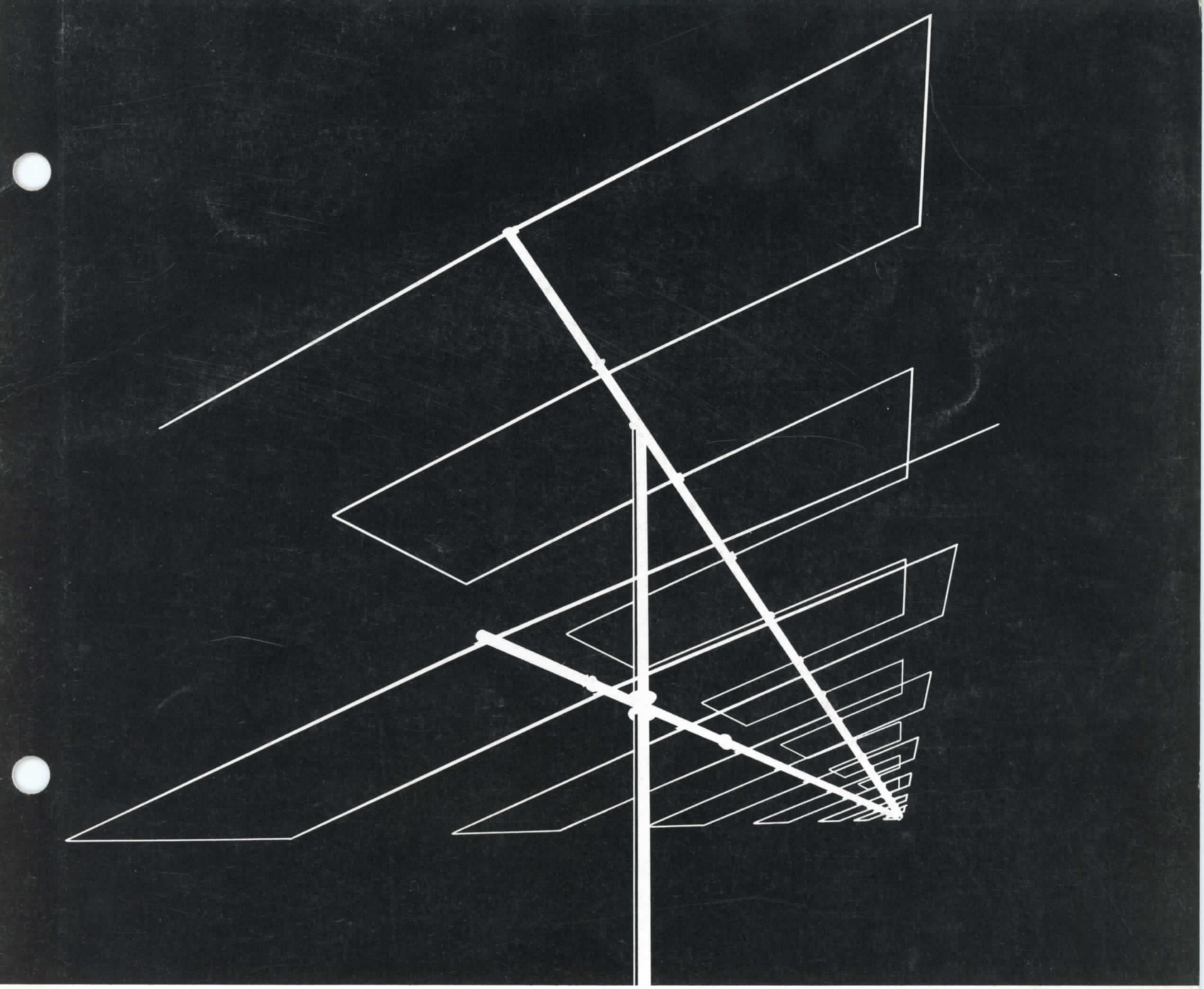
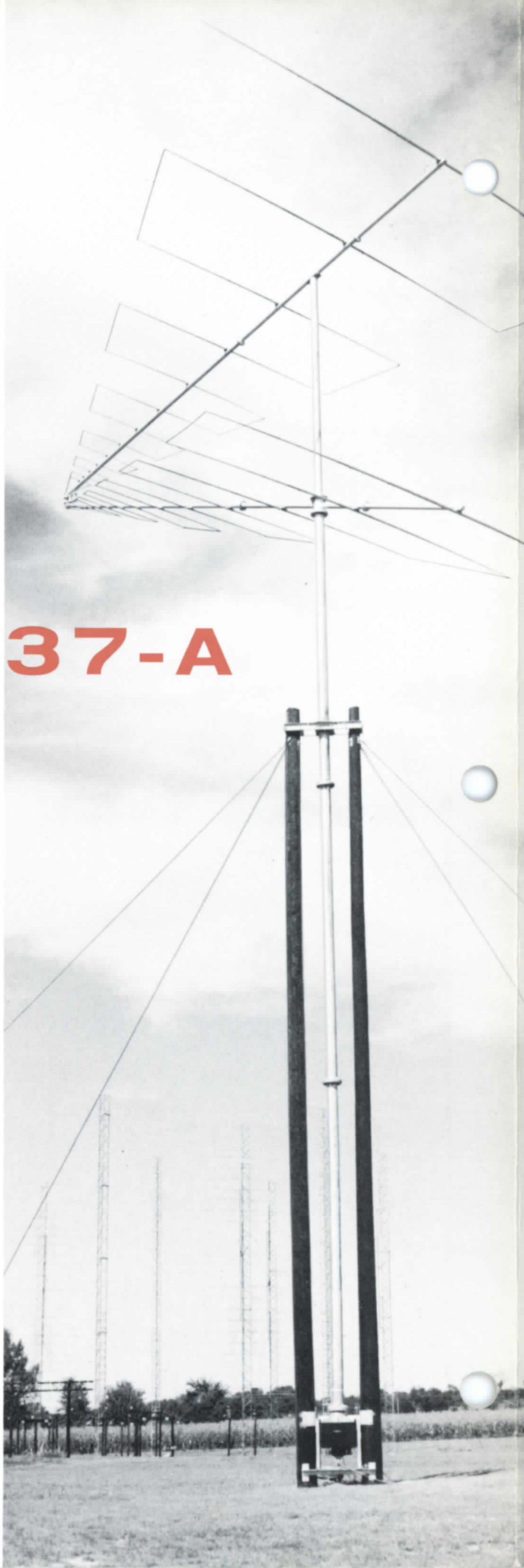


