). Attach the co-axial feeder to this bracket using the straight adaptor (item 32). See fig 14.

59 The fan assemblies and the standing line are to be conveniently and neatly laid along the length of the mast and temporarily secured approximately 1.5 metres from the base in such a manner that no damage will take place during erection.

#### ERECTION OF MAST AND ANTENNA

Notes ...

- (1) Do not attempt any adjustments whilst erection is in progress. If any adjustments are required, erection must cease, and not restart until the adjustments are completed.

(2) The mast must not be left in a partly erected position. If for any reason the mast erection cannot be completed and all the stays attached to their relevant anchor plates, the mast must be lowered on to its wooden supports.

60 Grease all pivoting points with XG 264 and check that all attachments to the mast are secure.

61 Refer to figs 9 and 10, and deploy the erection party as follows:

61.1 Position two men at the hauldown block to operate the tirfor T13 and keep the tirfor rope clean and lubricated while passing through.

61.2 Position one man at each side of the mast to control the mast and derrick side stays.

61.3 Position two men at the rear mast stay to make adjustments when necessary.

▶ 62 When the supervisor is satisfied that the men are in position the two men at the hauldown block are to operate the tirfor to raise the mast just clear of the wooden support. The supervisor is to satisfy himself that the mast and derrick side stays are correctly adjusted to maintain the mast and derrick in the vertical plane. ◀

63 Continue hauling up the mast, taking care to use irregular strokes on the tirfor so as not to induce 'bounce' into the mast; if the mast does start to bounce stop erection until it dies down.

64 Slowly pull the mast into a vertical position, coarsely adjusting the mast stays as necessary. Do not tension up at this stage.

#### TRANSFER OF STAYS AND STRAIGHTENING OF MAST

65 Carry out the following:

65.1 The item numbers quoted in the following paragraphs refer to Drawing SCSHQ 137723 unless otherwise stated.

65.2 Disconnect the two tirfor T7 ropes which are attached to the mast side stays (item 16) and transfer the complete stays to their relevant anchor plate using the shackles (item 14) to secure the stays to the first hole in each plate.

66 Remove the erection stays from the derrick head and secure them to the anchor plate as follows:

66.1 Slacken off the rigging screw connecting the lower stay to the derrick head and disconnect at the parafil termination by removing the clevis and split pins. Retain the clevis pin.

66.2 Attach the lower part of the stay removed in paragraph 35 to the parafil termination using the clevis pin and a new split pin.



66.3 Attach the complete stay to the lower hole in the anchor plate using the shackle provided. Adjust the tension if necessary.

66.4 Slacken off the top stay as in paragraph 66.1. It is essential that when transferring this stay the derrick is supported by two men, and carefully lowered to the ground.

66.5 Attach the lower part of the stay removed in paragraph 35 to the parafil termination using the clevis pin and a new split pin.

66.6 Attach the complete stay in the third hole of the anchor plate as in paragraph 66.3.

67 Dismantle the erector gear as follows:

67.1 Remove the tirfor ropes and tirlfors.

67.2 Remove the erector band (item 11 on SCSHQ 134854) from the mast and re-assemble).

67.3 Withdraw anchor pickets complete with shackles (items 9 and 10 on SCSHQ 134854).

67.4 Store all the erector gear in accordance with AP 119K-0004-1.

68 Straighten the mast, using the method set out in Annex A to this chapter. ◀

69 Tension the stays in still air conditions to the following tensions:

69.1 Top stay - 12180N (2740 lbs ± 5%). (PARAFIL 5.0TE BREAK)

69.2 Bottom stay - 1610N (360 lbs ± 5%). (PARAFIL 3.5TE BREAK). ◀

70 When all the stays have been tensioned up, the rigging screws must be greased with a protective mixture of PX1 and PX11 and wired with copper wire, then taped with denso tape.

#### GROUND INSTALLATION OF ANTENNA

71 The item numbers quoted in the following paragraphs refer to Drawing SCSHQ 137741 or SCSHQ 137740 as appropriate, unless otherwise stated.

72 By reference to the ground plan in fig 2 mark out the positions for twenty element anchors. Ensure that the 3-wire and 7-wire fan assemblies coincide with the appropriate anchor positions. At each of the twenty element anchor positions drive in an antenna anchor (item 9) leaving approximately 150mm of anchor above the ground. See fig 11.

73 At the mast base unfasten the fan assemblies etc which were temporarily secured 1.5m above ground level, uncoil and lay them out towards their respective anchors. Ensure that the wires are not looped or twisted. Make off each antenna element of the 3-wire and 7-wire fan assemblies to their respective anchor using a shackle, (item 10) cable group and thimble (items 16 & 17) as shown in fig 11.

TABLE 9 ITEM LIST FOR FIG 11 (SCSHQ 137740 or 137741)

Item	Drg No	Description	Qty	Remarks
9	Marconi Supply	Antenna Anchor	20	
10	"	Shackle 'D' captive pin	20	
16	90G109807/6	Grip Cable $\frac{3}{8}$ " circ	20	10B/9331564
17		Thimble steel	20	28Y 1076516

74 Tension up each element in the fan assemblies such that each fan assembly retains a uniform slope and shape without excessive sagging. This situation will occur with approximately 50N (10 lbs) tension in each element.

75 Couple up the fan assemblies into pairs by attaching the co-axial lines (item 4) from both 7-wire fan assemblies to the adjacent 3-wire fan assemblies. Connection is made between terminating units located in the lower part of the centre element in each fan assembly, see fig 12.

76 Layout the earth kit (item 5) with the four legs radiating from the mast base to the centre element of the fan assemblies. Ensure that lug terminated ends are at the mast base and the two legs with the extra wires attached are in line with the 3-wire fan assemblies (see fig 1). Connect the earth wire with the lug attached to the terminating units on the 3-wire fan assemblies. Lay the other five wires, equally spaced, on the ground. Strap the co-axial lines and the earth wires to the centre elements of the 3-wire fan assemblies using support tie (item 12). Strap the co-axial lines to the 7-wire fan assemblies using support tie (item 12). See fig 12.

TABLE 10 ITEM LIST FOR FIG 12 (SCSHQ 137740 or 137741)

Item	Drg No	Description	Qty	Remarks
3	Marconi Supply	3-wire fan assy	2	
4	"	Co-axial line	2	
5	"	Earth Kit	1	
12	"	Support tie	50	

77 Attach the earth wires to the tags at the mast base, using screws, nuts and washers (item 20, 23 & 26) see fig 13 or 14. Peg the co-axial cable lines and the earth kit to the ground using wire pegs (item 11). Care must be taken when driving the pegs in to ensure that the co-axial cable is not damaged. Where possible these cables are to be buried approximately 20mm to prevent damage from grass cutting operations etc.

Receive Antenna RA-5056-01

78 Drive an antenna anchor (item 35) into the ground near the mast base, leaving approximately 150mm above the ground. Secure the standing line, (item 41) to the anchor, using a shackle (item 13). See fig 1.

79 Connect the station co-axial line to the straight adaptor (item 32) on the mast tube, securing with nylon strapping and nylon binding, (items 36 and 37). See fig 14.

80 Clear the site of all tools and equipment.

Transmit Antenna RA-5053-02

81 Make off the transformer line (item 6) to the two hairpins provided at the mast base, using shackles, thimbles and cable grip (items 10, 16 & 17). Tension each wire to approximately 50N (10 lbs). See fig 13.

TABLE 11 ITEM LIST FOR FIG 13 (SCSHQ 137741/137723)

Item	Drg No	Description	Qty	Remarks
5	Marconi Supply	Earthing Kit	1	
6	"	Transformer Line	1	
7	"	Balancing Line	1	
8	"	Transformer Minns Type XDX 01A With 90° Adaptor B	1	
10	"	Shackle 'D' captive pin	23	
11	"	Round Wire Peg 12" x 4G	62	
14	SCSHQ 134797	Clamp Support	2	
16	90G109807	Grip Cable 3/4" circ	3	10B/9331564
17	28Y/1076516	Thimble Steel	3	
19	29A/1222772	Bolt M10 Hex hd x 35 lg	4	
20	29B/1228748	Screw M6 Hex hds x 12 lg	4	
22	29A/1226476	Nut M10	4	
23	29A/1350787	Nut M6	4	
25	29C/1226476	Washer M10	4	
26	29C/1228065	Washer M6	4	
6	PSA Supply	Mast Band 3 Piece (Galv.)	1	SCSHQ 137723
7	"	Bolt & Nut 3/4" dia (Sheradised)	3	SCSHQ 137723
8	"	Link Plate (Galv.)	1	SCSHQ 137723

TABLE 12 ITEM LIST FOR FIG 14 (SCSHQ 137740/137723)

Item	Drg No	Description	Qty	Remarks
5	Marconi Supply	Earthing Kit	1	
11	"	Round Peg	62	
20	29B/1228748	Screw M6 Hex hd x 12 lg	4	
23	29A/1350787	Nut M6	4	
26	29C/1228065	Washer Ø 6	4	
31	Marconi Supply	Co-axial feeder	1	
32	"	Straight adaptor 50 Ω series 34N-50-0-1	1	
34	SCSHQ 134777	Bracket Assy	1	
36	PT No TY8-S1	Nylon Strapping Black	5 reels	)Hellerman )Elec Div
37	PT No TY8-C1	Standard Nylon Binding Closure Black	50	
38	5120-99-203-6306	Tyton 800 Tool	1	
6	PSA Supply	Mast Band 3 Piece	1	
7	"	Bolt & Nut ½" Dia	3	
8	"	Link Plate	1	

82 Make off the balancing line (item 7) to the hairpin provided at the mast base using shackle, thimble and cable grip (items 10, 16 & 17). Tension the line to approximately 50N (10 lbs).

83 Attach the transformer (item 8) to the lower portion of the mast tube in the following manner, using two clamp supports, bolts, washers and nuts (items 14, 19, 22 & 25):

83.1 Two men are to support the transformer unit.

83.2 Mount the unit vertically, i.e. with the insulators upright on the top of the case, such that the jumper leads situated at the top end of the lower insulators on the transformer line will reach their respective insulators on the unit.

83.3 Remove transit sealing screw (colour yellow) from the pressure relief valve. Replace with rain shield using no-gasket washer.

83.4 Ensure the oil level is correct by inspection in the filler cap. Use shell diala 'BX' insulating oil to fill if necessary.

83.5 Connect the jumper leads on the transformer line to the insulators on the transformer unit by clamping the leads between the nuts supplied. Do not apply undue torque to the insulator caps.

83.6 Do not energize the transformer at full power unless connected to an antenna or load, with a VSWT of 2.5:1 or better.

83.7 Connect the station co-axial cable to the co-axial termination on the transformer.

84 Drive an antenna anchor (item 9) into the ground near the mast base leaving approximately 150mm above the ground. Secure the standing line (item 33) to the anchor with a shackle (item 13). See fig 1.

85 Clear the site of all tools and equipment.

#### INSTALLATION OF ANTENNA TO AN ERECTED MAST

##### Note...

Prior to installation, check that the mast is vertical and correctly stayed.

