

Racal

Issue 7

Antennas

RESEARCH & DEVELOPMENT • LF TO UHF ANTENNA SYSTEMS
MASTS & TOWERS • INSTALLATION SERVICES



INTRODUCTION

Antennas form a vital part of all radio communications links – choosing the right antenna is as important as the choice of all the other equipment.

As the result of many years of detailed involvement in radio communications system engineering and widely varied operational requirements worldwide, Racal Antennas has become a world leader in their specialized field. The company's expertise has been applied to the provision of a comprehensive selection of antennas for the HF/VHF/UHF communications bands as well as an impressive range of support masts and ancillaries built to rigorous engineering standards.

Particular attention has been given to tactical antennas for mobile use together with telescopic support masts designed for extremely rapid deployment on location.

PRODUCT INDEX

Brief details of the range of antennas, masts, towers and accessories available from Racal Antennas Limited are included in this catalogue. Where more detailed information is required, individual product data sheets should be requested. The related publication reference numbers are provided in the index.

Transportable or mobile antennas and those available in a transportable version are suitably identified in the text, and by a 'T' in the index. Products introduced since the last edition of this catalogue are shaded "new" for easy reference. The index is also shaded.

Shipping dimensions indicated in the text assume bolted aluminium masts except in the case of certain heavy duty antennas which assume welded steel masts.

Specifications assume a reflection coefficient of -1 and SSB transmission, except where indicated. Radiation patterns are based on calculated data unless otherwise stated.



RESEARCH & DEVELOPMENT

Extensive facilities for the development of antennas and ancillaries are key factors in the company's success. An anechoic chamber with associated computer control equipment allows measurements to be made under ideal conditions. There is also a continuous assessment of new materials which are rigorously tested under a wide range of environmental conditions before inclusion in any products. For example, regular use of a solar radiation simulator ensures that materials used in masts or antennas can withstand prolonged exposure in bright sunlight.

In addition to full laboratory facilities in which computer technology plays an important part there is a 20 acre test site in the New Forest devoted to full performance checking of antennas under actual operating conditions.

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T indicates that the device is transportable.

MF/HF OMNI-DIRECTIONAL ANTENNAS

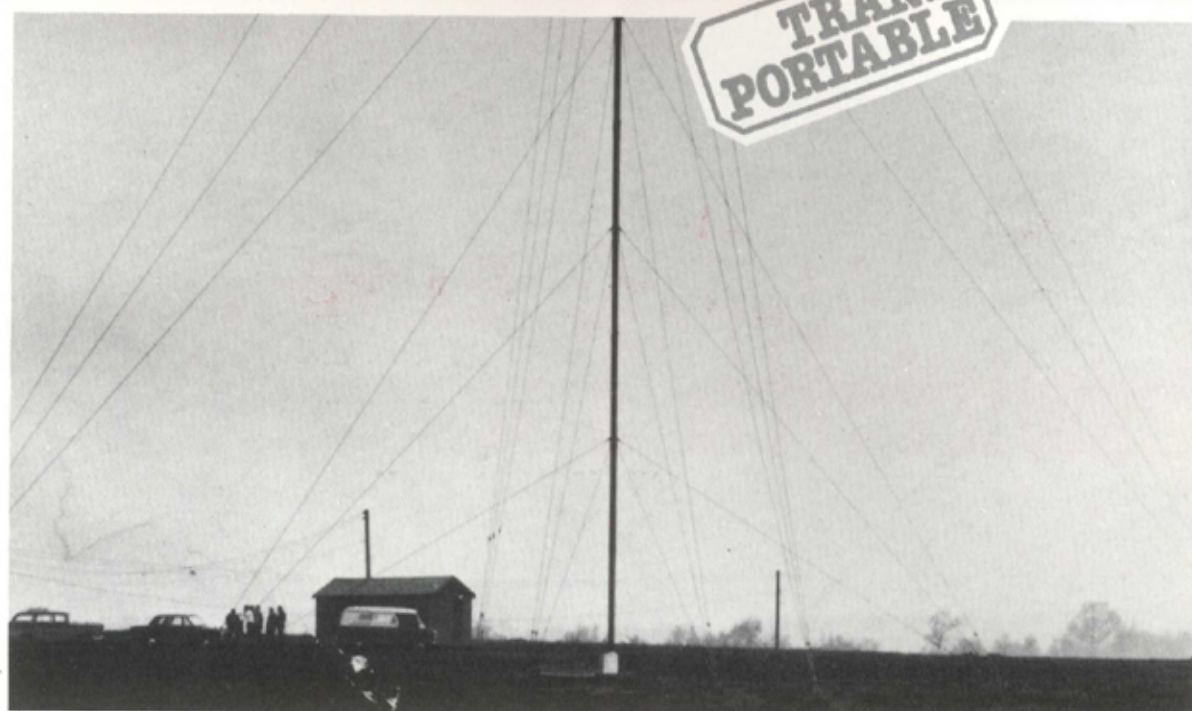
AE 3062 Variable Length Monopole

- Frequency Range: 2-30 MHz
3-30 MHz
4-30 MHz
6-30 MHz
- Power: 20 kW Av.
- VSWR: 1.2:1 Av (all frequencies)
- Gain: 4 dBi
- Impedance: 50 ohms
- Wind loading: 160 km/h, 100 mph, no ice, (2-30 MHz) 195 km/h, 120 mph, no ice, (other versions)

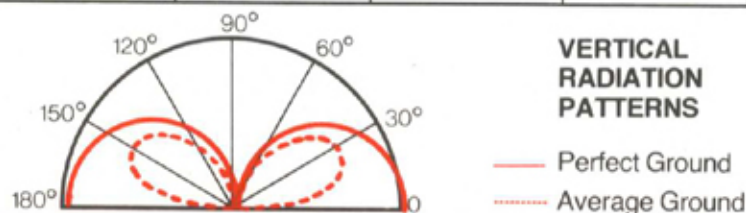
The AE3062 is a variable length monopole comprising a tubular fibre glass mast of 152mm diameter, inside which is a flexible copper tape forming the radiating element. Inside the base unit is an electro-mechanical package which automatically adjusts the length of the radiating element to a quarter wave length at the operating frequency. A servo system ensures that the antenna remains on tune, compensating for frequency drift or temperature changes. The base unit is connected by a multi-core cable, to a tuning control unit normally located adjacent to the transmitter.

The complete system comprises a mast in 3m sections, a base unit containing the antenna adjustment spools and servo system, dielectric guying system, ground anchors, radial ground screen, obstruction warning light and the tuning control unit. A complete erection kit is also available. The control cable can be supplied to lengths as specified by the customer.

The low take-off angle gives reliable, long hop, skywave propagation and, where the site ground conductivity is good, this is supplemented by a reliable groundwave signal. The antenna is therefore very well suited to coastal station use, for communications from shore-to-ship.



Dimensions	2-30 MHz	3-30 MHz	4-30 MHz	6-30 MHz
Height	39.3m	27.1m	21m	14.8m
Installation diameter	72.7m	48.5m	36.4m	24.2m
Weight (transportable versions with erection kit)	950 kg	665 kg	585 kg	525 kg



CMV 230 Conical Monopoles

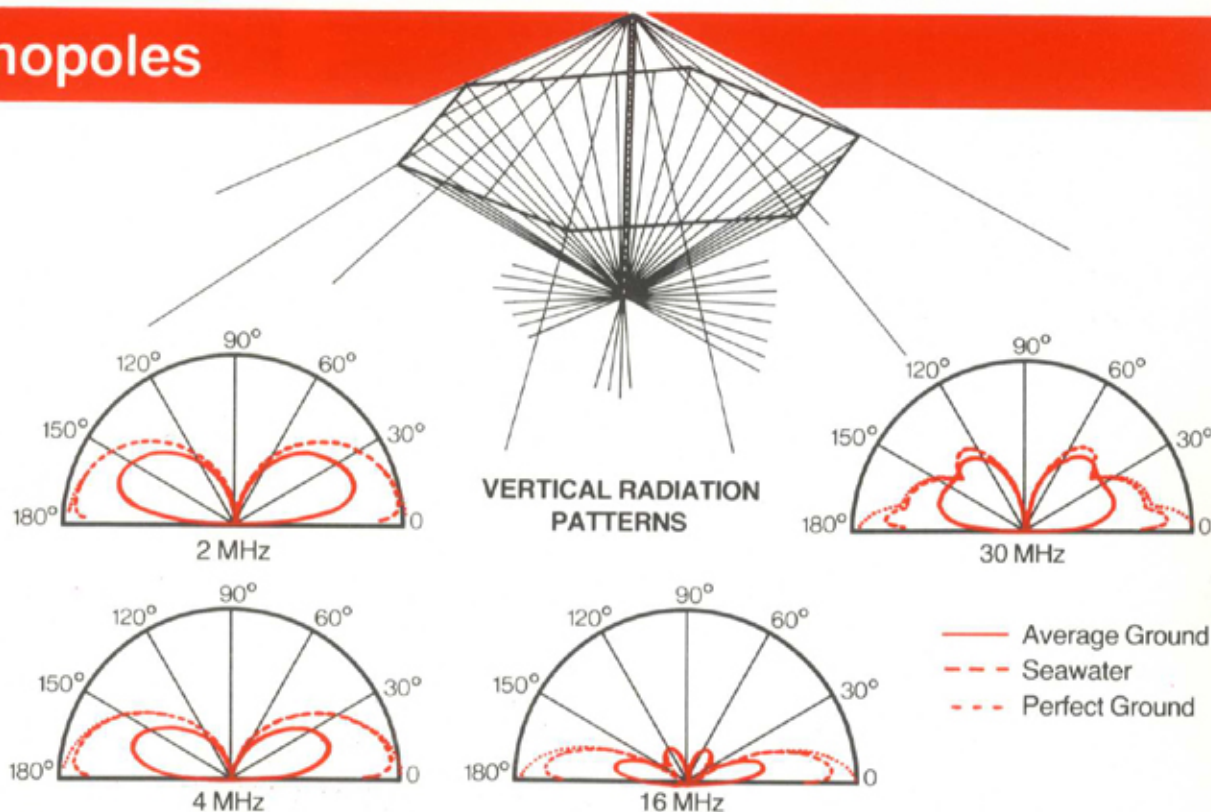
- Frequency Range: 2-30 MHz (CMV 230)
3-30 MHz (CMV 330)
4-30 MHz (CMV 430)
- Power: Up to 25 kW Av.
- VSWR: 2:1 maximum
- Gain: 5 dBi
- Impedance: 50 ohms
- Wind loading: 160 km/h, 100 mph, (no ice)

These antennas are designed for long range omnidirectional high power fixed station operation in the HF range. The low take-off angle produces long-hop propagation giving high reliability on long distance circuits. Where a suitable clear, good conductivity site exists, a reliable ground wave may supplement the skywave over short to medium distances. This characteristic makes these antennas particularly adaptable for shore to ship use. Masts are aluminium alloy and antennas alumoweld, both providing good resistance to salt spray and other environmental conditions that normally cause deterioration, making them suitable for worldwide use. Each antenna is shipped in four basic kit packs which facilitates rapid installation.

EQUIPMENT SUPPLIED:
Prefabricated alumoweld curtain, bolted 6061-T6 aluminium tower, guys, base insulator, anchors, ground screen, antenna coupler and fixing hardware.

OPTIONAL EQUIPMENT:
Obstruction lights, erection kit, repair kit, repair tool kit.

CMV230-WS MIL NOMENCLATURE AS-3186/FRC



Antenna	CMV230	CMV330	CMV430
Height	34.7m	22.25m	17.7m
Guy radius	68.6m	44.2m	34.3m
Ground screen radius	33.5m	21.3m	16.8m
Shipping weight (approx)	1134 kg	907.2 kg	680.4 kg
Shipping volume (approx)	2.55m ³	2.46m ³	2.0m ³

MF/HF OMNI-DIRECTIONAL ANTENNAS

CMV 602 Conical Folded Monopole

- Frequency Range: 2-12 MHz (602)
3-18 MHz (603)
4-24 MHz (604)
5-30 MHz (605)
- Power: 25 kW Av.
- VSWR: 2.5:1 maximum
- Gain: 4 dBi
- Impedance: 50 ohms
- Wind loading: 195 km/h (120 mph) no ice
144 km/h (90 mph) with
6.3mm radial ice

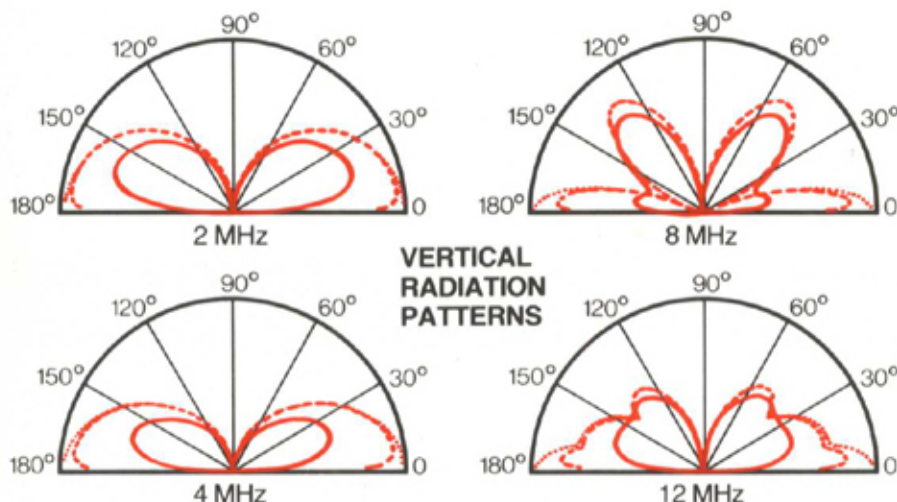
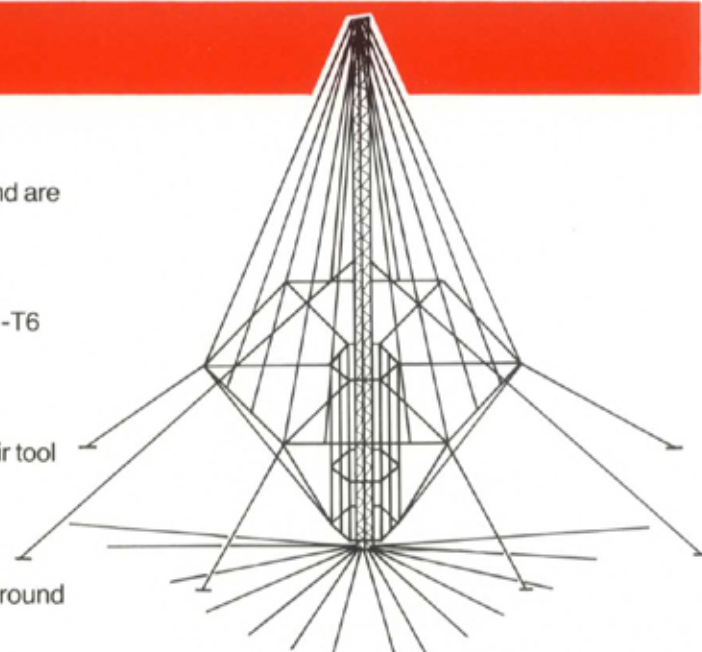
These Conical Monopoles are 6:1 bandwidth antennas, available in 4 different frequency combinations. They are vertically polarized and are used on short range groundwave circuits and medium to long range skywave circuits.

EQUIPMENT SUPPLIED:

Prefabricated alumoweld curtain, bolted 6061-T6 aluminium mast guys, curtain guys, anchors, ground screen and antenna coupler.

OPTIONAL EQUIPMENT:

Obstruction lights, erection kit, repair kit, repair tool kit.



— Average Ground
- - - Seawater
... Perfect Ground

Antenna	602	603	604	605
Height	27.4m	18.3m	13.7m	10.9m
Guy radius	18.3m	13.7m	9.1m	7.3m
Ground screen radius	38.1m	25.1m	16.8m	13.7m
Shipping weight	810.5 kg	720.8 kg	630 kg	544.3 kg
Shipping volume	2.0m ³	1.84m ³	1.7m ³	1.55m ³

'V' Series Heavy Duty Glass Fibre Whips

- Frequency Range: 0.2 to 30 MHz
- Power: 20 kW PEP
- Height: 9 to 24 metres
- Wind loading: 160 km/h (100 mph) with
18.7mm radial ice

These extremely strong, self-supporting glass fibre whip antennas are designed for receiving and transmitting applications in the MF/HF band and are in worldwide use for air traffic control services, navigational beacon systems, embassy radio links, off-shore oil rigs and general purpose radio communications. The antennas are also in use on warships of the Canadian and other Navies, and are approved for use by Civil Aviation Authorities; some models are NATO-codified.

The antennas are suitable for harsh environments and can all withstand windspeeds of 160 km/h (100 mph) or greater, with 18.7mm (3/4 inch) radial ice. Specific figures are available on request. Hinged base plates are available for all models – these can be mounted on concrete pads, rooftops or, where the base must be raised above flood level or snowline, on steel tower sections.

Antenna tuning units can be supplied with the antennas for transmitters of up to 10 kW average power (20 kW peak). Special base plates are available to mount the tuning units at the foot of the whip. Ground screen systems are also available. Certain models can be supplied with inductively loaded sections to resonate the antennas at a customer specified frequency – these are often used for NDB beacons and fixed frequency maritime coastal stations. Capacitive top loading is also available.

The whips are constructed of filament wound epoxy-glass sections joined by internal threaded ferrules in machined bronze. The base mounting flange is an integral part of the antenna and is formed by extending the high-strength filaments of the bottom section. The conducting elements

consist of 4 to 8 (depending on size of antenna) flattened, paralleled copper braids combined spirally in the inner wall of the epoxy-glass section, thereby forming a partial cylindrical conductor. Either side feed or below-the-base feed is available. The base feedthrough types are fitted with a feedthrough insulator. Dry withstanding voltage is 25 to 30 kV depending on type of antenna.

Some specific applications are:

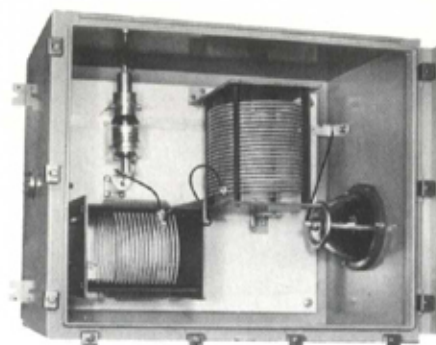
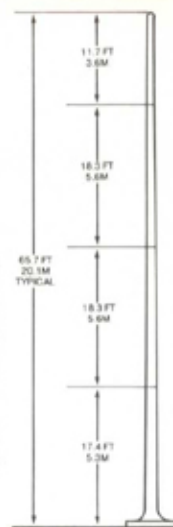
Embassy rooftop systems	V252
Lightships/oil rigs	V802
Small ships, patrol boats, shelters	V353
	V33070
NDB beacons/MF coast stations	V147

A summary of the range is shown below. Most of these are available in **sidefeed** and **feedthrough** configurations.

Model	Height		No of sections	Frequency range (MHz)	Max power kW (average)
	ft	metres			
V-132	36	10.9	2	2 to 30	10 †
V-147*	47	14.5	3	0.7 to 30	10 †
V-252	29	8.8	2	2 to 30	5
V-353	35	10.6	3	2 to 30	5
V-425	36	10.9	2	2 to 30	5
V-802	33	10.06	2	1.6 to 30	5
V-33047	47	14.3	3	0.2 to 30	10 †
V-33053	55	16.6	3	0.6 to 30	10 †
V-33065	65	20.1	4	0.5 to 30	10 †
V-33070*	74	22.7	4	0.1 to 30	10 †
V-33085	83	25.6	5	0.4 to 30	10 †

* Inductively loaded versions available

† Specify power level when ordering



Typical tuning unit, interior view.



MF/HF OMNI-DIRECTIONAL ANTENNAS

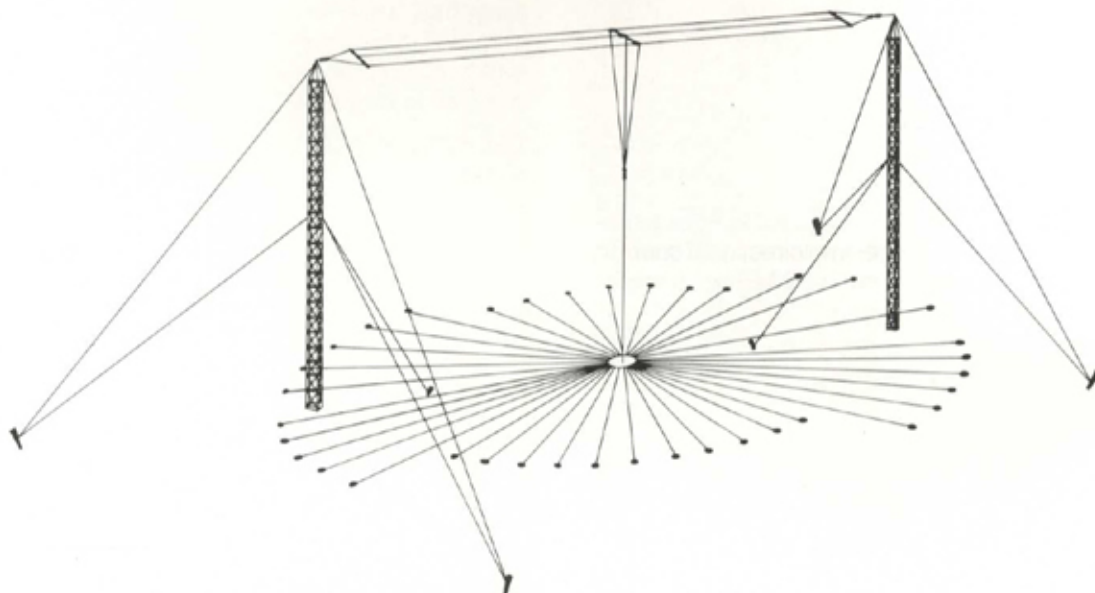
RA 1020 Medium Frequency 'T'

- Frequency Range: 200-500 kHz
- Power: 1 kW Av.
- Operating Windspeed: 160km/h with 6mm radial ice

The RA1020 MF 'T' is suitable for most NDB or low power coastal radio station applications. It comprises a triple wire horizontal element, with a span of 52m, supported between masts up to 45m high.

When supported at 30m and fed with 1kW from a suitable ATU, the RA1020 will produce a field strength of 70uV/m at ranges up to 520km over sea water, assuming the standard ground screen is used. Over land, the range is reduced considerably.

Support masts must be capable of sustaining a load of 6kN at the operating windspeed. Suitable masts are available from Racal Antennas in either lattice steel or fibreglass, the latter being preferred since they do not influence the radiation pattern and require minimal maintenance.



RA 1001 Difan Wideband Deltas

- Frequency Range: 1.6-16 MHz
4.5-22 MHz
- Power: 1 kW CW or PEP
- VSWR: 2.5:1 maximum
- Gain: 5.8 dBi min
- Impedance: 50 ohms
- Wind loading: 160 km/h, 100 mph, (no ice)

The DIFAN is a wideband delta antenna designed to radiate high-angle skywave signals for short to medium range HF communications. There are two basic models covering frequency ranges of 1.6 to 16 MHz and 4.5 to 22 MHz. Each of these basic models is available for either fixed or transportable applications. For receive-only use, all models can be used up to 30 MHz.

The DIFAN system comprises 3 pairs of delta travelling wave antennas linked, via a third terminating delta, to a terminating load. This novel method of feeding and terminating the elements makes the antenna performance substantially independent of ground constants; a ground screen system is not required.

The fixed station version uses a single, lightweight, lattice aluminium support mast and is supplied complete with hinged base plate, guys and guy anchors. The mast is shipped in knocked-down form to reduce freight volume; assembly is simple and requires only hand tools. The antenna array is constructed of phosphor-bronze wire, whilst the guys are of stranded, galvanized steel wire with fail-safe, ceramic insulators.

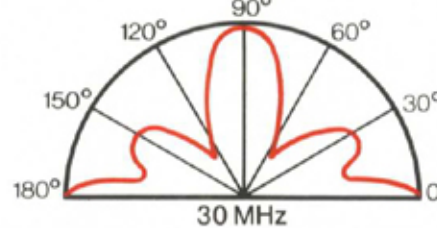
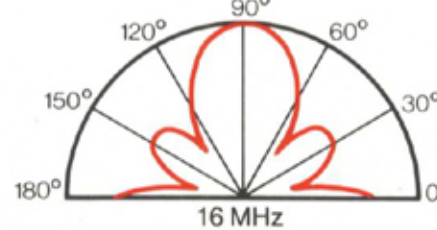
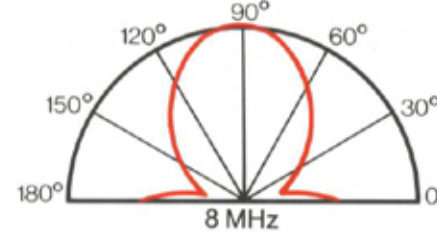
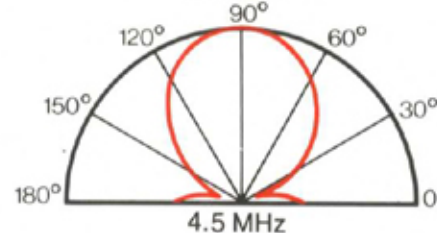
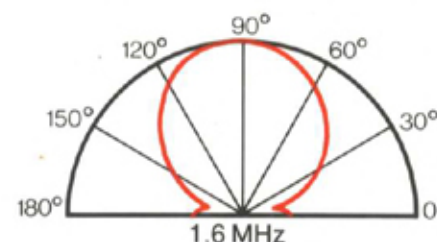
The transportable version is designed for rapid and frequent deployment and uses a tubular aluminium mast of 104mm (4 1/4") diameter. The array is constructed of PVC sheathed antenna braid, consisting of 16/36 SWG tinned copper wire laid up with a terylene cord, while the guys are of pre-stretched terylene rope with a galvanized steel wire lower section and stainless steel rigging screw. The complete transportable package comprises a robust transit case and two canvas carrier harnesses for the mast sections. The mast top cap and lower section are carried in the transit case with the antenna elements, balun transformer and terminating unit already fitted. Antenna elements and guy wires are supplied on winder frames and assembly and erection of the antenna can be completed in less than 2 hours.

An erection kit comprising a derrick pole assembly, derrick pole stays, stay anchors, winch, winch anchor and a hammer, is available for all models of the Difan antenna.

The antenna mast can be factory painted in white, olive green or desert sand colour. Alternate orange/white mast sections can be supplied for use where aviation obstruction marking is required.

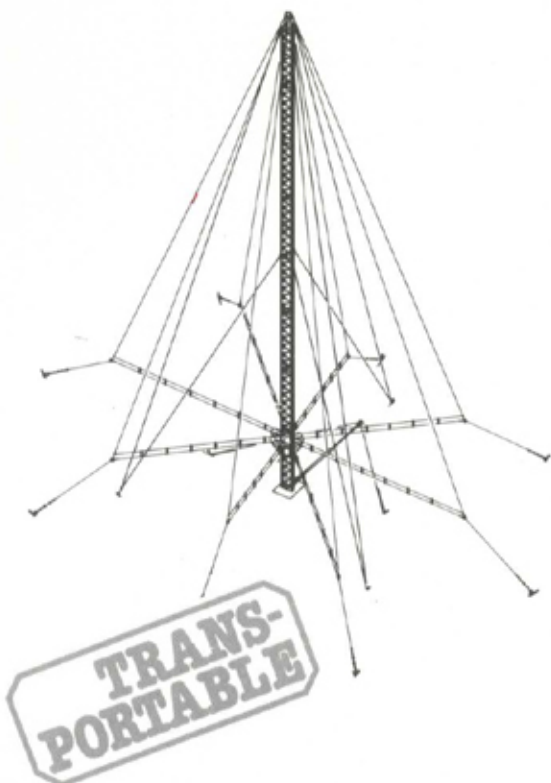
An EMP protection kit and aviation obstruction warning light system is available for all models.

Model	Application	Frequency
RA 1001	Fixed Station	1.6-16 MHz
RA 1002		4.5-22 MHz
RA 1003	Transportable Station	1.6-16 MHz
RA 1004		4.5-22 MHz



VERTICAL RADIATION PATTERNS

Specification	RA 1001 RA 1003*	RA 1002 RA 1004*
Mast height	14.8m	11.1m
Max radius	30.0m	19.0m
Shipping weight	158 kg	133 kg
	170 kg*	158 kg*
Shipping volume	0.5m ³	0.5m ³



MF/HF OMNI-DIRECTIONAL ANTENNAS

DP 208/312 Wideband dipole

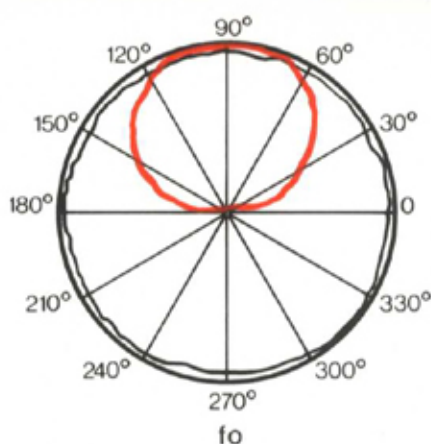
- Frequency Range: 2-8 MHz (DP 208)
3-12 MHz (DP 312)
- Power: 1 kW Av.
- VSWR: 2:1 maximum
- Gain: 4 dBi approximately
- Impedance: 50 ohms
- Wind loading: 160 km/h, 100 mph, (no ice)

The DP series of wide band dipoles are designed for short and medium range omnidirectional operation. All models are usable from 2-30 MHz with some degradation in performance outside the specified range.

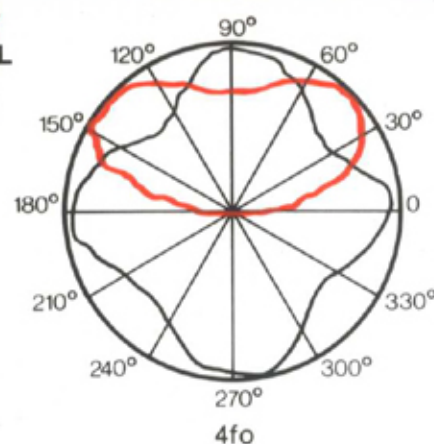
Fixed station systems use aluminium alloy lattice masts and stranded copper wire or phosphor bronze antenna elements, with pre-stretched terylene and wire guys. The transportable version is supplied with an aluminium tubular mast with terylene guys while the radiating elements are constructed from a non-kinkable antenna braid which consists of 16 strands of 36 SWG tinned copper wire laid up with a terylene cord, the whole being sheathed in PVC. Each transportable system is supplied packed in a reusable, lightweight, transit case.

An erection kit and obstruction lights can be supplied for all versions. The DP 312 'fixed station versions' series can be used in conjunction with the VH series sloping 'V' antenna, where both omnidirectional and directional coverage is required (but not simultaneously). (For details of VH 830 see MF/HF DIRECTIONAL ANTENNAS).

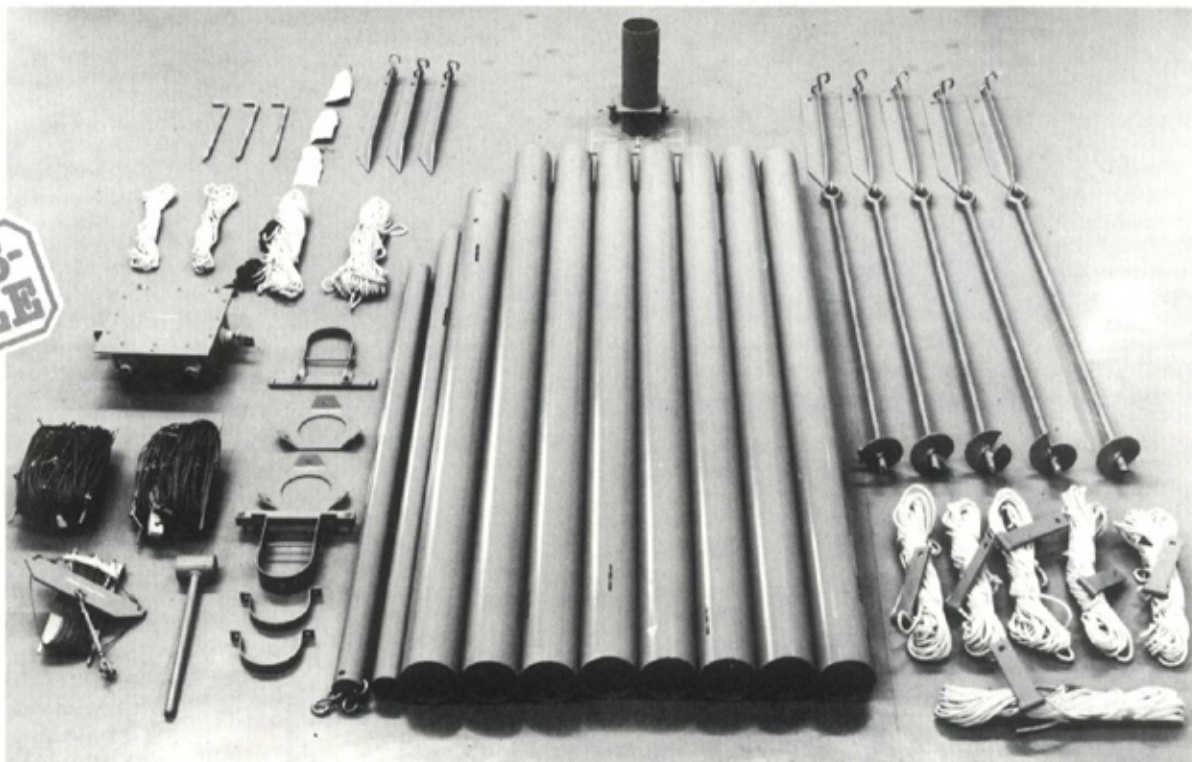
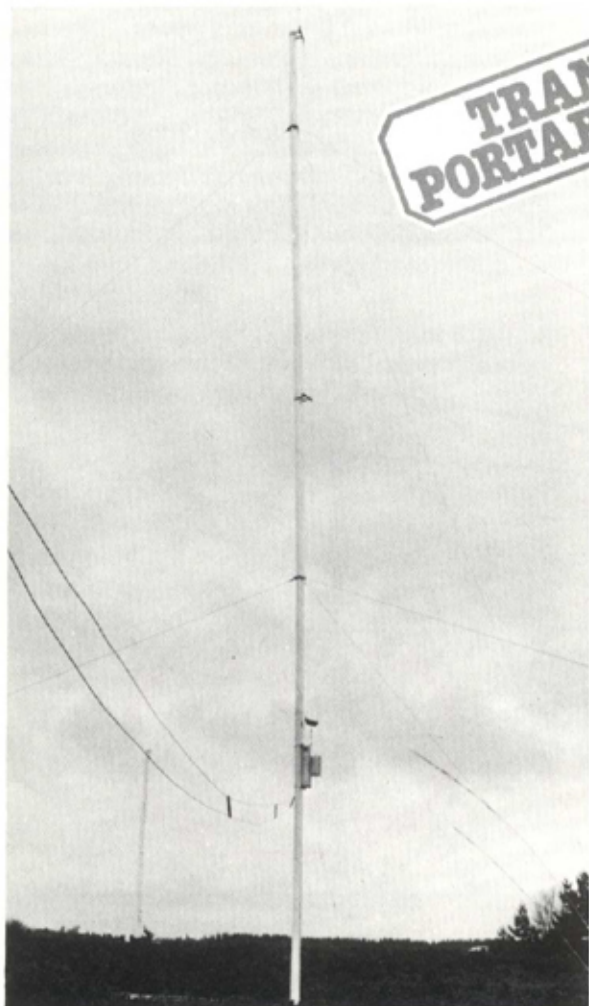
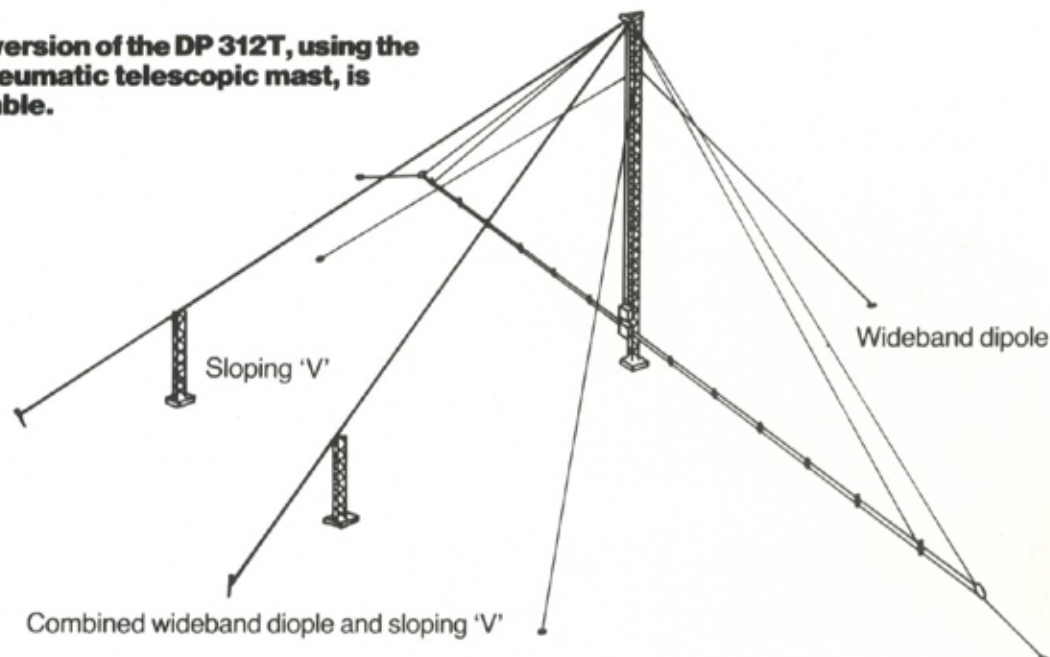
Model Number	Application
DP 208L	2 to 8 MHz, Fixed Station 1kW
DP 312L	3 to 12 MHz, Fixed Station 1kW
DP 312T	3 to 12 MHz, Transportable 1kW



**VERTICAL/
HORIZONTAL
RADIATION
PATTERNS**



A tactical version of the DP 312T, using the RA 457 pneumatic telescopic mast, is also available.



Transportable Kit

Antenna	208L	312L	312T
Height	22m	14.6m	14.6m
Installation area	100 x 22m	67 x 18m	67 x 18m
Weight	91 kg	68 kg	68 kg
Shipping weight	135 kg	90 kg	122 kg
Shipping volume	0.51m ³	0.35m ³	0.51m ³

Maximum crate dimensions any version 2.0m³

MF/HF OMNI-DIRECTIONAL ANTENNAS

SPR 230 Short Range Log Spiral

- Frequency Range: SPR 230 2-30 MHz
SPR 330 3-30 MHz
- Power: 1 kW, 10 kW or 25 kW Av.
- VSWR: 2:1 maximum
- Gain: 5 dBi min, 9 dBi max
- Impedance: 50 ohms
- Wind loading: 224 km/h (no ice)
144 km/h (12mm ice)

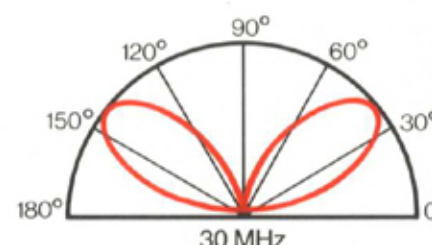
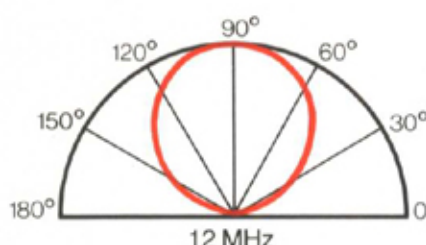
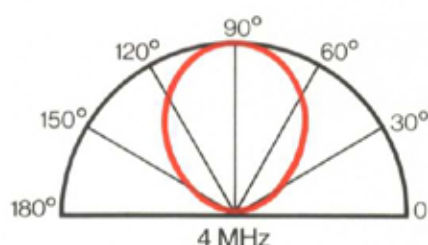
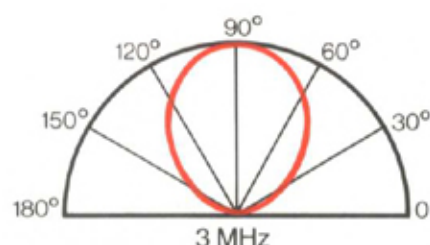
EQUIPMENT SUPPLIED:
Radiating element, radial catenaries, all masts and guys, guy anchors, balun transformer and resistive terminations.

OPTIONAL EQUIPMENT:
Erection kit, obstruction lights, repair kit, repair tool kit.

	SPR 230	SPR 330
Frequency range	2-30 MHz	3-30 MHz
Maximum height (H)	12.1m	10m
Curtain diameter (C)	76.2m	50.9m
Site diameter (D)	90.5m	64.6m
Shipping weight	1295 kg	1135 kg
Shipping volume	2.2 cu m	1.82 cu m
US MIL nomenclature	AS-3476/G	AS-3477/G

The SPR 230 and SPR 330 horizontal log periodic spiral antennas are high take-off angle broadband systems suitable for fixed station use on omnidirectional short to medium range skywave circuits.