COLLINS 237-A

UNIDIRECTIONAL ANTENNAS

CREATIVE LEADER IN COMMUNICATION

COLLINS



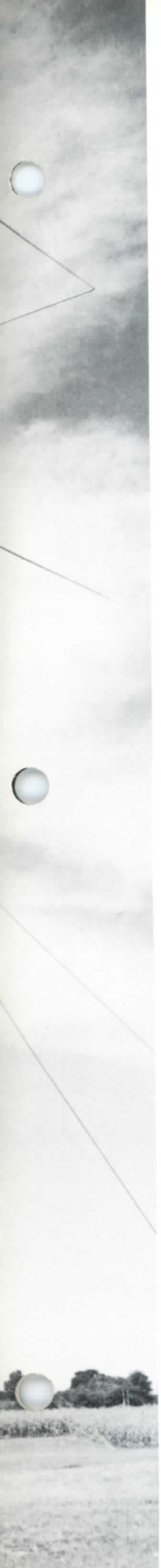
COLLINS 237-A

UNIDIRECTIONAL ANTENNAS

Collins 237A Antennas, with extremely broadband electrical characteristics, are especially suited for use in military or commercial communication networks requiring a wide range of operating frequencies. The 237A-1, 237A-2 and 237A-3 Antennas cover the 6.5-60 mc, 11.1-60 mc and 19-60 mc frequency ranges, respectively.

The antennas provide a horizontally polarized, unidirectional beam, having an average gain of 8 db over an isotropic antenna, with side lobes 16 db down. Free space radiation patterns and input impedance are essentially independent of frequency. The peak power handling capability of each antenna and its transmission line is 50 kw, with a VSWR of less than 2:1 over the full frequency range.

Rigid aluminum elements together with aluminum and galvanized steel booms are utilized in the antenna structure for weight reduction and high mechanical strength. Elements and booms are arranged in two planes, which are separated by a specified angle. The 237A Antenna is lightweight and may be mounted on a fixed or rotatable, vertical mast to permit maximum flexibility of application and multidirectional operation.



FEATURES

BROADBAND HF COVERAGE eliminates the requirement for several antenna structures at a communication facility.

HIGH PERFORMANCE comparable to a four element Yagi over the entire frequency range.