86 The item numbers quoted in the following paragraphs refer to drawings SCSHQ 137741 and SCSHQ 137740 as appropriate, unless otherwise stated.

87 Check that the twenty element anchors are positioned correctly, paragraph 72 refers. Position the elements according to para 72 and Fig 2, if necessary. Ensure that the anchors, cable grips, thimbles and shackles are serviceable, and renew where necessary.

88 Layout the four fan assemblies, (items 2 and 3) at the base of the mast and ensure that they are correctly positioned relative to their respective anchors. Position the receive transformer and support (items 8 and 33) or the transmit transformer line and balancing line (items 6 and 7), as appropriate, at the base of the mast.

89 Check the safety suspension chair and associated equipment in accordance with AP 119K-0304-15F, and attach to the mast as detailed below: ◀

##### Note...

▶ The snatch block, shackle and pin referred to below, are part of the associated equipment (AP 119K-0304-15F refers) and may be permanently attached to the mast. ◀

89.1 Attach the snatch block to the support band at the base of the mast, using the shackle and pin provided. Ensure that the snatch block is in line with the suspension chair pulley at the mast head. Re-align the support band if necessary.

89.2 Reeve the suspension chair rope through the snatch block. Disconnect the standing line from the anchor, and untie the knot so that the line is no longer in a continuous loop.

89.3 Secure one end of the standing line to the suspension chair rope with suitable tape, and reeve the suspension chair rope through the mast head pulley.

90 A man is now to ascend the mast using the suspension chair in accordance with AP 119K-0304-15F, taking with him a hauling rope 40m long and 8mm diam; and two 1/2 in UNF spanners when installing the transmit antenna, or one M10 and one 'O' BA spanner when installing the receive antenna. When the man is securely situated at the mast head, he is to release the spare pulley securing rope, reeve the hauling rope through the pulley and knot it to make a continuous loop with the ends at least one metre long. Installation of the antenna may then proceed as follows:

#### Transmit Antenna RA-5053-02

91 Lower the hauling rope and position the knot at the ground. Place one of the free ends of the hauling rope through the two uppermost thimbles on the transformer line and secure with a knot. Using the hauling rope raise and support the transformer line at the top of the mast.

92 The man at the top of the mast is to secure the transformer line to the correct bracket on the head cap with the shackles provided (see paragraph 47). With the transformer line secured the hauling rope is to be released from the transformer line, and the free end lowered to the ground.

93 Attach the balancing line and the four fan assemblies in turn, to the hauling rope and haul to the mast head. Attach the balancing line and the four fan assemblies to the appropriate lugs as detailed in paras 47 and 48 and shown in fig 7).

94 Remove and retain the nut and screw from the right hand side jumper lead situated just below the insulator on the transformer line. Connect the right hand jumper lead on the transformer line to the jumper lead on the adjacent 7-wire fan assembly, using the screw and nut (items 21 and 24). Connect the left hand jumper leads on the transformer line and 7-wire fan assembly, in a similar manner.

#### Receive Antenna RA-5056-01

95 With the man safely positioned at the head of the mast, lower the hauling rope and position the knot at ground level. Secure the transformer and support (items 30 and 33) to the free end of the hauling rope, and haul to the head of the mast. Support the transformer with the hauling rope until it is secured to the mast as detailed in para 55.

96 Return the hauling rope free end to the ground, attach one fan assembly to the hauling rope, and haul up the mast. Secure the fan assembly to the appropriate lug on the head cap, supporting the fan assembly with the hauling rope as required. Haul and attach the remaining three fan assemblies in a similar manner.

97 Connect the jumper lead located immediately below the insulator on the right hand 7-wire assembly, to the adjacent stand off insulator on the transformer. Do not apply undue torque to the insulator. Connect the left hand jumper lead to the appropriate stand off insulator, in a similar manner.

98 Connect the co-axial feeder (item 31) to the connector plug underneath the transformer. If it is necessary to relocate the transformer in order to connect the co-axial cable without undue strain, ensure that the transformer is supported by the hauling rope, before any adjustments are made.

### Transmit and Receive Antennas

99 Remove the hauling rope from the pulley and secure the pulley to the mast with one metre of terylene rope. Lower the man in the suspension chair to the ground in accordance with AP 119K-0304-15F.

100 Detach the suspension chair rope from the standing line and knot the standing line to make a continuous loop through the pulley. Leave the ends at least one metre long. Attach the standing line to the anchor provided. Remove and store the suspension chair and associated equipment, (snatch block, shackle bow and pin) in accordance with AP 119K-0304-15F.

101 Lay out the fan assemblies to their respective anchors, ensuring that the wires are not looped or twisted. Make off the antenna elements to their respective anchors as detailed in paras 73 to 85.

### LOWERING AND DISMANTLING

#### REMOVAL OF AN ANTENNA FROM AN ERECTED MAST

Notes...

- (1) Before starting this task, read paragraphs 8, 9 and 10.
- (2) Ensure that the transformer is not energized and that notices to the effect that men are working on the antenna are prominently displayed.

102 Disconnect the four co-axial connectors and the two earth links from the centre elements of the fan assemblies. Disconnect the station co-axial feeder at the transformer, or the straight adaptor as appropriate. Remove the station co-axial cable from the mast. Protect the co-axial connectors with caps, where provided, or polythene and tape.

#### Transmit Antenna RA-5053-02

103 Disconnect the jumper leads between the transformer line and transformer units at the transformer unit. Replace the fasteners on the insulators. Disconnect the transformer line and the balancing line at the hairpins by releasing the shackles. Replace the shackles on the lines.

104 Employ two men to support the transformer while the two transformer clamps are released. Remove the transformer from the mast and lower to the ground. Secure the clamps to the transformer and store the unit in a safe place.

#### Receive and Transmit Antennas

105 Disconnect the twenty antenna elements at their anchors by releasing the shackles. Replace the shackles on the antenna elements. Gather together the antenna elements and secure with tape approximately 1.5m from the mast base.

106 Secure and operate the suspension chair as detailed in paras 89 and 90. Removal of the antenna may now proceed as follows:

Transmit Antenna RA-0503-02

107 Separate the two jumper leads joining the transformer line to the two 7-wire fan assemblies by removing the nuts and screws. After the leads have been separated replace the screws and nuts on the transformer line for future use.

108 Place one of the 'free' ends of the hauling rope through the uppermost thimbles of the transformer line and secure by knotting the end. Ensure the rope will not pull through. One man on the ground is to take up the slack on the hauling rope while the man at the top of the mast releases the two shackles securing the transformer line to the head cap, and secure the shackles to the transformer line.

109 Lower the transformer line to the ground and remove the hauling rope. Coil the transformer line and remove to a safe place. Return the knot of the hauling rope to the mast head.

110 Lower the balancing line in a similar manner to the transformer line, as detailed in paras 108 and 109.

Receive Antenna RA-5056-01

111 Remove the jumper leads from the transformer and replace the nuts on the insulators. Disconnect the co-axial feeder from the transformer and replace the dust caps.

▶ Transmit and Receive Antennas ◀

112 Place one of the 'free' ends of the hauling rope through the uppermost thimble of one of the fan assemblies, and secure by knotting the end. Ensure that the rope will not pull through.

113 One man on the ground is to take up the slack on the hauling rope and support the weight of the fan assembly while the man at the head of the mast releases the shackles securing the fan assembly to the headcap. Replace the shackle on the fan assembly only.

114 Lower the fan assembly to the ground and remove the hauling rope. Coil the fan assembly neatly, and remove to a safe place. Pull the knot of the hauling rope to the head of the mast, and lower the remaining three fan assemblies in a similar manner.

Receive Antenna RA-5056-01

115 Secure one of the free ends of the hauling rope to the transformer and support. One man on the ground is to take up the slack on the hauling rope and support the weight of the transformer while the man at the top of the mast removes the 'U' bolt securing the transformer to the mast. Replace the 'U' bolt on the support only.

116 Lower the transformer and support to the ground, and remove the hauling rope. Remove the transformer and support to a safe place.



Transmit and Receive Antennas

117 Lower the man in the suspension chair to the ground in accordance with AP 119K-0304-15F. Detach the suspension chair from the standing line, and knot the standing line to form a continuous loop, leaving the ends at least one metre long.

118 Attach the standing line to the anchor provided. Secure the hauling rope to the mast. Remove the suspension chair to a safe place.

LOWERING THE MAST

119 Clear the site of any obstruction likely to impede this operation.

120 If the antenna system is attached to the mast, carry out the instructions given in paras 102 to 105 inclusive. Disconnect the standing line from the anchor, and the station co-axial cable from the straight adaptor where necessary. Remove the station co-axial feeder from the mast.

121 Ensure that the fan assemblies and standing line, and where appropriate the transformer line and balancing line, are neatly secured to the mast 1.5m from the base. Proceed to lower the mast as follows.

122 The item numbers quoted in the following paragraphs refer to Drawing SCHQ 134854 unless otherwise stated.

123 Drive into the ground four pickets (item 9) in the position shown in fig 5 and 6. To each of the pickets attach a Winch Tirfor type T7 or Winch Tirfor TU8 (item 5) using a shackle (item 10). ◀ ▶

124 Lay the derrick (item 1) horizontal with its head over the hauldown block and the two rigging screws uppermost. Securely attach the erector band (item 11) to the mast as near to the heel plug as possible using the screws, washers and nuts supplied with the band.

125 Attach the hooks of the two inner tirfor T7 ropes (item 6) to the side lugs on the derrick head using the shackles (item 3). Reeve the two Winch Tirfor type T7 or Winch Tirfor TU8 with the tirfor T7 ropes and attach the tirfor T13 rope (item 7) to the lower most lug on the derrick head using a shackle (item 3). ◀ ▶

126 Attach the tirfor T13 to the hauldown anchor block using a shackle, (item 12) and reeve the tirfor T13 with the tirfor rope.

127 Grease all pivoting points on the derrick and mast with XG 264. Ensure that the tirsors and their ropes are lubricated.

128 Tension the derrick side stays to maintain the derrick in line with the mast. Remove the tape and securing wire from all the rigging screws on the mast stays.

129 Slacken the stay rigging screws, beginning with the top stays, to reduce the tension in the mast stays. Ensure that the mast remains vertical, and that the rigging screws are not opened beyond a maximum of 540mm. Employ two men to raise and support the derrick at an angle of approximately 85° to the mast, until a stay is attached.

130 Detach the top stay from the stay anchor block adjacent to the derrick head by removing the shackle at the anchor plate. Replace this shackle on the stay. Keeping the stay taut, remove the lower portion at the parafil termination by removing the split and clevis pins. Label and retain the lower portion. Attach the parafil portion to the uppermost rigging screw using the clevis pin with a new split pin.

131 Take up the slack on the tirfor T13 rope (item 8).

Note...

The derrick will now be supported by the stay.

132 Transfer the lower stay in a similar manner to paragraph 130.

► 133 Ensure that the hauldown tirfor T13 rope (item 8) is taut and follow the procedures in Para 42."