The radiation elements are made from a continuous run of alumoweld wire giving long life and noise-free radiation. The six supporting catenaries, also alumoweld, are supported at the centre by a galvanized steel mast and at their outer ends by aluminium masts.



RA 919 Half Wave Centre Fed Dipoles

- Frequency Range: 2-30 MHz (spot frequencies)
- Power: 1 kW Av.
- VSWR: 2:1 typical
- Gain: 2 dBi
- Impedance: 50 ohms nominal

The half wave dipole RA 919 is an economical, simple antenna for fixed frequency over short to medium range skywave paths. Typical bandwidth is $\pm 2.5\%$ of resonant frequency. At practical heights above ground dipoles have a virtually omnidirectional horizontal pattern, tending to a figure-of-eight pattern at higher frequencies.

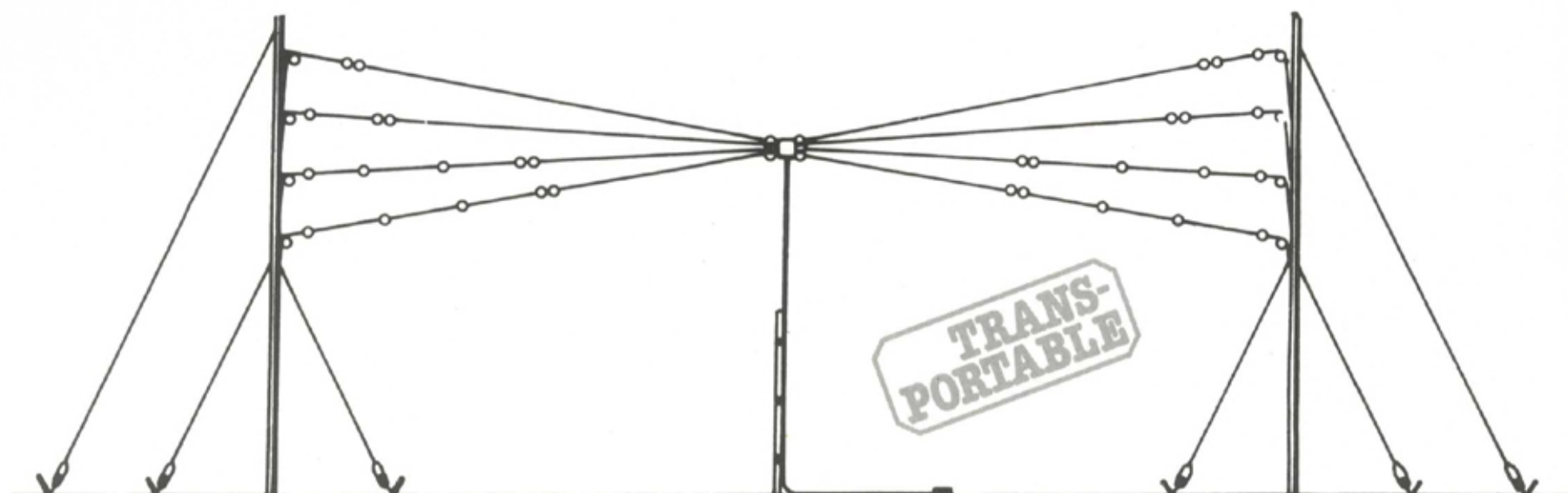
Up to 4 half wave dipole elements can be supported between one pair of masts and fed from a single centre junction, provided that the 4 frequencies are not harmonically related. These multifrequency dipoles provide a convenient antenna system for low power channelized equipments, where it is required to switch from channel to channel without changing the antenna feed.

Antenna elements are constructed of either cadmium copper or phosphor bronze stranded wire and the antenna is supplied complete with centre junction, insulators, terylene halyards and 50 metres of coaxial cable. Elements are normally supplied cut to 2 MHz, but can be factory-cut to specific frequencies if required.

Dipole antennas can be used with a single central support mast by disposing the elements in a V configuration with the outer ends pegged to the ground. A kit can be supplied for this purpose.

A range of lattice and tubular aluminium masts, together with aviation warning light systems, is available to support these antennas.

RA919A	Single Frequency Dipole
RA919B	2-Frequency Dipole
RA919C	3-Frequency Dipole
RA919D	4-Frequency Dipole



MF/HF OMNI-DIRECTIONAL ANTENNAS

MLA Series Miniloops

TRANSPORTABLE

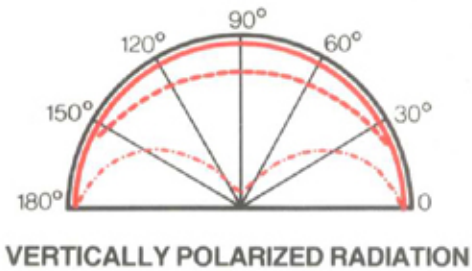
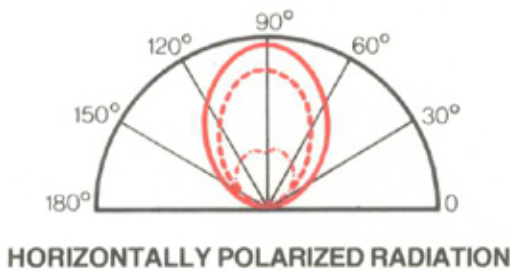
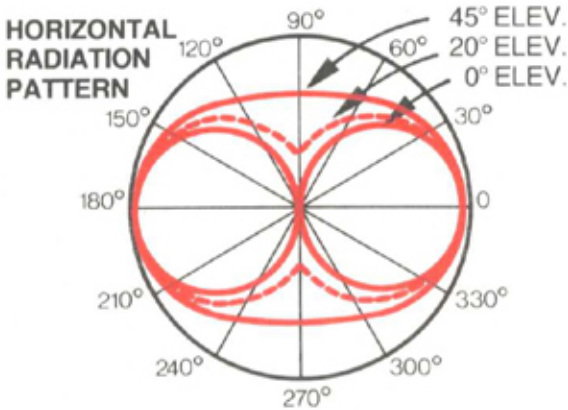
- Frequency Range: 1.8-14.5 MHz (MLA 1E)
2.3-16 MHz (MLA 1D)
3-24 MHz (MLA 2D)
3-24 MHz (MLA 2DQ)
3-24 MHz (MLA 2R)
2.182 MHz (MLA 2182)
- Power: 1 kW RMS continuous, when tuned
- VSWR: 2:1 maximum
- Gain: -14 to +7 dBi, dependant on type
- Impedance: 50 ohms

Miniloop antennas are high Q, optionally rotatable, tuned loop radiators of exceptionally small size, designed for harsh environments such as ship superstructures. Radiation is vertically polarized in a figure of eight pattern at low elevation angles (0-20°) changing to horizontal polarization and an essentially omnidirectional pattern above 20° azimuth. Although small in overall size, the loop has short, thick conductors, a very compact induction field that includes a minimum of ground and a positive (aiding) ground image. The miniloop is therefore highly efficient compared to conventional antennas such as horizontal wire dipoles and inverted Vees which have long, thin, lossy wires, a large volume of lossy ground in the induction field and a negative ground image. Because the Miniloop is a balanced antenna no ground screen is necessary and the impedance is relatively unaffected by its height above ground and the proximity of most non-resonant metallic structures. Zero elevation 20dB nulls in the radiation pattern permit an operator to null out interfering ground wave signals over short to medium haul paths. This can be done manually or by using the optional electrical rotating system. Tuning of the main loop is effected by a motor-driven vacuum capacitor, controlled by signals from a tuning control unit. This unit, the ART-D/1, is connected to the antenna by a control cable and a phase error cable and allows manual tuning to any frequency, together with a facility for push-button selection of pre-set frequencies. A 6 or 10-preset channel option is available. A phase error signal from the antenna ensures that the loop remains on-tune despite transmitter frequency drift or changes in loop parameters due to temperature variations. This tracking facility is not available on the receive-only versions since no transmitter reference signal is present. The largest model, the MLA-1/E, has an overall height of 3.5m, the actual loop dimensions being 1.53m and 2.1m. The mast base area is 0.457m x 0.457m.

Details of a 'hardened' version of the Miniloop appear in the section entitled "Special Antennas".



	MLA-1/E MLA-1/D	MLA-2/D	MLA-2/DQ	MLA-2/R	MLA-2182
Application	Tx/Rx	Tx/Rx	Tx/Rx	Rx only	R/x only (fixed frequency)
Channel Bandwidth at 3 MHz	4 kHz	4 kHz	8 kHz	8 kHz	4 kHz (2182 kHz)
Channel Bandwidth at upper frequency limit	80 kHz	135 kHz	220 kHz	220 kHz	—



— 4 MHz
- - - 10 MHz
... 15 MHz

VERTICAL RADIATION PATTERNS

HF DIRECTIONAL ANTENNAS

LPH 1 Rotatable Log Periodic

● Frequency Range:	6.2-30 MHz
● Power:	1 kW Av./2 kW PEP
● VSWR:	2.5:1 maximum
● Gain:	9 dBi from 6.2-12 MHz and 12 dBi from 12-30 MHz
● Impedance:	50 ohms
● Wind loading:	160 km/h, 100 mph

The LPH1 antenna is a reduced size low weight log periodic which can be either electrically or mechanically rotated. By inductively loading the rear element, the size and weight is reduced.

Suitable for medium and long distance skywave propagation, the antenna has an azimuth beam width of 65° while the elevation angle of the main beam varies from 35° at 6.2 MHz to 8° at 30 MHz.

The LPH1 utilises an aluminium lattice boom and mast, aluminium elements and a top mounted rotator. For ground mounted applications, an 18.2m mast is normally supplied. For rooftop mounting a 7.3m mast can be supplied.

The antenna can be directed to any azimuth heading by a control unit which is normally located at the transmitter. This unit has a lamp display indicating antenna heading and is connected to the antenna by a multi-core antenna cable. Length of cable required should be specified when ordering. Maximum length is 300 metres.

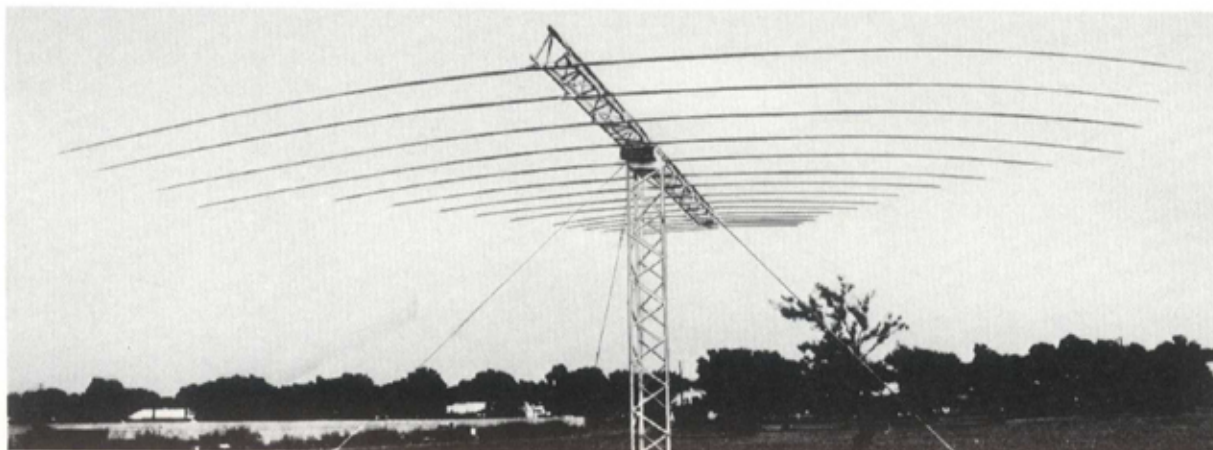
Optional accessories include an erection kit, winch and obstruction warning lights.

US Mil type number is AS-3520/F.

LPH1 Lightweight Rotatable Log Periodic Antenna

Boom length	12.8m
Longest element	16.5m
Height – ground mounted	18.2m
Height – roof mounted	7.3m
Turning radius	9.75m
Guy radius – ground mounted	15.2m
Guy radius – roof mounted	7m approx
Rotation speed	0.3 rpm
Array weight (net)	246 kgs
Shipping weight/volume (gross)	810 kgs/1.6 cu m

A clear area, approx 21m × 12.8m, is required for laying out and erecting the ground-mounted version.



LPH 24/30 Rotatable Log Periodic

● Frequency Range:	4-30 MHz (LPH24) 6-30 MHz (LPH30)
● Power:	25 kW Av./50 kW PEP
● VSWR:	2:1
● Gain:	Up to 13 dBi
● Impedance:	50 ohms
● Wind loading:	195 km/h, 120 mph (no ice) 128 km/h, 80 mph with 6.5mm radial ice

The LPH-30 and LPH-24 rotatable log periodic antennas provide excellent reliability on medium to long range HF communication circuits. Their high gain, azimuth selection and high power capability allow communications between a fixed station and mobile stations such as ships, aircraft or tactical deployment.

The two antennas in this range use a twin mast configuration with base mounted rotator driving a combined tabular steel drive and RF feeder shaft on bearings between the masts.

The arrays consist of full size, half-wave dipole elements manufactured from high grade tubular aluminium while the support masts are of galvanized lattice steel.

The support mast arrangement enables the antenna array and drive shaft to be lowered easily, leaving the masts in the erected position.

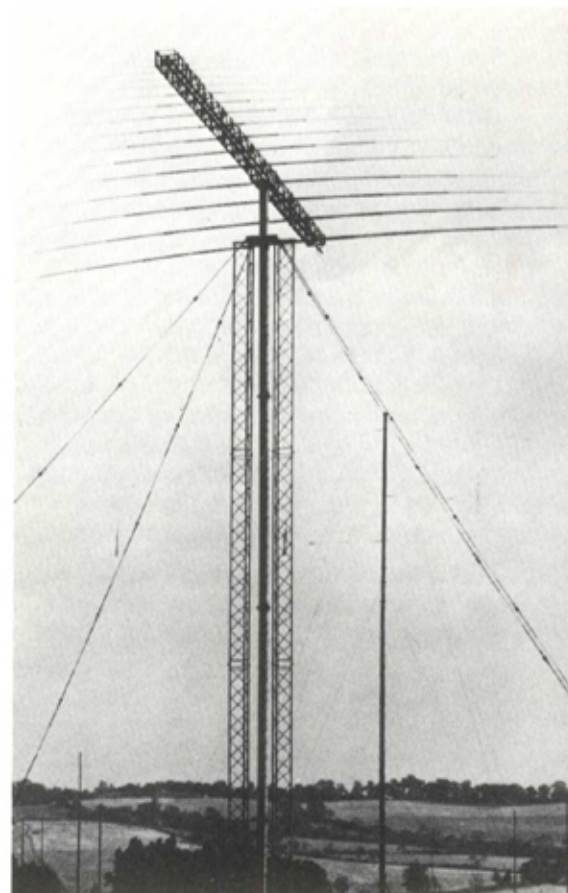
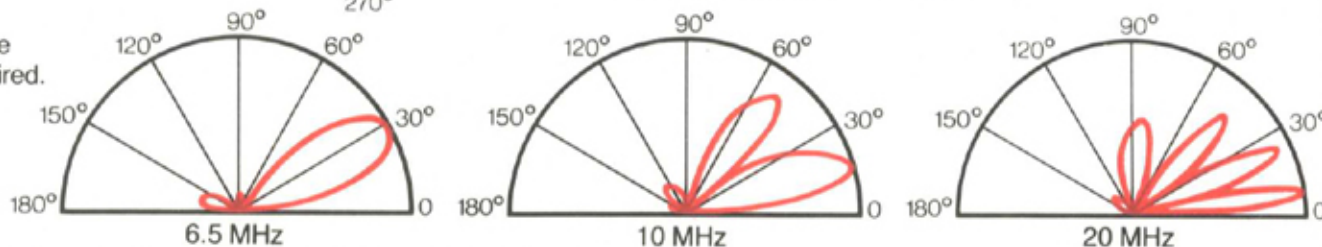
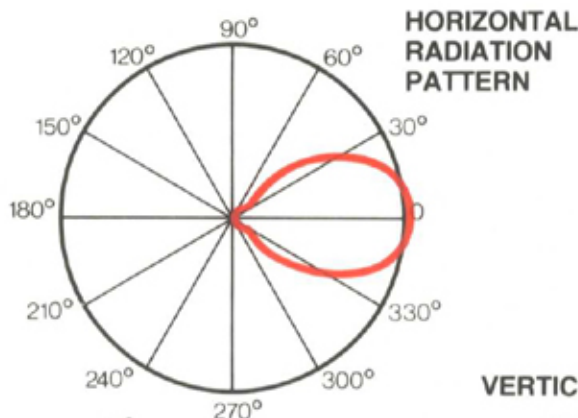
The antennas are supplied complete with remote rotator control unit for use up to 300 metres from the antenna base. Rotation is normally continuous through 360°. A 30° stepped control system is available to special order.

Lighting kits and painting to ICAO standards are available if aviation obstruction warning is required.

Antenna	LPH-24	LPH-30
Max height	27m	27m
Boom length	35m	20m
Longest element length	38m	25m
Rotation speed	0.3 rpm	0.5 rpm
Shipping weight/volume	6350 kg/20m ³	4050 kg/17m ³

Also available:

LPH72	6.5 to 30 MHz	NATO version of LPH30
LPH73	4 to 30 MHz	NATO version of LPH24



HF DIRECTIONAL ANTENNAS

LPH 89 Rotatable Log Periodic

● Frequency Range:	4-30 MHz
● Power:	25 kW Av./50 kW PEP
● VSWR:	2:1
● Gain:	Up to 12 dBi
● Impedance:	50 ohms
● Wind loading:	240 km/h, 150 mph (no ice) 144 km/h, 90 mph (12.7mm, ½in ice)

This antenna is designed specifically for harsh environments where windspeeds of up to 240 km/h, (150 mph) may be experienced.

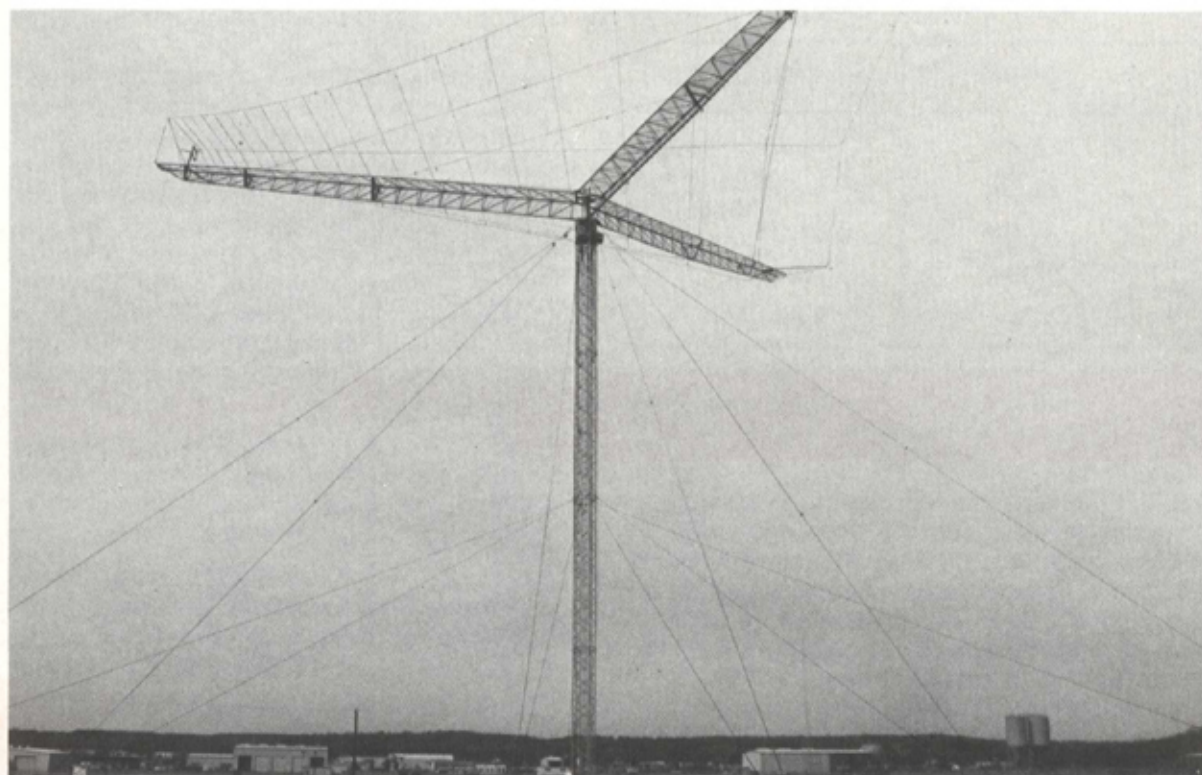
The antenna array is mounted on twin galvanized steel support masts, with a top mounted rotator, and is constructed of alumoweld wire on a Y-shaped lattice aluminium boom assembly. This type of construction combines high mechanical strength with maximum corrosion resistance.

The balun transformer is mounted at the base and feeds the antenna array via a 6 wire transmission line between the two masts.

One of the twin masts is pivoted at the base and can be lowered, together with the array, rotator and transmission line, under the control of a winch line which passes over a pulley at the top of the second, fixed mast. This lowering operation takes less than two hours and may be performed in winds up to 80 km/h (50 mph). The lowering facility has been proved particularly useful in areas where hurricanes or typhoons are prevalent.

The antenna system is supplied complete with all materials, other than concrete and reinforcing steel for the foundations.

Lighting kits and painting to ICAO standard are available on request.



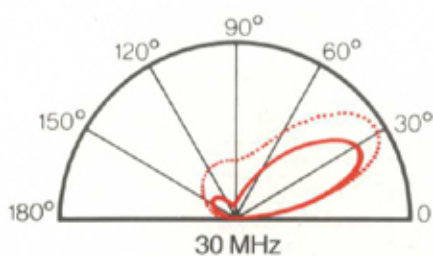
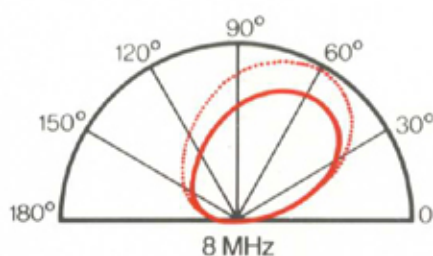
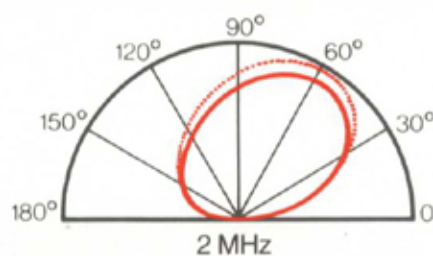
Max height	29m
Boom length	30m
Longest element length	37m
Rotation speed	Seeks any azimuth within 1 minute
Array weight	1116 kg
Shipping weight	7650 kg
Shipping volume	27.5m³
Erected dimensions (H x L x W)	29 x 56 x 49m

US Mil type AS-3482/GRC.

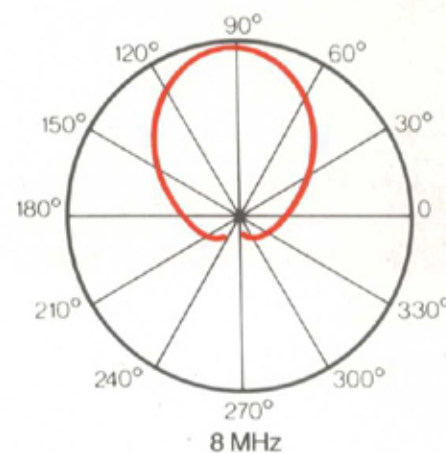
LPH 0300 Horizontal Log Periodic

● Frequency Range:	2-30 MHz LPH 0304 3-30 MHz LPH 0306
● Power:	10 kW Av./20 kW PEP
● VSWR:	2:1
● Gain:	8.5 dBi
● Impedance:	200 ohms
● Wind loading:	192 km/h, 120 mph (no ice)

The LPH 0300 series of Log Periodics is designed for short range directional skywave communications. Horizontal beamwidth is maintained at 80° between the 3 dB points. The antenna curtain is fabricated from Alumoweld wire with swaged electrical connections in the array to ensure good RF continuity. The standard tower is made of bolted aluminium sections and can be supplied with a lighting kit. Baluns are available to match the 200 ohms input impedance.

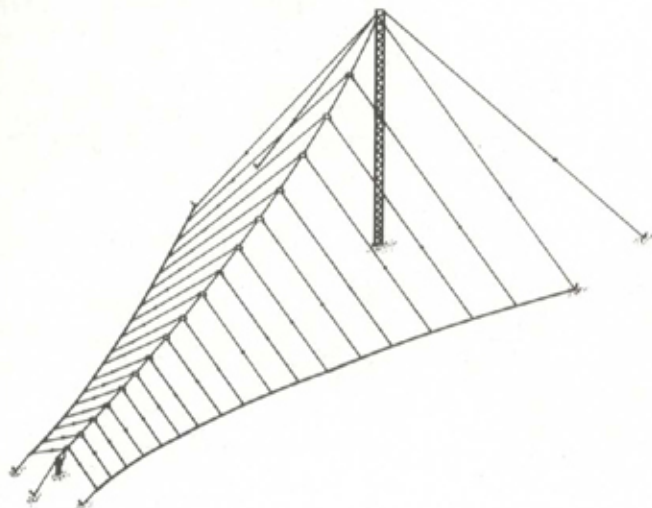


VERTICAL RADIATION PATTERNS



HORIZONTAL RADIATION PATTERN

— Average Ground
--- Perfect Ground



Antenna	LPH 0304	LPH 0306
Height	40.0m	25.6m
Length	98m	57m
Width	137m	85m
Shipping weight	818 kg	661 kg
Shipping volume	2.69m³	2.35m³

HF DIRECTIONAL ANTENNAS

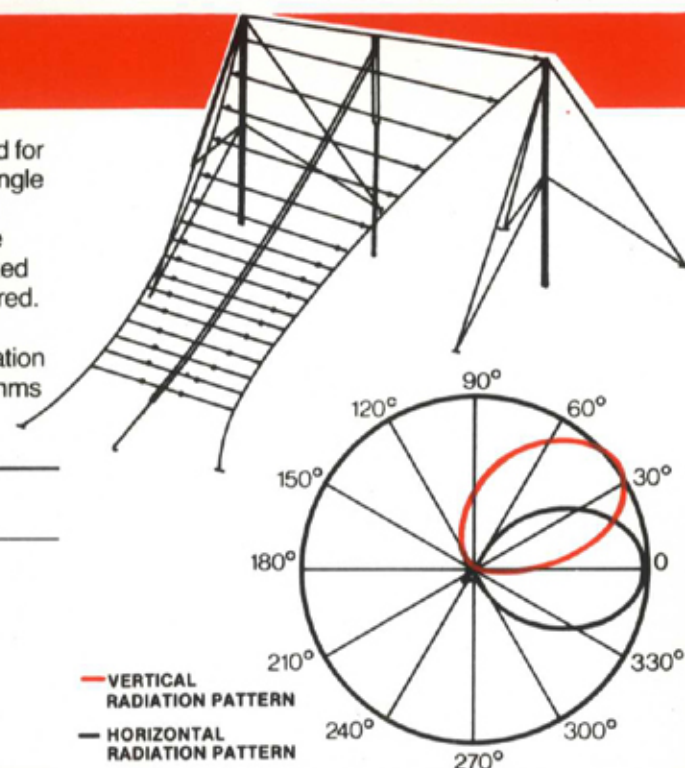
LPH 0400 Horizontal Log Periodic

- Frequency Range: 2-30 MHz (0404)
3-30 MHz (0406)
4-30 MHz (0408)
5.4-30 MHz (0411)
- Power: 25 kW Av.*
- VSWR: 2:1 maximum
- Gain: 10 dBi
- Impedance: 200 ohms
- Wind loading: 195 km/h, 120 mph (no ice)

* 1 kW and 10 kW versions available.

The LPH 0400 series log periodics are designed for short to medium haul circuits out to 1300 km (single hop). Take off angle is 43° and horizontal beam width 70° (3 dB points). The standard masts are aluminium lattice, but hot dipped steel, galvanized welded or bolted masts can be supplied if required. The preassembled curtain and catenaries are alumoweld. Lighting kit and painting to specification are available on request. Baluns to match 200 ohms are also available.

Antenna	0404	0406	0408	0411
Height	47.3m	30.5m	23m	18.3m
Width	157.3m	108m	72.5m	60.7m
Length	86.6m	61.9m	42.1m	34.1m
Shipping weight	1629 kg	1305 kg	945 kg	765 kg
Shipping volume	2.4m ³	1.7m ³	1.6m ³	1.5m ³



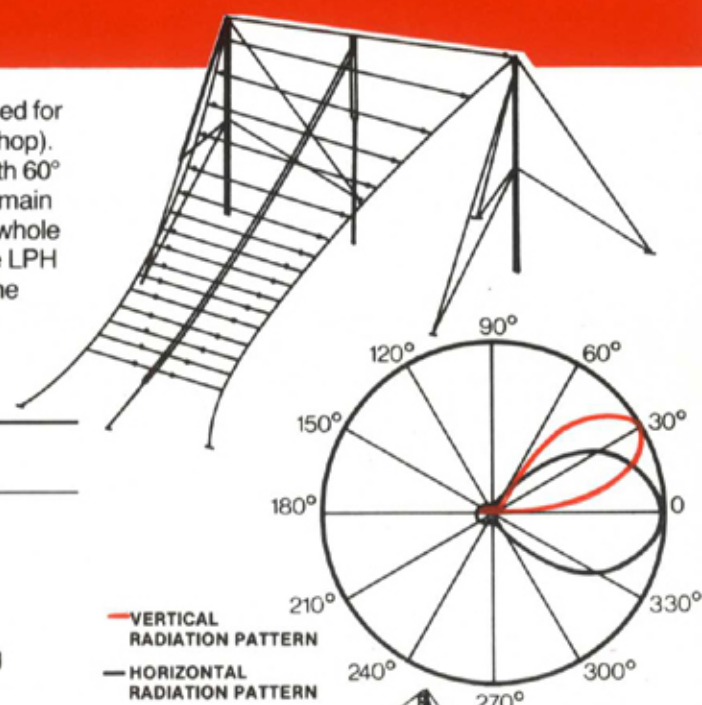
LPH 0500 Horizontal Log Periodic

- Frequency Range: 2-30 MHz (0504)
3-30 MHz (0506)
4-30 MHz (0508)
5.4-30 MHz (0511)
- Power: 25 kW Av.*
- VSWR: 2:1
- Gain: 12 dBi
- Impedance: 300 ohms
- Wind loading: 195 km/h, 120 mph (no ice)

* 1 kW and 10 kW versions available.

The LPH 0500 series log periodics are designed for medium range circuits out to 1930 km (single hop). Take off angle is 30° and horizontal beam width 60° (3 dB points). The vertical take-off angle of the main beam remains substantially constant over the whole frequency range. Construction is similar to the LPH 0400 series, and the antenna is offered with the same options. Baluns to match 300 ohms are available.

Antenna	0504	0506	0508	0511
Height	77m	52m	38m	31m
Length	122m	82m	61m	45m
Width	188m	126m	94m	70m
Shipping weight	3285 kg	2565 kg	1890 kg	1440 kg
Shipping volume	4.25m ³	3.4m ³	2.6m ³	2.3m ³



LMV 0200 Log Periodic Monopoles

- Frequency Range: 2.5-30 MHz (0205)
3.5-30 MHz (0207)
- Power: 25 kW Av.*
- VSWR: 2:1 maximum
- Gain: 11 dBi†
- Impedance: 50 ohms
- Wind loading: 195 km/h, 120 mph (no ice)

* 1 kW and 10 kW models available.

† (Assumes plane earth and reflection coefficient of +1)

The LMV-0200/2900 series antennas are fixed-station log periodic monopole antennas suitable for

short range groundwave circuits and medium to long range skywave circuits in the 2.5 to 30 MHz frequency band. The low mast height permits use near aircraft approach lanes where higher antennas may be prohibited.

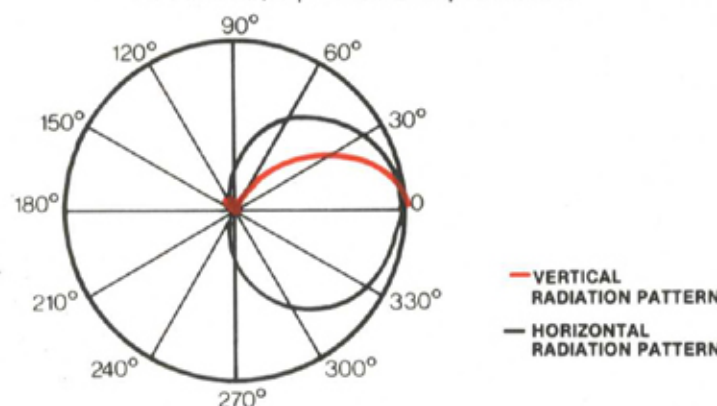
EQUIPMENT SUPPLIED:

Prefabricated alumoweld curtain, bolted 6061-T6 aluminium tower, guy wires, front pole guys, anchors, copper ground screen and balun transformer.

OPTIONAL EQUIPMENT:

Wood front pole (normally procured on-site), obstruction lights, ladder, safety climbing kit, erection kit, repair kit and repair tool kit.

Antenna	0205	0207
Height	42.7m	30.5m
Width	66.5m	47.5m
Length	118.26m	84.73m
Shipping weight	2962 kg	2105 kg
Array shipping volume	2m ³	1.3m ³
Bolted aluminium mast	1m ³	0.7m ³
Welded aluminium mast	7.1m ³	5.7m ³
Installation area and ground screen	67 × 122m	49 × 88.4m



HF DIRECTIONAL ANTENNAS

LPV 1200 Vertical Log Periodic

- Frequency Range: 3-30 MHz (1206)
4-30 MHz (1208)
5.4-30 MHz (1211)
7.2-30 MHz (1215)
- Power: Up to 25 kW Av.*
- VSWR: 2:1
- Gain: 12 dBi
- Impedance: 200 ohms
- Wind loading: 195 km/h, 120 mph (no ice)

* 1 kW and 10 kW versions available.

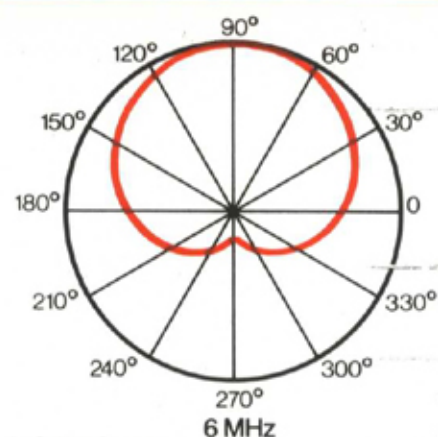
The LPV 1200 series are vertically polarized log periodic dipole antennas with a low angle of fire (typically 15°) ideally suited for long haul circuits. No ground screen is normally required. The curtain is of alumoweld and preassembled. The standard mast is of aluminium alloy bolted lattice construction, but steel bolted or welded masts are available on request. A 12m wooden pole, normally supplied locally, is required to support the front of each curtain. Lighting kits and painting to specification are available on request. Baluns to match 200 ohms are also available.

EQUIPMENT SUPPLIED:

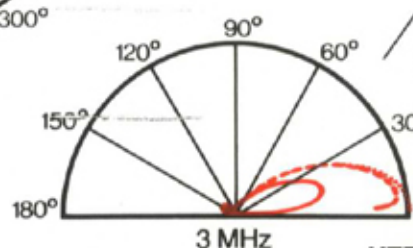
Prefabricated alumoweld curtain, 6061-T6 bolted aluminium mast, guy wires, front pole guys, anchors and installation hardware.

OPTIONAL EQUIPMENT:

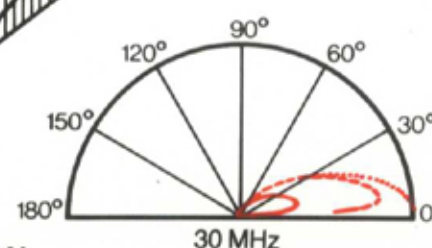
Balun transformer, obstruction lights, climbing ladder, safety climbing equipment, erection kit, repair kit and repair tool kit.



HORIZONTAL RADIATION PATTERN



VERTICAL RADIATION PATTERNS



Antenna	1206	1208	1211	1215
Height	61m	48.8m	34m	25.6m
Length	120m	100m	67m	52m
Width	95.1m	63.4m	48.8m	36m
Shipping weight	1395 kg	1125 kg	810 kg	585 kg
Shipping volume	2.8m ³	2.6m ³	2.3m ³	2m ³

LPV 1600 Vertical Log Periodic Rosette

- Frequency Range: 3-30 MHz (1606)
4-30 MHz (1608)
5.4-30 MHz (1611)
- Power: 25 kW Av.
- VSWR: 2:1 maximum
- Gain: 12 dBi
- Impedance: 200 ohms
- Wind loading: 195 km/h, 120 mph (no ice)

The LPV 1600 series are an arrangement of either 3 or 4 LPV 1200 series suspended from a central mast to provide sector coverage with gain in any selected direction. Performance is otherwise as for the LPV 1200. The antenna is normally supplied with a bolted aluminium mast but a bolted or welded steel mast is available on request. Baluns to match 200 ohms are also available.

Antenna	1606	1608	1611
Height	61m	48.8m	35.1m
Length x width	130 x 130m	103 x 103m	79 x 79m
Shipping weight	5315 kg	3955 kg	2975 kg
Shipping volume	4.93m ³	4.65m ³	3.79m ³

LPB 3000 Polarization Diversity

- Frequency Range: 3-30 MHz (3006)
4-30 MHz (3008)
5.4-30 MHz (3011)
- Power: Up to 25 kW Av.*
- VSWR: 2:1
- Gain: 12 dBi
- Impedance: 200 ohms (LPV 1200)
300 ohms (LPH 0500)
- Wind loading: 195 km/h, 120 mph (no ice)

* 1 kW and 10 kW versions available.

The LPB 3000 series diversity antennas are log periodic arrays arranged to minimize space requirements while retaining the mechanical detail and radiation patterns of the LPV 1200 and LPH 0500 series. The system provides polarization diversity reception to minimize signal fading on medium to long range circuits when difficult

propagation conditions prevail. Isolation between arrays is 20dB minimum. Baluns to match to 200 and 300 ohms are available. (See LPH 0500 and LPV 1200 series for typical radiation patterns).

Antenna	3006	3008	3011
Height	61m	48.8m	35.1m
Width	136.6m	97.5m	22.8m
Length	121m	89.9m	66.45m
Shipping weight	2600 kg	1800 kg	1250 kg
Shipping volume	4.7m ³	3.6m ³	3m ³

HF DIRECTIONAL ANTENNAS

VH 830 Sloping Vee

● Frequency Range:	8-30 MHz
● Power:	1 kW Av.
● VSWR:	2:1
● Gain:	13 dBi (8 MHz) 16 dBi (12 MHz) 18 dBi (20 MHz) 21 dBi (30 MHz)
● Impedance:	50 ohms
● Wind loading:	160 km/h, 100 mph (no ice)

A highly directional, low cost, terminated half rhombic antenna, the VH 830 leg lengths, slope, and spacing have been optimized for wideband operation without adjustment. The narrow beamwidth and low vertical take-off angle make the antenna suitable for long-range skywave communication using frequencies within the band 8 to 30 MHz at inputs of up to 1 kW average power. Both fixed station and transportable versions are available.