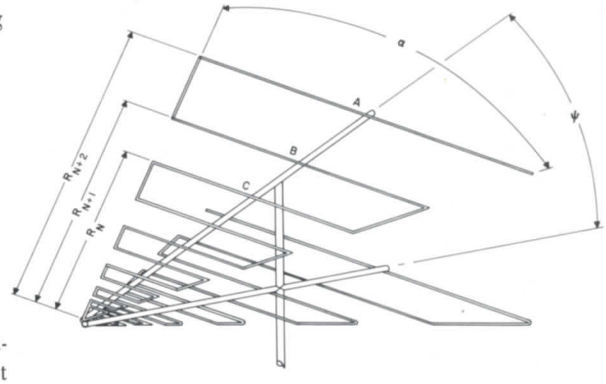
CONSTANT IMPEDANCE and uniform radiation patterns over the entire bandwidth of the antenna insure high performance.

DIRECTIONAL OPERATION is facilitated by full 360° azimuthal coverage using a reversible rotating mechanism and continuously rotatable transmission line connection. Remote systems for azimuth control are available, if desired.

LONG LIFE and consistently reliable performance in extreme environmental conditions is assured by rugged mechanical construction.

TILT UP MAST and antenna permit rapid erection without the need of heavy construction equipment.

ANTENNA CONFIGURATION



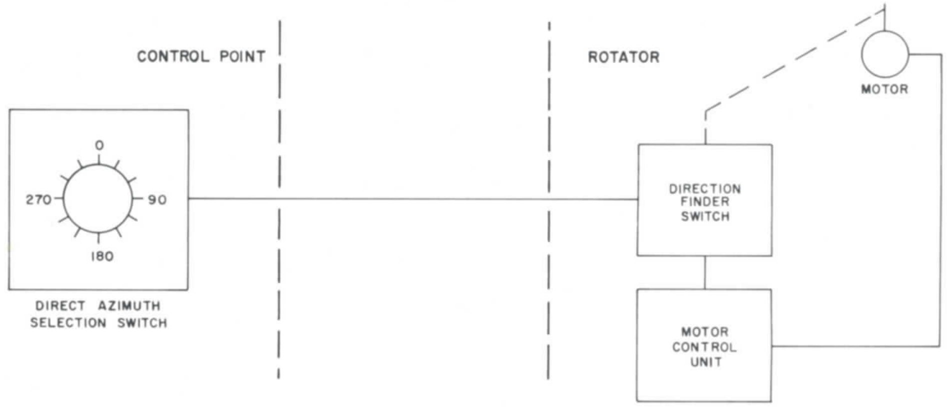
The geometrical configuration of the 237A Antennas enables the electrical characteristics to repeat periodically with the logarithm of the frequency. Since the variation of performance characteristics is small throughout one period, and because of the repetitive nature of the antenna, the variation in performance will be small throughout all periods. The result is an antenna with input impedance, gain characteristic and radiation patterns essentially independent of frequency.

The two structures comprising the 237A Antenna are formed by step-tapered aluminum tubing with their extremities alternately connected by radial tubes and their centers fastened on a boom running the length of the structure.

The 237A is horizontally polarized and produces a beam in the direction which the antenna points. The two halves of the antenna structure are fed against each other at the vertices by a coaxial transmission line which is contained in the lower boom. The low frequency limit of the antenna occurs when the longest transverse element is approximately ½ wavelength long. As frequency is increased, a smaller and smaller portion of the antenna is used to produce the beam. As one progresses from the feed point, it is found that the currents drop off rapidly after the point where a ½ wavelength long transverse element exists. The high frequency limit occurs where the shortest transverse element is approximately ¼ wavelength long.