134 Position the fitting party as follows before commencing mast lowering operations: ◀

134.1 Two men at the hauldown block to operate the tirfor T13 and keep the tirfor rope clean and lubricated.

134.2 One man at each derrick side stay to control the tirfor T7 and the mast side stays if necessary.

► 134.3 Two men at the mast stay opposite the derrick to control the stays.

135 When the supervisor is satisfied that the men are in position, the two men at the hauldown block are to operate the tirfor T13 to lower the mast. ◀

136 Irregular strokes are to be used on the tirfor T13 during lowering so as not to induce 'bounce' into the mast. If the mast starts to bounce stop lowering and wait until it dies away.

137 Stop lowering when the mast head cap is approximately 2 metres above the ground and position wooden blocks along the ground to support the mast in a horizontal position. Ensure that no damage will result to any items attached to the mast. Continue lowering the mast onto the wooden supports.

138 Slacken off the tirfor T13 rope (item 8). Slacken off the securing screws holding the erector band (item 11) at the mast base to enable the derrick to pivot.

▶ 139 Lower the derrick by operating one of the side Winches Tirfor type T7 or Winches Tirfor TU8 (item 5). Support the derrick with wooden blocks on the ground. ◀

140 Remove the erector band (item 11) from the mast and re-assemble.

141 Carry out the following:

141.1 Detach the mast stay from the Derrick by removing the split and clevis pins from the parafil terminations. Replace the clevis and split pins.

141.2 Remove the two T7 tirfor ropes from the mast side stays and coil the stays up.

142 Remove and store the tirsors and tirfor ropes in a safe place. Store the derrick in a safe place.

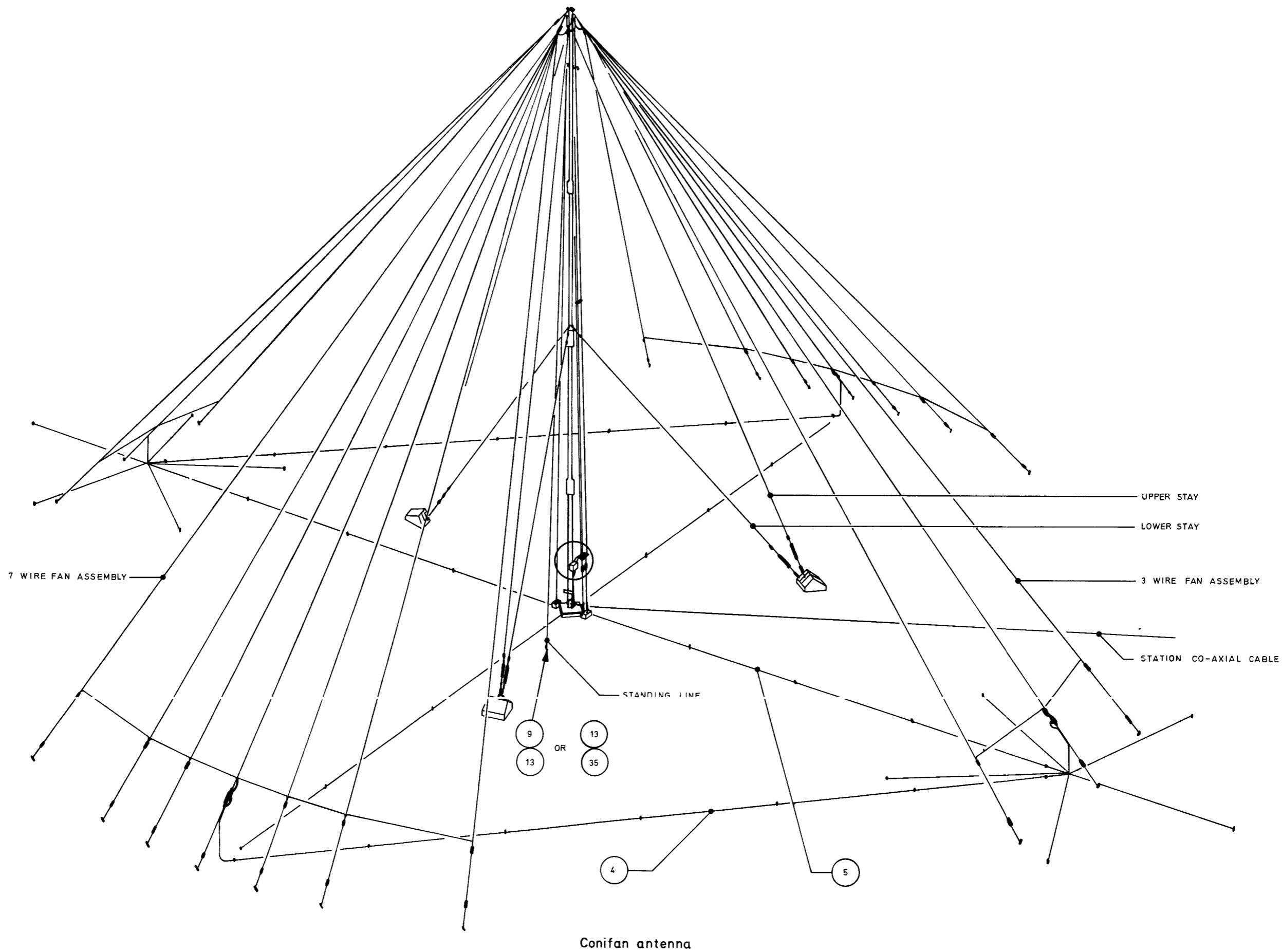
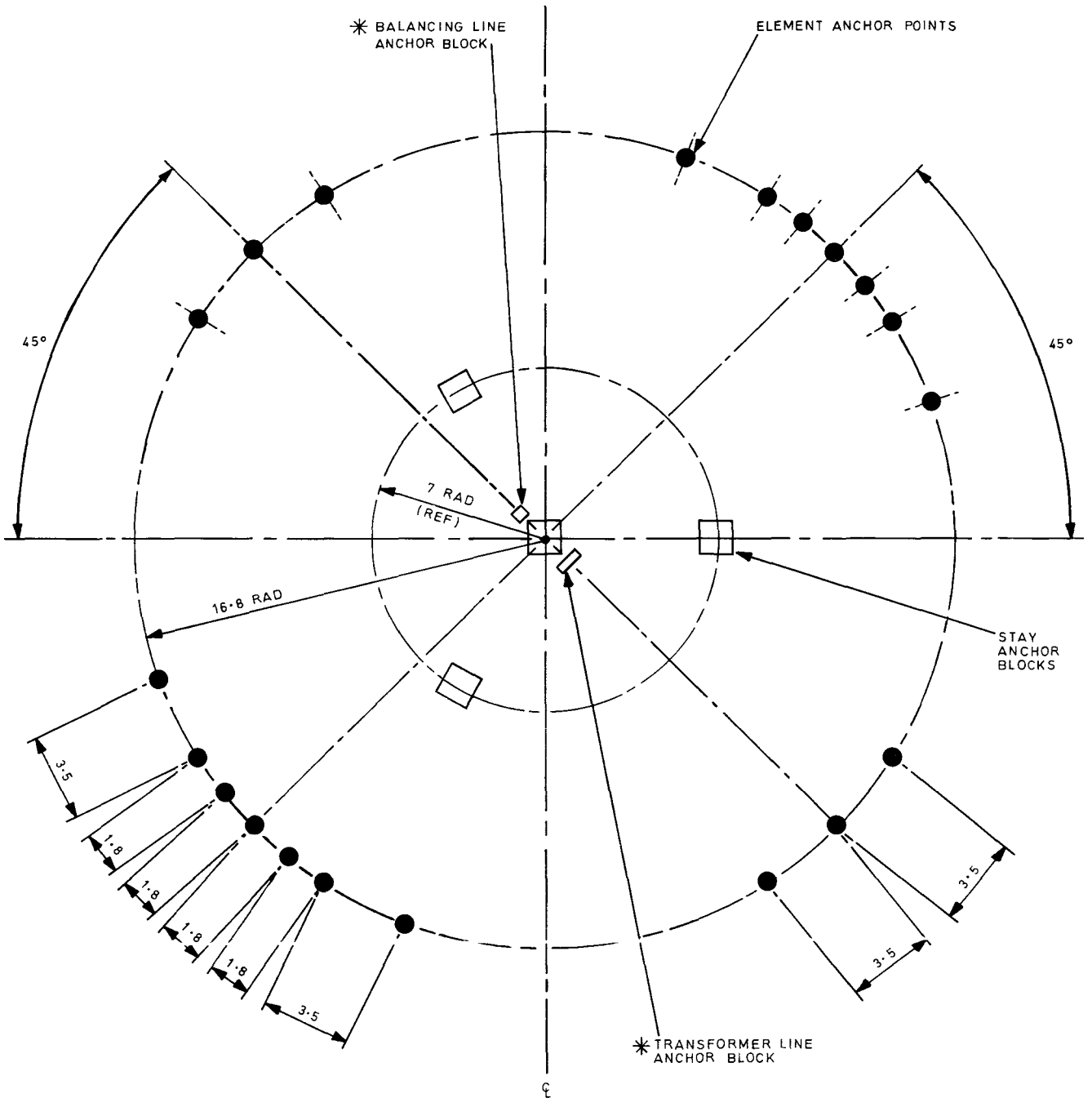