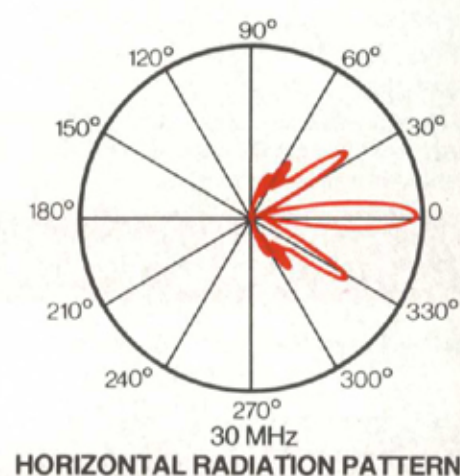
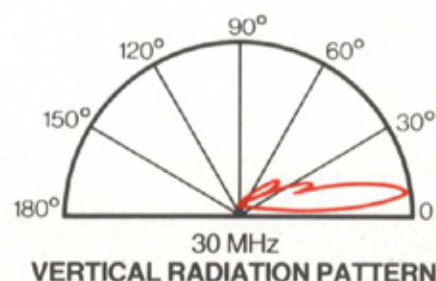
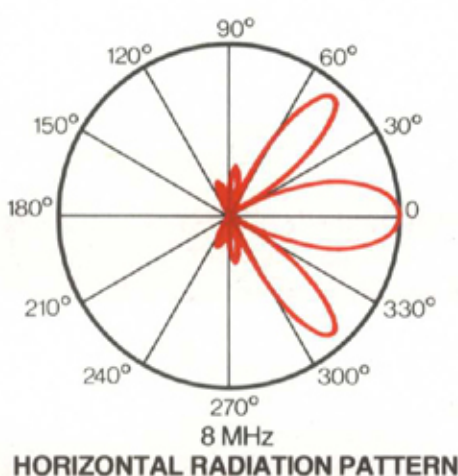
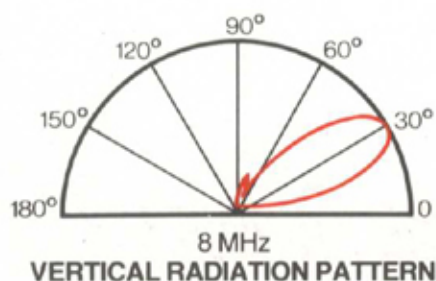
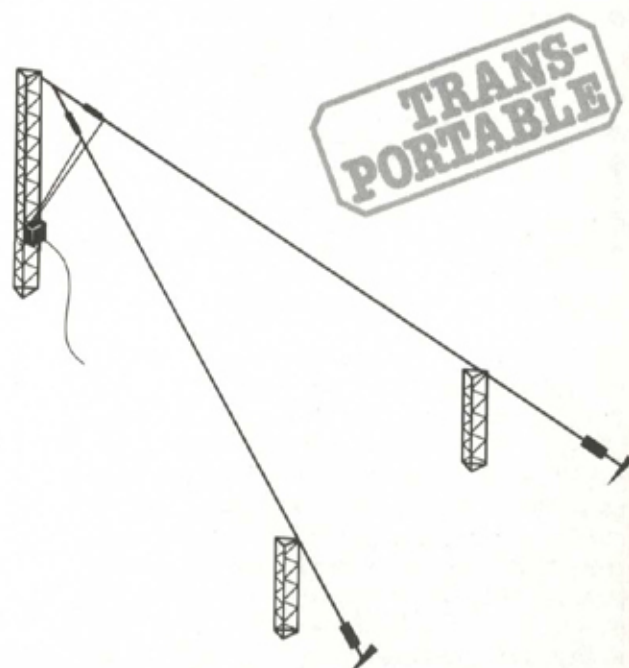
The antenna is supplied with leg lengths of 150 metres but, where space is restricted, leg lengths may be reduced to 60 metres if a reduced performance is acceptable. A comprehensive handbook gives full details of installation procedure.

Fixed station versions use an aluminium lattice mast which is assembled on site. Transportable versions have a tubular mast and require a falling derrick which is supplied in the kit. Mast height is 14.5m. The intermediate prop masts are not supplied with the transportable antenna. Obstruction lights are available on request.

The VH 830 can be used in conjunction with the DP 312 wideband dipole antenna on the same mast where both directional and omnidirectional coverage is required.

Typical dimensions for an 8-30 MHz VH 830 installation – height × width × length is 14.6 × 61.6 × 150m. Shipping weight and volume are 120 kg and 0.5m³.

A tactical version of this antenna, the RA905, appears in the "Tactical Antennas" section.



LW Long Wire

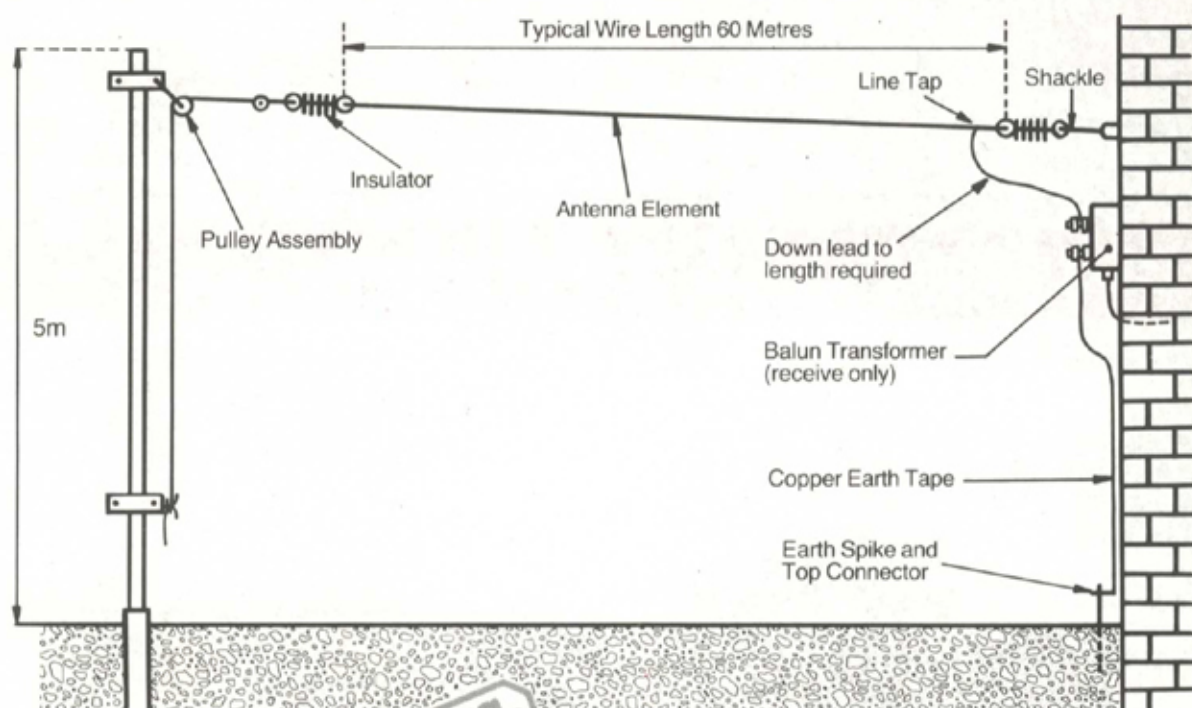
- Frequency Range: MF/HF
- Receive or Transmit at 1 kW
- Simple and economical
- Easy to install

The long wire or Inverted 'L' is a general purpose antenna more commonly used for reception but in conjunction with a suitable antenna tuning unit, for transmitting purposes.

The antenna is normally supplied for receiving applications and comprises a 100 metre length of stranded copper wire, terminated at one end by a ceramic insulator and halyard assembly. A second insulator, with line taps, is supplied to terminate the horizontal portion of the antenna, leaving the unused portion to form the downlead which terminates on a wideband transformer enabling the antenna to be fed by a 50 ohm coaxial cable (not supplied). An earthing kit, comprising approximately 8 metres of copper earth tape and a copper earth rod, is supplied for earthing the balun transformer. A typical receiving installation would have a horizontal portion of 60 to 70 metres in length and be supported about 5 to 9 metres above ground. Suitable masts are obtained from Racal Antennas; a 5 metre socketed version is illustrated.

For transmit applications, a customer-supplied antenna tuning kit is used instead of the balun transformer.

The antenna can be manufactured to a specific length if so requested when ordering.



TACTICAL ANTENNAS

Sectional Whip Antennas

- Copper plated chrome molybdenum steel tube
- Impact resistant fibreglass
- Non-jamming rolled thread
- 4m or 4.8m overall height
- NATO-codified

These antennas consist of 1 metre or 1.2 metre sections which screw together to form a flexible whip designed for use on vehicles or, as elevated whips, on tactical masts.

The entire range is NATO-codified and used extensively on military installations, including armoured fighting vehicles, throughout the world.

Three types of rod are available, two in steel and the other in fibreglass. All types use the same, well-proven, rolled thread at the ends of the sections and are thus completely interchangeable.

For HF use, whips can be assembled with three sections, using No. 1, 2 and 3, or four sections, using two No. 1's and one No. 2 and one No. 3. For VHF use, a 2 metre antenna can be made up from a No. 2 section and a No. 3 section. It should be noted that both No. 1 and No. 2 sections will interface directly with the antenna bases 31 and MA728.



Universal Adaptor



Vee Adaptor

Section	Steel 1m	Steel 1.2m	Fibreglass 1m
No. 1 (Bottom)	5985-99-630-8455 (MA681)	5985-99-949-1166	5985-99-649-8138 (RA746)
No. 2 (Middle)	5985-99-630-8456 (MA682)	5985-99-949-0985	5985-99-649-8139 (RA747)
No. 3 (Top)	5985-99-630-8457 (MA683)	5985-99-949-0995	5985-99-649-8140 (RA748)
Carry Case	5985-99-745-3190	5985-99-102-3666	5985-99-745-3190

The British Army preferred method of installation uses steel sections for the lower parts of the whips, with a fibreglass section at the top. This gives good flexibility and affords some measure of electric shock protection should the whip touch an overhead power line.

TRANS-PORTABLE



Antenna Bases

- HF/VHF/UHF
- 100W and 400W
- NATO-codified
- Standard mountings

Designed to support whip antennas on military mobiles, including armoured fighting vehicles, these bases are suitable for worldwide use in harsh environments. In addition to the military application, the bases are equally well suited to rugged, commercial radio requirements on tractors, earth moving machines, heavy lorries and cross-country vehicles. The Racal series of sectional whip antennas are designed for use with these support bases.

The Antenna Base No. 31 Mark 3 is the standard base used by the British Army and will support a 3 section whip antenna at operational vehicle speeds on roads or cross-country. When stationary, the whip height may be extended to 4 sections. The upper part of the base is an insulator constructed of black, high density, polyethylene. Flexibility is provided by an extremely tough rubber skirt moulded to the top insulator and continued around a metal fixing plate which is thereby completely encased in rubber, providing its own watertight seal. The NATO No. for this base is 5985-99-652-2708.

The MA728 series of bases has a rigid dome insulator of glass fibre composite material with flexibility provided by a robust barrel spring assembly which allows the whip antenna to deflect

under impact. The base will support a four metre whip in most operational conditions. Special VHF and UHF versions have an aluminium base casting, below the dome insulator, which carries the BNC cable connector. A high power HF version, handling 400 Watts PEP, is also available.

The antenna base requires 6 x 7.0mm mounting holes on 111.1mm PCD.

Application	Order No.
HF 100W	MA728
HF 400W	MA728H
VHF 100W	MA728M
UHF 100W	MA728U

A special version, the MA728-200, is used where an airtight seal is required over an aperture, on a pressurized Antenna Tuning Unit for example. These are tested to 5 psi (0.35 kg/sq cm) during production.



TRANS-PORTABLE

TACTICAL ANTENNAS

RA 905 Tactical HF Antenna System

● Frequency Range:	2-30 MHz as wideband dipole 8-30 MHz as sloping Vee
● Power:	400W, 500W and 1 kW
● VSWR:	2.5:1
● Gain:	3 dBi to 15 dBi as sloping Vee
● Input Impedance:	50 ohms
● Input Connector:	Type 'N'

The RA905 is a tactical antenna system, deployable as either a wideband, terminated dipole or as a sloping Vee, designed for use at support heights of from 6 to 9 metres. The complete antenna, less mast, packs into a canvas holdall and is easily carried.

In the wideband dipole configuration, the frequency range is 2 to 30 MHz and the antenna provides good, high angle radiation for short to medium range skywave communications. The horizontal pattern is substantially omnidirectional.

In the sloping Vee mode the design frequency range is 8 to 30 MHz but the antenna can be used down to 2 MHz if reduced performance is acceptable. Transmitter power must be reduced if used below 4 MHz to avoid overloading of the terminating resistors. The narrow horizontal beamwidth and low vertical take-off angle make this antenna particularly suitable for medium to long range, point-to-point communication.

The antenna radiating elements are constructed of a copper/terylene braid comprising 8 plaits of two-strand 0.2mm tinned copper wire and 8 plaits of terylene continuous filament yarn laid up round a core of continuous filament terylene and PVC sheathed in forest green. Overall circumference is approximately 10mm and breaking strain exceeds 712N. Temperature tolerance is -40°C to $+55^{\circ}\text{C}$.

The balun transformer is located at the antenna apex and fed by a 50 ohm coaxial cable. The transformer will locate directly in the top socket of some Racal support masts; alternatively it can be suspended by halyard. The Racal MA675 9 metre fibreglass support kit is a suitable tactical mast for this application.

The terminating loads are non-inductive, carbon film resistors mounted on a heatsink and fully enclosed. The loads are supported on drive-in stakes located at the ends of the elements.

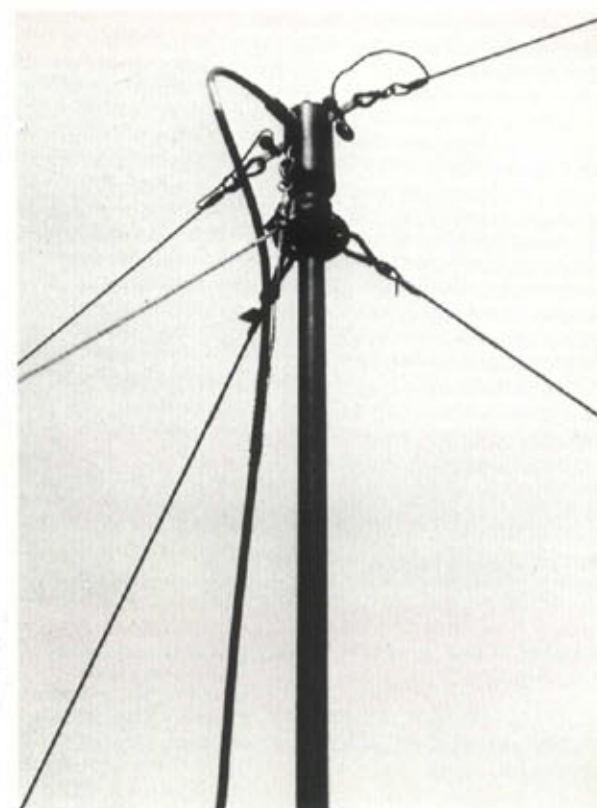
Strain relief devices are provided on coaxial cable and radiating elements so that no electrical connections are under physical strain.

Trailing earth wires and a copper earth rod are provided to improve performance over poor ground.

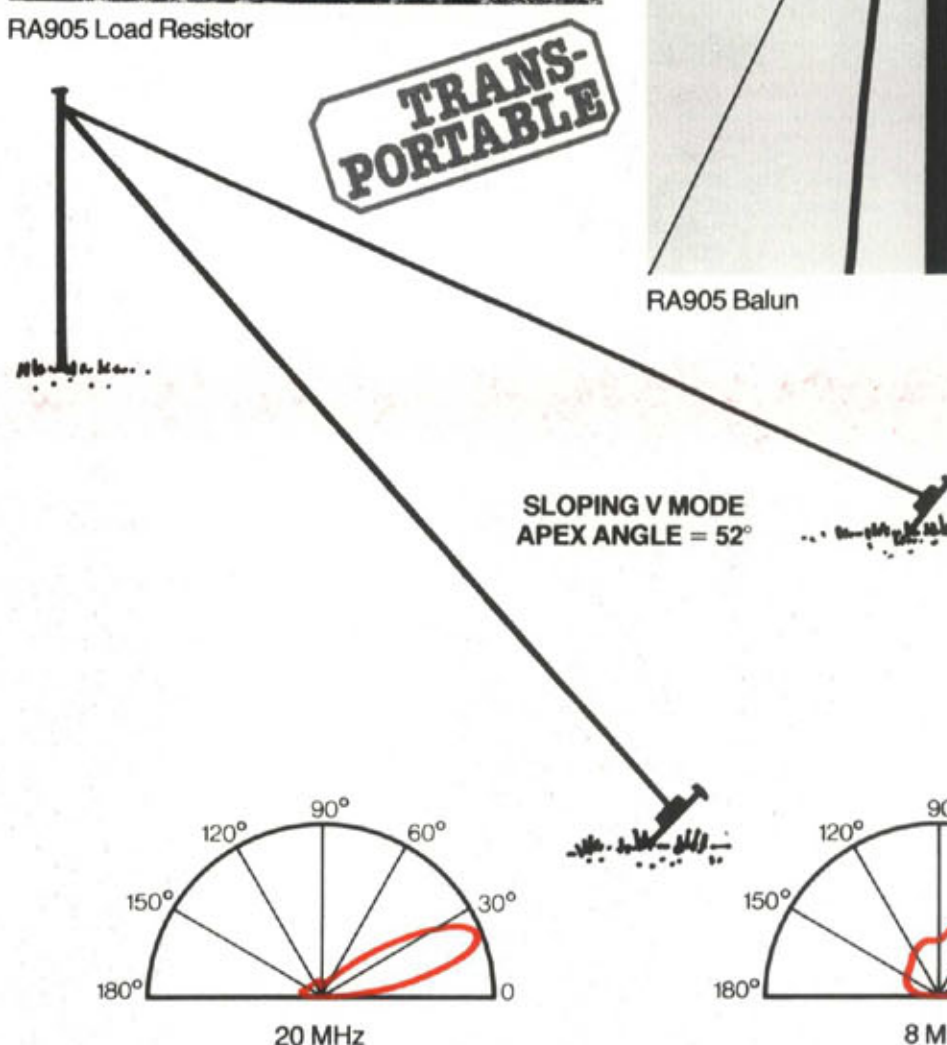
Type Number	Power Rating
RA905-903	400W
RA905-904	1 kW
RA905-905	500W



RA905 Load Resistor



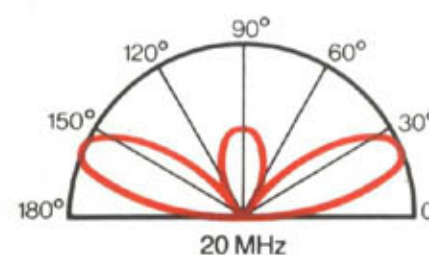
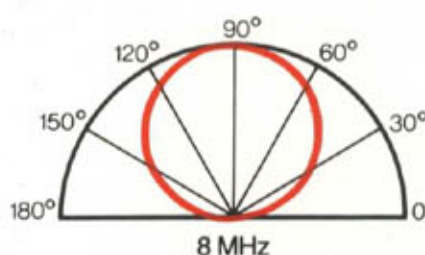
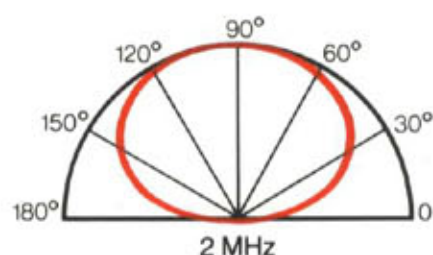
RA905 Balun



VERTICAL RADIATION PATTERNS



WIDEBAND DIPOLE MODE



VERTICAL RADIATION PATTERNS

TACTICAL ANTENNAS

RA 911 HF Parachutists Sloping Vee

● Frequency Range:	6-30 MHz
● Power:	25W PEP
● VSWR:	Less than 3:1 above 6 MHz
● Gain:	0.8 dBi at 6 MHz 12 dBi at 30 MHz
● Weight:	3.5 kg

The RA911 is a lightweight, sloping Vee, travelling wave antenna specifically designed to provide a rear link HF facility for airborne forces operating at medium to long distances from their base station. The antenna weighs only 3.5 kg and is small enough to be carried in the parachutist's normal kit.

The design height is 5 metres at the Vee apex and the antenna can be slung from any convenient mast or tree. When Vee angle is adjusted to optimum, the vertical take-off angle is typically 15° to 20°.

The antenna can also be used as a wideband, terminated dipole by bringing the elements down to ground in an inverted Vee mode and terminating with the normal terminating peg assemblies. In this configuration the antenna provides omnidirectional high angle radiation for short range skywave communications up to 15 MHz.



MA 797 HF Inverted 'L'/Long Wire

● Frequency Range:	1.6-30 MHz
● Power:	400W PEP

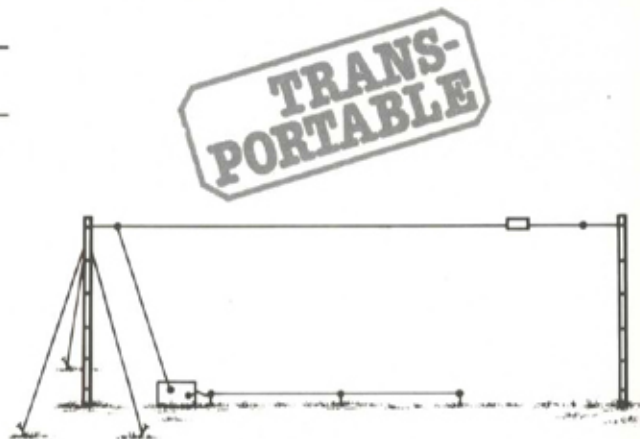
The MA797 is a tactical, lightweight kit for use as an inverted 'L' antenna at powers up to 400W PEP. An antenna tuning unit is required in conjunction with this antenna. A suitable tuner unit is the Racal BCC540.

The kit consists of a 20m PVC covered copper/terylene braid, radiating element, a 15 metre nylon halyard, a trailing earth system, 3 earth spikes and a carrying bag. The antenna can be supported on masts or trees.

The Racal MA1381 glassfibre 7.3 metre mast kit is suitable for this antenna system.

ITEMS SUPPLIED:

Part No.	Qty	Description
MA797/1	1	Radiating element 20m, with 15m nylon halyard, all wound on polypropylene winder frame
MA797/2	2	Trailing earth wire, 6m long
MA797/3	1	Earth link
MA797/4	1	Carrying case
MA797/6	1	Cord link with spring clips
FG1100	3	Earth spikes copper 18 inch



MA797 HF INVERTED 'L'

RA 961 HF Tactical Loop

● Frequency Range:	3-15 MHz
● Power:	100W PEP*
● VSWR:	2:1 max 5.5-15 MHz 3:1 max 3-5.5 MHz
● Gain:	-5 dBi to -16 dBi
● Polarization:	Vertical
● Input Impedance:	50 ohms
● Input Connector:	BNC

* In conditions of high humidity it may be necessary to limit transmitter power to 60W PEP.

The RA961 is a capacitively tuned HF loop antenna providing omni-directional, high and medium angle radiation for good reliable skywave communications over path lengths of up to 1500 km.

At low radiation angles the antenna exhibits a figure-of-eight horizontal pattern which can be used to null out interfering signals by rotating the loop assembly.

The antenna consists of a vertical 1.2m square loop of anodised aluminium tube, manually tuned by a capacitor housed in a control unit at the base of the loop, the whole being mounted on a 2-section fibreglass support mast giving an overall height of approximately 3.5 metres. A base plate, guys and guy anchors are supplied with the mast and the complete antenna packs into a robust carrying case. A bracket for mounting the antenna on the front bumper bar of a Landrover, or similar vehicle, is also available; this is for use only when the vehicle is stationary.

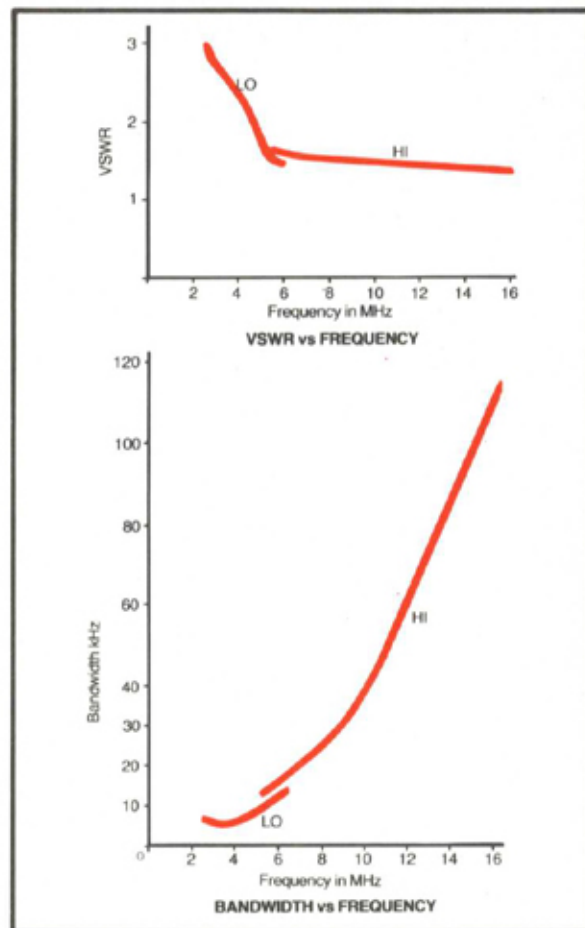
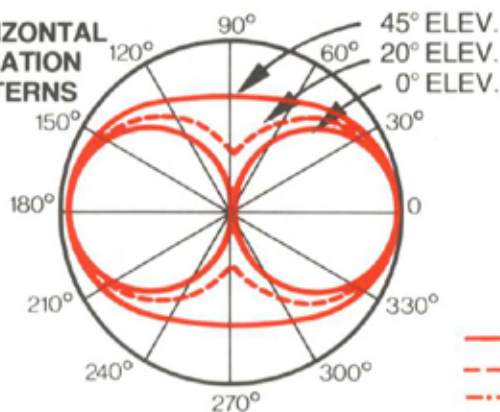
Operation is simple and entails setting the capacitor tuning control to a position indicated by a tuning graph on the control box and then tuning for maximum indication on a small tuning meter. The meter incorporates a Beta light so that it can be seen in darkness; a swivel cover obscures the light when tuning is completed.



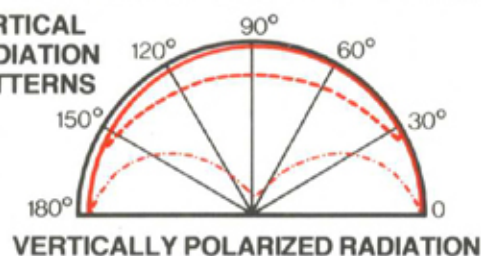
Weight: 14 kg

Packed dimensions: 1200 × 330 × 280mm

HORIZONTAL RADIATION PATTERNS



VERTICAL RADIATION PATTERNS



VERTICALLY POLARIZED RADIATION

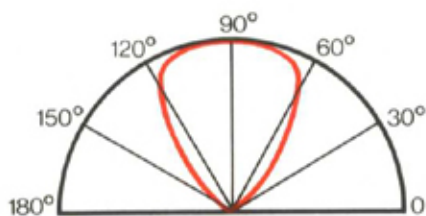
TACTICAL ANTENNAS

MA 677 HF Horizontal Loop

● Frequency Range:	2-10 MHz or 2-15 MHz (non standard)
● Power:	100W PEP
● VSWR:	2:1 (2-3 MHz) 1.5:1 (3-10 MHz)
● Impedance:	50 ohms
● Height:	1.8m

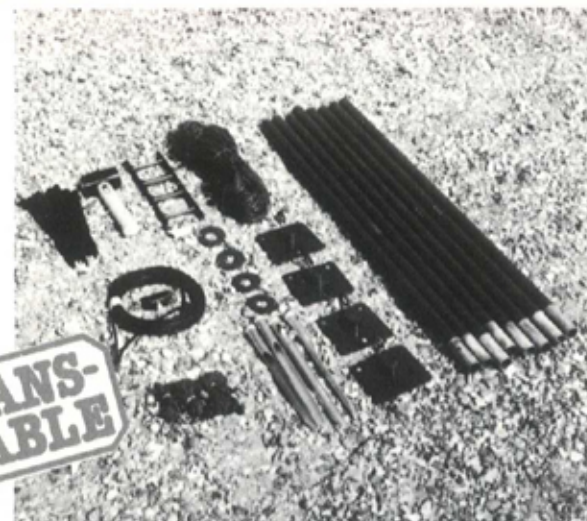
The MA 677 loop antenna comprises an arrangement of two half wave dipoles cut to a single frequency in the 2-10 MHz band and fed in phase. These are mounted in a square configuration on four 1.8 metre sectional glass fibre support poles. This arrangement gives a high angle of fire which is eminently suitable for short to medium range broadly omnidirectional communications, with the added advantage of presenting an extremely low profile. The antenna has good efficiency at low

power levels and is very quickly assembled. The antenna loop is made of a single PVC sheathed copper-terylene braid cut to the required frequency, but another additional loop cut to another frequency can be added to increase the frequency range. The whole antenna kit packs into an olive drab PVC coated nylon holdall measuring 1.2m x 0.175m x 0.175m and weighs 9.1 kg.



VERTICAL RADIATION PATTERNS

**TRANS-
PORTABLE**



ST 230 Transportable Log Spiral

● Frequency Range:	2-30 MHz
● Power:	500W or 1 kW PEP
● Gain (Even Mode):	2 MHz —16 dBi 30 MHz —6 dBi
● Gain (Odd Mode):	2 MHz —12 dBi 20 MHz —2 dBi
● Polarization:	Vertical
● VSWR:	2:1 maximum
● Wind loading:	100 km/h

The ST-230 is a dual-mode spiral transportable antenna covering the frequency range 2 to 30 MHz at a power input of 500 watts or 1 kW PEP. It provides two selectable modes of operation:-

Even Mode: Predominantly vertically polarized for medium to long range skywave.

Odd Mode: Predominantly horizontally polarized for short range skywave.

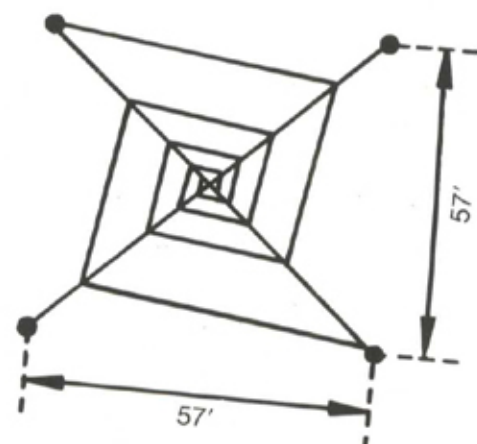
Designed for rapid deployment, the lightweight, telescopic 12m mast makes it possible for two men to erect the antenna in as little as 30 minutes. The electrical parameters of the mast are used in the design to improve the radiation characteristic.

The antenna is fed by a hybrid which has two 50 ohm inputs, one for each mode of operation. Both modes may be used simultaneously. A groundscreen system, comprising eight 12m radial wires, is supplied with the antenna system.

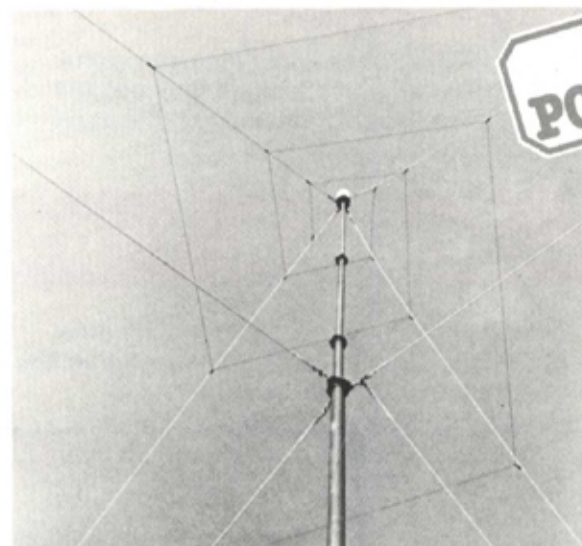
Input impedance is 50 ohms via 'N' connectors.

Mechanical Specification:

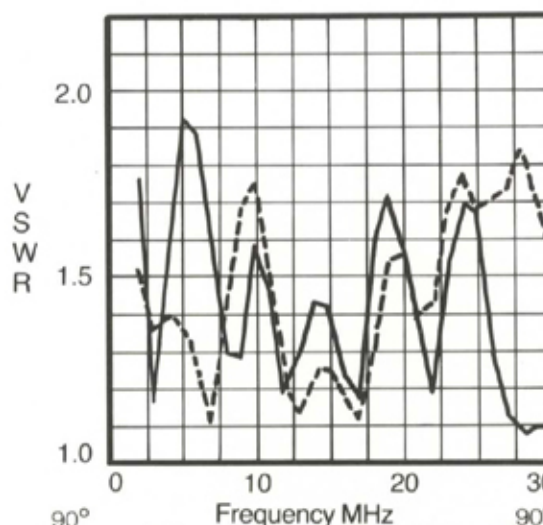
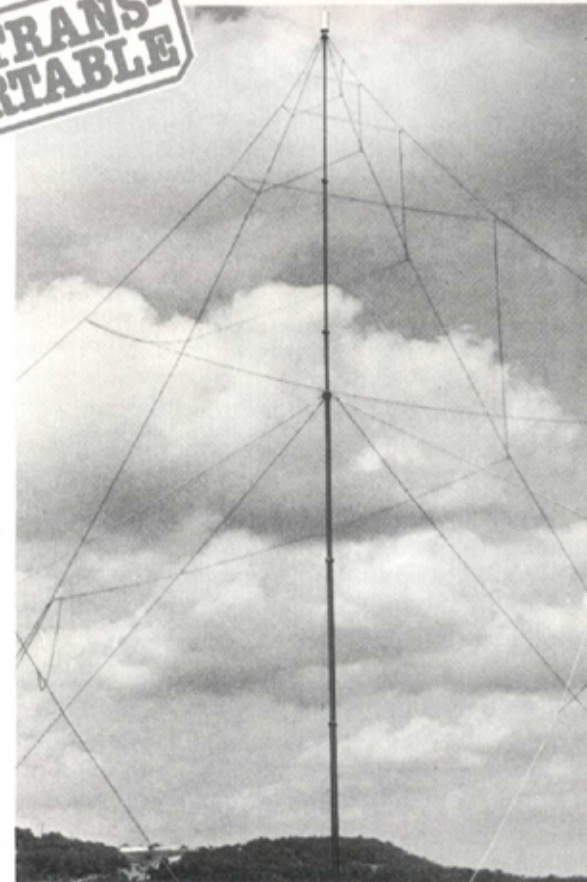
Height:	12m
Installation area:	17.4 x 17.4m
Packed dimensions:	1.83 x 0.5 x 0.5m approx.
Weight:	90 kg approx.



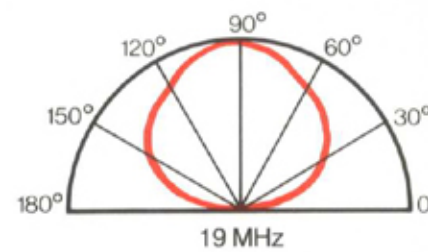
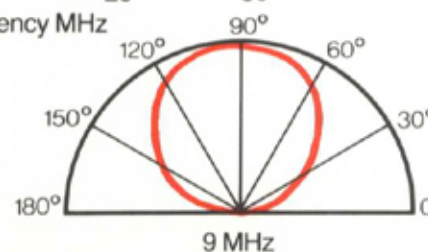
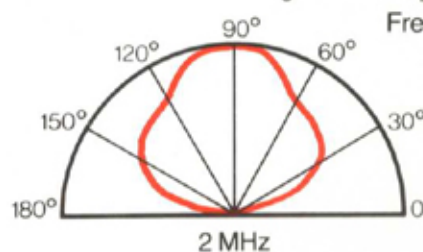
Plan View



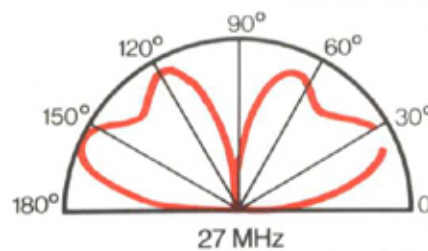
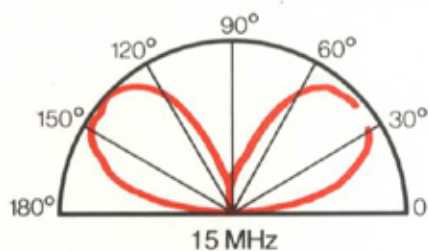
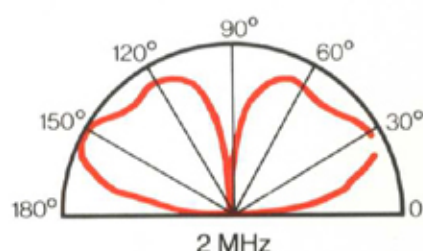
**TRANS-
PORTABLE**



--- Horizontal Polarization Mode
— Vertical Polarization Mode



VERTICAL RADIATION PATTERNS



ODD MODE

EVEN MODE

TACTICAL ANTENNAS

RA 944 VHF Wideband End Fed Whip

● Frequency Range:	26-90 MHz
● Power:	100W PEP
● VSWR:	3.0:1 30-80 MHz
● Impedance:	50 ohms
● Wind loading:	160 km/h, 100 mph
● Weight:	4 kg approx.

The RA944 is an economic and efficient solution to the multi-frequency requirements of tactical, mobile and fixed station radio systems which employ wideband or frequency agile techniques.



A wideband matching and coupling network within the base unit provides an impedance match for the antenna; no external antenna tuning unit is therefore required.

The RA944 is suitable for mounting on a mast or on a vehicle and is designed to withstand vibration and shock such as is encountered during high speed cross-country work. The spring assembly permits deflection of the whip elements if struck by overhanging trees.

Two versions are available, the RA944-900 and RA944-901. The RA944-900 is as illustrated and uses two whip elements of copper plated chrome molybdenum steel tube, one of 1 metre, the second of 0.73 metres, giving an overall assembly height, including base, of 1.88 metres.

A second version, the RA944-901, is supplied with two flexible, fibreglass whip elements which screw directly into the base insulator; the spring assembly is not used. The whip elements are each 0.85m in length and have a fibreglass core around which is a copper braid, the whole being covered by a Polyamid sheath. Overall height of this version is 1.86 metres approximately.

A spigot adaptor for mounting the antenna on a mast is also available; this spigot fits a standard 24mm socket. When used on a mast, the power input should be limited to 60W.

TRANS-PORTABLE



For tactical use, the complete system can be supplied in kit form comprising the antenna base, whip elements, masthead adaptor, 15m coaxial cable assembly and carrying bag. Alternatively, for permanent vehicle mounting, the antenna base and whip elements can be supplied separately.

RA 972 VHF Broadband Centre Fed Whip

● Frequency Range:	30-80 MHz
● Power:	50W CW
● Gain:	See graph
● VSWR:	3:1 maximum
● Polarization:	Vertical

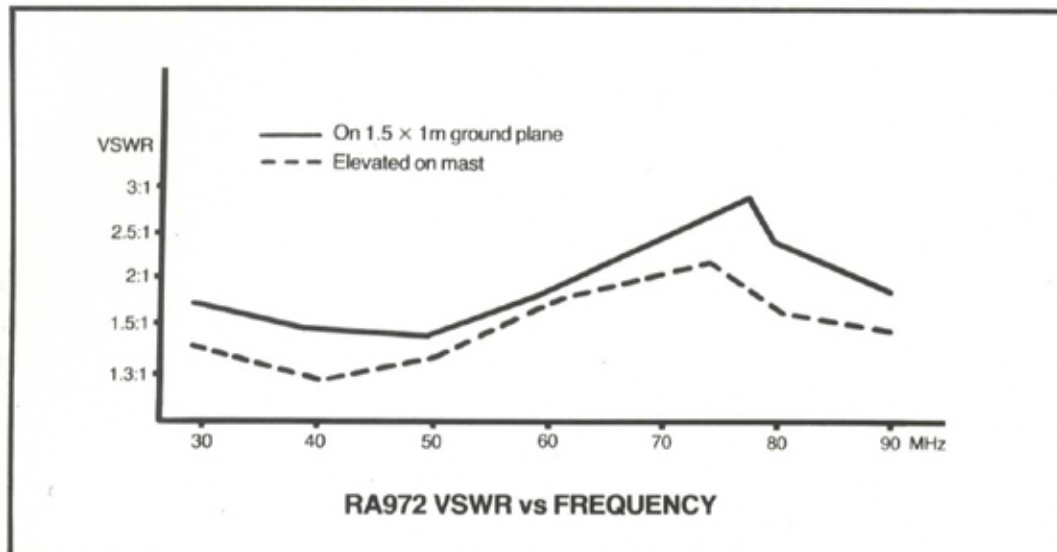
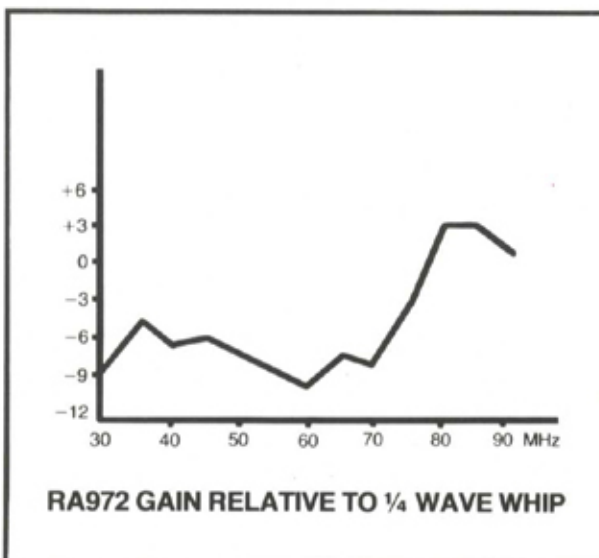
The RA972 is a broadband, centrefed, vertical whip antenna designed to cover the military VHF range of 30 to 80 MHz without an antenna tuning unit and can be used with frequency hopping or other spread spectrum radio systems.

The antenna is constructed of epoxy resin reinforced fibreglass with a steel shock spring between whip element and base flange. It is suitable for mounting on either armoured or soft-skinned military vehicles and is fixed by means of a bolt-down flange.