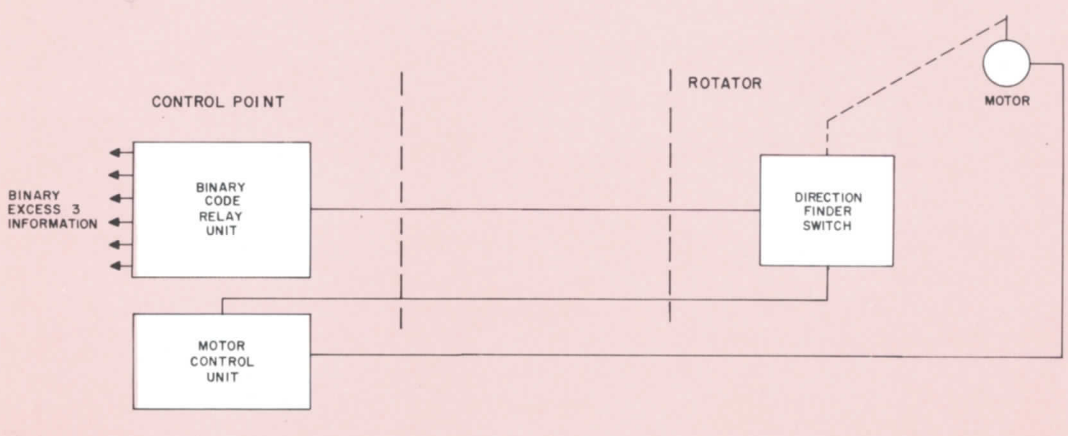
The two triangular halves have the ends of the transverse tubes defined by the angle α and the angle between the two halves denoted by ψ. The third defining parameter of the antenna is the design ratio τ which is equal to $\frac{R_n}{R^{(n+2)}}$. The periodicity of the structure is defined by this ratio. If the structure were infinitely long, it would appear exactly the same to a generator located at the feed point each time the frequency is changed by the factor τ, indicating that the input impedance or radiation pattern repeats each time the frequency is changed by this factor. A period of frequencies is defined by the frequency band of τ f to f.

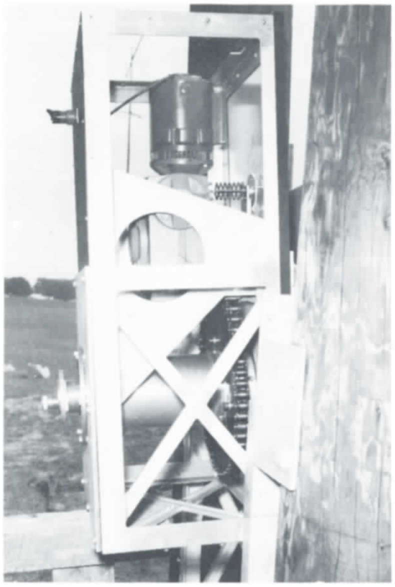
The design parameters especially selected for the 237A Antennas include high gain, low side lobes and low VSWR in a structure of moderate size. In the 237A-1 α is 67.5°, ψ 37° and τ 0.6°; the 237A-2 and 237A-3 factors are identical except that α is 60°. For a fixed ψ angle, the gain of the antenna could be increased by decreasing α. To increase gain, the boom would have to be lengthened and the number of elements increased, since the last element must be ½ wavelength long. The values of α equal to 67.5° and 60° were chosen as compromises between size and gain. For a fixed α angle, the angle ψ controls the gain and the front-to-back ratio or side lobe level. As ψ is increased from a small value, the gain increases but the side lobe level also increases. The angle ψ was set at 37° to maintain the side lobe level at an average value of 16 db down. Approximately 1 db of gain might be realized by increasing ψ to 50°; however, the side lobe level would increase approximately 8 db or 10 db. With α at 60° the parameter τ must be greater than approximately 0.4 to obtain essentially frequency independent operation. As τ is increased, the gain of the antenna will also increase, but the number of elements and amount of material in the antenna must be increased. The value of 0.6 was selected as it represents the approximate point of diminishing returns when considering gain and weight of the antenna structure.



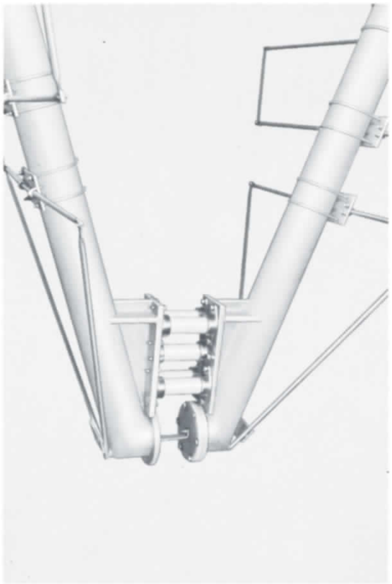
Direct control of azimuth selection is provided by the 143A-1 Control System.

The 143B-1 Control System utilizes binary code information for azimuth selection.

