ZIG ZAG

ANTENNAS FOR UHF BROADCASTING

JAMPRO

ANTENNA CO.

A Division of Composite Engineering Corporation

6939 POWER INN ROAD

SACRAMENTO, CALIFORNIA

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FOR UHF BROADCASTING

JAMPRO

ANTENNA COMPANY

FOREWORD

For the past ten years, Jampro Antenna Company has been exclusively engaged in the design, test and fabrication of TV and FM antennas for the broadcasting industry. It has concerned itself with other closely related items, such as diplexers, harmonic filters and filterplexers.

Its staff engineers have worked in TV stations, have done consulting work and are very familiar with TV antenna problems. The engineering staff includes several graduate antenna design engineers, with years of engineering experience on batwing, screen dipole, corner reflector, slot, vee and zig zag antennas.

This personal knowledge with all phases of antenna design, manufacturing, and tests, makes Jampro qualified to turn out the best product for the lowest cost. Antennas are not a side line with Jampro. They are its only basic product.

At the time this catalog was printed, Jampro FM and TV antennas were located in 59 foreign countries. This also includes eighteen foreign governments using Jampro antennas. Over 600 Jampro antennas are in use in the United States. The various government agencies using Jampro antennas, include the Department of Defense, U. S. Navy, U. S. Air Force, NASA and FAA. Jampro is qualified with experienced personnel to meet your exacting antenna requirements.

CONTENTS

JAMPRO UHF ZIG ZAG ANTENNAS

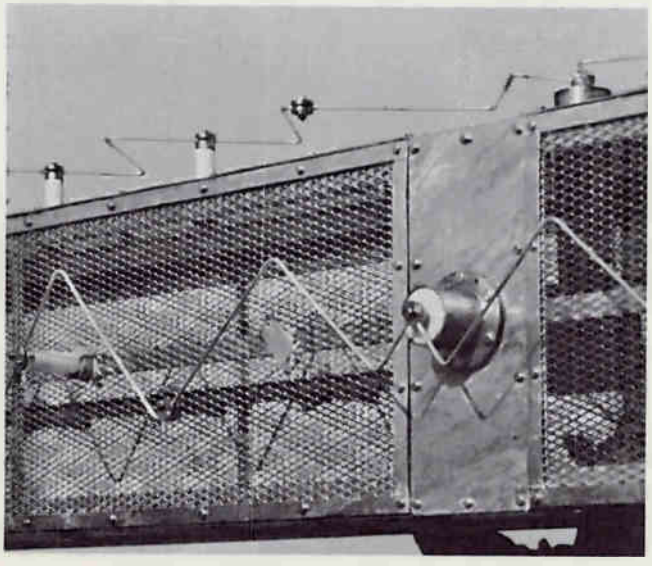
DESCRIPTION

The Jampro Zig Zag antenna consists of a number of panels arranged around a steel supporting tower. Each panel may be treated as a separate unit of the antenna. Thus great flexibility of horizontal patterns and vertical patterns is available. The antenna therefore can be custom made for each coverage requirement, at great savings in price over a slot or side fire helical type of antenna.

The zig zag panel consists of a rectangular shaped reflector with two zig zag shaped radiating conductors mounted on insulators, and spaced a small fraction of a wavelength from the panel.

The traveling wave principle is used to excite the large aperture from a single feed point. This feed system results in simplicity, with inherent high power capacity. Each panel is complete and in itself electrically independent. A great flexibility in application is achieved through this building block approach. Almost any desired antenna pattern can be achieved by the proper placement of the panels relative to each other, and by varying the relative power and phase to each panel. The large aperture of each panel is fed from a single feed point. This makes the antenna very simple for a mechanical feed system with a maximum of four points per bay.

The zig zag antenna is not a new development nor is the idea and use a new one. In 1929, a Frenchman, H. Chireix developed an antenna, using a series of dipoles, disposed in the form of a sawtooth. This was better than a series of dipoles, which required individual feeds since each half wave element was driven by the one preceding it.



Zig zag radiating element with feed stub backed by screen reflector.

In 1939, Chireix together with another Frenchman, Mesny, backed the zig zag with a screen reflector thereby making the first unidirectional antenna using this type of radiating element with its simple feed system. The antenna found favor in Europe during World War II and was adapted to VHF television in the late 40's and early 50's. It is now being manufactured by several different firms for UHF and VHF television use. Advantages include wide band pattern stability, low VSWR and more flexibility in patterns than the slot or helical type antennas.

BASIC RADIATING ELEMENT

The basic element of the zig zag panel consists of 16 linear radiators, each a half wavelength long and arranged in a zig zag form, hence the name. The angle between the elements and the horizontal plane is 30 degrees. The current distribution of this antenna can be resolved into reinforcing horizontal and opposing vertical components. While the electric fields are produced by the opposing vertical current components and cancel, the horizontal currents give rise to a horizontally polarized radiation field with a maximum in the direction normal to the plane of the array. The horizontal half power beam width depends on the spacing as well as the width of the reflecting panel. Velocity of the current can also be controlled to shape the vertical pattern. Therefore the size of the panel cross section, the distance between the zig zag and reflector, the element phasing, and amplitude, must be properly chosen.

SINGLE PANEL CONSTRUCTION

The Jampro series of UHF zig zag antennas are made in modular units, consisting of a series of panels, and feed systems. Various configurations of panels and feeds, result in different patterns and gains.

In order to facilitate construction and power handling capacity, a uniform size panel is used. This panel is 22½ inches wide for all omnidirectional UHF channels. In directional antennas, the panel width may be different. The omnidirectional types have horizontal pattern circularities which vary with channel. This is shown on page 57. The construction of all omnidirectional antenna panels for UHF are the same. The panel consists of a rugged steel frame, with a heavy gauge plate or screen reflector. The entire assembly is hot dip galvanized after fabrication, not only for corrosion resistance, but for electrical purposes. The zig zag radiating element is supported by hardened teflon insulators. The element is made of ⅜" solid copper rod.

The feed to each panel consists of a 3⅛" rigid line and flange, with large teflon feed thru bushings. The feed may have a step transformer for power splits, as required. Dielectric loading may also be used, when phasing is required for vertical pattern tilting.

Feed thru terminals are 3⅛" with all weather teflon.

The VSWR of each panel is better than 1.08 to 1 for a bandwidth of 6%. Therefore these antennas can be used for operation by two stations spaced 6 channels apart. A wideband diplexer is available for this purpose. (Jampro type PKU-50A)

Each panel is 8 wavelengths long on the operating channel. Thus the height of the antenna varies with channel, but the width remains the same. Therefore the E field pattern circularity is a function of the operating channel.

The zig zag elements are grounded at the far ends, since the currents are very low. End loading is used to provide an excellent current distribution across the aperture. This current loading not only improves the vertical pattern, but provides VSWR stability with weather changes.

The Jampro Zig Zag panel for UHF has a horizontal half power beam width of 67 degrees. The vertical half power beam width is 7 degrees. The power gain ratio over a dipole for a standard panel is 40.80 or 16.1 DB.

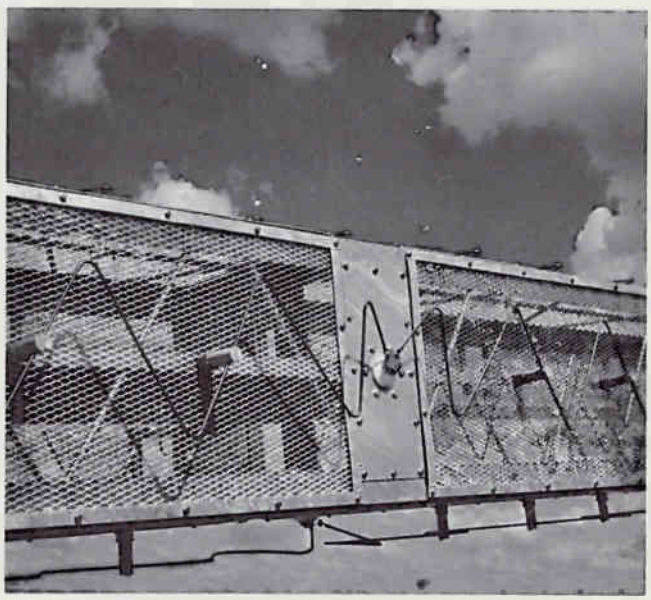
VERTICAL PATTERNS:

The power gain ratio of a single Jampro Zig Zag antenna is 40.8 over a dipole. This is achieved by proper illumination of the panel. Essentially, this involves the zig zag current distribution from feed point to each end. The rate of current decay is extremely important for greatest efficiency. The current velocity is controlled by three factors: zig zag shape, panel spacing and insulation.

The measured vertical pattern from the panel is very smooth, in that side lobe level is very low, (below 25 DB). However in an array, a grating lobe of moderate level may result, if the vertical pattern from the individual panels is not of the proper shape. Since the individual feed points of an array are about 8 wavelengths apart, the grating lobe will occur at approximately 7 and 14 degrees above and below the main lobe, if care is not used. Jampro panels are constructed so that the array factor does not create grating lobes, which will reduce the peak gain of the antenna.

The vertical patterns of antennas shown are based upon actual UHF and VHF antennas. The computerized plots are based upon the measured patterns of several antennas, and are not theoretical patterns.

Since the individual pattern gain is so high, the vertical pattern is narrow. For example, 6 panels, all pointing in one direction (directional antenna) would have a gain of 6 × 40.8 or 245 (23.8 DB)! This extremely high gain results in a half power beam width of about one degree!



Steel guy cables used to hold high gain omnidirectional antenna in place.

Special schemes must be used to keep this array physically in a true vertical position. The amount of power fed to the array, as in an omnidirectional antenna, does not change the half power vertical beam width. Therefore it is believed for practical reasons a six bay antenna of this type is the maximum. However, under special guying con-

ditions, a seven bay directional has been constructed with a gain of 285 and a half power beam width of one degree. Needless to say, the panel supporting structure is held in place with prestretched guy wires!

As stated elsewhere, the traveling wave current in each segment of the zig zag has a horizontal and a vertical component. The horizontal components add and the vertical components cancel in the horizontal plane. Less than one half of one percent of the radiated power is lost in vertical polarization.

Since the radiation is thus horizontally polarized, it does not "see" vertical or semi-vertical reflectors, such as guy cables. Therefore the zig zag antenna may be guyed through its aperture.

GUYING

Antennas up to and including three bays omnidirectional as well as directional are supplied as self supporting structures.

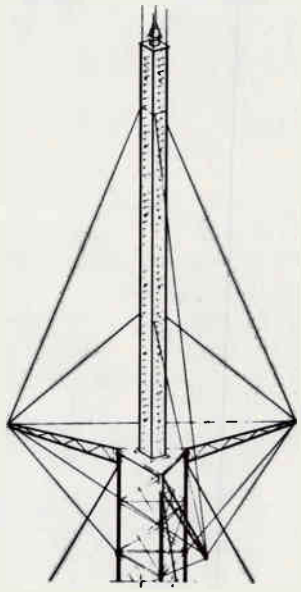
When an antenna has moderate to high gain values, it's mechanical stability becomes very important. Low gain antennas have relatively wide vertical patterns, and movements, do not greatly affect the received signal strength.

Wind deflection of high gain UHF zig zag, helical or slot antennas, can and do cause reception problems. Another cause for deflection is thermal expansion on the side facing the sunlight, while the shady side remains many degrees cooler. This causes the antenna to curve. As in the case of the tilting due to winds, the signal increases below its normal values under the horizontal and increases above the horizontal, in one axis.

To eliminate wind deflection and reduce sun-thermal expansion, Jampro recommends guying, to stabilize high gain antennas. Extensive pattern tests of antennas both in the lower and higher UHF channels have been made, to determine the effects of unbroken stranded steel guy cables, which run between 40 and 60 degrees, with the antenna axis. Using guy cables (4 way) with diameters up to 1" OD (worst case) the following measured results were obtained. (measured on channels 30 and 57)

	Non-guyed	Guyed
Circularity	±0.0DB	±0.05DB
Gain change	±0.0DB	±0.05DB
VSWR change	1.05/1	1.05/1

When the supporting tower is higher than 500 feet and the zig zag antenna is four or more bays, cantilever guying is desirable. It eliminates one or more sets of long guy cables but assures a stable antenna pattern due to a steady antenna. Cantilever guying develops the overtuning moment at the top of the supporting tower, which is also desirable. This moment would otherwise be transmitted to the tower legs in downward thrust caused by the normal type of guy cables. Since these conditions are special for each installation, the cost of such guying is not shown in this catalog.



The cross over point between the cost of a guyed omnidirectional antenna and one that is not guyed is 3 bays in UHF antennas. Therefore, all Jampro Zig Zag antennas with 4 or more bays are made for triangular 120 degree guying. The four and five bay antennas are guyed at one level, while the six and seven bays are guyed at two levels, depending on the overall height determined by the channel.

The old school of thought that guying through the antenna aperture degrades the antenna's performance is not valid, if the following 3 conditions exist. First the guy wire must be less than 10% of one wavelength in diameter; Second it must be from 40 to 90 degrees with respect to the polarization axis, and third, that it must not be resonant. At 90 degrees, it is well known that the guy cable would be transparent to RF. There are many microwave antennas in use today with cross polarized dipoles, with cross coupling in excess of 25DB. There are also microwave antennas, using flat strips across the aperture, to pass only the desired polarization and block the undesired. Large microwave horns are guyed across the dish to hold the antenna in place.

Guying Jampro Zig Zag antennas produces many advantages for the user.

1) Signal fading due to winds is reduced.
2) Original cost of the antenna is lower.
3) Cost of support steel tower is less.
4) Wind stability of antenna approches that of the supporting steel tower.
5) Antenna thermal curving is reduced in half.
6) Installation and transportation costs of the antenna are greatly reduced.

Jampro will be pleased to supply a copy of a technical paper on the subject of guying UHF and VHF antennas.

POWER GAINS:

Extremely high power gains are available from zig zag antennas, due to their nearly perfect aperture current illumination. By judicious use of design techniques it is possible to arrive at an excellent compromise between gain and VSWR bandwidth. The eight wavelength vertical aperture is most desirable to reduce the number of feed points, while maintaining gain as well as VSWR bandwidth. This bandwidth is so good as to permit diplexing two channels into one antenna separated 42 megacycles.

The power gain ratio of a single Jampro standard panel is 40.8 (16.1DB). Panels of actual UHF antennas, (channels 14 and 30), model panels and computer analysis, all confirm this value to be highly accurate. Higher gains are possible, with slightly different current distribution over eight wavelengths, but the horizontal pattern becomes narrower and decreases horizontal pattern circularity.

The gains of the full scale as well as the model panels were measured on the Jampro antenna range, and by another firm which specializes in antenna pattern measurements.

Special care has been exercised in the design, to provide a very narrow vertical pattern in the individual panels. Otherwise with eight wavelength feed spacing, a large grating lobe would result. By proper current distribution, the main lobe contains nearly all of the power, and side lobes are very low in voltage amplitude. This results in excellent vertical pattern control for stacking as many as 7 panels vertically.

The gains given for omnidirectional type antennas are RMS values as required by the FCC. That is, they are the root mean square values and not the peak gains. In the directional antennas, the peak gains are shown in conformity to the FCC rules. These values are those which occur at the vertical angle corresponding to the maximum field. The gain at the horizontal is also stated, since this is required by the Federal Communications Commission. It is also the value occuring at the maximum signal azimuth.

Directional antenna with radomes. Design results in two major lobes and one minor.

In directional antennas, extremely high gains are available. For example, by stacking seven panels vertically, all pointing in the same direction, the peak power gain will be 285! The horizontal half power beam width is 67 degrees and the vertical pattern is only one degree wide at the half power point. The first and second nulls may be filled in and the main beam tilted downward, all of which reduce the peak gain. See page 23. The half power beam widths do not vary with the amount of power fed to a particular set of panels.

Patterns are shown in the back portion of this catalog to give the reader ideas of readily available directional patterns. Computerized patterns of both the vertical as well as the horizontal patterns may be had from Jampro for $10.00. Slight changes in beam headings are easily made to conform to specific coverage service areas. These heading changes may or may not change the peak gains, depending on the pattern overlaps in the horizontal plane. Beam tilt and null fill in will always reduce the peak gains. The higher the original gain the more the reduction of gain due to beam tilting and null fill.

Tables are given for UHF antenna gains for easy reference.

COMPUTERIZED PATTERNS:

To facilitate pattern computations, two different computers and programs were used. More than a thousand vertical patterns have been plotted, for

antennas from one thru seven bays. Plots from no tilt, to 2.5 degrees tilt, in steps of 0.25 degrees were computed. Another group of 90 patterns were made with 10% first null fill in, another 90 with 15% and still another 90, with 20% fill in. Another 270 vertical patterns were computed with first and second null fill in, in steps of 10%, 15% and 20%. This very extensive computer program makes it easy to draw from a vast stock of vertical patterns, to fill nearly any requirement.

Any special pattern requirement not filled by the above computerized plots may be worked up by Jampro in a few minutes thru the use of an IBM 1130 computer using fortran language. This computer programming makes the consulting engineer's choice of patterns very easy, to meet any coverage requirement.

The horizontal field plots have also been worked out by computer and plotted on polar charts. Some of these appear in the back of this booklet. Patterns may be altered to fit particular coverage requirements. Consultants are asked to send their specifications to Jampro for pattern work out by a computer, without cost.

Fourteen of the Jampro Zig Zag antenna patterns were checked against the computer programming to determine accuracy. The computer patterns are in excellent agreement with measured patterns. The reading accuracy of the measured pattern is the limiting factor.

Jampro offers an exclusive service to consultants and chief engineers who want a computerized breakdown of vertical plots. This is available in 4 place figures, of voltage ratios. This data will be supplied to any consulting engineer without charge simply by asking, and stating the number of bays, beam tilt angle and amount of first and second null fill in.

RADOMES-DEICING

Antennas located in environments where icing occurs regularly, must be protected from ice. The active elements of the antenna, that is the zig zag, as well as the reflecting panel surface, are electrically changed from normal impedance and velocity with the accumulation of ice and snow. There are two popular ways to overcome this problem. One method is to apply electrical heat to the zig zag element, by passing heavy current through it. This method is costly to operate and does not remove the ice from the reflecting panel. Therefore the job of deicing electrically is only half done and at great operating cost due to heavy power consumption.

The second method is to prevent any ice or snow from building up on the zig zag element, or its supports and reflecting surfaces. This is done with the use of a radome. The ideal radome is electrically transparent, environmentally opaque and financially invisible! Since these qualities are rather difficult to obtain, Jampro has done the next best thing. Rigid radomes that are essentially transparent to the RF radiated energy are available for ice protection. The use of radomes in ice or heavy snow environments protects the antenna mechanically as well, from falling ice damage.

Deicing radomes placed over four panels of a directional zig zag antenna.

The initial cost of radomes is higher than "per bay" costs for electrical deicers. However, when the cost of running 12 KW of 240 VAC up a 500 foot tower is considered, to heat only one bay, the radome costs less. In a six bay omnidirectional antenna, electrical deicers require about as much electrical power as a 30 KW transmitter! The radomes of course do not require any electrical power.

The operational costs of radomes is zero, while a substantial power bill results from electrical deicers during the winter months.

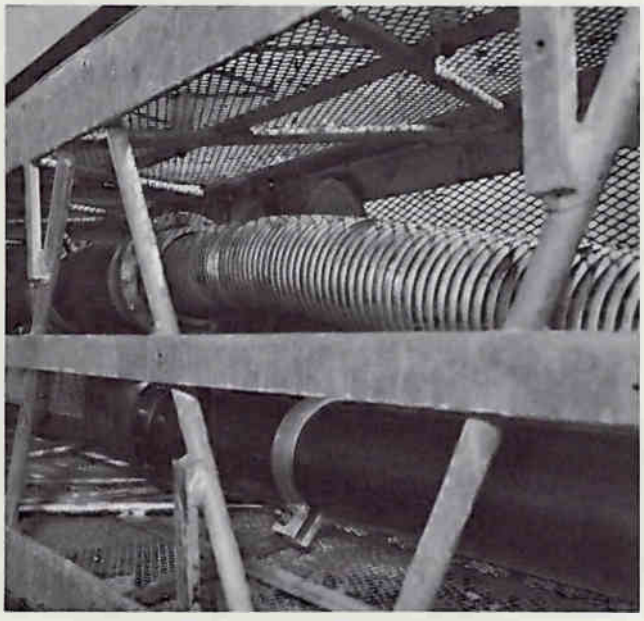
The theory of operation of radomes is very simple. The ice or snow is kept away from the velocity and impedance elements of the antenna. The RF energy however goes through the radome and its ice coating with essentially no loss. This is the situation with literally hundreds of thousands of radomes on microwave antennas in this country and abroad. Microwave antennas are nearly always "deiced" by the use of radomes. The proper plastic has extremely low power loss thru the use of low loss tangent material. Radome wall thickness is 3/16" and at channel 83 the RF loss through the Jampro radome is so small as not to be measur-

able! This same plastic material is used in radomes on microwave antennas operating at 16,000 mHz (20 times higher in frequency than the UHF bands).

Mechanically, the radomes are light in weight and actually reduce the wind loading by improving the shape factor. They may be easily repaired by a rigger, while in place, if damaged by gun shot. Lightning does not damage radomes as they are non-conductive and are shielded from lightning strikes by the rods around the top of the obstruction beacon. Jampro radomes are functional from −65°F to +150°F, at 100% humidity. Maximum safe wind velocity survival with ½ inch of ice is 150 MPH.

FEED SYSTEMS

Shunt feeding is used. A central 6⅛" main feeder is mounted in the center of the supporting square structure, for antennas with omni patterns. The power to each bay or panel is direct coupled to the main line, with quarter wave transformers. By this means, both amplitude and phase can be controlled for proper vertical, as well as horizontal patterns. Impedance match is achieved at each feed tap off point. Relative phase of any two groups is determined by the spacing increment between those groups in the main coaxial transmission line. In four, five, six and seven bay levels, the power is fed near the center through a tee, to eliminate beam tilt, across the TV channel. The antenna input, is normally 50 ohms, but may be supplied as 75 ohms, if so ordered. The coaxial line size is 6⅛" rigid EIA unless otherwise specified.



Main feeder power splitting tee, to permit feeding upper and lower panels.

TOWER SIDE MOUNTED ZIG ZAGS

It is highly economical to mount a UHF antenna on the three faces of a supporting tower. Thus an existing tower may be used. Or, two antennas may be supported by one common tower; one on top, and the other on the three faces. This same procedure may also be used on a square self-supporting tower.

The horizontal pattern circularity is a function of the TV channel. Page 57 shows this graphically. The RMS power gains of these antennas are the same as the conventional omnidirectionals, because each bay's power is fed into three panels, instead of four. However, the horizontal pattern circularity is nearly as good as a square four face antenna.

Several antennas can be stacked around the sides of a single tower. Coupling between antennas is extremely small and 2 wavelengths (3 to 4 feet depending on the channels) will provide more than 30 DB of isolation.

The horizontal pattern offers excellent opportunities for directionalizing. This may be done by power division, phasing, or complete elimination of panels on one side of the tower.

Directional antenna with panels leg mounted to a square tower.

In certain cases, the zig zag panels may be mounted on the legs of a tower to radiate tangentially around the tower,

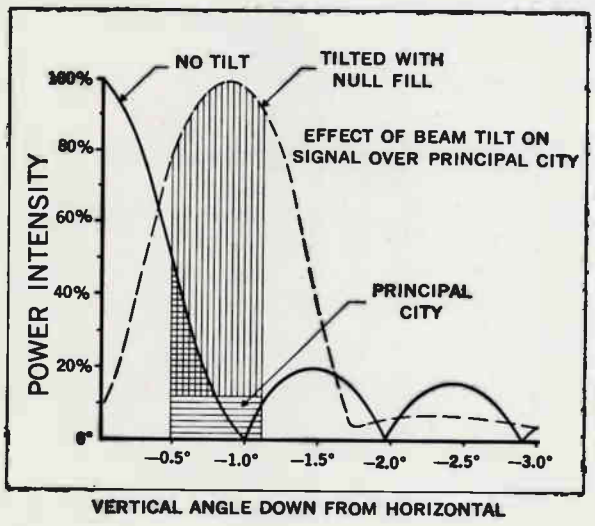
Good circularities varying from ±1.5 DB to ±4.2 DB are achieved, when these panels are mounted on the face or legs of a triangular, or square tower. By varying the amplitude and phase of the power going to the panels, as well as spacing of the panels, the horizontal pattern can be shaped as desired.

Independent vertical patterns, in the direction of each tower face, is also very easily available. Therefore, sculpturing can be done to any one of the tower faces to fill in nulls, tilt the main lobe in one direction and not in others, etc.

Beam tilting is accomplished in all directions, or only in selective lobes by either tilting the panels individually, by electrical phasing, or power division. If special or a great deal of tilting is required, both mechanical and electrical phasing may be used to maintain the gain as high as is possible.

IMPORTANCE OF BEAM TILT

Radiation lobes and nulls are common properties of antenna arrays. Lobes are desirable in the vertical plane near the horizon, for television use. Nulls exist even in one bay antennas, but usually are not of any importance. They become increasingly important in multi-bay antennas. It is very important to know the angles at which the nulls exist in television antennas for two reasons. First, to provide an adequate level of signal strength for reception to meet pre-determined areas of service. Second, ghosting may be caused by high levels of signal striking the ground near the transmitter, and reflected into areas of very low direct signals. The reflected being delayed, arrives as a ghost. Tests by technical groups have indicated that the reflected signal must be at least 24 DB below the desired signal, so as not to be objectionable.



The reader is asked to examine the VERTICAL ANGLE TO THE HORIZON chart, which appears on page 59 of this booklet. The antenna center of radiation, over the height of service areas, versus the distance, will immediately indicate that the main beam must be tilted downward, in order to strike the city. The higher the gain of the antenna, the narrower the vertical beam. And the more important it is to tilt this beam, so as to strike the area of desired coverage. This is often an overlooked factor in antenna planning.

Radiation nulls and the vertical beam width are the result of array factors of the multi-bay antenna. Zig zag antennas, as well as the side fire helical and the slot antenna, have nulls which read zero values at certain angles. Beam tilting, and null fill in must be used to get the desired coverage. Tilts down to 2.5° and null fill in of up to 50%, are available in Jampro Zig Zag antennas.

The null location is a function of the antenna height, number of bays in the antenna, and the distance between the bays. The expression is as follows:

$$D = \frac{ESH}{NW}$$

Where: D= the distance to the null in feet
E= number of bays
S= vertical spacing between bays, in feet
W= the wavelength of the channel in feet

It is extremely important that the vertical pattern fill the number of degrees between the farthest point and the closest areas to be served.

Looking at the chart on page 59 it is obvious that all antennas should have beam tilt, downwards, if the area is perfectly flat. If the antenna is mounted on a tall tower, on a hill or mountain, the vertical angle becomes even more important. The chart on page 59 was designed, using a computer, and is highly accurate. It shows the geometric horizon at a glance from various given heights, assuming a true earth curvature. The values must be corrected for hilly or mountainous terrain. When using the chart, use the difference between the antenna and the service area heights. For example, the transmitter is located on a hill, 10 miles from a town and is 2,700 feet above sea level. The tower is 500 feet high. This places the antenna 3,200 feet above sea level. Assume your principal city is 2,200 feet above sea level. This then gives a height of 1,000 feet. The question now is, how many degrees below the horizontal, is the principal city? The answer according to the chart is one degree. Height is 1,000 feet, distance is 10 miles and the angle read off the bottom of the chart is 1.1°. Note that the height above average terrain is not used in this computation.

It now becomes clear that if the main beam of the vertical pattern is to hit the city, it must occur at one degree below the horizontal.

The Federal Communications Commission has set up certain required minimum signal strength requirements. These are shown on page 14. The principal city grade level of 80 DBU represents the minimum signal over the farthest part of the studio city.

One important feature of the Jampro Zig Zag type of antenna, is the fact that the vertical pattern can be different in each direction, covered by a panel. Thus four different patterns and tilts are possible in the omnidirectional series with square construction, the JZZ-O series. In the JZT, triangular series, three different vertical patterns are possible. To illustrate this point see the two different vertical tilts on the sketch below.

Note that the beam tilts are different in the two directions of one axis. One beam tilts 1° while the other tilts downward 3°. In directional arrays tilts are also possible. With two panels in a directional array, the antenna may be mechanically tilted in the axis of the apex. The ability to furnish different tilts in each direction is a most worthwhile feature of the zig zag antenna.

Several thousand vertical patterns have been computed for antennas from one to seven bays, stacked vertically. With power division and phasing over a hundred different vertical patterns may be worked up for any given number of panels stacked vertically. Some representative examples are shown starting on page 37. Note that the bottom side of the major lobes are contoured in many cases, to provide a more useful signal. Null fill in and beam tilt can be worked out by Jampro engineers, to meet any requirement which a consulting engineer may desire. Patterns with the first null filled up to 50% are available.

VERTICAL PATTERNS FOR FCC FILING

A brief description of vertical patterns previously worked up and available, are as follows:

1) One through 7 bays, no beam tilt.
2) One through 7 bays, with beam tilt in increments of 0.25°, down to 2.5°.
3) Beam tilt from 0.25° to 2°, and first null fill in of 10%, 15% and 20%.
4) Beam tilts as above but with the 2nd null also filled in, 10%, 15% and 20%.

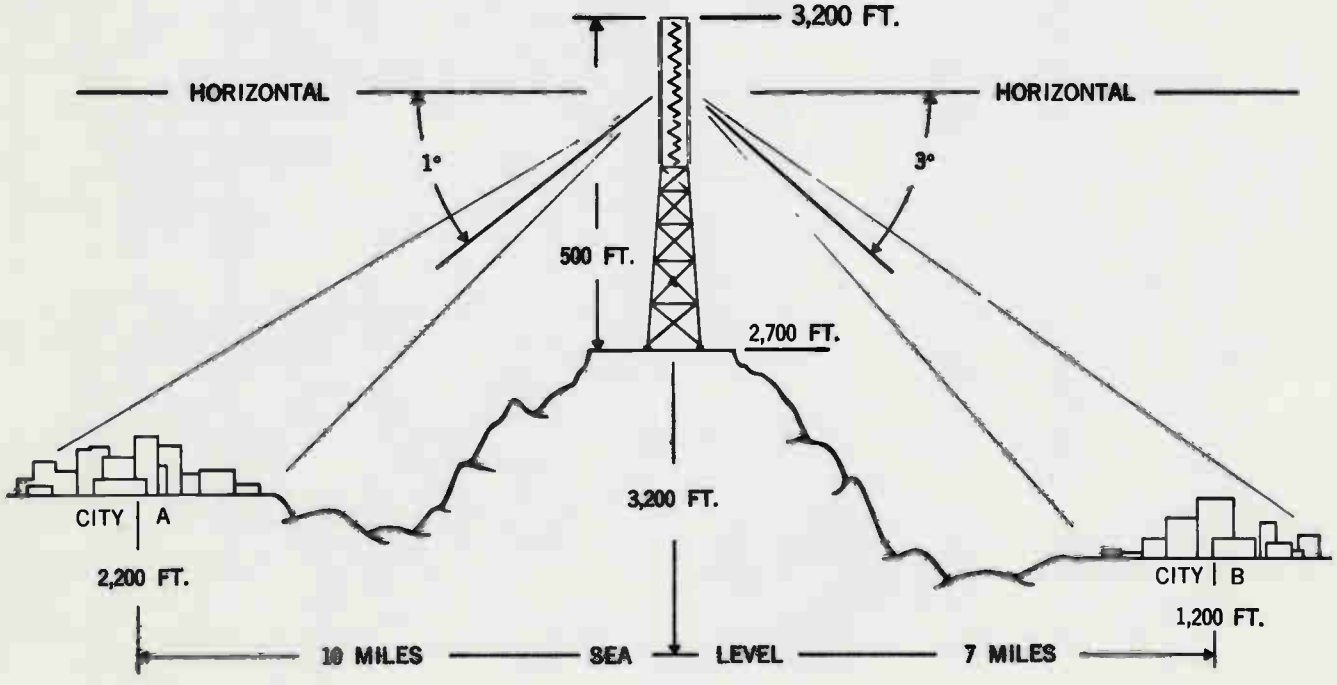
If your pattern is other than one of those now available, a new run will be made on the computer, in order to get your required pattern. This service is free to consultants and those seriously contemplating the use of a Jampro Zig Zag antenna. The following information is required before the computer can be used.

1) Desired peak gain.
2) Desired horizontal pattern*.
3) Amount of first and second null fill*.
4) Amount of beam tilt*.
5) Channel number.

*It would be helpful if one of the patterns shown in this booklet were referenced. Otherwise state as completely as possible.

From this information Jampro can supply a printed computer run, to help you analyze the pattern, in precise terms. The normalized field voltages as well as power ratios are indicated in different columns. For an example, see page 60.

This computer run was made for a six bay antenna, and shows the engineer, the normalized field voltage, the relative power gain as a percentage of the



maximum and the actual gain. The computer picks out the first and second nulls below the horizontal and indicates the angles as well as the amount of voltage. Along side the columns also appears a vertical field plot to the nearest 2.5% voltage. Please notice that the method of accomplishing the beam tilt and the null fill in, is also indicated by the amount of power split, distribution and phasing. To make the job of FCC filing easier, the peak gain in the directional antennas, the peak power gain, tilt angle and the gain at the horizontal are also typed out. This is another exclusive service to consultants from Jampro.

ANTENNA TESTS

All Jampro Zig Zag antennas are completely fabricated and tested, prior to shipping. This exclusive Jampro feature eliminates the need for a field engineer to supervise the assembly of the antenna, after it has arrived at the transmitter site. The following tests are always conducted on zig zag antennas at the plant prior to shipping.

1) VSWR across the channel as well as the two adjacent channels.
2) Dry air pressure test, at 40 PSI for 24 hours.
3) Megger test, at 3,000 Volts.
4) Current test, 20 amps per panel.

On special order, the antenna can be tested for both horizontal and vertical patterns, on the Jampro antenna range. This range is capable of rotating a six bay omnidirectional antenna on its vertical axis (normal mounting position). The antenna is placed parallel to the ground, on a wooden trestle, and rotated for the vertical pattern measurements. The illuminating source is a high gain parabolic antenna. The pattern measurement range is 10,000 feet.

ANTENNA INPUT VSWR

The voltage standing wave ratio (VSWR) of television antennas is the most important quality indicator. The amount of power reflected back or not accepted by the antenna, results in a VSWR ratio. The higher this VSWR the greater the amount of fixed ghosts transmitted. It is extremely important that the VSWR be kept as low as possible.

The effects of ghosting from antenna VSWR, is also a function of the length of the transmission line. The longer the line, in feet, the more displaced will be the ghost on the viewer's screen.

The specified VSWR of all Jampro Zig Zag antennas is 1.08 to 1, which is the lowest in the industry. In actual practice, antennas, have been delivered with VSWR values as low as 1.05 across the 6 megacycle channel. On special order, antennas may be supplied with VSWR values of 1.08 to 1 on two TV channels, 6 channels apart. This represents a band width of 42 megacycles, using FCC specs.

This same kind of wide band antenna can be supplied for CCIR requirements when two or even more channels are to be fed into one common antenna. Wide banding is possible with zig zag antennas, while still holding within reason, the gain, and therefore the horizontal and vertical patterns.

POWER RATINGS

The power rating specified for each antenna indicated is based on the full peak rating of the visual power. It also includes up to 20% aural power. For example, an antenna rated at 60 kilowatts in this catalog, would take the full visual power of 60 KW, and 12 KW of aural power. All Jampro antennas have a large built in safety power capability.

The present trend to combine the visual and aural transmitters into one output is popular in the United States. Dividing the antenna into two separate antennas, (an upper half and lower half), is popular in Europe and some other CCIR countries. Halved antennas are available from Jampro on special order.

TRANSMISSION LINE INPUT CONNNECTION

All Jampro Zig Zag antennas are normally supplied with a 6⅛" EIA input connector. This input flange, with a bullet (inner connector), is located just above the lowest part of the lowest panel, for omnidirectional antennas. The purely directional antennas, have their input connectors located 4 feet below the center of the longest side panels.

The antenna has gas seals at the element feed points and thus can be pressurized. A dry air or nitrogen gas pressure of 7 pounds per square inch is required at all times after installation, to keep moisture out.

DBU TO MICROVOLT COVERSION CHART

On page 52 appears a chart to convert the DBU value to the microvolts signal. The following table will be of interest and is based upon U.S Federal Communications Commission standards for UHF TV.

Type or Grade of service	Minimum DBU Value	Equivalent microvolts
Principal Grade	80 DBU	10,000
Grade A	74 DBU	5,000
Grade B	64 DBU	1,600

With the use of the FCC coverage contours, the DBU levels may be determined. This DBU value then may be converted into field voltage by the chart on page 52. This field is that to be found in a dipole, 30 feet above the ground. The U.S. F.C.C. method for standard fields is 50 percent of the locations, 50 percent of the time.

TRANSMISSION LINES

The main transmission line between the antenna and the transmitter is of importance to the broadcasters. Coaxial transmission line has replaced waveguide for UHF use. Five sizes of coaxial lines are available for UHF TV use. They are shown below.

EIA COAXIAL LINES

SIZE	IMPEDANCE	MAX FCC CHANNEL
3⅛"	50.0 ohms	83
5"*	50.0 ohms	83
6⅛"	50.0 ohms	35**
6⅛"	75.0 ohms	83
9-3/16"	75.0 ohms	40**

*Andrew air Heliax, semi-flexible
**Higher channels result in excessive frequency cutoff losses

On page 53 the safe power rating of these coaxial lines are shown on a chart. Please note that the power has been de-rated for a VSWR of 1.08 to 1, the maximum to be expected with these antennas.

The chart shows that the power rating goes down as the TV channel and frequency go up. The proper selection of line size is important. Although the initial cost of large diameter line is high, it will pay for itself in time. The wasted transmitter RF power costs, with klystron costs, must be balanced with initial coaxial line costs. Power and tube costs are continuing, while coaxial costs are a onetime only capital investment.

For UHF television use, the rigid copper lines are recommended for long runs. For relatively short lengths of up to 600 feet, Andrew air Heliax should be considered. This line is comparatively low in cost, handles modest power, but has higher losses than the rigid air dielectric lines.

Transmission lines must be handled with care at all times. The inside must be kept free from moisture to prevent copper oxidation, which causes the RF losses to increase. After installation, a dry air or nitrogen positive pressure of 7 pounds should be maintained. This will keep the moisture out, in the event of leaks.

LIGHTNING PROTECTION

Four lightning rods are furnished with each Jampro Zig Zag antenna for protection. These are supplied with each complete omnidirectional antenna, and with directional antennas, where Jampro also furnishes the supporting structure. In many directionals where panels are mounted on the customers tower, these rods are not supplied.

The rods are five feet long and usually long enough to provide considerable protection, when hit by lightning.

Beacon mounting plate, lightning rods and climbing steps are normally supplied with all antennas.

WIND RATINGS

The zig zag antennas and individual units of panels, are constructed to withstand safely, an actual wind velocity of 112 MPH. This corresponds to a load of 50 pounds per square foot of area, in accordance with RS-222A Standards of EIA. Where ice loading, or higher winds occur, antennas can be supplied, by Jampro to meet these needs. Any special wind loading requirement may be supplied simply by contacting Jampro.

Zig Zag elements and panels are grounded for lightning protection. Climbing steps are furnished

with omnidirectional arrays and ladders may be installed inside of the towers which support directional antennas.

The wind loading on an omnidirectional zig zag Jampro antenna is **reduced,** when radomes are installed. This is due to the fact that the shape factor is improved. Therefore, the shear, moment and thrust are indicated with radomes, which is the lower of the two conditions. Wind loading is increased 25% without radomes.

SHIPPING AND INSTALLATION SUPERVISION

Jampro Zig Zag antennas are usually shipped in one complete unit, fully crated. However, when the length exceeds maximum highway truck lengths, they are shipped in two or three sections. On special order, Jampro will arrange to ship by private truck from the plant directly to the antenna-tower site, to prevent damage, and expedite delivery.

Normally, a factory field supervisor is not required to assemble, or supervise the assembly of a zig zag antenna. Adequate instruction booklets are sent in advance to help the rigger. However, a field technician is available, who will supervise the assembly and conduct VSWR and other tests prior to hoisting, at prevailing rates.

Hoist ears and other conveniences are built into each antenna. Climbing steps are also provided, with each antenna which is supported by a structure furnished by Jampro.

HOW TO ORDER YOUR JAMPRO ZIG ZAG ANTENNA

Literally hundreds of horizontal and vertical patterns are available, using zig zag antennas. Scores of these have been cataloged here, with type numbers as well as mechanical and electrical information. When you order by type number, please indicate the TV operating channel. If you experience more than ¼" of ice for more than 5 days a year, radomes are recommended and should be ordered.

If you do not find your exact antenna, please refer to page 12 and send Jampro the information spelled out. You will receive a quick reply for an antenna meeting your requirements.

Specifications shown in this catalog are subject to change without notice.

FCC FILING INFORMATION AND CATALOG ANTENNAS

OMNIDIRECTIONAL TYPES

TYPE NO.	Page	Number of sections (bays)	Rated Input Power KW	Rated Input Power DBK	GAIN Power	GAIN DB	CHANNEL Range	HORIZONTAL Circularity	Vertical Patterns Tilt	Vertical Patterns Null Fill
JZZ-1-0B	18	1	30	14.77	8.0	9.03	14-70	±2.0 DB	0-10°	none
JZZ-2-0B	19	2	60	17.78	16.0	12.04	14-70	±2.0 DB	0-5°	0-25%
JZZ-3-0B	20	3	60	17.78	24.0	13.80	14-70	±2.0 DB	0-2.5°	0-30%
JZZ-4-0B	21	4	60	17.78	32.0	15.05	14-70	±2.0 DB	0-2.5°	0-40%
JZZ-5-0B	22	5	60	17.78	40.0	16.02	14-70	±2.0 DB	0-2.5°	0-50%
JZZ-6-0B	23	6	60	17.78	48.0	16.81	14-70	±2.0 DB	0-2.5°	0-50%
JZT-1-0	24	1	30	14.77	8.0	9.03	14-83	±3.0 DB	0-10°	none
JZT-2-0	24	2	60	17.78	16.0	12.04	14-83	±3.0 DB	0-10°	0-25%
JZT-3-0	24	3	60	17.78	24.0	13.80	14-83	±3.0 DB	0-5°	0-30%
JZT-4-0	24	4	60	17.78	32.0	15.05	14-83	±3.0 DB	0-2.5°	0-40%
JZT-5-0	24	5	60	17.78	40.0	16.02	14-83	±3.0 DB	0-2.5°	0-50%
JZT-6-0	24	6	60	17.78	48.0	16.81	14-83	±3.0 DB	0-2.5°	0-50%

DIRECTIONAL TYPES

JZZ-1D1B	26	1	10	10.00	40.8	16.10	14-83	67° (1)	0-10°	none
JZZ-2D1B	26	2	20	13.01	81.6	19.11	14-83	67°	0-5°	0-25%
JZZ-3D1B	26	3	30	14.77	122.4	20.87	14-83	67°	0-2.5°	0-30%
JZZ-4D1B	26	4	40	16.02	163.2	22.12	14-83	67°	0-2.5°	0-40%
JZZ-5D1B	26	5	50	16.99	204.0	23.09	14-83	67°	0-2.5°	0-50%
JZZ-6D1B	26	6	60	17.78	244.8	23.87	14-83	67°	0-2.5°	0-50%
JZZ-1D2B	27	1	20	13.01	18.2	12.60	14-83	153° (1)	0-10°	none
JZZ-2D2B	27	2	40	16.02	36.4	15.61	14-83	153°	0-5°	0-25%
JZZ-3D2B	27	3	60	17.78	54.6	17.37	14-83	153°	0-2.5°	0-30%
JZZ-4D2B	27	4	60	17.78	72.8	18.62	14-83	153°	0-2.5°	0-40%
JZZ-5D2B	27	5	60	17.78	91.0	19.59	14-83	153°	0-2.5°	0-50%
JZZ-6D2B	27	6	60	17.78	109.2	20.37	14-83	153°	0-2.5°	0-50%
JZZ-1D2C	28	1	20	13.01	18.9	12.76	14-83	177° (1)	0-10°	none
JZZ-2D2C	28	2	40	16.02	37.8	15.77	14-83	177°	0-5°	0-25%
JZZ-3D2C	28	3	60	17.78	56.7	17.53	14-83	177°	0-2.5°	0-30%
JZZ-4D2C	28	4	60	17.78	75.6	18.78	14-83	177°	0-2.5°	0-40%
JZZ-5D2C	28	5	60	17.78	94.5	19.75	14-83	177°	0-2.5°	0-50%
JZZ-6D2C	28	6	60	17.78	113.4	20.27	14-83	177°	0-2.5°	0-50%
JZZ-1D2D	29	1	20	13.01	19.5	12.90	14-83	67° (2)	0-10°	none
JZZ-2D2D	29	2	40	16.02	39.0	15.91	14-83	67°	0-5°	0-25%
JZZ-3D2D	29	3	60	17.78	58.5	17.67	14-83	67°	0-2.5°	0-30%
JZZ-4D2D	29	4	60	17.78	78.0	18.92	14-83	67°	0-2.5°	0-40%
JZZ-5D2D	29	5	60	17.78	97.5	19.89	14-83	67°	0-2.5°	0-50%
JZZ-6D2D	29	6	60	17.78	117.0	20.23	14-83	67°	0-2.5°	0-50%
JZZ-1D2E	30	1	20	13.01	20.4	13.09	14-83	67° (2)	0-10°	none
JZZ-2D2E	30	2	40	16.02	40.8	16.10	14-83	67°	0-5°	0-25%
JZZ-3D2E	30	3	60	17.78	61.2	17.86	14-83	67°	0-2.5°	0-30%
JZZ-4D2E	30	4	60	17.78	81.6	19.11	14-83	67°	0-2.5°	0-40%
JZZ-5D2E	30	5	60	17.78	102.0	20.08	14-83	67°	0-2.5°	0-50%
JZZ-6D2E	30	6	60	17.78	122.4	20.86	14-83	67°	0-2.5°	0-50%
JZZ-1DP2A	31	1	20	13.01	30.0	14.77	14-83	75° (3)	0-10°	none
JZZ-2DP2A	31	2	40	16.02	60.0	17.78	14-83	75°	0-5°	0-25%
JZZ-3DP2A	31	3	60	17.78	90.0	19.54	14-83	75°	0-2.5°	0-30%
JZZ-4DP2A	31	4	60	17.78	120.0	20.79	14-83	75°	0-2.5°	0-40%

Notes: (1) These are directional antennas with horizontal half power beam widths as indicated.
(2) Indicates the maximum half power horizontal beam width of each lobe.
(3) Half power horizontal beam width at maximum points.

OMNIDIRECTIONAL ZIG ZAG ANTENNAS
ONE BAY, TYPE JZZ-1-O-B

Channel Number	HEIGHT IN FEET Antenna (Ah)	Radiation Center (Rc)	Moment M (Lbs)	Shear S Kips	Weight W (Lbs)
14	16.63	8.31	18,000	2,161	936
16	16.23	8.12	17,100	2,109	915
18	15.82	7.91	16,300	2,056	892
20	15.46	7.73	15,800	2,009	875
22	15.30	7.65	15,200	1,989	855
24	14.78	7.39	14,200	1,921	840
26	14.46	7.23	13,650	1,879	822
28	14.15	7.07	13,100	1,839	805
30	13.84	6.92	12,450	1,799	790
32	13.56	6.78	11,950	1,762	772
34	13.29	6.65	11,500	1,727	760
36	13.01	6.50	11,000	1,691	745
38	12.76	6.38	10,600	1,658	730
40	12.53	6.27	10,250	1,628	720
42	12.28	6.14	9,850	1,596	705
44	12.06	6.03	9,500	1,567	695
46	11.85	5.97	9,150	1,540	683
48	11.65	5.83	8,850	1,514	670
50	11.45	5.73	8,550	1,488	660
52	11.25	5.63	8,250	1,462	652
54	11.05	5.53	7,950	1,436	640
56	10.86	5.43	7,700	1,411	630
58	10.68	5.34	7,450	1,388	620
60	10.52	5.26	7,200	1,367	610
62	10.35	5.18	6,970	1,345	602
64	10.19	5.10	6,760	1,324	597
66	10.04	5.02	6,570	1,305	590
68	9.86	4.98	6,430	1,281	580
70	9.74	4.87	6,160	1,266	570

EXAMPLE	POWER GAINS with 10% first null fill in. (also available 15% & 20%)						
TILT ANGLE	No Tilt	−0.5°	−0.75°	−1.00°	−1.25°	−1.50°	−2.00°
RMS Gain Ratio	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Ratio in DB	9.03	9.03	9.03	9.03	9.03	9.03	9.03
Horizontal Ratio	8.00	7.99	7.92	7.82	7.75	7.70	7.46
Ratio in DB	9.03	9.02	8.98	8.93	8.90	8.86	8.73

1) Height measurements are in accordance with the sketch on page 58
2) Rated power input is 60 KW. Includes black level visual and 20% aural power
3) Power gain figures are for omnidirectional patterns.
4) Circularity is better than ±2DB. At channel 14 ±1.6DB, channel 70 ±2.7DB
5) Input VSWR is 1.08 to 1 or better across entire 6 megacycle channel
6) Wind loads are based upon EIA 50 pound standards, 112 MPH wind, with radomes
7) Input is 6⅛" EIA, 50 ohms, or 75 ohms on special order.