The VSWR is better than 3:1 over the range 30 to 80 MHz and, because of the centre-fed arrangement, is somewhat less dependent on the groundplane than is the case with the end-fed configuration.

The antenna is fed via a 50 ohm 'N' type connector in the underside of the base flange.

The whip element is in two sections which screw together, the diameter being 20.5mm at the bottom and 6mm at the top. Total weight is 1.67 kg.



TRANS-PORTABLE

TACTICAL ANTENNAS

MA 685 VHF Adjustable Wire Dipole

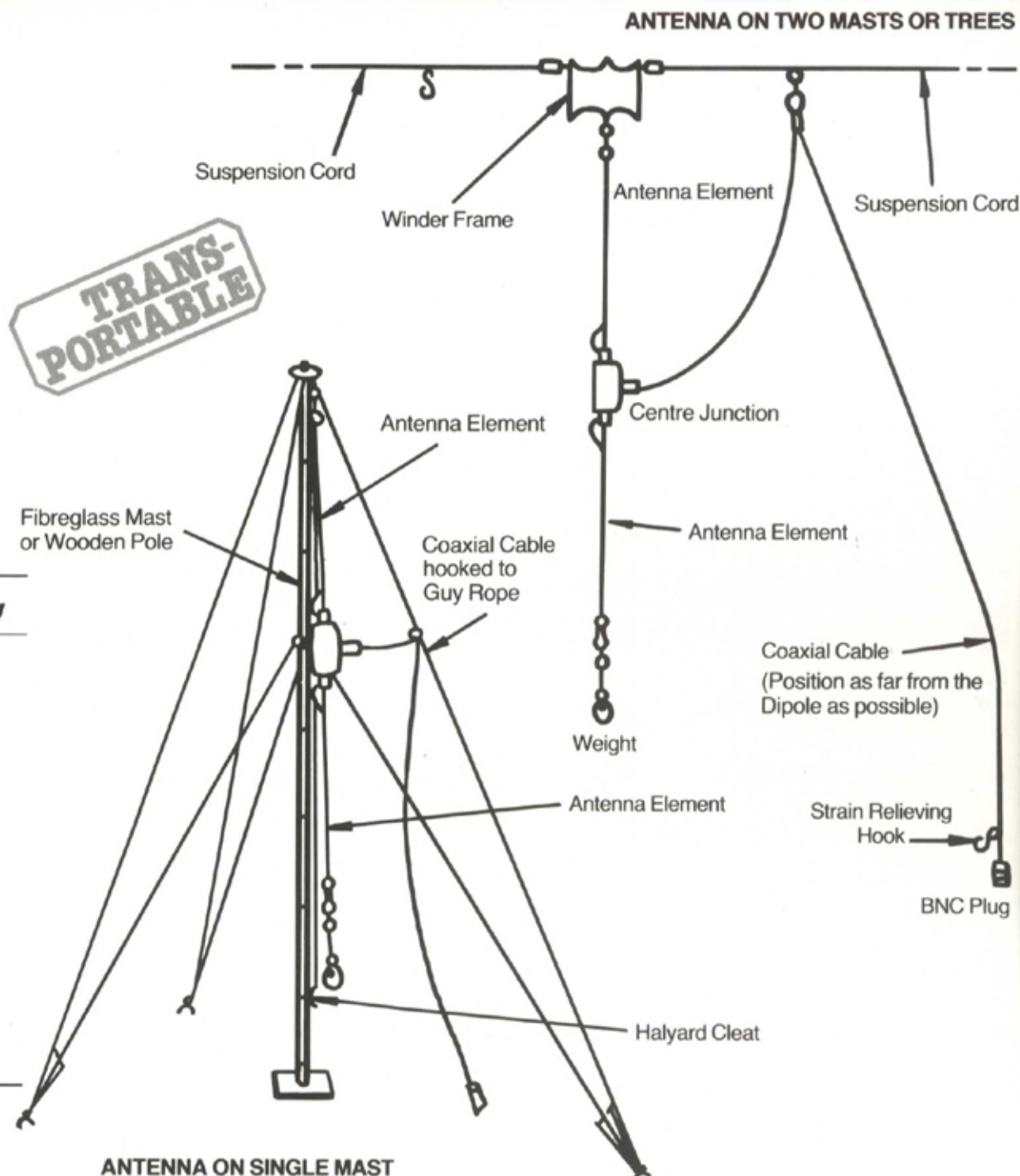
- Frequency Range: 30-76 MHz
- Power: 50W Av.
- VSWR: 2:1
- Gain: 2 dBi nominal
- Polarization: Vertical
- Impedance: 50 ohms
- Connector: BNC

The MA685 is a lightweight wire dipole, covering the frequency range 30 to 76 MHz in four bands and intended for use in the vertically polarized mode, providing an omnidirectional horizontal radiation pattern.

The antenna is supplied with dipole elements, 15 metre coaxial cable assembly with BNC connectors, dipole centre junction with transformer, winder frames, suspension cords and carrying case.

The dipole can be supported on a single fibreglass support mast or, by using the horizontal support cords, between two masts or any convenient trees etc.

Part No.	Description	Qty
MA685-1	Antenna Element 30-38 MHz Blue	2
MA685-2	Antenna Element 38-45 MHz White	2
MA685-3	Antenna Element 45-60 MHz Yellow	2
MA685-4	Antenna Element 60-76 MHz Red	2
MA685-5	Coaxial cable assembly	1
MA685-6	Centre junction with transformer	1
MA685-7	Suspension cord assembly	2
MA685-8	Winder Frame	2
MA685-10	Throwing cord assembly	1
MA685-12	Throwing weight assembly	2
MA685-16	Carrying case	1
	Instruction sheet	1

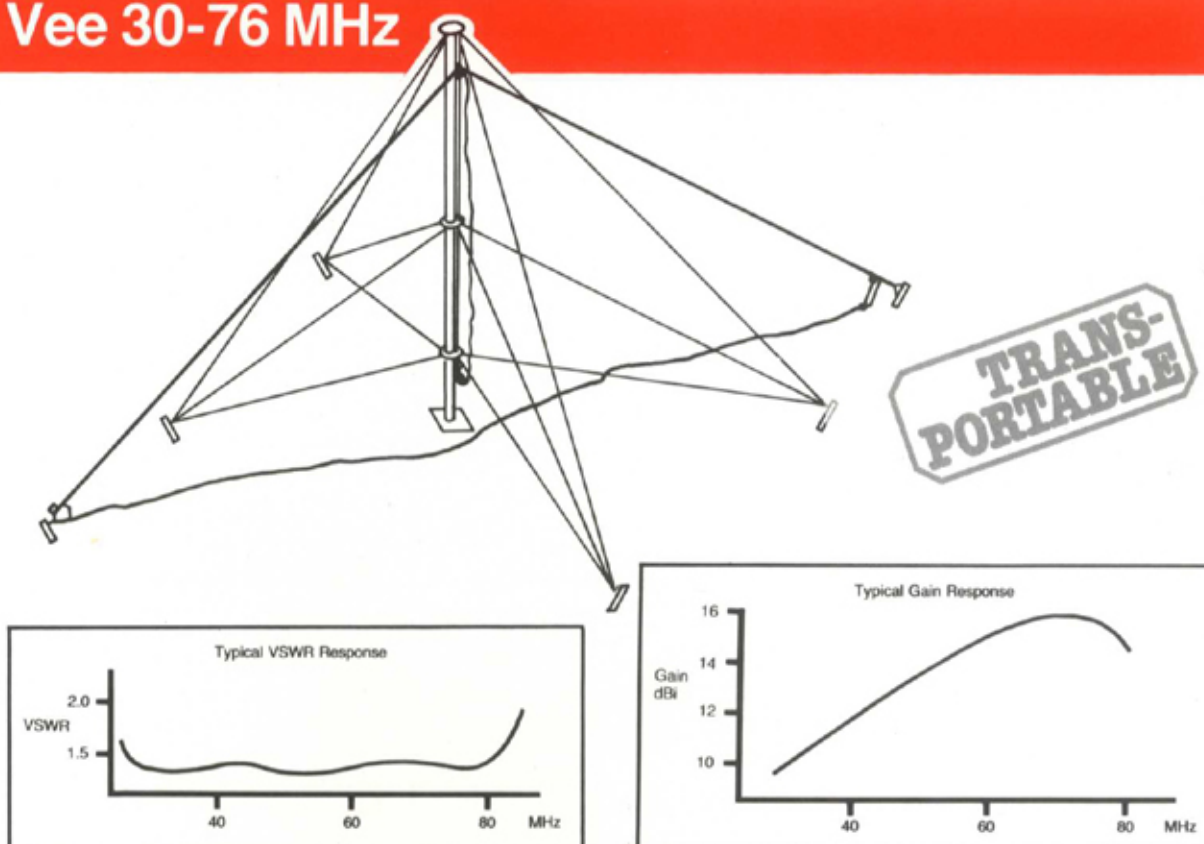


MA 743 VHF Inverted Vee 30-76 MHz

- Frequency Range: 30-76 MHz
- Power: 50W PEP
- VSWR: 1.5:1
- Gain: 9 dBi at 30 MHz
15.5 dBi at 76 MHz
- Impedance: 50 ohms
- Wind loading: 160 km/h, 100 mph (no ice)
- Beamwidth: At 50 MHz Vertical 35°, Horizontal 30°

The MA743 is a lightweight tactical half rhombic vertically polarized antenna for use where a point-to-point wideband link is to be established. The antenna utilizes a 10 section 11 metre glass fibre mast, terylene guys and braid antenna elements. It can be erected by 3 men in 10 minutes.

Deployed dimensions are 61m x 12m. The antenna kit complete weighs 15.5 kg and is supplied in a PVC covered nylon holdall 1020 x 250 x 300mm and the mast sections in a carrying case 1200 x 140 x 170mm.



TACTICAL ANTENNAS

RA 953 VHF Inverted Vee 20-30 MHz

- Frequency Range: 20-30 MHz
- Power: 1 kW Av.*
- Gain: 8 to 10 dBi
- VSWR: 2.5:1 maximum
- Polarization: Predominantly vertical
- E-Plane beamwidth: 14°
- H-Plane beamwidth: 45°
- Windspeed: 162 km/h, (100 mph)

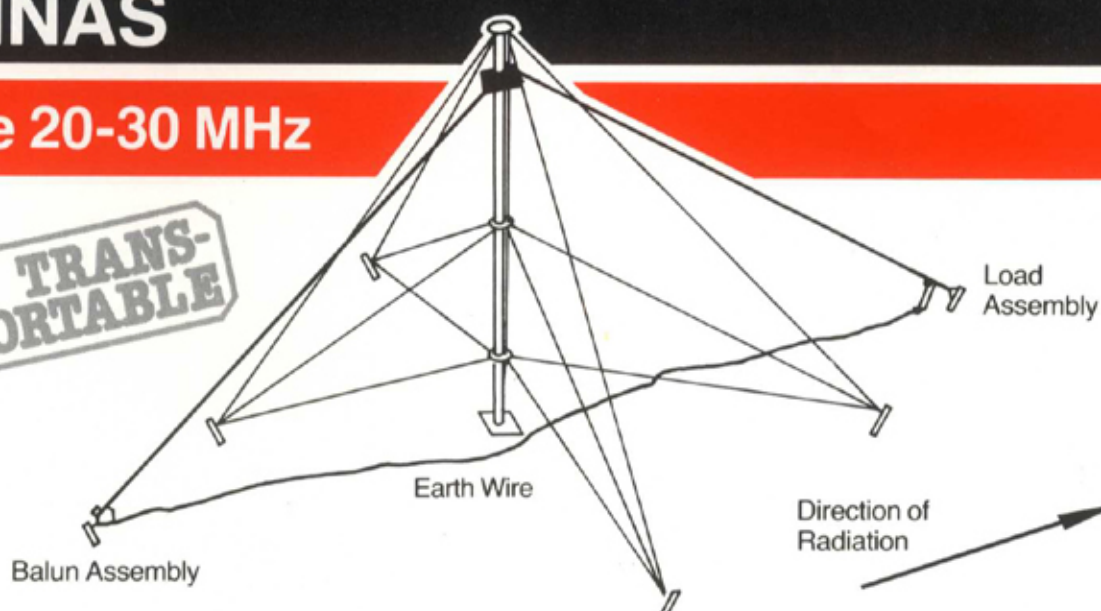
* A receive-only version is also available.

The RA953 is a wideband, directional, travelling wave antenna intended for tactical use with a 9m telescopic mast type MA798.

Polarization in the major direction of radiation is vertical, although there are horizontally polarized side lobes, and the main beam is slightly elevated.

The antenna consists of an inverted vee radiating element, fed at one end by a balun transformer and

TRANS-PORTABLE



terminated at the far end by a resistive load. The radiation from the two legs of the antenna is made to combine in-phase by a phase shifter at the apex of the vee.

Antenna elements are of PVC covered, copper/terylene antenna braid and are supplied on winder frames.

Installation dimensions are:

Length: 50m

Height: 7.5 or 9m

Width: Guying radius of mast

Packed dimensions are: 0.25m x 0.25m x 0.68m

Support mast, if required, must be ordered separately.

MA 745 VHF Wideband Adjustable Yagi

- Frequency Range: 50-100 MHz
- Power: 400W Av.
- VSWR: 2:1
- Gain: 7 dBi
- Impedance: 50 ohms

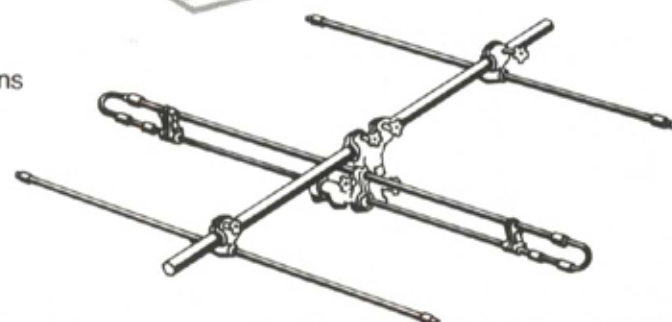
The NATO-codified MA745 adjustable VHF 3-element yagi is a lightweight antenna for point to point working. The elements are slightly asymmetrical to allow an unbalanced input without the need for a balun. E-Plane beamwidth is $\pm 35^\circ$ (3 dB points), H-Plane beamwidth is $\pm 45^\circ$. Element lengths and spacing are adjustable against markers

enabling the centre frequency to be set. The antenna is constructed from aluminium alloy, and mounts on to masts of up to 50mm diameter. An adaptor allows the antenna to be used either vertically or horizontally polarized.

Antenna weight is 5.5 kg and stowed dimensions are 1400 x 200 x 200mm.

(NATO No. 5985-419-2562).

TRANS-PORTABLE



MA 729 VHF Wideband Adjustable Ground Plane

- Frequency Range: 30-76 MHz
- Power: 100W or 400W PEP
- VSWR: 1.3:1
- Gain: 2 dBi
- Impedance: 50 ohms
- Wind loading: 100 km/h

TRANS-PORTABLE

The MA729 is a vertically polarized omnidirectional groundplane antenna with telescopic elements that can be adjusted to the correct length for the operating frequency. The antenna is therefore always operating at optimum performance and can be adjusted easily when frequencies are changed.

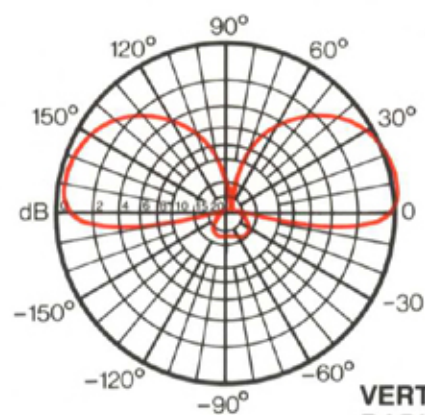
The telescopic elements are engraved with frequency in MHz and are firmly clamped by knurled sleeves which operate 4-joint chucks.

Elements are made from black chromium plated stainless steel while the central casting is black anodised aluminium. All elements are easily field replaceable.

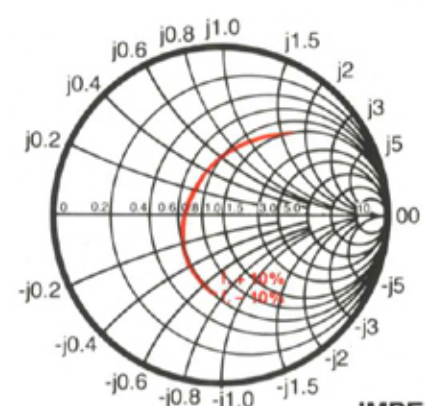
The antenna can be supplied with an 8.6mm spigot to fit the MA638 27 foot telescopic mast or with a 24mm spigot to fit the MA716 series of telescopic masts.

Weight is 5 kg and stowed dimensions are 980 x 140 x 140mm.

Part Number	Power	Connector	Spigot Diameter
MA729-901	400W	C	8.6mm
MA729-902	400W	C	24mm
MA729-903	100W	BNC	8.6mm
MA729-904	100W	BNC	24mm



VERTICAL RADIATION PATTERN



IMPEDANCE PLOT

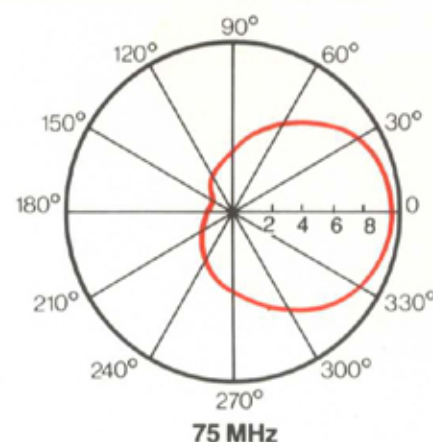
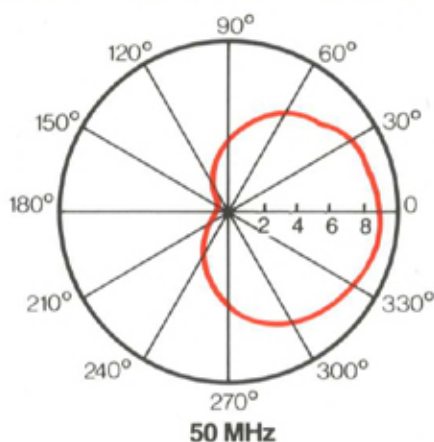
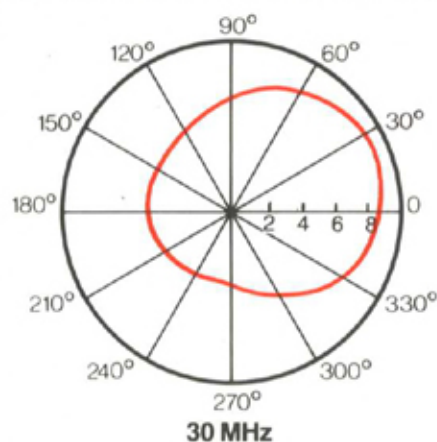
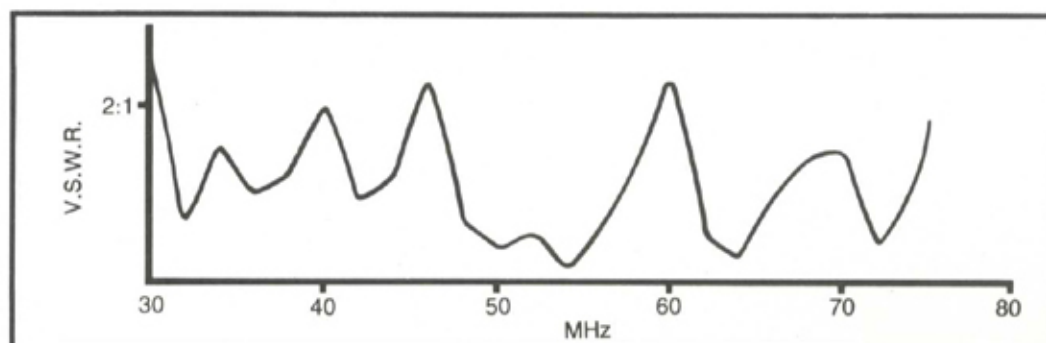
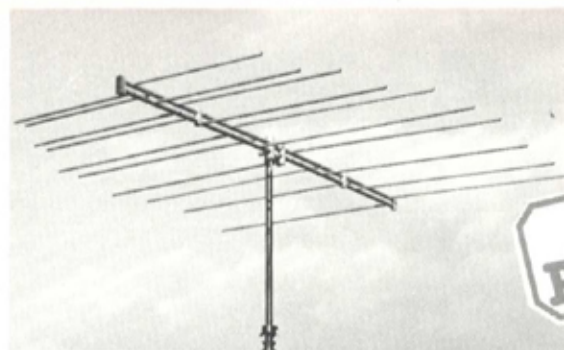
TACTICAL ANTENNAS

MA 751 VHF Log Periodic 30-76 MHz

● Frequency Range:	30-76 MHz
● Power:	400W PEP
● VSWR:	2.6:1 maximum
● Gain:	7 dBi
● Impedance:	50 ohms
● Wind loading:	162 km/h, 100 mph (no ice)

The MA751 transportable log periodic is an electrically shortened antenna for surveillance, monitoring or point to point communications. Mounting can be either for vertical or horizontal polarization on a ground mounted 9m telescopic mast with a glass fibre top section (MA798 or RA477). E-Plane 3 dB beamwidth is typically 65°-75° with an H-Plane beamwidth of 85°-105°. The double boom and elements are aluminium while insulating material is glassfibre. The finish is olive drab. Elements positively lock into the boom sections with stainless steel toggles and the antenna can be assembled by one man in less than 5 minutes.

Weight is 10.5 kg, length 3.2 metres. Maximum width 3.03m, the whole breaking down to 1.55 metres and supplied in a PVC coated nylon carrying bag.



HORIZONTAL RADIATION PATTERN

RA 943 VHF Log Periodic 28-100 MHz

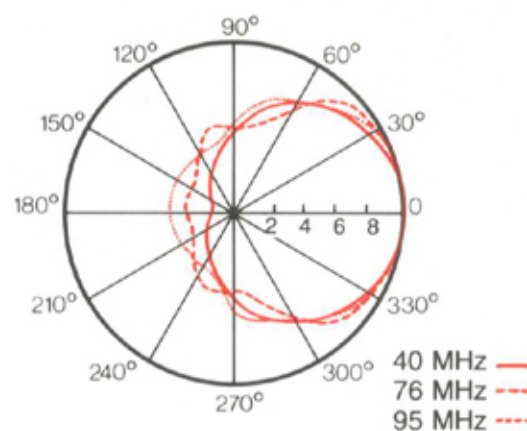
● Frequency Range:	28-100 MHz
● Power:	1 kW PEP
● VSWR:	Better than 2:1 over 30-100 MHz Better than 3:1 over 28-30 MHz
● Gain:	7.5 dBi
● Impedance:	50 ohms
● Polarization:	Vertical or horizontal
● Wind loading:	162 km/h, (100 mph)

The RA943 tactical log periodic is designed for optimum performance in the 28-100 MHz frequency band and is capable of handling 1 kW average. The RA943 is suitable for point to point communications or for use in the surveillance, ECM and ECCM role. The antenna can be used for receive purposes down to 20 MHz with degraded VSWR. E-Plane

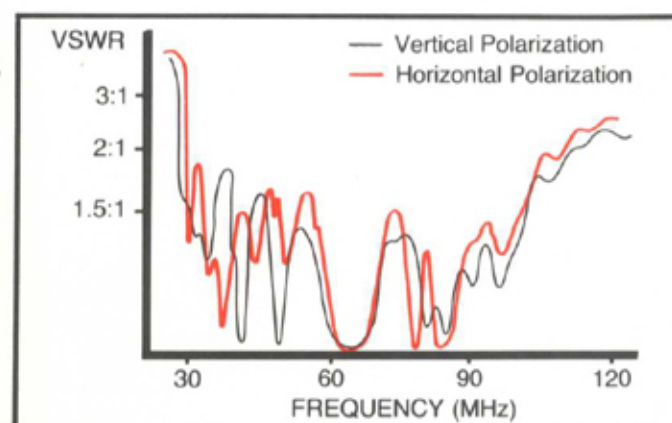
beamwidth at 3 dB points is 70° to 80° while the H-Plane beamwidth is approximately 100° to 120°.

The boom and elements are constructed from corrosion resistant aluminium with stainless steel fittings and glassfibre insulators. The elements and boom are engraved and easily identifiable to facilitate rapid erection and dismantling.

The antenna is supplied in two strong carrying bags containing the three boom sections, radiating elements and the dual polarity mounting adaptor. Antenna weight is 19.5 kg and the total length is 4.12m with the longest element measuring 1.91m. The RA943 has a 40mm diameter mounting spigot and interfaces directly with the Racal 6.8 metre pneumatic mast type RA459 which has a fibreglass top section to minimize pattern distortion when antenna is used in vertically polarized mode.



HORIZONTAL RADIATION PATTERN

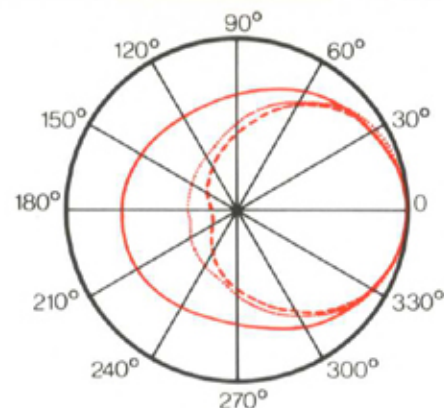
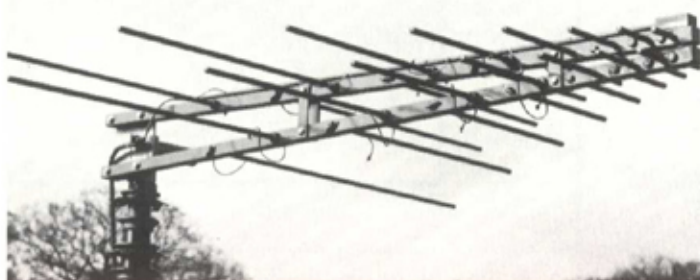
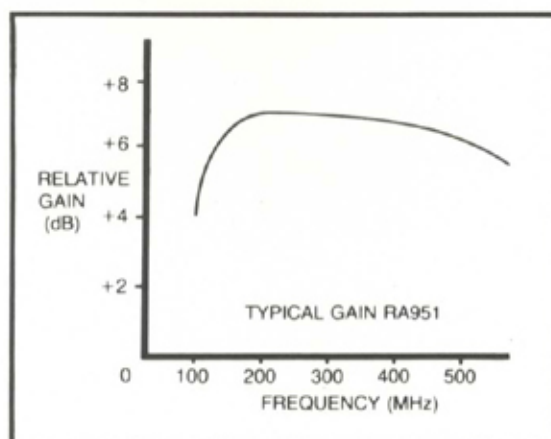


TACTICAL ANTENNAS

RA 951 VHF/UHF Log Periodic 100-500 MHz

- Frequency Range: 100-500 MHz transmit
100-1000 MHz receive
- Power: 400W PEP
- VSWR: 2.5:1 maximum
- Gain: 7 dBi
- Impedance: 50 ohms
- Wind loading: 162 km/h, 100 mph (no ice)

The RA951 can be used in the vertical or horizontal mode and is a companion to the RA943 but of smaller proportions. It covers the 100 to 500 MHz frequency range and is usable, for receive purposes, up to 1000 MHz. H-Plane beamwidth is 100° to 120° with the E-Plane beamwidth being typically 70° to 100° at the half-power points. The antenna uses a single piece boom and each removable element has a swivel-toggle coupling for secure attachment. The elements are retained by a terylene cord to prevent loss when antenna is dismantled. Input connector is 'N' type. Weight is 8 kg and boom length is 1.25m with the longest single element length being 740mm. The antenna is supplied in a strong carrying case. A 40mm diameter spigot permits mounting to the Racal MA798 or RA477 9 metre telescopic masts either vertical or horizontal polarization modes.



VERTICAL RADIATION PATTERN

— 100 MHz
- - - 300 MHz
... 500 MHz

TRANS-PORTABLE

RA 977 UHF Log Periodic 225-400 MHz

- Frequency Range: 225-400 MHz
- Power: 100W continuous
- Gain: 7 dBi maximum
- VSWR: 2:1
- Impedance: 50 ohms
- Wind loading: 162 km/h, 100 mph (no ice)

The RA977 is a reduced range version of the RA951 antenna and is designed for point to point communication links in the 225-400 MHz frequency band.

The lightweight, 4.5 kg approx, and the small

packed dimensions make this antenna suitable for tactical and transportable applications while the wide bandwidth permits its use with modern UHF frequency hopping radios.

E-Plane beamwidth at the 3 dB points is 60-70° while the H-Plane beamwidth is 80-90°.

The elements are secured to the boom by a threaded spigot and are held captive by wire cords to avoid loss when dismantled. The antenna is supplied in a strong carrying bag and will mount to the Racal series of telescopic masts.

TRANS-PORTABLE

Dimensions	
Boom length:	0.93m approx
Max. width:	0.88m approx

HC 30-76 VHF Helicone 30-76 MHz

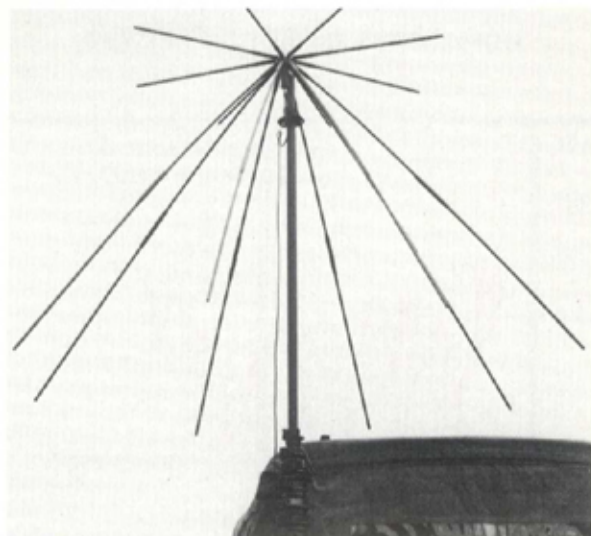
- Frequency Range: 30-76 MHz
- Power: 50W Av.
- VSWR: 2.5:1 typical
- Gain: 1.5 dBi
- Impedance: 50 ohms
- Temperature: -40°C to +65°C
- Weight: 4.5 kg

The HC helicone antennas have several advantages over conventional discons in that they are lighter, smaller and virtually unbreakable. Elements are copper plated steel helical springs mounted on a glassfibre former and moulded into a

nylon base. The springs are covered with a neoprene or nylon sheath. The elements unscrew from the boss but are retained by a wire, so that they can fold parallel to the mounting spigot. The lower elements are either full size or in two sections to reduce packing length. The U bolt mounting will fit masts from 25-45mm diameter.

An adaptor is available for mounting the antenna on the MA716 telescopic mast and the MA1382 glassfibre mast. Antennas have BNC or type 'N' connectors and are finished olive drab and black.

Other frequency bands are available on request.



TRANS-PORTABLE

RA 990 VHF Wideband Whip 30-88 MHz

- Frequency Range: 30-88 MHz
- Power Handling: 100W (200W available)
- VSWR: 3.5:1
- Typical Gain: RA990-910 -3dB to +6dB compared to tuned quarterwave whip in same configuration over the frequency band:
RA990-911 -3dB to +6dB
RA990-905 -1dB to +1dB
RA990-900 0dB

The RA990 series of VHF wideband high efficiency whips are specially designed for high efficiency VHF links with poor ground plane using frequency hopping and for wideband jamming and surveillance purposes.

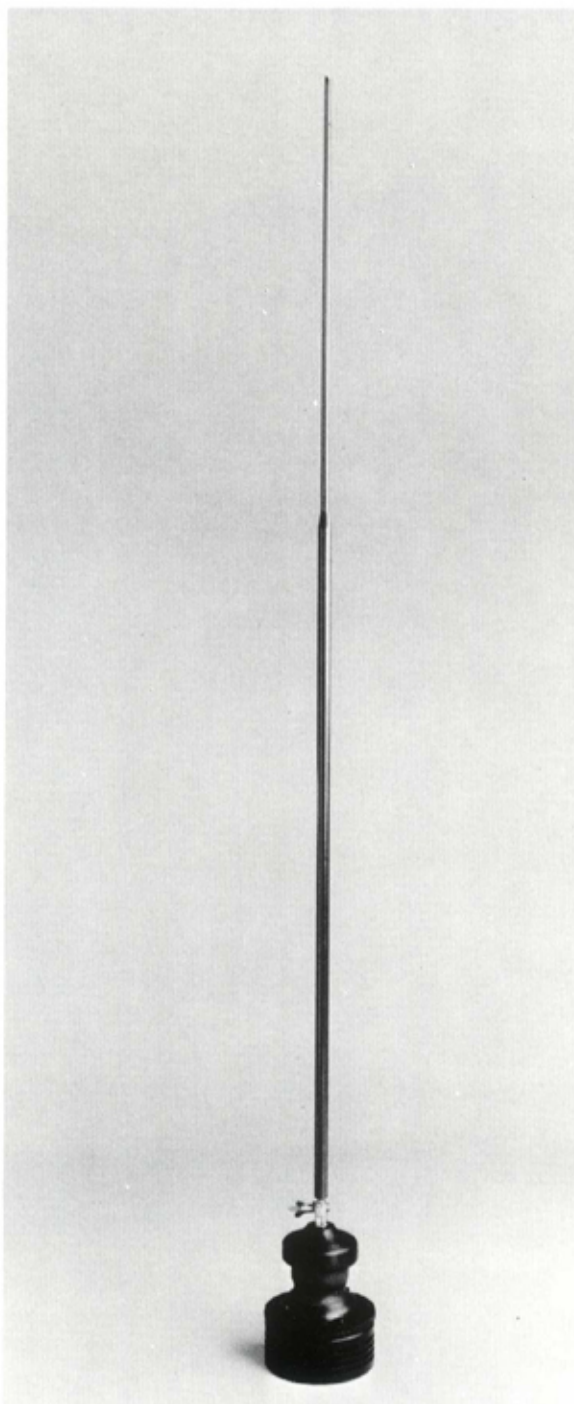
The basic antenna is 2.6m long and suitable for mobile use on support vehicles (RA990-911), for elevated use (RA990-905) and in a ground spike mounted role (RA990-900).

Its design, using reactance elements along its length, gives excellent performance when operating on poor ground planes.

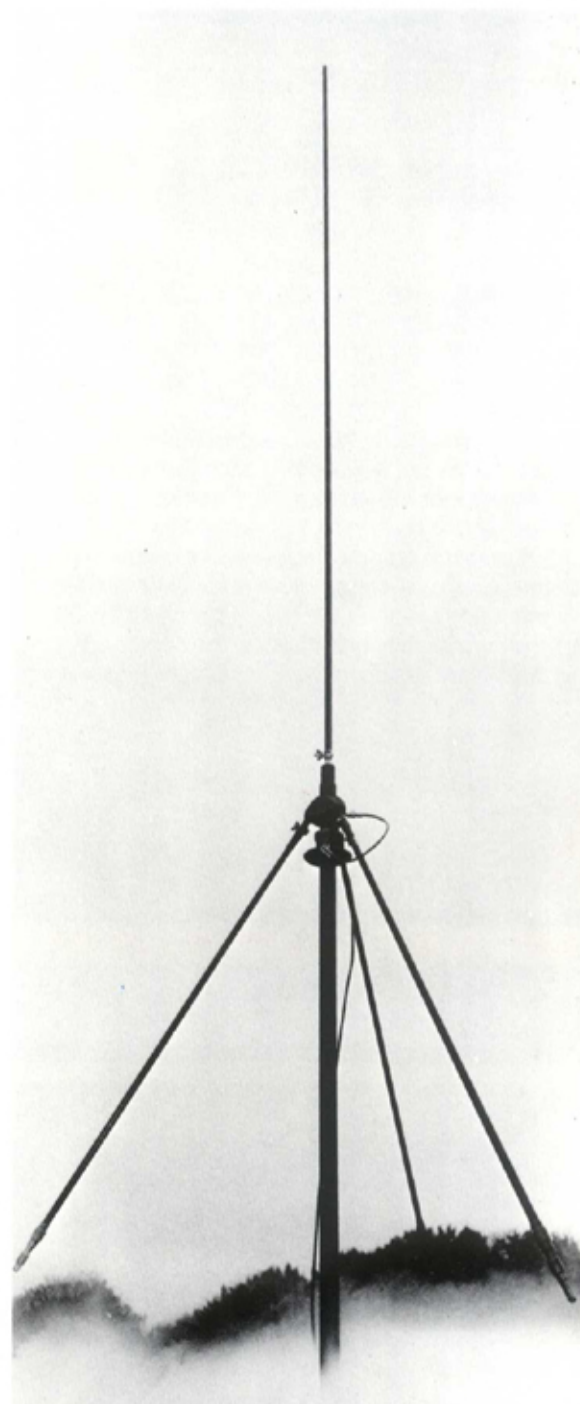
Each of the three versions is supplied with accessories and fittings appropriate to its role. These include a vehicle mounting base, telescopic ground plane elements and ground spike with radial wire ground-plane elements.

The RA990-910 mobile antenna, as illustrated, uses the standard Antenna Base 31.

An alternative mobile version, the RA990-911 is also manufactured. This uses the well-proven Racal Antenna Base MA728 which incorporates a robust spring mount.



RA990-910



RA990-905

RA 991 VHF Low Profile Whip 30-88 MHz

- Frequency Range: 30-88 MHz
- Power Handling: 100W
- VSWR: 3:1
- Typical Gain: Varies from -4dB to +2dB compared to tuned quarter-wave whip over the frequency band

The RA991 VHF wideband, medium efficiency, low profile whip is only 1.85m long and is designed for use on tracked and armoured vehicles with frequency hopping radios.

It is constructed using the well proven MA728 antenna

base and two whip elements of copper plated molybdenum steel tube.

A wideband matching network is contained in the base unit and no external tuning units are required.

RA 752 VHF Log Periodic 30-88 MHz

- Frequency Range: 30-88 MHz
- Power: 400W PEP
- VSWR: 2.5:1 typical
- Typical Gain: 7 dBi max, 4 dBi min.
- Impedance: 50 ohms
- Input Connector: Type 'N'

Essentially similar to the highly successful MA751 VHF Log Periodic, which covers 30-76 MHz, the RA752 provides an additional pair of driven elements and covers the extended frequency range of 30-88 MHz. This makes the RA752 ideal for frequency

hopping, surveillance, EW and point-to-point tactical communication applications whilst providing easy transportability and rapid assembly.

Mounting can be either for vertical or horizontal polarization on a ground or vehicle mounted 9m telescopic mast incorporating a glass fibre top section (to prevent pattern distortion in the vertically polarized mode). Recommended masts are the Racal MA798 or RA477.

The double boom and elements are of aluminium whilst insulating materials are glass fibre. The finish is

olive drab. Elements positively lock into the boom with stainless steel toggles and, for transportation, a PVC coated nylon carrying bag is provided.

WEIGHTS AND DIMENSIONS

Width:	3.1m max.
Boom length:	3.3m
Stowed length:	1.7m
Weight:	12.7 kg (excluding carrying case)

RA 1601 Tactical Satellite Communications

- Frequency Range: 7.25 to 8.4 GHz
- Fully transportable
- Erection in less than 5 minutes
- Fully adjustable in both planes
- Typical Gain: 41 dBi Rx, 41.5 dBi Tx
- High power handling up to 1 kW CW
- Adjustable legs for stability on rough or sloping ground

The RA1601 1.9m diameter Tactical SATCOM antenna is designed for use in transportable satellite ground station applications, over the full military frequency band 7.25 to 8.4 GHz, where it is essential that the station be operational within a few minutes of arrival on site. The antenna breaks down into 1-man loads for easy portability and assembly. In most conditions, including darkness, it can be assembled, on site, by one man in typically less than five minutes and, due to the advanced design of the quadrupod support structure, will sit firmly on uneven ground having slopes of up to 15° in any direction. On even ground, completely unballasted, the antenna system will operate at windspeeds of up to 20m/sec and will survive winds in excess of 30m/sec when ballasted. The antenna is adjustable in elevation and azimuth, with fine and coarse control in both planes. The stowed antenna can be loaded easily into a Land Rover or car.