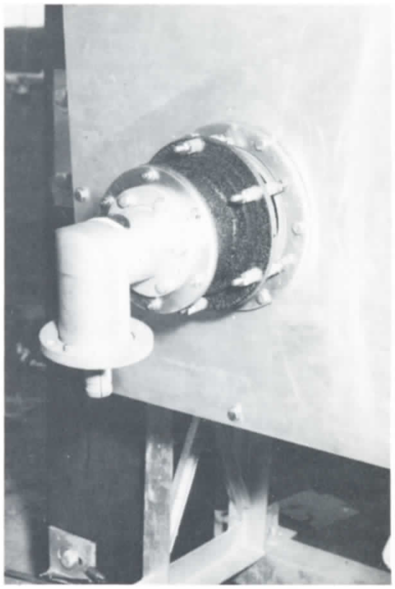




Easily accessible rotating mechanism is mounted at base of antenna.



Antenna sections are secured at feed point by sturdy ceramic insulators.



A rotary coaxial joint located on the rotator assembly connects to a 3⅛″ transmission line.

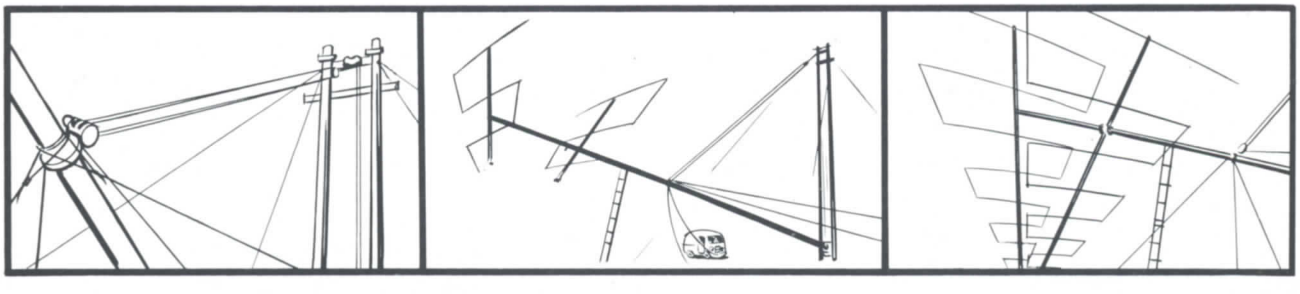
ACCESSORY EQUIPMENT

143A-1 and 143B-1 AZIMUTH CONTROL SYSTEMS

These control systems provide remote selection of azimuth in 30° steps when used with an antenna rotating mechanism. Following choice of azimuth by a switch, the antenna is automatically rotated in the shortest direction to obtain the desired azimuth. A circuit is provided to energize an indicator lamp when the desired direction has been obtained and rotation stopped.

The 143A-1 system uses a direct azimuth selection switch which may be mounted in a panel or control console. It is connected to a direction finder switch through a multi-conductor cable. The direction finder switch, mounted in the rotator housing, supplies run and reverse information to the motor control unit until a desired azimuth situation is obtained.

The 143B-1 employs a binary code relay unit to convert binary information to direction information for the direction finder switch. The relay unit is located at the control point. Control systems are available for use on either 115 volt, single phase or 220/440 volt 3 phase power sources.



Antenna mast suspended by rope, block and tackle in initial step of erection. The elements may be assembled at ground level.

Antenna is then arranged and mounted on mast as a second step. All elements under 15′ long are factory assembled, simplifying installation.

Raising of assembled antenna completes the easy installation of 237A. Necessary mechanical power may be supplied by a winch truck.

Part No.

SPECIFICATIONS

Antenna	Frequency	Longest Element (ft.)	Boom Length (ft.)	Tower Height (ft.)	Weight* (lbs.)
237A-1	6.5-60 mc	80	52.5	105	6000
237A-2	11.1-60 mc	46.8	41	84	4200
237A-3	19.0-60 mc	28.1	24.5	56	2800

*Weight of entire assembly less supporting poles.

Power Capability: 25 kw — average; 50 kw — peak.

VSWR: Less than 2:1 throughout the frequency range.

Free Space Antenna Gain: 6 db over a dipole.

Free Space Half-Power Beamwidths: Azimuthal plane — 65°, average value. Vertical plane — 90°, average value.

Polarization: Horizontal.

Side Lobe Level: −16 db, average.

Cross Polarization: −16 db, average.

Input: 50 ohm, 3⅛" coaxial line.

Antenna Coaxial System: 3⅛" or larger lines.

Wind and Ice Loading: 80 mph wind with ¼" radial ice.

Mounting Structure: 2 utility poles and rotating mechanism (steel towers optional). Fixed tower mounting also available.

Rotation: 1 rpm rotation, reversible, with rotary coaxial joint.

Part No. 056 0561 00 WP—8M—10-59

Printed in U. S. A.