OMNIDIRECTIONAL ZIG ZAG ANTENNAS
TWO BAYS, TYPE JZZ-2-O-B

Channel Number	HEIGHT IN FEET Antenna (Ah)	Radiation Center (Rc)	Moment M (Lbs)	Shear S Kips	Weight W (Lbs)
14	33.26	16.63	72,000	4,322	2,175
16	32.46	16.23	68,300	4,218	2,125
18	31.64	15.82	65,200	4,112	2,075
20	30.92	15.46	63,200	4,018	2,030
22	30.60	15.30	60,800	3,978	1,990
24	29.56	14.78	56,700	3,842	1,950
26	28.92	14.46	54,600	3,758	1,915
28	28.30	14.15	52,400	3,678	1,875
30	27.68	13.84	49,800	3,598	1,840
32	27.12	13.56	47,700	3,524	1,805
34	26.58	13.29	46,000	3,455	1,490
36	26.02	13.01	44,000	3,382	1,470
38	25.52	12.76	42,500	3,316	1,445
40	25.06	12.53	41,000	3,256	1,420
42	24.56	12.28	39,400	3,192	1,395
44	24.12	12.06	38,000	3,134	1,370
46	23.70	11.85	36,600	3,080	1,350
48	23.30	11.65	35,400	3,028	1,327
50	22.90	11.45	34,200	2,976	1,310
52	22.50	11.25	33,000	2,924	1,285
54	22.10	11.05	31,800	2,872	1,265
56	21.72	10.86	30,800	2,822	1,245
58	21.36	10.68	29,800	2,776	1,225
60	21.04	10.52	28,800	2,734	1,210
62	20.70	10.35	27,900	2,690	1,190
64	20.38	10.19	27,100	2,648	1,175
66	20.08	10.04	26,300	2,610	1,160
68	19.72	9.86	25,700	2,562	1,140
70	19.48	9.74	24,700	2,532	1,130

EXAMPLE	POWER GAINS with 10% first null fill in. (also available 15% & 20%)							
TILT ANGLE	No Tilt	−0.50°	−0.75°	−1.00°	−1.25°	−1.50°	−1.75°	−2.00°
RMS Gain Ratio	16.00	15.75	15.57	15.55	15.53	15.31	14.70	14.36
Ratio in DB	12.03	11.97	11.92	11.91	11.90	11.85	11.67	11.57
Horizontal Ratio	16.00	15.96	14.39	13.41	12.09	9.06	7.37	5.72
Ratio in DB	12.03	12.02	11.58	11.27	10.82	9.57	8.67	7.57

1) Height measurements are in accordance with the sketch on page 58
2) Rated power input is 60 KW. Includes black level visual and 20% aural power
3) Power gain figures are for omnidirectional patterns.
4) Circularity is better than ±2DB. At channel 14 ±1.6DB, channel 70 ±2.7DB
5) Input VSWR is 1.08 to 1 or better across entire 6 megacycle channel
6) Wind loads are based upon EIA 50 pound standards, 112 MPH wind, with radomes
7) Input is 6⅛" EIA, 50 ohms, or 75 ohms on special order.

OMNIDIRECTIONAL ZIG ZAG ANTENNAS
THREE BAYS, TYPE JZZ-3-O-B

Channel Number	HEIGHT IN FEET Antenna (Ah)	Radiation Center (Rc)	Moment M (Lbs)	Shear S Kips	Weight W (Lbs)
14	49.89	24.95	162,000	6,483	4,735
16	48.69	24.35	154,000	6,327	4,635
18	47.46	23.73	147,000	6,168	4,520
20	46.38	23.19	142,000	6,027	4,420
22	45.90	22.95	137,000	5,967	4,330
24	44.34	22.17	128,000	5,763	4,235
26	43.38	21.69	123,000	5,691	3,745
28	42.45	21.23	118,000	5,517	3,625
30	41.52	20.76	112,000	5,398	3,555
32	40.68	20.34	107,000	5,286	3,465
34	39.87	19.93	103,000	5,181	3,425
36	39.03	19.52	99,000	5,073	3,350
38	38.28	19.14	95,300	4,974	3,295
40	37.59	18.80	92,300	4,884	2,865
42	36.84	18.42	88,500	4,788	2,805
44	36.18	18.09	85,500	4,701	3,755
46	35.55	17.77	82,300	4,620	2,705
48	34.95	17.48	79,500	4,542	2,665
50	34.35	17.18	77,000	4,464	2,625
52	33.75	16.87	74,300	4,386	2,585
54	33.15	16.58	71,500	4,308	2,545
56	32.58	16.29	69,300	4,233	2,175
58	32.04	16.02	67,000	4,164	2,145
60	31.56	15.78	64,700	4,101	2,115
62	31.05	15.53	63,800	4,035	2,075
64	30.57	15.28	60,800	3,972	2,050
66	30.12	15.06	59,200	3,915	2,015
68	29.58	14.79	57,900	3,843	1,985
70	29.22	14.61	55,500	3,798	1,965

EXAMPLE	POWER GAINS with 10% first null fill in. (also available 15% & 20%)						
TILT ANGLE	No Tilt	−0.25°	−0.50°	−0.75°	−1.00°	−1.25°	−1.50°
RMS Gain Ratio	24.00	23.98	23.90	23.60	23.60	23.20	23.00
Ratio in DB	13.80	13.79	13.78	13.72	13.72	13.65	13.61
Horizontal Ratio	24.00	23.20	21.00	17.90	14.22	10.30	6.66
Ratio in DB	13.80	13.65	13.23	12.53	11.53	10.13	8.23

1) Height measurements are in accordance with the sketch on page 58
2) Rated power input is 60 KW. Includes black level visual and 20% aural power
3) Power gain figures are for omnidirectional patterns.
4) Circularity is better than ±2DB. At channel 14 ±1.6DB, channel 70 ±2.7DB
5) Input VSWR is 1.08 to 1 or better across entire 6 megacycle channel
6) Wind loads are based upon EIA 50 pound standards, 112 MPH wind, with radomes
7) Input is 6⅛" EIA, 50 ohms, or 75 ohms on special order.

OMNIDIRECTIONAL ZIG ZAG ANTENNAS
FOUR BAYS, TYPE JZZ-4-O-B

Channel Number	HEIGHT IN FEET Antenna (Ah)	Radiation Center (Rc)	Moment M (Lbs)	Shear S (Lbs)	Weight W (Lbs)	Thrust T (Lbs)
14	66.52	33.26	ANTENNAS FOR THESE CHANNELS ARE NORMALLY GUYED. MAY BE DESIGNED SELF-SUPPORTING.	4,322	3,130	26,800
16	64.92	33.46		4,218	3,060	26,400
18	63.28	32.64		4,112	2,990	24,000
20	61.84	30.92		4,018	2,920	23,600
22	61.20	30.60		3,978	2,850	23,200
24	59.12	29.56		3,842	2,790	22,800
26	57.84	28.92		3,756	2,720	22,400
28	56.60	28.30		3,678	2,650	22,000
30	55.36	27.68		3,598	2,580	21,600
32	54.24	27.12		3,524	2,510	21,200
34	53.16	26.58		3,448	2,440	20,800
36	52.04	26.02		3,382	2,370	20,800
38	51.04	25.52		3,316	2,300	20,000
40	50.12	25.06	164,000	6,512	5,010	THESE ANTENNAS ARE NOT GUYED
42	49.12	24.56	157,000	6,384	4,910	
44	48.24	24.12	152,000	6,228	4,820	
46	47.40	23.70	146,000	6,160	4,730	
48	46.60	23.30	142,000	6,056	4,660	
50	45.80	22.90	137,000	5,952	4,590	
52	45.00	22.50	132,000	5,848	4,510	
54	44.20	22.10	127,000	5,744	4,430	
56	43.44	21.72	123,000	5,644	3,920	
58	42.72	21.36	118,000	5,552	3,850	
60	42.08	21.04	115,000	5,468	3,810	
62	41.40	20.70	112,000	5,380	3,730	
64	40.76	20.38	109,000	5,296	3,700	
66	40.16	20.08	105,000	5,220	3,640	
68	39.44	19.72	103,000	5,124	3,590	
70	38.96	19.48	99,000	5,064	3,550	

EXAMPLE	POWER GAINS with 10% first null fill in. (also available 15% & 20%)						
TILT ANGLE	No Tilt	−0.25°	−0.50°	−0.75°	−1.00°	−1.25°	−1.50°
RMS Gain Ratio	32.00	31.70	31.65	31.60	31.25	31.05	30.80
Ratio in DB	15.05	15.02	15.01	15.00	14.95	14.92	14.89
Horizontal Ratio	32.00	30.10	25.10	19.10	10.72	5.02	1.55
Ratio in DB	15.05	14.79	14.00	12.81	10.31	7.01	1.91

1) Height measurements are in accordance with the sketch on page 58
2) Rated power input is 60 KW. Includes black level visual and 20% aural power
3) Power gain figures are for omnidirectional patterns.
4) Circularity is better than ±2DB. At channel 14 ±1.6DB, channel 70 ±2.7DB
5) Input VSWR is 1.08 to 1 or better across entire 6 megacycle channel
6) Wind loads are based upon EIA 50 pound standards, 112 MPH wind, with radomes
7) Input is 6⅛" EIA, 50 ohms, or 75 ohms on special order.

OMNIDIRECTIONAL ZIG ZAG ANTENNAS
FIVE BAYS, TYPE JZZ-5-O-B

Channel Number	HEIGHT IN FEET Antenna (Ah)	Radiation Center (Rc)	Moment M (Lbs)	Shear S (Lbs)	Weight W (Lbs)	Thrust T (Lbs)
14	83.15	41.58	ANTENNAS FOR THESE CHANNELS ARE NORMALLY GUYED. MAY BE DESIGNED SELF-SUPPORTING.	5,403	4,050	30,350
16	81.15	40.58		5,273	3,950	29,800
18	79.10	39.55		5,140	3,850	29,250
20	77.30	38.65		5,023	3,760	28,700
22	76.50	38.25		4,973	3,670	28,150
24	73.90	36.95		4,803	3,580	27,600
26	72.30	36.15		4,698	3,490	27,050
28	70.75	35.38		4,598	3,400	26,500
30	69.20	34.60		4,498	3,340	26,000
32	67.80	33.90		4,405	3,270	25,600
34	66.45	33.23		4,318	3,200	25,200
36	65.05	22.53		4,228	3,130	24,800
38	63.80	31.90		4,145	3,060	24,400
40	62.65	31.33		4,070	2,990	24,000
42	61.40	30.70		3,990	2,920	23,600
44	60.30	30.15		3,918	2,850	23,200
46	59.25	29.62		3,850	3,780	22,850
48	58.25	29.13		3,785	3,720	22,500
50	57.25	28.63		3,720	2,660	22,150
52	56.25	28.13		3,655	2,600	21,800
54	55.25	27.63		3,590	2,540	21,400
56	54.30	27.15		3,528	2,480	21,050
58	53.40	26.70		3,470	2,420	20,700
60	52.60	26.30		3,418	2,360	20,350
62	51.75	25.87		3,363	2,300	20,000
64	50.95	25.48	169,000	6,620	5,100	NOT GUYED
66	50.20	25.10	165,000	6,525	5,050	
68	49.30	24.65	161,000	6,405	4,960	
70	48.70	24.35	155,000	6,330	4,900	

EXAMPLE	POWER GAINS with 10% first null fill in. (also available 15% & 20%)						
TILT ANGLE	No Tilt	−0.25°	−0.50°	−0.75°	−1.00°	−1.25°	−1.50°
RMS Gain Ratio	40.00	39.95	39.90	39.41	39.10	39.00	37.80
Ratio in DB	16.02	16.01	16.00	15.96	15.92	15.91	15.77
Horizontal Ratio	40.00	36.94	27.65	16.65	7.28	1.95	.12
Ratio in DB	16.02	16.01	14.42	12.22	8.62	2.92	−.95

1) Height measurements are in accordance with the sketch on page 58
2) Rated power input is 60 KW. Includes black level visual and 20% aural power
3) Power gain figures are for omnidirectional patterns.
4) Circularity is better than ±2DB. At channel 14 ±1.6DB, channel 70 ±2.7DB
5) Input VSWR is 1.08 to 1 or better across entire 6 megacycle channel
6) Wind loads are based upon EIA 50 pound standards, 112 MPH wind, with radomes
7) Input is 6⅛" EIA, 50 ohms, or 75 ohms on special order.

OMNIDIRECTIONAL ZIG ZAG ANTENNAS
SIX BAYS, TYPE JZZ-6-O-B

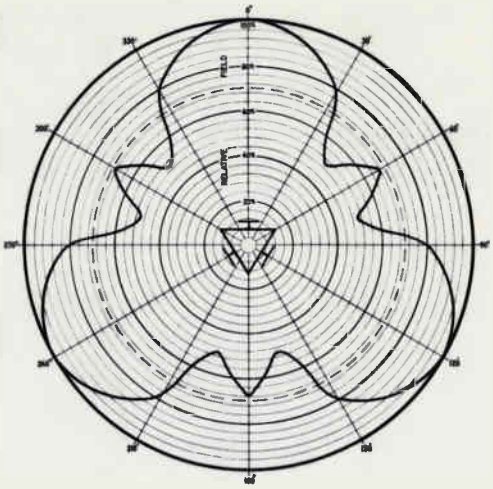
Channel Number	HEIGHT IN FEET Antenna (Ah)	Radiation Center (Rc)	Shear S Kips	Weight W (Lbs)	Thrust T (Lbs)
14	99.78	49.89	6,483	4,900	36,900
16	97.37	48.69	6,327	4,800	35,300
18	94.92	47.46	6,167	4,700	34,600
20	92.76	46.38	6,027	4,600	33,900
22	91.80	45.90	5,967	4,500	33,200
24	88.68	44.34	5,763	4,400	32,600
26	86.76	43.38	5,637	4,300	31,900
28	84.90	42.45	5,517	4,200	31,200
30	83.04	41.52	5,397	4,100	30,500
32	81.36	40.68	5,286	3,950	29,800
34	79.74	39.87	5,181	3,800	29,400
36	78.06	39.03	5,073	3,700	29,000
38	76.56	38.28	4,974	3,600	28,400
40	75.18	37.59	4,884	3,550	28,000
42	73.68	36.84	4,788	3,500	27,500
44	72.36	36.18	4,701	3,450	27,000
46	71.10	35.55	4,620	3,400	26,500
48	69.90	34.95	4,542	3,350	26,200
50	68.70	34.35	4,464	3,300	25,900
52	67.50	33.75	4,386	3,250	25,600
54	66.30	33.15	4,308	3,200	25,300
56	65.16	32.58	4,233	3,150	24,950
58	64.08	32.04	4,164	3,100	24,600
60	63.12	31.56	4,101	3,050	24,250
62	62.10	31.05	4,035	3,000	23,900
64	61.14	30.57	3,972	2,900	23,550
66	60.24	30.12	3,915	2,850	23,200
68	59.16	29.58	3,843	2,800	22,850
70	58.44	29.22	3,796	2,750	22,500

EXAMPLE	POWER GAINS with 10% first null fill in. (also available 15% & 20%)						
TILT ANGLE	No Tilt	−0.25°	−0.50°	−0.75°	−1.00°	−1.25°	−1.50°
RMS Gain Ratio	48.00	47.9	47.8	47.6	47.5	46.9	45.9
Ratio in DB	16.81	16.8	16.79	16.77	16.76	16.71	16.61
Horizontal Ratio	48.00	42.28	27.25	14.98	2.59	.12	2.59
Ratio in DB	16.81	16.26	14.36	11.76	4.13	—.79	4.13

1) Height measurements are in accordance with the sketch on page 58
2) Rated power input is 60 KW. Includes black level visual and 20% aural power
3) Power gain figures are for omnidirectional patterns.
4) Circularity is better than ±2DB. At channel 14 ±1.6DB, channel 70 ±2.7DB
5) Input VSWR is 1.08 to 1 or better across entire 6 megacycle channel
6) Wind loads are based upon EIA 50 pound standards, 112 MPH wind, with radomes
7) Input is 6⅛" EIA, 50 ohms, or 75 ohms on special order.

ELECTRICAL SPECIFICATIONS

OMNIDIRECTIONAL ZIG ZAG ANTENNAS TYPE JZT-0



Meets FCC Rule 73.685(e) for UHF antennas.
For pattern circularity, see page 57.
Each bay consists of three panels around tower.
Antenna includes triangular steel tower section.
Power capability 30 KW one bay, 60 KW 2 or more bays.
Power rating is the visual power plus 20% aural.
VSWR is better than 1.08 across the UHF channel.
Antenna input connector is 6⅛" 50 ohms, EIA.
Input connector located at the bottom of array.
Antenna-tower to mount on top of customers tower.
Contact Jampro for patterns & gains not shown.

JAMPRO TYPE NR.	JZT-1-0	JZT-2-0		JZT-3-0		JZT-4-0		JZT-5-0		JZT-6-0	
Number of Bays	1	2		3		4		5		6	
Vertical ½ PBW	7.0°	3.5°		2.3°		1.7°		1.4°		1.17°	
RMS power gain with out tilt or null fill	8.0	16.0		24.0		32.0		40.0		48.0	
	RMS power gain ratios and horizontal ratios with 10% first null fill										
TILT = −0.25°		15.6	14.9	23.3	22.6	29.8	28.0	39.1	36.1	46.5	41.3
−0.50°		15.4	14.2	23.1	20.4	29.9	23.2	38.9	27.3	46.3	26.5
−0.75°		15.2	13.9	22.7	17.2	29.4	16.5	38.8	17.6	46.0	11.5
−1.00°		15.0	13.2	22.4	13.9	29.2	10.1	38.7	6.9	45.5	2.4
−1.25°		14.9	9.9	22.4	5.3	28.9	4.5	38.4	1.5	45.1	.5
−1.50°		14.8	7.3	22.4	6.2	28.5	1.4	36.7	6.9	45.0	.3
−1.75°		13.4	6.4	20.6	1.7	27.6	.5	35.5	1.9	42.9	.4
−2.00°		13.2	5.4	20.2	.8	27.0	1.2	34.7	3.3	42.0	3.3
	RMS power gain ratios and horizontal ratios with 15% first null fill										
TILT = −0.25°		15.4	15.0	22.2	21.6	28.2	26.1	37.9	35.1	43.1	37.8
−0.50°		15.3	14.4	22.1	20.0	28.0	22.1	37.8	26.7	42.8	31.2
−0.75°		15.2	13.5	22.0	16.7	27.8	16.0	37.7	15.8	42.4	11.2
−1.00°		14.2	11.3	21.3	13.1	27.7	9.6	37.5	6.9	42.1	3.1
−1.25°		14.0	10.0	20.0	9.2	27.2	4.5	37.2	1.9	41.8	1.8
−1.50°		13.6	8.2	19.2	3.7	27.1	1.7	34.8	1.6	41.2	3.9
−1.75°		13.3	7.5	19.1	2.1	25.9	.9	33.5	2.7	39.4	5.4
−2.00°		12.9	6.5	18.8	1.4	25.1	3.5	32.8	3.9	38.8	4.4
	RMS power gain ratios and horizontal ratios with 20% first null fill										
TILT = −0.25°		14.4	14.3	20.8	20.2	28.0	26.4	36.3	33.1	41.4	36.4
−0.50°		14.3	13.8	20.6	18.5	27.8	22.0	36.0	25.2	41.2	24.1
−0.75°		14.2	13.1	20.6	15.7	27.7	15.8	35.8	15.7	40.8	11.2
−1.00°		14.1	12.3	20.3	12.5	25.0	9.0	35.6	7.3	40.5	3.7
−1.25°		13.9	10.8	20.0	9.3	25.0	4.6	35.2	2.6	40.2	2.4
−1.50°		13.5	8.7	17.7	4.2	24.6	2.2	34.6	1.5	39.5	4.5
−1.75°		13.0	6.9	17.2	2.9	23.9	1.7	33.5	2.7	38.2	5.9
−2.00°		12.6	5.4	17.0	2.5	23.4	2.9	29.0	4.6	37.4	4.8

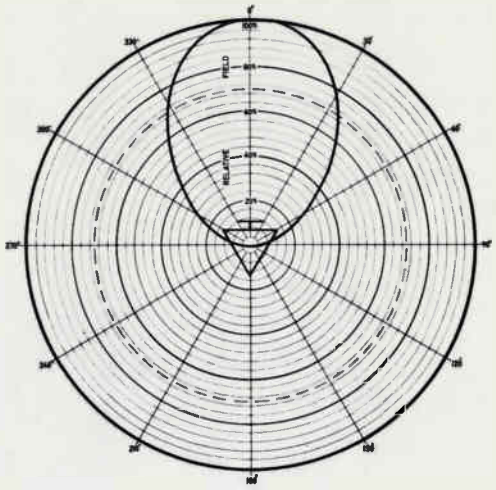
MECHANICAL SPECIFICATIONS
TYPE JZT OMNIDIRECTIONAL ANTENNAS

Wind loads are based upon EIA RS-222A standards.
Wind rating is 50 pounds, rounds, and 112 MPH.
Loads are calculated using radomes
Input connector is located at bottom of array.
Electrical deicers not used. Radomes available.
Four, five and six bay antenna-tower have guy ears.
All antenna-towers furnished with top beacon mounting plate and lightning discharge rods.
All tower fabrication hot dipped galvanized.

	Height in Feet						Weight in Lbs.			Shear in Kips Lbs.		
Bays	1	2	3	4	5	6	1	2	3	1	2	3
Channel												
14	16.63	33.26	49.89	66.52	83.15	99.78	859	1,749	2,666	4,490	8,980	13,479
16	16.23	32.46	48.69	64.92	81.15	97.37	841	1,713	2,612	4,382	8,764	13,146
18	15.82	31.64	47.46	63.28	79.10	94.92	822	1,670	2,556	4,271	8,542	12,814
20	15.46	30.92	46.38	61.84	77.30	92.76	806	1,631	2,495	4,174	8,348	12,522
22	15.30	30.60	45.90	61.20	76.50	91.80	792	1,617	2,467	4,131	8,262	12,393
24	14.78	29.56	44.34	59.12	73.90	88.68	769	1,570	2,397	3,990	7,981	11,971
26	14.46	28.92	43.38	57.84	72.30	86.76	754	1,528	2,341	3,904	7,808	11,712
28	14.15	28.30	42.45	56.60	70.75	84.90	740	1,500	2,299	3,820	7,641	11,461
30	13.84	27.68	41.52	55.36	69.20	83.04	720	1,472	2,257	3,736	7,473	11,210
32	13.56	27.12	40.68	54.24	67.80	81.36	708	1,447	2,206	3,661	7,322	10,983
34	13.29	26.58	39.87	53.16	66.45	79.74	696	1,417	2,170	3,588	7,176	10,764
36	13.01	26.02	39.03	52.04	65.05	78.06	683	1,391	2,132	3,512	7,025	10,538
38	12.76	25.52	38.28	51.04	63.80	76.56	672	1,362	2,098	3,446	6,890	10,335
40	12.53	25.06	37.59	50.12	62.65	75.18	661	1,341	2,047	3,383	6,766	10,149
42	12.28	24.56	36.84	49.12	61.40	73.68	650	1,319	2,013	3,315	6,631	9,946
44	12.06	24.12	36.18	48.24	60.30	72.36	640	1,299	1,984	3,256	6,307	9,768
46	11.85	23.70	35.55	47.40	59.25	71.10	631	1,274	1,949	3,199	6,399	9,598
48	11.65	23.30	34.95	46.60	58.25	69.90	615	1,256	1,922	3,145	6,291	9,436
50	11.45	22.90	34.35	45.80	57.25	68.70	606	1,238	1,895	3,091	6,183	9,274
52	11.25	22.50	33.75	45.00	56.25	67.50	597	1,213	1,855	3,037	6,075	9,112
54	11.05	22.10	33.15	44.20	55.25	66.30	588	1,113	1,831	2,983	5,967	8,950
56	10.86	21.72	32.58	43.44	54.30	65.16	579	997	1,812	2,901	5,864	8,796
58	10.68	21.36	32.04	42.72	53.40	64.08	571	981	1,777	2,883	5,767	8,650
60	10.52	21.04	31.56	42.08	52.60	63.12	564	966	1,744	2,840	5,680	8,521
62	10.35	20.70	31.05	41.40	51.75	62.10	556	950	1,721	2,794	5,589	8,383
64	10.19	20.38	30.57	40.76	50.95	61.14	549	935	1,692	2,751	5,502	8,253
66	10.04	20.08	30.12	40.16	50.20	60.24	542	922	1,679	2,710	5,421	8,132
68	9.86	19.72	29.58	39.44	49.30	59.16	534	906	1,653	2,662	5,324	7,986
70	9.74	19.48	29.22	38.96	48.70	58.44	523	895	1,634	2,629	5,259	7,889
72	9.60	19.20	28.80	38.40	48.00	57.60	517	882	1,607	2,592	5,184	7,776
74	9.45	18.90	28.35	37.80	47.25	56.70	510	868	1,586	2,551	5,103	7,654
76	9.32	18.64	27.96	37.28	46.60	55.92	504	857	1,562	2,516	5,032	7,549
78	9.19	18.38	27.57	36.76	45.95	55.14	493	834	1,535	2,448	4,897	7,346
80	9.07	18.14	27.21	36.28	45.35	54.42	493	834	1,434	2,448	4,897	7,346
82	8.94	17.88	26.82	35.76	44.70	53.64	487	822	1,504	2,413	4,827	7,241

DIRECTIONAL ZIG ZAG ANTENNAS
TYPE JZZ - D1B

The power capability is 10 kilowatts per bay.
Power rating is the visual power plus 20% aural.
The horizontal half power beam width is 67°.
VSWR is better than 1.08 at the UHF channels.
Antenna input connector is 6⅛", 50 ohms EIA.
Input connector located at the bottom of array.
Windload is the maximum, with or without radomes.
These antennas made to mount on customers tower.
Suitable for either tower leg or face mounting.
Supplied with tilt or azimuth mounting hardware.
Center of radiation is one half of the height.
Interpolate, for values in between channels.
Contact Jampro for patterns & gains not shown.
Power gain values shown are without null fill.



HORIZONTAL HALF POWER
BEAM WIDTH IS 67°

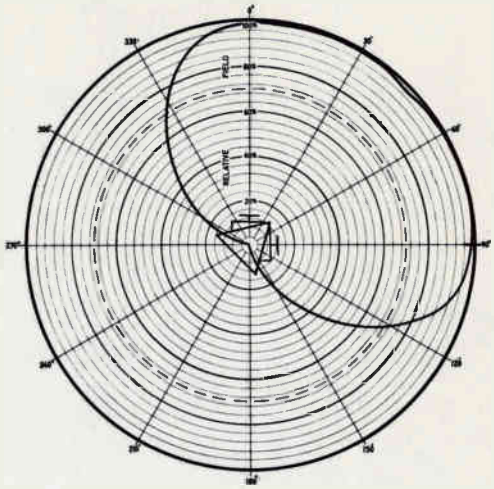
JAMPRO TYPE NR.	JZZ-1-D1B	JZZ-2-D1B	JZZ-3-D1B	JZZ-4-D1B	JZZ-5-D1B	JZZ-6-D1B
NUMBER OF BAYS	1	2	3	4	5	6
Peak Power Gain (1)	40.8	81.6	122.4	163.2	204.0	244.8
−0.5° Peak Gain (2)	40.7	81.0	120.8	160.5	192.7	238.0
−0.5° Horizontal (2)	40.5	78.0	108.9	97.8	139.5	154.0
Vertical ½ PBW	7.0°	3.5°	2.33°	1.75°	1.4°	1.17°
Height, Channel, Ft.						
14	16.63	33.26	49.89	66.52	83.15	99.78
20	15.46	30.92	46.38	61.84	77.30	92.76
30	13.84	27.68	41.52	55.36	69.20	83.04
40	12.53	25.06	37.59	50.12	62.65	75.18
50	11.45	22.90	34.35	45.80	57.25	68.70
60	10.52	21.04	31.56	42.08	52.60	63.12
70	9.74	19.48	29.22	38.96	48.70	58.44
83	8.88	17.76	26.64	35.52	44.40	53.28
Weight, Channel, Lbs.						
14	134	264	402			
20	121	242	484			
30	112	224	336			
40	104	208	312			
50	95	190	285			
60	89	178	267			
70	83	166	249			
83	76	152	228			
Shear, Channel, Lbs.						
14	1,496	2,993	4,490			
20	1,391	2,782	4,174			
30	1,245	2,491	3,736			
40	1,127	2,255	3,383			
50	1,030	2,061	3,091			
60	946	1,893	2,840			
70	876	1,753	2,629			
83	799	1,598	2,397			

FOR THESE ANTENNAS CONTACT JAMPRO FOR OVER-TURNING MOMENT, SHEAR AND THRUST

(1) Power gain ratio without tilt or null fill in
(2) Power gains with -0.5° tilt and no null fill in. Contact Jampro for other tilts and null fill ins

DIRECTIONAL ZIG ZAG ANTENNAS
TYPE JZZ - D2B

The power capability is 20 kilowatts per bay.
Power rating is the visual power plus 20% aural.
Horizontal half power beam width is 153°.
VSWR is better than 1.08 at the UHF channels.
Antenna input connector is 6⅛", 50 ohms EIA.
Input connector located at the bottom of array.
Windload is the maximum, with or without radomes.
These antennas made to mount on customers tower.
Suitable for either tower leg or face mounting.
Supplied with tilt or azimuth mounting hardware.
Center of radiation is one half of the height.
Interpolate, for values in between channels.
Contact Jampro for patterns & gains not shown.



HORIZONTAL HALF POWER
BEAM WIDTH IS 153°

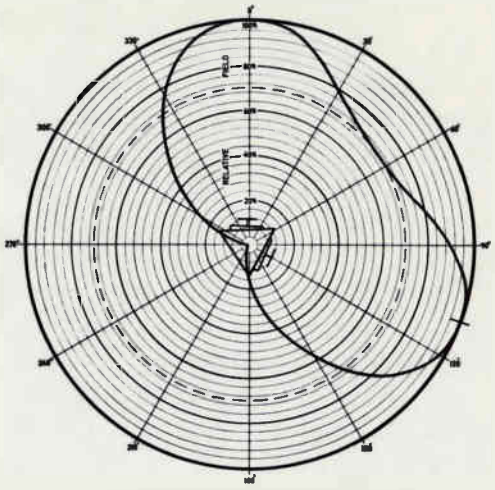
JAMPRO TYPE NR.	JZZ-1-D2B	JZZ-2-D2B	JZZ-3-D2B	JZZ-4-D2B	JZZ-5-D2B	JZZ-6-D2B
NUMBER OF BAYS	1	2	3	4	5	6
Peak Power Gain (1)	18.2	36.4	54.6	72.8	91.0	109.2
−0.5° Peak Gain (2)	18.1	36.2	54.2	71.6	86.1	106.0
−0.5° Horizontal (2)	18.0	34.8	48.6	43.7	62.2	64.2
Vertical ½ PBW	7.0°	3.5°	2.33°	1.75°	1.4°	1.17°
Height, Channel, Ft.						
14	16.63	33.26	49.89	66.52	83.15	99.78
20	15.46	30.92	46.38	61.84	77.30	92.76
30	13.84	27.68	41.52	55.36	69.20	83.04
40	12.53	25.06	37.59	50.12	62.65	75.18
50	11.45	22.90	34.35	45.80	57.25	68.70
60	10.52	21.04	31.56	42.08	52.60	63.12
70	9.74	19.48	29.22	38.96	48.70	58.44
83	8.88	17.76	26.64	35.52	44.40	53.28
Weight, Channel, Lbs.						
14	269	597	919			
20	243	557	879			
30	224	507	784			
40	209	464	713			
50	190	426	670			
60	179	392	612			
70	164	371	578			
83	154	341	529			
Shear, Channel, Lbs.						
14	2,993	5,986	8,980			
20	2,782	5,565	8,348			
30	2,426	4,982	7,473			
40	2,255	4,510	6,766			
50	2,061	4,122	6,183			
60	1,893	3,787	5,680			
70	1,753	3,506	5,259			
83	1,598	3,196	4,795			

FOR THESE ANTENNAS CONTACT JAMPRO FOR OVER-TURNING MOMENT, SHEAR AND THRUST

(1) Power gain ratio without tilt or null fill in
(2) Power gains with -0.5° tilt and no null fill in. Contact Jampro for other tilts and null fill ins

DIRECTIONAL ZIG ZAG ANTENNAS
TYPE JZZ - D2C

The power capability is 20 kilowatts per bay.
Power rating is the visual power plus 20% aural.
The horizontal half power beam width is 177°.
VSWR is better than 1.08 at the UHF channels.
Antenna input connector is 6⅛", 50 ohms EIA.
Input connector located at the bottom of array.
Windload is the maximum, with or without radomes.
These antennas made to mount on customers tower.
Suitable for either tower leg or face mounting.
Supplied with tilt or azimuth mounting hardware.
Center of radiation is one half of the height.
Interpolate, for values in between channels.
Contact Jampro for patterns & gains not shown.



HORIZONTAL HALF POWER
BEAM WIDTH IS 177°

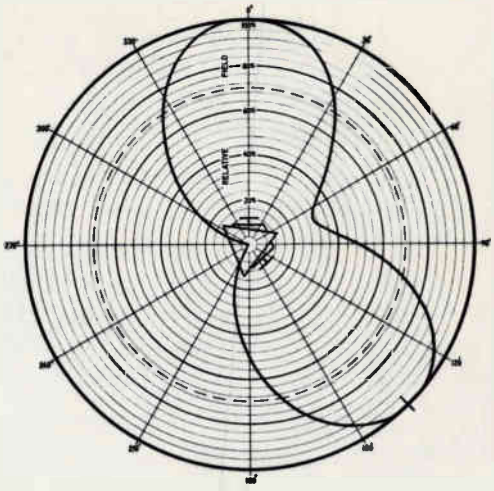
JAMPRO TYPE NR.	JZZ-1-D2C	JZZ-2-D2C	JZZ-3-D2C	JZZ-4-D2C	JZZ-5-D2C	JZZ-6-D2C
NUMBER OF BAYS	1	2	3	4	5	6
Peak Power Gain (1)	18.9	37.8	56.7	75.6	94.5	113.4
−0.5° Peak Gain (2)	18.8	37.6	56.2	74.4	89.5	110.0
−0.5° Horizontal (2)	18.7	36.1	50.4	45.4	64.6	66.7
Vertical ½ PBW	7.0°	3.5°	2.33°	1.75°	1.4°	1.17°
Height, Channel, Ft.						
14	16.63	33.26	49.89	66.52	83.15	99.78
20	15.46	30.92	46.38	61.84	77.30	92.76
30	13.84	27.68	41.52	55.36	69.20	83.04
40	12.53	25.06	37.59	50.12	62.65	75.18
50	11.45	22.90	34.35	45.80	57.25	68.70
60	10.52	21.04	31.56	42.08	52.60	63.12
70	9.74	19.48	29.22	38.96	48.70	58.44
83	8.88	17.76	26.64	35.52	44.40	53.28
Weight, Channel, Lbs.						
14	269	597	919			
20	243	557	879			
30	224	507	784			
40	209	464	713			
50	190	456	670			
60	179	392	612			
70	164	371	578			
83	154	341	529			
Shear, Channel, Lbs.						
14	2993	5986	8980			
20	2782	5565	8348			
30	2426	4982	7475			
40	2255	4510	6766			
50	2061	4122	6183			
60	1893	3787	5680			
70	1753	3506	5259			
83	1598	3196	4795			

FOR THESE ANTENNAS CONTACT JAMPRO FOR OVER-TURNING MOMENT, SHEAR AND THRUST

(1) Power gain ratio without tilt or null fill in
(2) Power gains with -0.5° tilt and no null fill in. Contact Jampro for other tilts and null fill ins

DIRECTIONAL ZIZ ZAG ANTENNAS
TYPE JZZ - D2D

The power capability is 20 kilowatts per bay.
Power rating is the visual power plus 20% aural.
The horizontal half power beam widths are 67°.
VSWR is better than 1.08 across the UHF channel.
Antenna input connector is 6⅛", 50 ohms EIA.
Input connector located at the bottom of array.
Windload is the maximum, with or without radomes.
These antennas made to mount on customers tower.
Suitable for either tower leg or face mounting.
Supplied with tilt or azimuth mounting hardware.
Center of radiation is one half of the height.
Interpolate, for values in between channels.
Contact Jampro for patterns & gains not shown.



HORIZONTAL HALF POWER
BEAM WIDTHS ARE 67°

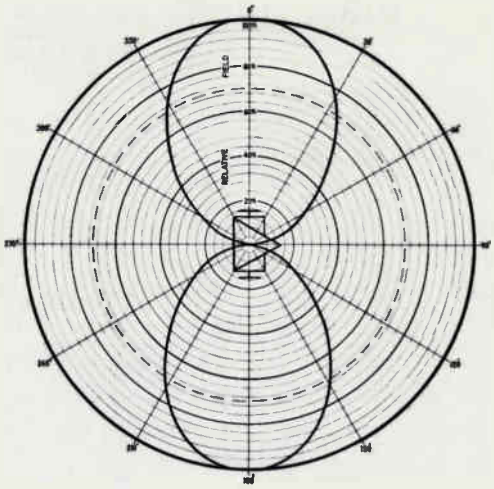
JAMPRO TYPE NR.	JZZ-1-D2D	JZZ-2-D2D	JZZ-3-D2D	JZZ-4-D2D	JZZ-5-D2D	JZZ-6-D2D
Number of Bays	1	2	3	4	5	6
Peak Power Gain (1)	19.5	39.0	58.5	78.0	97.5	117.0
−0.5° Peak Gain (2)	19.4	38.8	58.1	76.7	92.2	113.5
−0.5° Horizontal (2)	19.3	37.2	52.0	46.8	66.8	68.8
Vertical ½ PBW	7.0°	3.5°	2.33°	1.75°	1.4°	1.17°
Height, Channel, Ft.						
14	16.63	33.26	49.89	66.52	83.15	99.78
20	15.46	30.92	46.38	61.84	77.30	92.76
30	13.84	27.68	41.52	55.36	69.20	83.04
40	12.53	25.06	37.59	50.12	62.65	75.18
50	11.45	22.90	34.35	45.80	57.25	68.70
60	10.52	21.04	31.56	42.08	52.60	63.12
70	9.74	19.48	29.22	38.96	48.70	58.44
83	8.88	17.76	26.64	35.52	44.40	53.28
Weight, Channel, Lbs.						
14	269	597	919			
20	243	557	879			
30	224	507	784			
40	209	464	713			
50	190	426	670			
60	179	392	612			
70	164	371	578			
83	154	341	529			
Shear, Channel, Lbs.						
14	2,993	5,986	8,980			
20	2,782	5,565	8,348			
30	2,426	4,982	7,473			
40	2,255	4,510	6,766			
50	2,061	4,122	6,183			
60	1,893	3,787	5,680			
70	1,753	3,506	5,259			
83	1,598	3,196	4,795			

FOR THESE ANTENNAS CONTACT JAMPRO FOR OVER-TURNING MOMENT, SHEAR AND THRUST

(1) Power gain ratio without tilt or null fill in
(2) Power gains with -0.5° tilt and no null fill in. Contact Jampro for other tilts and null fill ins

DIRECTIONAL ZIG ZAG ANTENNAS
TYPE JZZ - D2E

The power capability is 20 kilowatts per bay.
Power rating is the visual power plus 20% aural.
The horizontal half power beam widths are 67°.
VSWR is better than 1.08 at the UHF channels.
Antenna input connector is 6⅛", 50 ohms EIA.
Input connector located at the bottom of array.
Windload is the maximum, with or without radomes.
These antennas made to mount on customers tower.
Suitable for either tower leg or face mounting.
Supplied with tilt or azimuth mounting hardware.
Center of radiation is one half of the height.
Interpolate, for values in between channels.



HORIZONTAL HALF POWER
BEAM WIDTHS ARE 67°

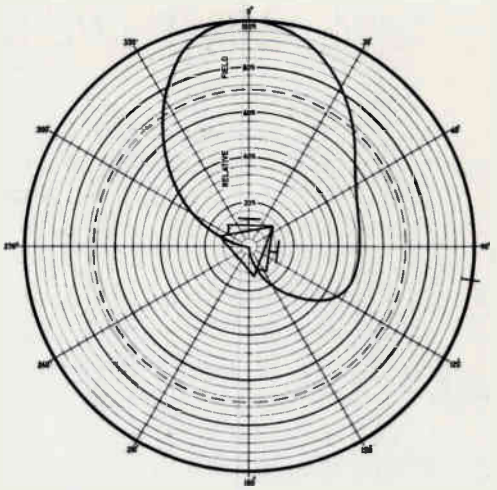
JAMPRO TYPE NR.	JZZ-1-D2E	JZZ-2-D2E	JZZ-3-D2E	JZZ-4-D2E	JZZ-5-D2E	JZZ-6-D2E
NUMBER OF BAYS	1	2	3	4	5	6
Peak Power Gain (1)	20.4	40.8	61.2	81.6	102.0	122.4
−0.5° Peak Gain (2)	20.3	40.6	60.8	80.4	96.4	119.0
−0.5° Horizontal (2)	20.2	39.0	54.5	49.0	69.9	66.2
Vertical ½ PBW	7°	3.5°	2.3°	1.75°	1.4°	1.17°
Height, Channel, Ft.						
14	16.63	33.26	49.89	66.52	83.15	99.78
20	15.46	30.92	46.38	61.84	77.30	92.76
30	13.84	27.68	41.52	55.36	69.20	83.04
40	12.53	25.06	37.59	50.12	62.65	75.18
50	11.45	22.90	34.35	45.80	57.25	68.70
60	10.52	21.04	31.56	42.08	52.60	63.12
70	9.74	19.48	29.22	38.96	48.70	58.44
83	8.88	17.76	26.64	35.52	44.40	53.28
Weight, Channel, Lbs.						
14	269	597	919			
20	243	557	879			
30	224	507	784			
40	209	464	713			
50	190	426	670			
60	179	392	612			
70	164	374	578			
83	154	341	529			
Shear, Channel, Lbs.						
14	2,993	5,986	8,980			
20	2,782	5,565	8,348			
30	2,426	4,982	7,473			
40	2,255	4,510	6,766			
50	2,061	4,122	6,183			
60	1,893	3,787	5,680			
70	1,753	3,506	5,259			
83	1,598	3,196	4,795			

FOR THESE ANTENNAS CONTACT JAMPRO FOR OVER-TURNING MOMENT, SHEAR AND THRUST

(1) Power gain ratio without tilt or null fill in
(2) Power gains with -0.5° tilt and no null fill in. **Contact Jampro for other tilts and null fill ins**

DIRECTIONAL ZIG ZAG ANTENNAS
TYPE JZZ - DP2A

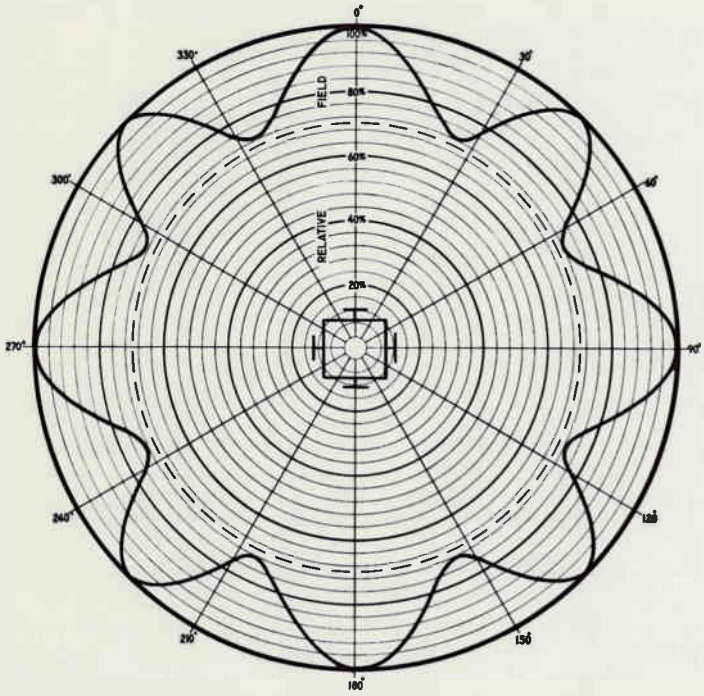
Patterns by power division and panel headings.
Each bay consists of two panels around tower.
For patterns of this series see page 35 and 36.
Pattern on right is for a JZZ-1-DP2A antenna.
Peak gains indicated below are for major lobes.
The power capability is 20 kilowatts per bay.
Power rating is the visual power plus 20% aural.
VSWR is better than 1.08 across the UHF channel.
Antenna input connector is 6⅛" 50 ohms, EIA.
Input connector located at the bottom of array.
These antennas made to mount on customers tower.
For mechanical data, contact Jampro.
Contact Jampro for patterns & gains not shown.