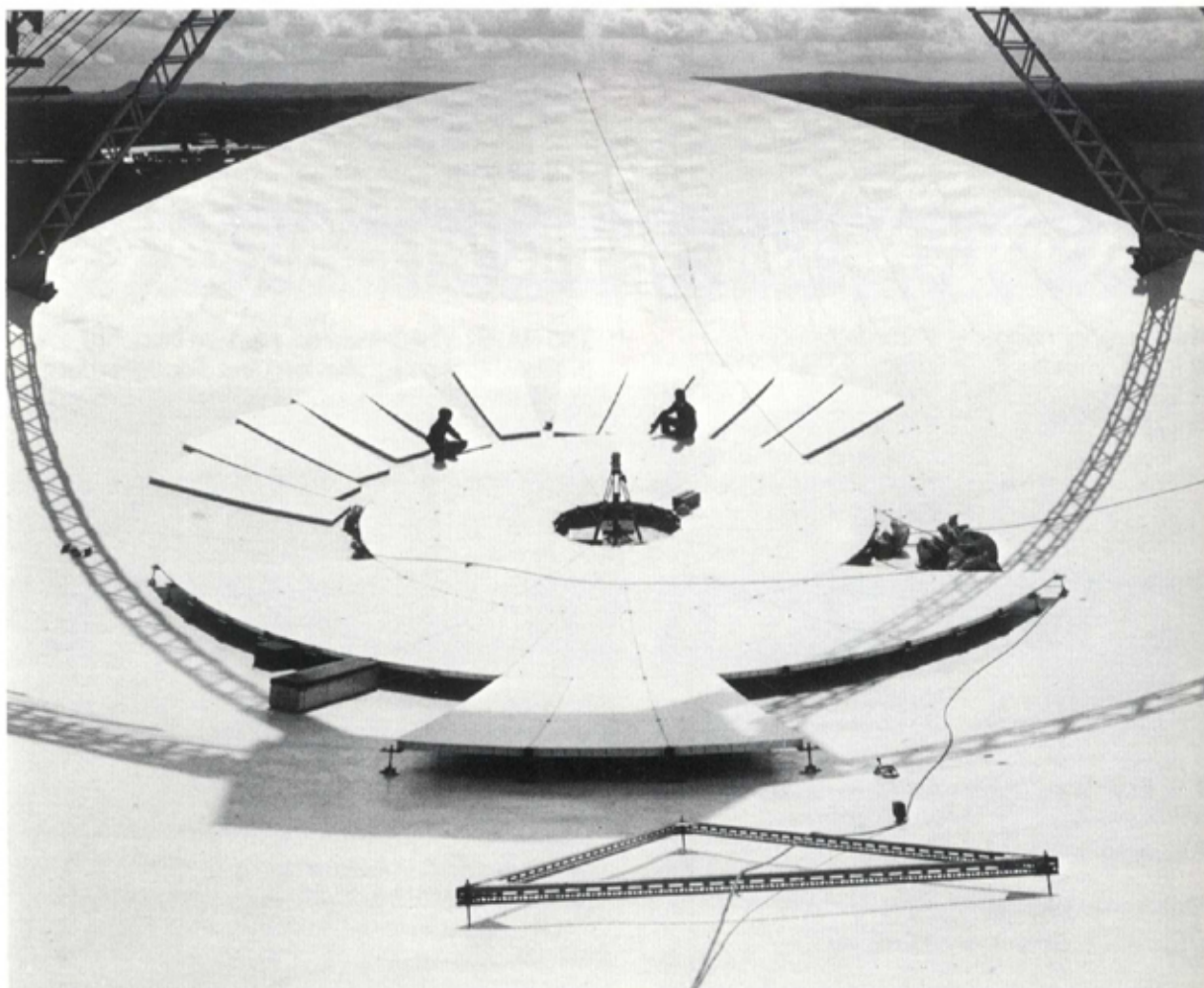
Antenna Reflector Panels

Aluminium antenna reflector panels can be manufactured to customer requirements for radio telescopes, and satellite, line-of-sight, or tropospheric scatter applications.

The panels are fabricated from aluminium alloy, Z-section stiffened, to form a framework which supports an aluminium alloy sheet surface, the accuracy of which can be better than 0.5mm RMS.

The maximum panel size available is 3.2m x 1.65m and these can be mounted on a backing structure to form antennas which are greater than 2m diameter.

The panels have been used to resurface the Jodrell Bank MK II radio telescope in Manchester, England, which has an elliptical surface measuring 43m x 25m.



Nuffield Radio Telescope MK II at Jodrell Bank.

Radio Relay Antennas

The RRA series of Radio Relay Antennas covers Bands 1, 2 and 3 and are specially designed for the military tactical role.

Bands 2 (610-960 MHz) and 3 (1350-1850 MHz) are covered by a unique high-efficiency paraboloid antenna designed for low discernable profile and high jamming and intercept protection.

Two versions are available; a high gain medium profile antenna and a medium gain low profile antenna.

The antenna comprises a grid reflector and two interchangeable feed units, one for each band which can be supplied individually or together.

Vertical or horizontal polarization can be selected in the field by a simple adjustment.

The antenna is characterised by very low sidelobes due to the offset principle used with excellent front to back ratio.

The Band 1 (225-400 MHz) antenna is a ruggedized corner reflector which can be folded up for stowage and is lightweight and low profile.

RRA 1020	Band 1 Antenna
RRA 2020	Band 2 Antenna
RRA 2030	Band 2 Antenna, low profile
RRA 3020	Band 3 Antenna
RRA 3030	Band 3 Antenna, low profile



Wideband Microwave RF Unit 23 GHz

● Frequency Range:	21.2 to 23.6 GHz
● Frequency:	Tuneable to specific customer choice
● Frequency stability:	300 ppm (-30°C to $+50^{\circ}\text{C}$)
● Modulation:	AM
● Channelization:	50 MHz
● Power output	
TX Unit:	20mW typical
● Signal/Noise ratio	
Rx Unit:	16 dB typical for 10^{-9} BER
● Noise figure	
Rx Unit:	8 dB typical for 10^{-9} BER
● Bandwidth:	Adequate to supply a 2M bit data channel or a TV Video channel

These lightweight, all weather 23 GHz RF units are designed to be incorporated into data and video transmission systems for short-haul operation and consist of separate transmitter and receiver units.

The interfaces with customer-supplied units are a video or data cable and power supply cable.

The units are fully weather-resistant and are fitted with a gimbal bracket to allow easy mounting upon a variety of simple structures or buildings.



RA 1486 Tactical Telescopic Mast

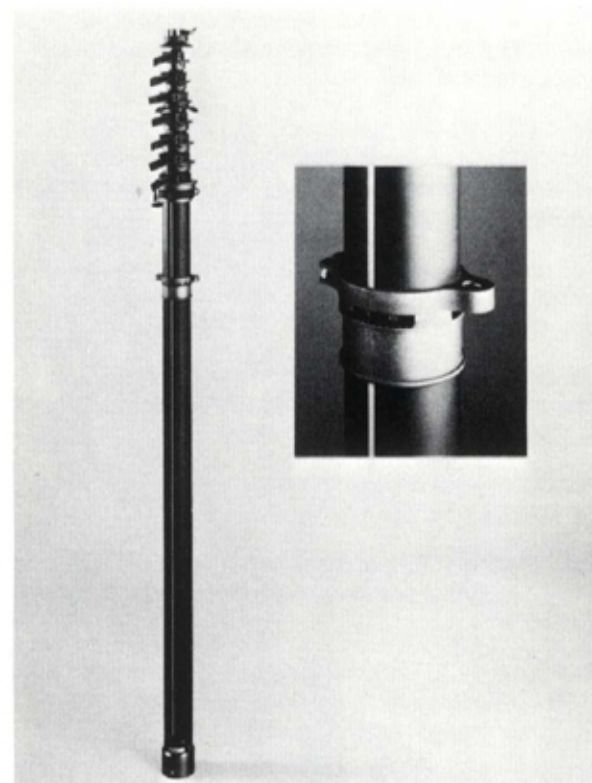
- Extended height: 12m
- Heavy duty locking clamps
- Integral antenna bearing graticule
- Self-locking guy adjusters
- Air-damped retraction

The RA1486 12m eight-section, push-up telescopic mast (Nato No. 5985-99-730-7467) has been adopted into service for the support of Ptarmigan small SHF radio-relay antennas and can support 15 kg headload.

Based on the design of the highly successful Clansman MA716 8m model, the mast is constructed from anodized aluminium telescopic tube sections which are locked by means of the unique Racal single-lever clamping assembly. A yellow indicator line on each section aids antenna alignment in darkness and an integral bearing graticule is provided. Feeder cable guides are incorporated in each section and, for easy erection, self-locking guy adjusters are supplied as standard. Mast weight is 13 kg approximately.

Retraction is air-damped, affording maximum protection to both headload and operator. Retracted length is 2m. For applications where pneumatic extension is required, an adapted model, RA486, powered by electric compressor or foot-pump can be supplied.

A comprehensive accessory kit is supplied (weight 21 kg approximately); this contains all items required for ground mounting.



Special Purpose Telescopic Masts

- Large headload
- Low deflection
- Low retracted height
- Pneumatic operation
- (Typical product has an elevated height of 3.5m and a collapsed height of 1.2m)

These heavy duty masts are developed from the successful Intermediate Duty range and are for use in situations where a heavy load is to be elevated by only a few metres.

By using the same tube diameters as the Intermediate Duty (ID) mast range and varying the length and number of sections, very stiff masts can be produced. These will elevate a headload of approximately 100 kg. The maximum permitted height depends on both weight and wind surface area of the load.

Typical applications are elevated optical sights, laser guidance systems, radar controlled target acquisition systems, electronic sign panels, loudspeakers, TV cameras, etc.

A custom-build service is offered for specific customer requirements.



Further information on these new products can be provided on request.

Racal reserve the right to vary in detail from the description and specification in this publication.

RACAL

Racal Antennas Limited

First Avenue, Millbrook Trading Estate, Southampton SO1 0LJ
Telephone: 0703 785241 Telex: 47476

TACTICAL ANTENNAS

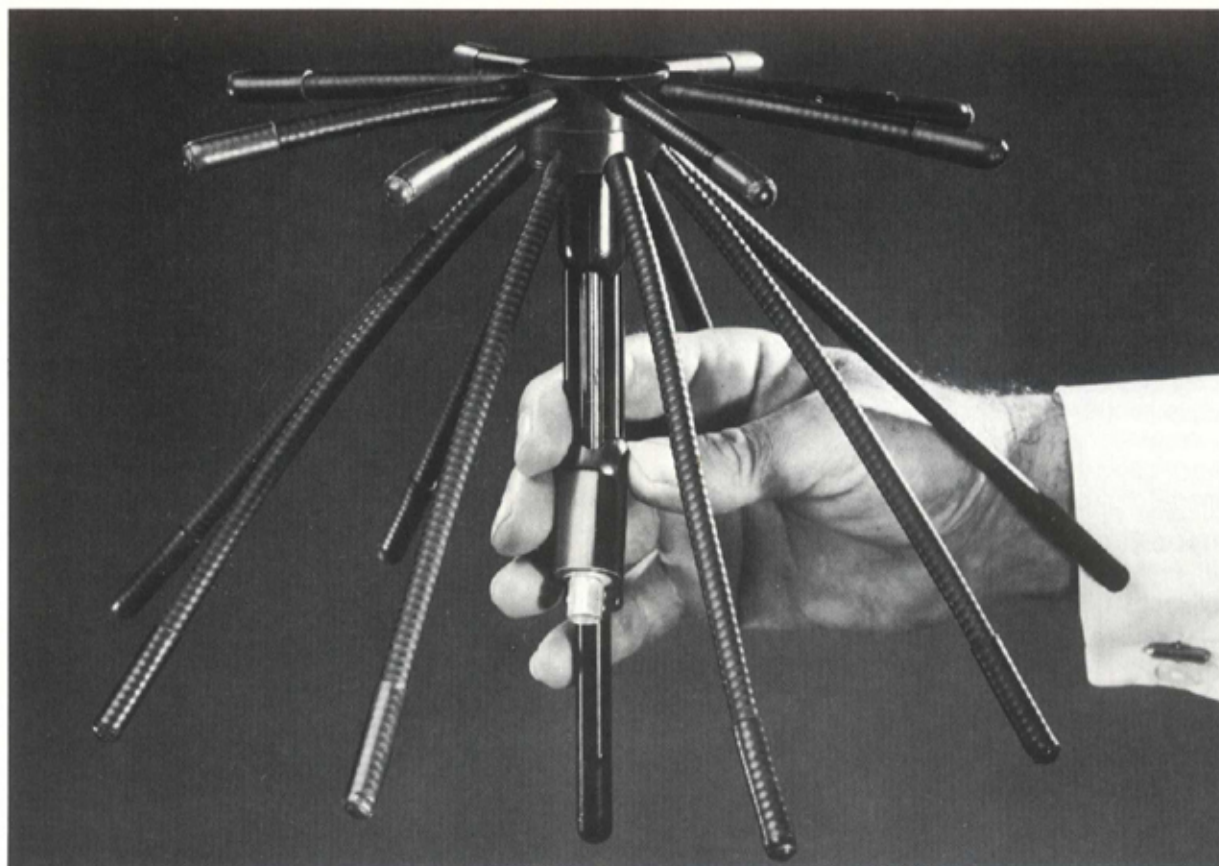
HC 225-475 UHF Helicone 225-400 MHz

- Frequency Range: 225-475 MHz
- Power: 50W Av.
- VSWR: 3.5:1 maximum
- Gain: 1.5 dBi
- Impedance: 50 ohms
- Temperature: -40°C to +65°C

Lightweight and small in size, the HC225-475 helicone is comprised of neoprene-covered, helically wound antenna elements which are extremely strong and flexible. The elements are moulded into a nylon boss which is similarly moulded on to the 9.6mm diameter mounting spigot. An integral BNC connector completes the assembly and assures complete weatherproofing.

HC helicones of other frequency bands within the UHF range can be supplied if required.

TRANS-PORTABLE



RA 975/976 VHF Biconicals

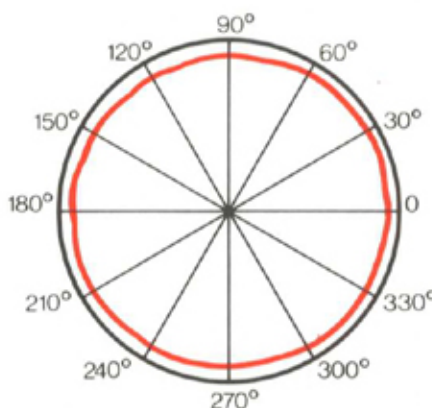
- Frequency Range: 20-90 MHz (RA975)
30-90 MHz (RA976)
- Power: 100W PEP with RG58
500W PEP with R213
2 kW PEP with Suhner
K07252
- Gain: +1.2 to -1.6 dBi
- VSWR: Better than 3:1
- Wind loading: 108 km/h
- Weight approx: 9.4 kg with case and cable

The RA975 and RA976 are broadband, biconical antennas providing vertical or horizontal polarization. When vertically polarized, the antennas give an omnidirectional azimuth pattern while, in the horizontally polarized mode there is a difference of at least 30 dB between maximum and minimum radiation. The deep nulls can be used to reduce the effect of unwanted signals.

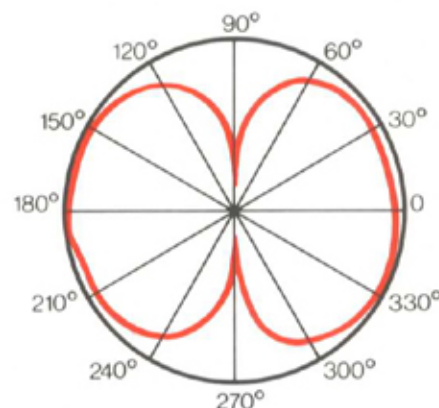
The antennas consist of two cones attached to a centre-junction assembly. Each cone comprises

eight elements; two-section elements are used in the case of the 30-90 MHz model, three-section elements for the 20-90 MHz model.

Antenna elements are made of hardened chrome molybdenum steel tube, zinc plated and chromated in olive green.

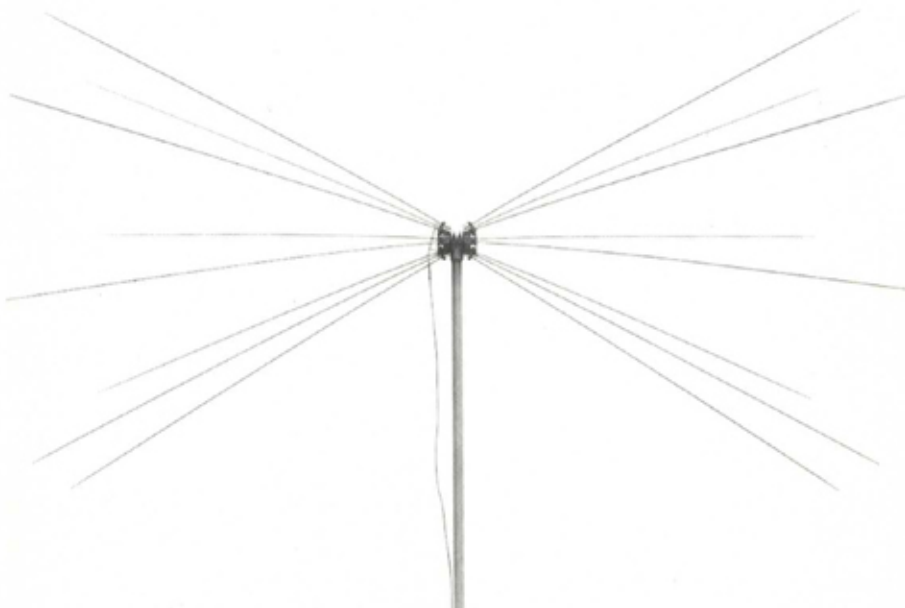
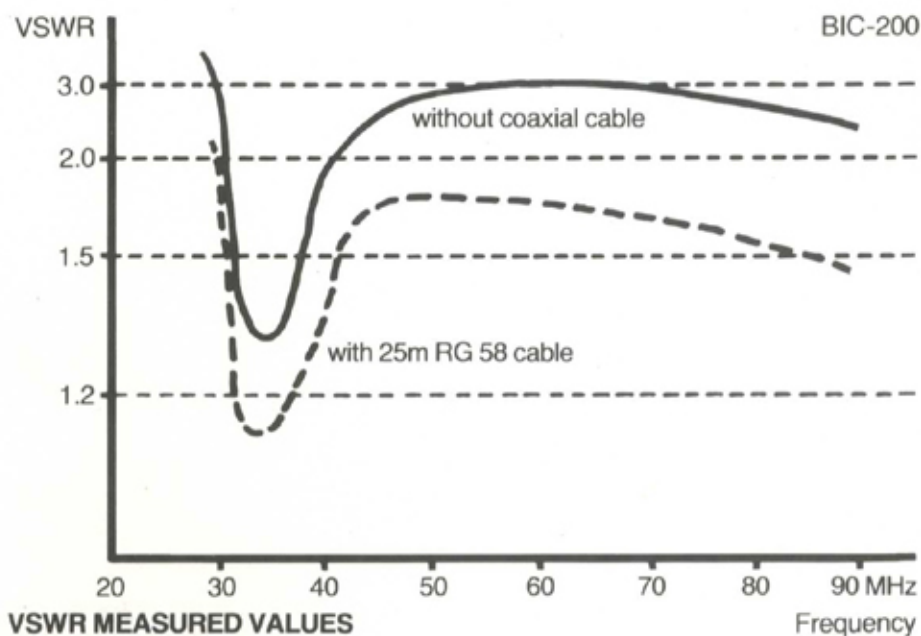


Vertically polarized antenna



Horizontally polarized antenna

HORIZONTAL RADIATION PATTERNS



TACTICAL ANTENNAS

Tactical Broadband VHF/UHF Discones

● Frequency Range:	30-90 MHz (RA959) 90-400 MHz (RA966) 200-600 MHz (RA973) 400-1100 MHz (RA974)
● VSWR:	Better than 3:1
● Power:	Up to 1 kW depending on cable
● Gain:	-2.35 to +5.15 dBi
● Polarization:	Vertical
● Wind loading:	108 km/h

This family of broadband, tactical, omnidirectional discones can be used to cover the frequency range 30 to 1100 MHz, either for general communication links or for surveillance purposes and all models pack down into small dimensions for easy transportation.

RA959 – 30-90 MHz

The disc consists of six 1.08m single-section element rods and the cone of eight 2.08m two-section elements. The performance between 30 and 40 MHz can be enhanced by changing the cone configuration to four three-section elements of 3.08m. 25 metres of RG58 cable is supplied in the standard kit. Weight 5.9 kg, including carrying bags.

RA966 – 90-400 MHz

The disc consists of six single-section 370mm rods with eight 1.08m cone rods. 15 metres of RG213 cable is supplied in the standard kit. Weight 5.5 kg including carrying bags.

RA973 – 200-600 MHz

The disc consists of six 200mm elements with eight 525mm cone elements. The standard antenna kit is supplied with 15 metres of RG213 cable and the total weight is 5.1 kg including carrying bags.

RA974 – 400-1100 MHz

This antenna has a solid disc of 240mm diameter with eight 250mm cone elements. The standard antenna kit is supplied with 15 metres of RG213 cable. Total weight is 5.1 kg including carrying bags.

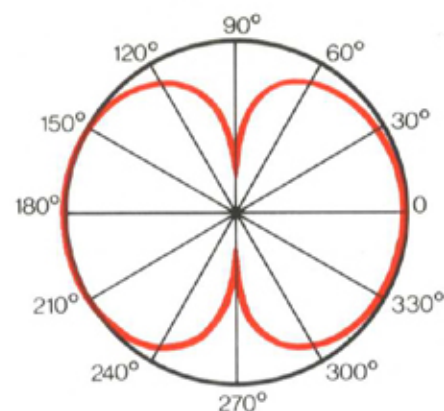
The rod elements are made of hardened chrome molybdenum steel, zinc plated and chromated in olive green colour, and are quickly and easily assembled to the centre junction assembly by means of spring-loaded sockets and/or toggle-operated cam locks.

Power

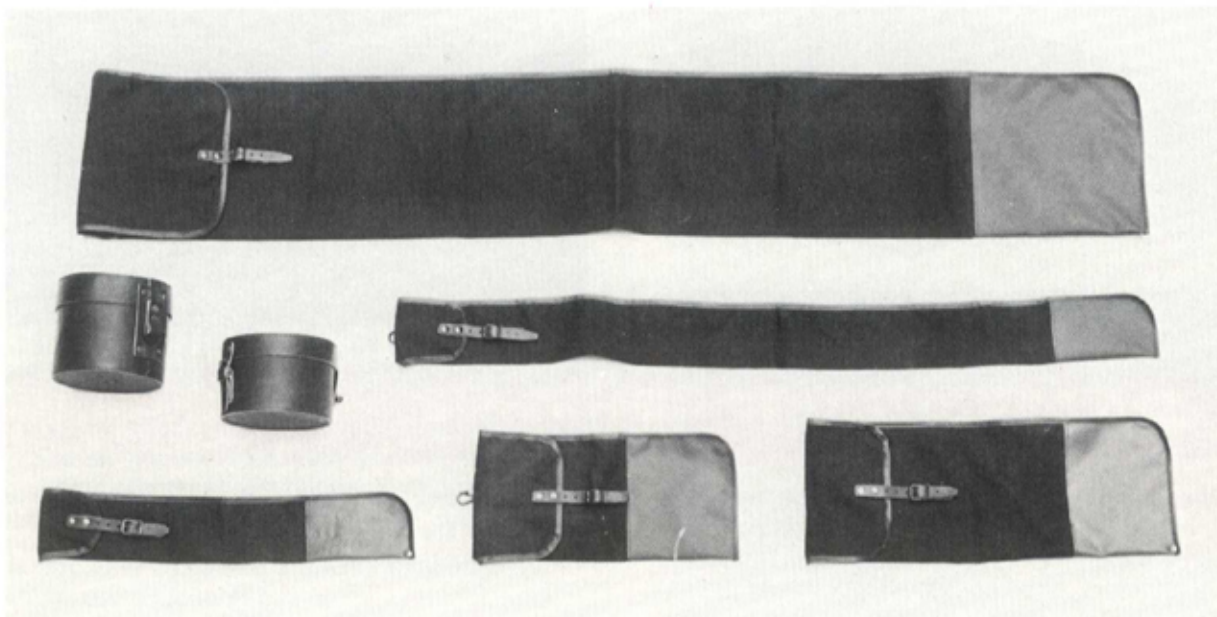
Power handling is determined by type of coaxial cable and connector which may be either BNC or N. Antennas can be supplied with RG58, RG213 or Suhner K07252 coaxial cables. Power requirements should be specified when ordering.

Mounting

The antennas can be mounted on Racal telescopic masts and boom assemblies are available for dual arrays.

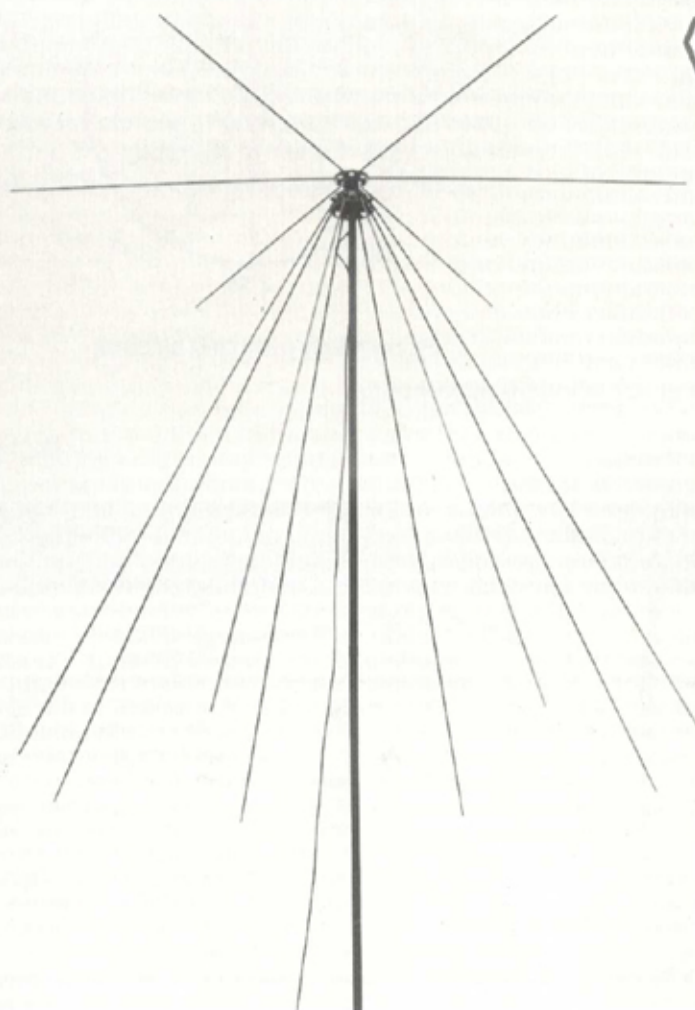


VERTICAL RADIATION PATTERN

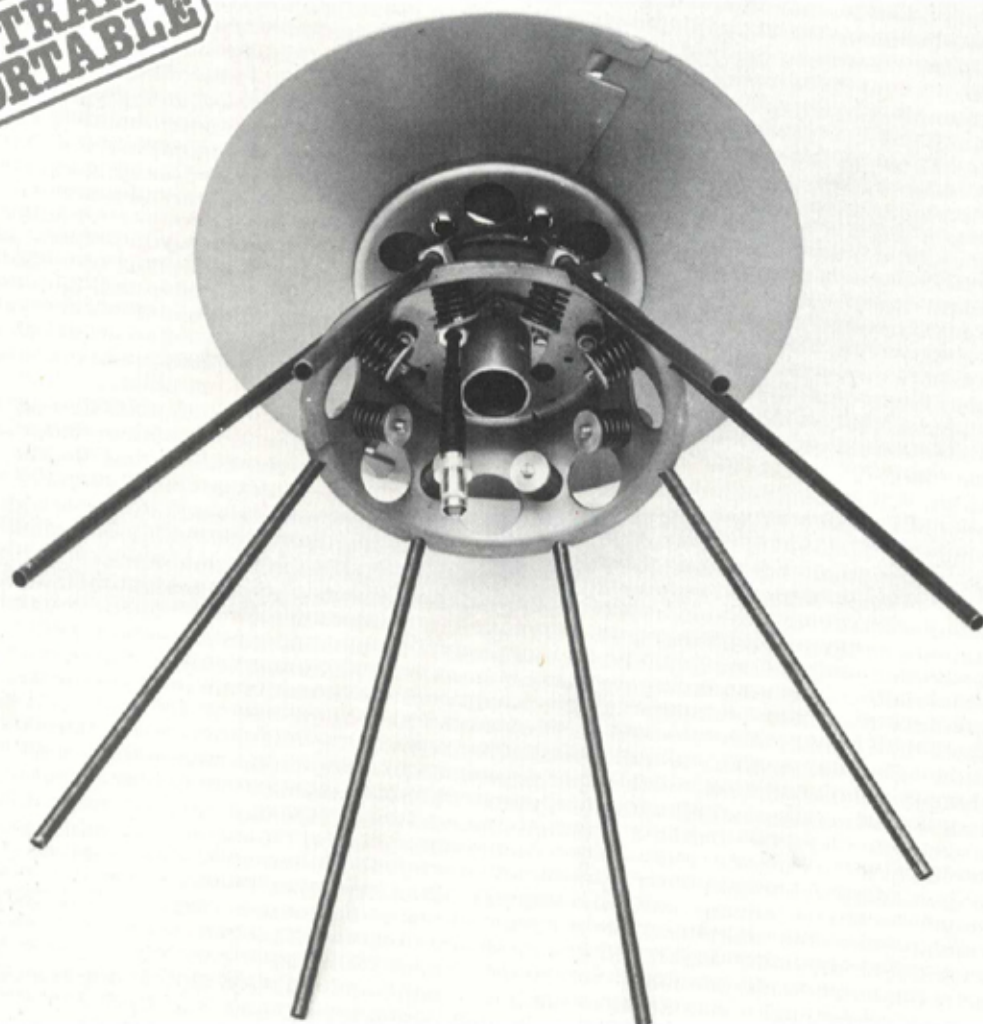


Carrying Bags

TRANSPORTABLE



RA959



RA974

BASE STATION & MOBILE ANTENNAS

DC Series VHF/UHF Discones

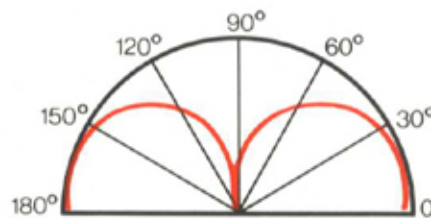
- Frequency Range: 30-1000 MHz
- Power: 1 kW PEP
- VSWR: 2:1 maximum
- Gain: 1.5 dBi
- Impedance: 50 ohms
- Wind loading: 195 km/h, 120 mph (no ice)

The DC series of VHF and UHF discone broadband, omnidirectional antennas are particularly well suited for short range surveillance and ground to air communications.

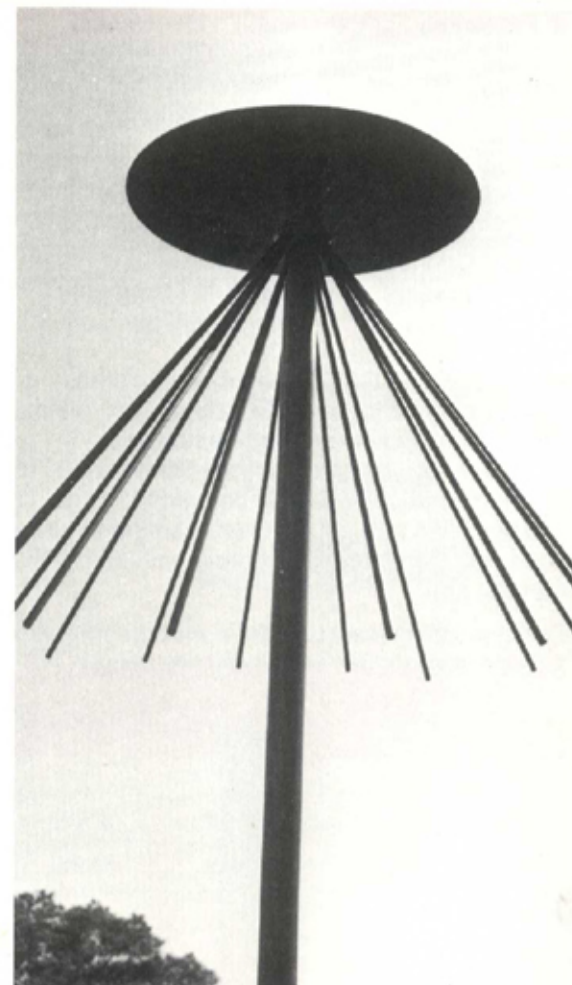
Manufactured throughout of non-corrosive materials, they have no exposed dissimilar metal joints.

Discone antennas are at DC ground potential so precluding the possibility of static charge build up.

Assembly and installation are easily accomplished using only standard hand tools.



VERTICAL RADIATION PATTERN
(at lowest operating frequency)



Specification	Antenna Type					
	DC30	DC80	DC100	DC190	DC2250	DC400
Frequency (MHz)	30-80	80-230	90-250	190-425	225-400	400-1000
Shipping weights	18 kg	6.4 kg	5.9 kg	2.5 kg	2.3 kg	1.8 kg
Shipping volume	0.05m ³	0.014m ³	0.018m ³	0.02m ³	0.017m ³	0.015m ³
Polarization	Vertical					
Radiation pattern	E-Plane 100°, typical H-Plane omnidirectional					
Input	Type 'N' (Socket)					
Mounting	3.5" OD	All 1.66" OD				

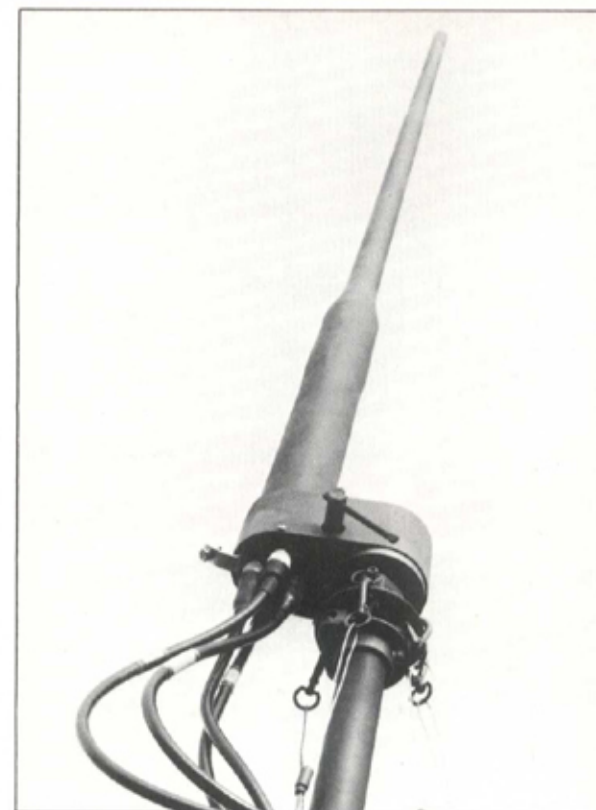
D Series VHF/UHF Multidipols

- Frequency Range: 116-150 MHz (VHF)
118-136 MHz (VHF)
150-174 MHz (VHF)
225-400 MHz (UHF)
400-500 MHz (UHF)
- Power: 50W carrier modulated
95% AM.
- VSWR: 2:1 maximum
- Gain: 1 dBi
- Isolation: 30 dB minimum
(25 dB for D2260)
- Wind loading: 120 km/h with 50mm
radial ice

Multidipole antennas provide a means of co-locating a number of independent, wideband VHF or UHF

dipoles within a single one-piece fibreglass support tube, with isolation between dipoles of more than 30 dB (25 dB in the case of D2260, 3-VHF model). Each of the dipoles operates completely independently and up to 3 VHF (V/V/V) or 4 UHF antennas (U/U/U/U) are accommodated in one structure; other combinations include V/U/V, U/V/U, U/U, V/V etc.

The system minimizes the need for single horizontally displaced antennas with their attendant disadvantages of a high risk of interaction and possible effect on radiation patterns. A typical application is airfield control towers. Multidipols are moulded into a glassfibre tube with 'N' connectors in the base. The mounting clamp is integral with the



antenna base and mates with a 76.2mm mast as illustrated. An in-line clamping arrangement is also available.

● indicates an independently fed dipole, e.g. D2118 has 1 VHF and 2 UHF dipoles housed in a single fibreglass support tube.

All dipole elements operate, without retuning, over the entire VHF (116-150 MHz) or UHF (225-400 MHz) bands with a VSWR of less than 2:1.

MODEL	VHF (116-150 MHz)	VHF (118-136 MHz)	UHF (225-400 MHz and/or 400-500 MHz)	Height (m)
D2118	●		● ●	2.9
D2212	● ●			3.86
D2213	●		●	2.13
D2214			● ●	2.13
D2216	●			1.38
D2217			●	0.76
D2218	● ●		●	4.27
D2219			● ● ●	2.90
D2221			● ● ● ●	4.27
D2260	● ● ●			4.35
D2261A-1		● (4 dB Gain)		1.45
D2262A			● (4 dB Gain)	1.72
D2272		● ●		3.86
D2273		●	●	2.13
D2274			● ●	2.13
D2276		●		1.38
D2277			●	0.82

BASE STATION & MOBILE ANTENNAS

RA 957/971 VHF Monopole

● Frequency Range:	RA957 115-155 MHz RA971 225-400 MHz
● Power:	RA957 1 kW PEP RA971 400W PEP
● Gain:	2 dBi nominal
● VSWR:	2:1
● Polarization:	Vertical
● Input Impedance:	50 ohms
● Input Connector:	'N'
● Wind loading:	198 km/h, (123 mph) 25mm radial ice

The RA957 and RA971 are folded monopole antennas, enclosed in a robust fibreglass radome, supported above an inclined counterpoise comprising three quarter wave radial elements. The antennas operate over the frequency ranges 115-155 MHz and 225-400 MHz and can therefore be used over the whole aeronautical VHF and UHF bands.

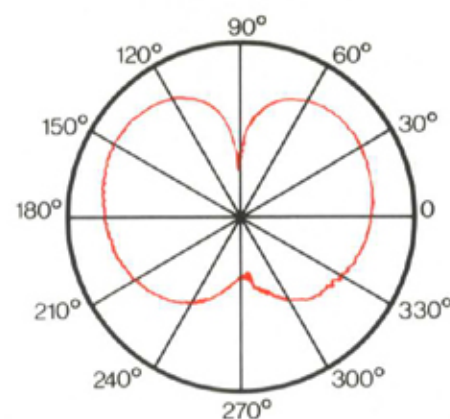
Designed for military use, the antennas have been fully environmentally tested and can operate in

temperatures of -40°C to $+55^{\circ}\text{C}$, in driving rain and snow or when ice covered. Tests, to the appropriate section of DEF-STAN 07-55, included solar radiation, low/high temperature, salt corrosion, dust/sand, driving rain and fungoid growth.

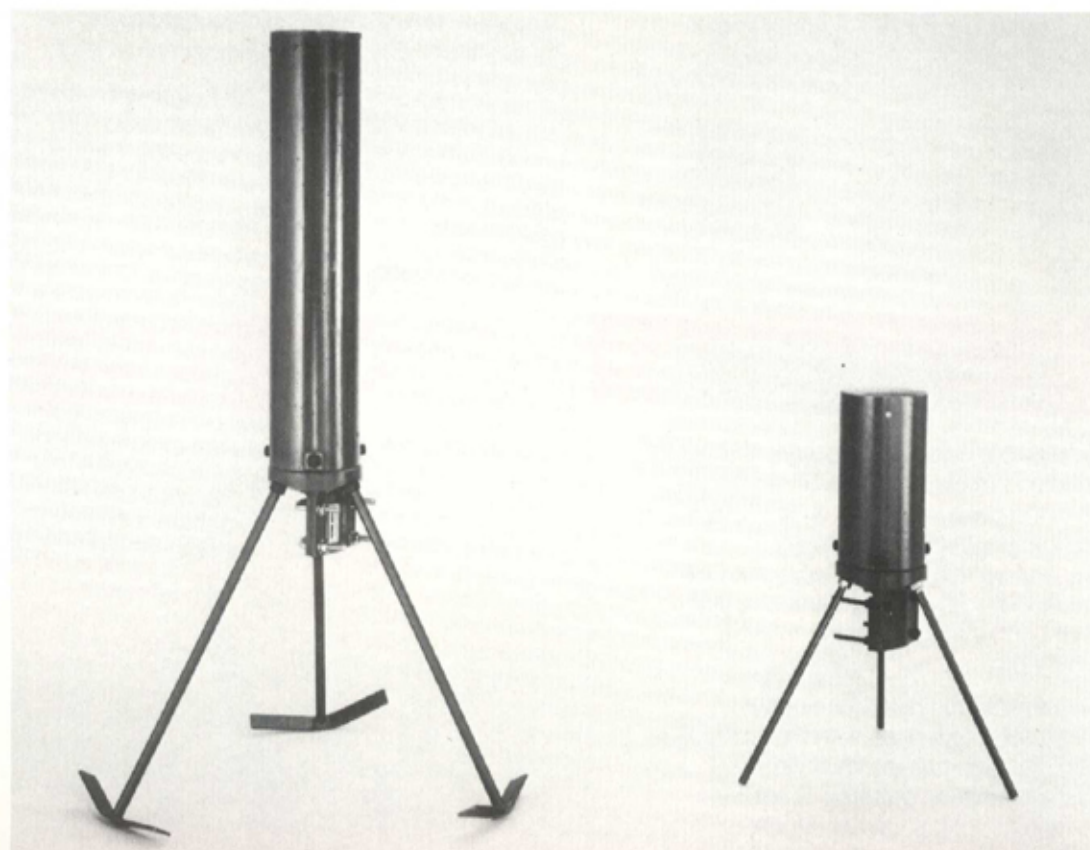
The horizontal radiation pattern is omnidirectional while the vertical pattern is similar to that of a dipole antenna.