Fig 1

Oct 78

Fig 1



\* TRANSMITTER  
ANTENNA ONLY

Fig 2 Antenna anchorage

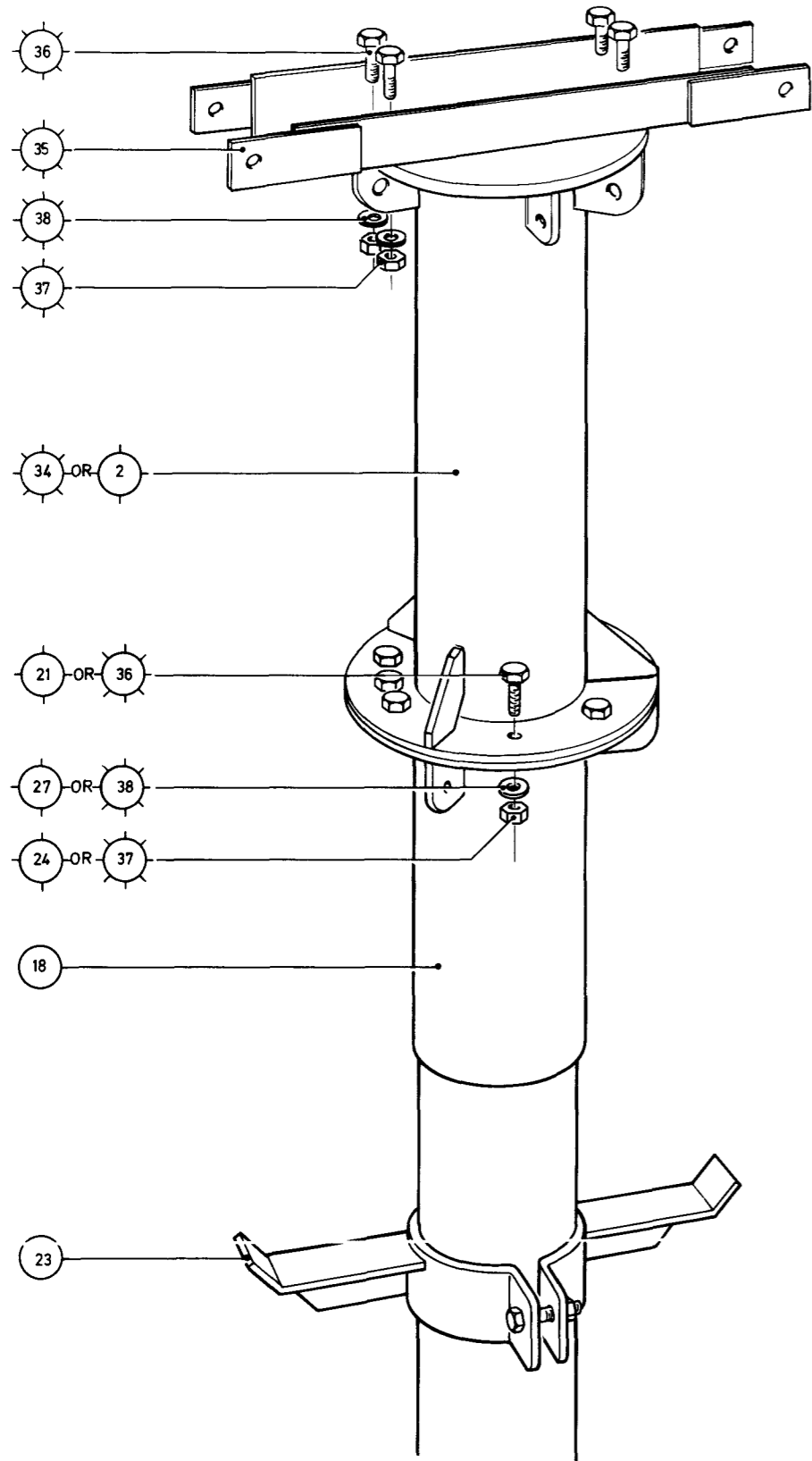
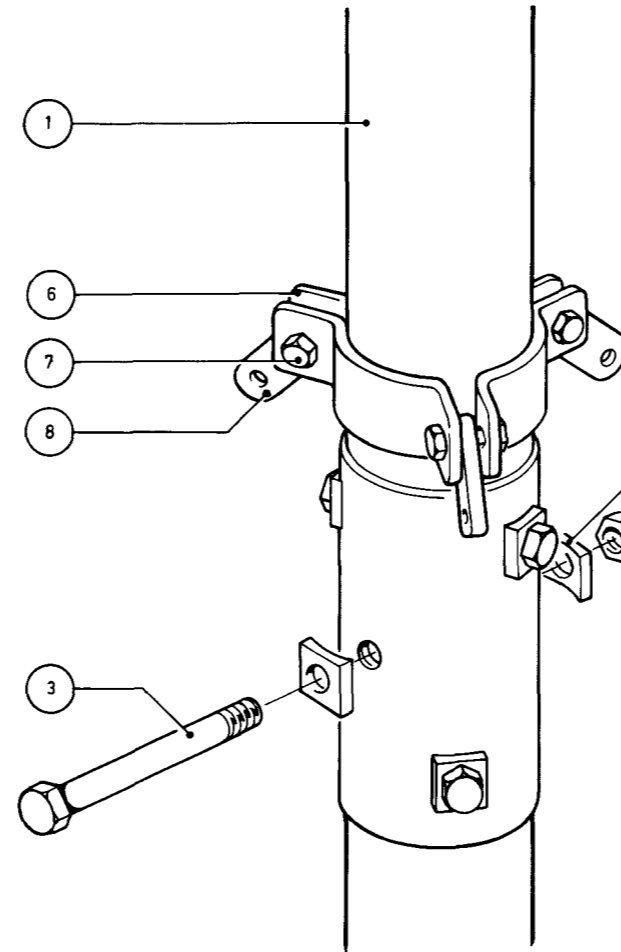


Fig 3

Oct 78



TYPICAL JOINT

- ITEM EXTRACTED FROM DRG RAFSCSHQ 137723
- ITEM EXTRACTED FROM DRG RAFSCSHQ 137740
- ITEM EXTRACTED FROM DRG RAFSCSHO 137741