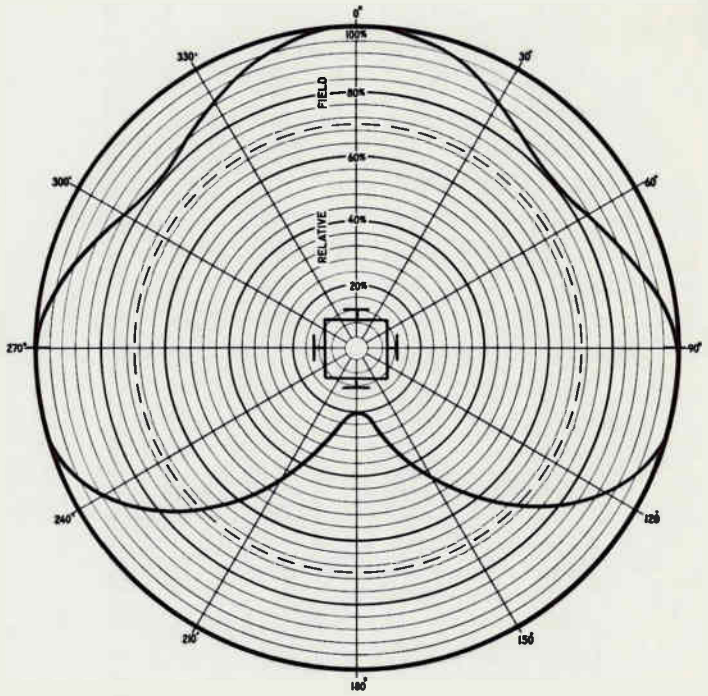
JZZ-1-DP2A HORIZONTAL PATTERN

JAMPRO TYPE NO.	JZZ-1-DP2A		JZZ-2-DP2A		JZZ-3-DP2A		JZZ-4-DP2A	
Number of Bays	1		2		3		4	
Vertical ½ PBW	7°		3.5°		2.3°		1.75°	
Peak power gain without tilt or null fill	30.0		60.0		90.0		120.0	
	Peak power gain ratios and horizontal ratios, with 10% first null fill							
TILT = −0.25°	29.2	27.9	55.8	52.5	87.5	83.9	117.0	111.7
−0.50°	28.9	26.7	56.0	43.5	86.8	80.0	115.5	107.0
−0.75°	28.4	26.0	55.1	31.0	85.2	78.0	113.8	104.0
−1.00°	28.2	24.7	54.8	19.0	84.6	74.1	113.0	99.0
−1.25°	28.0	18.5	54.2	8.5	84.0	55.9	112.0	74.4
−1.50°	27.8	13.7	53.5	2.7	83.5	21.1	111.3	54.8
−1.75°	25.2	12.0	51.8	0.9	75.6	36.0	101.0	48.0
−2.00°	24.8	10.1	50.6	2.3	74.5	30.3	99.3	40.4
	Peak power gain ratios and horizontal ratios, with 15% first null fill							
TILT = −0.25°	28.8	28.2	52.8	49.0	86.5	84.6	115.2	113.0
−0.50°	28.7	27.0	52.6	41.5	86.1	81.0	115.0	108.0
−0.75°	28.5	25.3	52.2	29.9	85.5	76.0	114.3	101.2
−1.00°	26.6	21.2	51.9	18.0	79.8	63.6	106.5	84.8
−1.25°	26.2	18.7	51.0	8.4	73.6	56.1	105.0	74.8
−1.50°	25.4	15.3	50.3	3.1	76.2	46.0	102.0	61.2
−1.75°	25.0	14.1	48.5	1.7	75.0	42.3	100.0	56.4
−2.00°	24.2	12.1	47.0	6.6	72.6	36.3	97.0	48.4
	Peak power gain ratios and horizontal ratios, with 20% first null fill							
TILT = −0.25°	27.0	26.9	52.4	49.4	81.0	80.9	108.0	107.5
−0.50°	26.8	25.9	52.1	41.2	80.5	77.8	107.3	103.5
−0.75°	26.6	24.6	51.8	29.6	79.9	74.0	106.5	98.5
−1.00°	26.4	23.0	46.8	16.9	79.2	69.0	105.7	92.0
−1.25°	26.0	20.3	46.7	8.6	78.0	61.0	104.1	81.3
−1.50°	25.2	16.3	46.0	4.1	75.9	49.0	101.0	65.2
−1.75°	24.4	12.9	44.8	3.1	73.2	38.7	97.7	51.6
−2.00°	23.6	10.1	43.8	5.4	70.9	30.3	94.5	40.4

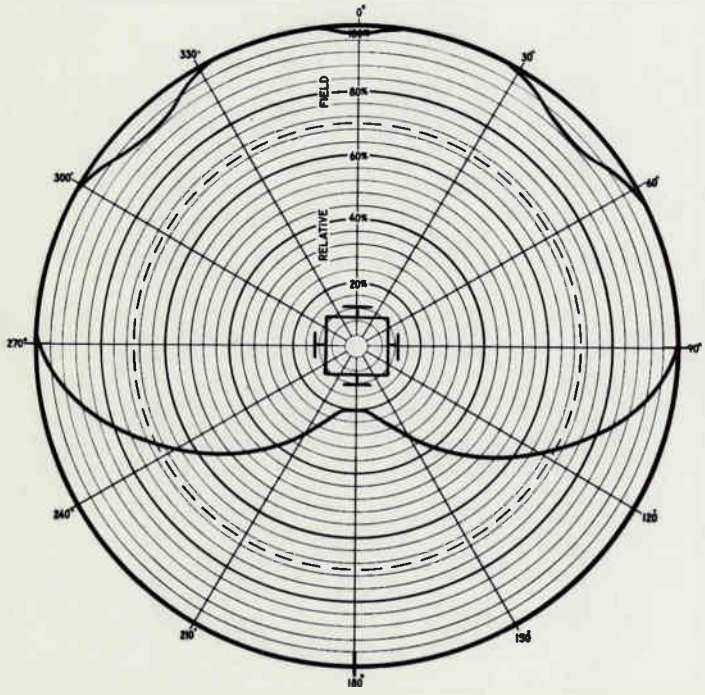
TYPICAL MEASURED AND CALCULATED HORIZONTAL FIELD PATTERNS



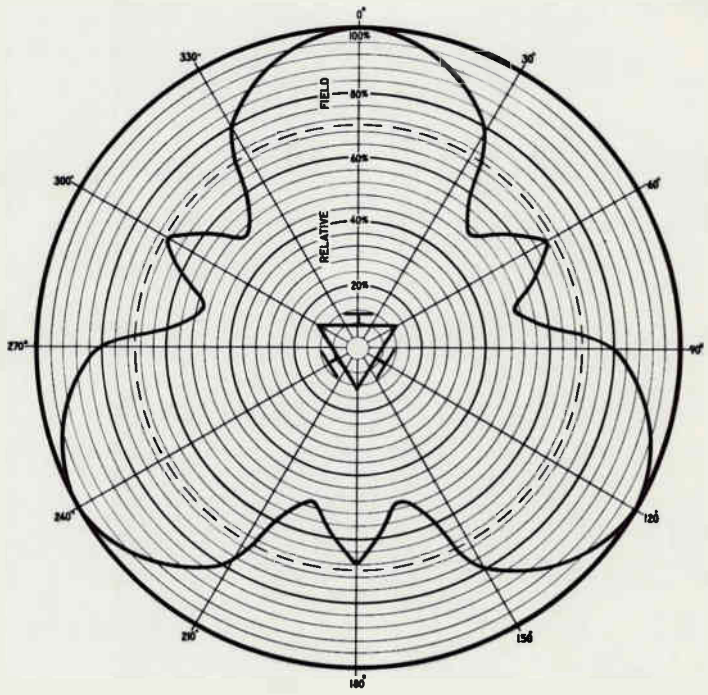
PATTERN NO. 1
Jampro type JZZ-1-OB. Pattern circularity ±1.4 DB
Maximum horizontal directivity ratio 1.28 = 1.06 DB
The RMS gain ratio per bay is 8.06 which is 9.03 DB



PATTERN NO. 3
Jampro type JZZ-1-CPA. Pattern circularity ± 7.0 DB
Maximum horizontal directivity ratio 1.47 = 1.68 DB
Peak power gain ratio per bay, 11.76 which is 10.7 DB

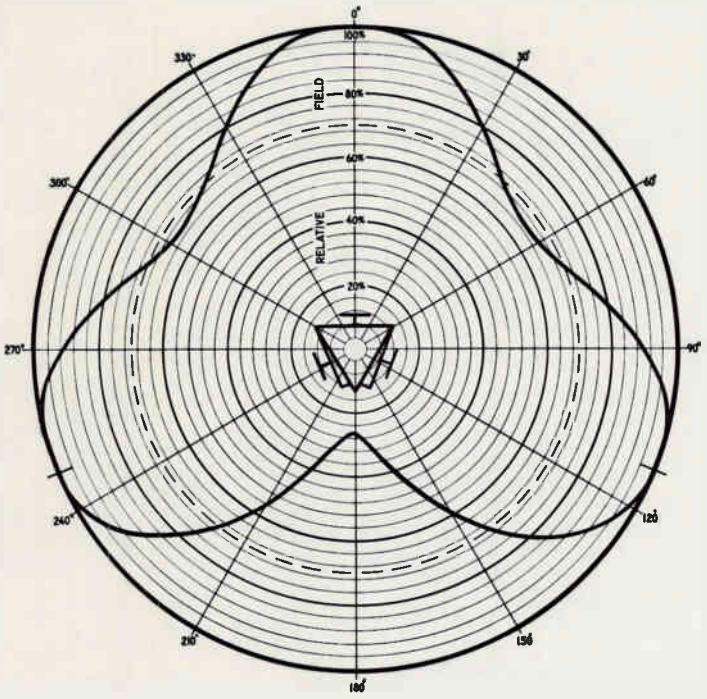


PATTERN NO. 2
Jampro type JZZ-1-C4B. Pattern circularity ± 7.0 DB
Maximum horizontal directivity ratio 1.51 = 1.80 DB
Peak power gain ratio per bay, 12.08 which is 10.8 DB

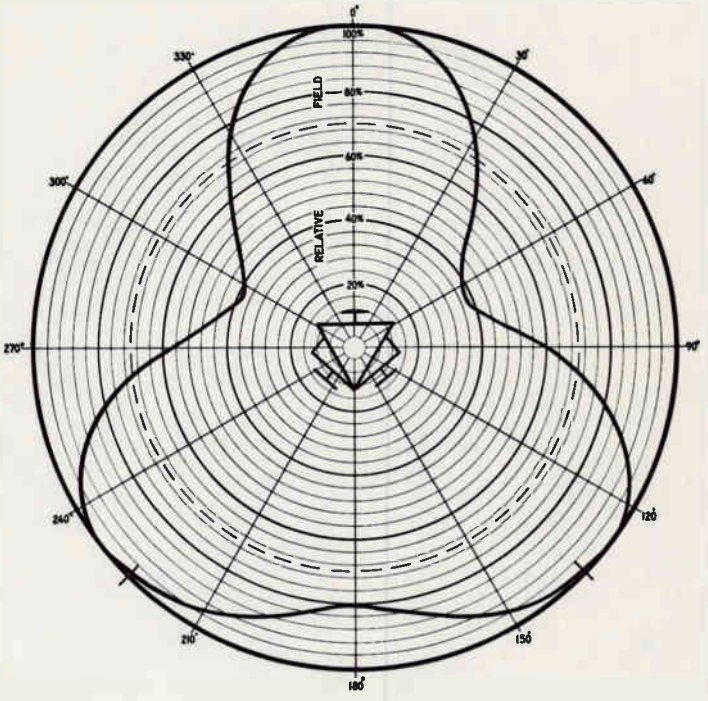


PATTERN NO. 4
Jampro type JZT-1-D. Pattern circularity ± 3.0 DB
Maximum horizontal directivity ratio 1.62 = 2.1 DB
The RMS gain ratio per bay is 8.00 which is 9.03 DB

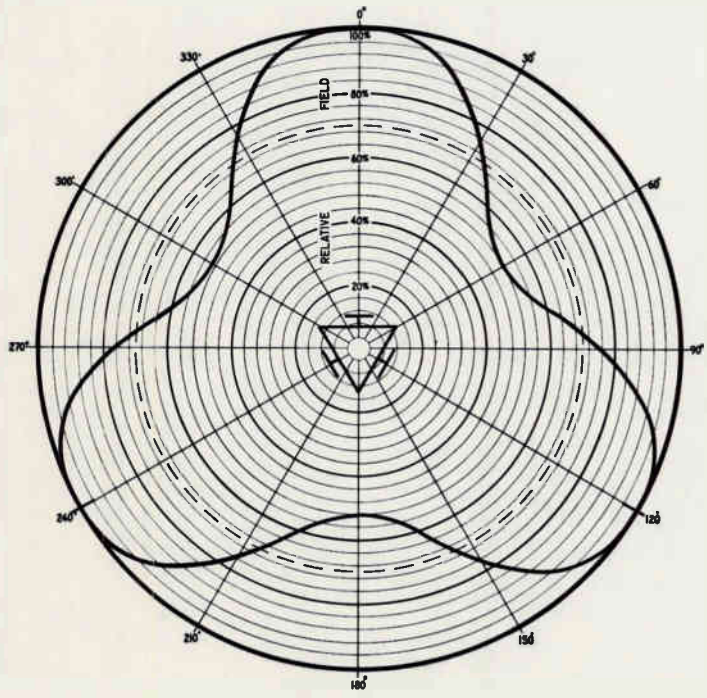
TYPICAL MEASURED AND CALCULATED HORIZONTAL FIELD PATTERNS



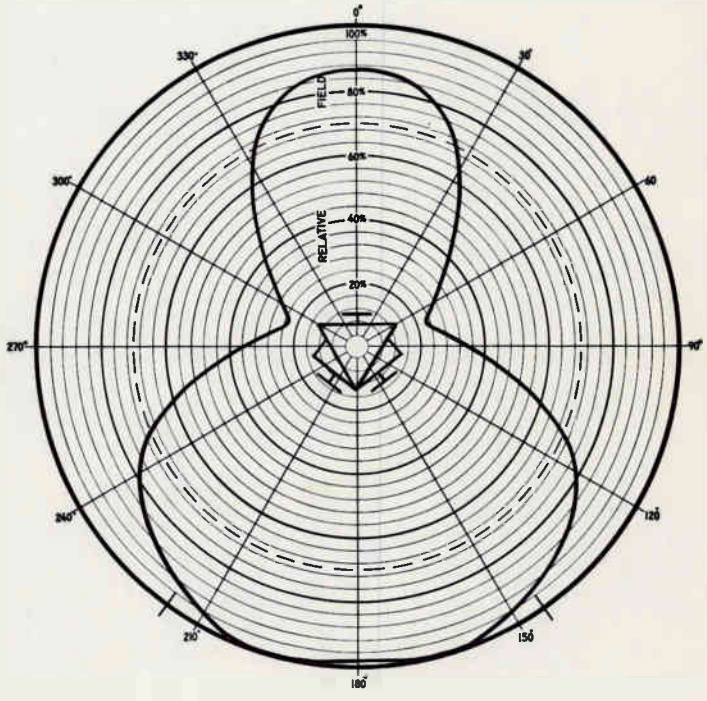
PATTERN NO. 5
Jampro type JZT-Custom. Pattern circularity ± 5.7 DB
Maximum horizontal directivity ratio 1.59 = 2 DB
Peak power gain ratio per bay, 12.44 which is 10.95 DB



PATTERN NO. 7
Jampro type JZT-Custom. Pattern circularity ± 4.2 DB
Maximum horizontal directivity ratio 1.58 = 2.0 DB
Peak power gain per bay, 12.42 which is 10.95 DB

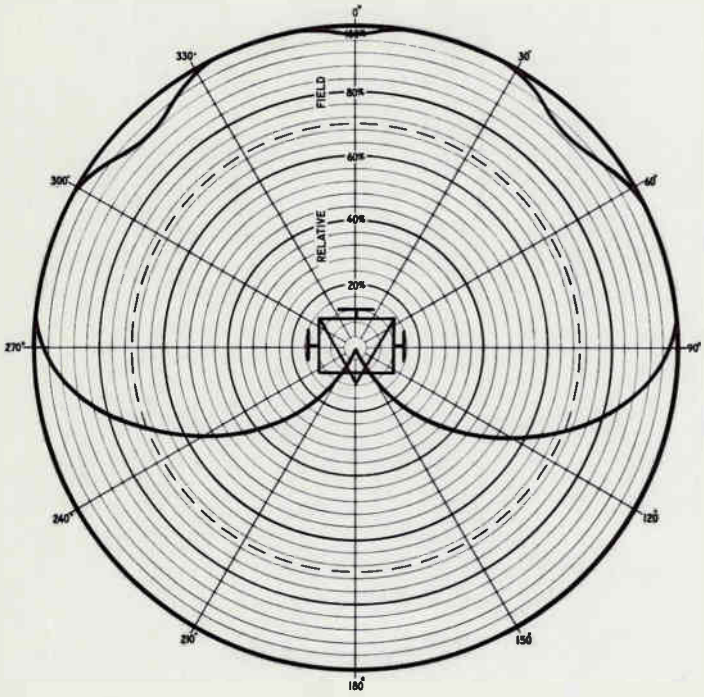


PATTERN NO. 6
Jampro type JZT-Custom. Pattern circularity ± 2.8 DB
Maximum horizontal directivity 1.62 = 2.1 DB
The RMS gain ratio per bay is 8.00 which is 9.03 DB

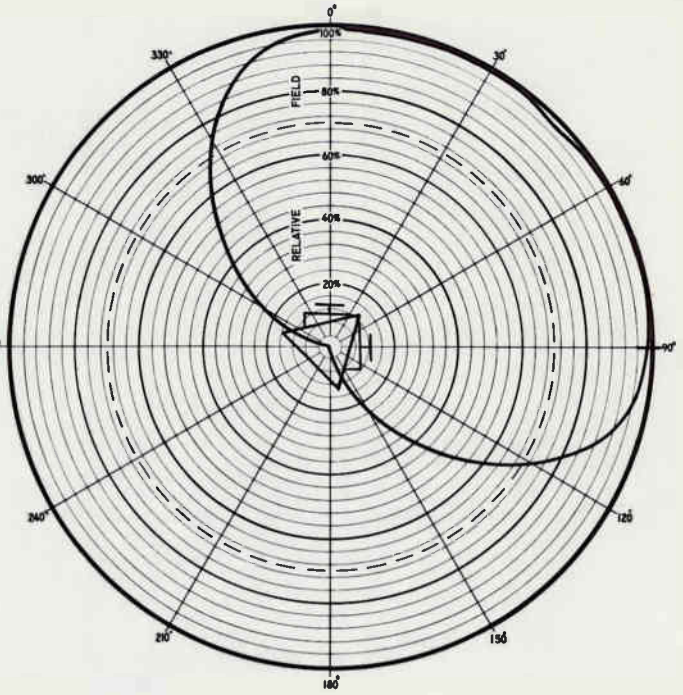


PATTERN NO. 8
Jampro type JZT-Custom. Pattern circularity ± 6.4 DB
Maximum horizontal directivity ratio 1.96 = 2.91 DB
Peak power gain ratio per bay, 15.46 which is 11.9 DB

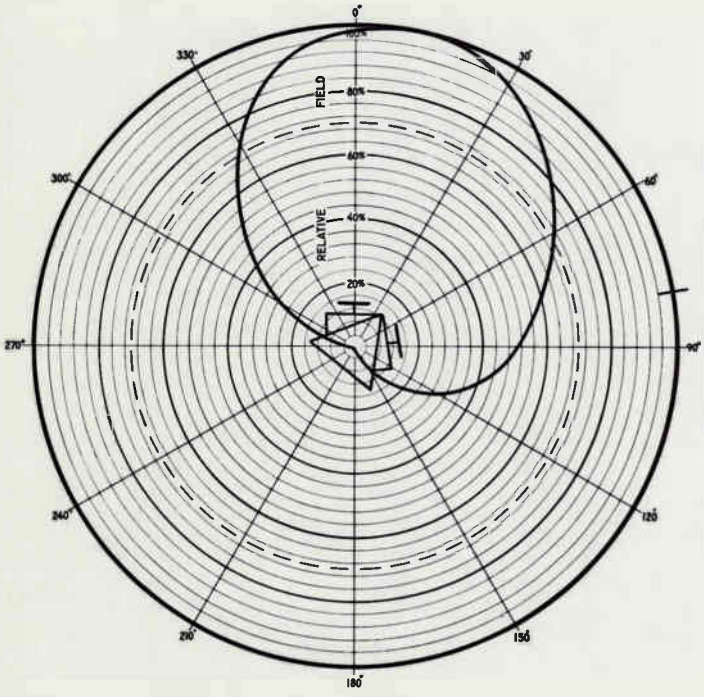
TYPICAL MEASURED AND CALCULATED HORIZONTAL FIELD PATTERNS



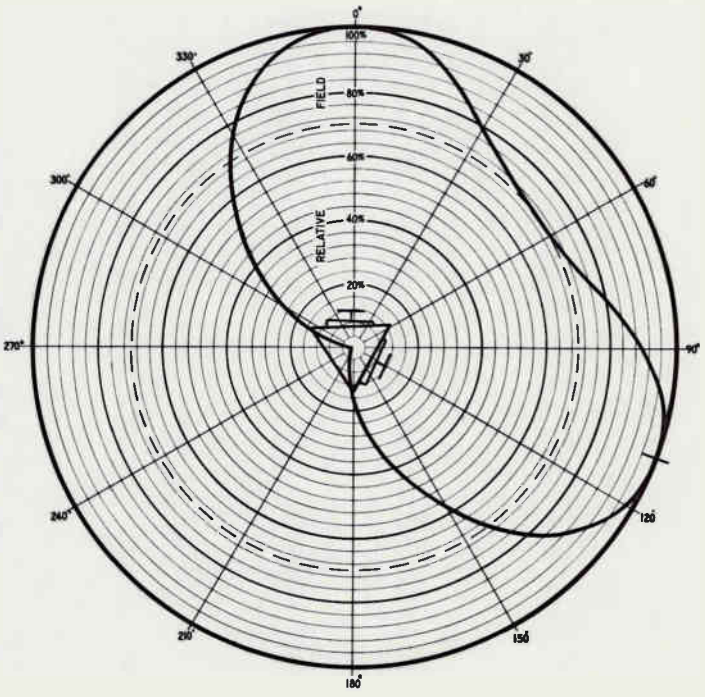
PATTERN NO. 9
Jampro type JZZ-1-D3B. Half power beam width = 228°
Maximum horizontal directivity ratio 1.62 = 2.1 DB
Peak power gain ratio per bay, 12.66 which is 11.0 DB



PATTERN NO. 11
Jampro type JZZ-D2B. Half power beam width = 153°
Maximum horizontal directivity ratio 2.33 = 3.66 DB
Peak power gain ratio per bay, 18.23 which is 12.6 DB

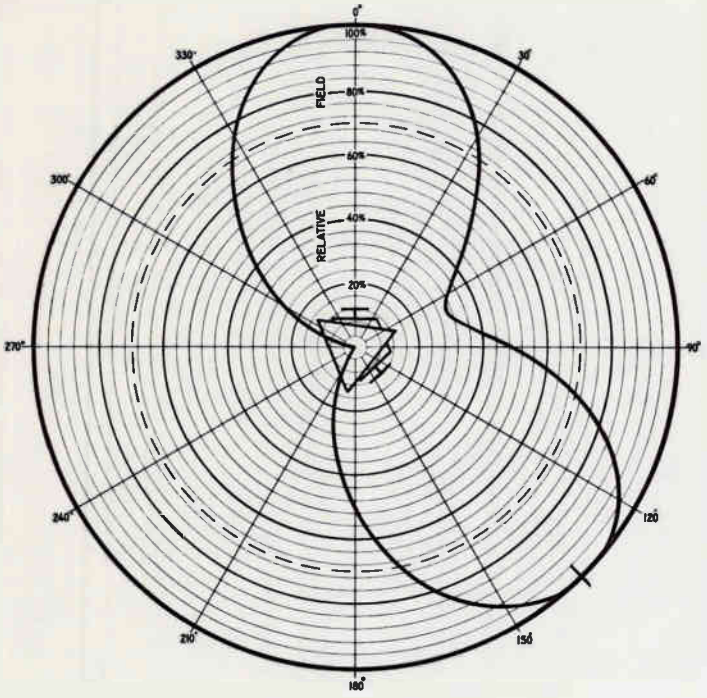


PATTERN NO. 10
Jampro type JZZ-1-D21A. Half power beam width = 93°
Maximum horizontal directivity ratio 3.59 = 5.51 DB
Peak power gain ratio per bay, 28.07 which is 14.49 DB

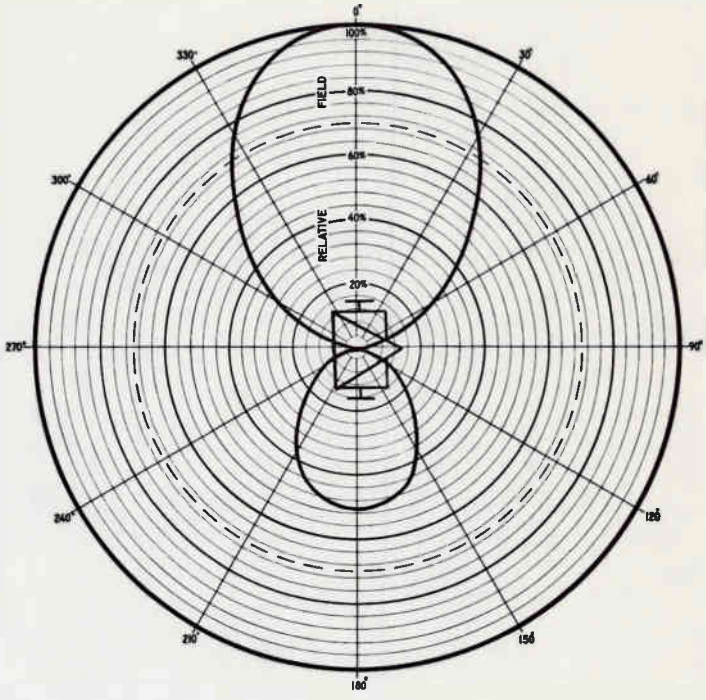


PATTERN NO. 12
Jampro type JZZ-1-D2C. Half power beam width =177°
Maximum horizontal directivity ratio 2.42 = 3.81 DB
Peak power gain ratio per bay, 18.92 which is 12.77 DB

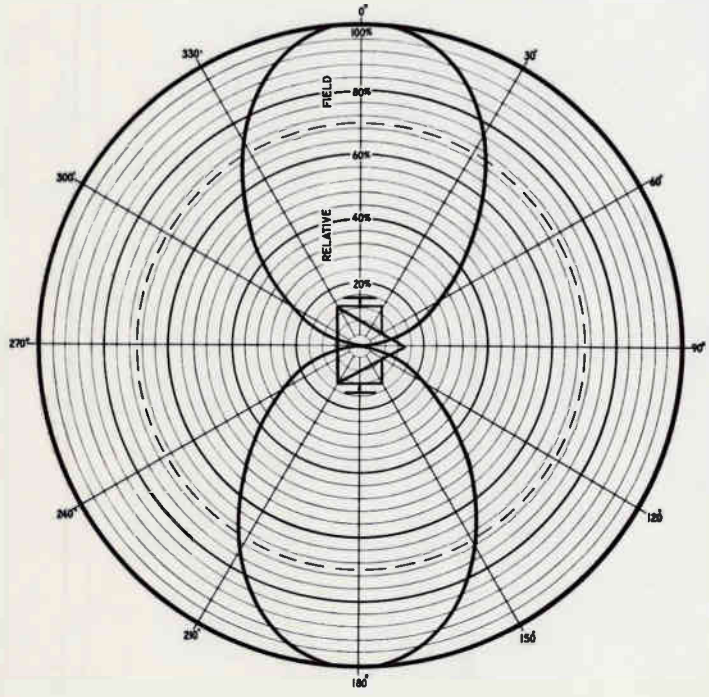
TYPICAL MEASURED AND CALCULATED HORIZONTAL FIELD PATTERNS



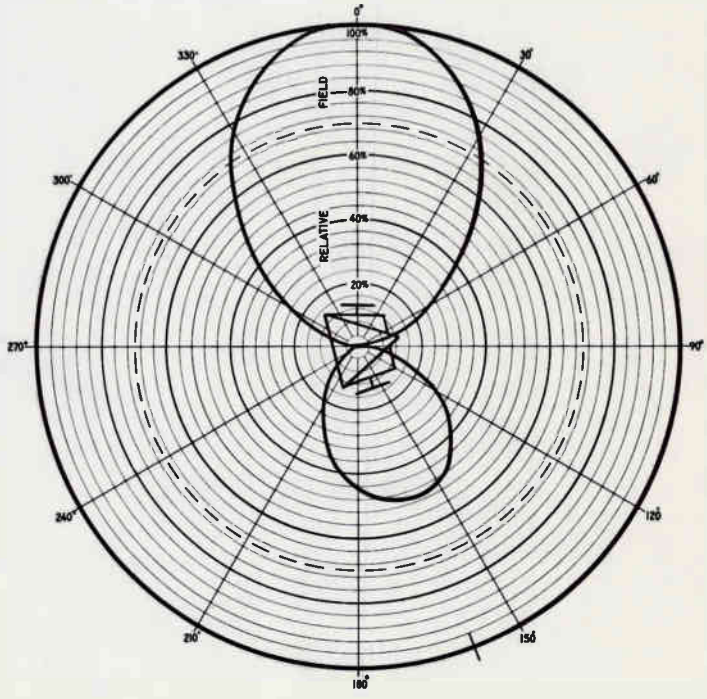
PATTERN NO. 13
Jampro type JZZ-1-D2D. Half power beam width = 67°
Maximum horizontal directivity ratio 2.46 = 3.91 DB
Peak power gain ratio per bay 19.5, which is 12.9 DB



PATTERN NO. 15
Jampro type JZZ-DP2E. Half power beam width is 67°
Maximum horizontal directivity ratio 3.9 = 5.9 DB
Peak power gain ratio per bay 30.6, which is 14.85 DB

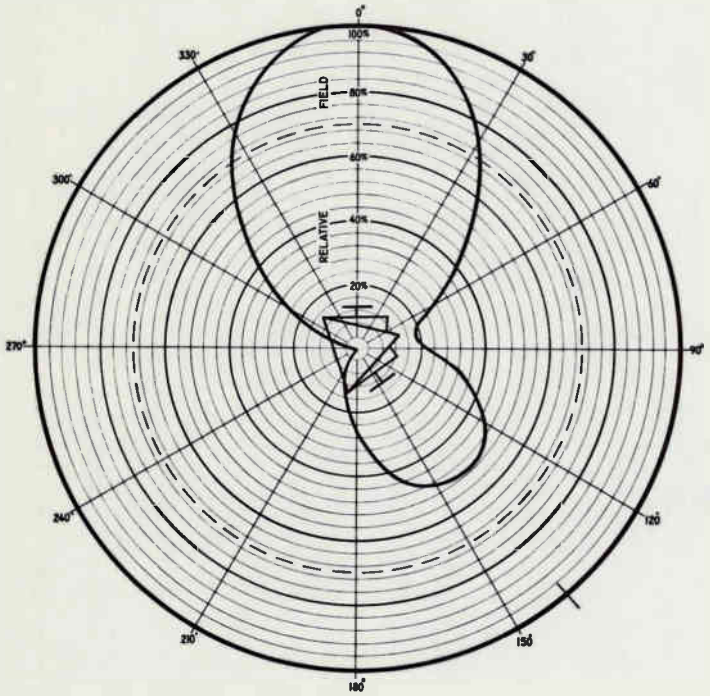


PATTERN NO. 14
Jampro type JZZ-1-D2E. Half power beam width = 67°
Maximum horizontal directivity ratio 2.60 = 4.15 DB
Peak power gain ratio per bay, 20.4 which is 13.1 DB

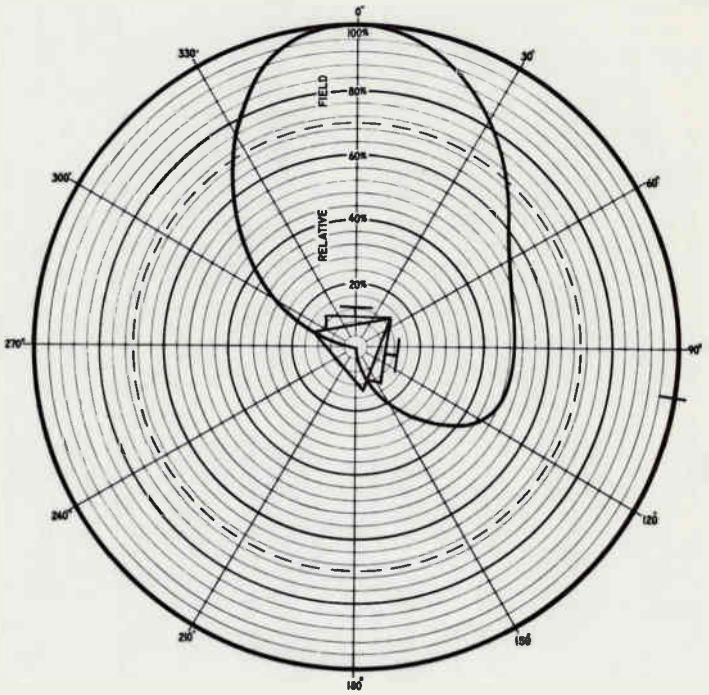


PATTERN NO. 16
Jampro type JZZ-DP2D. Half power beam width is 67°
Maximum horizontal directivity ratio 3.9 = 5.9 DB
Peak power gain ratio per bay 30.6, which is 14.85 DB

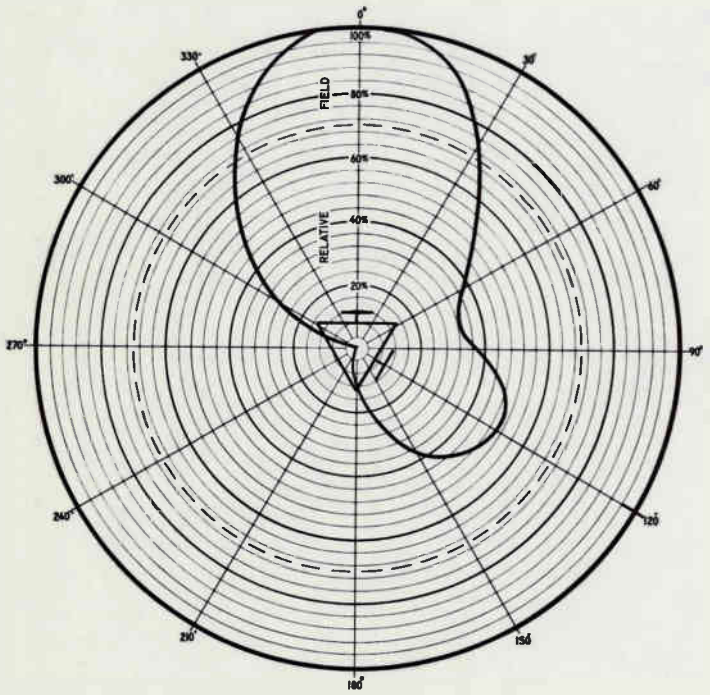
TYPICAL MEASURED AND CALCULATED HORIZONTAL FIELD PATTERNS



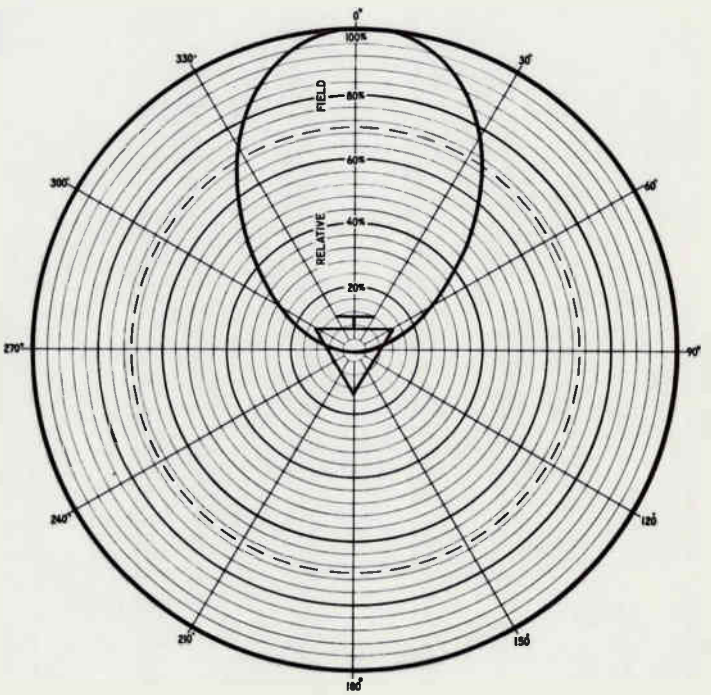
PATTERN NO. 17
Jampro type JZZ-DP2C. Half power beam width is 67°
Maximum horizontal directivity ratio 3.9 = 5.9 DB
Peak power gain ratio per bay 30.6, which is 14.85 DB



PATTERN NO. 19
Jampro type JZZ-DP2A. Half power beam width is 78°
Maximum hosizontal directivity ratio 2.46 = 3.91 DB
Peak power gain ratio per bay 29.5 which is 14.7 DB

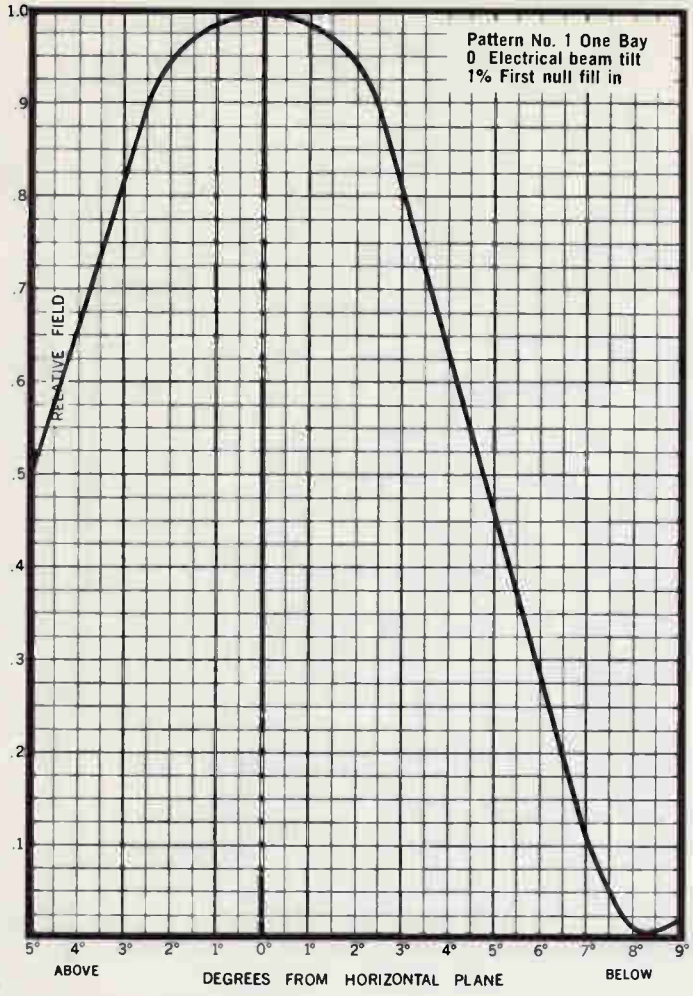


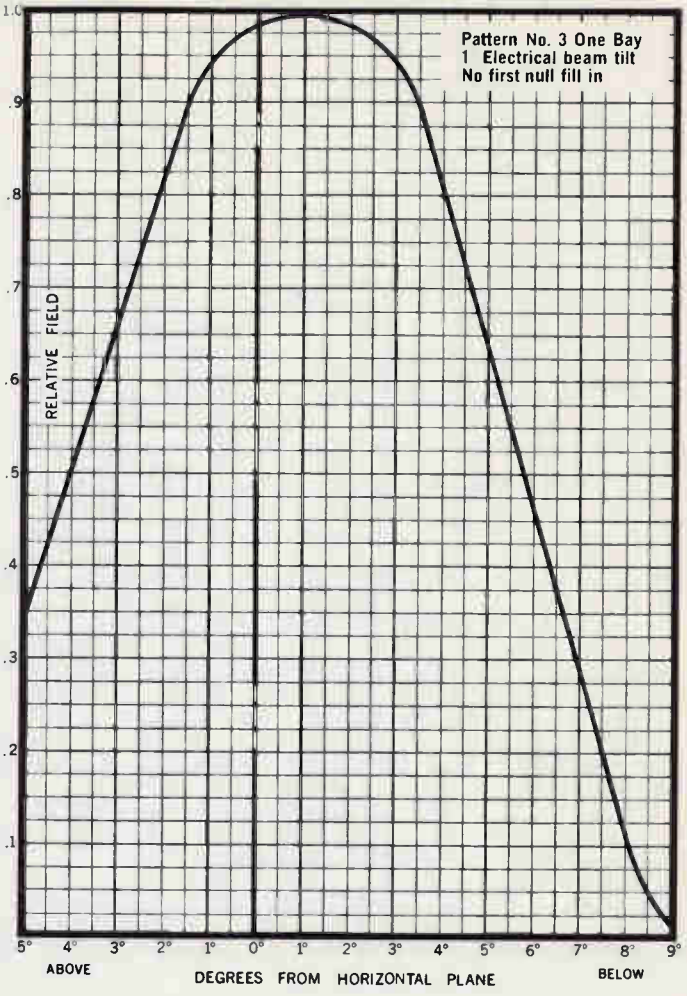
PATTERN NO. 18
Jampro type JZZ-DP2B. Half power beam width is 67°
Maximum horizontal directivity ratio 3.9 = 5.9 DB
Peak power gain ratio per bay 30.6, which is 14.85 DB

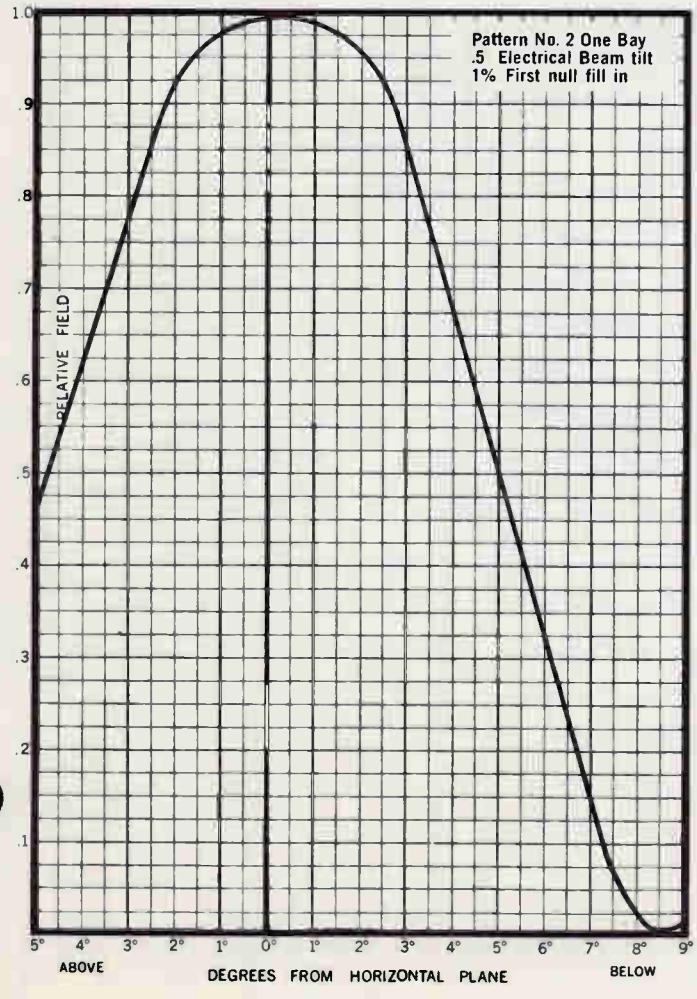


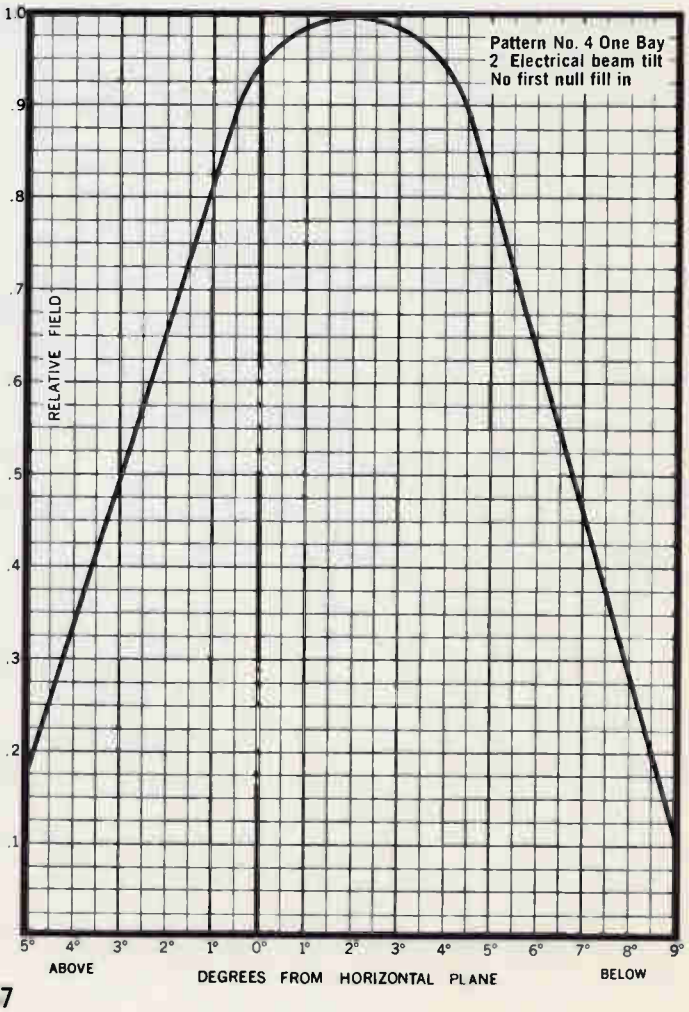
PATTERN NO. 20
Jampro type JZZ-1-D1B. Half power beam width = 67°
Maximum horizontal directivity ratio 5.217 = 7.17 DB
Peak power gain ratio per bay, 40.8, which is 16.1 DB

MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

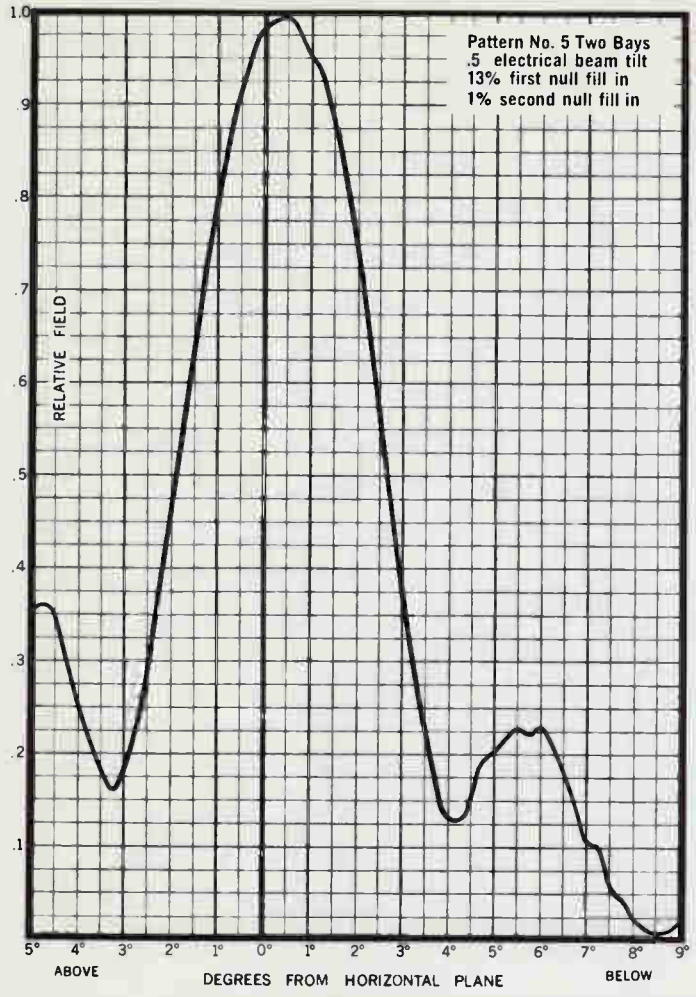


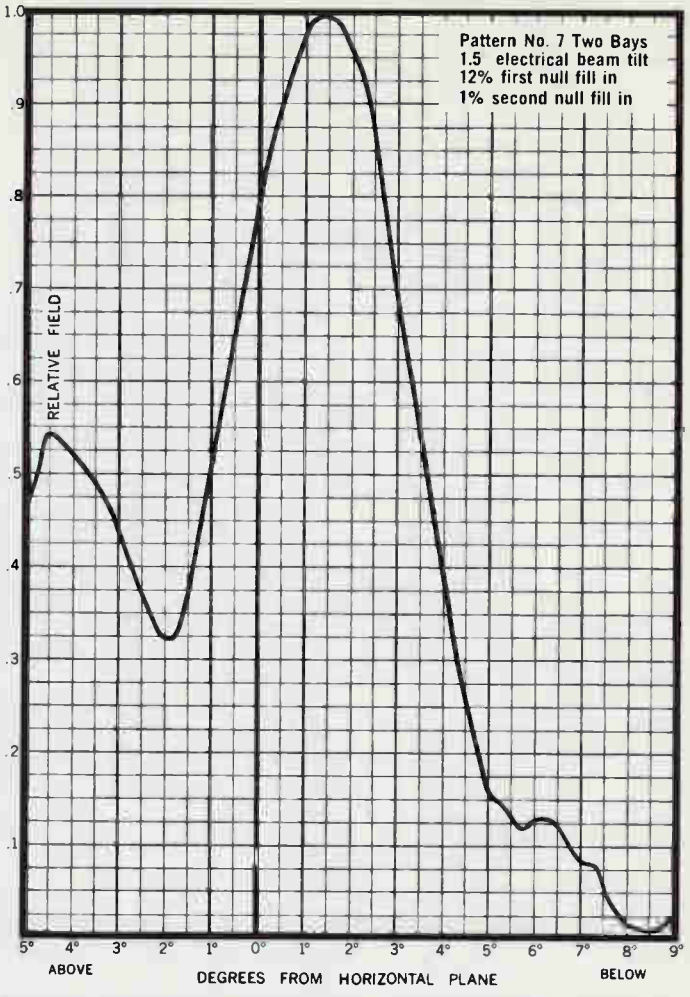


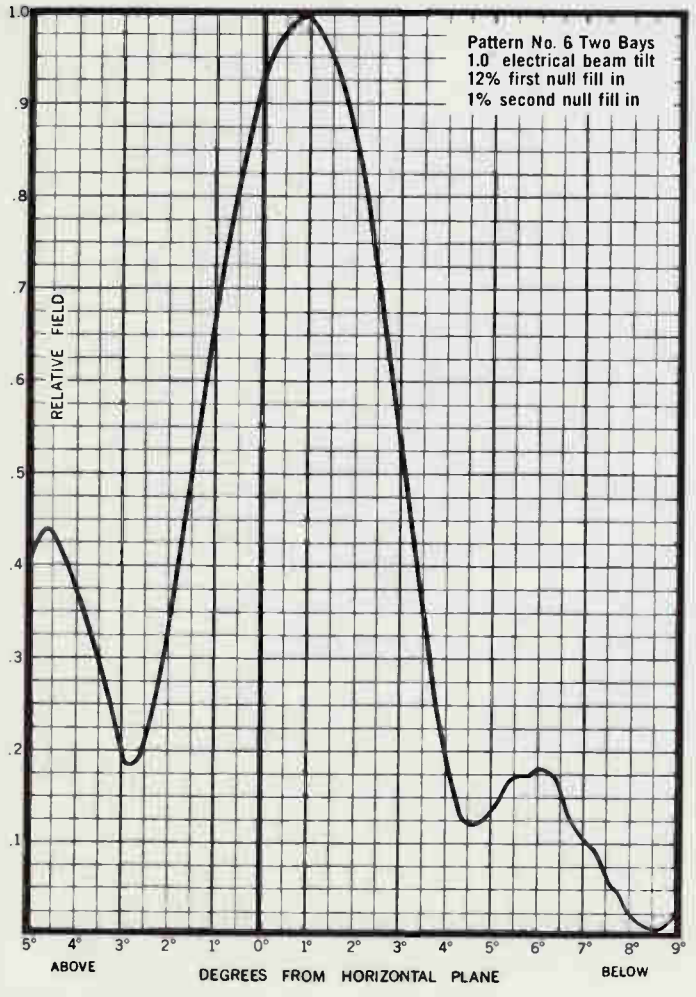


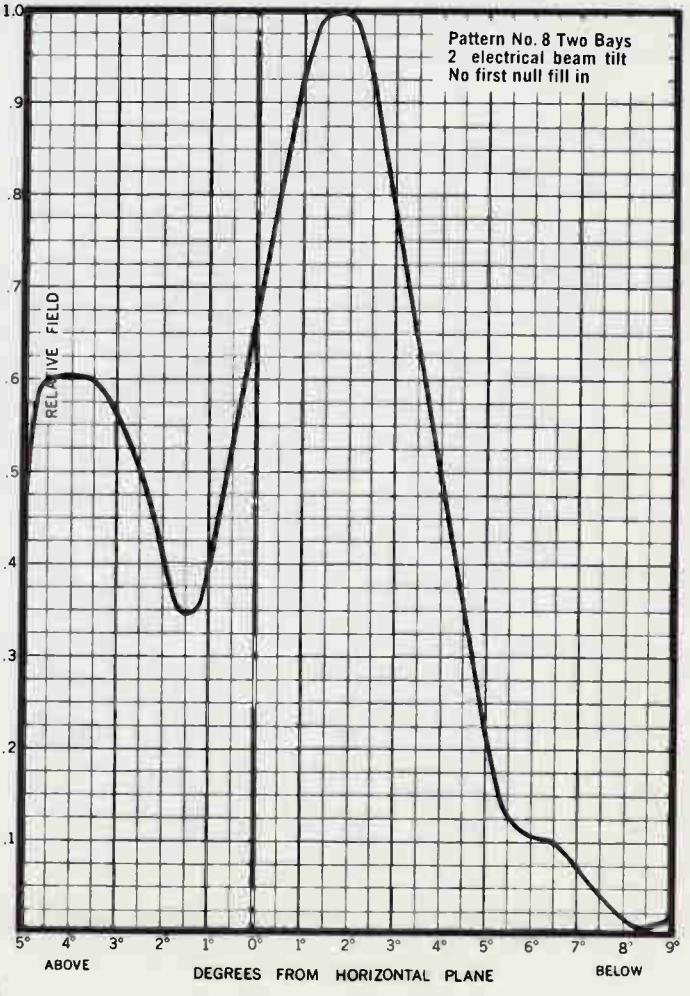


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

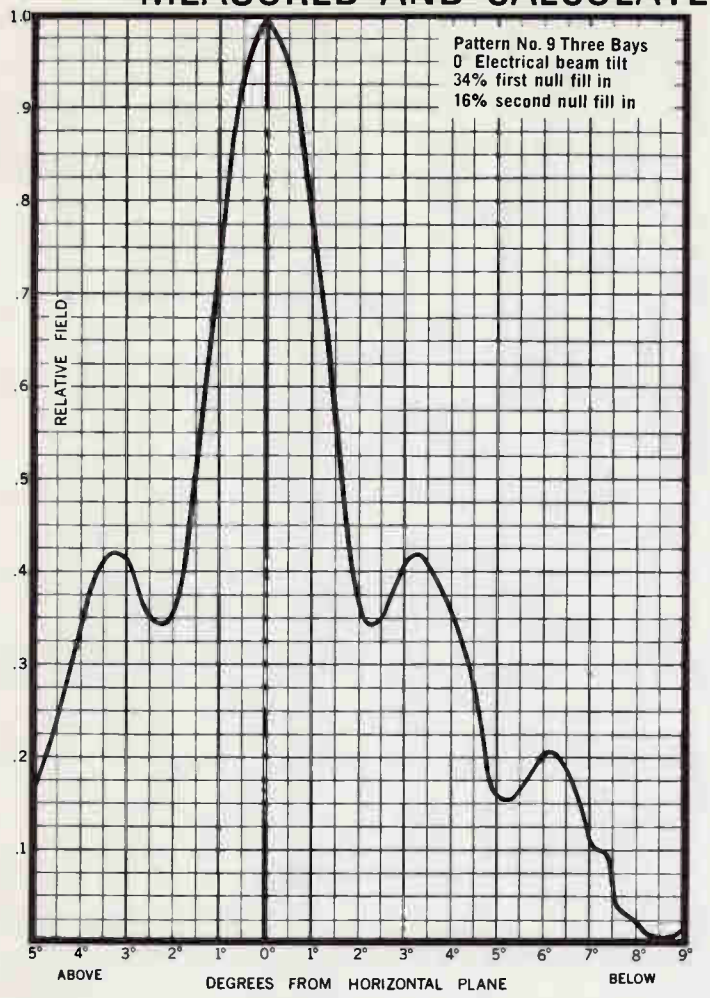


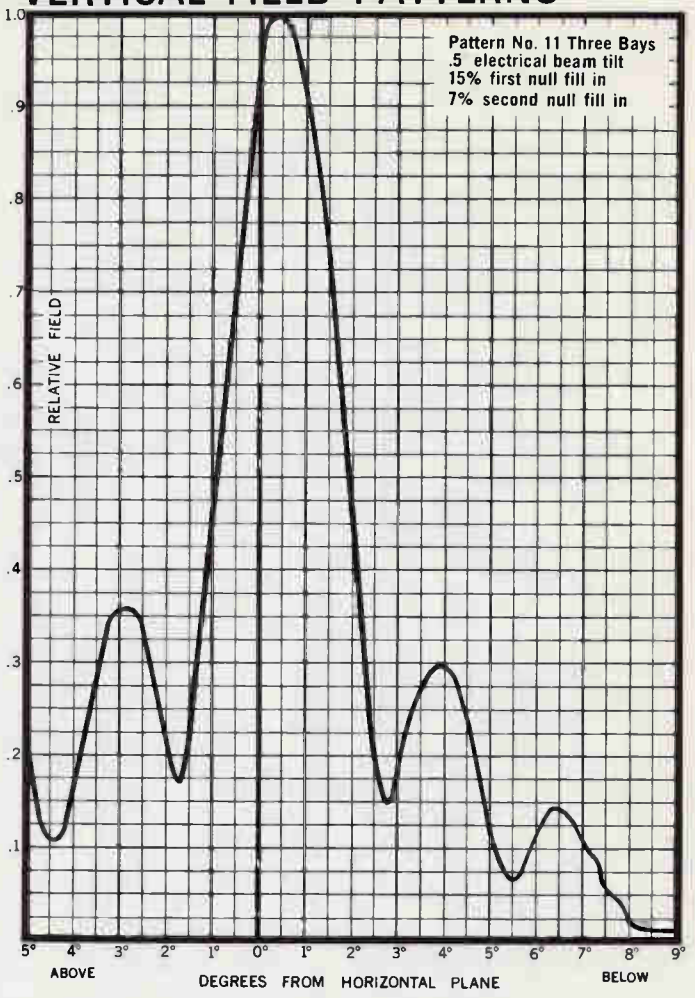


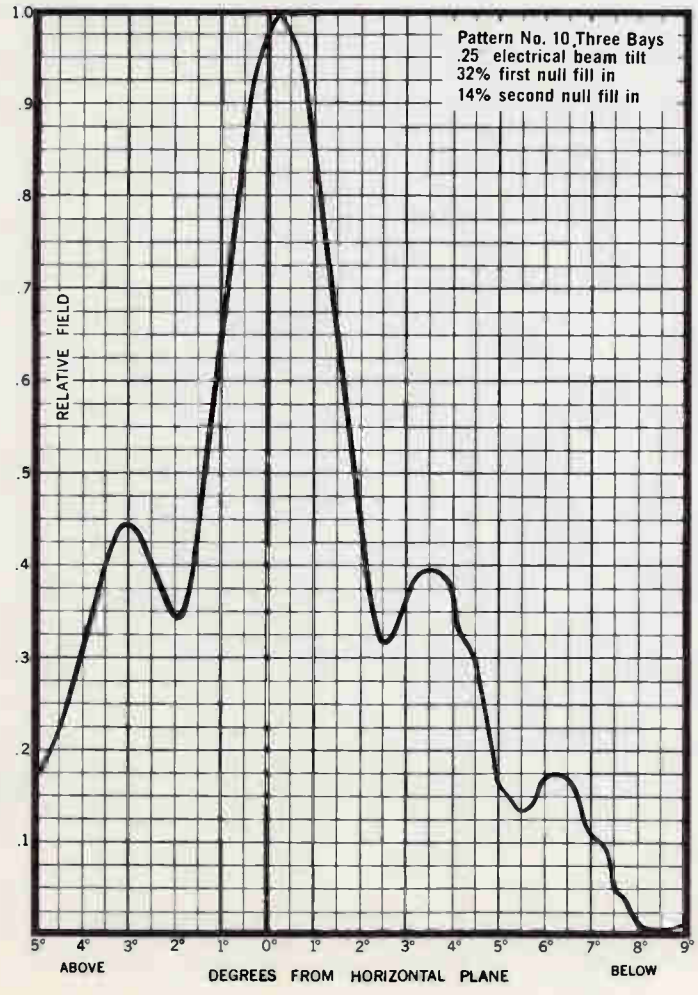


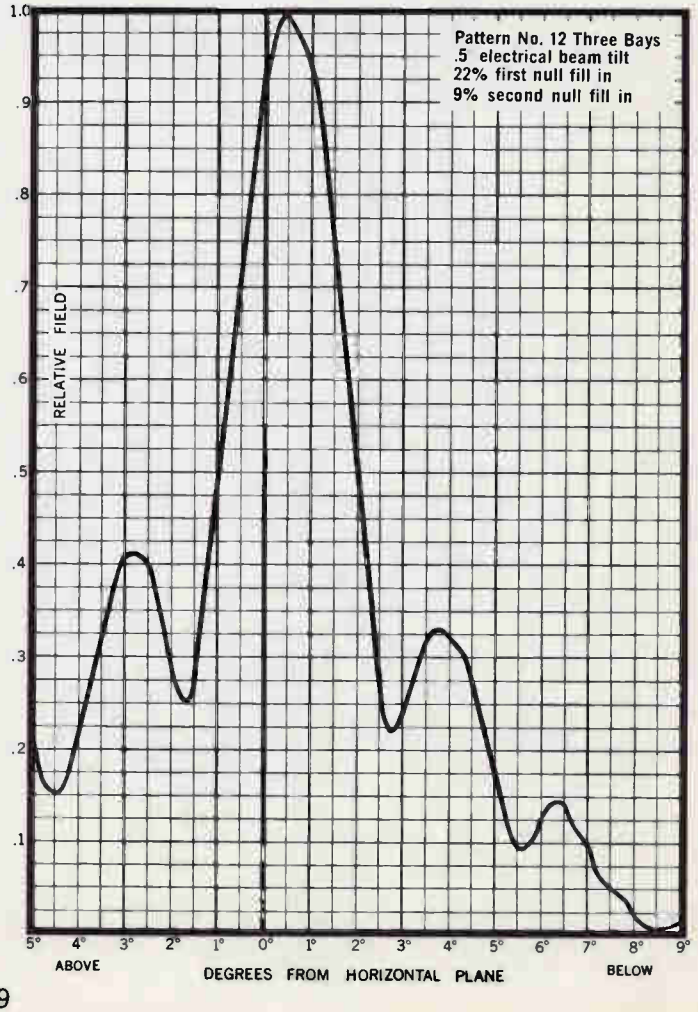


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

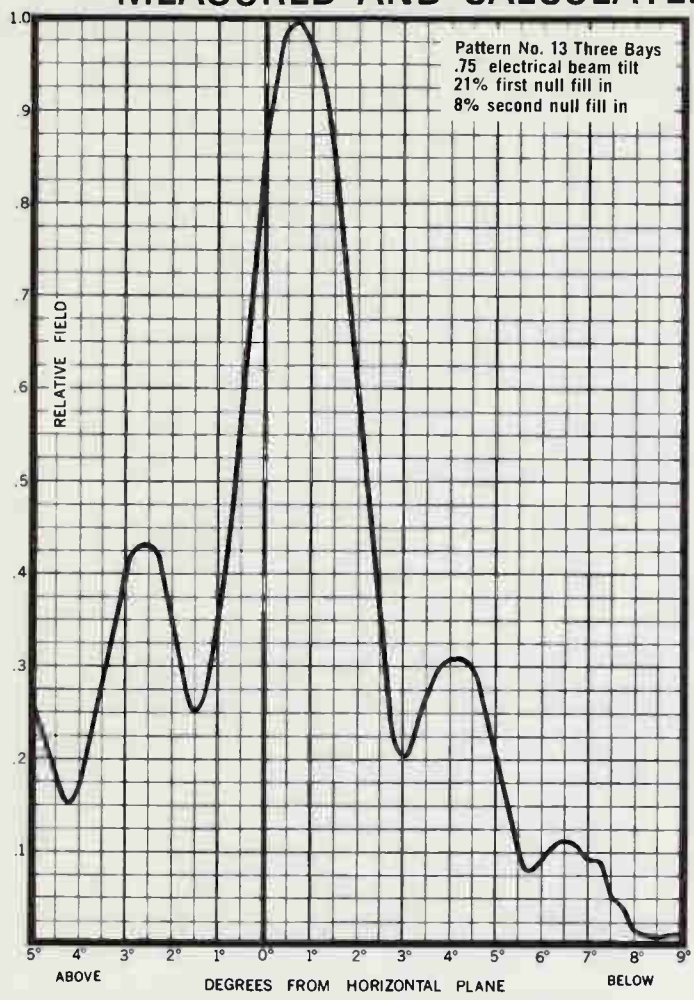


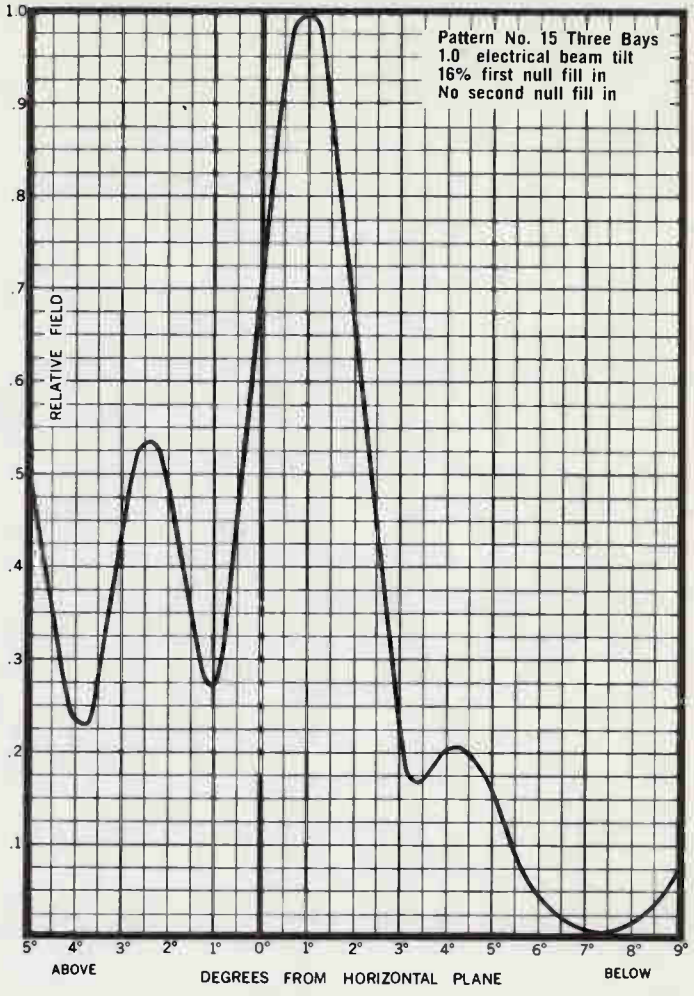


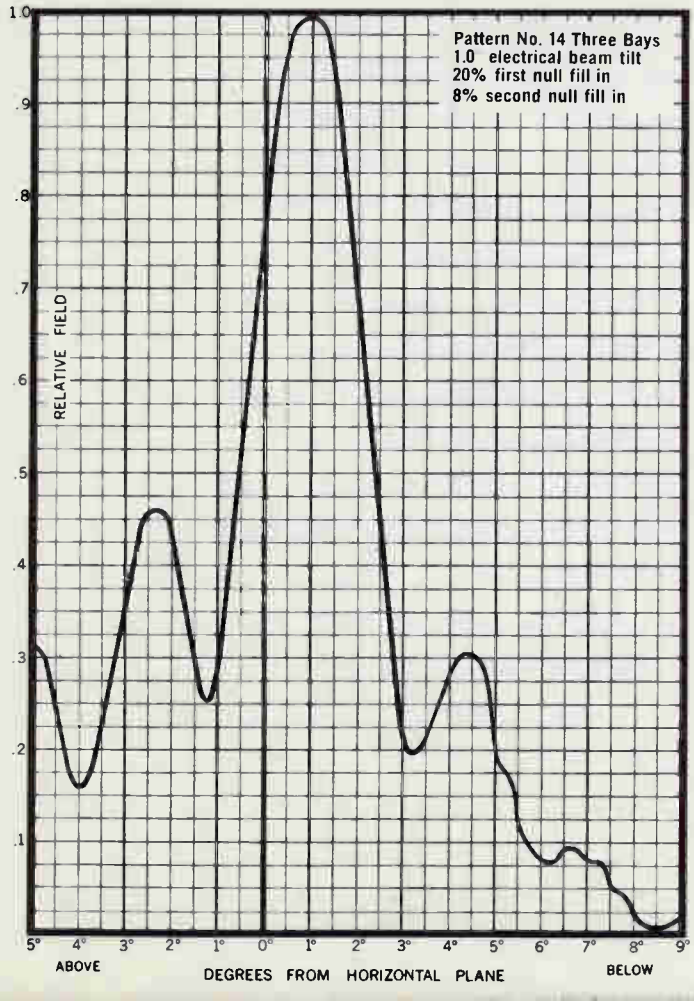


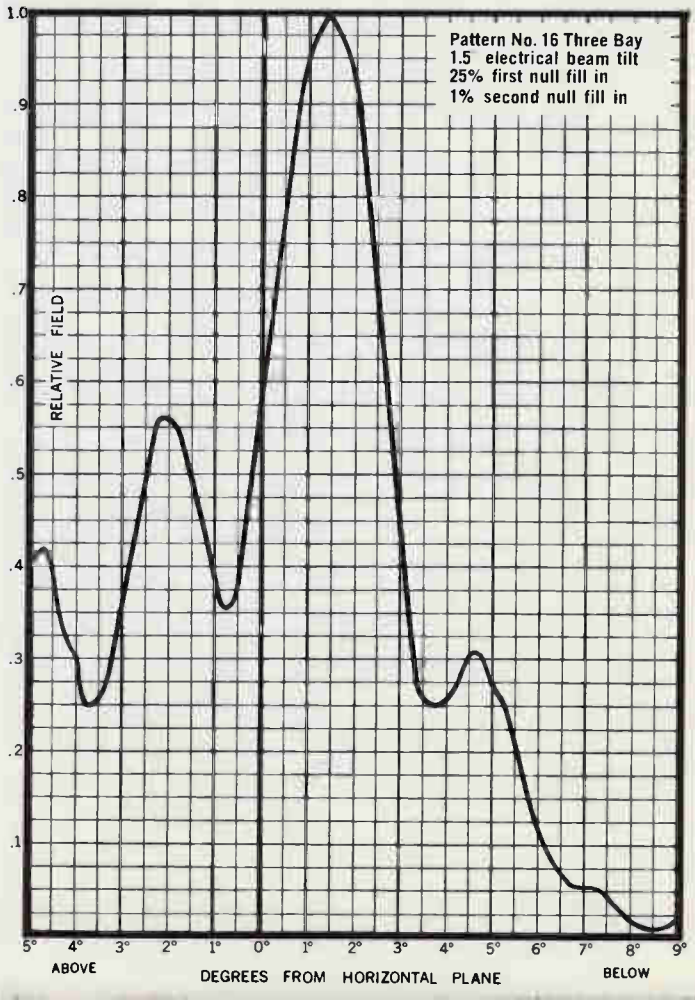


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

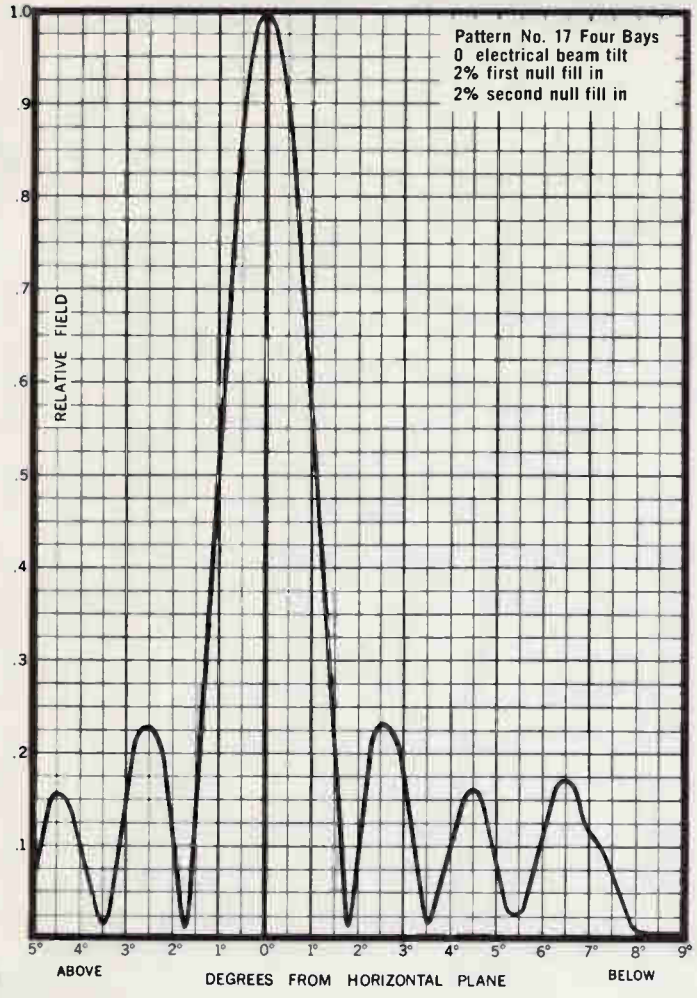


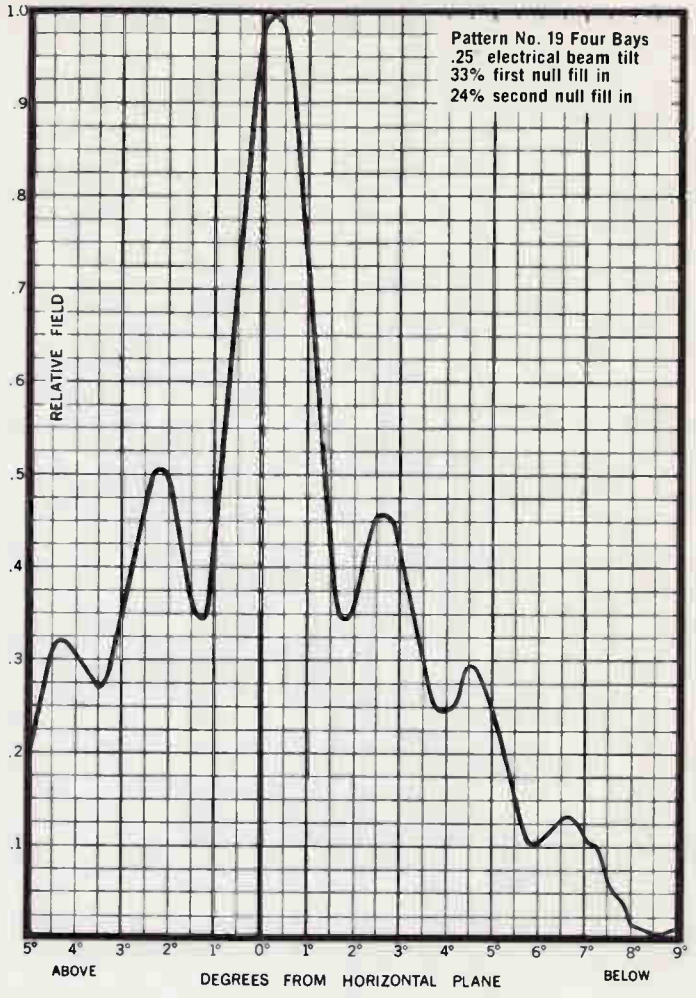


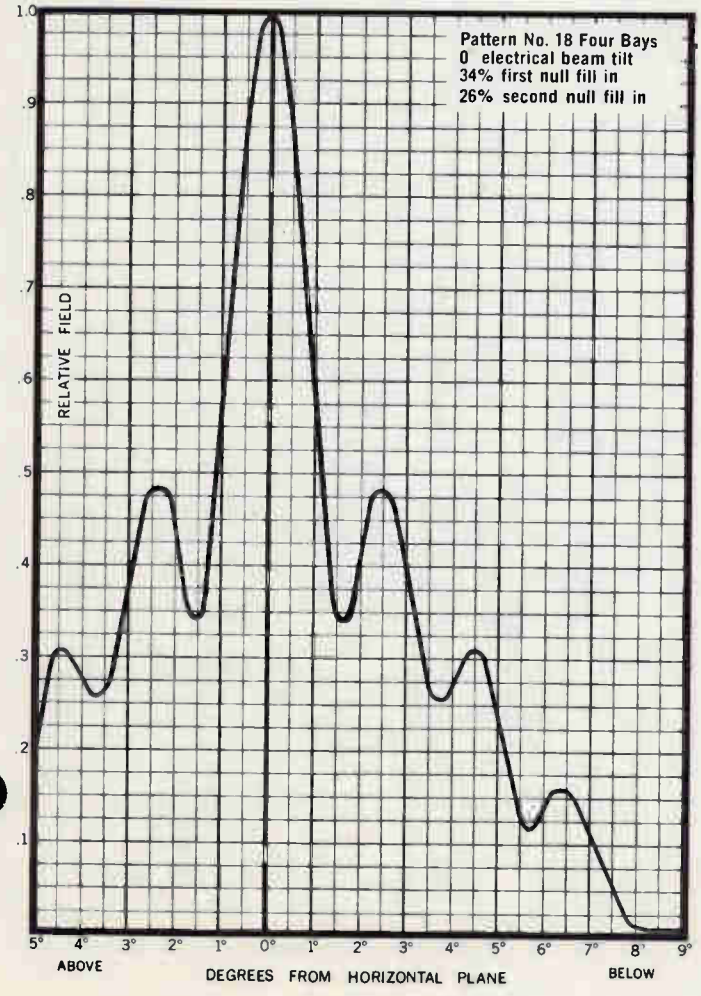


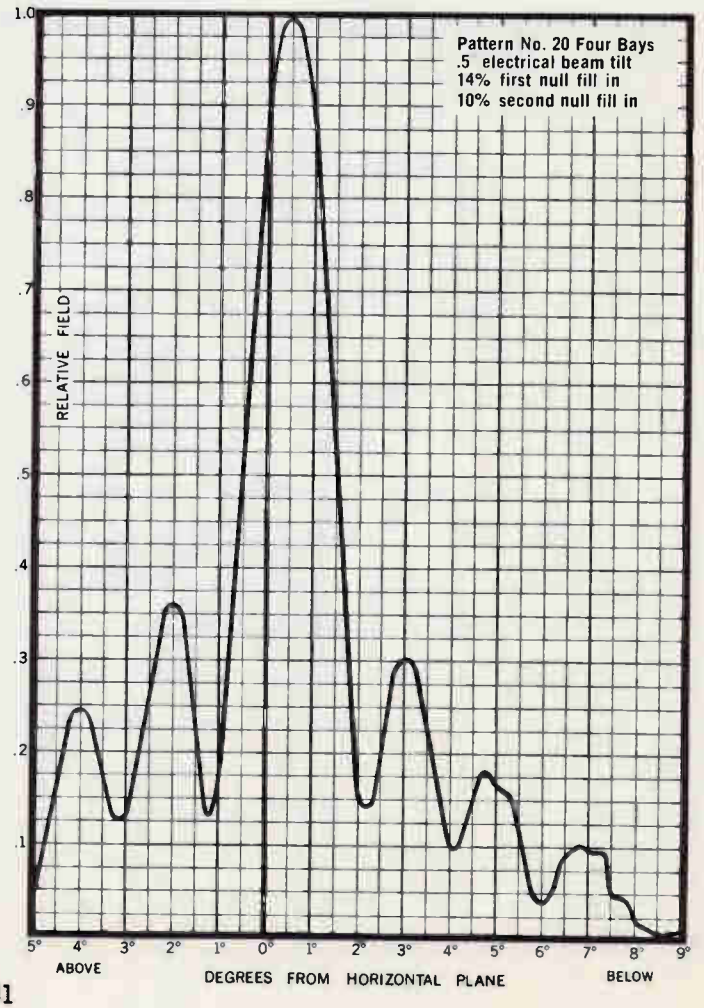


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

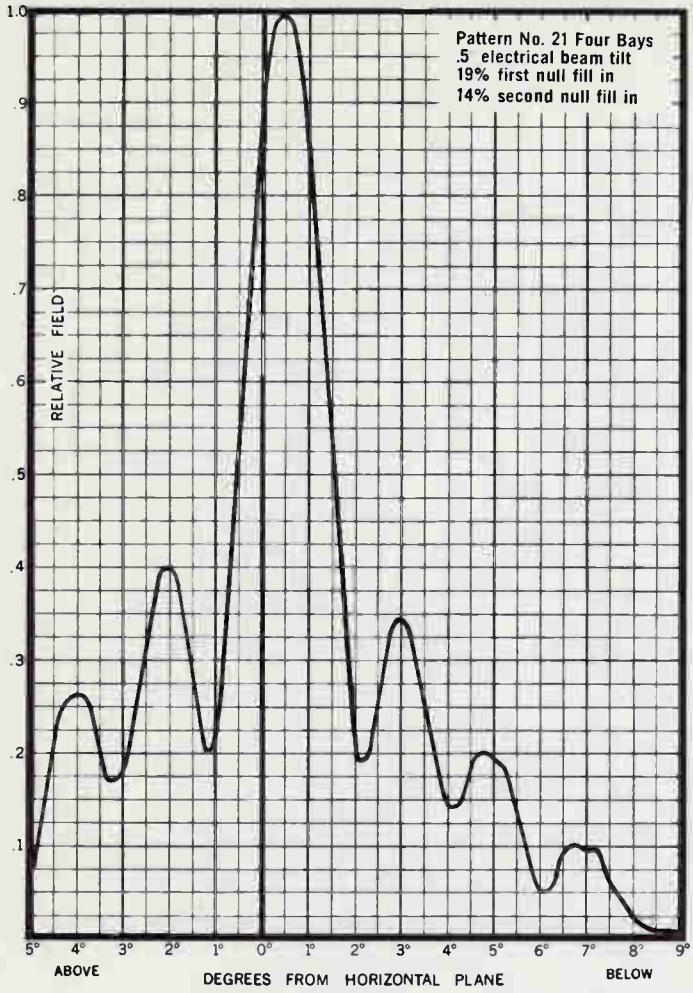


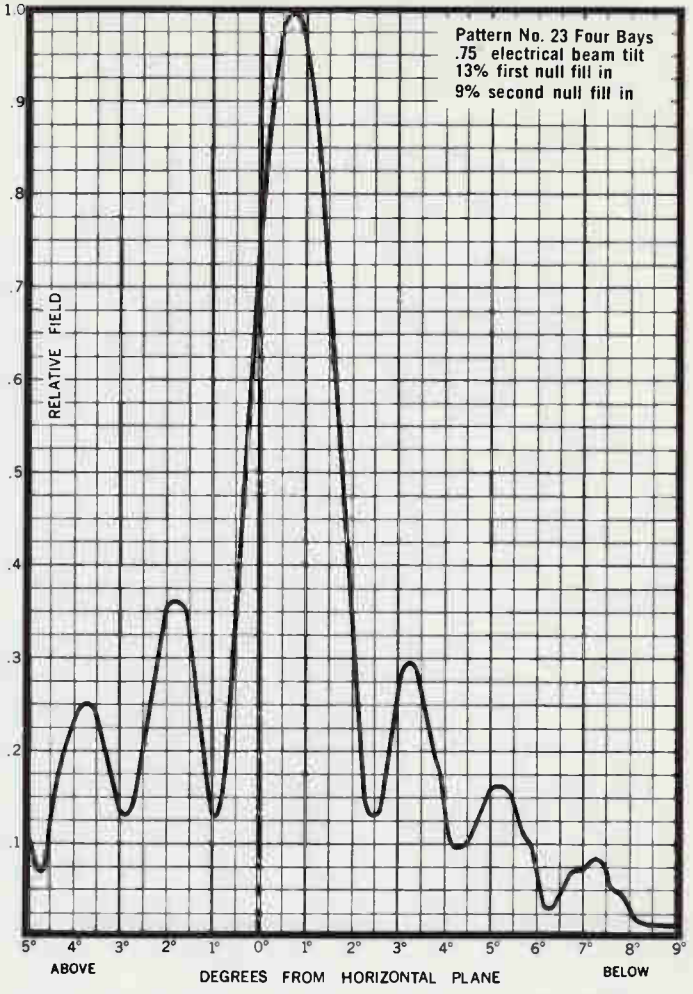


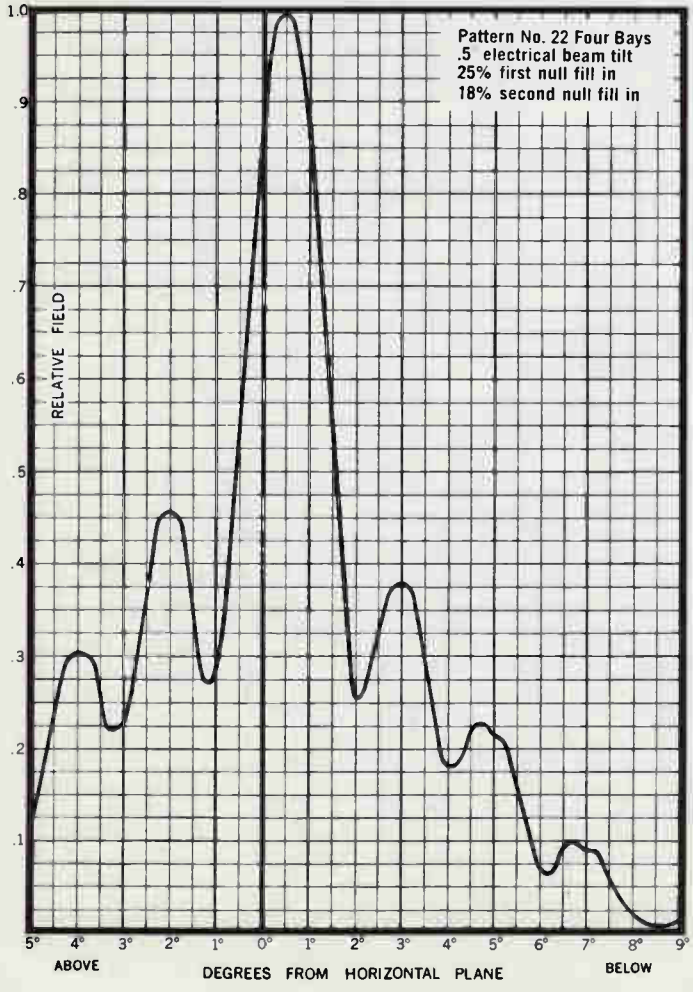


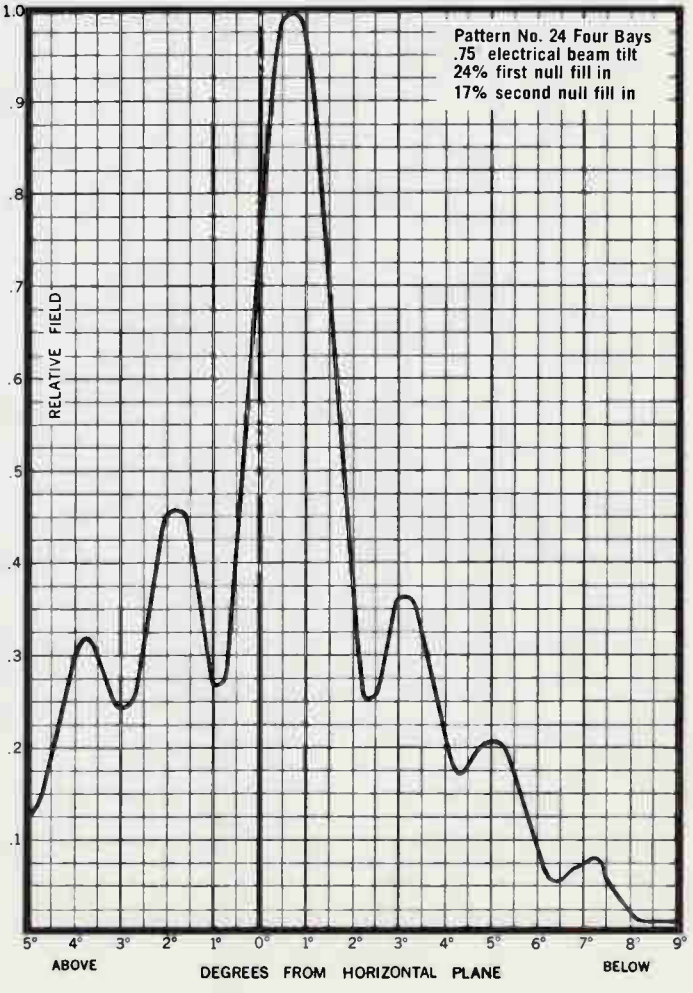


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

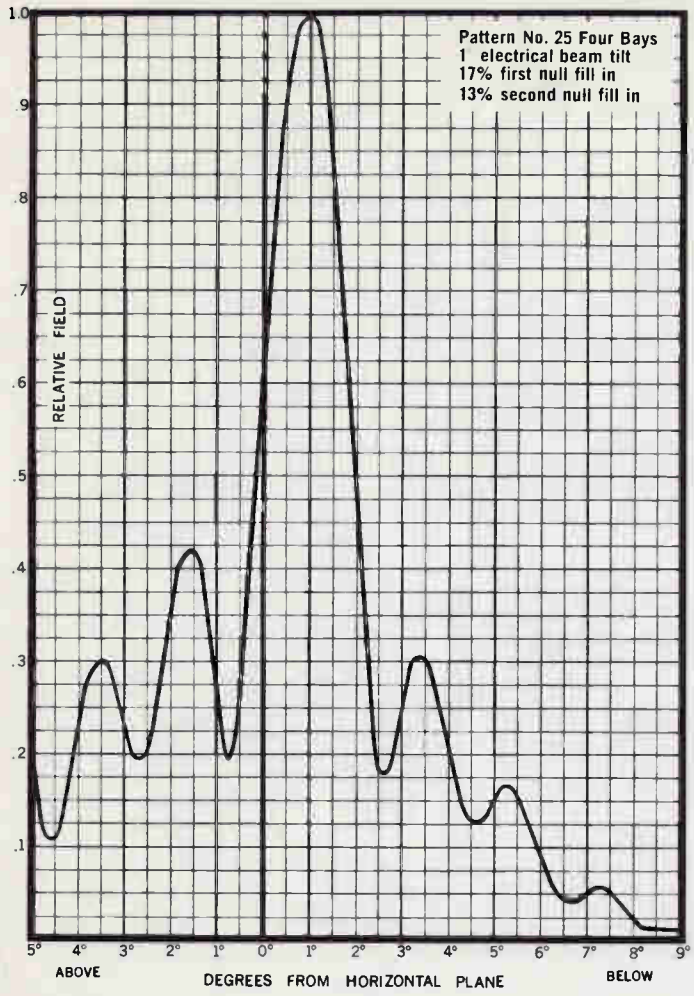


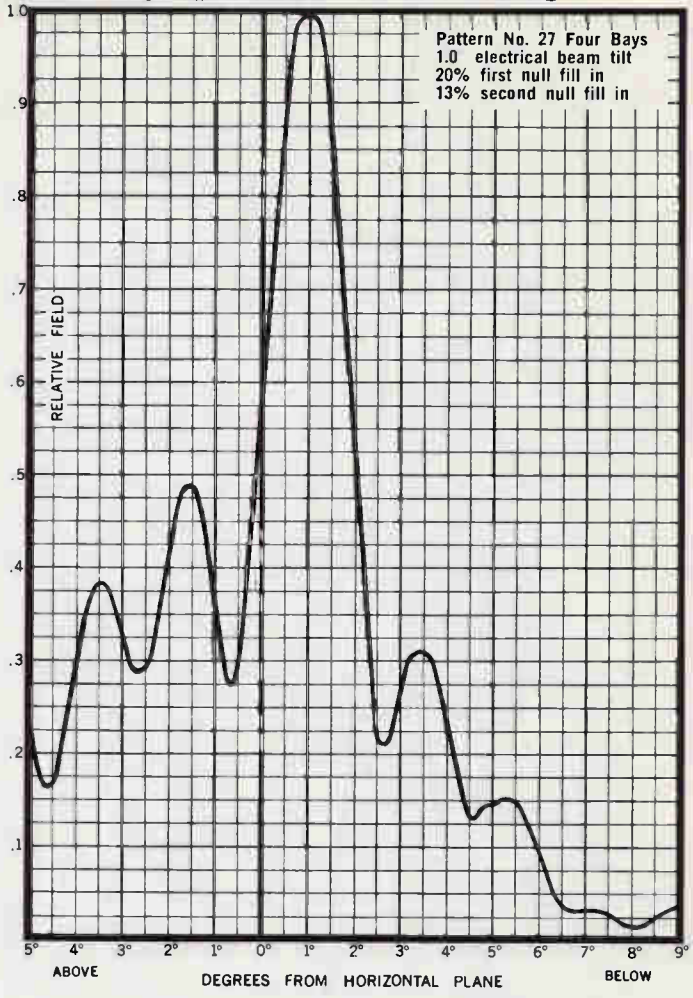


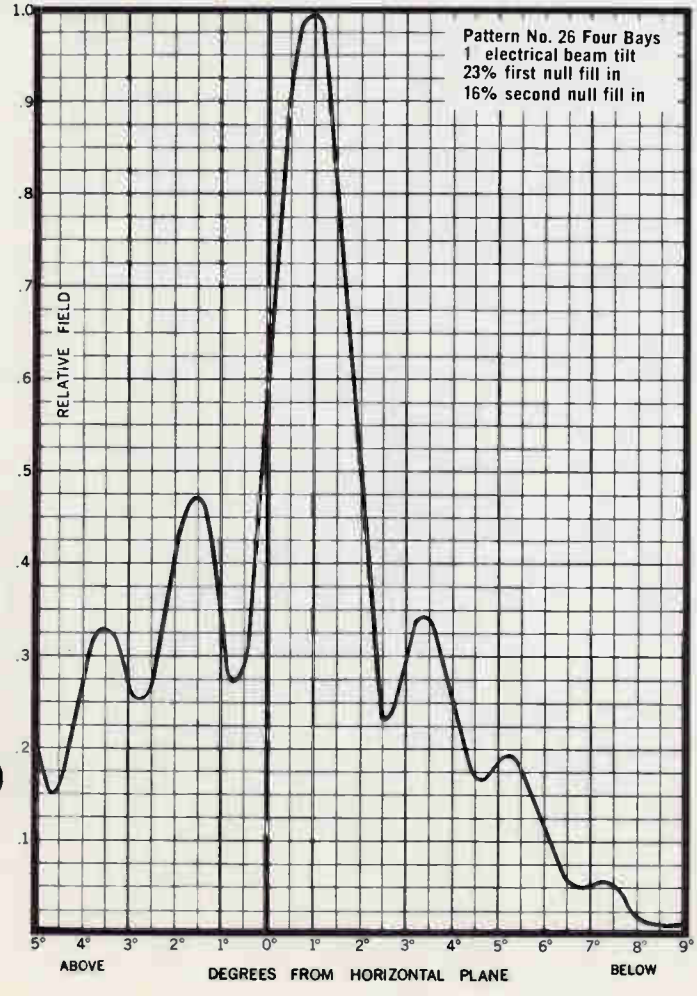


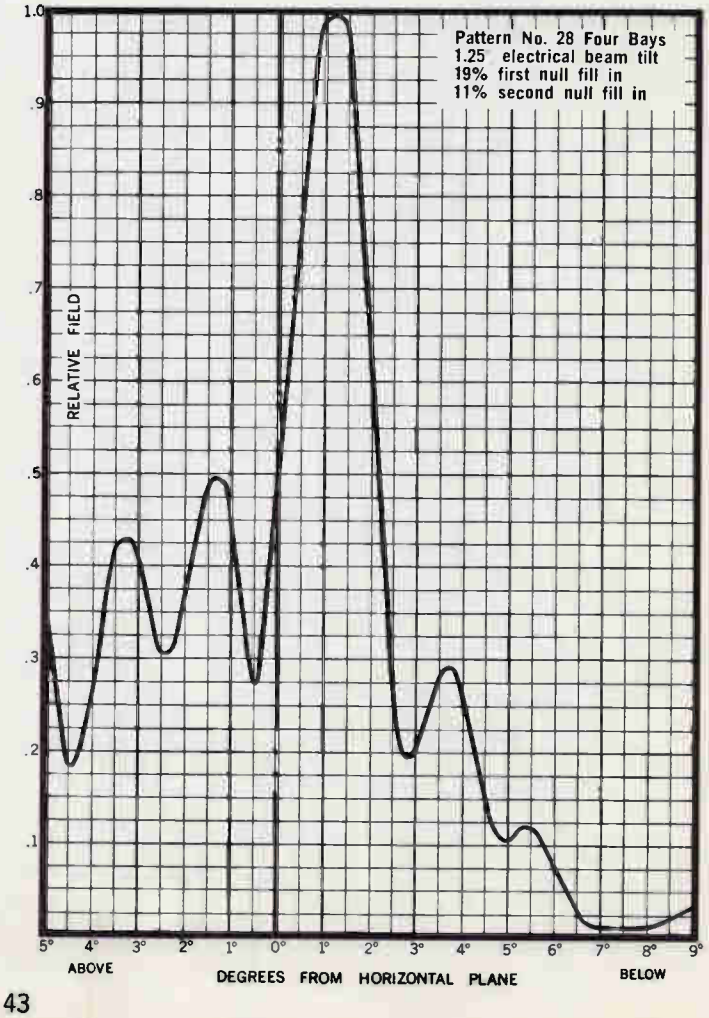


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

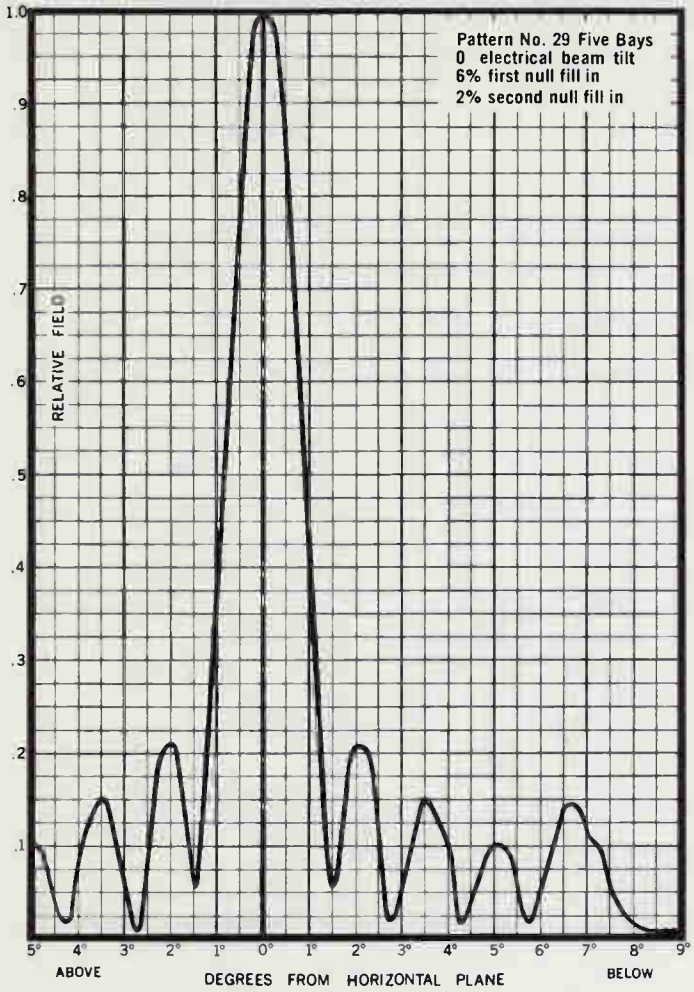


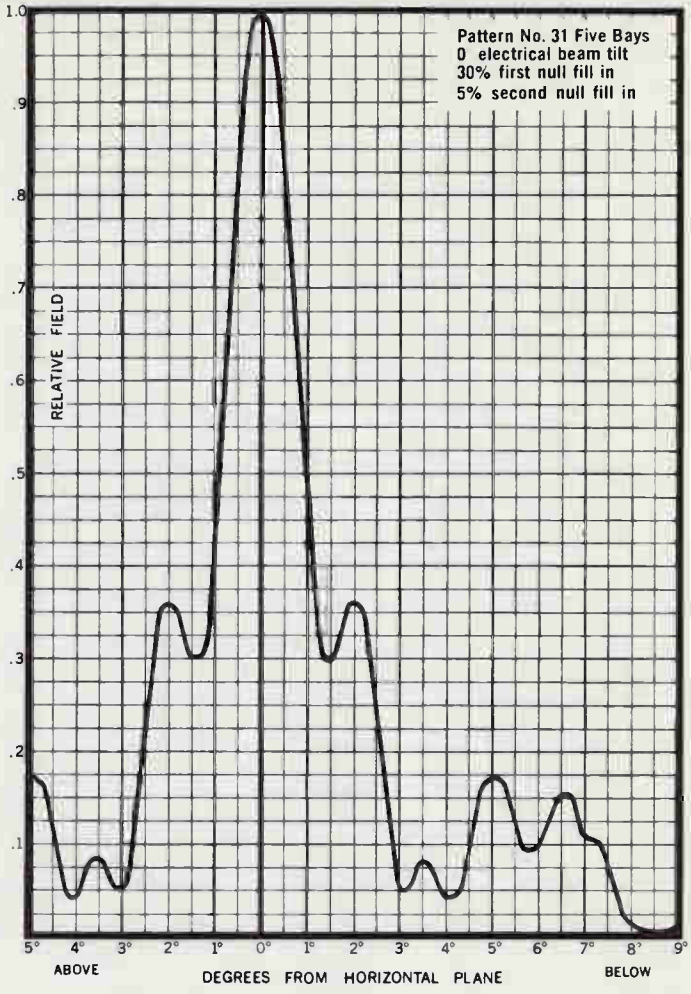


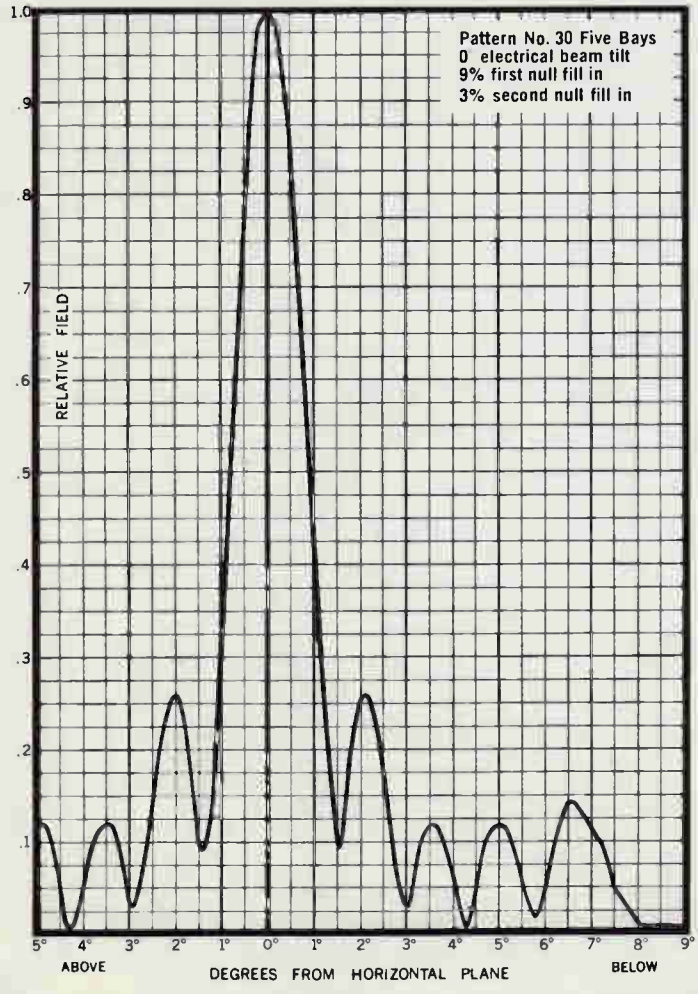


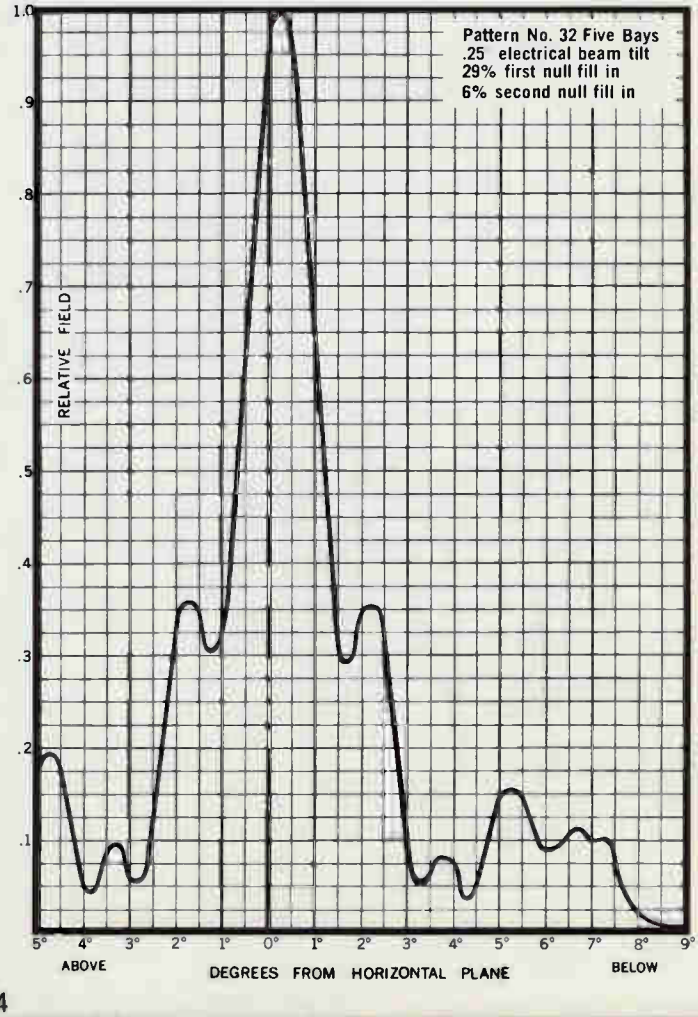


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

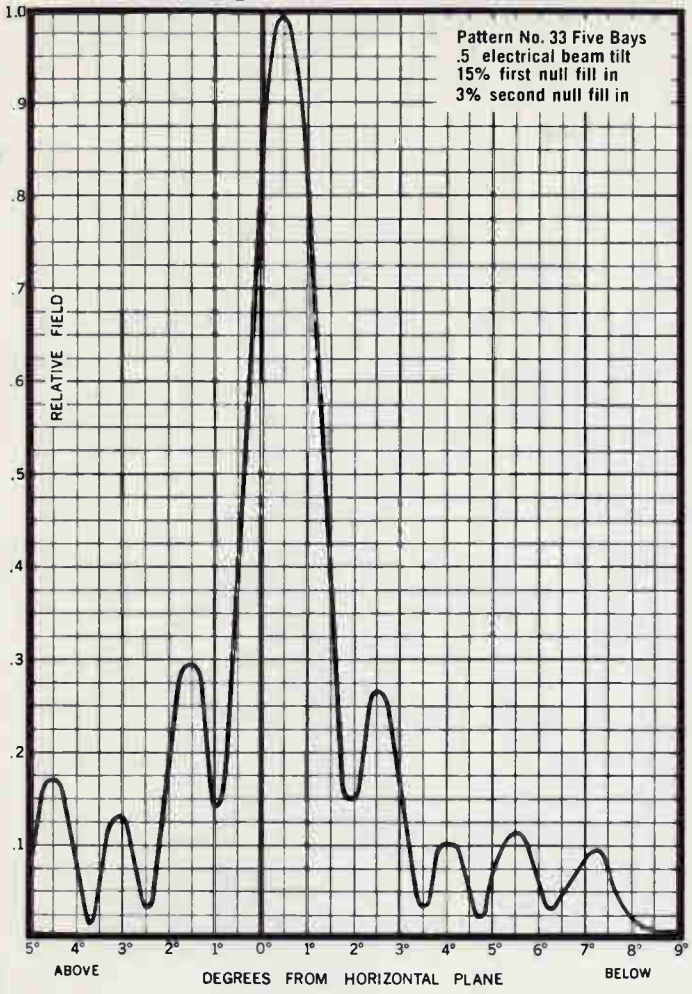


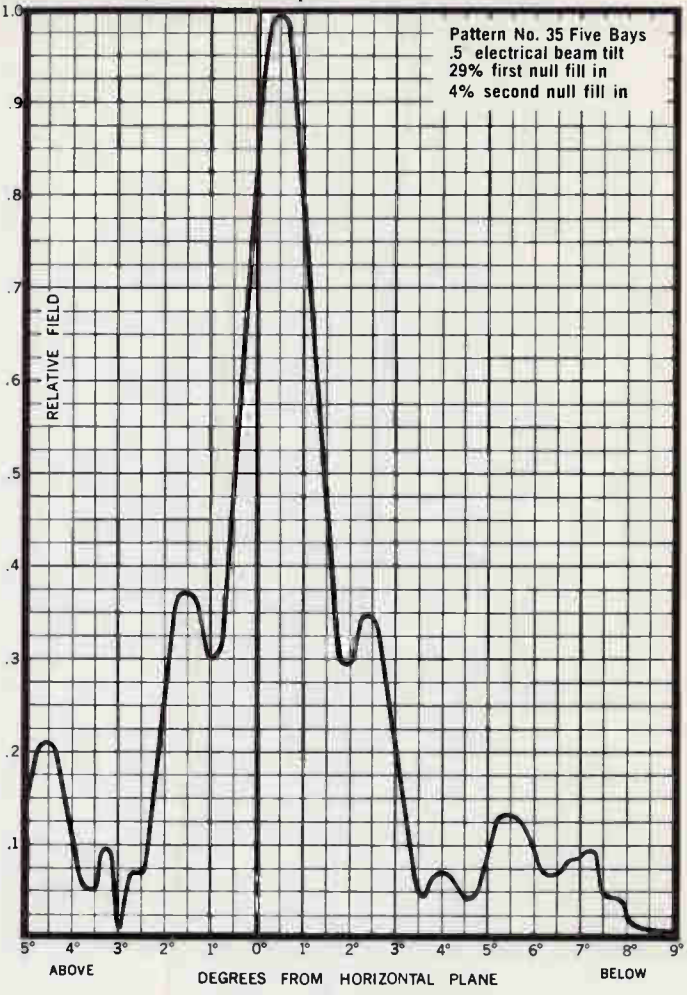


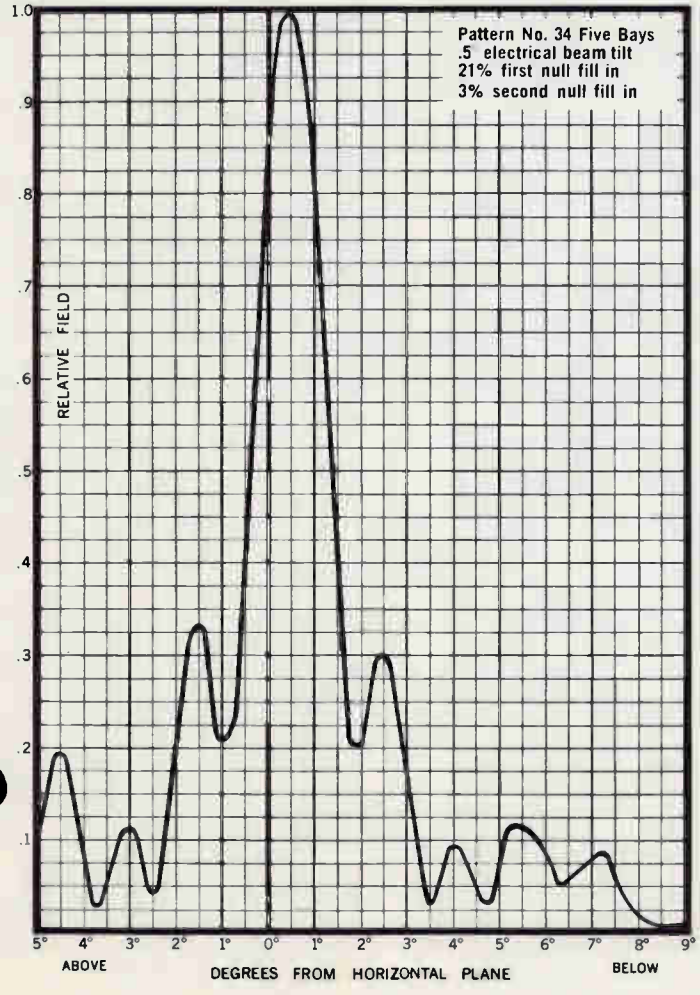


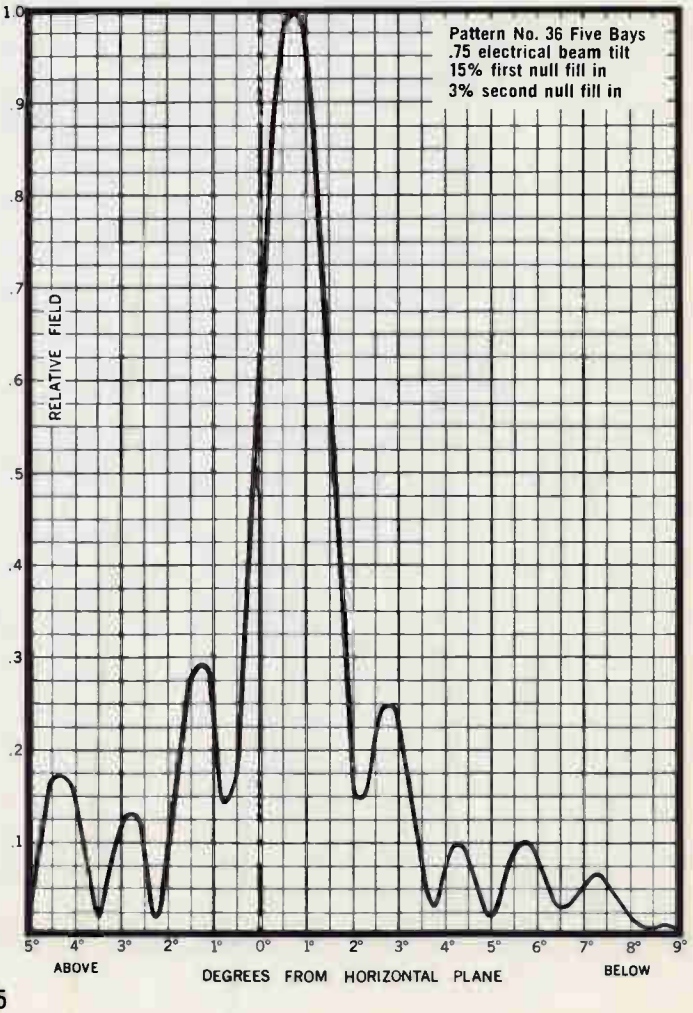


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

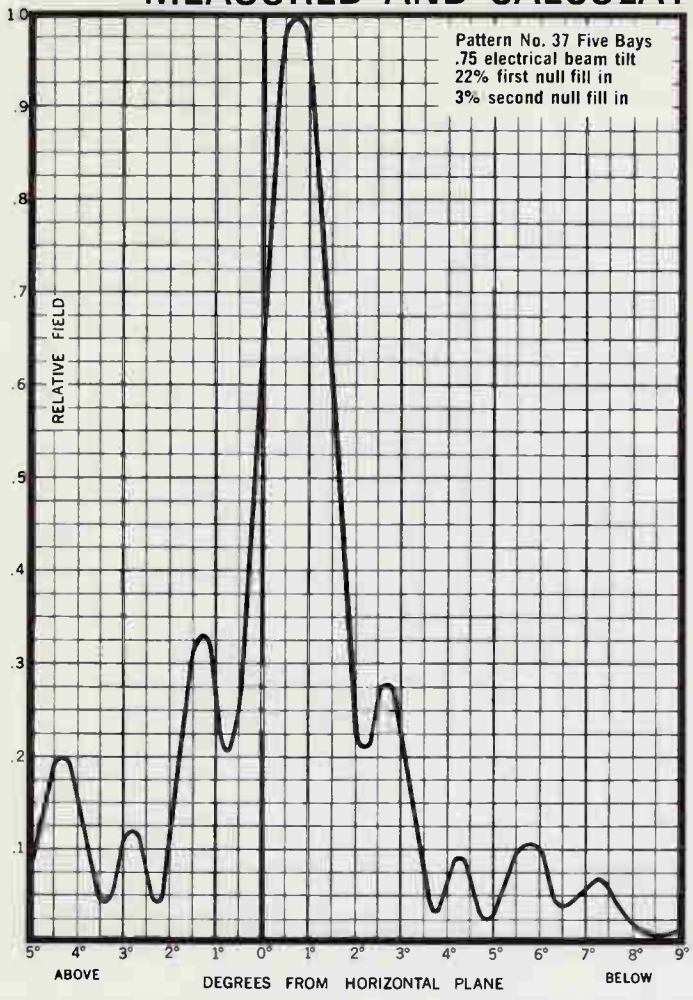


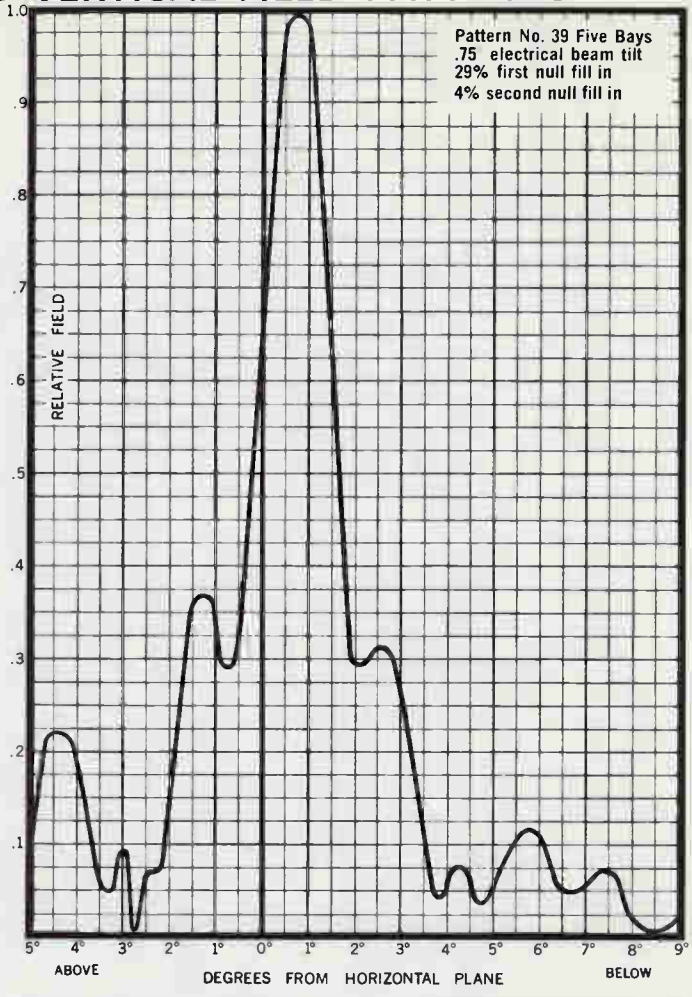


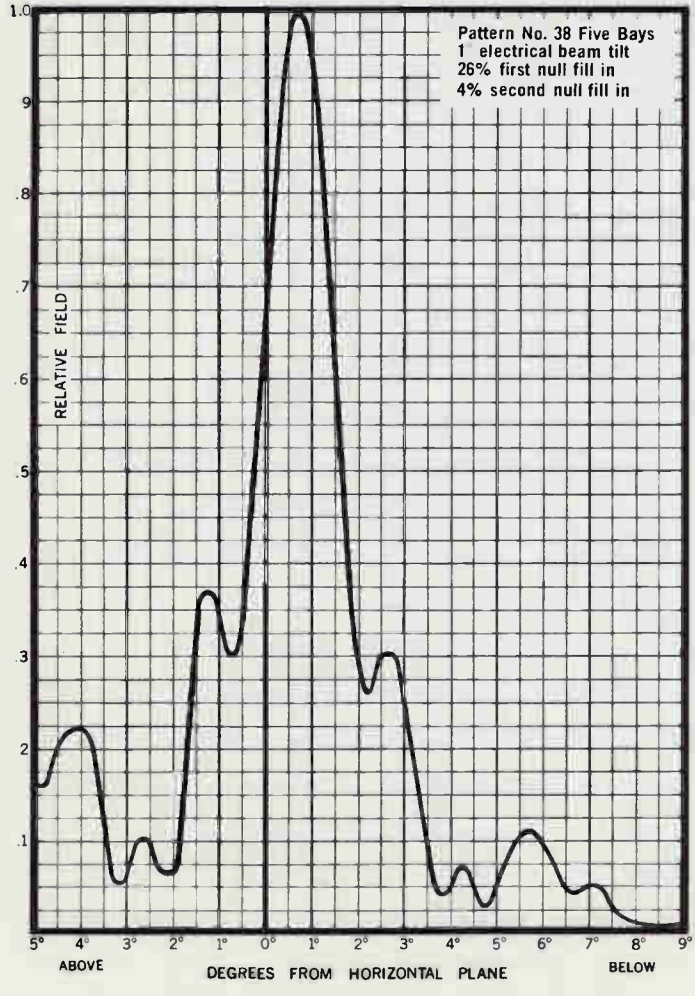


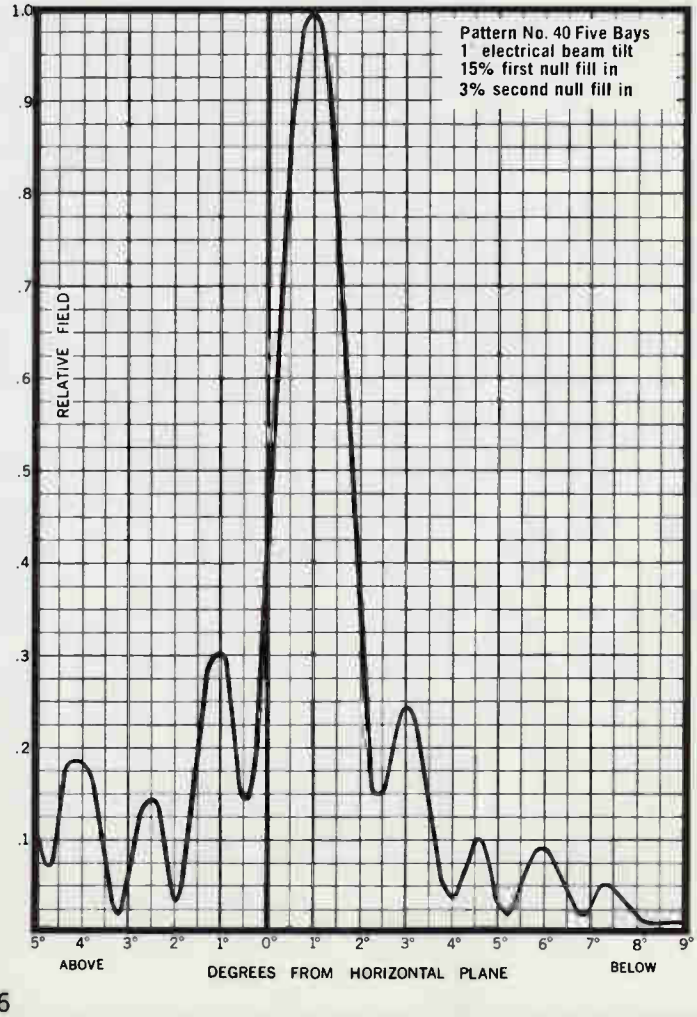


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

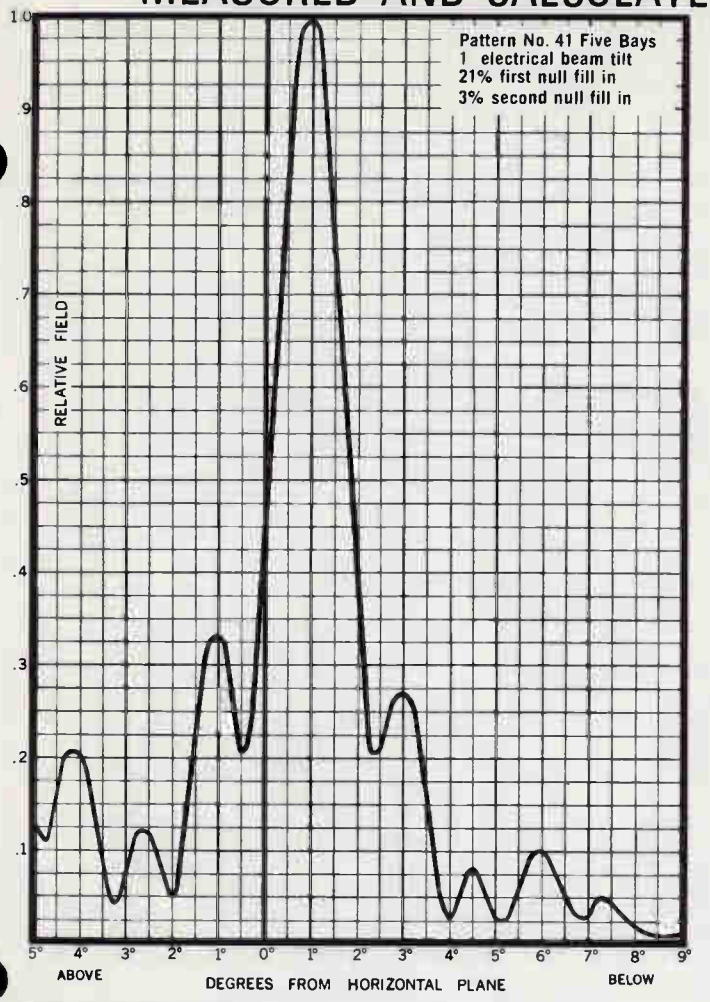


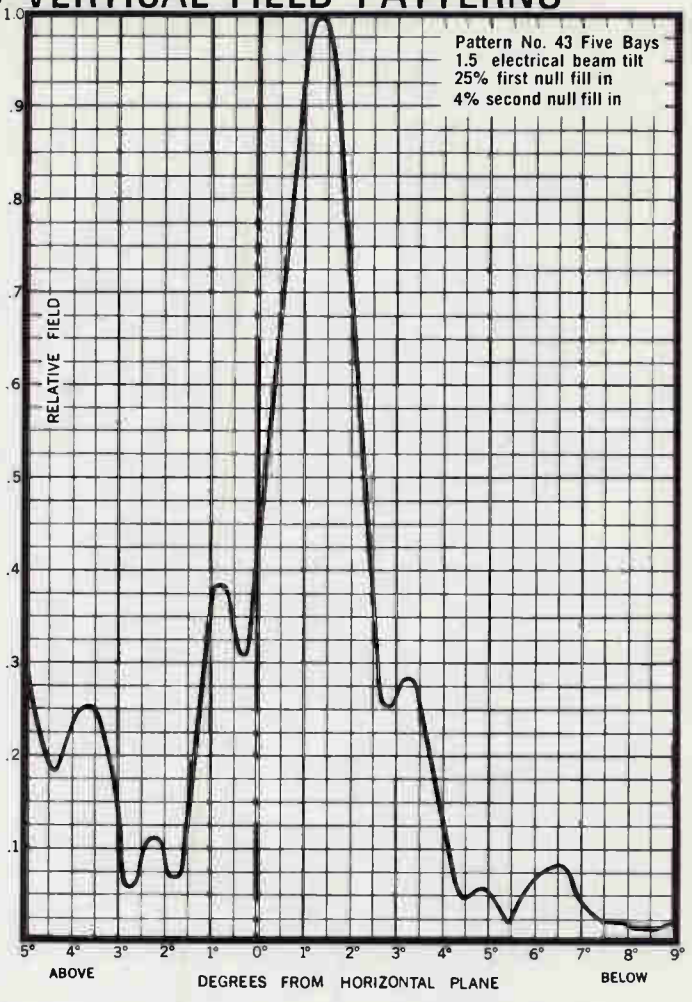


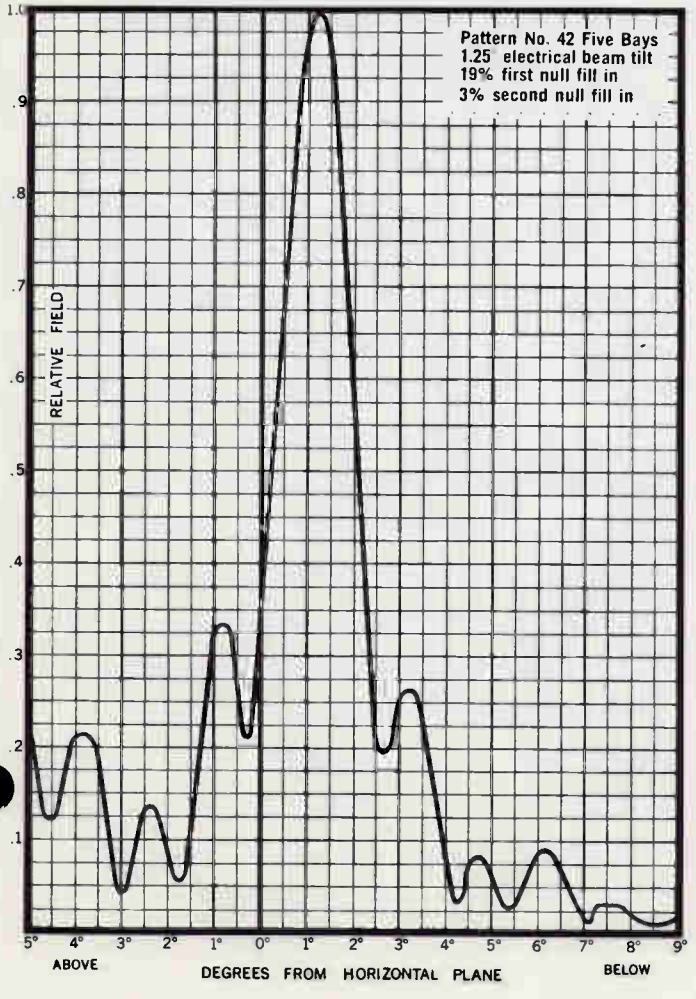


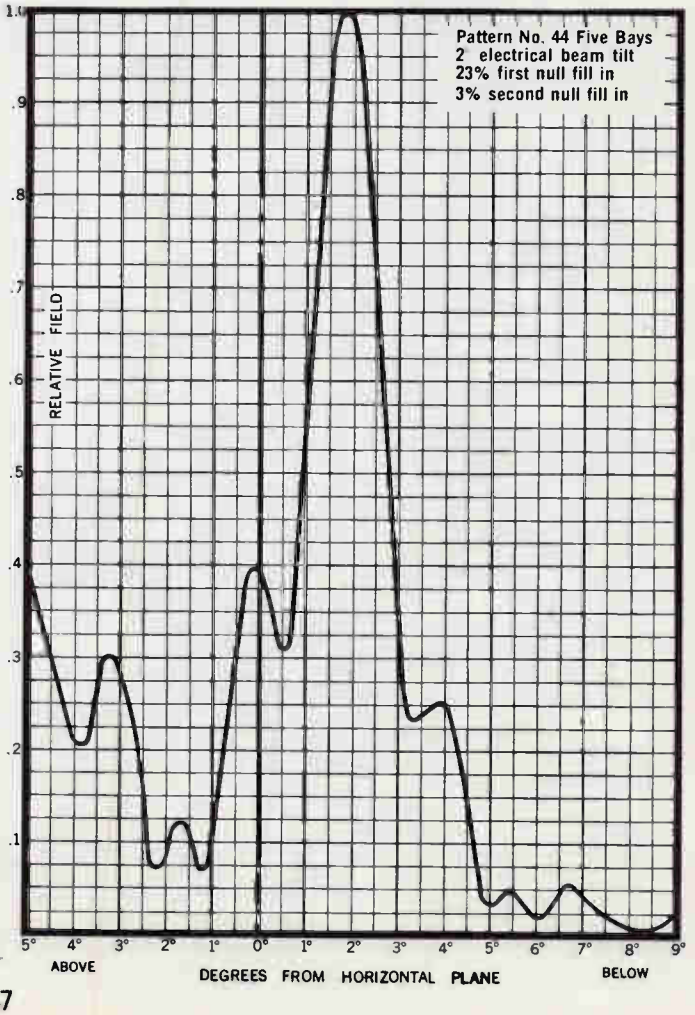


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

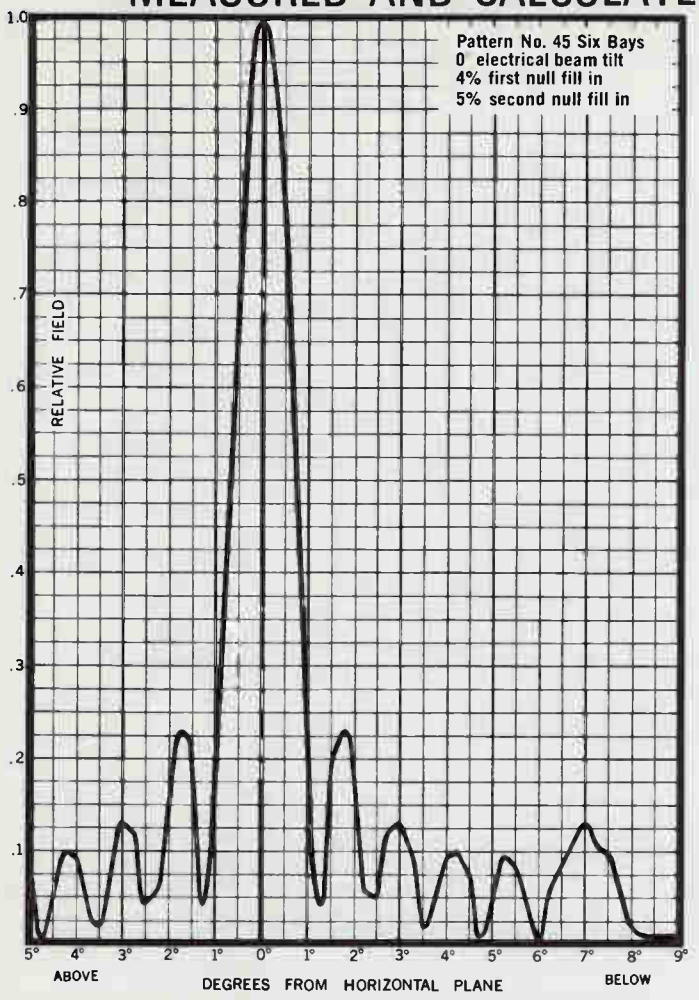


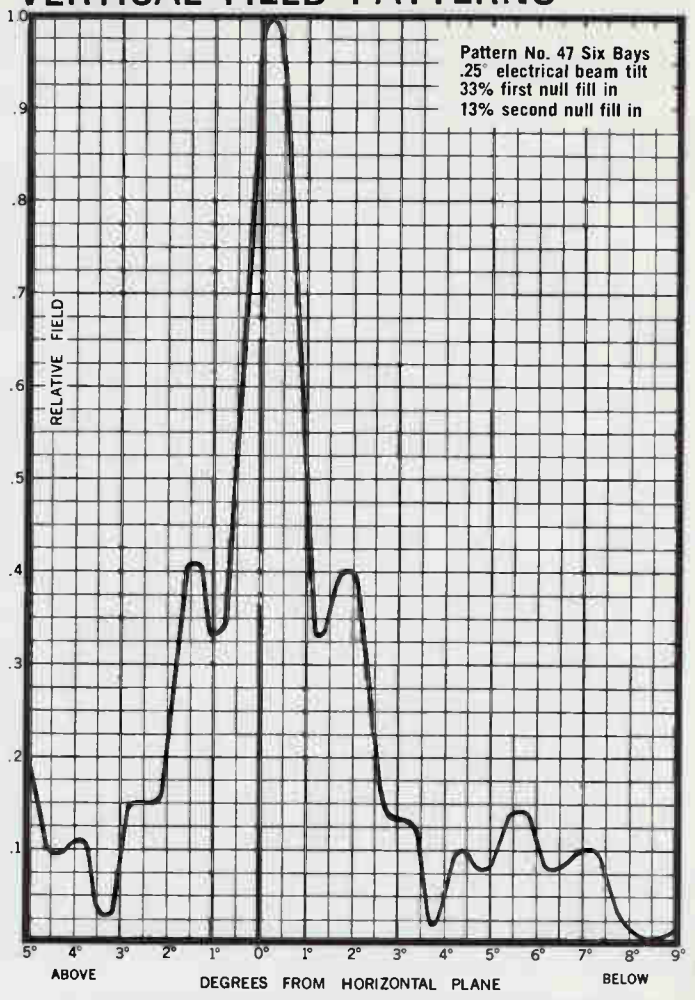


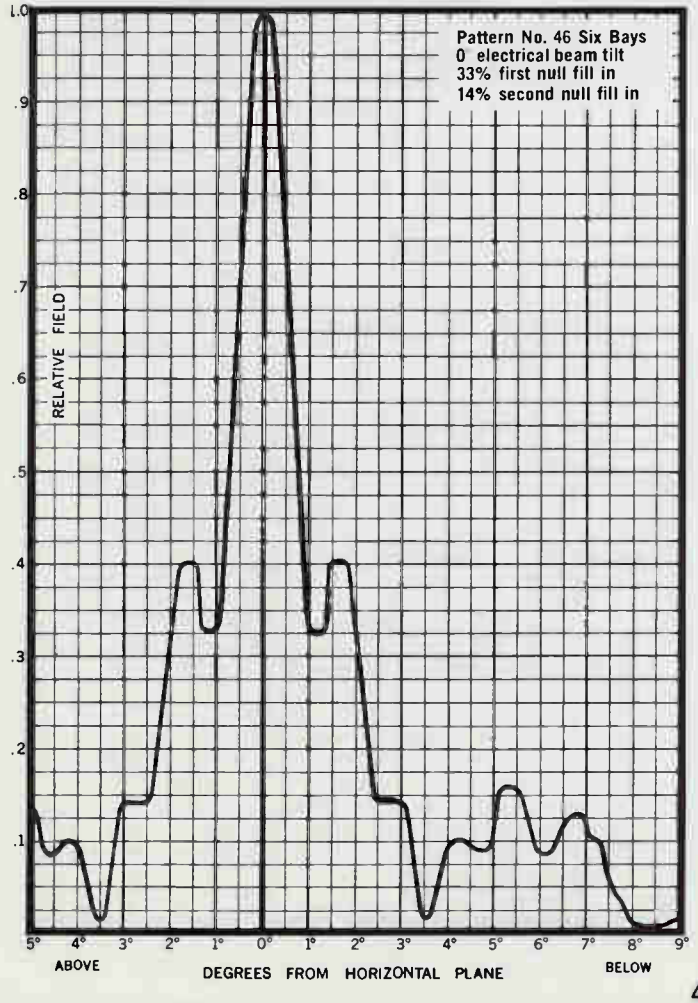


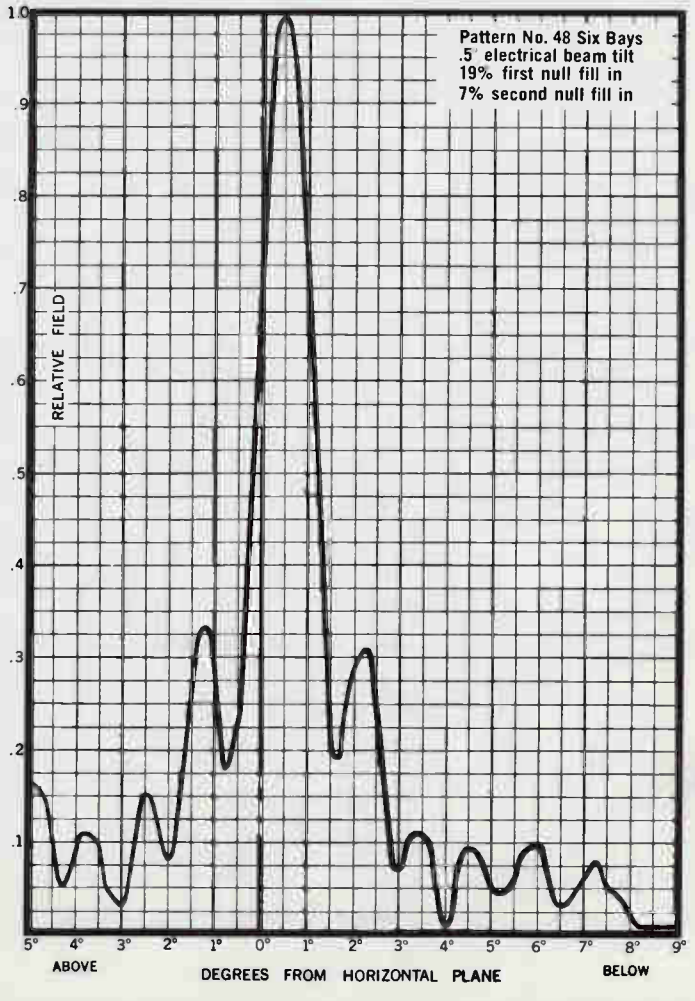


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

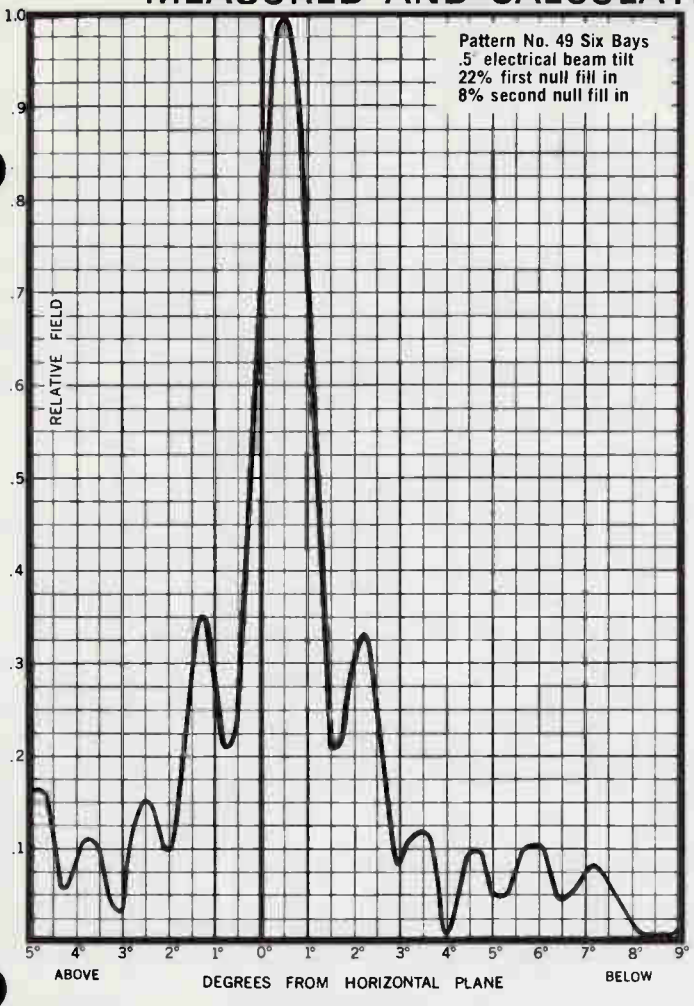


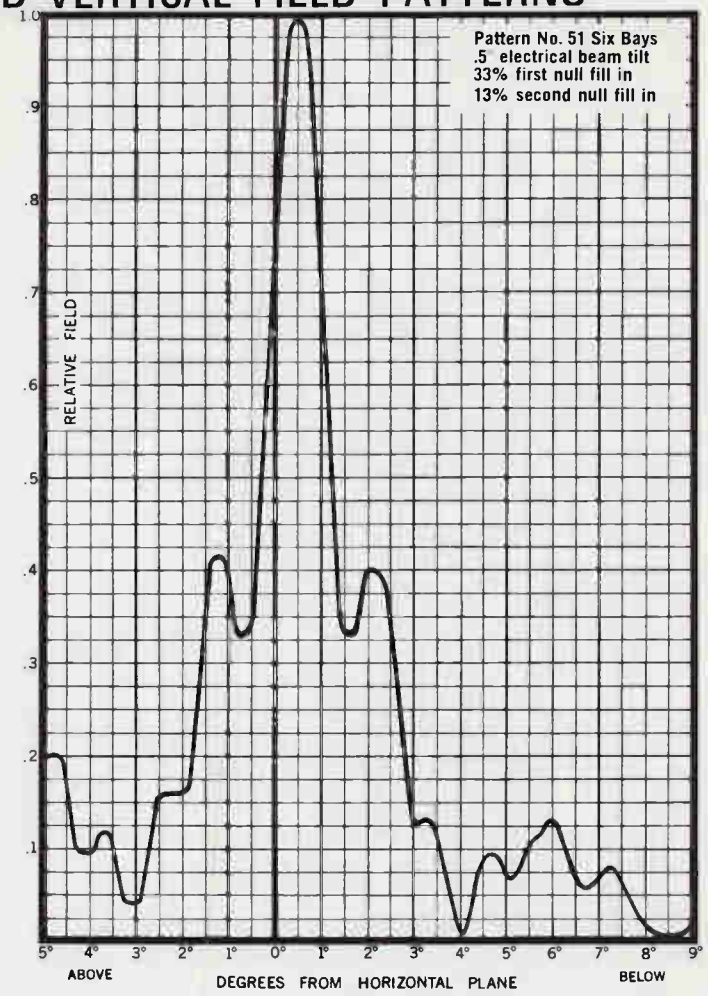


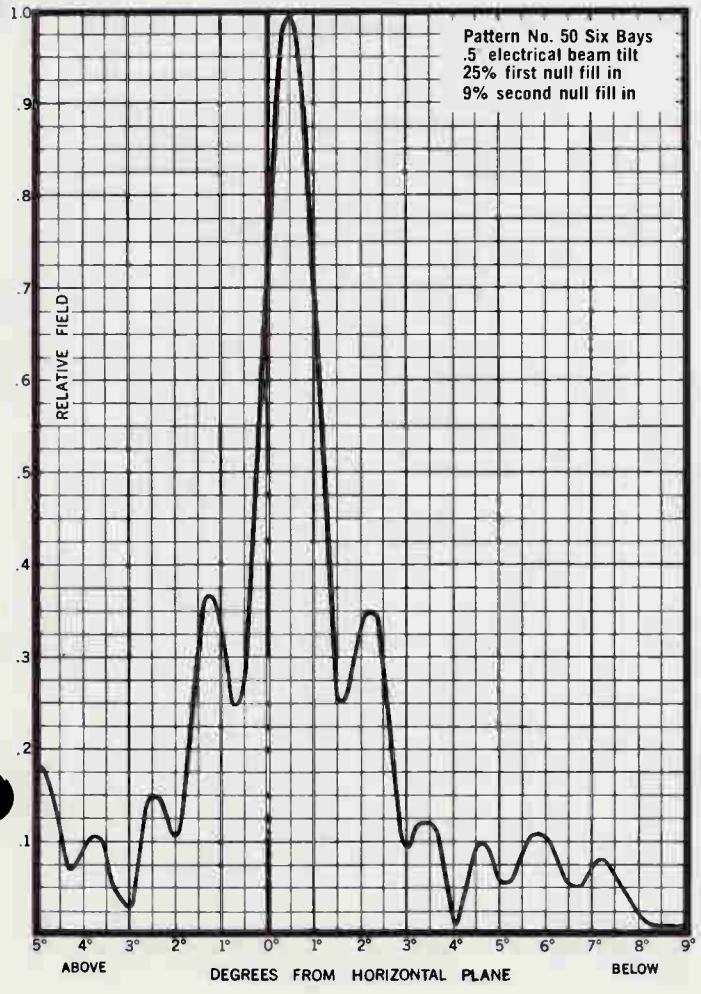


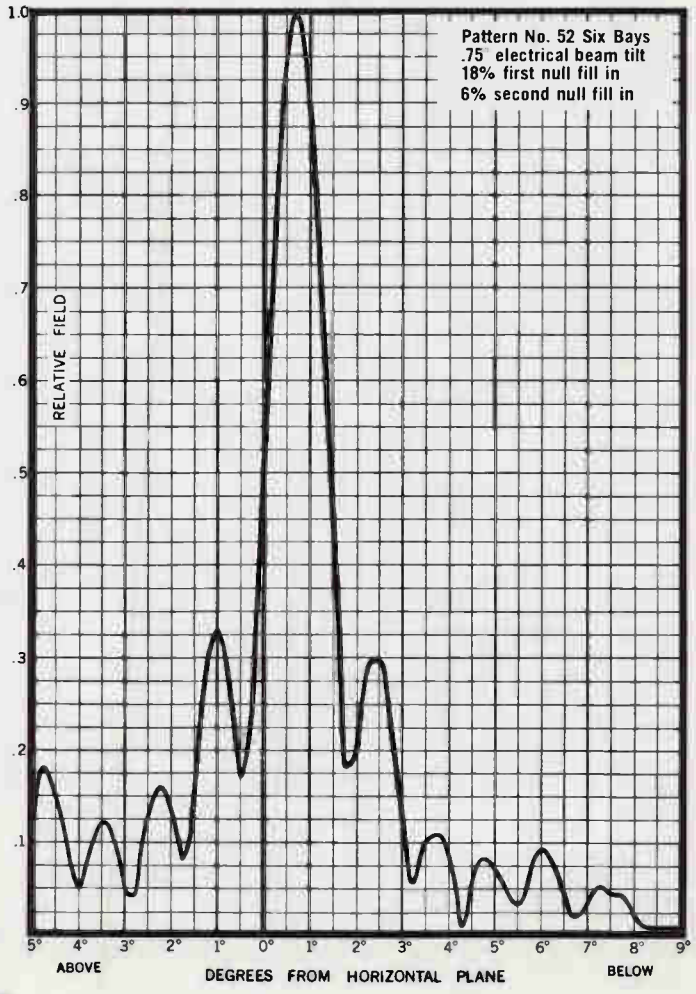


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

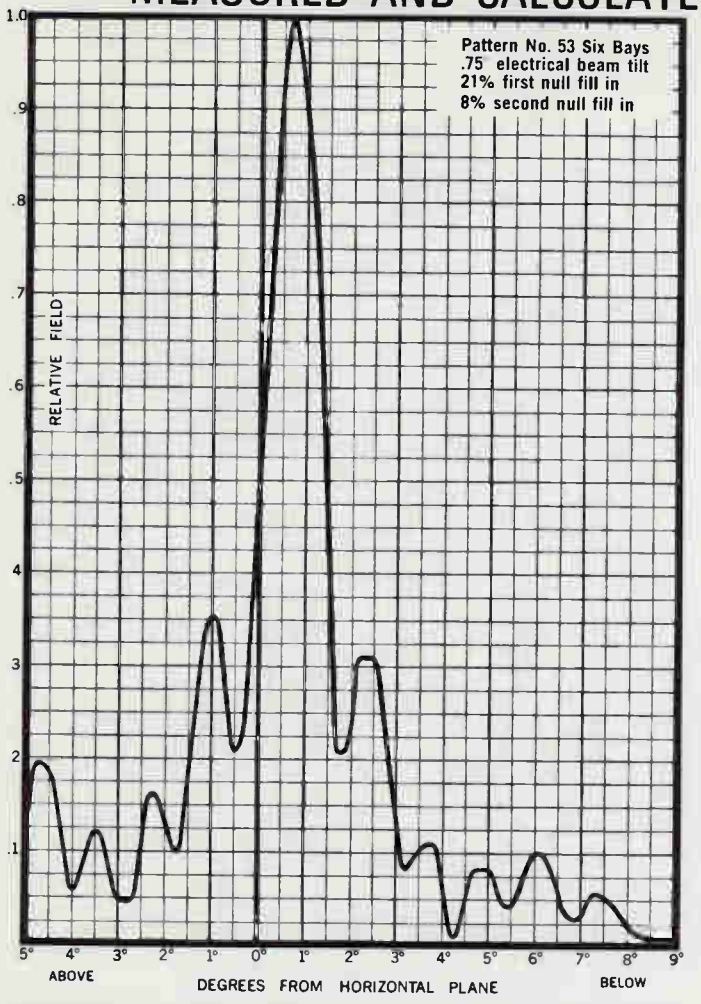


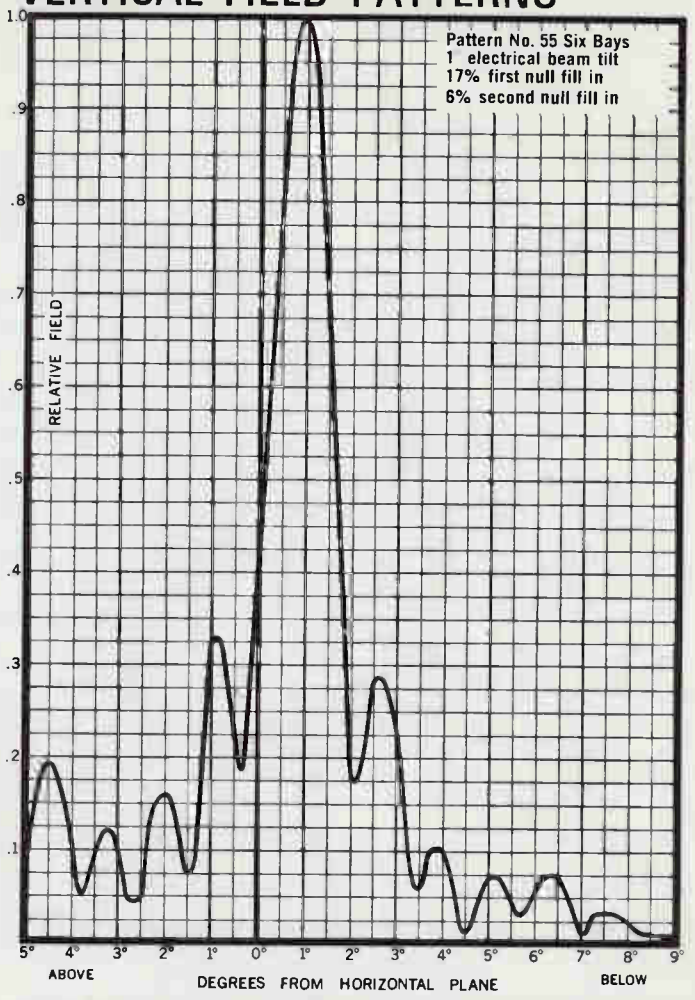


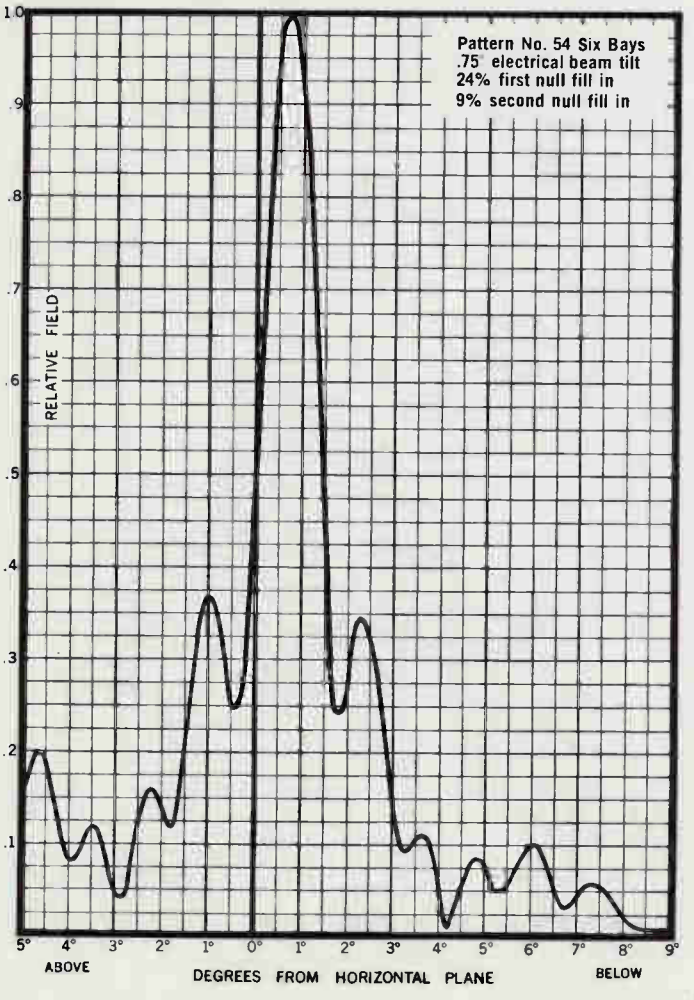


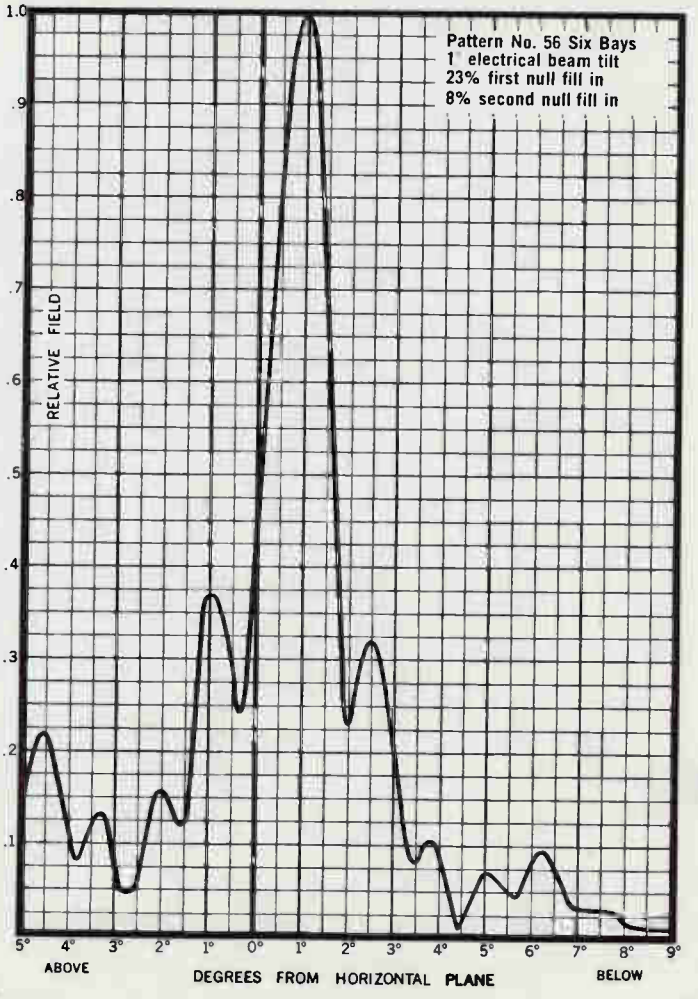


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

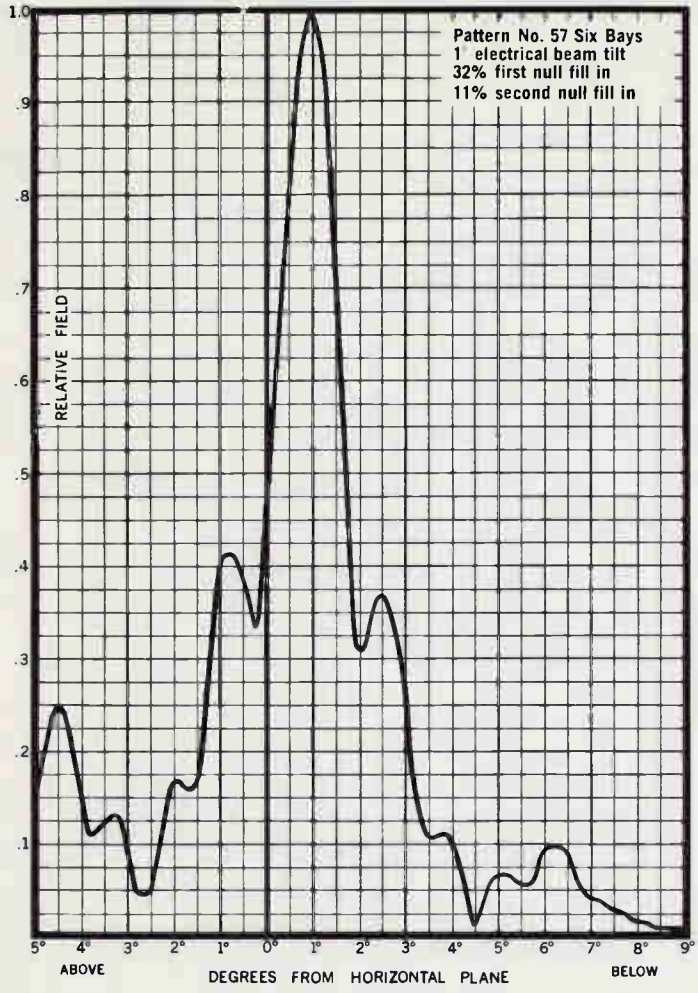


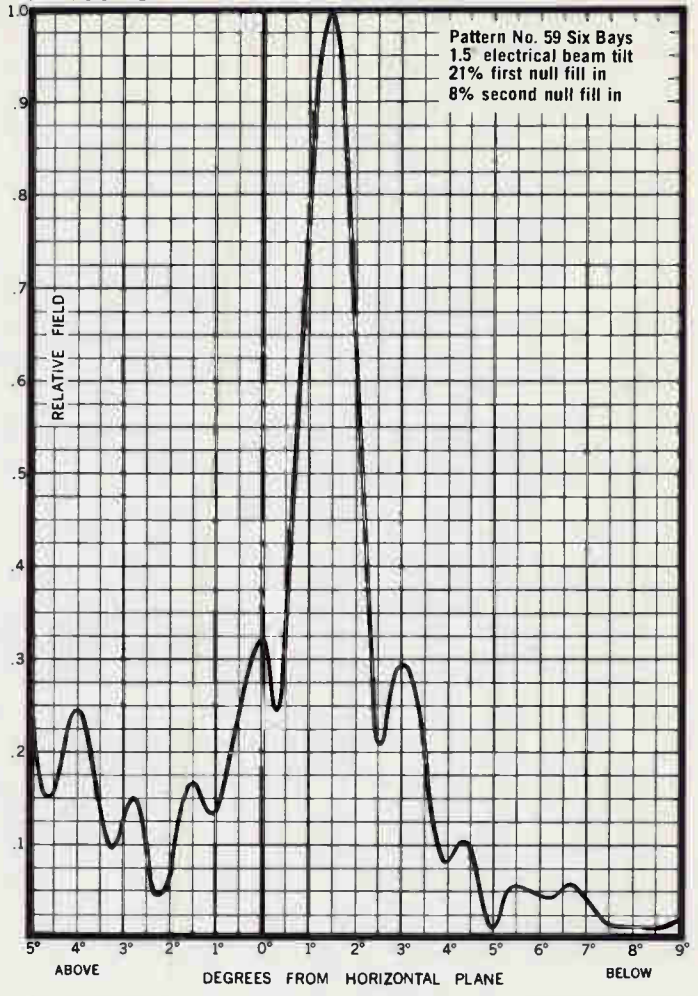


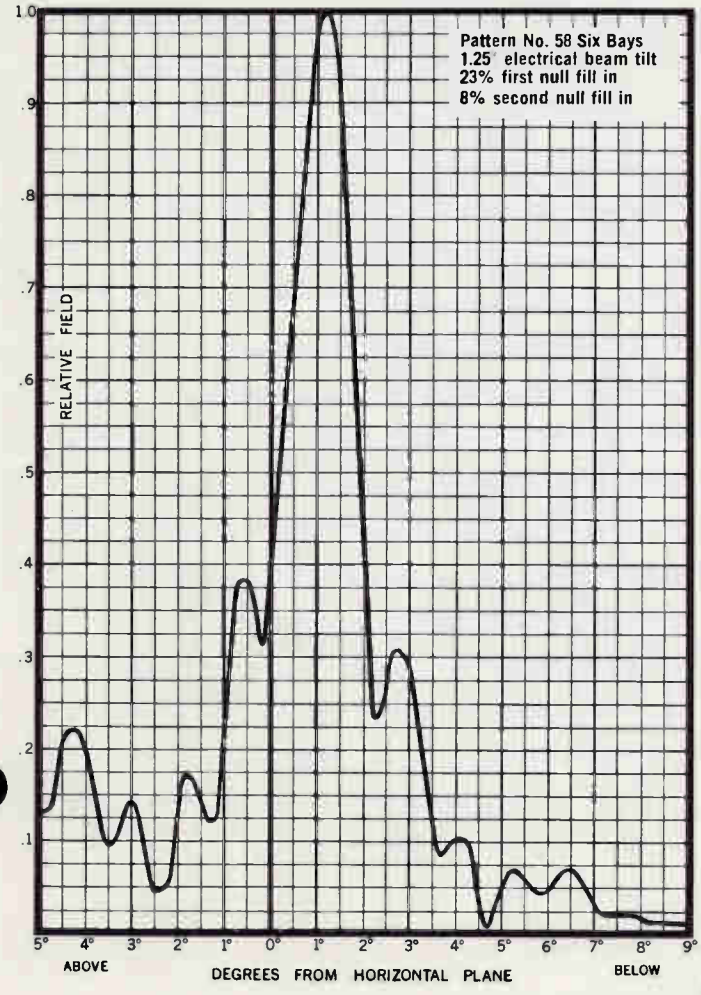


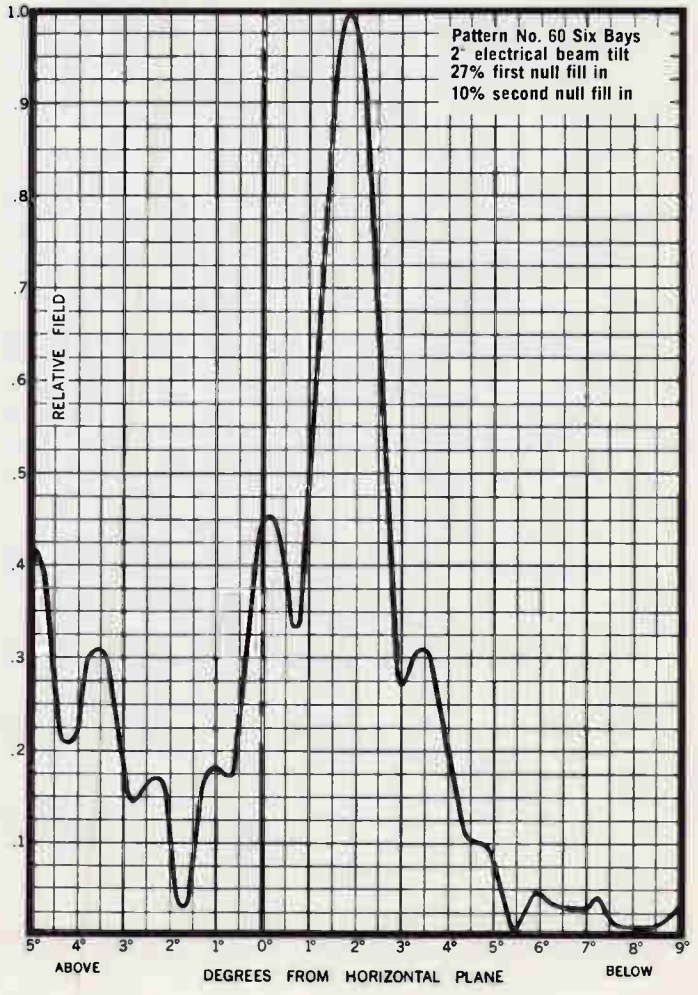


MEASURED AND CALCULATED VERTICAL FIELD PATTERNS

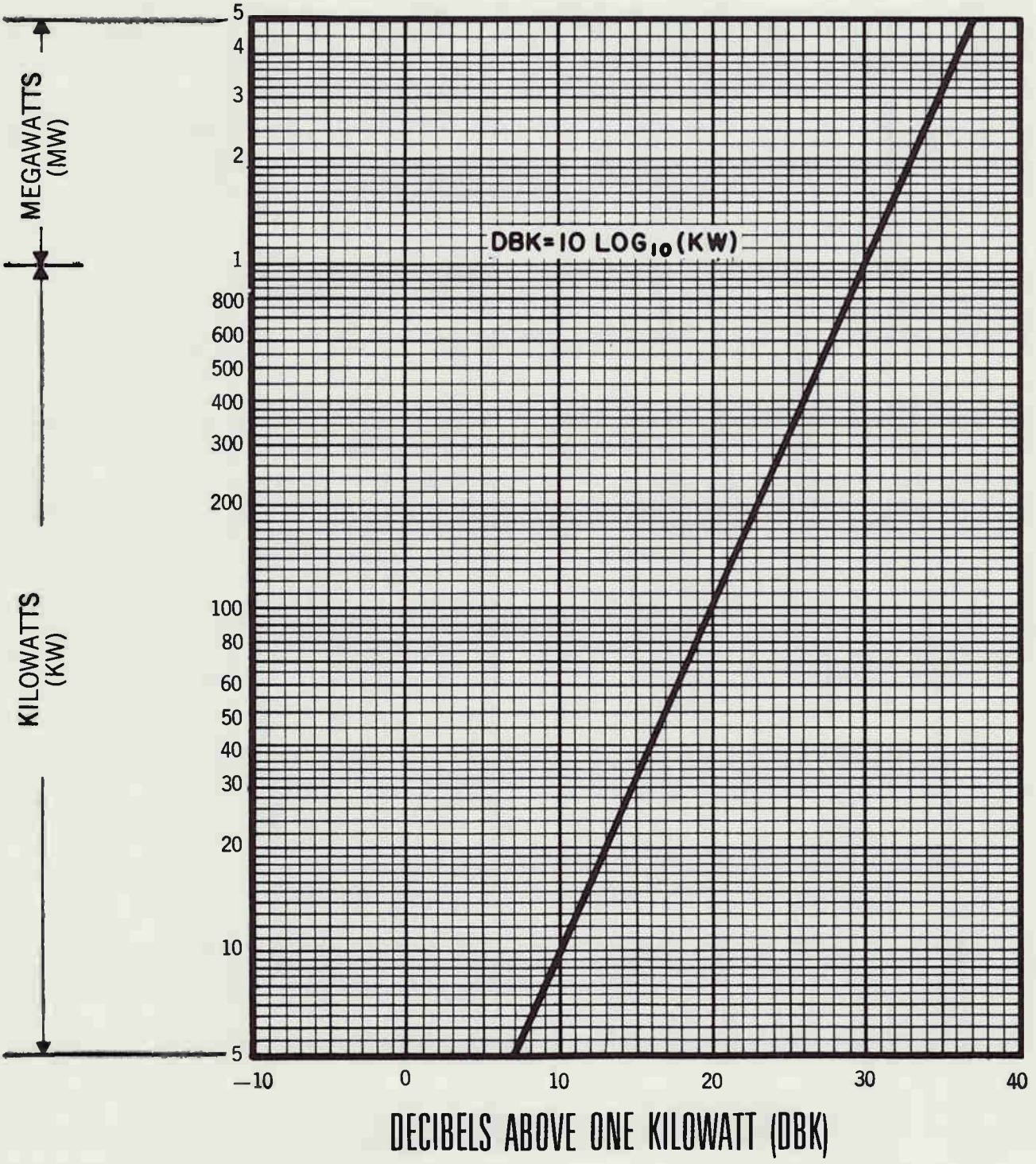








CONVERSION OF KILOWATTS AND MEGAWATTS TO DECIBELS ABOVE ONE KILOWATT



TRANSMISSION LINE POWER RATINGS
AVERAGE POWER IN KW AT 40° C, (104°F), 1.08/1 VSWR

UHF CHANNEL	3-1/8" 50.0	5" Air Heliax®	6-1/8" 50.0	6-1/8" 75.0	9-3/16" 75.0
14	20.0	29.5	67.0	83.6	156
15	20.0	29.1	67.0	83.4	155.6
16	19.9	28.7	66	83.2	155.2
17	19.8	28.3	66	82.9	154.8
18	19.7	27.9	65	82.7	154.4
19	19.6	27.5	65	82.5	154.0
20	19.5	27.2	64	81.9	153.3
21	19.5	27.1	64	81.3	152.6
22	19.4	26.9	63	80.7	151.9
23	19.3	26.8	63	80.0	151.1
24	19.2	26.7	62	79.3	149.3
25	19.1	26.6	62	78.7	148.6
26	19.0	26.5	61	78.1	147.9
27	18.9	26.4	60	77.5	147.1
28	18.8	26.4	60	76.9	146.2
29	18.7	26.3	59	76.2	145.3
30	18.6	26.3	59	75.5	144.4
31	18.5	26.2	58	74.8	143.5
32	18.4	26.1	58	74.2	142.5
33	18.3	26.0	57	73.4	141.5
34	18.2	25.9	57	72.8	140.3
35	18.1	25.9	56	72.2	139.1
36	18.0	25.8		71.5	138.0
37	17.9	25.7		70.8	136.8
38	17.8	25.6		70.1	135.7
39	17.7	25.5		69.5	134.5
40	17.6	25.4		68.9	
41	17.5	25.3		68.3	
42	17.4	25.2		67.7	
43	17.3	25.1		67.1	
44	17.2	25.0		66.5	
45	17.1	24.9		66.1	
46	17.0	24.8		65.7	
47	16.9	24.8		65.3	
48	16.8	24.7		64.9	
49	16.7	24.6		64.6	
50	16.6	24.5		64.2	
51	16.5	24.4		63.9	
52	16.5	24.4		63.5	
53	16.4	24.3		63.0	
54	16.4	24.1		62.4	
55	16.3	23.9		62.0	
56	16.3	23.8		61.6	
57	16.2	23.6		61.2	
58	16.2	22.5		60.7	
59	16.1	22.3		60.3	
60	16.1	22.1		59.9	
61	16.0	23.0		59.5	
62	15.9	22.8		59.0	
63	15.9	22.7		58.6	
64	15.8	22.6		58.0	
65	15.7	22.5		57.4	
66	15.7	22.3		56.8	
67	15.6	22.1		56.2	
68	15.6	21.9		55.6	
69	15.5	21.8		55.0	
70	15.5	21.7		54.5	
71	15.4	21.6		54.0	
72	15.3	21.5		53.5	
73	15.2	21.3		53.0	
74	15.1	21.2		52.5	
75	15.0	21.0		52.0	
76	14.9	20.8		51.5	
77	14.8	20.5		51.0	
78	14.8	20.4		50.0	
79	14.7	20.2		49.5	
80	14.7	20.0		49.0	
81	14.6	19.9		48.5	
82	14.6	19.8		48.0	
83	14.5	19.7		47.5	

NOT RECOMMENDED ABOVE THIS CHANNEL BECAUSE OF MODEING LOSSES

NOT RECOMMENDED ABOVE THIS CHANNEL BECAUSE OF MODEING LOSSES

® Andrew Corporation

3⅛ INCH 50 OHM RIGID COPPER TRANSMISSION LINE
EFFICIENCY IN PERCENT

Channel	DB Loss Per 100 Feet	Length in Feet												
		100	200	300	400	500	600	700	800	900	1000	1200	1400	1600
14	.223	95.0	90.2	85.7	81.4	77.4	73.5	69.8	66.3	63.0	59.8	54.0	48.7	44.0
15	.225	05.0	90.2	85.6	81.3	77.2	73.3	69.6	66.1	62.7	59.6	53.7	48.4	43.7
16	.227	94.9	90.1	85.5	81.1	77.0	73.1	69.4	65.8	62.5	59.3	53.4	48.1	43.3
17	.229	94.9	90.0	85.4	81.0	76.8	72.9	69.1	65.6	62.2	59.0	53.1	47.1	43.0
18	.231	94.8	89.9	85.3	80.8	76.7	72.7	68.9	65.3	62.0	58.8	52.8	47.5	42.7
19	,233	94.8	89.8	85.1	80.7	76.5	72.5	68.7	65.1	61.7	58.5	52.5	47.2	42.4
20	.234	94.8	89.8	85.1	80.6	76.4	72.4	68.6	65.0	61.6	58.3	52.4	47.0	42.2
21	.235	94.7	89.7	85.0	80.5	76.3	72.3	68.5	54.9	61.5	58.2	52.2	46.9	42.1
22	.237	94.7	89.7	84.9	80.4	76.1	72.1	68.3	64.6	61.2	57.9	52.0	46.6	41.8
23	.239	94.6	89.6	84.8	80.2	75.9	71.9	68.0	64.4	50.9	57.7	51.7	46.3	41.5
24	.240	94.6	89.5	84.7	80.2	75.9	71.8	67.9	64.3	60.8	57.5	51.5	46.1	41.3
25	.242	94.6	89.5	84.6	80.0	75.7	71.6	67.7	64.0	60.6	57.3	51.2	45.2	41.0
26	.243	94.6	89.4	84.6	80.0	75.6	71.5	67.6	63.9	60.4	57.2	51.1	45.7	40.9