A concentric clamp arrangement allows the antennas to be mounted to tubes of between 35-60mm. The design incorporates a DC static discharge path to ground.

Dimensions	RA957 (VHF)	RA971 (UHF)
Overall height	950mm	535mm
Max diameter	500mm	400mm
Weight (approx)	3.5 kg	3.0 kg



VERTICAL RADIATION PATTERN



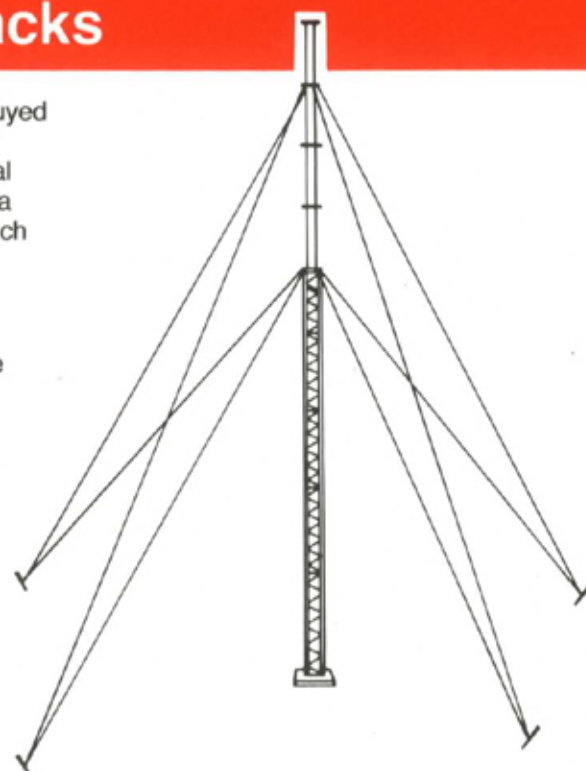
DPV 42/43 VHF/UHF Collinear Dipole Stacks

● Frequency Range:	118-150 MHz DPV 42 225-400 MHz DPV 43
● Power:	50W
● VSWR:	2:1
● Gain:	2 dBi DPV 42 4 dBi DPV 43
● Impedance:	50 ohms
● Wind loading:	160 km/h, 100 mph with 250mm of radial ice

The DPV 42 (VHF) and the DPV 43 (UHF) collinear dipole antennas are designed for line-of-sight ground-to-air communication applications. The units are stackable in all VHF, all UHF or any combination of VHF and UHF units up to a maximum of four antennas. The isolation between any two antennas in a stack (VHF, UHF or Mixed) is 30 dB. Three through-put coaxial cables are provided with each antenna to enable RF connections to other antennas in the stack. The top antenna in a stack is installed with a cover plate to protect against rain and debris.

The antennas are mounted on top of a 48 foot guyed mast, which consists of four 12-foot sections. If three or more antennas are stacked, an optional dielectric guy kit is recommended. The mast is a knock-down bolted aluminium construction which has a minimal size and weight for economical overseas shipment.

The mast is guyed in 4 directions to facilitate erection with a falling derrick. The antennas are assembled on the mast prior to erection.



BASE STATION & MOBILE ANTENNAS

CA 4000 UHF Omnidirectional Arrays

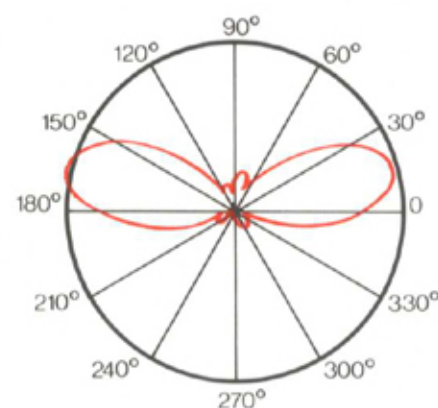
- Frequency Range: 225-400 MHz
- Power: Varies – see table
- VSWR: 1.8:1 maximum
- Gain: Varies – see table
- Impedance: 50 ohms
- Wind loading: Varies – see table

The CA 4000 series of UHF arrays provide a broadband omnidirectional antenna system, which

offers proven performance even under the most adverse ground and shipboard environmental conditions.

The collinear radiating elements are housed in a cylindrical fibreglass radome and the whole system is designed to meet the requirements of various MIL STD environmental specifications.

Model	Power (Av)	Gain	Wind (kph/mpg) (no ice)	Height	Diameter	Weight
CA 4001	2 kW	4.5 dBi	190/120	1.8m	235mm	21.2 kg
CA 4004	2 kW	7.5 dBi	190/120	4.3m	235mm	49.5 kg
CA 4004 HP	20 kW	7.5 dBi	240/150	4.4m	375mm	90 kg
CA 4008	2 kW	10 dBi	190/120	7.9m	235mm	98 kg
CA 4008 HP	20 kW	10 dBi	240/150	7.9m	356mm	225 kg



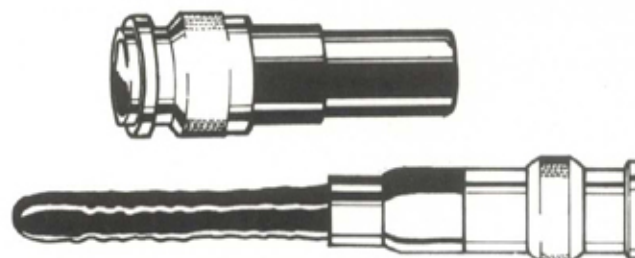
CA 4001 at 250 MHz

**VERTICAL
RADIATION PATTERN**

FX/FXU Helical Whips for Manpacks

The helical spring antenna is a useful alternative to conventional whip or telescopic antennas where there is a risk of breaking elements due to rough handling or where equipment is used in confined spaces. Elements are 40-75% shorter than the equivalent quarter wave antenna, and have the flexibility of the spring. All springs are copper plated steel and hermetically sealed to the termination using a nylon moulding. Very short elements are totally enclosed in a nylon moulding (FXU series) and a nylon outer sheath. The FX series illustrated are sealed into a thick walled flexible sleeve, or totally nylon moulded. All antennas are available in a wide variety of terminations.

VHF	FX Series	38-250 MHz	25 W	230mm at 156 MHz
UHF	FXU Series	414-475 MHz	25 W	91mm at 435 MHz

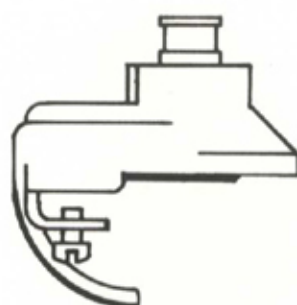
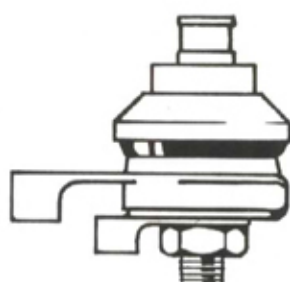
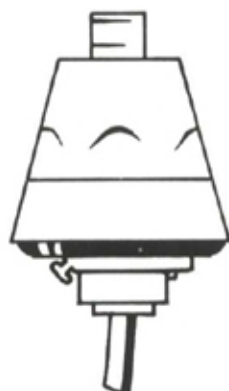
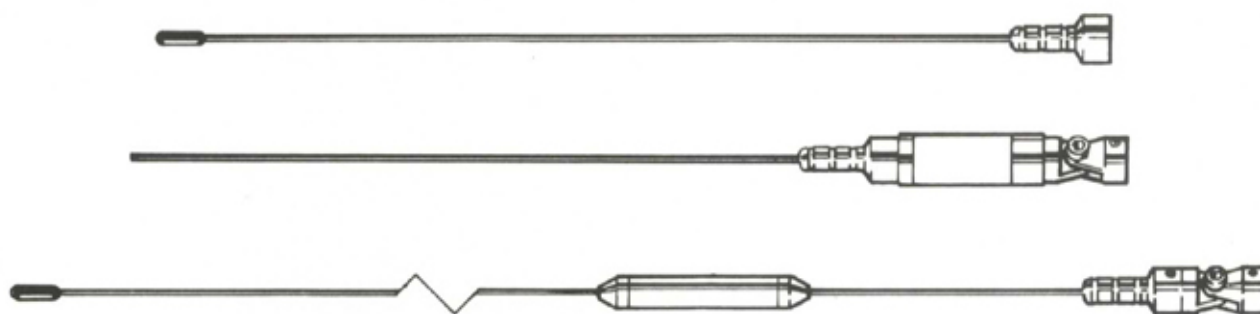


Bases and Whips for Land Mobiles

- Frequency Range: 60-480 MHz
- Power: 50W PEP
- VSWR: 1.5:1
- Gain: Up to 3 dBd
- Impedance: 50 ohms

A range of VHF and UHF whip antennas for mounting on cars and motorcycles is available. At the lower frequencies whips are normally a quarter wave radiator, but at higher frequencies 5 dB collinear antennas are available. Rods are constructed of stainless steel, while couplings are chrome plated brass. Antenna rods and couplings are locked together by hexagonal headed screws. Loading coils are moulded over with nylon as is the tip of top sections. VHF gain antennas have a bottom loading coil while UHF gain antennas have

the collinear phasing coil mounted above the lower quarter wave section. Hinged bases are also available to fold the antenna horizontally for garaging purposes.



A range of antenna bases with various configurations of 50 ohm terminations and vehicle fixing arrangements are available. Magnetic mounts for temporarily fixing antennas to vehicle roofs can be used up to speeds of 112 km/h (70 mph) depending on the whip surface area. Bases are also available with various coaxial terminations to suit customers requirements.

SPECIAL ANTENNAS

AE 3001/3002 Active Receive

AE 3001 (Monopole)

- Frequency Range: A – 15 kHz to 100 MHz
B – 100 kHz to 100 MHz
C – 1 MHz to 100 MHz
- Impedance: 50/75 ohms
- Effective length: 0.3m
- IMP
2nd order: 2×55 mV/m
3rd order: –75 dB
–100 dB
- Max safe signal: 50 V/m
- Noise: 9 dB (above 3 MHz)

AE 3002 (Dipole)

- Frequency Range: B – 170 kHz to 100 MHz
C – 1 MHz to 100 MHz
- Impedance: 50/75 ohms
- Effective length: 0.4m
- IMP
2nd order: 2×60 mV/m
3rd order: –80 dB
–100 dB
- Max safe signal: 50 V/m
- Noise: 8 dB (above 3 MHz)

The Racal AE 3001 Monopole and AE 3002 Dipole Active Receiving Antennas are designed to fulfil the increasing need for compact yet efficient broadband receiving antennas suitable for quick installation in confined spaces. Both omnidirectional and

directional coverage is possible, the latter by means of phased arrays.

Broadband conventional MF/HF passive antennas are, by necessity, large structures. This too often results in a received signal far in excess of the level required for satisfactory reception and attenuation has to be introduced at the associated receiver. These problems are overcome by active antennas.

AE 3001 and AE 3002 antennas are provided with an integral solid state highly linear amplifier which ensures a constant impedance over the operating band and thus a good receiver match.

Power supply to the amplifier is normally via the RF cable from a separate (optional) power supply with RF feedthrough facility. In the case of the 15 kHz version, power is fed to the antenna via a separate cable.

AE 3001 and AE 3002 antennas are supplied with integral mounting fixtures. These consist of 178mm fluted spigot complete with clamp, so permitting the antenna to be mounted on a customer supplied galvanized steel mast of 13mm to 15mm outside diameter.

Various mounting kits are available on request.



Dimensions	AE 3001	AE 3002
Overall length	1105mm	2250mm
Maximum diameter	88mm	88mm
Mounting tube length	180mm	180mm
Mounting tube diameter	32mm	32mm

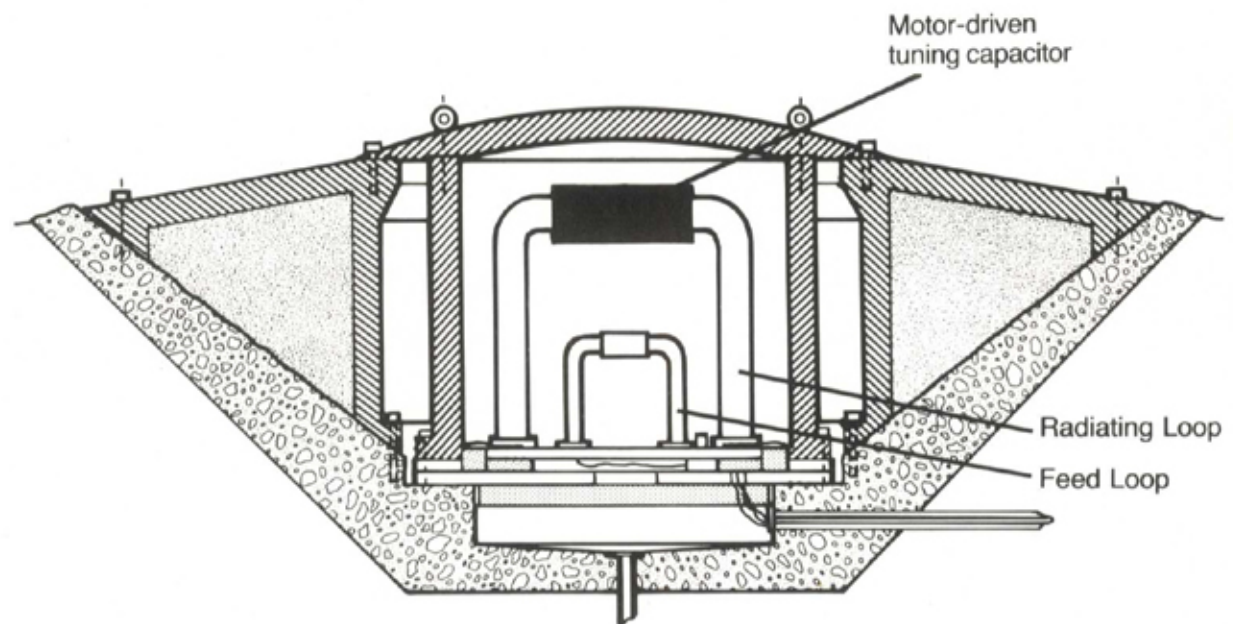
MLH-2/D Hardened HF Miniloop

- Frequency Range: 3-24 MHz
- Power: 1 kW Av.
- VSWR: 2.3:1 maximum
- Impedance: 50 ohms
- Wind loading: 960 km/h, 600 mph (no ice)
720 km/h, 450 mph
(5mm radial ice)

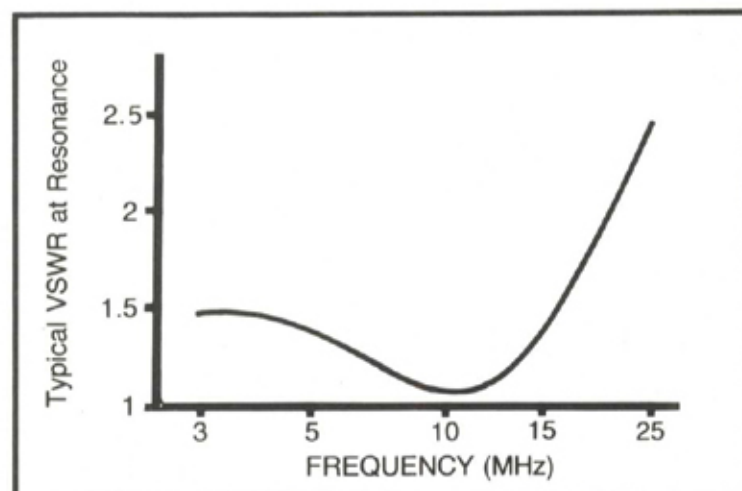
The MLH-2/D is a special version of the MLA series Miniloop designed for installation in a concrete bunker or behind blast walls to give maximum protection from nuclear explosions.

The Miniloop is an electrically small, tuned, rectangular $\frac{1}{2}$ loop antenna which is mounted on a ground plane. It is relatively unresponsive to local man-made noise fields. The antenna's height is 1.2 metres, and its maximum horizontal dimensions are established by its ground plane, 2 metres by 1 metre. This represents a reduction in size of 27 to 1 when compared to a half wave horizontal dipole at 3 MHz. It offers all of the superior properties of a balanced loop for receiving, PLUS the ability to transmit with high efficiency, powers up to 1 kW.

The Miniloop is a low impedance device, and is relatively unaffected by its proximity to the ground, or to metallic structures, so long as they do not become resonant at the operating frequency. Thus the antenna can be installed in a concrete 'bunker' for maximum protection. In a rugged environment the reliability of the Miniloop has proven itself far superior to that of the automatic and semi-automatic whip-tuner combination in current use. On initial installation, at a fixed site, the zero elevation angle nulls in the Miniloop pattern permit "nulling out" of an interfering ground wave signal over short and medium haul paths, thereby greatly reducing interference or fading in the presence of high angle skywave. The high-Q of the Miniloop allows simultaneous operation in the receiving mode in the presence of other transmitting antennas.



MLH-2/D in customer-supplied bunker

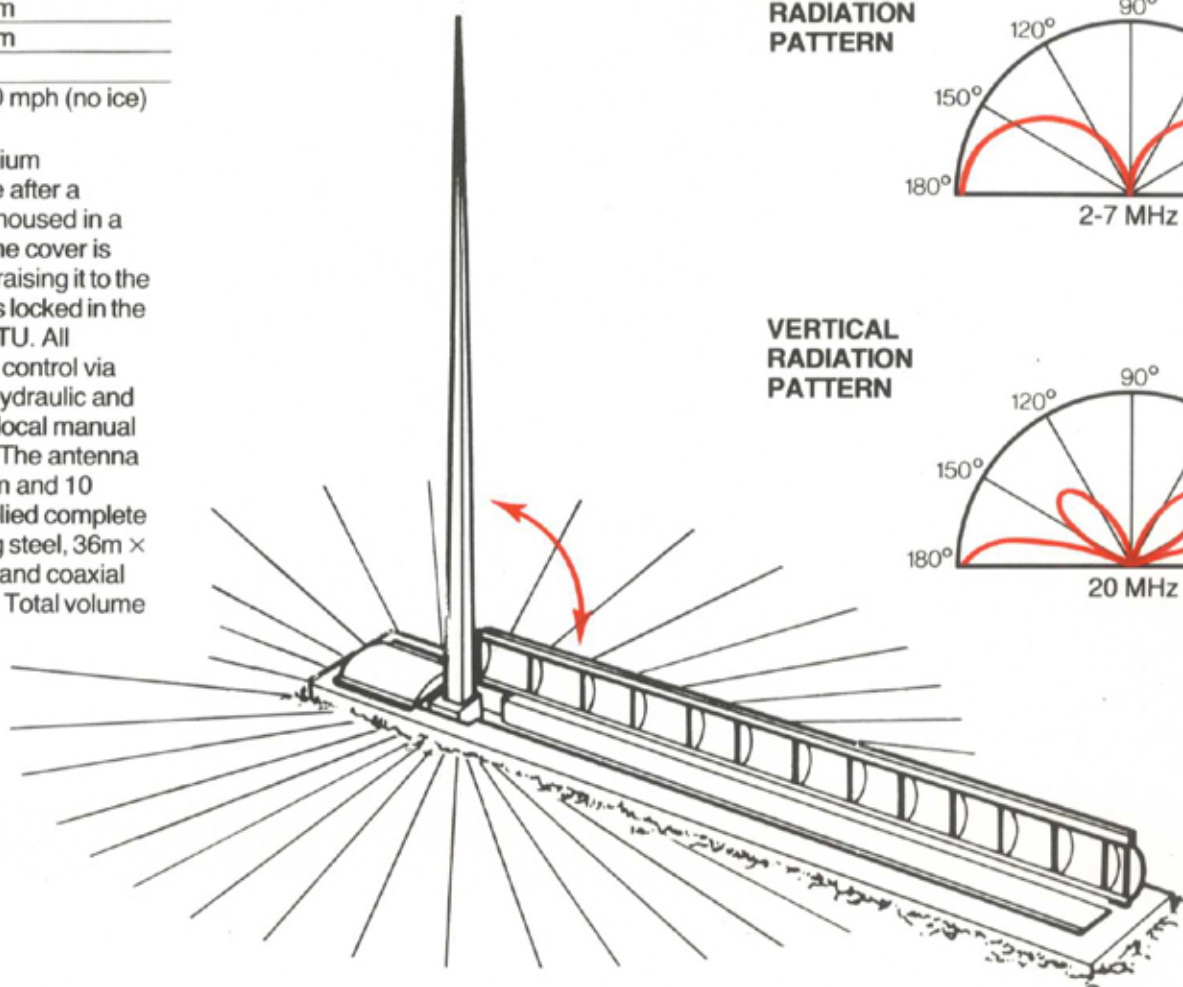


SPECIAL ANTENNAS

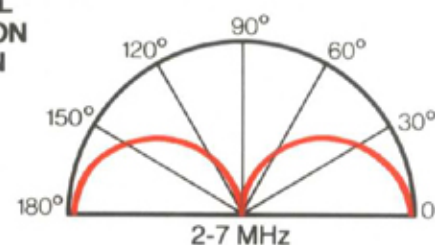
CA 3009A Hardened Transmit Monopole

- Frequency Range: 2-20 MHz
- Power: 1 kW PEP
- VSWR: 1.5:1 maximum
- Gain: 2 dBi maximum
- Impedance: 50 ohms
- Wind loading: 195 km/h, 120 mph (no ice)

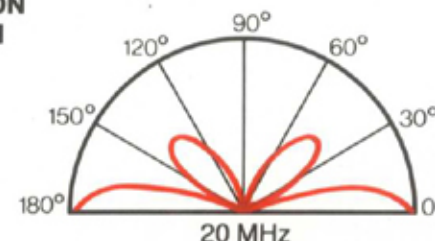
The CA 3009A is a 10.6 metre aluminium deployable monopole antenna for use after a nearby nuclear blast. The antenna is housed in a concrete bunker with a steel cover. The cover is opened and the antenna deployed by raising it to the vertical through an arc of 90° where it is locked in the operating position and tuned via an ATU. All operation of the antenna is by remote control via underground cables. Deployment is hydraulic and can be from the antenna bunker by a local manual override in the event of power failure. The antenna housed will withstand 1 Mton at 1.6 km and 10 Mtons at 3.2 km. The antenna is supplied complete except for bunker concrete, reinforcing steel, 36m × 36m underground radials and control and coaxial cables. Total shipping weight 1932 kg. Total volume 7.16m³.



VERTICAL RADIATION PATTERN



VERTICAL RADIATION PATTERN



MLS VHF Miniloops

- Frequency Range: 30-100 MHz (MLS 310/A)
90-300 MHz (MLS 930/A)
- Power: 1W maximum
- VSWR: 2:1 maximum
- Null depth: Greater than 20 dB
- Impedance: 50 ohms
- Bandwidth: 200 kHz average,
1600 kHz at 100 MHz
(MLS 310/A)
- Linear polarization

The MLS 310/A antenna is tunable over a significantly extended range from about 26-129 MHz. Efficiency increases with frequency to a value approaching 85% at the upper end of the extended range, but drops off rapidly below 30 MHz.

Both models are constructed of silver plated copper, delrin and fibreglass.



The MLS 930/A and MLS 310/A are designed for special purpose applications where a narrow bandwidth VHF transmitting or receiving antenna is required. They represent the smallest possible antenna with radiation characteristics comparable to a halfwave resonant dipole. The antennas are sufficiently small to be concealed in many locations otherwise rendered impossible by size of more conventional antenna systems. They offer excellent characteristics for simple direction finding applications. The antennas are designed to be peaked at the desired frequency of operation by the use of a small tuning tool. Only a single tuning adjustment is required to resonate antennas at any frequency within their band of operation with the VSWR not exceeding 2:1.

Model	Loop Diameter	Overall Height	Weight
MLS 310/A	254mm (10 ins)	457mm (18 ins)	0.9 kg (2 lb)
MLS 930/A	76mm (3 ins)	305mm (12 ins)	0.4 kg (1 lb)

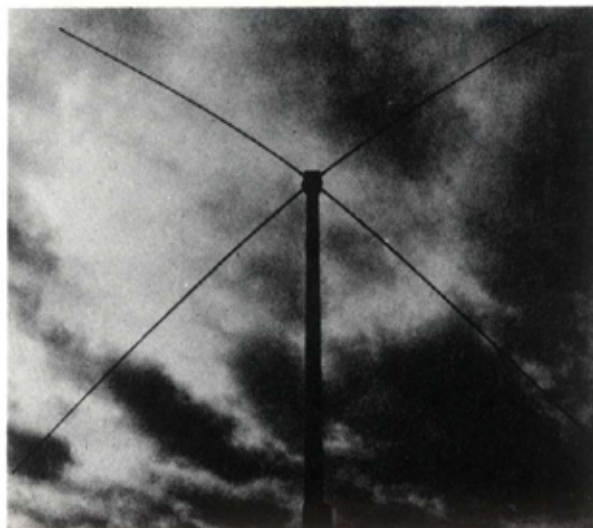
SPECIAL ANTENNAS

DPA-230/A Active Diversity Receive Antenna

● Frequency Range:	2-32 MHz
● Power:	Receive only
● Noise factor:	4 dB maximum
● Connectors:	'N' type (2)
● Wind loading:	240 km/h, no ice 162 km/h, 25mm radial ice

The DPA-230/A is a general purpose, high frequency, receiving antenna which permits the optimum use of polarization diversity over both short and long distance communication paths. The antenna consists of two orthogonal dipoles, which may be mounted in either the 45° or 90° vertical polarization modes. Tapered, "fibreglass" whips are used for elements to reduce generation of precipitation static. High quality, broadband toroidal baluns are used to feed each dipole at a high impedance level to ensure maximum efficiency over the entire 2-32 MHz range. Fibreglass, rather than metal, was chosen for the vertical mast in order to prevent unwanted re-radiation of signals within the antenna structure which would destroy the high isolation between the two dipole elements and their balance with respect to ground. The two coaxial transmission lines are fed through the fibreglass mast with ferrite-sleeve chokes to prevent the same kind of re-radiation and unbalance. These sleeves also help prevent "common-mode" interference. A

unique feature of the antenna is an additional set of threaded sockets in the mounting head which permit the elements to be arranged in a horizontal, rather than vertical, cross for improved diversity reception on short-haul circuits. High quality construction and materials are used throughout the antenna to ensure the best possible performance and reliability. The ARC-1/A Antenna Rotator is available as an option for use with the DPA-230/A Antenna System.



The dual-channel preamplifier has a noise factor of 4 dB maximum and will tolerate an input of 0.5 volts peak-to-peak for 1 dB gain compression. The antenna can be supplied without the preamplifier if required.

Dimensions	
Antenna elements	2.44m each 4.88m tip-to-tip
Mast height	3.65m
Overall height	5.33m

Mounting

Self-supporting, no guys required

Weights

Antenna and mast	37 kg
Preamplifier	5.5 kg
Rotator	22.67 kg

SAS-11/E Broadband Active Receive

Electrical

● Frequency Range:	300 Hz-1 GHz in 2 ranges of 300 Hz-150 MHz and 100 MHz to 1 GHz
● Polarization:	Vertical
● Output Impedance:	50 ohms nominal
● Directivity:	Omnidirectional
● Circuitry:	Solid-state
● Low Band Tangential Sensitivity:	Better than 0.2 microvolts per metre (3 dB S/N with 1 kHz bandwidth) when followed by a receiver having a noise figure lower than 3 dB
● Low Band Antenna Factor:	Approximately 15 dB
● High Band Gain:	-3 dB to +2 dB relative to isotropic (does not include 10 dB pre-amplifier gain which raises output to +7/+ 12 dB relative to isotropic)
● High Band Noise Figure:	Integral Pre-amp less than 6 dB
● Output Connector:	BNC Female for each channel

consists of two separate antennas arranged in a collinear configuration such that the top-hat of the high-band antenna becomes the ground plane for the low-band antenna. Considerable overlapping in frequency coverage has been provided to increase flexibility of operation. Each band is provided with a separate output at the base of the antenna system. The SAS-11 can be provided with a single combined output for both bands (model SAS-11/E-1). In spite of its extreme sensitivity, the antenna system does not easily overload in the presence of strong signals. A level in excess of 2 volts per metre is required to overload the low-band channel while at least 100 millivolts per metre can be tolerated by the high-band antenna. Harmonic, intermodulation and cross-modulation products are well below

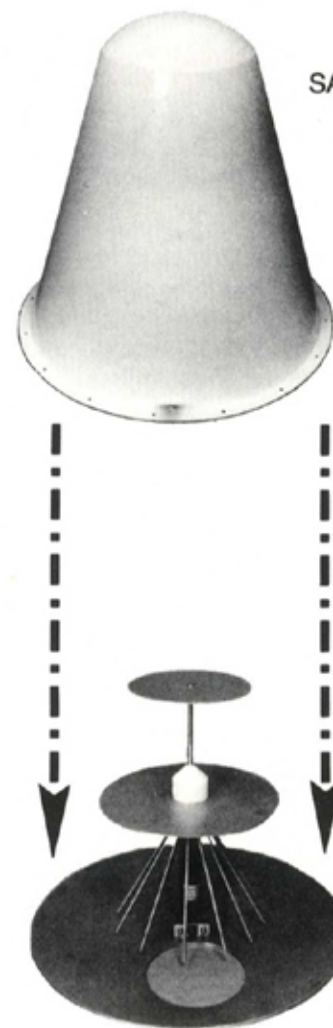
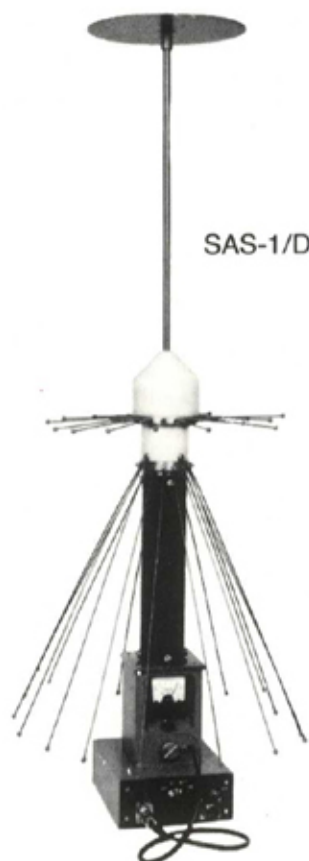
troublesome levels even in the presence of strong local fields. A general roll-off in the response below 10 kHz prevents overload due to strong 50 Hz harmonics in areas where man-made noise is a problem. A fibreglass radome protects the antenna from environmental extremes and from damage during transit. The FET of the low-band and the amplifier of the high-band are both accessible for replacement, should this become necessary due to accidental misuse.

	SAS-1/D	SAS-11/E
Height	812mm (32 ins)	508mm (20 ins)
Diameter	360mm (14 ins)	533mm (21 ins)
Radome		635mm (25 ins) x 711mm (28 ins)
Weight	2.2 kg (5 lbs)	15.6 kg (35 lbs)

Power Requirements

SAS-1/D	Self contained batteries AC Mains Optional
SAS-11/E	12 Volts DC at 150mA from AC mains unit supplied.

The SAS-1/D is for indoor use: the SAS-11/E is suitable for external mounting on a vehicle and is fitted with a fibreglass radome. The system actually



SPECIAL ANTENNAS

Tempest Measurement

- Frequency Range 1 kHz to 12.4 GHz
- Provide E and H field measurements
- High sensitivity with good signal handling
- Compact, portable design

A wide range of broadband antennas can be supplied for use in RFI, EMI and Tempest measurement applications where compact, transportable E and H field sensors are required.

The antennas are available as individual items, or as complete antenna kits, together with discreet, fibreglass lockable suitcases for transportation.

A typical Tempest Antenna Kit contains the following types of antennas:

(a) BBH 500 Magnetic Field Sensors (1 kHz to 50 MHz)

Wideband response is achieved by use of a special coupling technique in conjunction with a ferrite loaded coil, balanced to ground by a Faraday shield. The antenna is omnidirectional in the vertical plane and bidirectional in the horizontal plane. The null depth is typically 20 dB minimum.

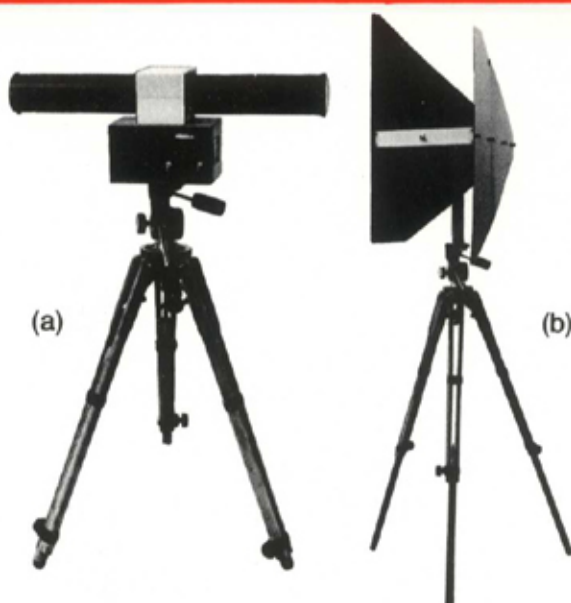
An optional rotator mechanism can be provided, incorporating a well shielded, noiseless (at RF) motor. AC power units are available for the portable battery-powered model.

The special outdoor versions will withstand 320 km/h, 200 mph (no ice) and 160 km/h, 100 mph (with 100mm, (4 in) of radial ice).

Other frequency ranges are available.

(b) LPV 2010/A E-Field Log-Periodic Vee Antenna (200 MHz to 1 GHz)

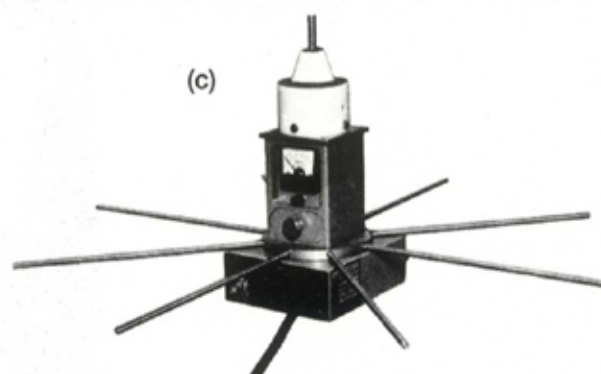
This linearly-polarized directional-beam antenna is used to measure electric field intensity. It consists of two pairs of printed circuit element assemblies, a rigid vee-shaped mainframe to which they are attached by thumbscrews to form the antenna, and a supporting mast. Gain is typically 6 dBi – a nominal output impedance of 50 ohms – and a VSWR typically 2:1.



(c) AVW1/C Broadband E Field Whip Antenna (1 kHz to 100 MHz)

A small retractable broadband whip antenna giving outstanding performance in the HF band. It is a small battery operated device suitable for hand-held use, or for mounting on a 1/4 in threaded stub via a tapped hole in the antenna base.

The antenna employs an integral active network with a very low intrinsic noise, the input impedance being greater than the reactive component of the equivalent antenna impedance.



(d) BCD Passive Biconical Antenna (20 MHz to 200 MHz)

Designed for E field measurement in the VHF and upper HF ranges, this antenna kit is of strong and durable construction and built to resist corrosion, as is the whole Tempest range. The BCD Passive Biconical with the other antennas in this range, packs away neatly into one of the two lockable suitcases, which will also carry a tripod, inter-connecting cables and power supply and the operators handbook and calibration charts. Details of other Tempest kits are available on request.

Other special purpose antennas in the range are:

LPD 112/A

Lightweight, portable, receiving log-periodic antenna – 1 GHz to 12.4 GHz.

LPD 130/RAK

Lightweight, portable, 500W log-periodic antenna – 100 MHz to 300 MHz.

VBC Series

Active vertical biconical antennas covering the range 20 MHz to 1000 MHz.

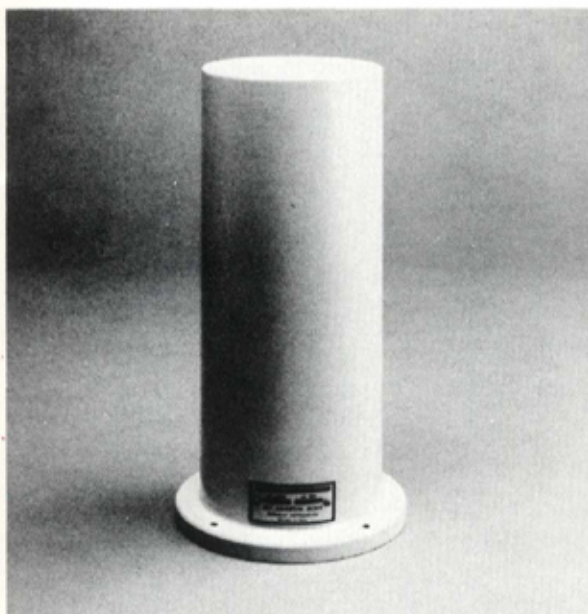
MLA 1100/A

Balanced loop, portable antenna system with motor driven tuning capacitor 1.5 to 500 MHz.



RA 552 Satellite Navigation

- Frequency Range: 1.45-1.65 GHz
- Gain: +1 dBi \pm 2
- VSWR: 2:1 maximum
- Polarisation: Right hand circular
- Azimuth pattern: Omnidirectional
- Vertical: Hemispherical
- Weight: 0.227 kg



The RA552 antenna is designed to receive circularly polarized signals from navigational satellites for use with shipborne positioning equipment.

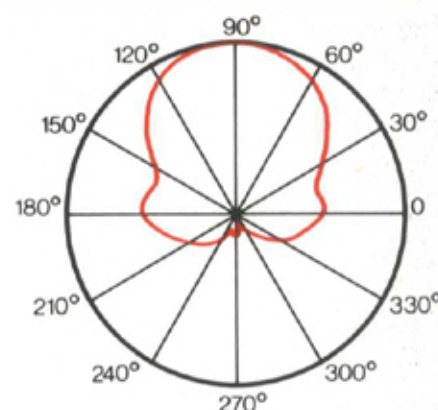
The antenna operates in the frequency range 1.45-1.65 GHz and comprises four slant dipoles in phase quadrature, showing a VSWR of better than 2:1 over the band.

The gain of the antenna is +1 \pm 2 dBi and polarization is right hand circular.

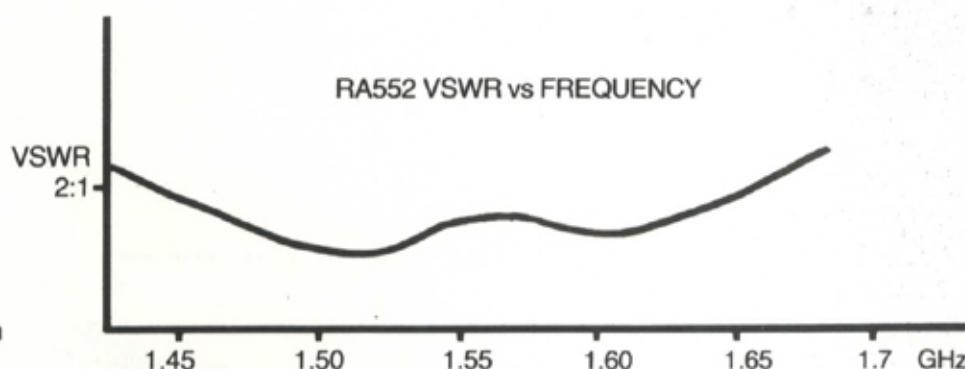
The vertical radiation pattern is shown on the graph and it can be seen that coverage is substantially hemispherical, extending from the zenith down to -15° . In the azimuth plane the antenna exhibits an omnidirectional characteristic.

Dimensions:
Base flange 130mm diameter
Radome 100mm diameter
Height 261.6mm

Mounting holes:
4 holes 5mm diameter
equispaced on 120mm pitch diameter circle



VERTICAL RADIATION PATTERN



MASTS & TOWERS

Light Duty Telescopic Masts

This series of masts are precision engineered units, designed to meet extremes of environment to Defence Specification DEF-133. Made from high tensile anodized aluminium alloy, masts can be erected on a wide variety of terrains using the comprehensive accessory kit supplied. Brackets are available for shelter and wall mounting while Land Rover mounting kits allow the mast to be raised vertically even when the vehicle is on sloping ground. Similar mounting kits can be supplied for customers own vehicles. The telescopic sections are extended manually or pneumatically, dependent upon model, each being locked in position by a simple lever action friction clamp which eliminates lateral movement between sections thereby avoiding wind induced mechanical noise. Lowering is effected by unlocking each clamp in turn, allowing the mast to retract under its own weight. Rate of retraction is controlled by a pneumatic damping system specially designed to give sufficient cushioning effect during retraction while imposing minimal drag during extension.