Mast assembly

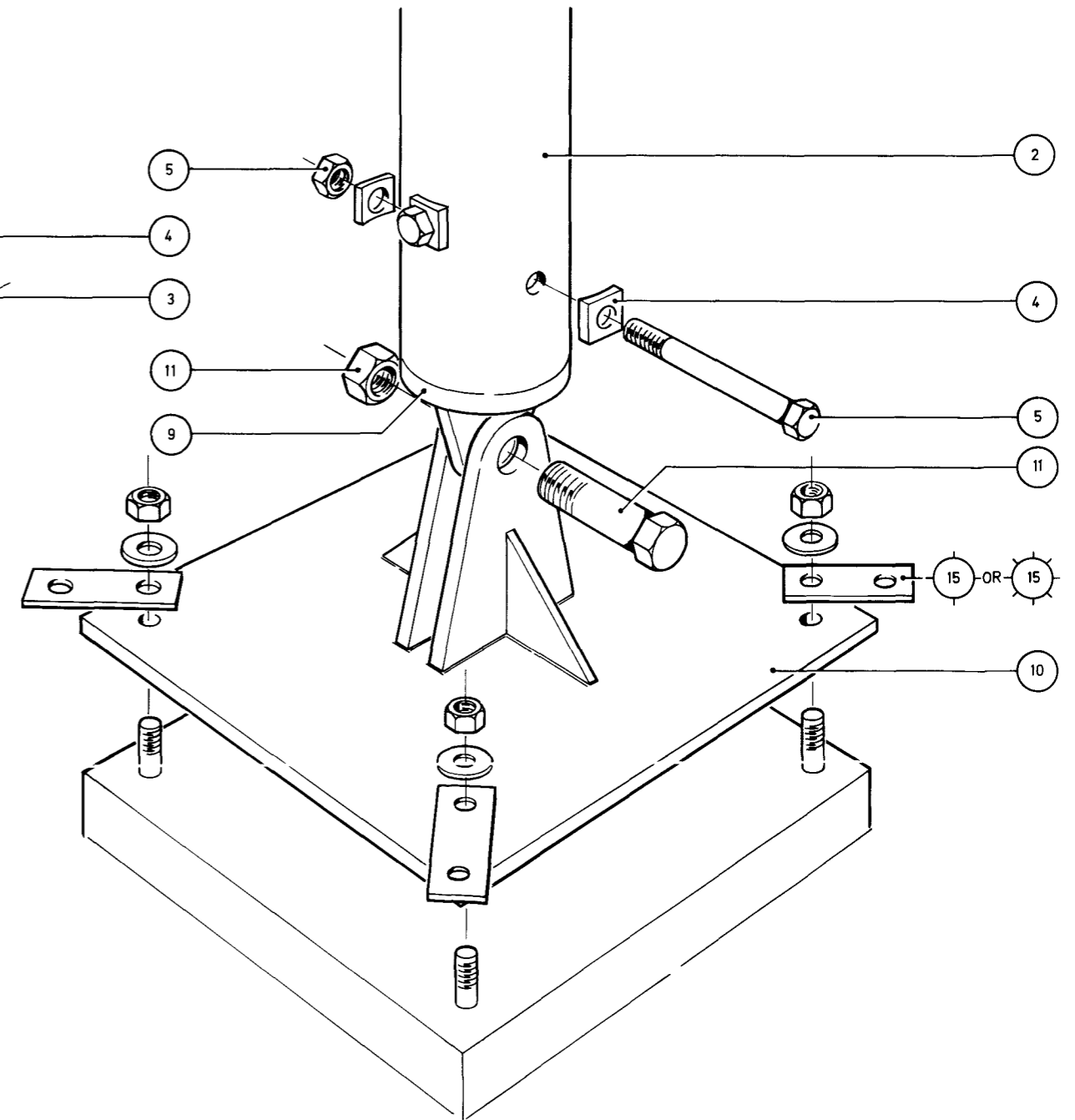


Fig 3

Chap 1  
Page 31/32

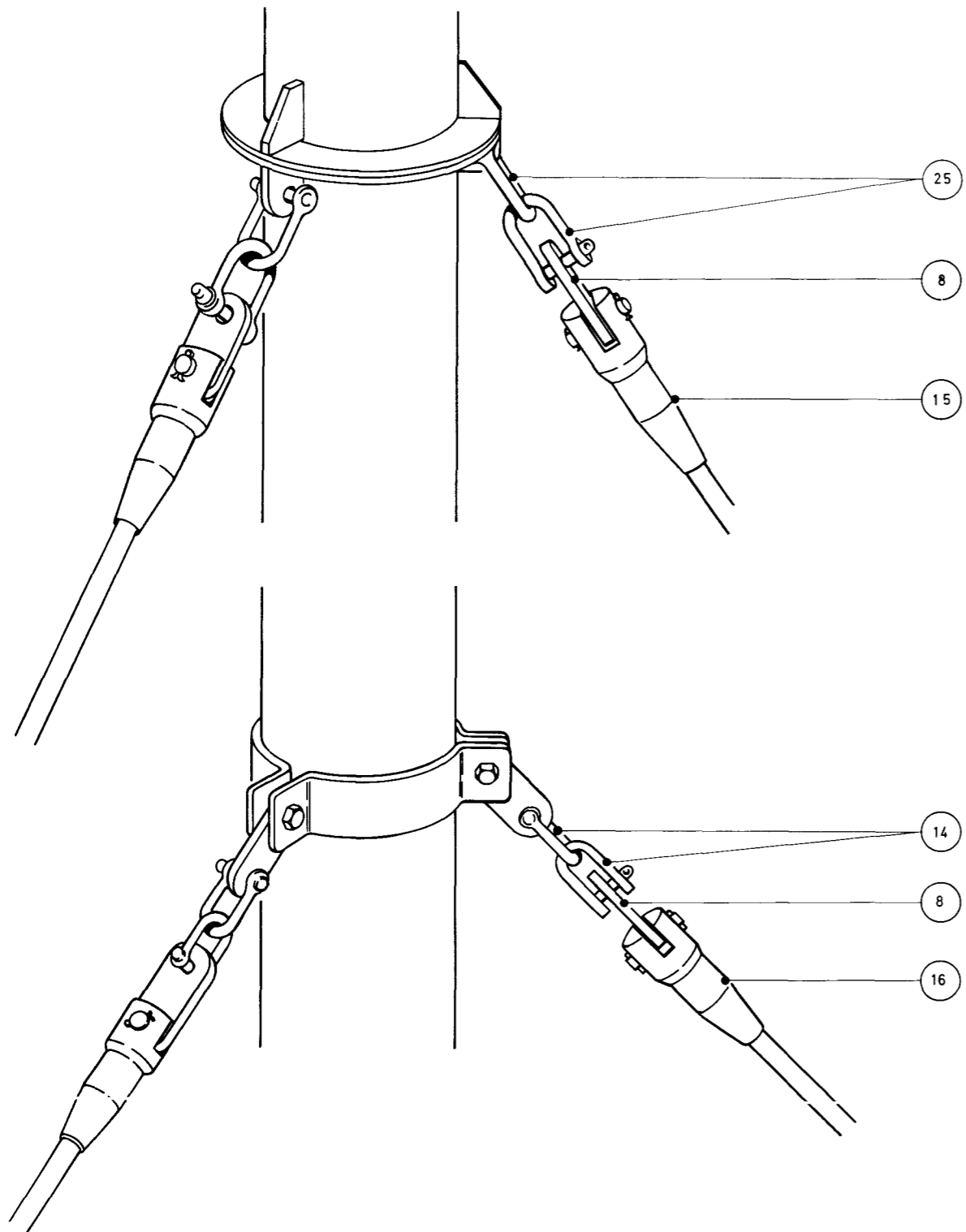


Fig 4

Oct 78

Stay attachment details

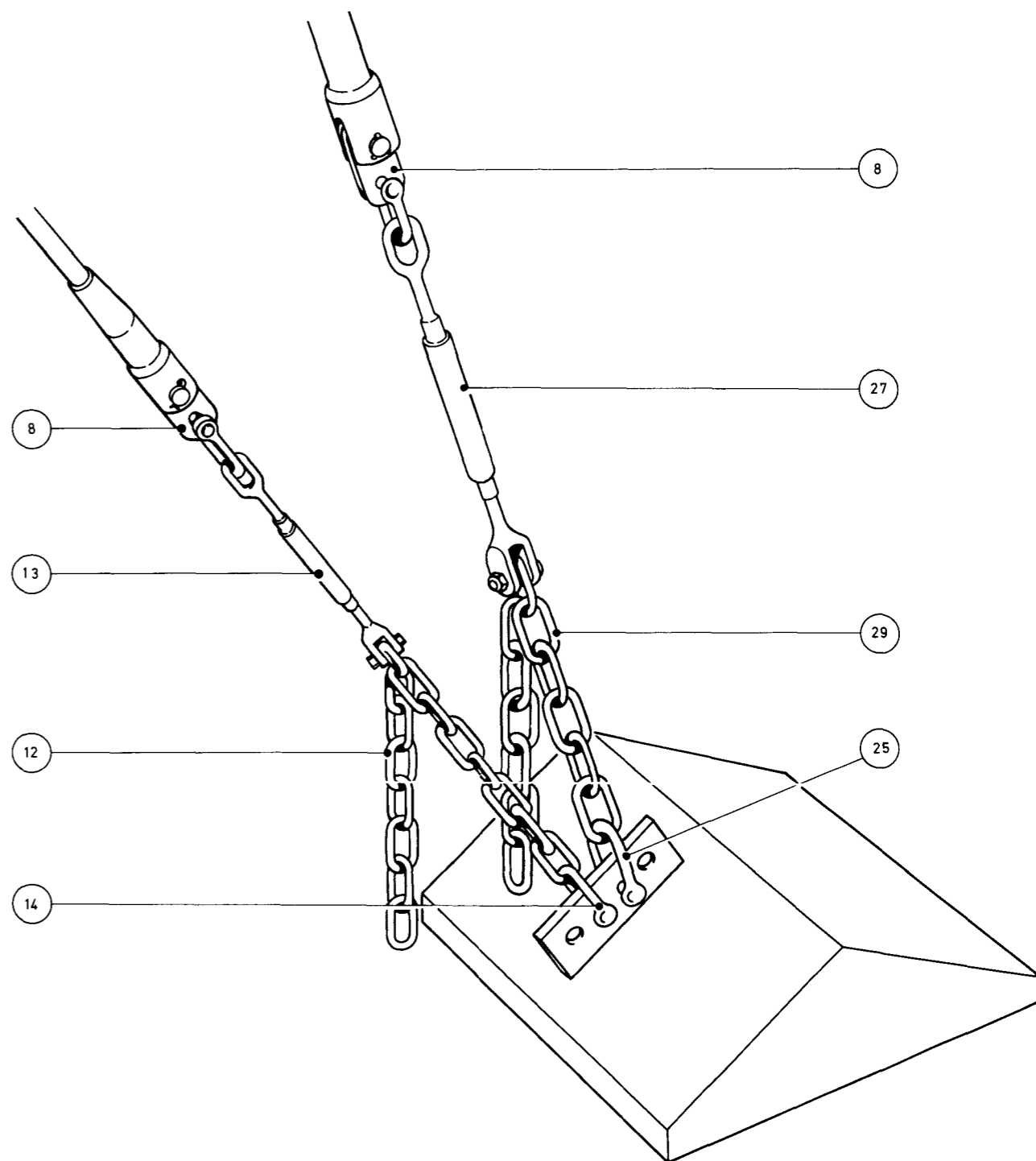


Fig 4

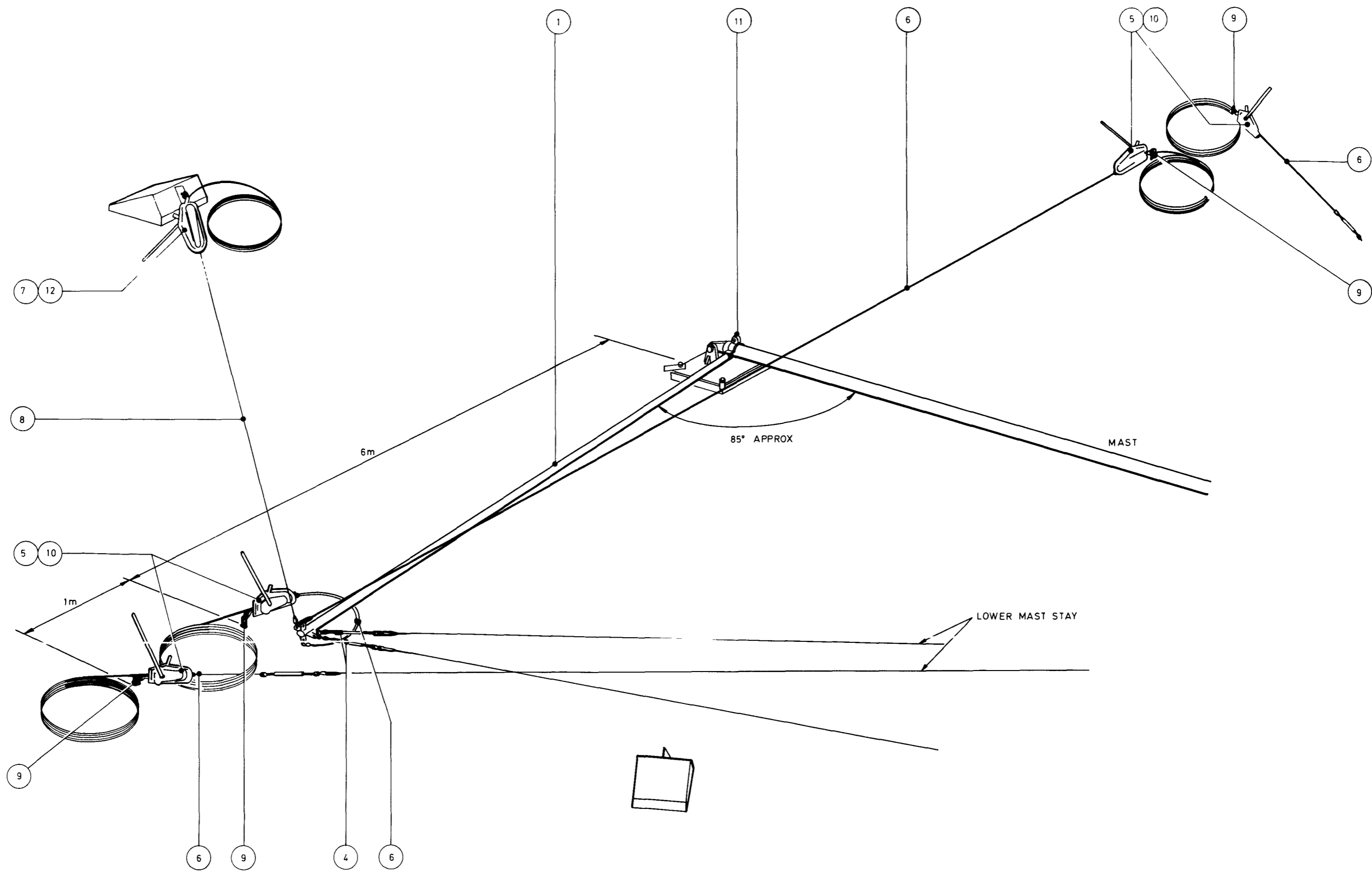


Fig 5

Derrick assembly

Fig 5



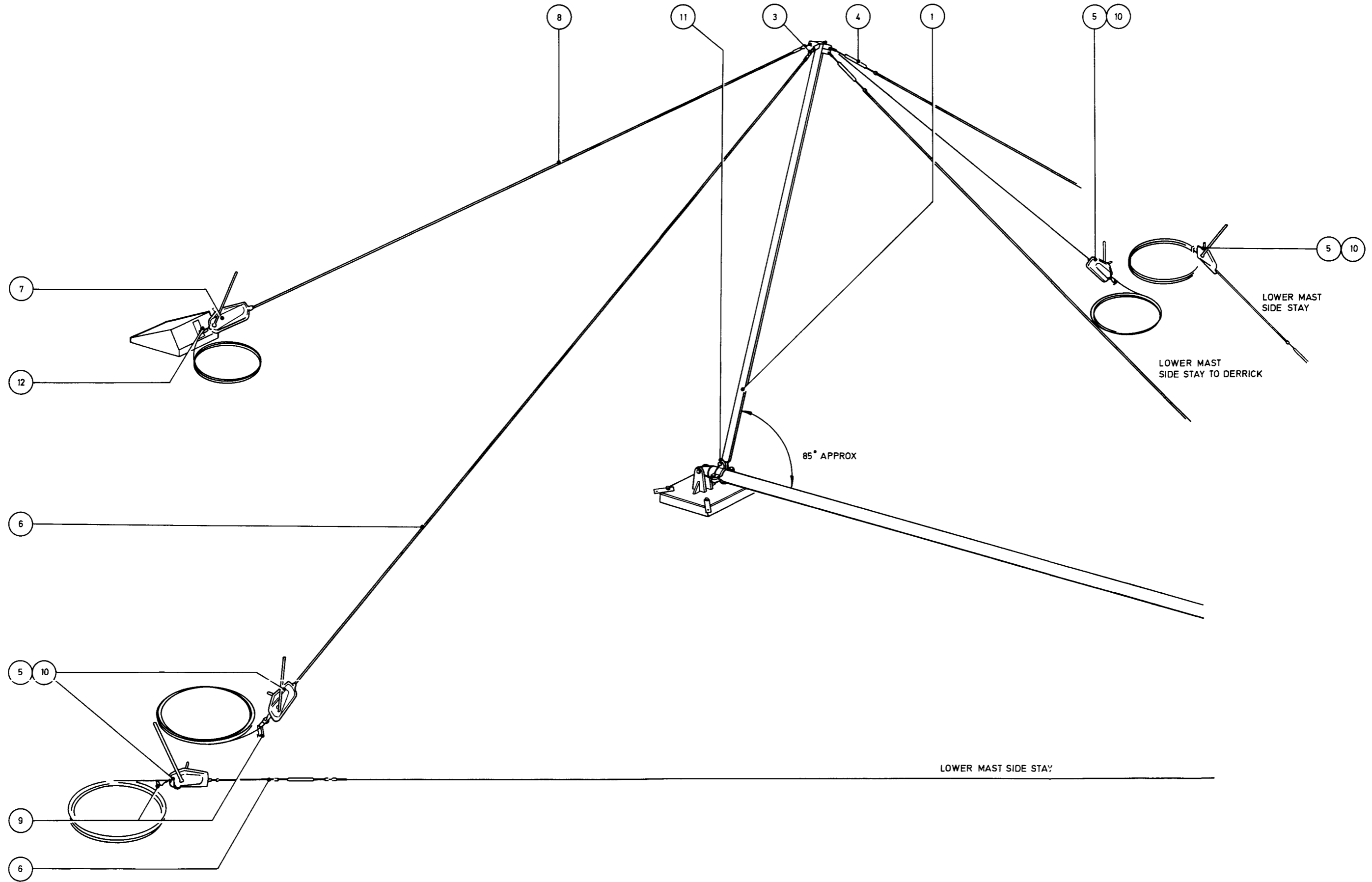


Fig 6

Derrick erected with side stays attached

Fig 6

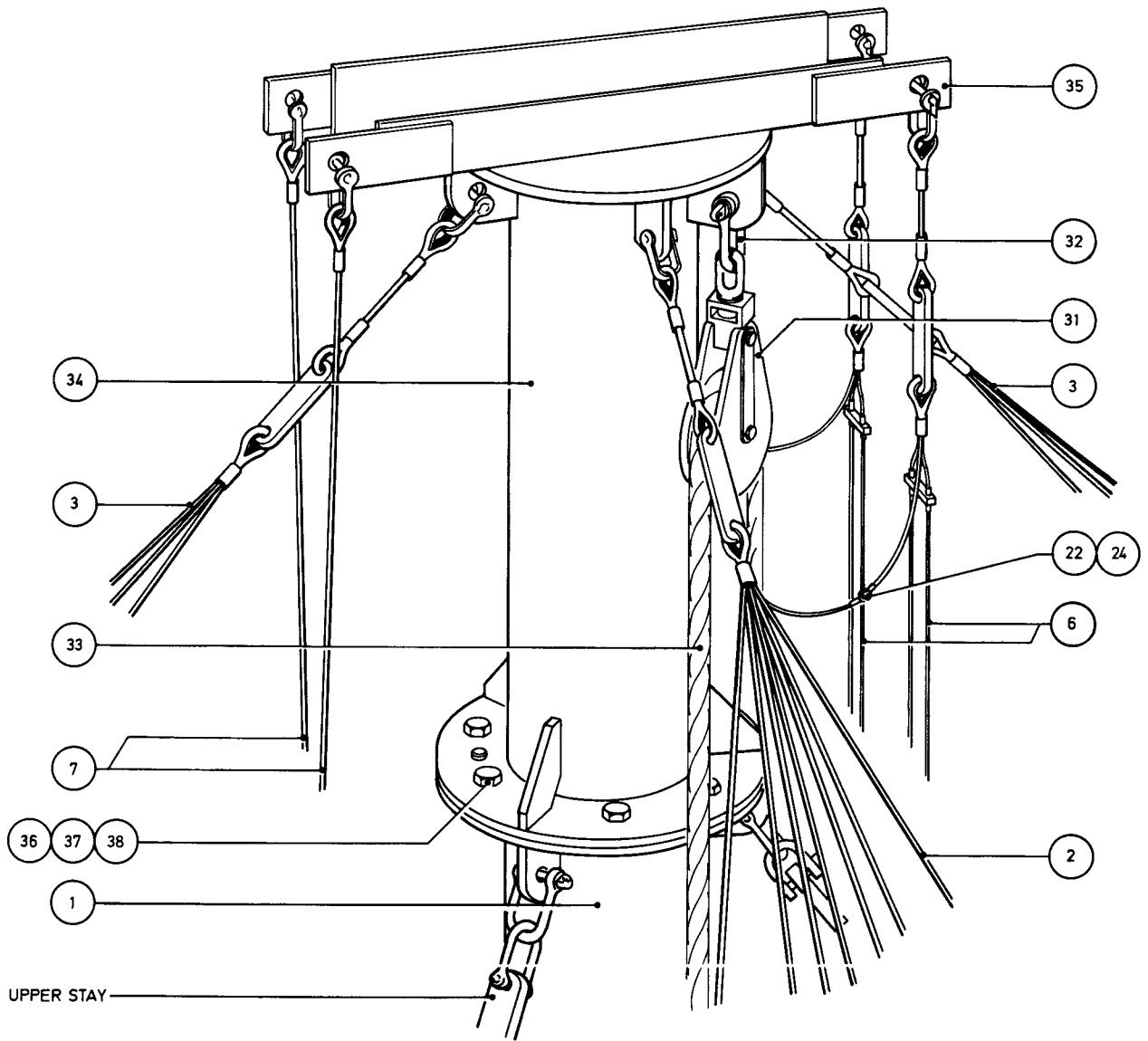


Fig 7 Head cap - transmitter antenna

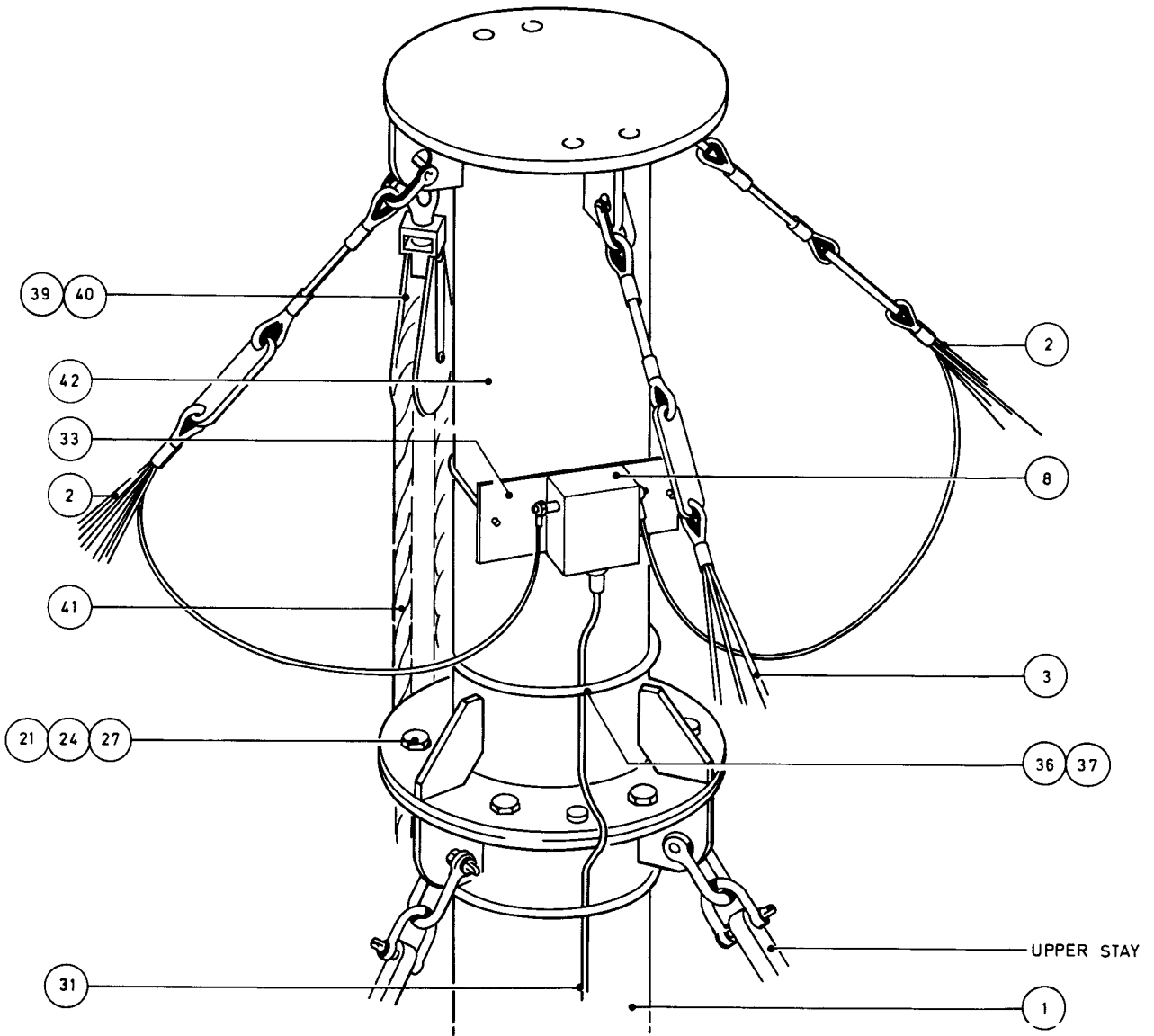


Fig 8 Head cap - receiver antenna

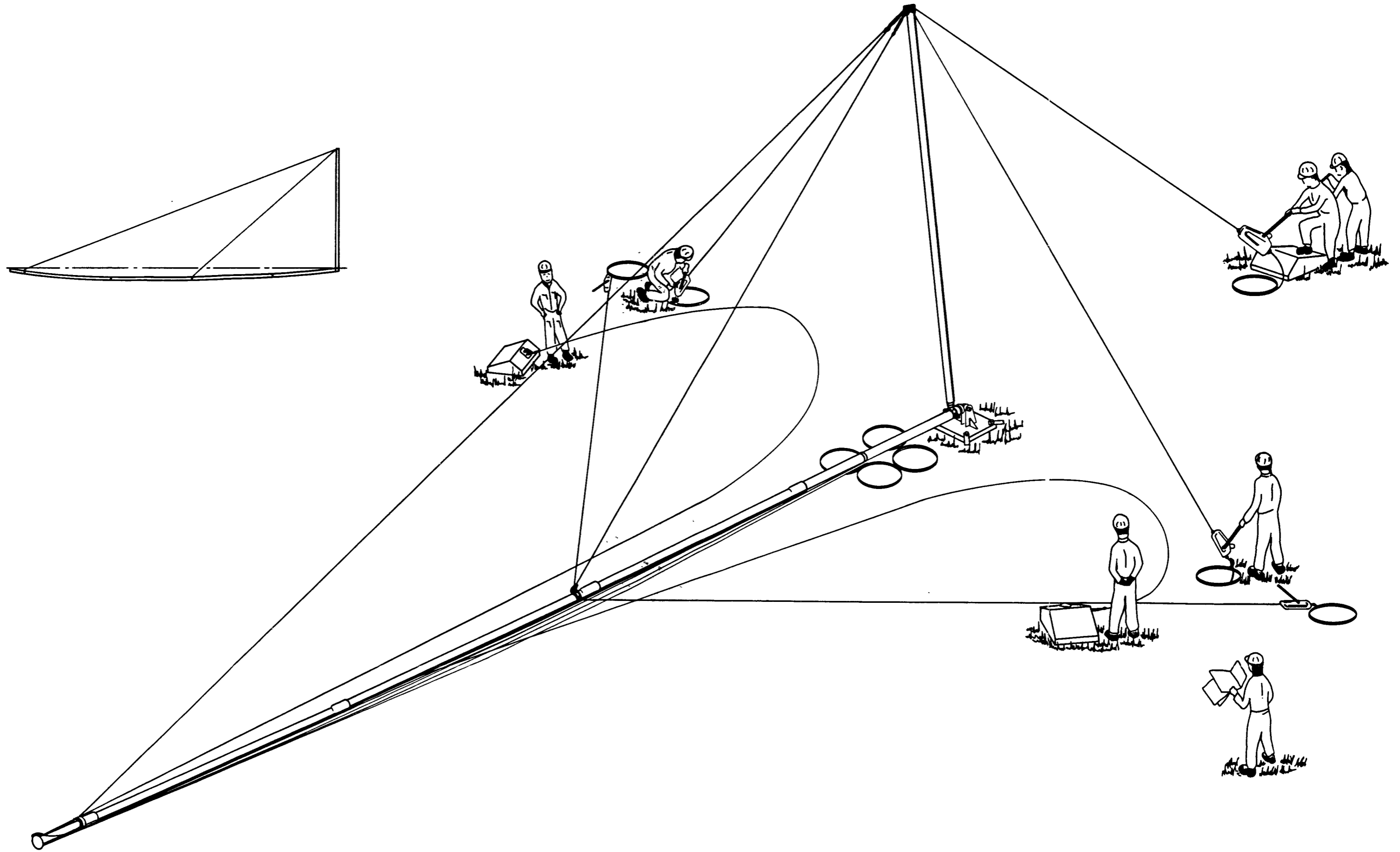


Fig 9

Stage 1-erection

Fig 9

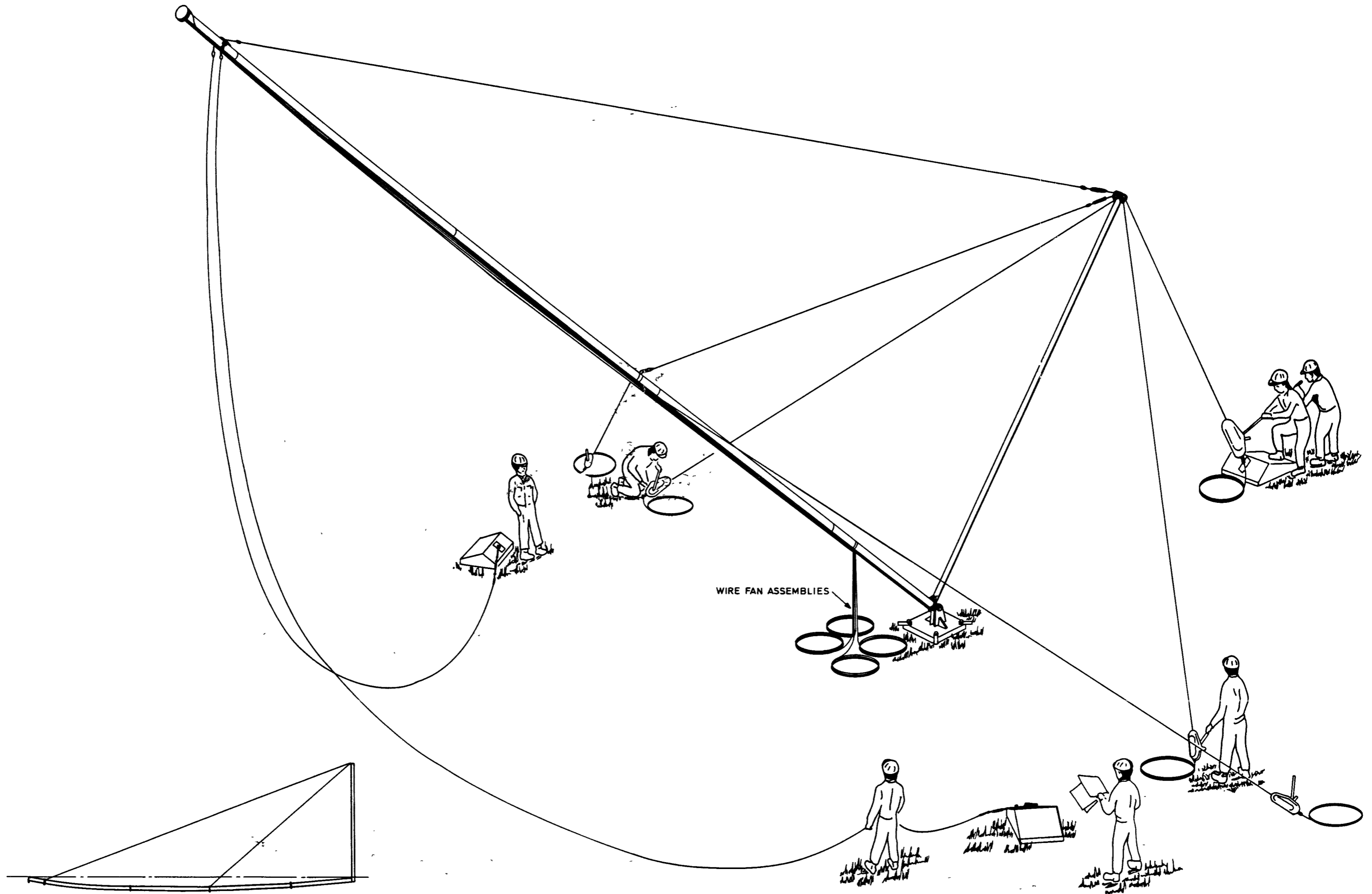


Fig 10

Stage 2 - erection

Fig 10