27	.245	94.5	89.3	84.4	79.8	75.4	71.3	67.4	63.7	60.2	56.9	50.8	45.4	40.6
28	.247	94.5	89.3	84.3	79.7	75.3	71.1	67.2	63.5	60.0	56.6	50.5	45.1	40.3
29	.249	94.4	89.2	84.2	79.5	75.1	70.9	67.0	63.2	60.0	56.4	50.3	44.8	40.0
30	.250	94.4	89.1	84.1	79.4	75.0	70.8	66.8	63.1	59.6	56.2	50.1	44.7	39.8
31	.252	94,4	89.0	84.0	79.3	74.8	70.6	66.6	62.9	59.3	56.0	49.8	44.4	39.5
32	.254	94.3	89.0	83.9	79.1	74.6	70.4	66.4	62.6	59.1	55.7	49.6	44.1	39.2
33	.255	94.3	88.9	83.9	79.1	74.6	70.3	66.3	62.5	59.0	55.6	49.4	43.9	39.1
34	.256	94.3	88.9	83.8	79.0	74.5	70.2	66.2	62.4	58.8	55.5	49.3	43.8	38.9
35	.257	94.3	88.8	83.7	78.9	74.4	70.1	66.1	62.3	58.7	55.3	49.2	43.7	38.8
36	.258	94.2	88.8	83.7	78.9	74.3	70.0	66.0	62.2	58.6	55.2	49.0	43.5	38.7
37	.260	94.2	88.7	83.6	78.7	74.1	69.8	65.8	61.9	58.3	55.0	48.8	43.3	38.4
38	.262	94.1	88.6	83.4	78.6	74.0	69.6	65.6	61.8	58.1	54.7	48.5	43.0	38.1
39	.264	94.1	88.6	83.3	78.4	73.8	69.4	65.3	61.5	5.79	54.5	48.2	42.7	37.8
40	.265	94.1	88.5	83.3	78.3	73.7	69.4	65.2	61.4	57.7	54.3	48.1	42.6	37.7
41	.266	94.1	88.5	83.2	78.3	73.6	69.3	65.1	61.3	57.6	54.2	48.0	42.4	37.5
42	.267	94.0	88.4	83.2	78.2	73.5	69.2	65.0	61.2	57.5	54.1	47.8	42.3	37.4
43	.269	94.0	88.3	83.0	78.0	73.4	69.0	64.8	60.9	57.3	53.8	47.6	42.0	37.1
44	.270	94.0	88.3	83.0	78.0	73.3	68.9	64.7	60.8	57.2	53.7	47.4	41.9	37.0
45	.272	93.9	88.2	82.9	77.8	73.1	68.7	64.5	60.6	56.9	53.5	47.2	41.6	36.7
46	.274	93.9	88.1	82.8	77.7	72.9	68.5	64.3	60.4	56.7	53.2	46.9	41.3	36.4
47	.275	93.8	88.0	82.7	77.6	72.9	68.4	64.2	60.3	56.6	53.1	46.8	41.2	36.3
48	.276	93.8	88.1	82.6	77.6	72.8	68.3	64.1	60.1	56.4	53.0	46.6	41.1	36.2
49	.278	93.8	88.0	82.5	77.4	72.6	68.1	63.9	59.9	56.2	52.7	46.4	40.8	35.9
50	.279	93.8	87.9	82.5	77.3	72.5	68.0	63.8	59.8	56.1	52.6	46.3	40.7	35.8
51	.281	93.7	87.9	82.4	77.2	72.4	67.8	63.6	59.6	55.9	52.4	46.0	40.4	35.5
52	.282	93.7	87.8	82.3	77.1	72.3	67.7	63.5	59.5	55.7	52.2	45.9	40.3	35.4
53	.283	93.7	87.8	82.2	77.1	72.2	67.6	63.4	59.4	55.6	52.1	45.7	40.2	35.3
54	.284	93.7	87.7	82.2	77.0	72.1	67.5	63.3	59.3	55.5	52.0	45.6	40.0	35.1
55	.285	93.7	87.6	82.1	76.9	72.0	67.5	63.2	59.2	55.4	51.9	45.5	39.9	35.0
56	.286	93.6	87.7	82.1	76.8	71.9	67.4	63.1	59.1	55.3	51.8	45.4	40.0	34.9
57	.287	93.6	87.6	82.0	76.8	71.9	67.3	63.0	58.9	55.2	51.6	45.2	39.6	34.7
58	.290	93.5	87.5	81.8	76.6	71.6	67.0	62.7	58.6	54.8	51.3	44.9	39.3	34.4
59	.292	93.5	87.4	81.7	76.4	71.5	66.8	62.5	58.4	54.6	51.1	44.6	33.0	34.1
60	.294	93.5	87.3	81.6	76.3	71.3	66.6	62.3	58.2	54.4	50.8	44.4	38.8	33.9
61	.295	93.4	87.3	81.6	76.2	71.2	66.5	62.2	58.1	54.3	50.7	44.3	38.6	33.7
62	.297	93.4	87.2	81.5	76.1	71.0	66.3	62.0	57.9	54.0	50.5	44.0	38.4	33.5
63	.298	93.4	87.2	81.4	76.0	71.0	66.3	61.9	57.8	53.9	50.3	43.9	38.3	33.4
64	.299	93.3	87.1	81.3	75.9	70.9	66.2	61.8	57.7	53.8	50.2	43.8	38.1	33.2
65	.300	93.3	87.1	81.3	75.9	70.8	66.1	61.7	57.5	53.7	50.1	43.7	38.0	33.1
66	.301	93.3	87.1	81.2	75.8	70.7	66.0	61.6	57.4	53.6	50.0	43.5	37.9	33.0
67	.302	93.3	87.0	81.2	75.7	70.6	65.9	61.5	57.3	53.5	49.9	43.4	37.8	32.9
68	.3025	93.3	87.0	81.1	75.7	70.6	65.8	61.4	57.3	53.4	49.8	43.4	37.7	32.8
69	.303	93.3	87.0	81.1	75.6	70.6	65.8	61.4	57.2	53.4	49.8	43.3	37.7	32.7
70	.3035	93.2	87.0	81.1	75.6	70.5	65.8	61.3	57.2	53.3	49.7	43.2	37.6	32.7
71	.304	93.2	86.9	81.1	75.6	70.5	65.7	61.3	57.1	53.3	49.7	43.2	37.5	32.6
72	.305	93.2	86.9	81.0	75.5	70.4	65.6	61.2	57.0	53.1	49.5	43.1	37.4	32.5
73	.306	93.2	86.7	81.0	75.4	70.3	65.5	61.1	56.9	53.0	49.4	42.9	37.3	32.4
74	.307	93.2	86.8	80.9	75.4	70.2	65.4	61.0	56.8	52.9	49.3	42.8	37.2	32.3
75	.3075	93.2	86.8	80.9	75.3	70.2	65.4	60.9	56.8	52.8	49.3	42.8	37.1	32.2
76	.308	93.2	86.8	80.8	75.3	70.1	65.3	60.9	56.7	52.8	49.2	42.7	37.1	32.2
77	.3085	93.1	86.8	80.8	75.3	70.1	65.3	60.8	56.7	52.8	49.2	42.6	37.0	32.1
78	.309	93.1	86.7	80.8	75.2	70.1	65.3	50.8	56.6	52.7	49.1	42.6	36.9	32.0
79	.310	93.1	86.7	80.7	75.2	70.0	65.2	60.7	56.5	52.6	49.0	42.5	36.8	31.9
80	.311	93.1	86.7	80.7	75.1	70.0	65.1	60.6	56.4	52.5	48.9	42.3	36.7	31.8
81	.312	93.1	86.6	80.6	75.0	69.8	65.0	60.5	56.3	52.4	48.8	42.2	36.6	31.7
82	.3125	93.1	86.6	80.6	75.0	69.8	64.9	60.4	56.2	52.3	48.7	42.2	36.5	31.6
83	.313	93.0	86.6	80.6	75.0	69.7	64.9	60.4	56.2	52.2	48.6	42.1	36.5	31.6

6⅛ INCH 75 OHM RIGID COPPER TRANSMISSION LINE
EFFICIENCY IN PERCENT

Channel	DB Loss Per 100 Feet	Length in Feet												
		100	200	300	400	500	600	700	800	900	1000	1200	1400	1600
14	.105	97.6	95.3	93.0	90.8	88.6	86.5	84.4	82.4	80.4	78.5	74.8	71.3	67.9
15	.106	97.6	95.2	92.9	90.7	88.5	86.4	84.3	82.3	80.3	78.4	74.6	71.1	67.7
16	.107	97.6	95.2	92.9	90.6	88.4	86.3	84.2	82.1	80.1	78.2	74.4	70.8	67.4
17	.1075	97.6	95.2	92.8	90.6	88.4	86.2	84.1	82.0	80.0	78.1	74.3	70.7	67.3
18	.108	97.5	95.2	92.8	90.5	88.3	86.1	84.0	82.0	80.0	78.0	74.2	70.6	60.2
19	.109	97.5	95.1	92.8	90.5	88.2	86.0	83.9	81.8	79.8	77.8	74.0	70.4	66.9
20	.1095	97.5	95.1	92.7	90.4	88.2	86.0	83.8	81.7	79.7	77.7	73.9	70.3	66.8
21	.110	97.5	95.1	92.7	90.4	88.1	85.9	83.8	81.7	79.6	77.6	73.8	70.2	66.7
22	.111	97.5	95.0	92.6	90.3	88.0	85.8	83.6	81.5	79.4	77.5	73.6	70.0	66.4
23	.112	97.5	95.0	92.6	90.2	87.9	85.7	83.5	81.4	79.3	77.3	73.4	69.7	66.2
24	.113	97.4	94.9	92.5	90.1	97.8	85.5	83.3	81.2	79.1	77.1	73.2	69.5	65.9
25	.1135	97.4	94.9	92.5	90.1	87.7	85.5	83.3	81.1	79.0	77.0	73.1	69.4	65.8
26	.1140	97.4	94.9	92.4	90.0	87.7	85.4	83.2	81.1	79.0	76.9	73.0	69.3	65.7
27	.1145	97.4	94.9	92.4	90.0	87.7	85.4	83.1	81.0	78.9	76.8	72.9	69.1	65.6
28	.115	97.4	94.8	92.4	90.0	87.6	85.3	83.1	80.9	78.8	76.7	72.8	69.0	65.5
29	.116	97.4	94.8	92.3	89.9	87.5	85.2	83.0	80.8	78.6	76.6	72.6	68.8	65.2
30	.117	97.3	94.8	92.3	90.0	87.4	85.1	82.8	80.6	78.5	76.4	72.4	68.6	65.0
31	.1175	97.3	94.7	92.2	89.7	87.3	85.0	82.7	80.5	78.4	76.3	72.3	68.5	64.9
32	.118	97.3	94.7	92.2	89.7	87.3	85.0	82.7	80.5	78.3	76.2	72.2	68.4	64.7
33	.1185	97.3	94.7	92.1	89.7	87.2	84.9	82.6	80.4	78.2	76.1	72.1	68.3	64.6
34	.119	97.3	94.7	92.1	89.6	87.2	84.8	82.6	80.3	78.1	76.0	72.0	68.2	64.5
35	.120	97.3	94.6	92.1	89.5	87.1	84.7	82.4	80.2	78.0	75.9	71.8	67.9	64.3
36	.1205	97.3	94.6	92.0	89.5	87.0	84.7	82.3	80.1	77.9	75.8	71.7	67.8	64.2
37	.121	97.3	94.6	92.0	89.5	87.0	84.6	82.3	80.0	77.8	75.7	71.6	67.7	64.0
38	.1215	97.2	94.6	91.9	89.4	86.9	84.5	82.2	79.9	77.1	75.6	71.5	67.6	63.9
39	.122	97.2	94.5	91.9	89.4	86.9	84.5	82.2	80.0	77.7	75.5	71.4	67.5	63.8
40	.123	97.2	94.5	91.9	89.3	86.8	84.4	82.0	79.7	77.5	75.3	71.2	67.3	63.6
41	.1235	97.2	94.5	91.8	89.2	86.7	84.3	82.0	79.6	77.4	75.2	71.0	67.1	63.4