The 9 metre masts, RA477 and MA798 have a dielectric, glassfibre top section and are designed to support log periodic antennas such as the Racal MA751 and RA951. The dielectric top section reduces pattern distortion when antennas are used in the vertically polarized mode. Additionally, these masts have rotatable guy plates to permit mast rotation from ground level and the chosen bearing can be maintained by pegging down the special ladder assembly supplied in the accessory kit.

All masts are supplied complete with accessory kit for ground mounting including base plate, guys, guy anchor stakes, halyard and sledgehammer. Foot pumps and electric compressors can be supplied for pneumatic versions.

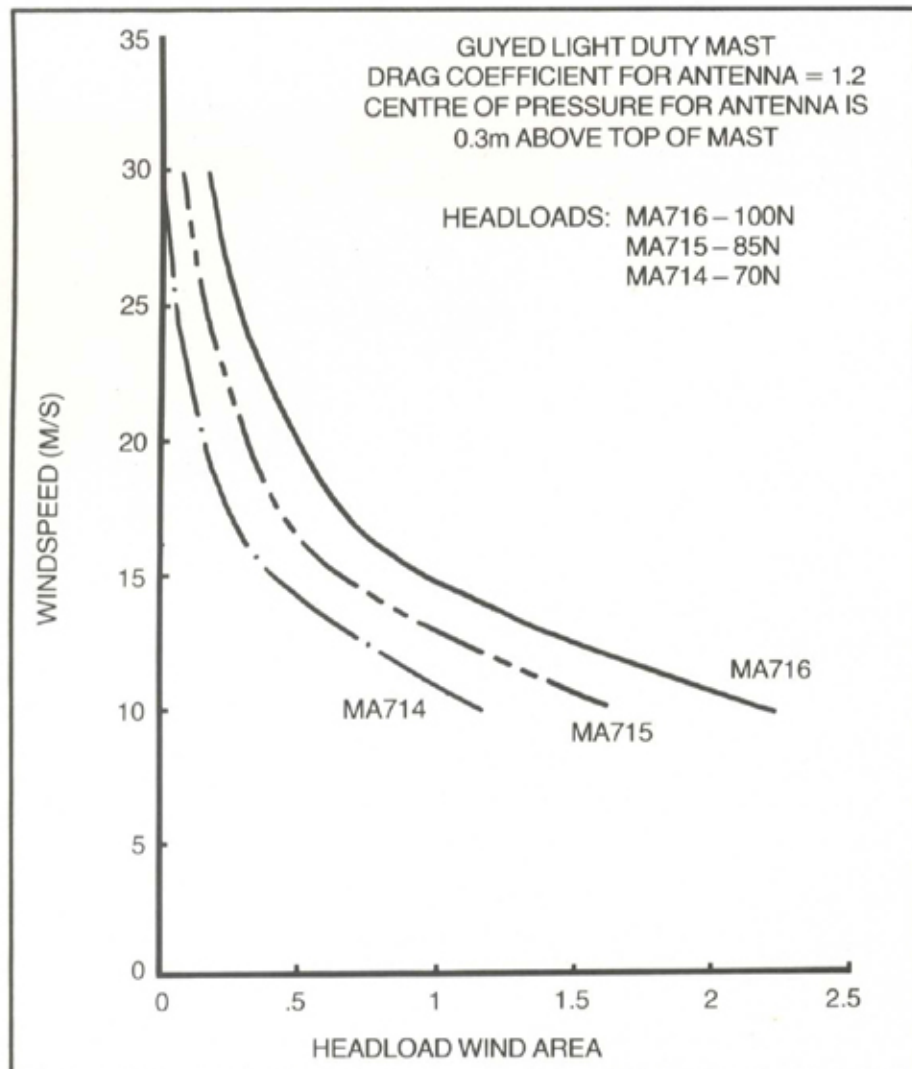
Note: Static headloads are calculated with 35 kg side thrust at masthead. Maximum torque is 14 N/m on all masts.

	8 metre	9 metre	10 metre	12 metre
Pneumatic mast	RA476	RA477	RA478	RA479
Push-up mast	MA716*	MA798	MA715	MA714*
Extended height	8m	9m	10m	12m
Closed height	1.5m	2.17m	1.75m	2m
Weight of mast	10.2 kg	10.6 kg	11.6 kg	13 kg
Weight of accessories	18 kg	25 kg	21 kg	21 kg
Static headload	10 kg	15 kg	8.5 kg	7 kg

* NATO CODIFIED MA716 5985-99-645-0001
MA714 5985-99-719-4328



CAN BE USED AS A MAST
RADIATOR (1 kW Av/PEP)



MASTS & TOWERS

RA 456 Telescopic Intermediate Duty Pneumatic

The RA456/7/8/9 is a new range of pneumatically operated telescopic masts designed to carry headloads of up to 45 kg at varying wind speeds and extended heights.

Engineered to the same high standards as the well proven Racal MA700 series, these intermediate duty masts are fully pneumatic, enabling heavy headloads to be elevated quickly and safely, and are available in heights of 6.8, 12, 15 and 17 metres. The tube sections are all of aluminium alloy except for the top section of the 6.8 metre mast which is glassfibre to prevent pattern distortion when used with vertically polarized log periodic antennas. A relief valve protects the mast against over-pressure.

The telescoping sections can be locked at full extension, or at any intermediate height, by means of a single, lever-operated friction clamp, or by screw type clamp collars, which will keep the mast extended when the air pressure is removed.

Relative rotation between sections is prevented by a machined key and groove system so that directional stability can be maintained during extension and

retraction; azimuthal rotation of the complete mast is easily effected by hand, enabling directional antennas to be oriented correctly by an operator at ground level. The correct bearing is maintained by pegging down the ladder assemblies or, when vehicle mounted, by tightening the upper mounting clamp.

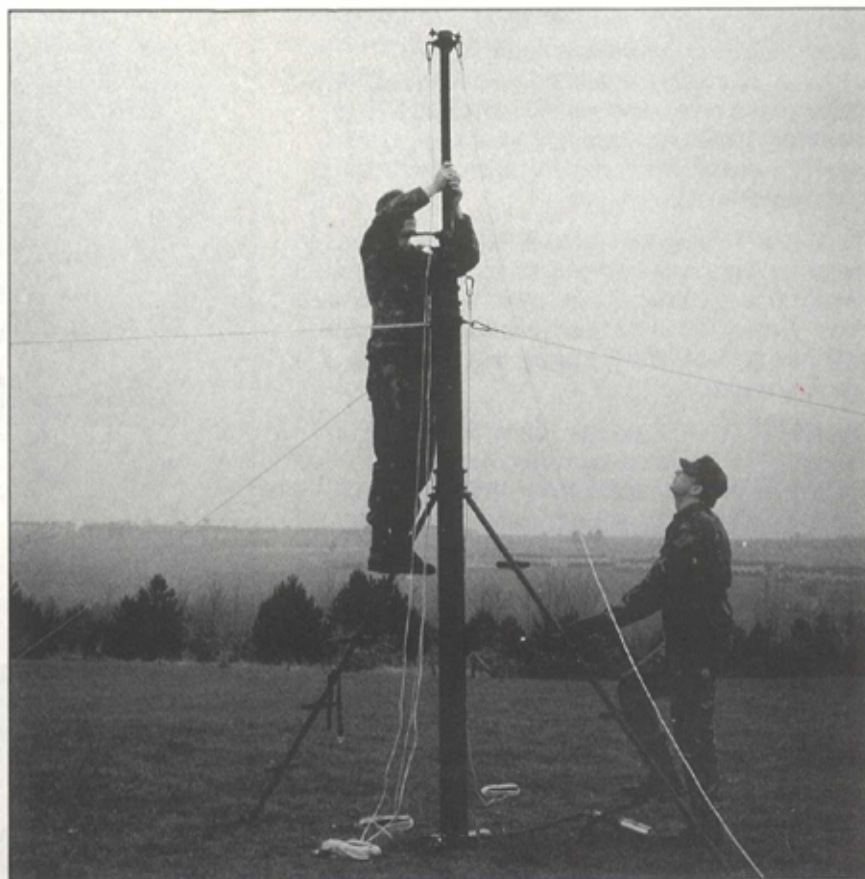
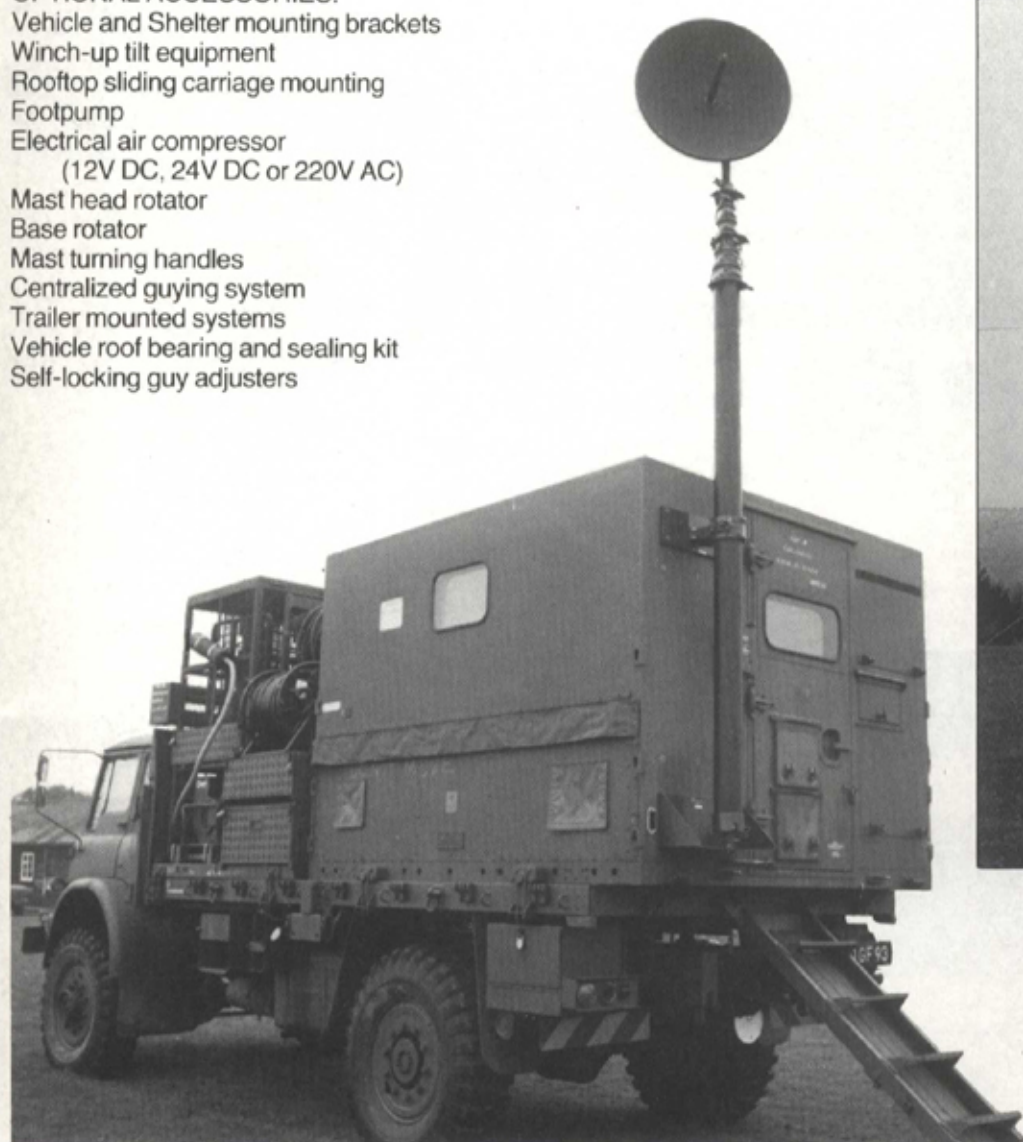
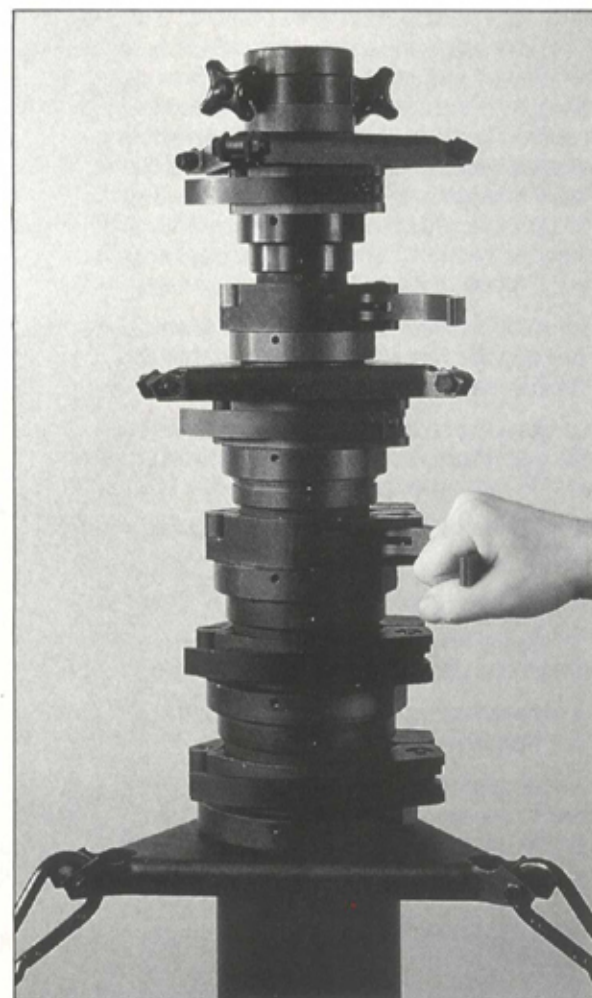
The relatively low retracted height allows the mast to be mounted vertically on many types of vehicle or shelter and brackets are available for this purpose. For free-standing use, a complete ground mounting kit, including base plate, three-lane guys, guy anchors and hammer is available.

In order to obtain masthead access when mounting heavy antennas, a winch-up arrangement is available which allows the retracted mast to be tilted over towards the horizontal thus bringing the masthead closer to the ground. After fitting the antenna the mast is winched back to vertical and then extended. This arrangement can be supplied for both ground and vehicle mounted configurations.

	12 metre	15 metre	17 metre	6.8 metre
Mast with lever clamps	RA456	RA457	RA458	RA459
Mast with collar clamps	RA450	RA451	RA452	RA453
Extended height	12m	15m	17m	6.8m
Closed height	2.3m	2.7m	3.0m	2.15m
Number of sections	7	7	7	4
Guy radius	8.5m	10.5m	12m	5.5m
Mast weight	40 kg	46 kg	50 kg	30 kg
Accessory kit weight	38 kg	41 kg	45 kg	38 kg

OPTIONAL ACCESSORIES:

- Vehicle and Shelter mounting brackets
- Winch-up tilt equipment
- Rooftop sliding carriage mounting
- Footpump
- Electrical air compressor
(12V DC, 24V DC or 220V AC)
- Mast head rotator
- Base rotator
- Mast turning handles
- Centralized guying system
- Trailer mounted systems
- Vehicle roof bearing and sealing kit
- Self-locking guy adjusters



MASTS & TOWERS

MA 638 Lightweight Steel Telescopic

The MA638 telescopic mast extends to 8.2 metres and has a collapsed length of 1.47 metres. The mast is made from 7 tubular steel sections and is available with a wide range of accessories, for use either as a vertical monopole antenna, a support for 'F' rods or as a support for other antennas. The mast can also be mounted on a vehicle. Each section is raised by hand and locked by a knurled ring which positively locks the inner tube while giving a low electrical resistance. Steel sections are copper plated and stove enamelled olive drab. The mast can be mounted on almost any terrain by one man using the two level fixing terylene guys supplied. Over 20,000 of these masts are in use worldwide.

This mast was developed from our Mark I pattern to meet specific requirements for a lightweight portable mast with the following features:

To operate as a direct radiator of 27ft (8.2m) effective height with the ability to accept antenna rods 'F' to increase the height to 43ft (13m).

As a 27ft mast to a support dipole rod antenna with coaxial feed.

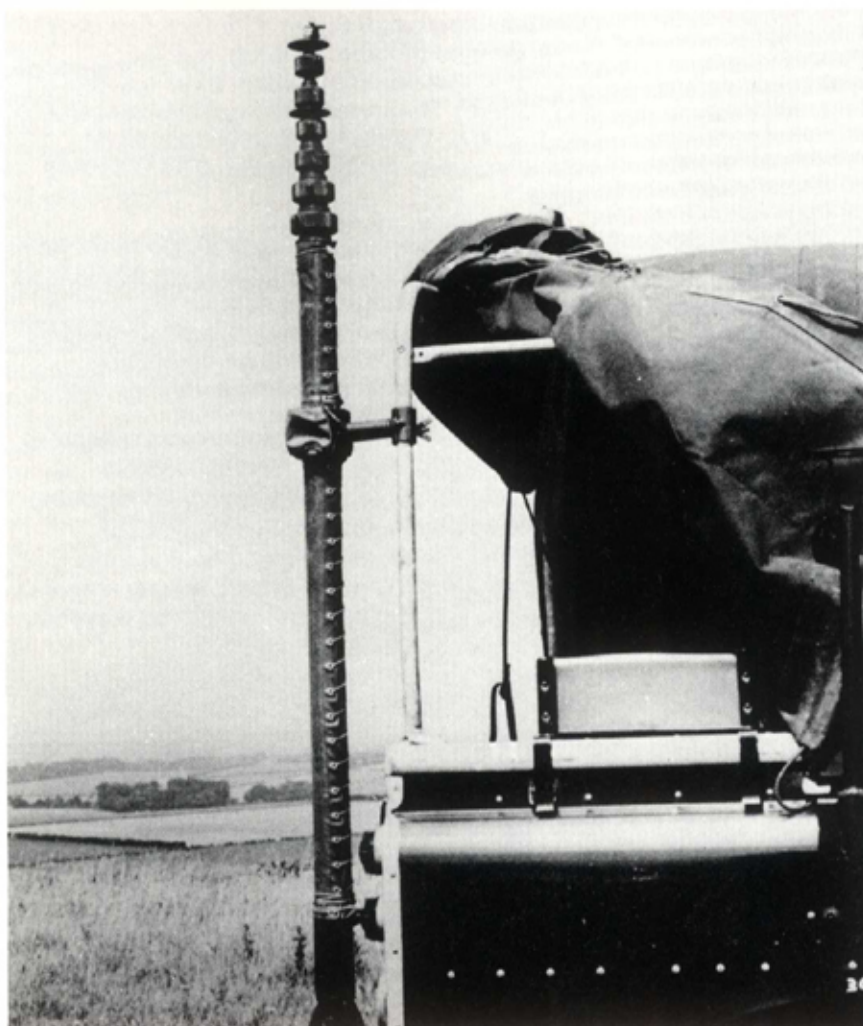
As a support for span antennas of all types.

The closed length being less than 5ft it can be carried in a Land Rover or similar vehicle.

Easily erected by one man in confined spaces, i.e. thick woodland, etc.

Various mountings are provided which enable the mast to be erected on virtually any terrain or on a vehicle hard top.

(NATO No. 5985-99-102-8303).



MA 675/1381/2231 Fibreglass Mast Kits

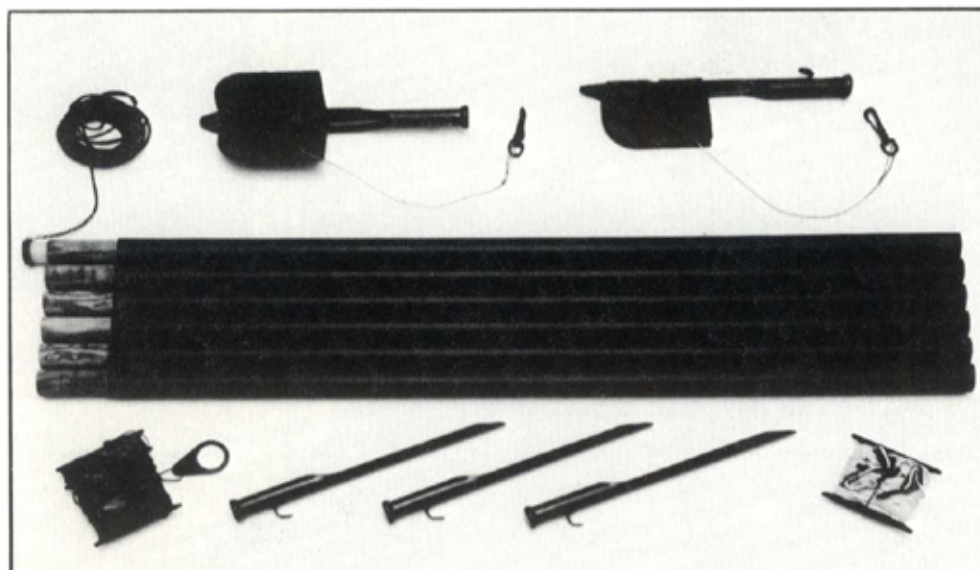
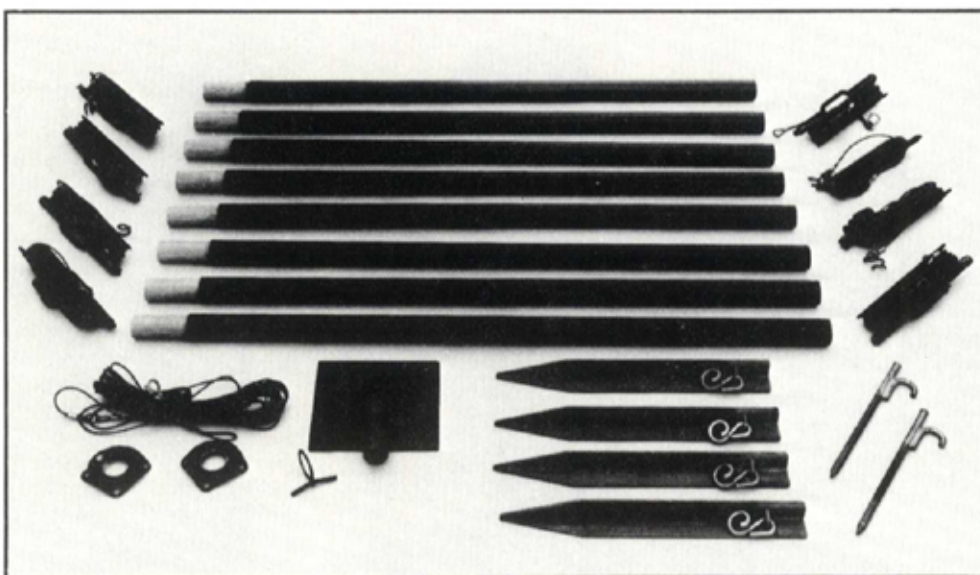
A range of glassfibre masts designed for use with military field communications equipment is available. All masts are painted olive drab and are supplied as a comprehensive kit complete with all necessary guys, hardware and a hammer, in olive drab PVC coated nylon carrying case which can be carried by one man.

The MA2231 designed for the British Army Clansman equipment weighs 3.5 kg total and makes up to a 5.5m mast using six 32mm diameter tubes. The mast can be used as a support for wire antennas or, using the F adaptor and down lead, as a vertical radiator.

The MA1381 (NATO codified 5985-99-108-0857) makes up to 7.3m using eight 38mm diameter tubes and is designed as a support for vertical, sloping wire or inverted Vee antennas using the endless halyard supplied in the kit. The kit weighs 9.5 kg.

The MA675 consists of eight 45mm diameter sections making up to a 9 metre mast having 2 levels of 4 guys. The kit weight is 20.5 kg. The mast can be used as a support for most wire or elevated ground plane antennas.

An additional mast, the MA1382, is designed specifically to support the helicone type HC 30-76. This mast is fitted with 4 guy lanes and supplied with a helicone mounting adaptor.



MASTS & TOWERS

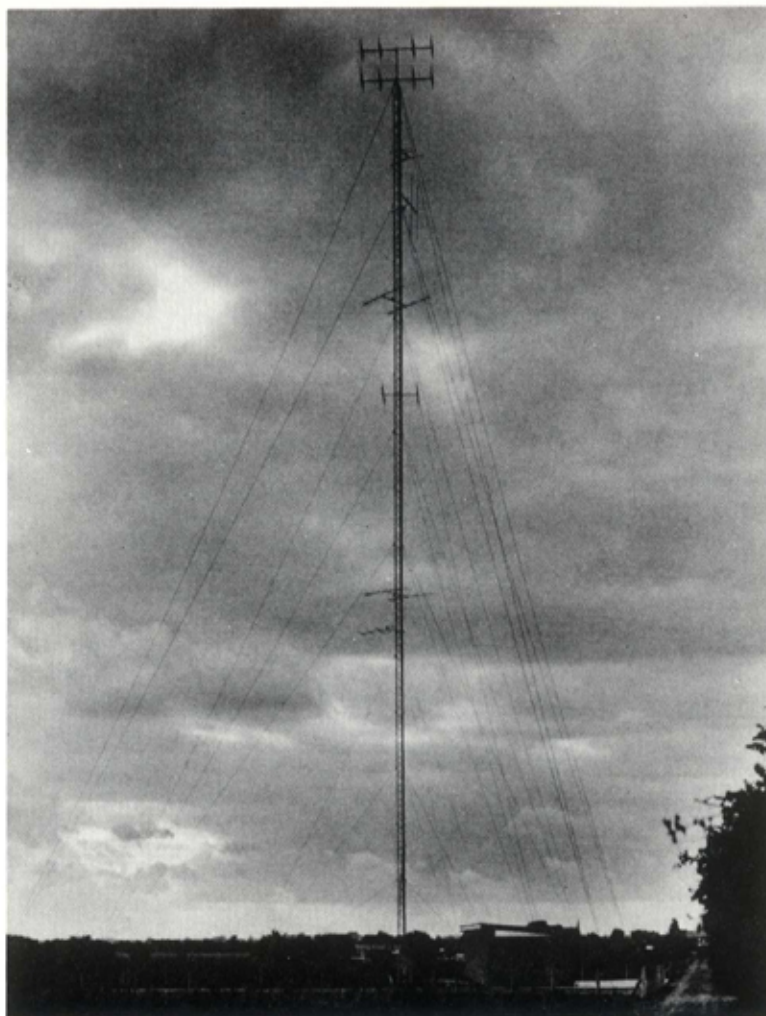
Heavy Duty Tubular and Lattice Steel

Lattice masts are triangular, varying from 400mm to 850mm cross-section. Sections are partly welded on two sides before shipment to reduce shipping volume; final assembly by bolting is completed on site. Design heights up to 100m are available for headloads up to 430 kg for VHF/UHF antennas or up to 1200 kg for long wire antennas, dependent upon local conditions.

Tubular masts can be supplied in diameters of up to 114mm and in heights up to 36m for headloads up to 565 kg.

Guying is of galvanized steel, Alumoweld or PVC-coated steel, suitably broken up with fail-safe ceramic insulators. Masts have integral climbing rungs; alternatively, internal or external ladders can be provided with or without safety cages.

A range of self-supporting towers is available in heights up to 130m in bolted sections for such applications as elevated radar scanners or lightweight UHF antenna arrays.

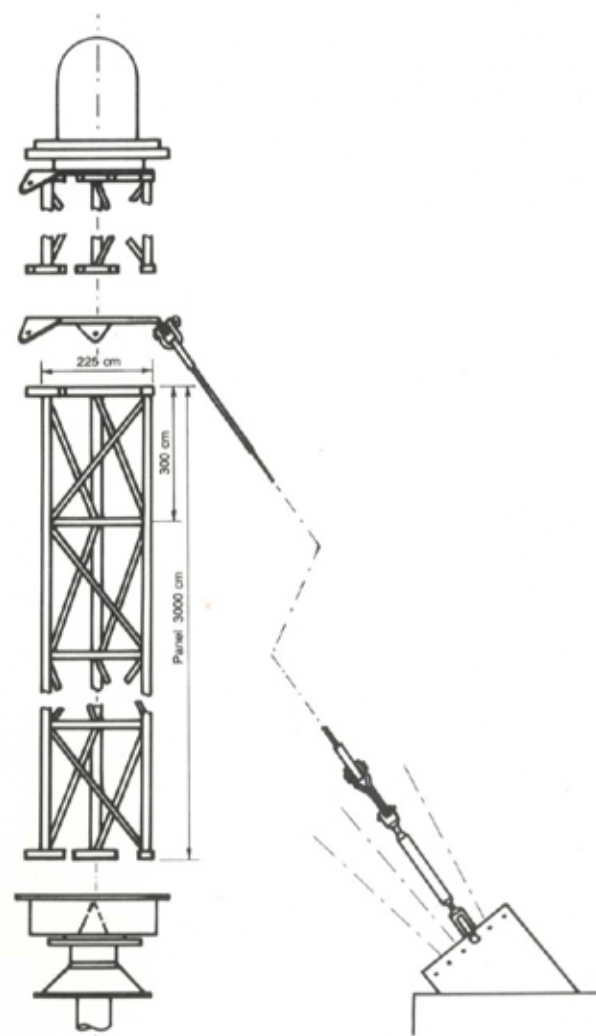
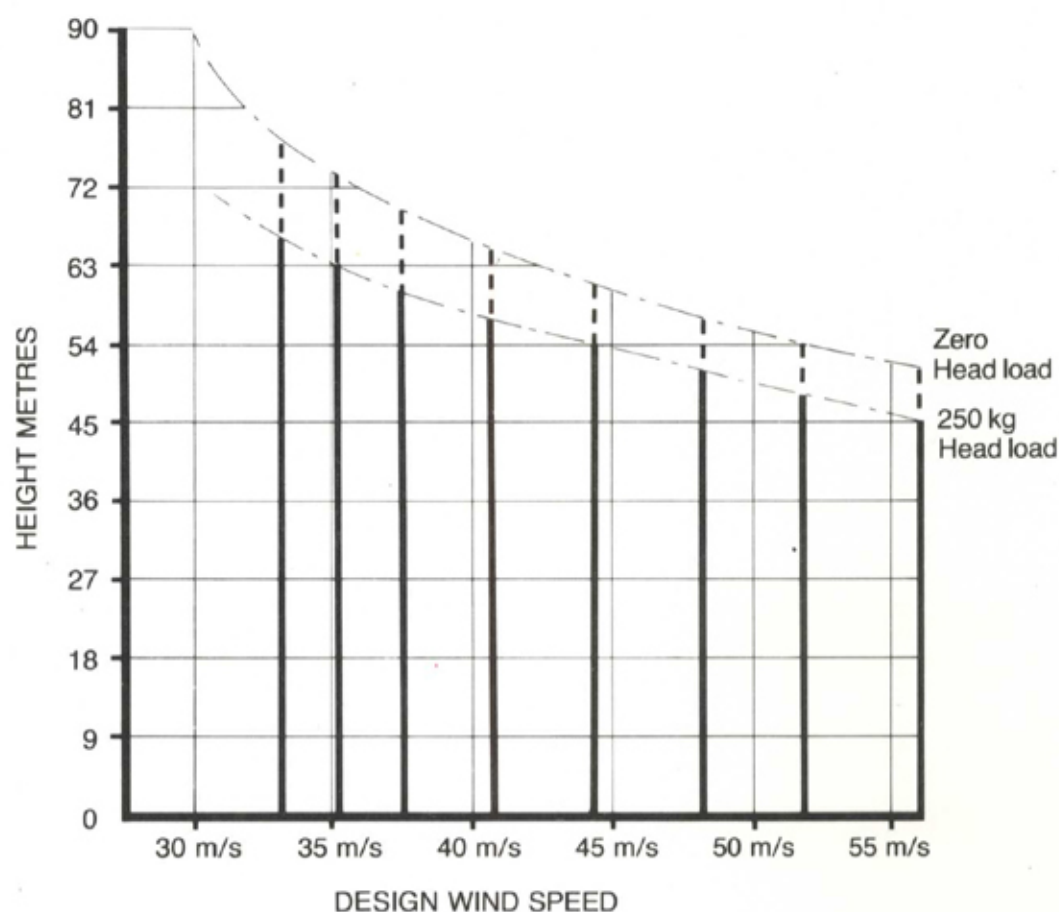


Light Duty Lattice Steel

A range of triangular steel lattice, guyed lightweight masts in heights from 9m to 80m is available. These masts are suitable for headloads of, for example, 250 kg at 45m and will tolerate wind speeds of up to 198 km/h, dependent upon the guying arrangement. Three lanes of guys are used at 9m

intervals; the number of guying points being dependent upon the mast height specified. Guys are supplied with preformed dead ends and all necessary thimbles and shackles. Anchoring hardware is also provided although concrete and reinforcing steel is normally supplied by the

customer. Where the mast is required to be insulated from ground, a base insulator can be provided.



MASTS & TOWERS

RA 400 Light Duty Lattice Aluminium

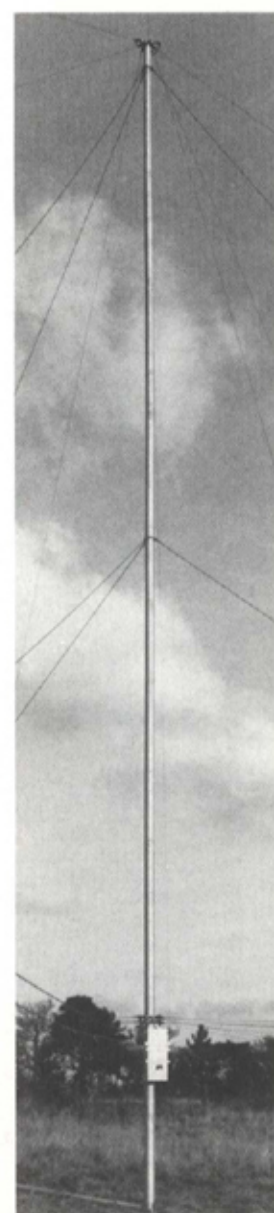
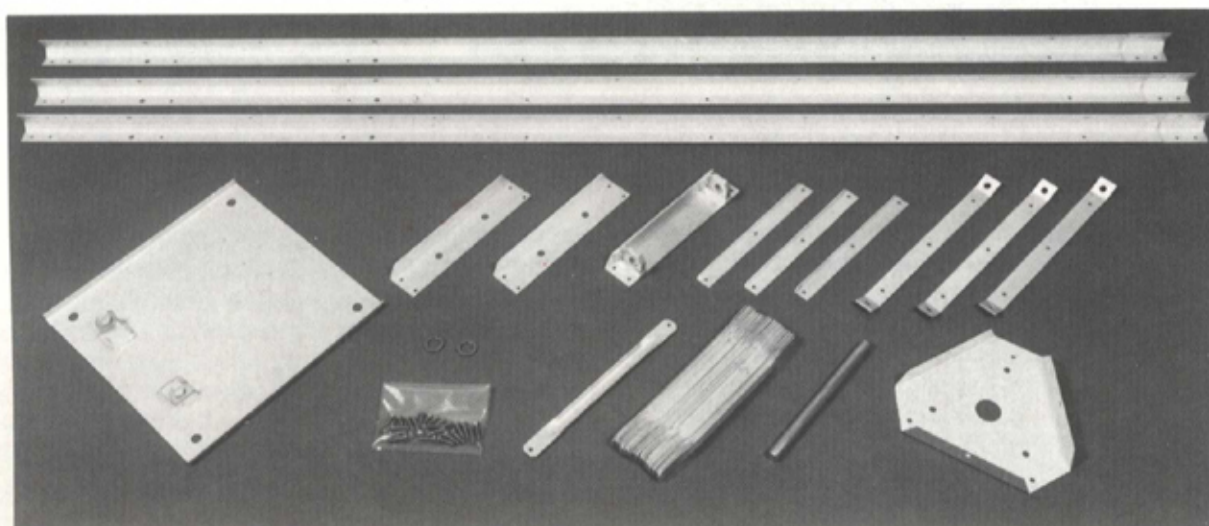
Lattice aluminium masts for fixed station use are supplied with galvanized steel guys, guy anchors and hinged aluminium base plate. Despatched in knocked-down form to minimize shipping volume, assembly is simple with stainless steel nuts and bolts supplied. Concrete foundations are only required on very soft ground. Lattice masts can be used without guys for heights up to 7.3m when used with lightweight top-loads.

For transportable applications, tubular aluminium masts utilize sections of 104mm OD tube and can be supplied with canvas carriers. Sections simply slot into each other and galvanized steel wire guys are attached to the mast during erection, these being terminated with screw-in guy anchors.

Erection kits, consisting of a derrick, stabilizing guys and a hand winch are available for all models and guys can be provided with insulated sections, if required. Terylene guys can also be supplied if specified.

These masts have a design load of 500N (vertical) and 1500N (horizontal) at a windspeed of up to 162 km/h and are supplied in 1.82m sections. The wind figure of 162 km/h relates to the fixed station version with guy anchors set in concrete blocks. Wind loading capability of the transportable version depends almost entirely on the efficiency of the guy ground anchors, which, in turn, depends on soil conditions.

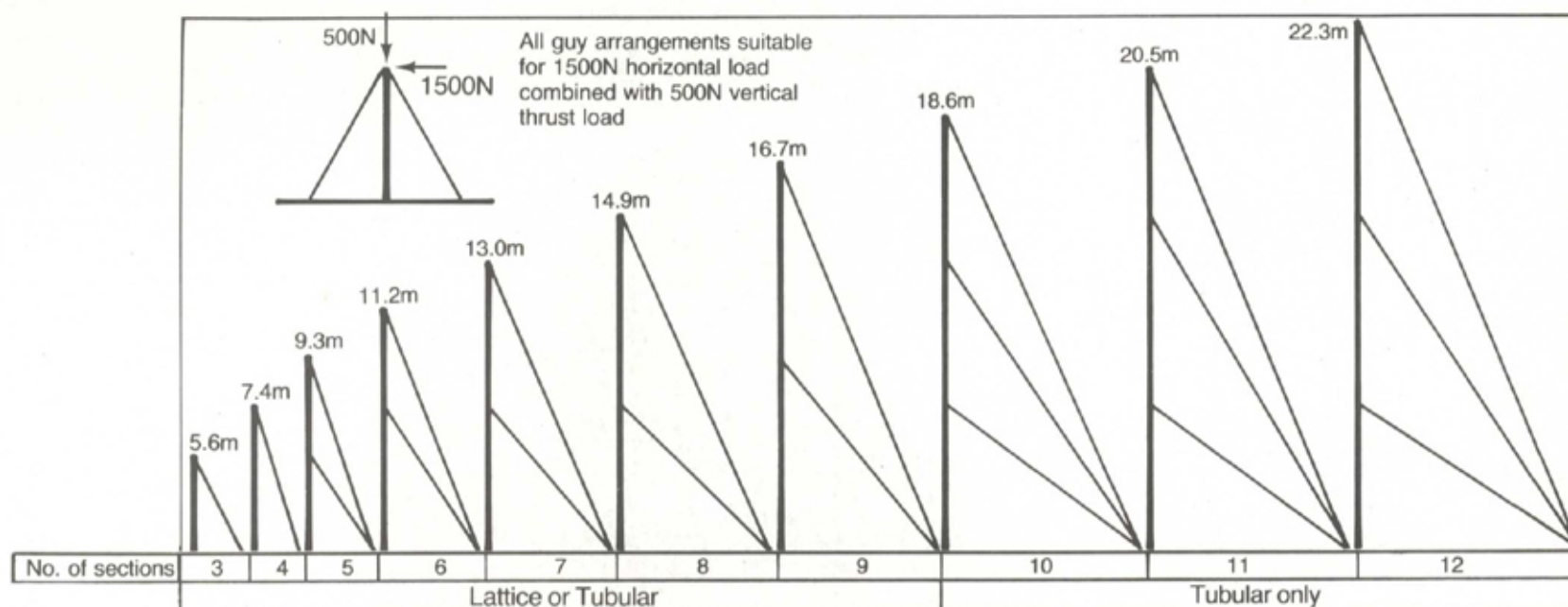
When ordering, it is only necessary to state the required height; a suitable guying arrangement to sustain the design load will then be supplied. Special guying arrangements can be supplied at extra cost where higher masthead loads are expected. These must be specified when ordering. Mast surface finish is normally bright aluminium but painted desert sand or olive drab finish can be provided if required. Alternatively, an orange and white finish to meet ICAO specifications for aviation obstruction can be supplied.



Typical tubular mast supporting HF antenna and balun.



Typical lattice mast supporting HF antenna and balun.



When ordering, state:

RA400 tubular/height in metres.
or RA400 lattice/height in metres.