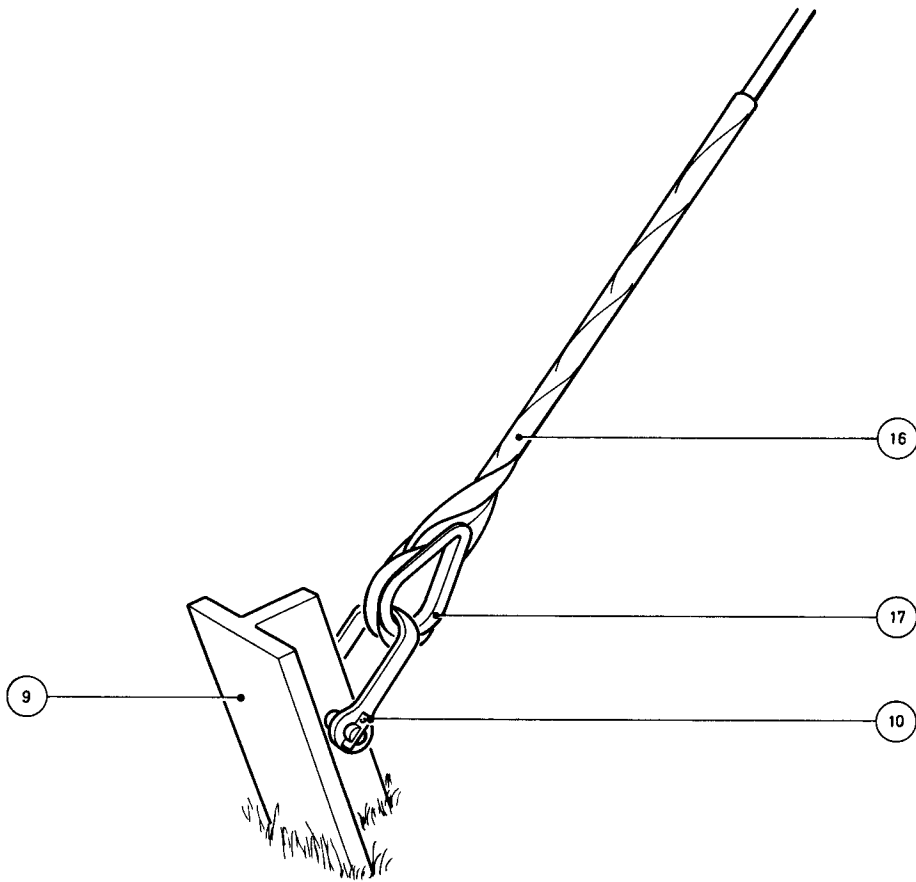


Fig11 Ground fixing of elements

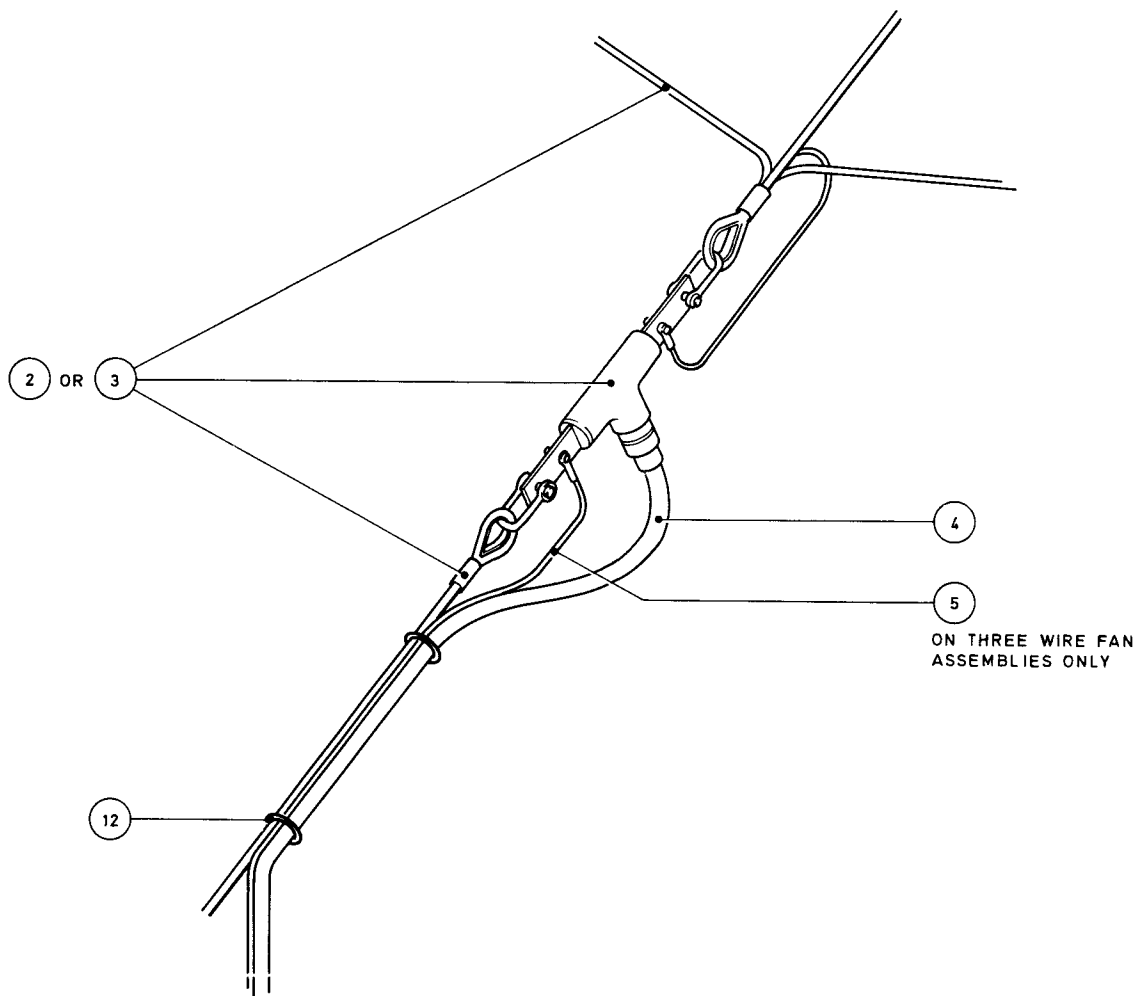


Fig 12 Antenna co-axial terminations

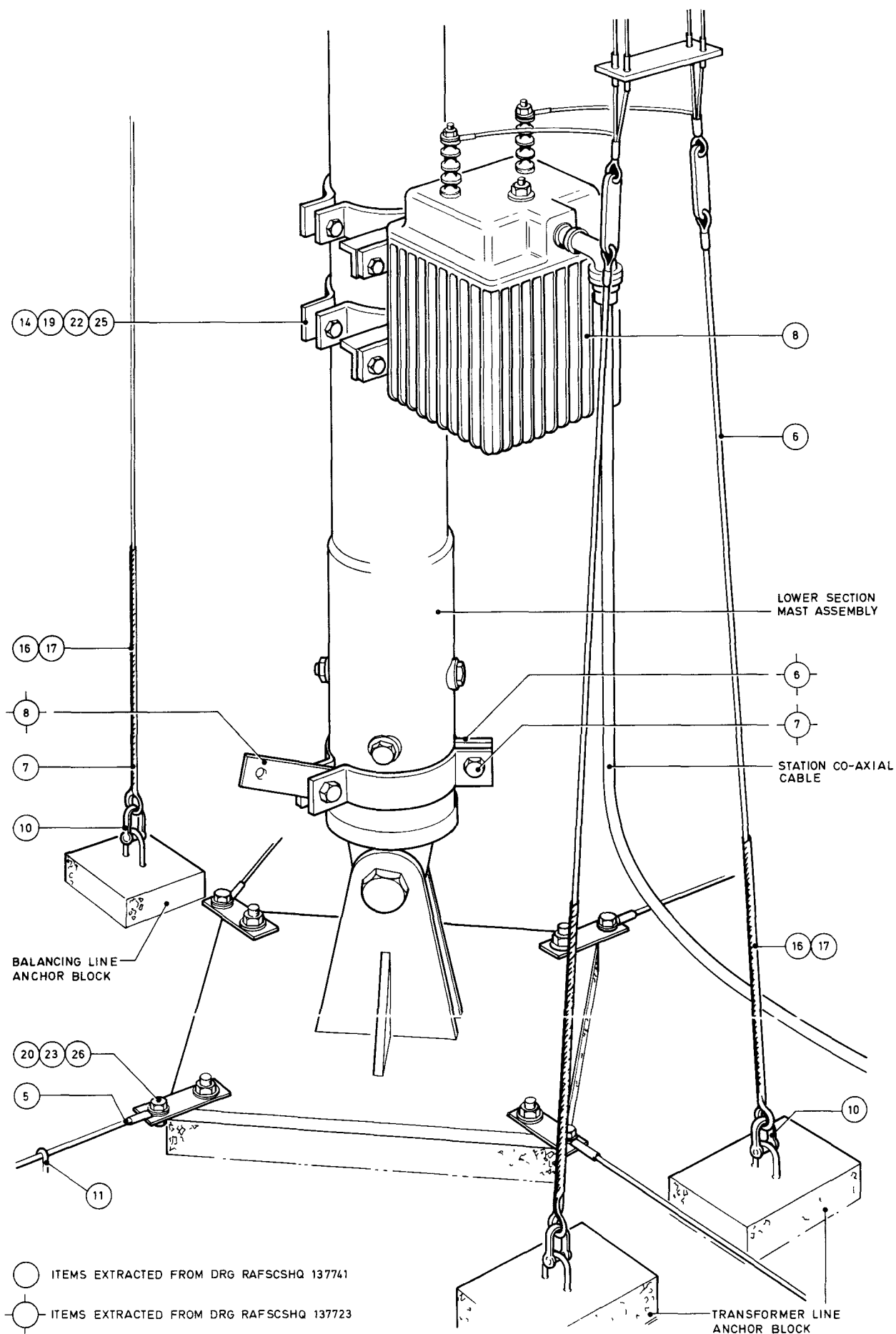


Fig 13 Mast base : transmitter antenna



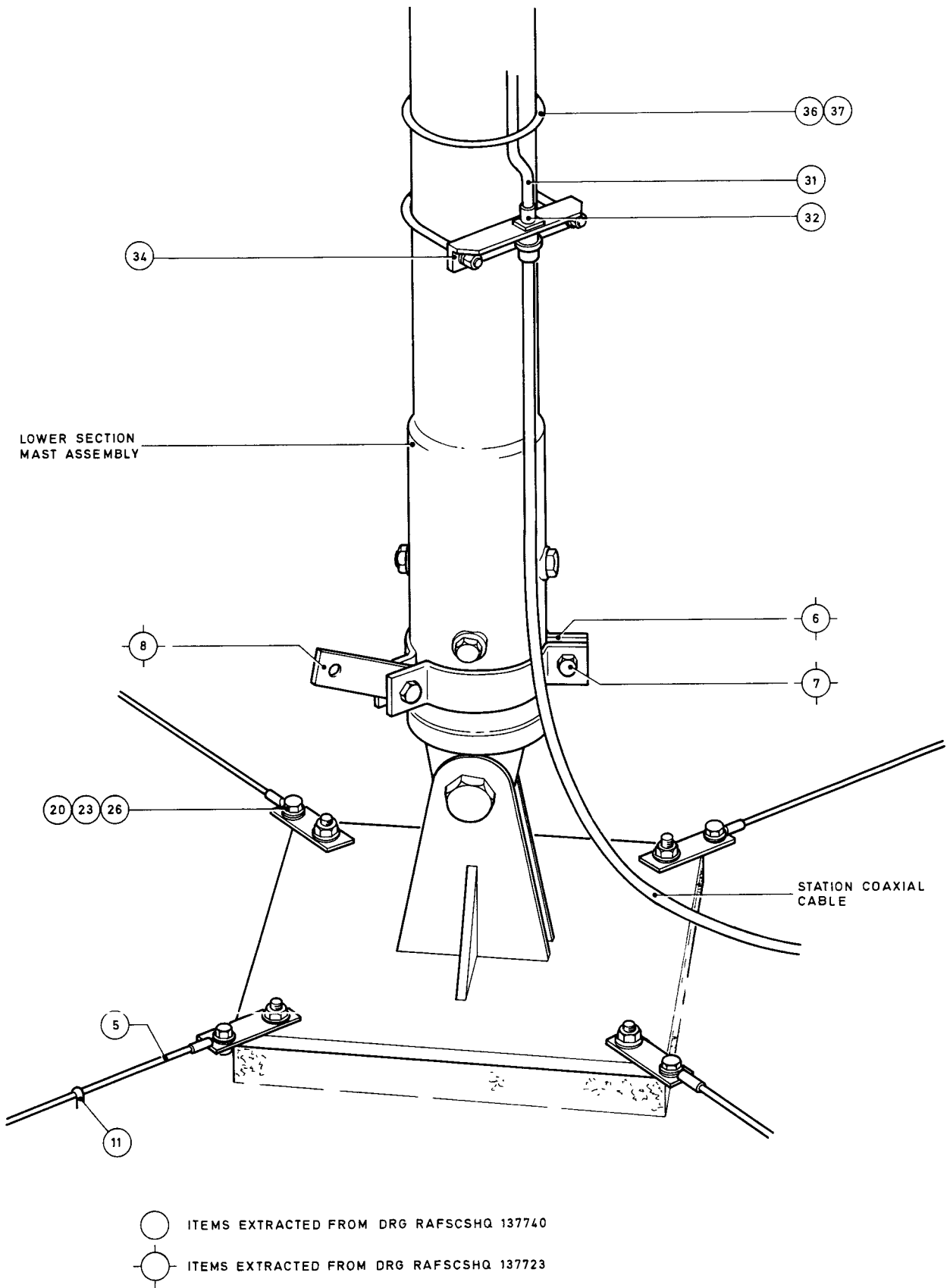


Fig 14 Mast base : receiver antenna

Chapter 1 Annex AMETHOD FOR STRAIGHTENING A MAST USING TWO THEODOLITESGeneral

1. When straightening a mast it is essential to view it from two directions at 90° to each other. The relative heights of the theodolites are not important. The mast should be straightened from the base working upwards. The mast should be vertical and straight. The axis of the mast should be vertical to within 1 inch for every 80 feet of height.