42	.124	97.2	94.5	91.8	89.2	86.7	84.3	81.9	79.6	77.3	75.2	71.0	67.1	63.3
43	.1245	97.2	94.4	91.8	89.2	86.6	84.2	81.8	79.5	77.3	75.1	70.9	66.9	63.2
44	.125	97.2	94.4	91.7	89.1	86.6	84.1	81.8	79.4	77.2	75.0	70.8	66.8	63.1
45	.126	97.1	94.4	91.7	89.0	86.5	84.0	81.6	79.3	77.0	74.8	70.5	66.6	62.9
46	.1265	97.1	94.3	91.6	89.0	86.4	84.0	81.6	79.2	76.9	74.7	70.0	66.5	62.7
47	.127	97.1	94.3	91.6	89.0	86.4	83.9	81.5	79.1	76.9	74.6	70.4	66.4	62.6
48	.128	97.1	94.3	91.5	88.9	86.3	83.8	81.4	79.0	76.7	74.0	70.2	66.2	62.4
49	.129	97.1	94.2	91.5	88.8	86.2	83.7	81.2	78.9	76.5	74.3	70.0	66.0	62.2
50	.130	97.1	94.2	91.4	88.7	86.1	83.6	81.1	78.7	76.4	74.1	69.8	65.8	61.9
51	.1305	97.0	94.2	91.4	88.7	86.1	83.5	81.0	78.6	76.3	74.0	69.7	65.7	61.8
52	.131	97.0	94.1	91.4	88.6	86.0	83.4	81.0	78.6	76.2	74.0	69.6	65.6	61.7
53	.132	97.0	94.1	91.3	88.5	85.9	83.3	80.8	78.4	76.1	73.8	69.4	65.3	61.5
54	.1325	97.0	94.1	91.3	88.5	85.9	83.3	80.8	78.3	76.0	73.7	69.3	65.2	61.4
55	.133	97.0	94.1	91.2	88.5	85.8	83.2	80.7	78.3	75.9	73.6	69.3	65.1	61.3
56	.1335	97.0	94.0	91.2	88.4	85.8	83.2	80.6	78.1	75.8	73.5	69.1	65.0	61.2
57	.134	97.0	94.0	91.2	88.4	85.7	83.1	80.6	78.1	75.8	73.5	69.1	64.9	61.0
58	.1345	96.9	94.0	91.1	88.3	85.7	83.0	80.5	78.0	75.7	73.4	69.0	64.8	60.9
59	.135	96.9	94.0	91.1	88.3	85.6	83.0	80.4	78.0	75.6	73.3	68.9	64.7	60.8
60	.136	96.9	93.9	91.0	88.2	85.5	82.9	80.3	77.8	75.4	73.1	68.7	64.5	60.6
61	.1365	96.9	93.9	91.0	88.2	85.5	82.8	80.3	77.8	75.4	73.0	68.6	64.4	60.5
62	.137	96.9	93.9	91.0	88.1	85.4	82.8	80.2	77.7	75.3	72.9	68.5	64.3	60.4
63	.1375	96.9	93.9	90.9	88.1	85.4	82.7	80.1	77.6	75.2	72.9	68.4	64.2	60.3
64	.138	96.9	93.8	90.9	88.1	85.3	82.6	80.1	77.6	75.1	72.8	68.3	64.1	60.2
65	.1385	96.9	93.8	90.0	88.0	85.3	82.6	80.0	77.5	75.0	72.7	68.2	64.0	60.0
66	.139	96.9	93.8	90.8	88.0	85.2	82.5	79.9	77.4	75.0	72.6	68.1	63.9	60.0
67	.140	96.8	93.8	80.8	87.9	85.1	82.4	79.8	77.3	74.8	72.4	67.9	63.7	59.7
68	.141	96.8	93.7	90.7	87.8	85.0	82.3	79.7	77.1	74.7	72.3	67.7	63.5	59.5
69	.1415	96.8	93.7	90.7	87.8	85.0	82.2	79.6	77.1	74.6	72.2	67.6	63.4	59.4
70	.142	96.8	93.7	90.7	87.7	84.9	82.2	79.5	77.0	74.5	72.1	67.5	63.3	59.3
71	.1425	96.8	93.7	90.6	87.7	84.9	82.1	79.5	76.9	74.4	72.0	67.5	63.2	59.2
72	.143	96.8	93.6	90.6	87.7	84.8	82.1	79.4	76.8	74.4	71.9	67.4	63.1	59.1
73	.1435	96.7	93.6	90.6	87.6	84.8	82.0	79.4	76.8	74.3	71.9	67.3	63.0	58.9
74	.144	96.7	93.6	90.5	87.6	84.7	82.0	79.3	76.7	74.2	71.8	67.2	62.9	58.8
75	.145	96.7	93.5	90.5	87.5	84.6	81.9	79.2	76.6	74.1	71.6	67.0	62.7	58.6
76	.1455	96.7	93.5	90.4	87.5	84.6	81.8	79.1	76.5	74.0	71.5	66.9	62.6	58.5
77	.146	96.7	93.5	90.4	87.4	84.5	81.7	79.0	76.4	73.9	71.4	66.8	62.5	58.4
78	.1465	96.7	93.5	90.4	87.4	84.5	71.7	79.0	76.3	73.8	71.4	66.7	62.4	58.3
79	.147	96.7	93.5	90.3	87.3	84.4	81.6	79.0	76.3	73.8	71.3	66.6	62.3	58.2
80	.1475	96.7	93.4	90.3	87.3	84.4	81.6	78.8	76.2	73.7	71.2	66.5	62.2	58.1
81	.148	96.7	93.4	90.3	87.3	84.3	81.5	78.8	76.1	73.6	71.1	66.4	62.1	58.0
82	.149	96.6	93.4	90.2	87.2	84.2	81.4	78.6	76.0	73.5	71.0	66.3	61.9	57.8
83	.1495	96.6	93.3	90.2	87.1	84.2	81.3	78.6	75.9	73.4	70.9	66.2	61.8	57.7

5 INCH 50 OHM ANDREW AIR HELIAX® COPPER TRANSMISSION LINE EFFICIENCY IN PERCENT

Channel	DB Loss Per 100 Feet	Length in Feet												
		100	200	300	400	500	600	700	800	900	1000	1200	1400	1800
14	.183	95.8	92.2	88.1	84.4	80.2	77.6	74.5	71.0	68.9	65.8	60.5	55.6	46.9
20	.192	95.6	91.8	87.7	83.8	79.8	76.9	73.5	70.0	67.4	64.2	58.8	54.1	44.0
25	.199	95.5	91.1	87.3	83.3	79.5	75.9	72.6	69.4	66.3	63.4	57.8	52.7	43.8
30	.205	95.4	91.0	86.8	82.8	79.2	75.2	72.1	68.5	65.4	62.5	56.8	51.6	42.5
35	.211	95.2	90.8	86.5	82.4	78.6	74.8	71.2	67.8	64.4	61.5	55.7	50.7	41.7
40	.216	95.1	90.5	86.1	82.1	77.9	74.0	70.6	67.4	64.0	60.8	55.0	50.0	
45	.222	95.0	90.3	85.9	81.5	77.5	73.6	70.0	66.5	63.0	60.0	52.2	49.0	
50	.227	94.9	90.1	85.5	81.1	77.0	73.1	69.3	66.0	62.5	59.3	53.6	47.9	
55	.234	94.7	89.7	85.0	79.6	76.4	72.3	68.7	64.8	61.6	58.3	52.4	46.9	
60	.239	94.6	89.5	84.7	80.2	75.9	71.9	78.0	64.4	60.9	57.6	51.9		
65	.244	94.4	89.2	84.5	79.7	75.6	70.9	67.6	63.8	60.1	56.8	51.0		
70	.249	94.3	89.0	84.1	79.4	75.0	70.6	66.9	63.0	59.9	56.1	50.0		
75	.255	94.2	88.9	83.9	79.1	74.8	70.1	66.2	62.9	59.3	55.6	49.8		
80	.261	94.1	88.8	83.4	78.7	74.0	69.8	66.0	62.4	58.2	54.8	48.6		
83	.263	94.0	88.8	83.2	78.6	73.9	69.6	65.8	62.1	57.8	54.4	48.3		

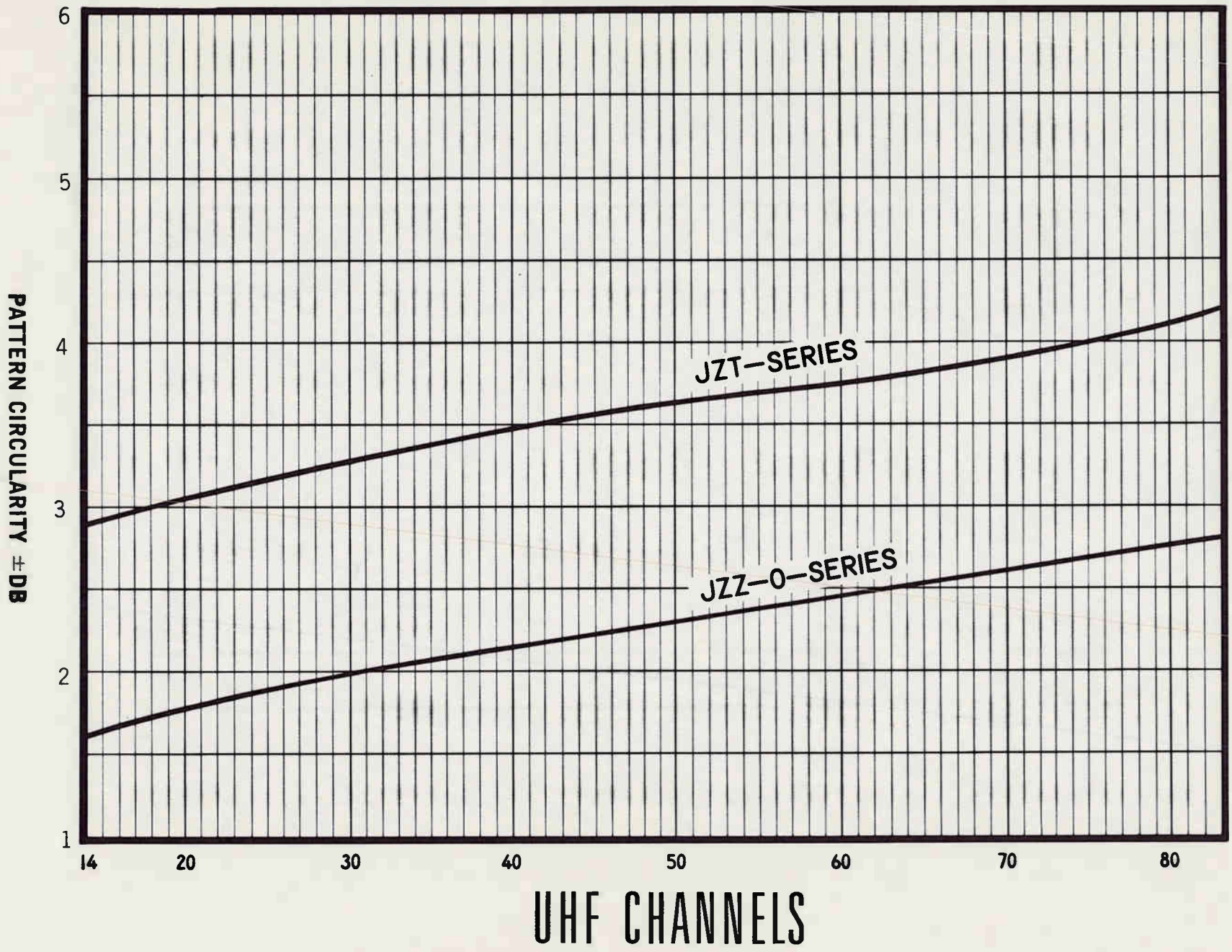
6⅛ INCH 50 OHM RIGID COPPER TRANSMISSION LINE EFFICIENCY IN PERCENT

Channel	DB Loss Per 100 Feet	Length in Feet													
		100	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000
14	.116	97.4	94.8	92.3	89.9	87.5	85.2	83.0	80.8	78.6	76.6	72.6	68.8	65.2	61.8	58.6
15	.117	97.4	94.8	92.2	89.8	87.4	85.1	82.8	80.6	78.5	76.4	72.4	68.6	65.0	61.6	58.3
16	.118	97.4	94.7	92.2	89.7	87.3	85.0	82.7	80.5	78.3	76.2	72.2	68.4	64.5	61.3	58.1
17	.119	97.4	94.7	92.1	89.6	87.2	84.8	82.5	80.3	78.2	76.0	72.0	68.1	64.5	61.1	57.8
18	.120	97.3	94.6	92.0	89.5	87.1	84.7	82.4	80.2	78.0	75.9	71.8	68.0	64.3	60.8	57.6
19	.1205	97.3	94.6	92.0	89.5	87.0	84.7	82.4	80.1	78.0	75.8	71.7	67.8	64.1	60.7	57.4
20	.121	97.2	94.6	92.0	89.5	87.0	84.6	82.3	80.0	77.8	75.7	71.6	67.7	64.0	60.6	57.3
21	.1215	97.2	94.6	92.0	89.4	87.0	84.5	82.2	80.0	77.7	75.6	71.5	67.6	63.9	60.4	57.2
22	.122	97.2	94.5	91.9	89.4	86.9	84.5	82.1	80.0	77.7	75.5	71.4	67.5	63.8	60.3	57.0
23	.1225	97.2	94.5	91.9	89.3	86.9	84.4	82.1	79.8	77.6	75.4	71.3	67.4	63.7	60.2	56.9
24	.123	97.2	94.5	91.9	89.3	86.8	84.4	82.0	79.7	77.5	75.3	71.2	67.3	63.6	60.1	56.8
25	.1235	97.2	94.5	91.8	89.3	86.7	84.3	82.0	79.6	77.4	75.2	71.1	67.2	63.4	60.0	56.6
26	.124	97.2	94.5	91.8	89.2	86.7	84.3	81.9	79.6	77.3	75.2	71.0	67.0	63.3	59.8	56.5
27	.1245	97.2	94.4	91.8	89.2	86.7	84.2	81.8	79.5	77.3	75.1	70.9	66.9	63.2	59.7	56.4
28	.125	97.2	94.4	91.7	89.1	86.6	84.1	81.8	79.4	77.2	75.0	70.8	66.8	63.1	59.6	56.2
29	.1255	97.1	94.4	91.7	89.1	86.6	84.1	81.7	79.4	77.1	74.9	70.7	66.7	63.0	59.4	56.1
30	.126	97.1	94.4	91.7	89.0	86.5	84.0	81.6	79.3	77.0	74.8	70.6	66.6	62.8	59.3	56.0
31	.127	97.1	94.3	91.6	89.0	86.4	83.9	81.5	79.1	76.9	74.6	70.4	66.4	62.6	59.1	55.7
32	.128	97.1	94.3	91.5	88.9	86.3	83.8	81.4	79.0	76.7	74.5	70.2	66.2	62.4	58.8	55.5
33	.1285	97.1	94.3	91.5	88.8	86.3	83.7	81.3	79.0	76.6	74.4	70.1	66.1	62.3	58.7	55.3
34	.129	97.1	94.2	91.5	88.8	86.2	83.7	81.2	78.9	76.5	74.3	70.0	66.0	62.2	58.6	55.2
35	.130	97.0	94.2	91.4	88.7	86.1	83.5	81.1	78.7	76.4	74.1	70.0	65.8	62.0	58.4	55.0