MASTS & TOWERS

RA 440 "Mathweb" Fibreglass Lattice

The unique glassfibre construction of "Mathweb" sectional triangular lightweight lattice masts provides considerable benefits over similar steel constructions in many applications. Transparent to RF and having a strength-to-weight ratio of some four times that of steel. "Mathweb" masts require no painting, since colouration is introduced during manufacture, and minimal maintenance as the material is chemical and corrosion-resistant. Three-lane guying in alumoweld or dielectric material, with all fittings, can be provided; the number of guying points being dependent upon site conditions and mast loading. Self-supporting structures can also

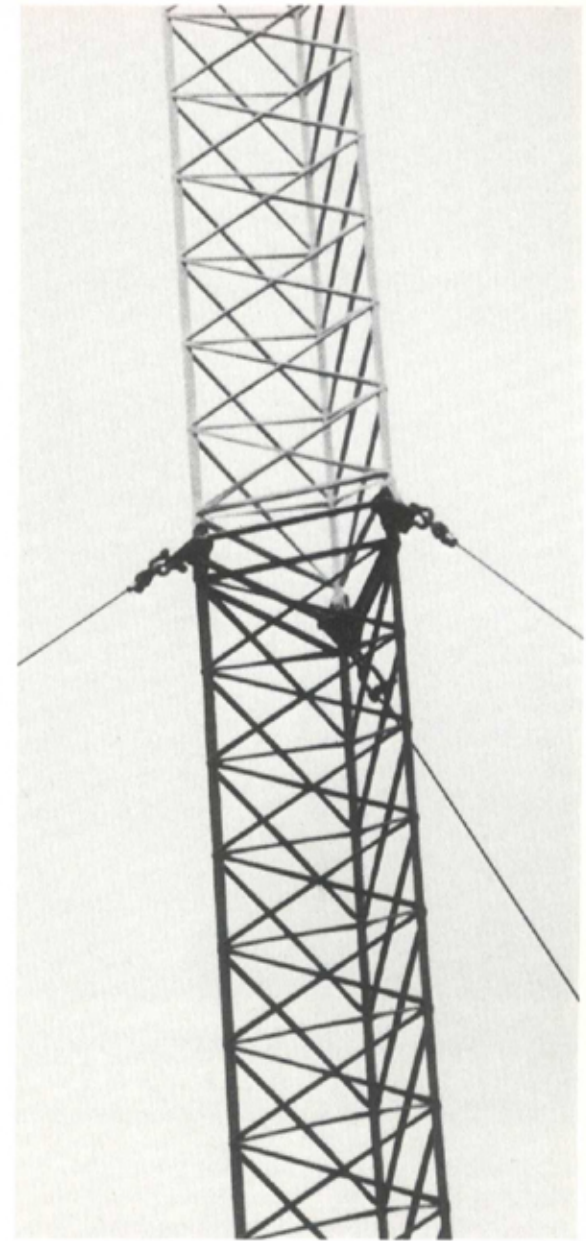
be provided for heights up to 9m; these are particularly suited to rooftop or marine applications. Each mast is supplied with a hinged base plate to facilitate erection. Design headloads for guyed masts are 150 kg (vertical) and 500 kg (horizontal), thus "Mathweb" masts are well suited for the support of larger wire antennas, microwave dishes, scanners and floodlighting arrays with wind areas up to 3 square metres. Windloading is 160 km/h. Maximum height, in most applications, is 36m although higher structures, up to 45m, are available.

Standard Guying Configuration				
Mast Height	9m	18m	27m	36m
Part No.	RA 441	RA 443	RA 444	RA 445
Guy Radius	6.3m	12.6m	18.9m	25.2m
Concrete Volume	1.8 cu. m	2.9 cu. m	3.9 cu. m	5.2 cu. m
Mast Weight (Less guys)	44 kg	77 kg	124 kg	183 kg

Mast sections are in lengths of 3 or 4.5 metres and are normally fitted with galvanized steel flange connectors. Stainless steel connectors can be provided if required.

Aviation obstruction light kits and erection kits are available as options. Colour of mast should be specified when ordering. Masts can be supplied in alternate orange/white sections if required.

*Mathweb is a trademark of the BP Group



"Mathweb" Tilt-Up Fibreglass Lattice

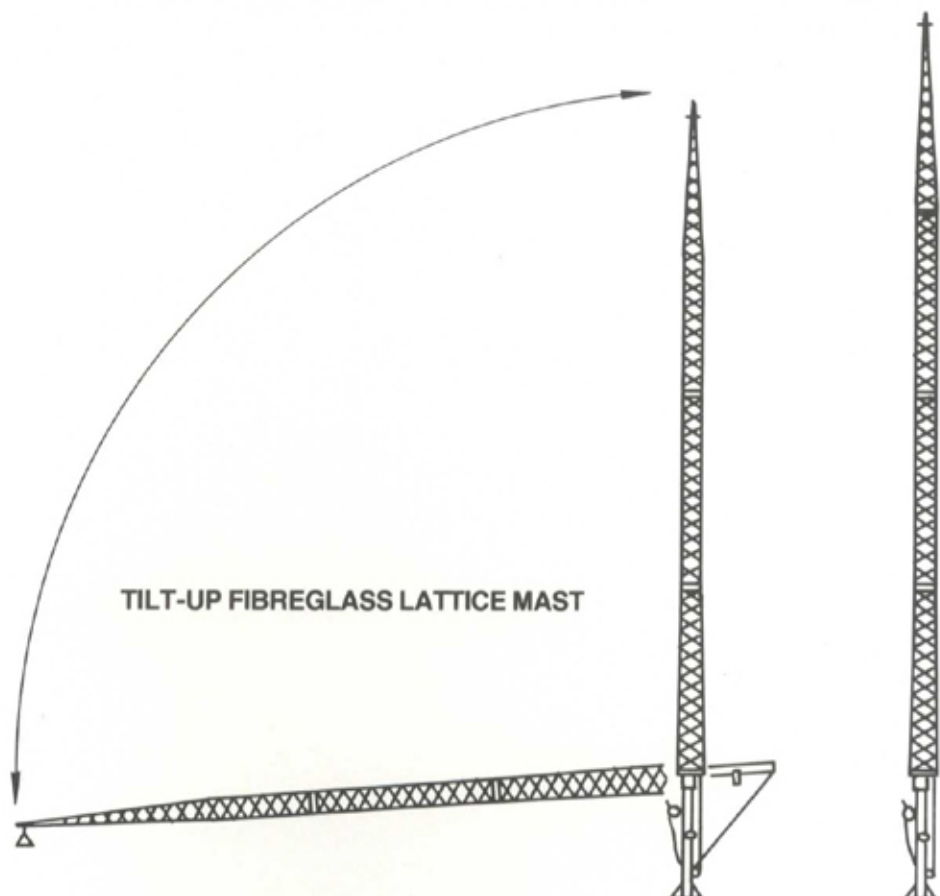
This range of hinged, self-supporting masts is constructed of Mathweb* fibreglass lattice sections and can support headload areas of approximately 0.38 square metres in winds of 162 km/h.

Available at heights of 6, 9, 12 and 15 metres, the masts can carry many types of VHF and UHF antenna array and are particularly useful at airports and communication establishments where the radio and radar translucency of fibreglass is an important factor when considering reduction of radar ground clutter and radiation pattern perturbations.

To give easy access to the masthead equipment, the mast is hinged on a 2 or 3 metre base post allowing it to be pivoted from horizontal to vertical under the control of a winch mounted on the post. The winch can be removed from the post when not required for use.

SPECIFICATION:

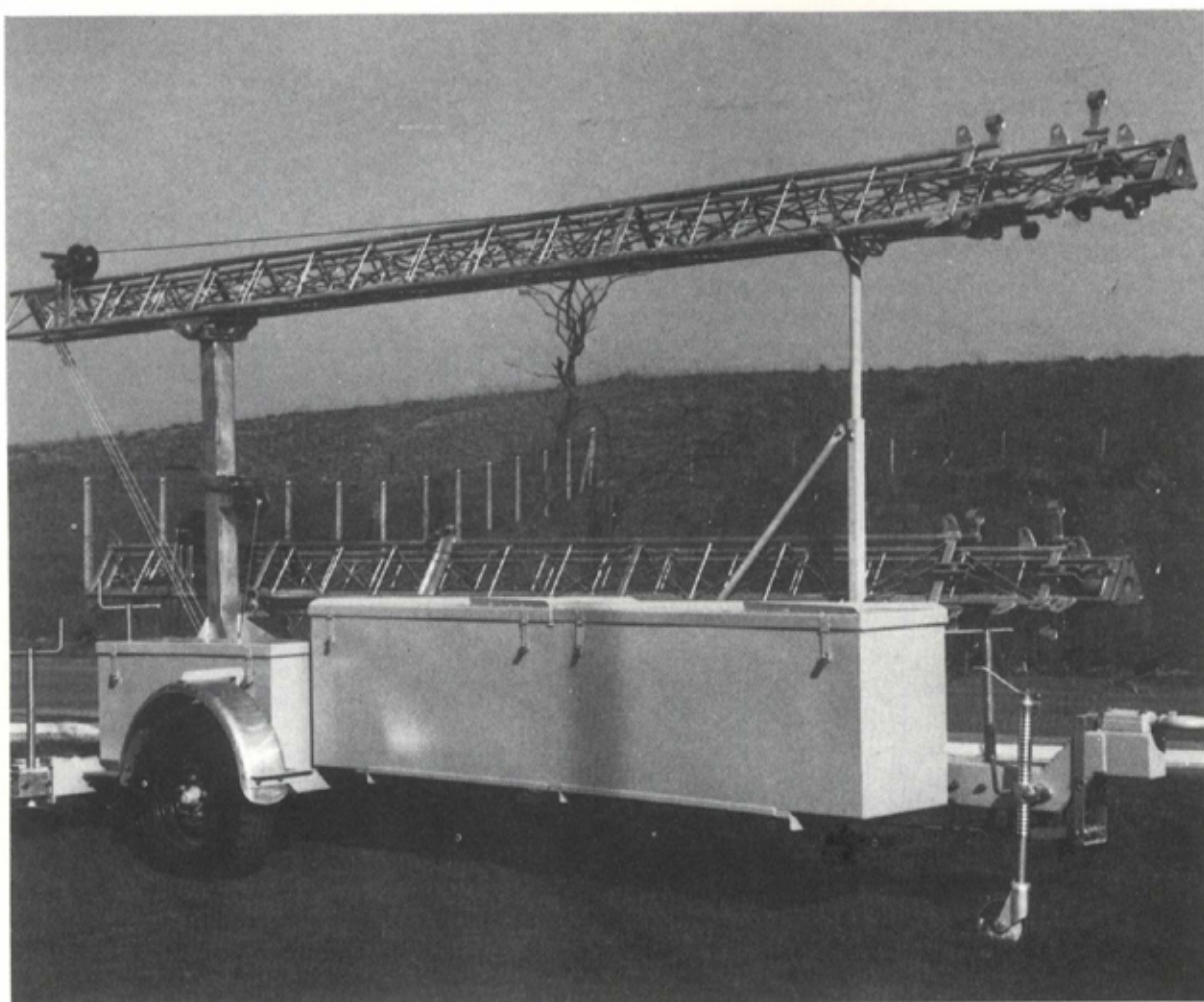
Headload weight: 22 kg
 Headload wind area: 0.38 square metres
 Survival wind speed: 162 km/h (100 mph)
 Top deflection: Less than 1/30th height at 96 km/h
 Face width: 450mm tapering at top to 235mm
 Sections length: 3 metres
 Colour: Self pigmented to customer requirement



*Mathweb is a trademark of the BP Group

MASTS & TOWERS

Versatower Telescopic Lattice



A comprehensive range of well-proven winch-up galvanized steel telescopic masts and accessories is available with fully extended heights of up to 36 metres and capable of supporting headloads of 56 kg.

Mast heights of up to 18 metres can be self-supporting or, in common with the taller structures, can be supplied with guying kits.

Trailer mounted versions can be manufactured for mast heights of up to 30 metres and trailers are supplied complete with all running gear, including lights and brakes.

A complete range of mounting gear, winches, pulleys, shackles and anchors is available for all Versatower models as are lighting kits and generating equipment.

**TRANS-
PORTABLE**



Mast Mounting Hardware

A complete range of brackets and fixings is available for attaching telescopic masts to shelters and soft-skinned or armoured vehicles. Standard items include fixings for Land Rovers to suit MA716, RA476, MA638 and RA456 series telescopic masts. Unless otherwise specified, brackets and mounting hardware are supplied in an olive drab finish.



**TRANS-
PORTABLE**

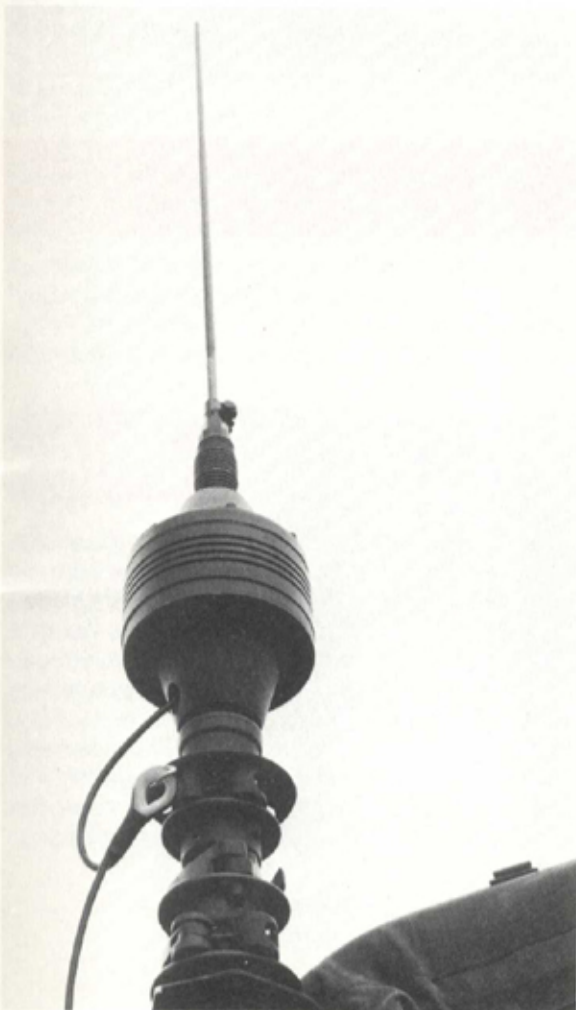
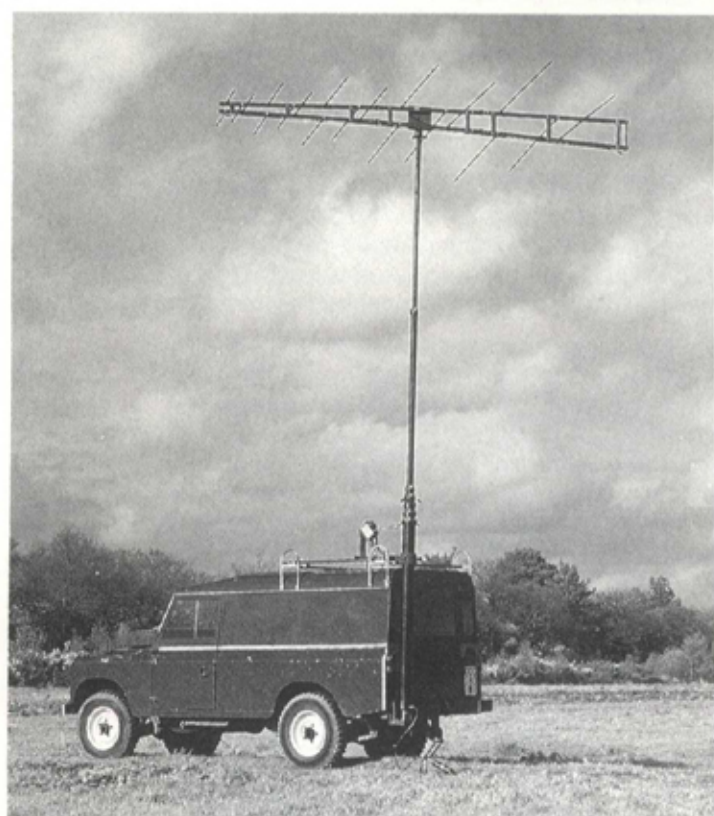
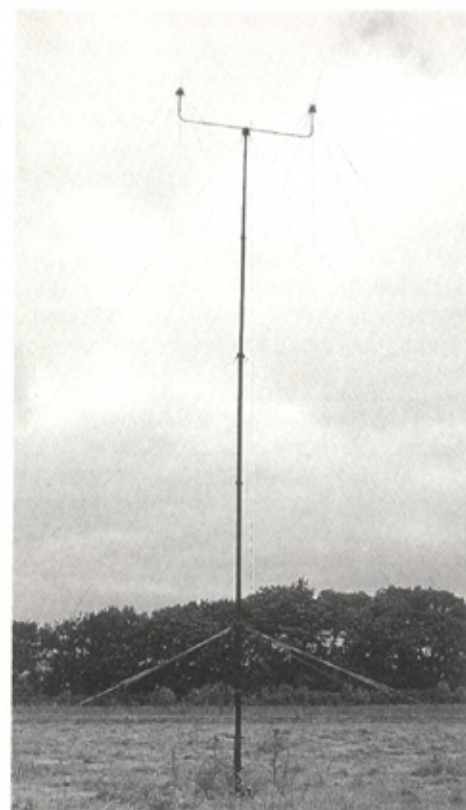
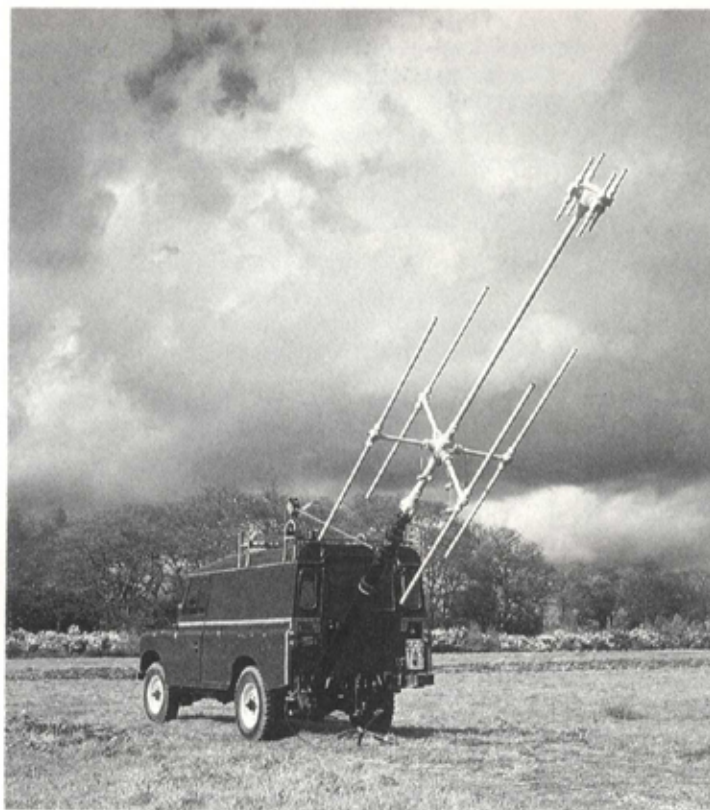
MASTS & TOWERS

Antenna/Mast Interface Systems

Racal Antennas Ltd can design and manufacture antenna mounting systems to meet a customer specification.

These may be for either fixed or transportable applications and can include rotation systems, tilt-over masts, dielectric guying, arrays of antennas, antenna switches etc.

Customers must give full details of their environmental requirements when using this service so that the design can be engineered to meet the expected wind and ice loadings.



ANCILLARIES

RA 545 Transmitter Power Splitter

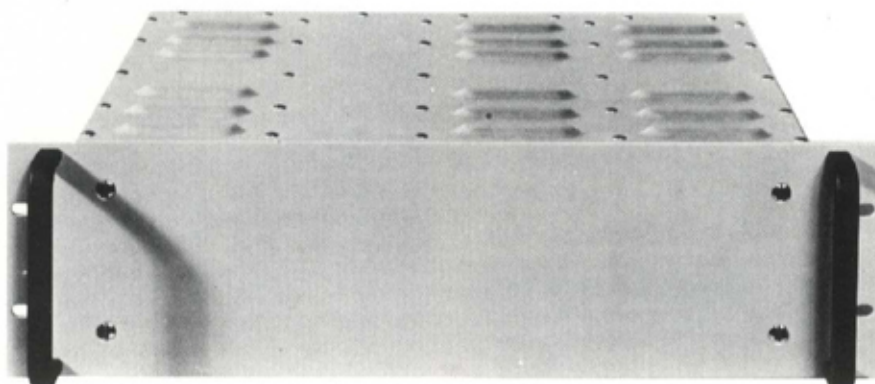
● Frequency Range:	2-30 MHz
● Power:	1 kW CW, 4 kW PEP
● VSWR:	1.2:1
● Inputs:	1
● Outputs:	3

This unit permits three antennas to be fed from a single transmitter and could be used, for example, where a single transmitter is required to give omnidirectional ground-wave coverage, short to medium range high angle radiation and, simultaneously, a low angle directional radiation pattern.

The RA545 consists of a 483mm (19in) wide rackmounted unit of height 134mm (5.25in) and 229mm (9in) depth with rear-mounted HN connectors. Externally mounted dummy loads are

available to terminate unused ports, if required. Unit insertion loss, per port, is less than 0.2 dB and the

splitting ratio is equal between each of the three output ports.



MA 1969 HF Transmit Multicoupler

● Frequency Range:	100 kHz-32 MHz
● Power:	1 kW mean per channel*
● Isolation:	30 dB minimum
● Insertion Loss:	0.5 dB maximum
● Connectors:	HN type

*10 kW model also available

The MA1969 HF Multicoupler enables a single wideband antenna to be fed simultaneously from two separate transmitters working at different frequencies.

The unit consists of a high pass and low pass filter, each connected to a common output. With one transmitter tuned to operate in the pass band of each filter, there is an isolation of at least 30 dB between them and therefore negligible interaction.

The frequency at which the cut-off of the high pass filter crosses the cut-off of the low pass filter is pre-determined by the design of any particular model. There is a narrow band of frequencies on each side of this cross-over point which should not be used as, in this band, the isolation between the two channels is less than 30 dB. This region typically occupies a band of frequencies equal to 16% of the cross-over frequency.

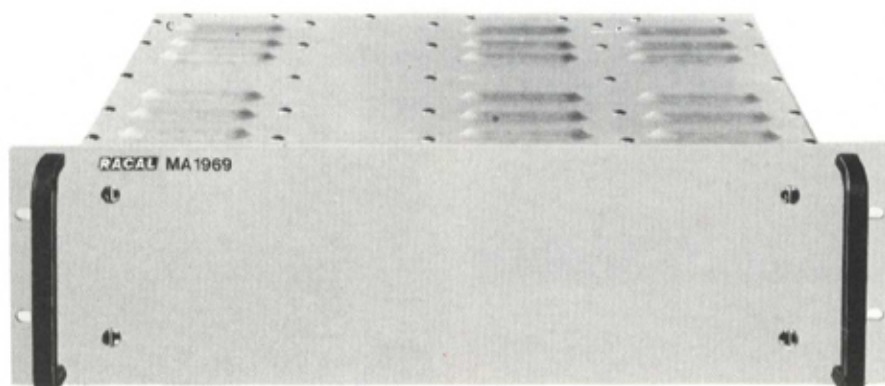
Each filter has a very low insertion loss and the two transmitters may operate at different power outputs, provided that the power rating at each channel is not exceeded.

It follows that filter type multicouplers are not suitable for combining signals at a common frequency.

A further method of use of filter type multicouplers is to feed a single transmitter into the common port. Depending on the frequency of the transmitter, the

output will appear at one or other of the remaining ports. In this way the transmission can be routed to different antennas depending on the frequency in use.

Dimensions			
Height	Width	Depth	Weight
133mm	483mm	350mm	4.5 kg



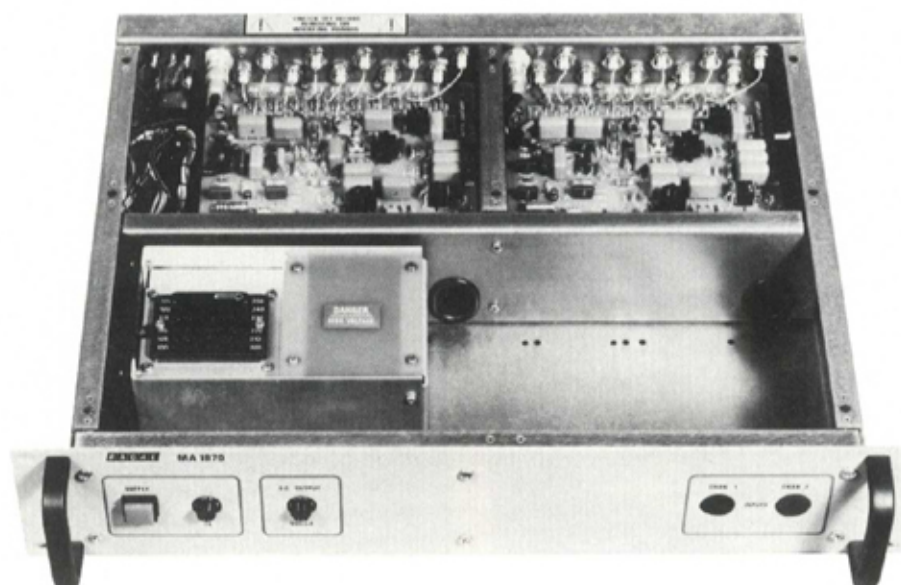
MA 1970 HF Receive Multicoupler

● Frequency Range:	100 kHz-30 MHz
● No. of outputs:	MA1970A - 20 MA1970B - 40 MA1970C - 2 x 20
● Gain:	0 to + 2 dB per outlet
● Impedance:	50 ohms
● Noise figure:	8 dB maximum

The MA1970 HF Receiving Antenna Multicoupler is used when it is required to feed a number of receivers from a common antenna input. The 'A' and 'B' versions provide 20 and 40 outputs respectively from a single antenna input, while the 'C' version provides 2 x 20 outputs from 2 antennas.

The multicoupler, designed for 50 ohms working, has a minimum isolation between output and input of - 40 dB with at least 30 dB isolation between any two outputs. Second and third order intermodulation products are - 80 dB relative to either of two 100 mV EMF signals. The device will withstand a continuous CW signal of 30V RMS at the input without damage. A spark gap is provided to handle static discharges of 2 kW. The multicoupler can operate from 24V DC; 100-125V AC or

200-250V AC 40-60 Hz, and fits a standard 483mm rack. Height is 89mm, depth 355mm and weight 7.3 kg approximately.



ANCILLARIES

Receive Antenna Distribution and Switching System

- Frequency Range: 100 kHz-30 MHz
- Gain: - 0.5 to + 2 dB per outlet
- VSWR: 1.7:1 maximum
- Isolation: Better than 50 dB at 30 MHz

The Racal Antenna Distribution and Switching Equipment provides a flexible, easily expanded system for distributing RF signals in the range 100 kHz to 30 MHz from one or more antennas to any number of radio receivers, with the facility for each radio operator to select the required antenna by means of a control switch at the operator position.

The system uses the well-proven Racal MA1970 Multicoupler to provide multiple outputs from each antenna and these are fed to coaxial switch units which are controlled by low voltage DC signals from the switch at the operator position. The coaxial switch units contain reed relays sealed in nitrogen-

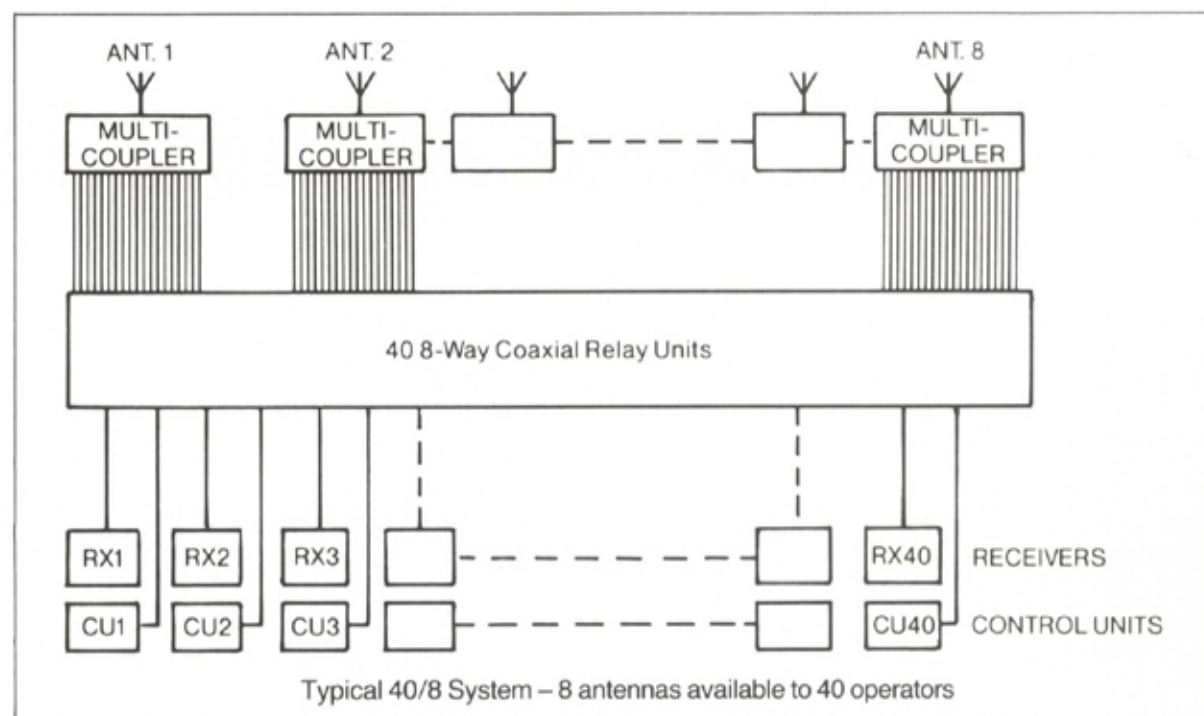


filled glass tubes and housed in an anodized aluminium relay assembly. This arrangement gives low insertion loss and high isolation, together with high reliability and has minimal effect on the VSWR. Unselected channels can be automatically terminated in a load resistor if so desired. Band pass filters, with a pass band of 2 MHz to 30 MHz can be fitted if it is required to exclude strong local MF signals.

Systems are available to satisfy most user requirements and are designed with a view to easy expansion if the need arises. By using standard rack

configurations, containing various quantities of multicouplers and switching units, it is possible to build up a system to almost any required size.

At the receiver position, selection of antennas is achieved by operation of a simple control unit connected to the central switch racks by a multi-core cable. Only this cable and one coaxial cable carrying the RF receiver input are required to each receiver position.



HF Balun Transformers

- Frequency Range: 1.5-32 MHz
- Power: 25 kW PEP
- Insertion Loss: Less than 0.25 dB
- VSWR: 1.3:1 maximum
- Load VSWR: 2.5:1 maximum
- Impedance match: As required

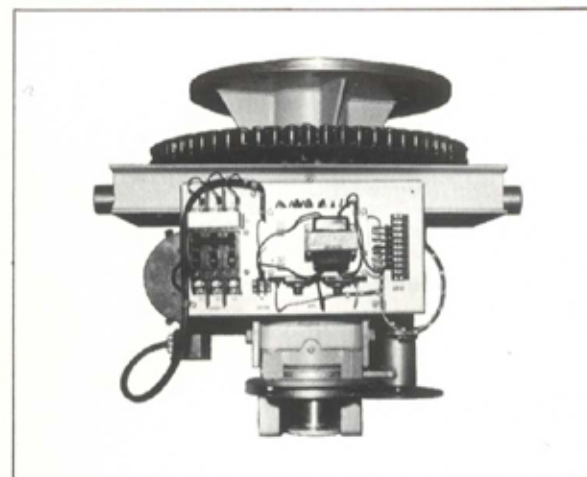
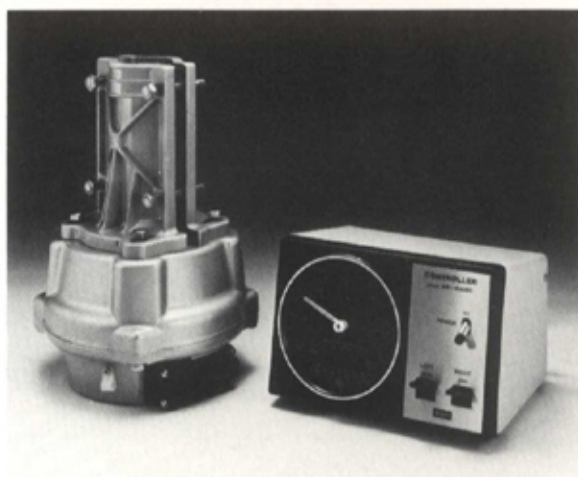
HF baluns are available in a wide range of power ratings from 10 W to 25 kW to match all known impedances. Units for use up to 300 W can be supplied with built in strain relief for the antenna feeder connection on dipole antennas. Units up to 10 kW are solidly encapsulated, air cooled and can be mounted in any position.

Above 10 kW, units are fitted inside a hermetically sealed oil filled housing with a bracket mounting. Terminations can be to customer specifications. The standard range covers 50 or 75 ohm unbalanced, to 200, 300 or 600 ohms balanced, with or without a centre tap. A range of receiving antenna couplers and hybrid transformers is also available. Alternative impedance configurations can be supplied on request, and an earthing point is provided when required.



Antenna Rotators

A series of rotators is available for use with Racal supplied antennas or as a package to interface with existing masts and antennas. These are available in a variety of configurations and supply voltages for use worldwide. Options are either 12 position or continuous rotation through 360°, torque up to 4.52kN and local, extended or remote control of antenna rotation. Remote control may be by Racal SCORE system and this consists of a local and remote control unit Type MA 1966/1967. SCORE is compatible with modems using CCITT V.28 format.



ANCILLARIES

Coaxial Cable Junction Units, Insulators, Wire, Pickets, etc.

A range of coaxial cable junction units for use with dipole antennas with a rating of up to 1 kW Av/PEP and strain up to 680 kg is available for customers spares or for making up into antennas.

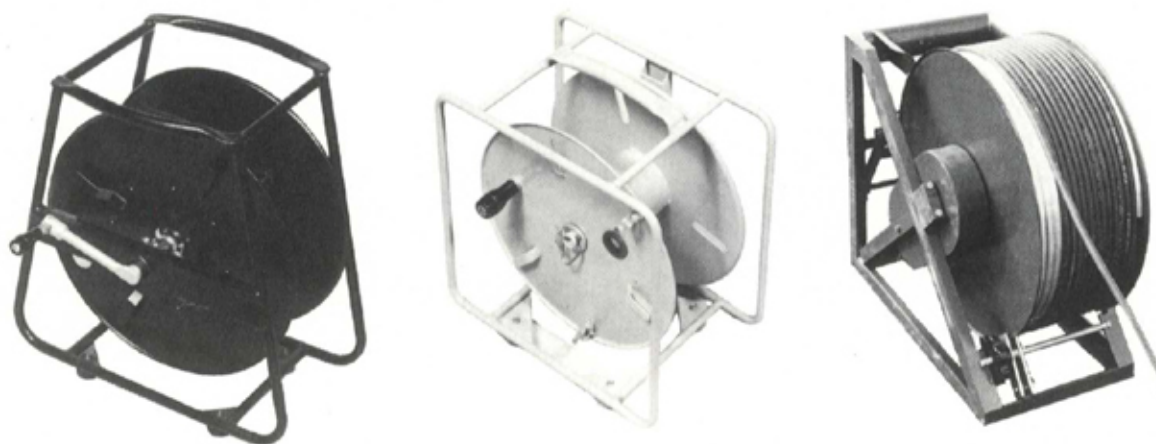
Racal Antennas is able to supply insulators in ceramic or polypropylene, pickets, ground spikes, ground screens, spring clips, thimbles, stay adjusters, wire and braided terylene for antennas and ground screens and a range of halyard and guying materials in synthetic fibres from nylon to terylene.



CD Cable Drums

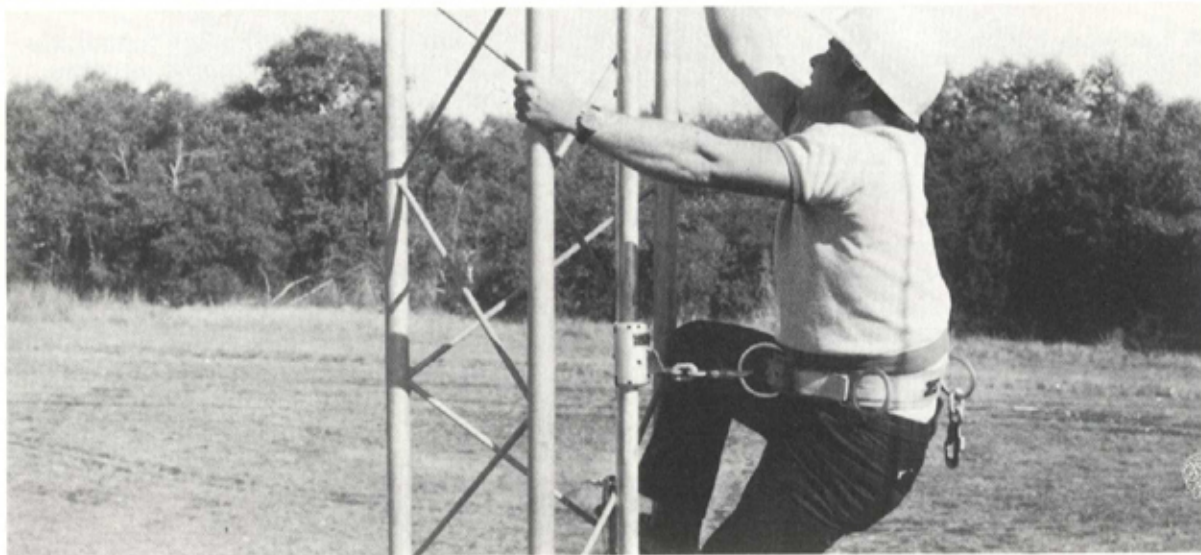
A series of cable drums which will accommodate up to 100m of 13mm cable are available. All drums have the facility for connecting to both ends of the cable without having to rewind the whole cable. Additionally all drums can be locked to prevent accidental unwinding of the cable during transit. A spring-tensioned self-winding cable drum is available for short lengths of cable.

**TRANS-
PORTABLE**



Safety Climbing Equipment

The equipment comprises a precision aluminium sleeve which is positioned on a rail attached to the structure. The system gives maximum safety on all types of ladders, wood and metal poles, masts and similar structures. The sleeve which has five precision stainless steel ball bearings to allow it to run freely on the rail, also has a spring-loaded aircraft grade stainless steel pawl which engages the notches on the rail. The rail is notched every 150mm. The padded belt harness, made of moisture and fungus resistant webbing, is designed to protect the wearer against slip out and is attached to the sleeve by a forged steel link and double locking hook. Safety climbing rails are available in 6061-T6 aluminium, hot dipped galvanized carbon steel or stainless steel for compatibility with the existing structure.



To
Racal Antennas Ltd.

Please send information on the following products:

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.....
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Name:.....

Company:.....

Address:.....

.....

Tel:..... Date:.....



To
Racal Antennas Ltd.

Please send information on the following products:

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Racal Antennas Ltd.

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Name:.....

Company:.....

Address:.....

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Tel:..... Date:.....



RACAL ANTENNAS LTD.,
FIRST AVENUE,
MILLBROOK TRADING ESTATE,
SOUTHAMPTON,
HAMPSHIRE,
SO1 OLJ,
ENGLAND.



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MILLBROOK TRADING ESTATE,
SOUTHAMPTON,
HAMPSHIRE,
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SOUTHAMPTON,
HAMPSHIRE,
SO1 OLJ,
ENGLAND.





MINISTRY OF DEFENCE

Defence Quality Assurance Board

This is to Certify that

RACAL ANTENNAS LIMITED

*has been registered as complying with the
Quality Assurance Requirements
specified in*

DEFENCE STANDARD 05-21

Registration Number

103R03

This Registration is valid until
31.03.2005
and covers the
products/services for which
you have been assessed.



P. C.
DIRECTOR GENERAL QUALITY ASSURANCE

K. Bannock
DIRECTOR
CONTRACTOR AGREEMENT INSPECTOR

This certificate is the property of the Ministry of Defence (Operations) Directorate and is to be retained on RACAL files.

QUALITY CONTROL

The quality control procedures are in strict accordance with Defence Standard 05-21 (Register No. 103R03).

This ensures that all test equipment is calibrated to traceable standards and that development contracts are carried out to a controlled and well-defined procedure.



MANUFACTURING FACILITIES

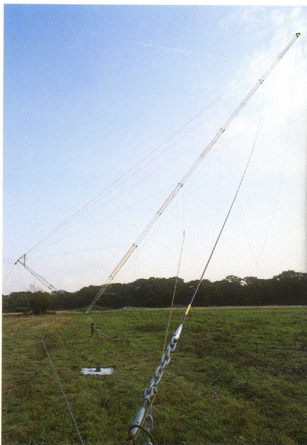
The Racal Antennas factory is located at Southampton, with good access to road, rail and sea port facilities. The factory covers an area of 35,000 square feet and includes a modern painting and stove enamelling process facility.

Administration, design, production and shipping facilities are all housed in a single building permitting continuous liaison between departments and ensuring that orders are processed without delay.

SYSTEMS PLANNING AND INSTALLATION

Racal Antennas can provide a full System Planning and Installation service including design of antenna system, for fixed station, mobile and transportable applications.

Engineers can be made available for site survey, propagation analysis, installation supervision and system commissioning. An experienced rigging team is available for erection of all types of antenna.



DISTRIBUTOR:



Racal Antennas Limited, First Avenue, Millbrook Trading Estate,
Southampton SO1 0LJ, Hampshire, England.
Telephone: 0703 705705 Telex: 47476

RACAL