2. All stay tensions at any level must be equal and within ±5% of the given value.
3. The above conditions apply in still air only.

Initial sequence of operations

4. Position the two theodolites so that the mast can be viewed from two directions at approximately 90° to each other and so that each instrument can cover the whole height of the mast in one sweep.
5. Level the base of each theodolite by adjusting the screws provided until the bubbles of the spirit levels fixed in the base are centred.

Note...

The accuracy of the instrument depends upon the accuracy of this adjustment.

6. Sight the cross wires of the telescope on the base of the mast.
7. Swing the telescope through vertical observing the line of the mast.

WARNING...

CARE MUST BE TAKEN TO ENSURE THAT THE MAST DOES NOT BECOME UNSTABLE DURING THE ADJUSTMENT IN PARA.8.

8. Adjust mast stays as directed by each theodolite operator to obtain a preliminary straightening of the mast in the vertical plane.

Final straightening

9. Move the theodolite telescope between the lower stay attachment position and the mast base.

WARNING...

DURING THE FOLLOWING PROCEDURE THE SUPERVISOR OF THE PARTY MUST OBSERVE THE WHOLE MAST TO ENSURE A SAFE CONDITION EXISTS AT ALL TIMES.

10. Adjust the mast stays as directed by the theodolite operators to bring the centre of the stay attachment point on the mast vertically over the mast base.