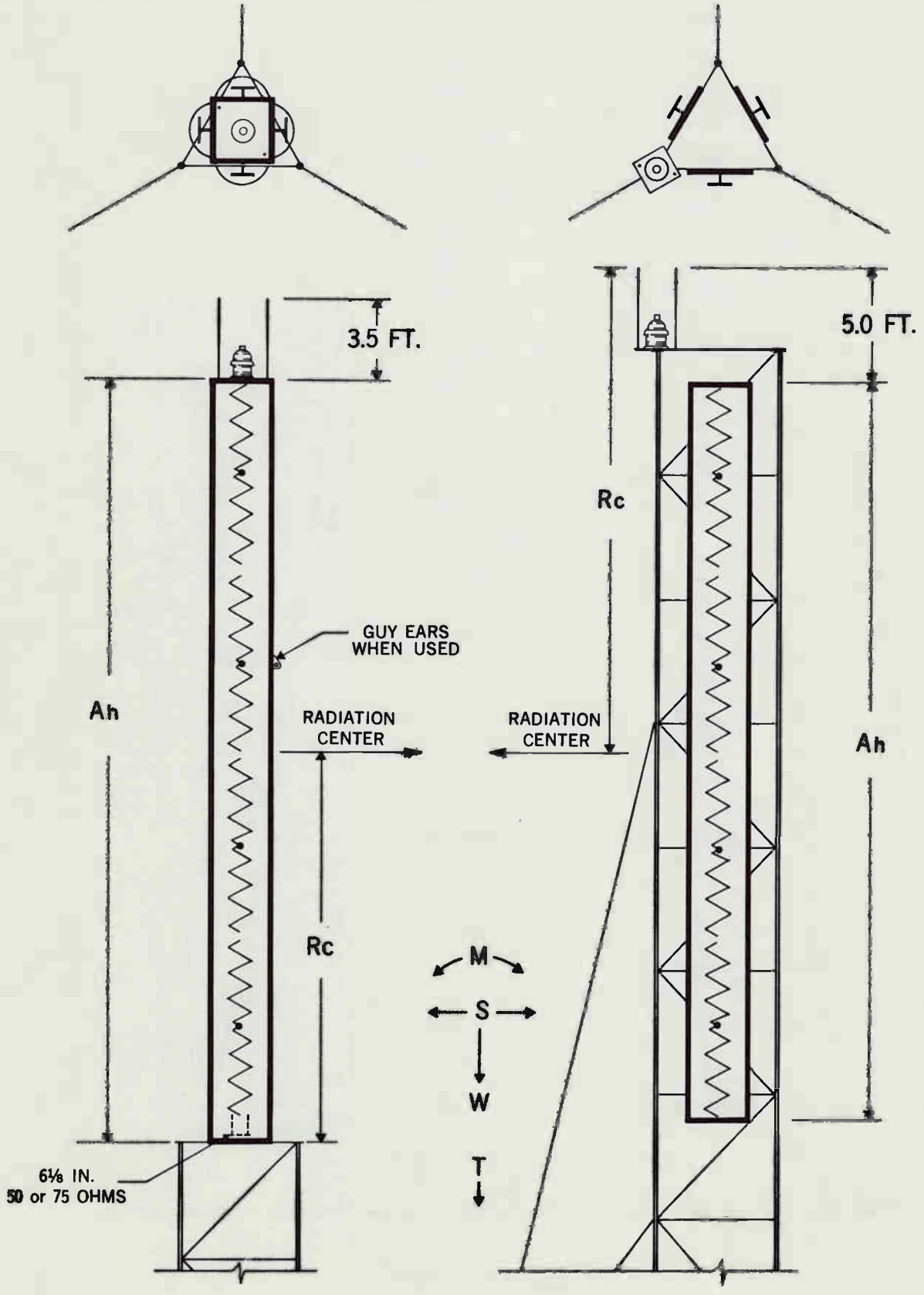
9-3/16 INCH 75 OHM RIGID COPPER TRANSMISSION LINE EFFICIENCY IN PERCENT

Channel	DB Loss Per 100 Feet	Length in Feet												
		100	200	300	400	500	600	700	800	900	1000	1200	1400	1600
14	.0678	98.5	96.9	95.4	93.9	92.5	91.1	89.6	88.3	86.9	85.5	82.9	80.4	77.9
15	.068	98.4	96.9	95.4	93.9	92.5	91.0	89.6	88.2	86.9	85.5	82.9	80.3	77.8
16	.0685	98.4	96.9	95.4	93.9	92.4	91.0	89.5	88.1	86.8	85.4	82.8	80.2	77.7
17	.069	98.4	96.9	95.3	93.8	92.4	90.9	89.5	88.1	86.7	85.3	82.6	80.1	77.6
18	.0696	98.4	96.8	95.3	93.8	92.3	90.8	89.4	88.0	86.6	85.2	82.5	79.9	77.4
19	.070	98.4	96.9	95.4	93.8	92.2	90.8	89.4	87.9	86.5	85.1	82.4	79.9	77.3
20	.0704	98.4	96.8	95.3	93.7	92.2	90.7	89.3	87.8	86.4	85.0	82.3	79.7	77.2
21	.0709	98.4	96.8	95.2	93.7	92.2	90.7	89.2	87.8	86.3	84.9	82.2	79.6	77.0
22	.0715	98.4	96.8	95.2	93.6	92.1	90.6	89.1	87.7	86.2	84.8	82.1	79.4	76.8
23	.072	98.4	96.7	95.1	93.6	92.0	90.5	89.0	87.6	86.1	84.7	82.0	79.3	76.7
24	.0724	98.3	96.7	95.1	93.5	92.0	90.5	89.0	87.5	86.1	84.6	81.9	79.2	76.6
25	.0727	98.3	96.7	95.1	93.5	92.0	90.4	88.9	87.5	86.0	84.6	81.8	79.1	76.5
26	.073	98.3	96.7	95.1	93.5	91.9	90.4	88.9	87.4	86.0	84.5	81.7	79.0	76.4
27	.0735	98.3	96.7	95.0	93.5	91.9	90.3	88.8	87.3	85.9	84.4	81.6	78.9	76.3
28	.074	98.3	96.6	95.0	93.4	91.8	90.3	88.8	87.3	85.8	84.3	81.5	78.8	76.1
29	.0745	98.3	96.6	95.0	93.4	91.8	90.2	88.7	87.2	85.7	84.2	81.4	78.6	76.0
30	.075	98.3	96.6	94.9	93.3	91.7	90.2	88.6	87.1	85.6	84.1	81.3	78.5	75.9
31	.0755	98.3	96.6	94.9	93.3	91.7	90.1	88.5	87.0	85.5	84.0	81.2	78.4	75.7
32	.076	98.3	96.6	94.9	93.2	91.6	90.0	88.5	86.9	85.4	83.9	81.1	78.3	75.6
33	.0763	98.3	96.5	94.9	93.2	91.6	90.0	88.4	86.9	85.4	83.9	81.0	78.2	75.5
34	.0766	98.3	96.5	94.8	93.2	91.6	90.0	88.4	86.8	85.3	83.8	80.9	78.1	75.4
35	.0768	98.3	96.5	94.8	93.2	91.5	89.9	88.4	86.8	85.3	83.8	80.9	78.1	75.4
36	.077	98.2	96.5	94.9	93.2	91.6	89.9	88.4	86.9	85.5	83.8	80.9	78.1	75.3
37	.0773	98.2	96.5	94.8	93.1	91.5	89.9	88.3	86.7	85.2	83.7	80.8	77.9	75.2
38	.0777	98.2	96.5	94.8	93.1	91.4	89.8	88.2	86.7	85.1	83.6	80.7	77.8	75.1
39	.078	98.2	96.5	94.8	93.1	91.4	89.8	88.2	86.6	85.1	83.6	80.6	77.8	75.0
40	.0783	98.2	96.5	94.7	93.0	91.4	89.8	88.1	86.6	85.0	83.5	80.5	77.7	74.9

HORIZONTAL PATTERN CIRCULARITY VERSUS CHANNEL



HEIGHT AND CENTER OF RADIATION SKETCH



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UNIVERSITY OF WISCONSIN–EXTENSION
TELECOMMUNICATIONS CENTER
821 UNIVERSITY AVENUE MADISON, WISCONSIN 53706 AREA CODE 608 263-2121

WHA-TV Madison Wisconsin

September 24, 1979

TO: All Those Concerned

FROM: Tom Wisniewski

RE: Saturday Morning Lively

At our recent production meeting (9/20), some key ideas were discussed regarding Saturday Morning Lively. This memo is a summary of important elements of that discussion. Please retain/share this information as your needs indicate.

1. Saturday Morning Lively will commence on October 6, 1979 as a live broadcast.

2. Our immediate schedule indicates that nine Saturday broadcasts out of our forty week season will be taped (primarily in response to engineering and other scheduled production considerations).

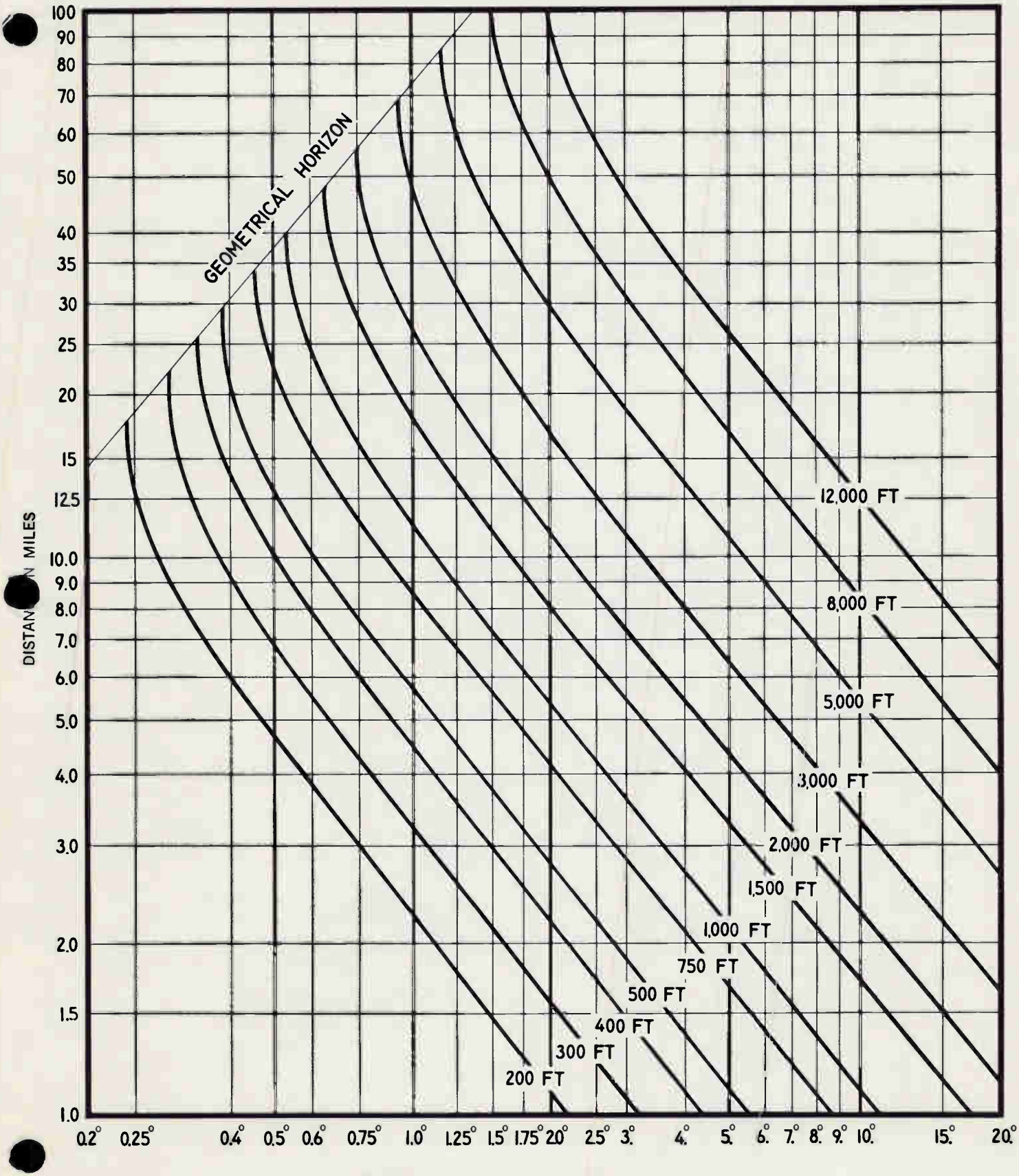
3. Our consumption of station resources are as follows: four hours live telecast time when live, three and one-half hours studio time when we are taped, ten hours of producer time, between four and ten hours of director time, ten hours of p.a. time (Kostecke), eight hours (maximum) of vidifont composition time for each program (this includes presence of operator at each telecast), and approximately twelve hours of preproduction studio time (set check, promo making, rehearsal broadcast, taping of emergency filler library for "no shows" during our season).

4. Additionally, two special production periods are committed as of this date: 1) October 18 Black Music Specials which Saturday Morning is paying for, but which will be primarily used for Sunday broadcast and added to our "emergency library" for Saturday Morning Lively offering, and 2) January 16 Mark Twain Moments which will form our "emergency library" and a promotable on-going feature for January-June.

5. We have been investigating Young Filmmakers' Festival as a feature for Saturday Morning Lively. The Friends have expressed some interest in supporting this project financially with prize money, etc. THIS IS NOT COMMITTED AT PRESENT TIME. THIS WILL BE DISCUSSED AT PROJECT COUNCIL WHEN DETAILS ARE FIRM. THIS FEATURE OF SATURDAY MORNING/FILM FILLERS WILL CONSUME NO ADDITIONAL RESOURCES. IN THE BUDGETS WHICH EXIST FOR SATURDAY MORNING AND WHA'S FILM SERIES, THERE IS SUFFICIENT MONETARY AND FINANCIAL RESOURCES TO TRANSFER FILM. Our present status with Young Filmmakers is to design an 8mm transfer system which has been devised with assistance of Don Bednarek, John Glaeser, and Steve Jandacek.

6. Editing Time has been expressed as a concern. SATURDAY MORNING WILL BE SHOT LIVE TELEVISION OR LIVE-ON-TAPE STYLE. HOWEVER, IT IS CONCEIVABLE THAT FOR A GIVEN TAPING DATE, A CERTAIN EVENT MAY BE MORE EFFICIENTLY PRODUCED USING SOME EDITING. SUCH WILL BE LIMITED, BUT IS LIKELY THAT THIS WILL OCCUR DURING OUR SEASON.

TILT VERSUS DISTANCE FOR VARIOUS ANTENNA HEIGHTS BASED ON TRUE EARTH CURVATURE



COMPUTER RESULTS FOR A TYPICAL SIX BAY VERTICAL PATTERN

JAMPRO ANTENNA COMPANY

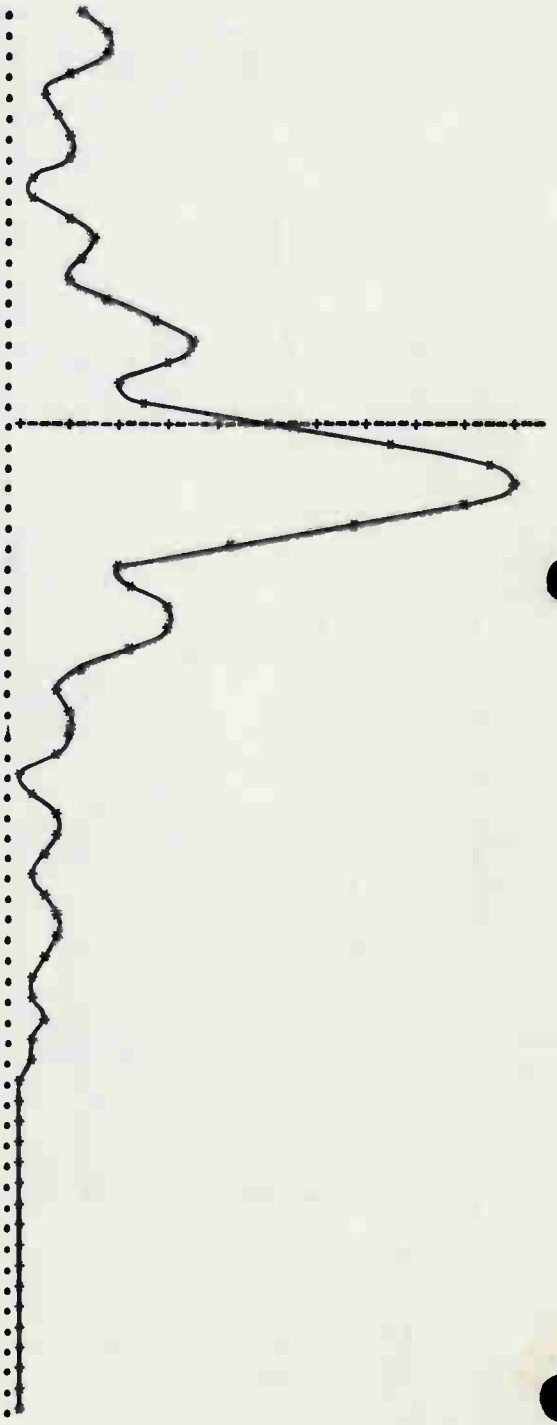
ZZ ANTENNA VERT. PATTERN NUMBER OF BAYS= 6 PHASE= 36 DEG.

PEAK GAIN=239.37 PEAK GAIN TILT= -0.75 DEG. GAIN AT HORIZON= 62.75

POWER DIST.= 0.35 UPPER 0.65 LOWER
POWER SPLIT=0.087, 0.087, 0.087, 0.087, 0.325, 0.325,
PHASE DISTRIB= 0., 36., 72., 108., 144., 180.,

FIRST NULL FILL= 0.2111 FIRST MINIMUM ANG.=-1.750 DEG.
SECND NULL FILL= 0.0794 SECND MINIMUM ANG.=-3.250 DEG.

ANGLE	ARR. FACT	ANT. FACT	GROSS-E	NORM-E	REL. GAIN	ACT GAIN
5.00	1.7680	0.4730	0.8363	0.1480	0.0219	5.2455
4.75	2.0183	0.5310	1.0717	0.1897	0.0359	8.6150
4.50	1.7399	0.5850	1.0178	0.1801	0.0324	7.7708
4.25	1.1144	0.5960	0.6641	0.1175	0.0138	3.3086
4.00	0.5988	0.6310	0.3779	0.0668	0.0044	1.0710
3.75	0.7725	0.6680	0.5160	0.0913	0.0083	1.9975
3.50	0.9713	0.7080	0.6877	0.1217	0.0148	3.5471
3.25	0.8102	0.7500	0.6076	0.1075	0.0115	2.7694
3.00	0.3276	0.7940	0.2601	0.0460	0.0021	0.5074
2.75	0.2849	0.8410	0.2396	0.0424	0.0017	0.4307
2.50	0.7846	0.8910	0.6991	0.1237	0.0153	3.6660
2.25	0.9726	0.9440	0.9181	0.1625	0.0264	6.3226
2.00	0.7944	0.9580	0.7610	0.1347	0.0181	4.3442
1.75	0.5890	0.9660	0.5689	0.1007	0.0101	2.4280
1.50	1.0698	0.9820	1.0505	0.1859	0.0345	8.2774
1.25	1.7077	0.9880	1.6872	0.2986	0.0891	21.3513
1.00	2.0159	0.9910	1.9977	0.3536	0.1250	29.9333
0.75	1.7959	0.9940	1.7852	0.3159	0.0998	23.9023
0.50	1.2041	0.9970	1.2005	0.2125	0.0451	10.8102
0.25	1.4778	0.9990	1.4763	0.2613	0.0682	16.3474
0.00	2.8926	1.0000	2.8926	0.5120	0.2621	62.7547
-0.25	4.3656	0.9990	4.3612	0.7719	0.5959	142.6535
-0.50	5.3881	0.9970	5.3719	0.9508	0.9041	216.4360
-0.75	5.6836	0.9940	5.6495	1.0000	1.0000	239.3768
-1.00	5.1754	0.9910	5.1288	0.9078	0.8241	197.2882
-1.25	3.9962	0.9880	3.9483	0.6988	0.4884	116.9184
-1.50	2.4750	0.9820	2.4305	0.4302	0.1850	44.3060
-1.75	1.2346	0.9660	1.1926	0.2111	0.0445	10.6685
-2.00	1.3589	0.9580	1.3018	0.2304	0.0531	12.7115
-2.25	1.9082	0.9440	1.8013	0.3188	0.1016	24.3364
-2.50	1.9810	0.8910	1.7651	0.3124	0.0976	23.3682
-2.75	1.5565	0.8410	1.3090	0.2317	0.0536	12.8523
-3.00	0.8950	0.7940	0.7106	0.1257	0.0158	3.7878
-3.25	0.5923	0.7580	0.4489	0.0794	0.0063	1.5118
-3.50	0.8702	0.7080	0.6161	0.1090	0.0118	2.8469
-3.75	0.9602	0.6680	0.6414	0.1135	0.0128	3.0858
-4.00	0.6780	0.6310	0.4278	0.0757	0.0057	1.3727
-4.25	0.1271	0.5960	0.0757	0.0134	0.0001	0.0430
-4.50	0.4737	0.5850	0.2771	0.0490	0.0024	0.5761
-4.75	0.8872	0.5310	0.4711	0.0833	0.0069	1.6645
-5.00	0.9510	0.4630	0.4403	0.0779	0.0060	1.4541
-5.25	0.6919	0.4290	0.2968	0.0525	0.0027	0.6608
-5.50	0.6730	0.3750	0.2523	0.0446	0.0019	0.4777
-5.75	1.2838	0.3250	0.4172	0.0738	0.0054	1.3056
-6.00	1.8513	0.3020	0.5591	0.0989	0.0097	2.3445
-6.25	2.0078	0.2530	0.5079	0.0899	0.0080	1.9354
-6.50	1.6345	0.2120	0.3465	0.0612	0.0037	0.9005
-6.75	1.1092	0.1620	0.1797	0.0318	0.0010	0.2422
-7.00	1.8240	0.1200	0.2188	0.0387	0.0015	0.3593
-7.25	3.3189	0.1020	0.3385	0.0599	0.0035	0.8595
-7.50	4.6969	0.0600	0.2818	0.0498	0.0024	0.5956
-7.75	5.5405	0.0420	0.2327	0.0411	0.0016	0.4061
-8.00	5.6307	0.0250	0.1407	0.0249	0.0006	0.1486
-8.25	4.9459	0.0150	0.0741	0.0131	0.0001	0.0412
-8.50	3.6638	0.0100	0.0366	0.0064	0.0000	0.0100
-8.75	2.1494	0.0150	0.0322	0.0057	0.0000	0.0077
-9.00	1.1303	0.0250	0.0282	0.0050	0.0000	0.0059
-9.25	1.4831	0.0350	0.0519	0.0091	0.0000	0.0202
-9.50	1.9625	0.0450	0.0883	0.0156	0.0002	0.0584
-9.75	1.9403	0.0540	0.1047	0.0185	0.0003	0.0823
-10.00	1.4606	0.0650	0.0949	0.0168	0.0002	0.0676
-10.25	0.8111	0.0680	0.0551	0.0097	0.0000	0.0228
-10.50	0.6135	0.0710	0.0435	0.0077	0.0000	0.0142
-10.75	0.8967	0.0740	0.0663	0.0117	0.0001	0.0330
-11.00	0.9493	0.0750	0.0712	0.0126	0.0001	0.0380
-11.25	0.6429	0.0740	0.0475	0.0084	0.0000	0.0169
-11.50	0.0902	0.0730	0.0065	0.0011	0.0000	0.0003
-11.75	0.4964	0.0720	0.0357	0.0063	0.0000	0.0095
-12.00	0.8931	0.0710	0.0634	0.0112	0.0001	0.0301



CIRCULARLY POLARIZED FM ANTENNAS

TV ANTENNAS

FM ANTENNAS

HARMONIC FILTERS

MILITARY ANTENNAS

NOTCH DIPLEXERS

VSB FILTERS

FILTERPLEXERS

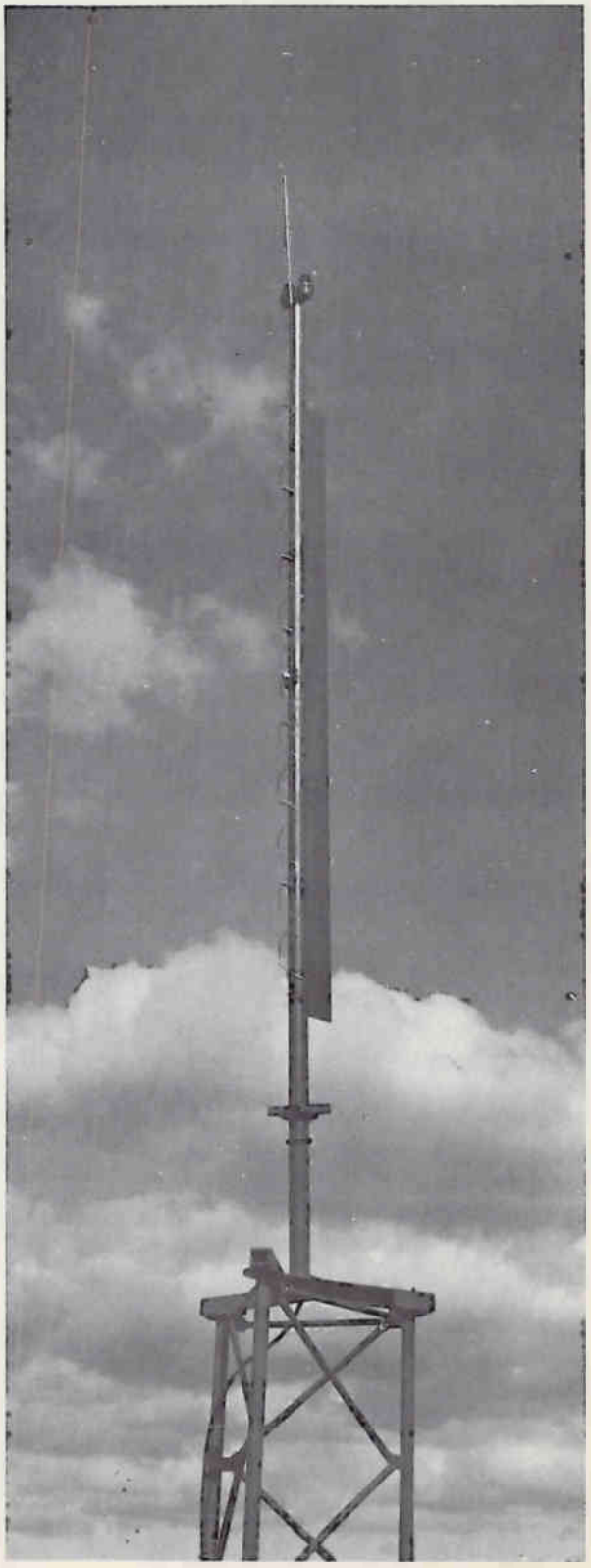
JAMPRO

ANTENNA COMPANY
a division of Computer Equipment Corporation
6939 POWER INN ROAD
SACRAMENTO, CALIF. 95828

JAMPRO
subsidiary of Computer Equipment Corporation
ANTENNA COMPANY
6939 POWER INN ROAD
SACRAMENTO, CALIFORNIA 95828
Phone: (916) 383-1177

UHF TRANSLATOR ANTENNAS

BROADCAST QUALITY • ZIG ZAG DESIGN
FCC CHANNELS 14 - 83 • CCIR 21 - 69
POWER, 4 to 6 KW, DEPENDING ON CHANNEL
LOW WIND LOADS • LOW WEIGHTS • RADOMES
MANY PATTERNS • OMNI • UNIDIRECTIONAL
VSWR 1.08 • INPUT 50 OHMS • TROUBLE FREE



The zig zag antenna, with nine years of high power broadcast application, is now available for translator and low power TV use. This efficient radiator uses only one feed point for each eight wavelengths of antenna. The zig zag is formed on the round tubular support tube. It is fed in the center and grounded at the two ends, and has excellent lightning protection. The antenna is rugged enough for high wind, mountain top installations. Ice protection is available through radomes, with slight increase in wind loading.

The antenna consists of a steel support tube with a rigid 1⅝ inch 50 ohm coax line, running on the inside. A curved zig zag radiating element is mounted on teflon support insulators on one face of the tube. A steel pattern shaping fin is welded to the tube opposite the radiating element. This simple construction, with one feed point for eight wave-lengths of aperture, provides a low cost antenna system, with excellent electrical characteristics.

There is great pattern flexibility. Omnidirectional as well as unidirectional patterns are available. The six patterns on the back of this sheet are just a few of the hundreds measured. The angle of the small steel fin produces an infinite number of different polar patterns. The vertical pattern can be tailored for beam tilt as well as null fill. Contact your dealer or Jampro for other patterns and gains.

These antennas provide greatly improved performance over yagi or corner reflector arrays. The VSWR bandwidth is 1.08 to 1 over any one FCC or CCIR TV channel. The flat amplitude response across the channel without phase distortion, is very important for good color operation.

The rugged construction is accomplished with small size and weight. The mechanical specifications are on the reverse side. The calculated windloads are shown together with size and weight.

This antenna is strongly recommended, where a high quality receiving antenna with moderate or high gain is desired. It will greatly out-perform yagis or corners, with ghost free pictures and excellent signal pickup. The single lobe pattern 5 is most ideal for this purpose. With one bay, the gain is 15.5 DB, two bays 18.5 DB and three bays have a gain of 20.3 DB.

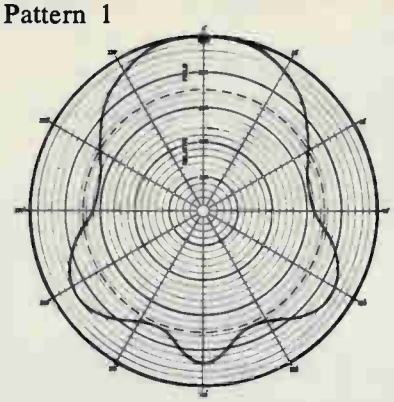
High quality teflon support insulators and coax seals are used. All steel is hot dip galvanized after fabrication and is supplied with stainless steel hardware. Each bay is shunted across the single internal rigid coax feed line. Antennas thirty feet and taller are designed for one level guying. Three fibre glass insulators each fourteen feet long are included with these larger antennas. Plastic tube radomes can be supplied to protect the antenna against the effects of ice and snow. No power is required for heating.

PATTERNS AND GAINS

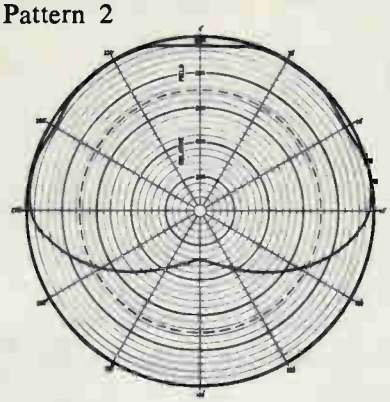
Pictured are six of the most popular patterns from these antennas. Many others are available. It is also possible to change these patterns as much as 25%. The pattern shape determines the gain ratio, which is indicated in the electrical specifications as the peak gain over a dipole. This is the FCC value, used in ERP calculations. The horizontal beam width on the chart indicates the half power points in the six patterns. Vertical beam width is the half power vertical pattern beam width in degrees and is fixed by the number of bays. Measured values from several antennas have been normalized and used for the patterns and gain data.

UHF TRANSLATOR ANTENNAS

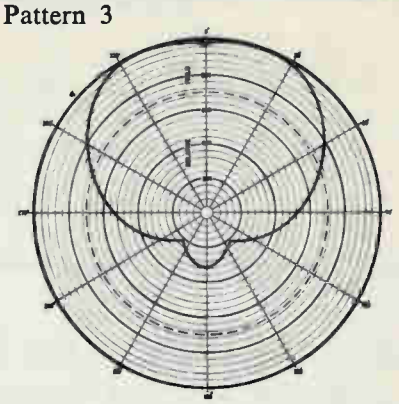
Pattern 1



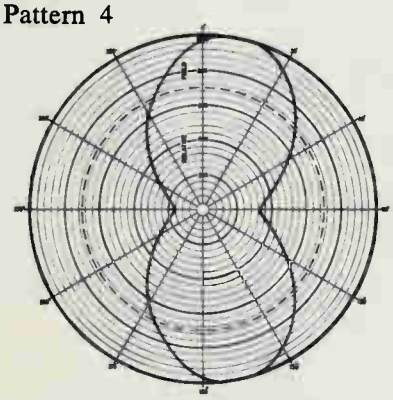
Pattern 2



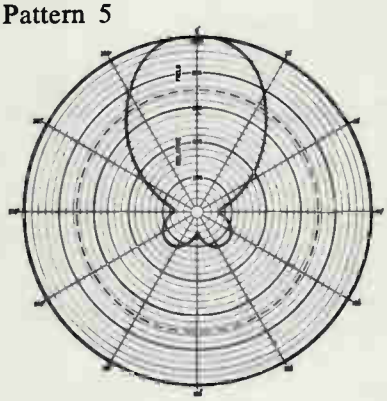
Pattern 3



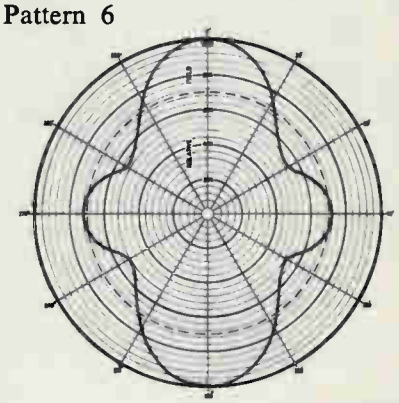
Pattern 4



Pattern 5



Pattern 6



ELECTRICAL SPECS

FCC Gains — Reference Dipole

Model-Pattern	Gain Ratio	Gain In DB	Horiz. Beam Width	Vert. Beam Width
JTZ1-1	12.6	11.0	360	6.5°
JTZ1-2	12.3	10.9	220	6.5
JTZ1-3	18.9	12.8	140	6.5
JTZ1-4	18.5	12.7	70	6.5
JTZ1-5	35.4	15.5	70	6.5
JTZ1-6	15.1	11.8	70	6.5
JTZ2-1	25.2	14.0	360	3.3°
JTZ2-3	24.6	13.9	220	3.3
JTZ2-3	37.8	15.8	140	3.3
JTZ2-4	36.9	15.7	70	3.3
JTZ2-5	70.8	18.5	70	3.3
JTZ2-6	30.2	14.8	70	3.3
JTZ3-1	37.8	15.8	360	2.2°
JTZ3-2	37.0	15.7	220	2.2
JTZ3-3	56.7	17.5	140	2.2
JTZ3-4	55.2	17.4	70	2.2
JTZ3-5	106.2	20.3	70	2.2
JTZ3-6	45.3	16.6	70	2.2

MECHANICAL SPECS & PRICES

Loads at 112 MPH wind, no ice or Radome

	Channel	Height Feet	Weight Pounds	Shear Pounds	Moment Ft./Lbs.	Power KW	Antenna Price
ONE BAY	14 Thru 27	17	220	210	1,800	6	$ 3,800
	28 Thru 41	15	190	180	1,300	5	$ 3,750
	42 Thru 55	13	165	155	930	5	$ 3,700
	56 Thru 69	11	145	140	750	4	$ 3,650
	70 Thru 83	10	120	130	590	4	$ 3,600
TWO BAYS	14 Thru 27	34	440	420	7,150	6	$ 9,800
	28 Thru 41	29	380	360	5,200	5	$ 9,550
	42 Thru 55	25	330	305	3,750	5	$ 9,350
	56 Thru 69	22	330	275	3,000	4	$ 9,200
	70 Thru 83	20	270	245	2,400	4	$ 9,000
THREE BAYS	14 Thru 27	50	660	770	19,125	6	$13,600
	28 Thru 41	44	590	665	14,500	5	$13,000
	42 Thru 55	37	510	460	8,375	5	$12,700
	56 Thru 69	33	460	410	6,750	4	$12,300
	70 Thru 83	30	410	365	5,300	4	$12,000

PRICES AND ACCESSORIES

Radomes are $575.00 per bay. A 300 MM beacon mounting plate is $125.00. Lightning rod, $22.00. Top double obstruction light with lightning rod, $115.00. The antenna is painted international orange and supplied with climbing steps. Standard input connector is 1⅝" EIA 50 ohms gas tight flange. Adaptor to Type N, $80.00, and $75.00 for ⅞" EIA input flange. All prices include domestic packaging, suitable for motor freight, and are FOB Sacramento.

Jampro JHCP FM broadcast antennas

Extremely high-power handling capacity, heavy-duty mechanical construction

- **Extremely High-Power Corona-Free Operation**
- **Excellent VSWR Bandwidth**
- **Heavy Duty Mechanical Construction**
- **True Circular Polarization**
- **Two-Year Material and Workmanship Warranty**

The JHCP antenna is a circularly polarized FM antenna for the broadcaster who wants extremely high-input power capability, coupled with the patented design that has become an industry standard. This design is sophisticated in concept yet simple in execution. Each bay consists of a radiating element with its associated 6⅛ inch (15.56 cm) interbay feed line. The element and line are supported by a heavy brass casting which is attached to the support structure by its mounting bracket.

The radiating element consists of four 3 inch (7.62 cm) diameter quarter wave arms attached to a 3¼ inch brass boom by castings.

The interbay feed lines and boom are pressurized out to the feed point by the transmission line pressurization system. A pressure relief valve is supplied at the top of the antenna for pressurization system purging as well as overpressure relief.

Power Rating

The JHCP antenna is conservatively rated at 30 KW per bay, with a maximum system rating of 80 KW for three bays and above. These ratings are reduced well below both the average and peak power ratings for the power distribution system, with corona and high voltage arcing problems eliminated by the use of very low Q radiating elements. This lowers the surface charge density over the radiating surface areas preventing corona at 30 KW levels, even during rain or fog.

VSWR Rating

The JHCP antenna has an excellent VSWR bandwidth of 1.1:1 or better ± 200 KHz of carrier. This specification must be met during factory tuning on a structure similar to that of the customer before it leaves the factory. Under normal conditions the antenna will not require field tuning to maintain the factory VSWR specification because of this factory tuning.

PAT NO. 3,541,570

Radiation Pattern

The circularity of the JHCP element is ± 1.0 dB in free space. The azimuth pattern will tend to be distorted somewhat by the structure on which the antenna is mounted, with circularity of the antenna typically ± 1.2 dB mounted on a steel pole and typically ± 3.0 dB mounted on a 30 inch face tower. Jampro Pattern Measurement Service is recommended for this and all antennas to insure that there are no azimuth pattern nulls at the broadcaster's service area.

Non Ionizing Radiation

Since many factors contribute to a station's compliance with the FCC exposure guidelines for radio frequency radiation, Jampro Antennas cannot accept any responsibility in this matter. The station must examine and determine its status based on each individual situation. For reduced low angle radiation near the tower, a low RFR model of this antenna is available. Contact the factory for pricing, data and further details.

Jampro 6939 Power Inn Road, P.O. Box 28425, Sacramento, CA 95828 (916) 383-1177 Telex: 377321

EN 8886C

Jampro JHCP FM broadcast antennas

Antenna Mounting
The JHCP antenna is supplied with standard galvanized brackets for round-leg mounting on uniform face towers. Special galvanized brackets can be supplied at additional cost for mounting the JHCP on tapered towers, on poles, or for tower-face mounting. All hardware is included with mounting brackets. Custom antenna support poles can be supplied. Contact factory for pricing.

Deicing
Deicing equipment is recommended for the JHCP in environments where regular icing and sleet conditions prevail in order to preserve the antenna's excellent VSWR specifications. The deicing system consists of a stainless steel sheathed heater element in each element arm for a total of 1 KW of heating with 240 volts 50/60 hz applied. The system can be operated at one quarter power on 120 volts under light icing conditions in order to conserve electricity. Bay junction boxes and interbay cable are supplied with the heaters. A precision thermostat system is available as an accessory to control the deicers.

Beam Tilt and Null Fill
The JHCP antenna is optionally available with custom beam tilt and/or null fill to satisfy the requirements of the customer and consulting engineer, in order to optimize radiation toward the desired service area. Power gain figures at the horizontal plane will be affected by beam tilt or null fill; details supplied upon request.

Directional Antennas
Custom Directional antenna patterns are available to meet FCC requirements, or for use in countries where such directional antennas are readily useable. Nulls may be produced depending on protection requirements of azimuth heading and null depth. Full-scale antenna range testing and pattern certification are offered for directional antennas. Specific details for special requirements available upon request.

Tower Space Requirement and Antenna Input
Tower space requirement in feet for the JHCP antenna array

is equal to $\frac{(\ 984\ )}{\text{frequency in mhz}}$ (Number of bays — 1).

Tower space requirement in meters for the JHCP antenna array is equal to $\frac{(\ 300\ )}{\text{frequency in mhz}}$ (Number of bays — 1).

The input connector location and size for the JHCP is:
- One bay: at the bay itself (3 ⅛ inch (79.4 mm) EIA male)
- Two through four bays: 3 feet (.91m) below the bottom bay (6⅛ inch (156mm) EIA female)
- Five and six bays: 8 feet (2.44m) below bottom bay (6⅛ inch (156mm EIA female)
- Seven through twelve bays: Thirteen feet (3.96m) below array center (6⅛ inch (156mm) EIA female)

Two Year Warranty
A limited warranty is offered on the JHCP antenna to the original purchaser of the antenna. The warranty covers defects in material and workmanship for a period of 24 months after the date of delivery of the antenna.

Type No. and Bays	Power Gain	Gain in dB	Field Gain	FS @ 1 Mile KW, Mv/M	Net Weight	Safe Power Rating	Input Feed Point	Windload 50/33 PSF
JHCP-1	.46	—3.37	0.678	93.2	212 Lbs.	30 KW	End	269 Lbs.
JHCP-2	1.0	0	1.0	137.6	425 Lbs.	60 KW	End	540 Lbs.
JHCP-3	1.6	2.04	1.25	172.	634 Lbs.	80 KW	End	806 Lbs.
JHCP-4	2.1	3.22	1.46	201.	1077 Lbs.	80 KW	End	1254 Lbs.
JHCP-5	2.7	4.31	1.65	227.	1167 Lbs.	80 KW	End	1460 Lbs.
JHCP-6	3.3	5.19	1.82	250.	1320 Lbs.	80 KW	End	1662 Lbs.
JHCP-7	3.9	5.91	1.97	270.	1540 Lbs.	80 KW	Center	2055 Lbs.
JHCP-8	4.5	6.53	2.11	291.	1758 Lbs.	80 KW	Center	2330 Lbs.
JHCP-10	5.7	7.56	2.38	328.	2202 Lbs.	80 KW	Center	2827 Lbs.
JHCP-12	6.7	8.26	2.59	356.	2640 Lbs.	80 KW	Center	3410 Lbs.

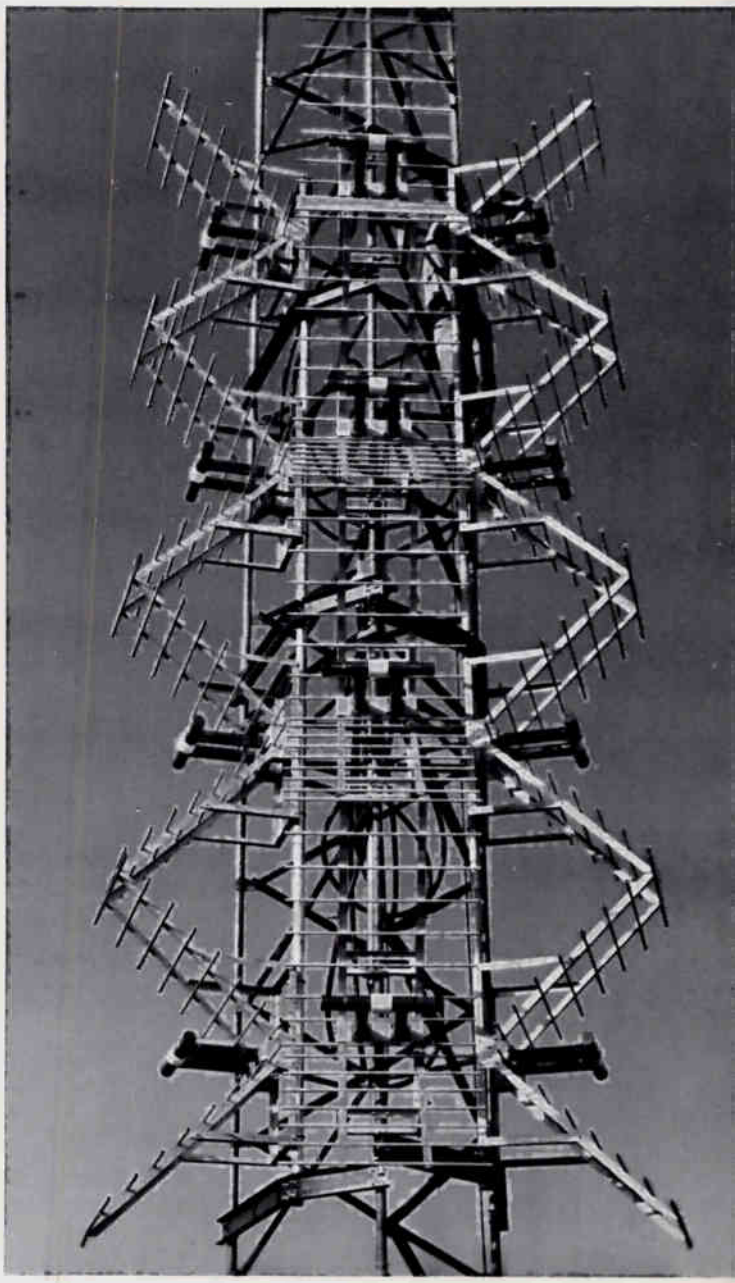
JAMPRO ANTENNAS, INC.

6939 Power Inn Road, P.O. Box 28425, Sacramento, CA 95828 (916) 383-1177 Telex: 377321

The Jampro Model JCR VHF-TV Antenna

A corner reflector design ideal for high-band VHF coverage in several directions

- Available for U.S. Channels 7 through 13
- Custom design for Low-band and UHF
- Rugged Mechanical Construction and Mounting
- Beam Tilt and/or Null Fill Available
- Two Year Material and Workmanship Warranty



The Jampro model JCR antenna is a corner reflector antenna suitable for use on US VHF channels seven through thirteen. The basic corner reflector unit consists of a broadband dipole with Teflon covered feed point, and a steel reflector assembly which has been hot dip galvanized for long life. Several units are assembled into a complete antenna system by adding the appropriate power divider(s) and feed cables.

Power Rating

The Jampro model JCR corner reflector antenna is rated at 5 kw combined visual and aural power per corner reflector unit. The system power rating is determined by the lesser of the total unit power rating or the power divider input rating. The standard element input connector is type LC female.

VSWR Rating

The VSWR of the Jampro JCR antenna is 1.1 to 1 or better over the 6 MHz television channel for which the system is tuned. The antenna is factory tuned to this specification both as individual units and as a complete system.

Gain

The peak power gain of a single corner reflector unit is 6.31. The use of several units either arranged around a support structure or stacked vertically will change the peak gain referenced to system input power; the net stacked gain of an array of corner reflectors is 6.31 times the number of elements aimed in one direction times the percent of antenna input power fed to those elements. Contact the factory for further information.

Beam Tilt and Null Fill

Beam tilt can be accomplished in the Jampro JCR antenna without additional cost. The customer must advise beam tilt or null fill values at time of order.

Jampro 6939 Power Inn Road, P.O. Box 28425, Sacramento, CA 95828 (916) 383-1177 Telex: 377321

EN 00660

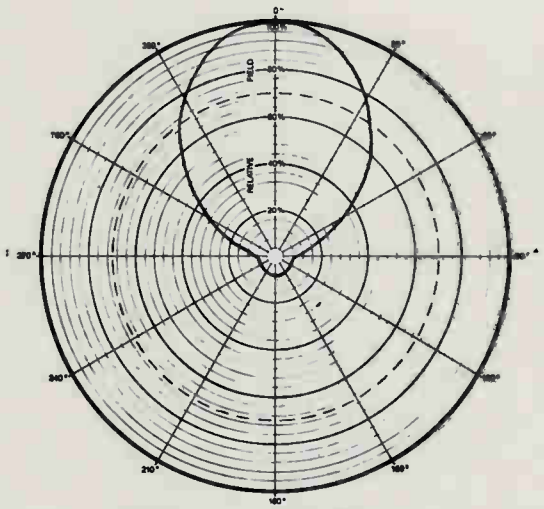
Jampro Model JCR VHF-TV Antenna

Azimuth Patterns

The basic pattern for a single JCR corner reflector is a single 65° half power beam width lobe. These lobes can be combined by computer calculations to provide desired patterns.

Warranty

A limited warranty is offered on the JCR antenna to the original purchaser of the antenna. The warranty covers any defects in material or workmanship for a period of 24 months after the date of delivery of the antenna. Refer to Jampro complete warranty.



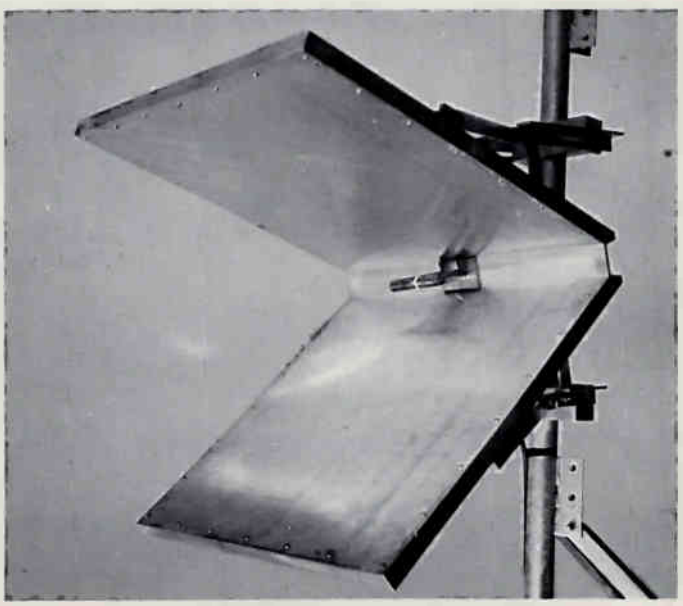
Typical Single Panel Azimuth Pattern

Custom CH-5 cardioid pattern antenna.

Mechanical Specifications for High-band VHF

Weight:	117 lbs. (53 kg) per element
Windload:	325 lbs. (147 kg) at 50/33 lbs. per square foot (112 mph/180 kmh)
Height:	5 ft., 5 in. (165 cm) per element
Width:	4 ft., 0 in. (122 cm) per element

While the standard corner reflector unit is made for High-band VHF, Jampro also makes custom units for Low-band VHF and UHF. Contact the factory for further details and quotations.



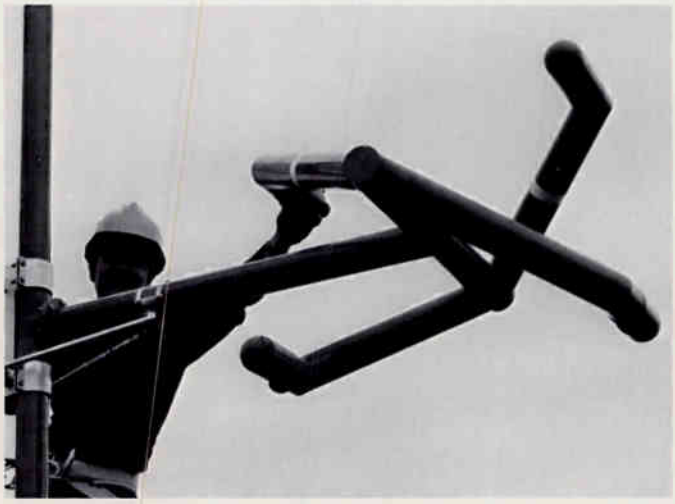
Custom UHF unit for use singly or in arrays.

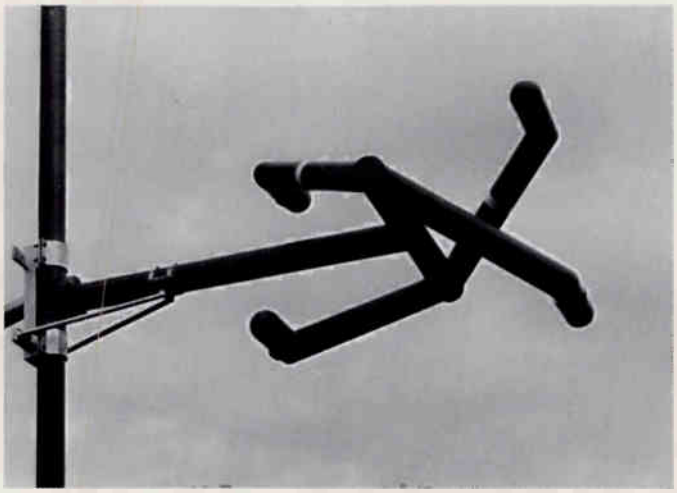
JAMPRO ANTENNAS, INC

6939 Power Inn Road, P.O. Box 28425, Sacramento, CA 95828 (916) 383-1177 Telex: 377321

The Jampro Model JBCP FM Antenna

The model JBCP antenna, manufactured by Jampro Antennas, is a circularly polarized FM antenna designed for applications requiring relative insensitivity to icing along with high antenna input power. The antenna elements are fabricated of high strength thick wall brass and copper with a 3⅛ inch outside diameter. The JBCP antenna will handle up to 40 KW per bay and up to 120 KW per system, depending upon the number of bays, shunt line size and input connector.





VSWR Rating

The JBCP antenna is inherently broadband, using an internal pressurized feed system; it can be used for diplexing applications with a VSWR of 1.20 to one or better over a 4 MHz bandwidth, making it suitable for diplexing. On a single frequency, the VSWR is 1.07 to 1 plus or minus 200 KHz of carrier with field tuning; deicers are not normally required, as the typical VSWR is 1.4 to one or better with up to ½ inch of radial ice. The individual radiating elements may be field tuned for best VSWR. The VSWR at the antenna input without field tuning will be 1.5 to one or less when side mounted on a tower.

Warranty

A limited warranty is offered on the JBCP antenna to the original purchaser of the antenna. The warranty covers defects in material and workmanship for a period of 24 months after the date of delivery of the antenna.

Antenna Mounting

The JBCP antenna is supplied with standard galvanized brackets for round-leg mounting on uniform face towers. Special galvanized brackets can be supplied at additional cost for mounting the JBCP on tapered towers, on poles, or for tower-face mounting. All hardware is included with mounting brackets. Custom antenna support poles can be supplied. Contact factory for pricing.

Beam Tilt and Null Fill

The JBCP antenna is optionally available with custom beam tilt and/or null fill to satisfy the requirements of the customer and consulting engineer, in order to optimize radiation toward the desired service area. Power gain figures at the horizontal plane will be affected by beam tilt or null fill; details supplied upon request.

PAT NO. 3,541,570

Jampro 6939 Power Inn Road, P.O. Box 28425, Sacramento, CA 95828 (916) 388-1177 Telex: 377321

EN 0686G

Jampro JBCP FM Broadcast Antennas

No. of Bays	Power Gain Ratio	Gain In dB	Field Gain	Type Feed	Female 50 Ohm Input	Safe Power Rating	Calculated Weight lbs	Calculated Wind Load Without Ice 50/33 PSF	Calculated Wind Load With ½" Radial Ice, 50/33 PSF
1	0.46	—3.37	0.678	End	3⅛"	40KW	83	109	143
2	1.0	0.0	1.0	End	3⅛"	40KW	222	320	421
2	1.0	0.0	1.0	Center	6⅛"	64KW	318	443	559
3	1.5	1.76	1.23	End	3⅛"	40KW	342	502	628
4	2.1	3.22	1.45	End	3⅛"	40KW	461	685	905
4	2.1	3.22	1.45	Center	6⅛"	64KW	555	811	1047
5	2.7	4.31	1.64	End	3⅛"	40KW	579	868	1148
6	3.2	5.05	1.79	End	3⅛"	40KW	709	1076	1429
6	3.2	5.05	1.79	Center	6⅛"	64KW	813	1221	1589
7	3.8	5.80	1.95	End	3⅛"	40KW	828	1259	1671
8	4.3	6.34	2.07	End	3⅛"	40KW	947	1439	1911
8	4.3	6.34	2.07	Center	6⅛"	64KW	1050	1589	2076
10	5.5	7.40	2.35	Center	3⅛"	40KW	1208	1835	2439
10	5.5	7.40	2.35	Center	6⅛"	64KW	1288	1956	2563
12	6.6	8.20	2.57	Center	3⅛"	40KW	1445	2201	2925
12	6.6	8.20	2.57	Center	6⅛"	64KW	1525	2324	3050
2	1.0	0.00	1.0	End	6⅛"	40KW	340	436	540
3	1.5	1.76	1.23	End	6⅛"	80KW	513	714	878
4	2.1	3.22	1.45	End	6⅛"	120KW	740	991	1217
5	2.7	4.31	1.64	End	6⅛"	120KW	920	1269	1555
6	3.2	5.05	1.79	End	6⅛"	120KW	1135	1630	1992

Notes

1. Weights and windloads shown include mounting brackets.
2. Windload ratings are 50/33 PSF, 112 miles per hour.
3. Feed point when end fed, 3 feet below bottom bay. When center fed 18 ft. below center.
4. All inputs EIA flange, female.

Warranty

A limited warranty is offered on the JBCP antenna to the original purchaser of the antenna. The warranty covers defects in material and workmanship for a period of 24 months after the date of delivery of the antenna.

Options

Options available include: Pattern Measurement Service, Pattern Optimization, Beam tilt and Null fill, and Special mounting brackets.

Non Ionizing Radiation

Since many factors contribute to a station's compliance with the FCC exposure guidelines for radio frequency radiation, Jampro Antennas cannot accept any responsibility in this matter. The station must examine and determine its status based on each individual situation. For reduced low angle radiation near the tower, a low RFR model of this antenna is available. Contact the factory for pricing, data and further details.

JAMPRO ANTENNAS, INC.

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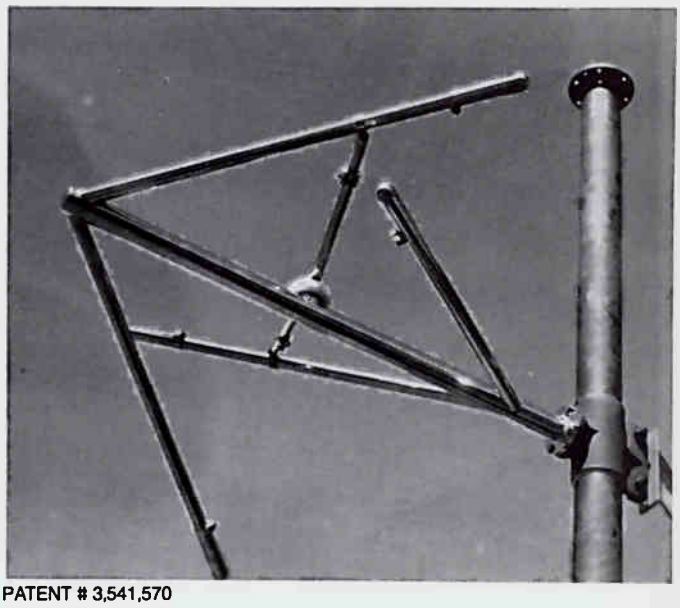
JAMPRO ANTENNAS, INC.

The Jampro JHPC FM Broadcast antenna

True circular polarization, excellent VSWR bandwidth, help make it a standard for the broadcast industry Improved penetrator

- **New High Power Design**
- **Excellent Performance for Stereo, SCA and Quadraphonic Broadcasting**
- **Rugged Mechanical Construction and Mounting**
- **Custom Options Available**
- **True Circular Polarization**
- **Factory-Tuned on a "Customer" Structure**
- **Two-Year Material and Workmanship Warranty**



PATENT # 3,541,570

The Jampro JHPC antenna is an improved version of a circularly polarized FM broadcast antenna that has become the industry standard. Each bay consists of a radiating element with associated 1⅝ inch (41.3 mm) flange, and both element and line are bolted to the mounting bracket for that bay. The interbay feed lines are joined by 3⅛ inch flanges, using inner conductor connectors for maximum contact life and minimum power loss.

The patented radiating element consists of four quarter-wave arms attached to a support boom, which also contains the element feed. A tuning cap, incorporating a large-radius tip, is supplied on each arm, which eliminates corona while facilitating field tuning.

The antenna system is fabricated of heavy gauge marine brass and copper throughout. The interbay line and element boom are pressurized up to the feed point by the transmission line pressurization system, with a pressure relief valve at the top of the antenna.

Power Rating
15 KW per element.

VSWR-Bandwidth Capability
1.1:1 ± 200 KHz from factory (per channel) side mounted on a pole or tower. 1.07:1 ± 200 KHz per channel with field tuning.

Multiple Channel Operation
1.2:1 ± 150 KHz at given channels over 4 MHz bandwidth. Special input matching device required. Contact factory for details.

Frequency Range
Factory tuned to one frequency from 88 to 108 MHz (see multiple channel operations).

Polarization
Right hand, clockwise, circular.

Free Space Azimuth Pattern Circularity
± 2 db.

Power Gain
Based on half wave dipole in free space (see schedule).

Radomes
White gel coat over reinforced fiberglass. Stainless steel hardware provided. Radome used where extreme icing occurs.

Deicers
500 watts per bay @ 50/60 HZ 500.

6939 Power Inn Road, P.O. Box 28425, Sacramento, CA 95828 (916) 383-1177 Telex: 377321 Fax: (916) 383-1182

Jampro JHPC FM Broadcast Antennas (Improved Penetrator)

Type No. —Bays	Power Gain Ratio	Gain In dB	FS @ 1 Mile 1 KW,	Safe Power Rating	Input Feed Point	Net Weight With Mounting Brackets		Windloads At 50/33PSF (112 mph/180 kmh) With Mounting Brackets	
JHPC-1	0.46	-3.37	93.2	15KW	End	25 lbs.	(11. kg)	48 lbs.	(21.7 kg)
with deicers						34 lbs.	(15.4 kg)	57 lbs.	(25.9 kg)
with radomes						55 lbs.	(24.9 kg)	128 lbs.	(58.1 kg)
JHPC-2	1.0	0.0	137.6	30KW	End	125 lbs.	(56.7 kg)	195 lbs.	(88.5 kg)
with deicers						143 lbs.	(64.9 kg)	219 lbs.	(99.3 kg)
with radomes						185 lbs.	(83.9 kg)	355 lbs.	(161.0 kg)
JHPC-3	1.5	1.76	168.4	35KW	End	199 lbs.	(90.3 kg)	320 lbs.	(145.1 kg)
with deicers						225 lbs.	(102.0 kg)	368 lbs.	(166.9 kg)
with radomes						289 lbs.	(131.1 kg)	560 lbs.	(254.0 kg)
JHPC-4	2.1	3.22	199.2	45KW	End	274 lbs.	(124.3 kg)	443 lbs.	(200.9 kg)
with deicers						308 lbs.	(139.7 kg)	516 lbs.	(234.1 kg)
with radomes						394 lbs.	(178.7 kg)	763 lbs.	(346.1 kg)
JHPC-5	2.7	4.31	225.2	50KW	End	350 lbs.	(158.8 kg)	568 lbs.	(257.6 kg)
with deicers						393 lbs.	(178.3 kg)	664 lbs.	(301.2 kg)
with radomes						500 lbs.	(226.8 kg)	968 lbs.	(439.1 kg)
JHPC-6	3.2	5.05	246.0	50KW	End	498 lbs.	(225.9 kg)	730 lbs.	(331.1 kg)
with deicers						506 lbs.	(229.5 kg)	851 lbs.	(386.0 kg)
with radomes						678 lbs.	(307.5 kg)	1210 lbs.	(548.8 kg)
JHPC-7	3.8	5.80	268.0	50KW	End	532 lbs.	(241.3 kg)	854 lbs.	(387.4 kg)
with deicers						591 lbs.	(268.1 kg)	999 lbs.	(453.1 kg)
with radomes						742 lbs.	(336.6 kg)	1414 lbs.	(641.4 kg)
JHPC-8	4.3	6.34	285.2	60KW	Center	609 lbs.	(276.2 kg)	979 lbs.	(444.1 kg)
with deicers						677 lbs.	(307.1 kg)	1148 lbs.	(520.7 kg)
with radomes						849 lbs.	(385.1 kg)	1619 lbs.	(734.4 kg)
JHPC-10	5.5	7.40	322.4	60KW	Center	774 lbs.	(351.1 kg)	1265 lbs.	(573.8 kg)
with deicers						859 lbs.	(389.6 kg)	1483 lbs.	(672.7 kg)
with radomes						1074 lbs.	(487.2 kg)	2065 lbs.	(936.7 kg)
JHPC-12	6.6	8.20	353.2	60KW	Center	929 lbs.	(421.4 kg)	1514 lbs.	(686.7 kg)
with deicers						1032 lbs.	(468.1 kg)	1780 lbs.	(807.4 kg)
with radomes						1289 lbs.	(584.7 kg)	2475 lbs.	(1122.6 kg)

Notes:

1. Weights and windloads shown include standard leg mounting brackets.
2. Windload ratings are based on 50/33 PSF (98 MHz—midband).
3. Feed point when end fed, 3 feet below bottom bay. When center fed 13 ft. below center.
4. All inputs EIA flange, female.
5. Power derating occurs above 2,000 ft. elevation. Contact factory for details.
6. Power and dB gains are typical for horizontal and vertical components.
7. Antennas supplied with standard mounting brackets for tower leg size up to 3½ in. Special mounting brackets available.
8. Other combinations of EIA inputs & power rating available.

Warranty
A limited warranty is offered on the JHPC antenna to the original purchaser of the antenna. The warranty covers defects in material and workmanship for a period of 24 months after the date of delivery of the antenna.

Options
Options available include FCC-Directionalization, Pattern Measurement Service, Pattern Optimization, Beam tilt and Null fill, Special mounting brackets. Pricing and additional information are available upon request.

Non-ionizing Radiation
Since many factors contribute to a station's compliance with the FCC exposure guidelines for radio frequency radiation, Jampro Antennas cannot accept any responsibility in this matter. The station must examine and determine its status based on each individual situation. For reduced low angle radiation near the tower, a low RFR model of this antenna is available. Contact the factory for pricing, data and further details.

All specifications are subject to change without prior notice.

JAMPRO ANTENNAS, INC.

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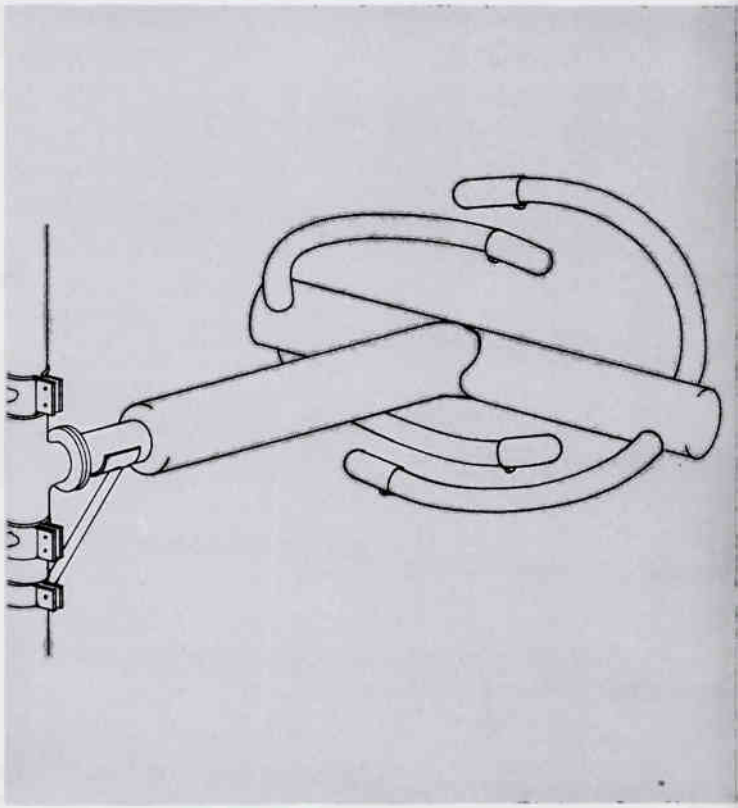
JAMPRO ANTENNAS, INC.

The Jampro Model JBBP FM Antenna



- **First Balanced Omni-Directional CP FM Antenna**
  A new patented feed design ensures the balanced excitation of the antenna and eliminates the undesirable radiation from the feed and the antenna boom.
- **JBBP Series-1 Symmetrical Pattern**
  Superior pattern symmetry and circularity is achieved by eliminating the feed radiation and obvious isometrics inherent in similar designs.
- **Superior Frequency Stability—Lower VSWR**
  The unique feed design eliminates the frequency sensitivity due to mismatch at the feed point and result in a better VSWR stability.
- **Superior Axial Ratio**
  By eliminating radiation from the horizontal members of the antenna element.
- **Broadband Element**
  Optimized bandwidth over nominal 50 ohm.
- **High Power Capabilities**
  Flexible for high power application due to improved feed design.
- **Multi-Station Applications**
  Improved bandwidth enhances multi-station use.

VSWR Bandwidth Capability
1.1:1 ± 200 KHz from factory (per channel) side mounted on a pole or tower. 1.07:1 ± 200 KHz per channel with fine tuning.

Multiple Channel Operation
1.2:1 ± 150 KHz at given channels over 4 MHz bandwidth. Special input matching device required. Contact factory for details.

Frequency Range
Factory tuned to one frequency from 88 to 108 MHz (see multiple channel operations).

Power Rating
34 KW per element.

Polarization
Right hand, clockwise, circular.

Free Space Pattern
± 2 db.

Power Gain
Based on half wave dipole in free space (see schedule).

Radomes
White gel coat over reinforced fiberglass. Neoprene gasket and stainless steel hardware. Radome used where extreme icing occurs.

Deicers
Under normal environmental conditions deicing is not required. Up to ½ inch radial ice will produce a typical VSWR of 1.5:1. If required, 500 watts per bay @ 50/60 Hz 500.

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The Jampro Model JBBP FM Antenna

No. of Bays	Power Gain Ratio	Gain In dB	Field Gain	Type Feed	Female 50 Ohm Input	Safe Power Rating	Calculated Weight lbs	Calculated Wind Load Without Ice 50/33 PSF	Calculated Wind Load With ½" Radial Ice, 50/33 PSF
1	0.46	-3.37	0.678	End	3⅛"	40KW	68	116	152
2	1.0	0.0	1.0	end	3⅛"	40KW	192	340	450
2	1.0	0.0	1.0	Center	6⅛"	64KW	288	470	595
3	1.5	1.76	1.23	End	3⅛"	40KW	292	530	670
4	2.1	3.22	1.45	End	3⅛"	40KW	416	730	963
4	2.1	3.22	1.45	Center	6⅛"	64KW	495	860	1114
5	2.7	4.31	1.64	End	3⅛"	40KW	504	920	1220
6	3.2	5.05	1.79	End	3⅛"	40KW	619	1140	1520
6	3.2	5.05	1.79	Center	6⅛"	64KW	723	1300	1690
8	4.3	6.34	2.07	End	3⅛"	40KW	827	1930	2020
8	4.3	6.34	2.07	Center	6⅛"	64KW	730	1690	2210
10	5.5	7.40	2.35	Center	3⅛"	40KW	1058	1950	2600
10	5.5	7.40	2.35	Center	6⅛"	64KW	1138	2080	2730
12	6.6	8.20	2.57	Center	3⅛"	40KW	1265	2340	3110
12	6.6	8.20	2.57	Center	6⅛"	64KW	1345	2470	3250

Notes

1. Weights and windloads shown include mounting brackets.
2. Windload ratings are 50/33 PSF, 112 miles per hour.
3. Feed point when end fed, 3 feet below bottom bay. When center fed 13 ft. below center.
4. All inputs EIA flange, female.

Warranty

A limited warranty is offered on the JBBP antenna to the original purchaser of the antenna. The warranty covers defects in material and workmanship for a period of 24 months after the date of delivery of the antenna.

Options

Options available include: Pattern Measurement Service, Pattern Optimization, Beam tilt and Null fill, and Special mounting brackets.

Non-Ionizing Radiation

Since many factors contribute to a station's compliance with the FCC exposure guidelines for radio frequency radiation, Jampro Antennas cannot accept any responsibilty in this matter. The station must examine and determine its status based on each individual situation. For reduced low angle radiation near the tower, a low RFR model of this antenna is available. Contact the factory for pricing, data and further details.

All specifications are subject to change without prior notice.

PRELIMINARY

JAMPRO ANTENNAS, INC.

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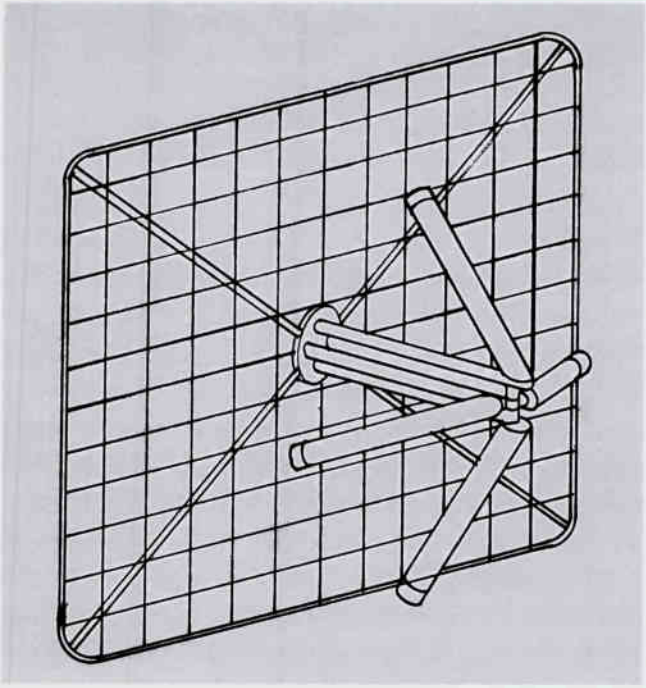
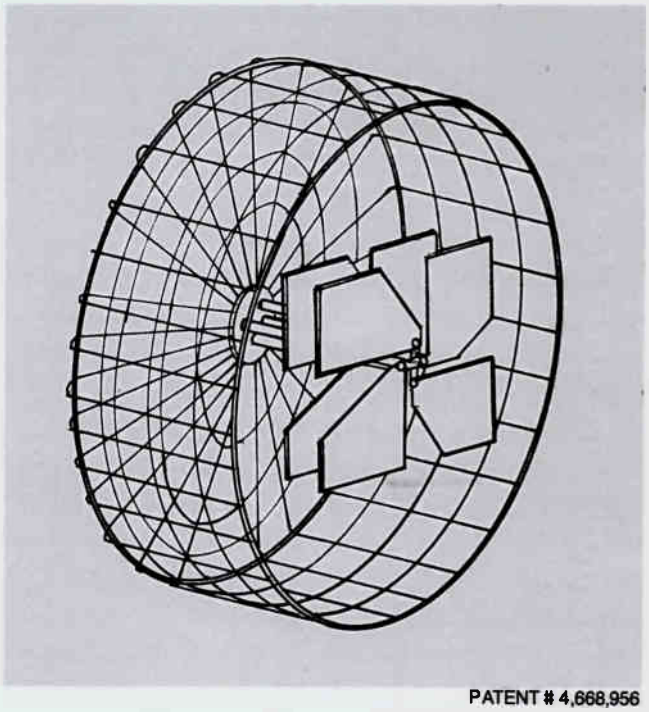
JAMPRO ANTENNAS, INC.

BROADCAST PANEL ANTENNAS

- **Two broadcast panel antennas to choose from**
- **Multi-station application**
- **Circularly polarized**
- **Directional or omni-directional radiation pattern**
- **Available in arrays through 16 layers (special designs available)**
- **Single or two line feed**
- **All band design, FM through UHF-TV**



JAHD CP Arrowhead Screen Dipole



PATENT # 4,668,956

JSDP CP Spiral Broadband Antenna

The JAHD Flat Screen Dipole Panel Antenna is designed to permit a number of high power FM stations to share a common antenna. The resulting design also makes it possible to achieve excellent horizontal pattern circularities when the antenna is mounted on the sides of a large tower, or other large supporting structure. The antenna is circularly polarized for optimum coverage and is available in omni-directional, as well as directional patterns. The antenna can be used for a number of FM stations operating on different frequencies. The antenna has extremely high power capabilities. Three of these panels are mounted around the faces of a triangular tower, to make up one bay ("stack" or "layer"). Up to 16 bays are available to provide the desired power gain.

The JSDP Cavity Backed Antenna utilizes a patented wide-band element to excite a cavity resonator for maximum beam control. The result is an antenna system which is far superior to standard flat panel antennas. This antenna has low VSWR, uniform pattern and axial ratio across a wide band of frequencies. The feed system includes dry air pressurized power dividers, flexible copper cables and feed baluns. The antenna will be supplied either single line feed or as a split antenna, with the ability to feed either upper or lower half. Optionally, directional patterns are available. All elements are grounded for maximum lightning protection. The balun and dipole feeds can be enclosed in a radome. The completed antenna is tested and measured at JAMPRO's test range.

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THE BROADCASTER COMMUNITY ANTENNA (JAHD) CIRCULAR POLARIZED ARROWHEAD SCREEN DIPOLE ANTENNA

JAMPRO offers an excellent FM broadcast antenna known as the JAMPRO CP Arrowhead Dipole Broadband Antenna (JAHD). The screen dipole provides improved stereo separation because of its non-reactive load through the side bands.

The Arrowhead Dipole is designed to accept large amounts of power, over a wide frequency range. The JAHD can be used as a combined FM-TV antenna, using CP, horizontal or vertical polarization separately between the stations. This flexibility provides unique options for both FM and TV stations.

The Arrowhead Dipole Antenna provides an excellent omnidirectional signal, as well as directional patterns. Both beam tilt and null fill are available in the antenna system. The JAHD Arrowhead Dipole Antenna is equally adaptable for multi-station use with VHF and FM.

UNIQUE FEATURES OF THE JAHD ARROWHEAD SCREEN DIPOLE

Multi-station Community Antenna: A selected number of stations can each obtain acceptable performance from an Arrowhead panel antenna.

Pattern Circularity: In an omni-directional configuration circularity is ± 2 dB or better (5 ft. face or smaller).

CP Axial Ratio: The JAHD dipole element provides excellent control over the axial ratio which is typically better than 3 dB.

Environmental protection: The JAMPRO panel antenna is pressurized through the feed system including the Arrowhead dipole. Deicers on radomes protect the Arrowhead dipole from the harsh environment and icing.

JAHD CP Arrowhead Screen Dipole

Pattern circularity: Excellent circularity, poor tracking of vertical and horizontal components (circularity and tracking may vary according to frequency separations).

Axial ratios: _ 2 dB

VSWR:
Individual panel = 1.1:1 or better (typical)
Typical system = 1.1:1 or better (system)

Power Rating:
10 KW / panel (special high power designs available)

Polarization:
CP or HP

Patterns Available:
Omni or directional

Feed Arrangements: Single or dual feed (upper-lower)

Antenna Application:
Designed specifically for multi-station applications & omni-directional patterns around large towers.

Gains:
.46 (omni) / layer

Environment Protection:
Deicers, radomes optional.

Input Connection:
EIA 50 ohm.

Construction:
Copper, brass & pure Teflon dipole element. Panel reflector is a 6' square flat panel (welded mesh over structural tube members — galvanized)

Total Number of Frequencies:
Limited by total input power

THE BROADCASTER COMMUNITY ANTENNA (JSDP) CIRCULAR POLARIZED CAVITY BACKED BROADBAND ANTENNA

The premium FM broadcast antenna is the JAMPRO CP Cavity Backed Broadband Antenna. The spiral dipoles excite the cavity providing a uniform beam. The uniform beam is easily controlled in the antenna system, resulting in an antenna that has a flat response across the FM band.

JAMPRO's patented balun feed system allows for unique control of the horizontal and vertical signal, minimizing the tower effects and giving an unmatched axial ratio. JAMPRO's dipole provides a broadband radiator with a stable impedance over the entire FM band. This allows each station in a JSDP community antenna and each succeeding station, to have the optimum performance from the antenna.

The Cavity Backed Antenna provides an excellent omni-directional signal, as well as excellent pattern control for directional arrays. Both beam tilt and null fill are available in the antenna system.

The (JSDP) Cavity Backed Antenna is equally adaptable for multi-station use with high-band VHF and UHF applications.

UNIQUE FEATURES OF THE JSDP

Multi-station Community Antenna: A selected number of stations can each obtain the same excellent performance from the antenna. As a true broadband element, the JSDP cavity has uniform characteristics. Stations should be aware, many other antennas claiming multi-station broadband capability use stagger tuning which produces high levels of VSWR and impedance mis-matches.

Pattern Circularity: In an omni-directional configuration, circularity is ± 2 dB or better. Directional patterns are available.

CP Axial Ratio: A spiral dipole and balun gives excellent control over the axial ratio which is typically better than 1 dB.

Power rating: System input power rating can be over 240 KW, based on cavity element ratings and the number of layers.

Environmental Protection: The JSDP Antenna is pressurized through the feed system, balun and the dipole. Deicers on radomes protect the dipole from harsh environment.

JSDP CP Cavity Backed Broadband Antenna

Pattern Circularity: Excellent circularity and tracking of horizontal and vertical components (± 2 dB). (Circularity and tracking will vary according to frequency separations.)

Axial ratios: 1 dB or better

VSWR:
Individual panel = 20% bandwidth under 1.1:1 available
Typical system = 20% bandwidth under 1.1:1 available

Power Rating/per cavity:
55 KW (3⅛ input)
23 KW (1⅝ input)
10 KW (⅞ input)

Polarization:
Right hand CP

Patterns Available:
Omni or directional

Feed Arrangements: Single or dual feed (upper-lower)

Antenna Application:
Designed specifically for multi-station applications & omni-directional patterns around large towers.

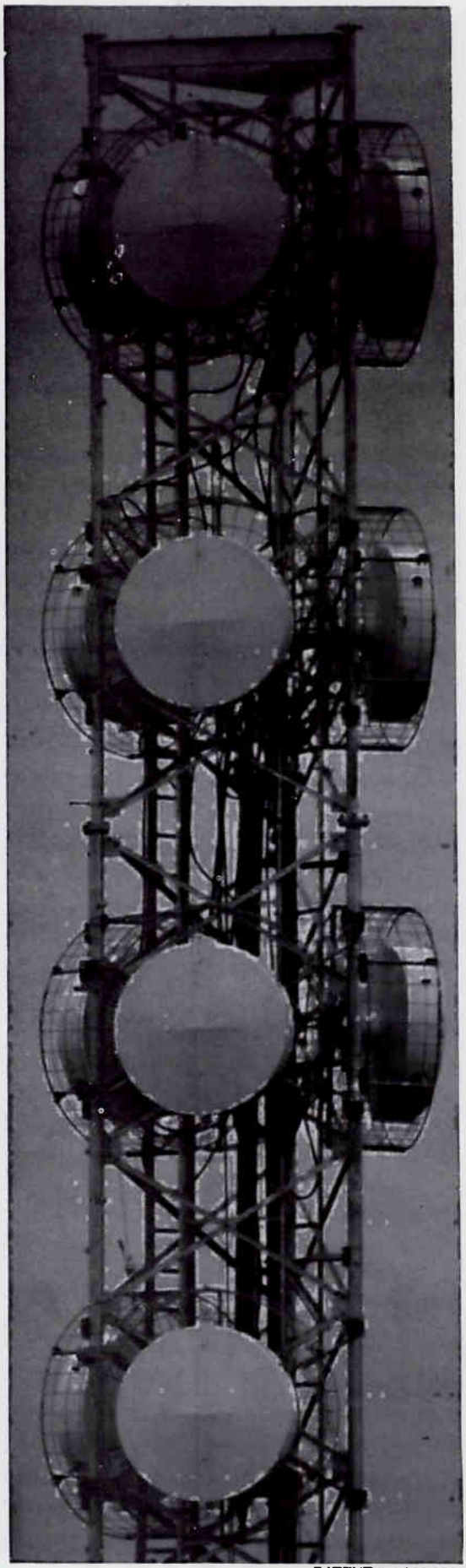
Gains:
.46 (omni) / layer

Environment Protection:
Deicers, radomes optional.

Input Connection:
EIA 50 ohm.

Construction:
Copper, brass & pure Teflon dipole element. Reflector is a 6' round × 2' deep cavity with welded mesh over structural frame — galvanized

Total Number of Frequencies:
Limited only by the total input power.



PATENT # 4,668,956

Mechanical and Electrical Data
JSDP CP Cavity Backed Spiral Broadband Antenna

# of levels — 3 panels per level	Power Gain (Type H & V)	dB Gain	Aperture (ft)	Windloads Standard		Windloads Radomes		Weight Standard		Weight Radome	
1	.46	-3.37	10	985#	451kg	1590#	721kg	1080#	490kg	1188#	539kg
2	1.00	.0	20	1900#	903kg	3180#	1442kg	2160#	480kg	2376#	1078kg
3	1.55	1.91	30	2985#	1353kg	4770#	2164kg	3240#	1470kg	3564#	1617kg
4	2.15	3.32	40	3980#	1805kg	6360#	2885kg	4320#	1960kg	4752#	2156kg
5	2.70	4.31	50	4975#	2255kg	7950#	3605kg	5400#	2450kg	5940#	2695kg
6	3.30	5.18	60	5970#	2706kg	9540#	4327kg	6480#	2939kg	7128#	3233kg
8	4.40	6.43	80	7960#	3610kg	12720#	5770kg	8460#	3919kg	9504#	4311kg
10	5.50	7.40	100	9950#	4510kg	15900#	7210kg	10800#	4899kg	11880#	5389kg
12	6.60	8.20	120	11940#	5412kg	19080#	8655kg	12960#	5879kg	14256#	1467kg
14	7.70	8.87	140	13930#	6314kg	22260#	10094kg	15120#	6859kg	16632#	7545kg
16	8.80	9.45	160	15920#	7221kg	25440#	11540kg	17280#	7838kg	19008#	8622kg

JAHD CP Arrowhead Screen Dipole

1	.46	-3.37	10	1400#	635kg	1600#	726kg	714#	324kg	804#	635kg
2	1.00	.0	20	2800#	1270kg	3200#	1451kg	1428#	648kg	1608#	730kg
3	1.55	1.91	30	4200#	1905kg	4800#	2177kg	2142#	791kg	2412#	1094kg
4	2.15	3.32	40	5600#	2540kg	6400#	2903kg	2856#	1296kg	3216#	1459kg
5	2.70	4.31	50	7000#	3175kg	8000#	3628kg	3570#	1620kg	4020#	1824kg
6	3.30	5.18	60	8400#	3810kg	9600#	4355kg	4284#	1943kg	4824#	2188kg
8	4.40	6.43	80	11200#	5080kg	12800#	5806kg	5712#	2590kg	6432#	2918kg
10	5.50	7.40	100	14000#	6350kg	160000#	7258kg	7140#	3239kg	8040#	3647kg
12	6.60	8.20	120	16800#	7620kg	19200#	8710kg	8568#	3886kg	9648#	4376kg
14	7.70	8.87	1409	19600#	8890kg	22400#	10160kg	9996#	4534kg	11256#	5106kg
16	8.80	9.45	160	22400#	10160kg	25600#	11612kg	11424#	5182kg	12864#	5835kg

Notes:
1. Weights and windloads based on 98.0 MHz. spaced one wavelength apart.
2. Weights and windloads shown do not include mounting brackets, feed lines or power dividers.
3. Windload ratings are based on 50/33 PSF.
4. All inputs EIA flange, female.
5. Windloads based on three element around mounting structure.

Warranty:
A limited warranty is offered on the panel antenna to the original purchaser of the antenna. The warranty covers defects in material and workmanship for a period of 24 months after the date of delivery of the antenna.

Options:
Options available include FCC pattern service, pattern measurement, beam tilt, null fill and special mounting brackets.

Non-Ionizing Radiation:
Since many factors contribute to a station's compliance with the FCC exposure guidelines for radio frequency radiation, JAMPRO ANTENNAS, INC. cannot accept any responsibility in this matter. The station must examine and determine its status based on each individual situation. For reduced low angle radiation, near the tower, a low RFR model of this antenna is available. Contact the factory for further details and pricing.

All specifications are subject to change without prior notice.

JAMPRO ANTENNAS, INC
6939 Power Inn Road, P.O. Box 28425, Sacramento, CA 95828 (916) 383-1177 Telex: 377321 Fax: (916) 383-1182

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ANTENNAS, INC.

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JAMPRO Antennas — The Leading Edge!

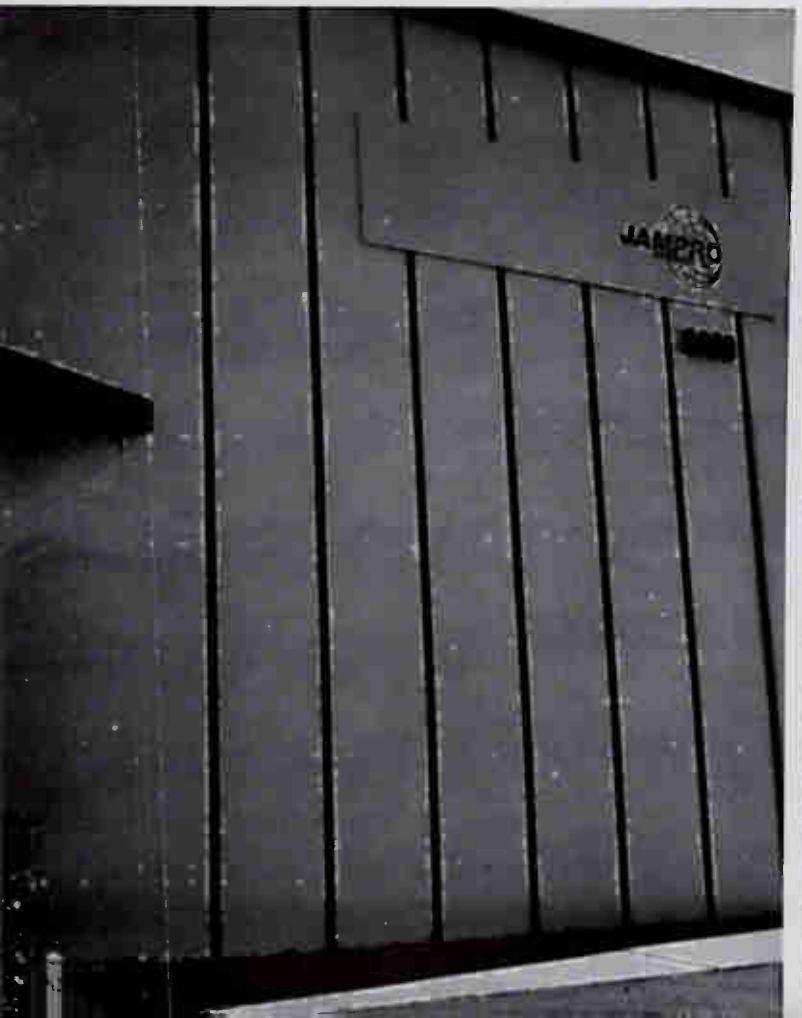
We take pride in presenting the complete product line of JAMPRO Antennas in this short form catalog. For over 28 years, JAMPRO has specialized in high quality broadcast antennas for the TV and FM broadcasting industry. In 1967 we introduced the JSCP "Penetrator" FM CP antenna series. It is now broadcasting around the world as over 1,500 have been delivered. Their long and reliable service has helped establish the reputation of Jampro's high quality production and engineering. By 1974 we were testing CP television on the air under FCC authorization. When CP TV was first permitted in 1977, JAMPRO was ready with the patented SPIRAL antenna. Since then it has proven its outstanding qualities in many major cities and installations. A new advancement in broadband dipoles was announced by JAMPRO in 1985, and since then the SPIRAL DIPOLE has added a major improvement of uniform impedance to the wide band antenna. Several have been placed in service by Jampro Antennas offering many improvements over other models.

UHF slot antennas by Jampro are in service at a number of stations, and now a development program has resulted in several improvements in this television antenna. An extended range of various gains and several patterns is now available.

JAMPRO ANTENNAS, INC. manufacturing and sales facilities are located in Sacramento, California, near major shipping facilities for world-wide distribution. A flat 7,000 foot antenna range with two elevation and five azimuth turntables is used by Jampro for testing. There, modern testing and measuring equipment is used in the test of all television antennas as well as all FM directional production. Antennas such as the SPIRAL CP TV made for ABC's WLS-TV and mounted on the Sears Building in Chicago have been given their final production proof there. This antenna is pictured on our front cover in a helicopter photo taken at installation time in early 1982.

Currently, R & D work continues at JAMPRO to improve already existing models of antennas as well as to increase its antenna offering. In its over 28 years of growth, Jampro has truly become a major supplier of high quality broadcast antennas to the television and FM industry. In 1986, the company returned to independent status and its original corporate name, JAMPRO ANTENNAS, INC.

JAMPRO Offices, Factory, and Test Range located in Sacramento, California



Why Circular Polarization?

The CP TV Story

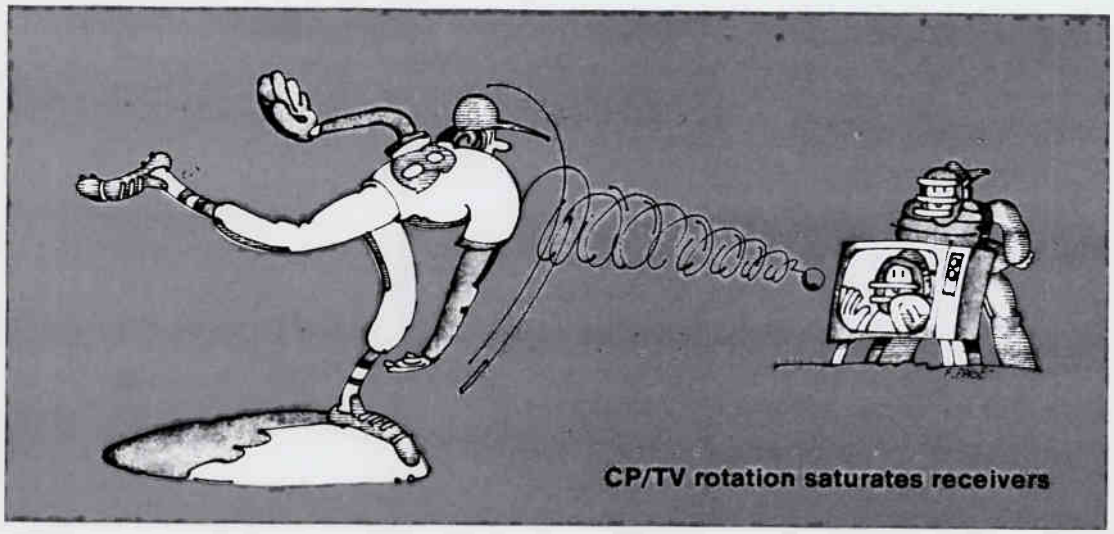
First permitted by the FCC in 1977, CP TV transmission has since been adopted by many leading stations. This has outstandingly benefitted these stations with increased pictured quality. Viewers have experienced less critical tuning and other adjustments. And of course, CP TV can give outstanding ghost reduction. In one word: CP TV EXCELS. It has increased audience share at station after station due to its exclusive advantages over horizontal polarization. Wise broadcasters agree, CP TV pays off, and JAMPRO is the EDGE in CP antennas.

Type JTC - Spiral

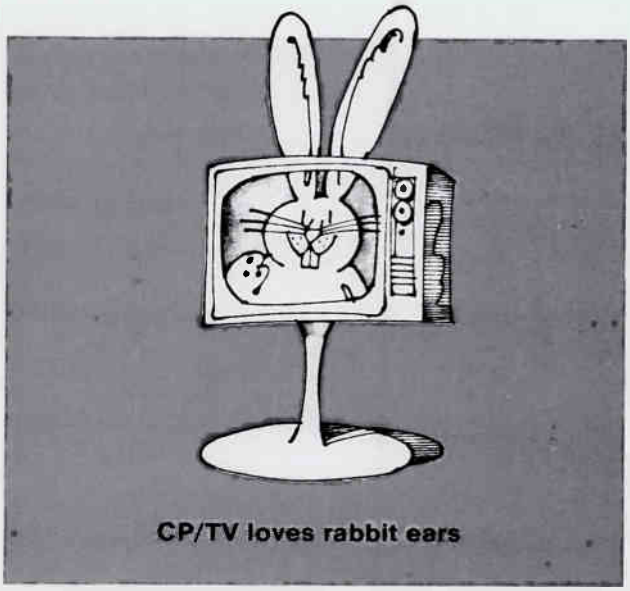
The patented Spiral CP TV antenna by JAMPRO ANTENNAS gives unmatched omni-directional operation. It has the highest gain per wavelength plus smooth control over null fill and beam tilt. Axial ratio lower than 2.0 dB is achieved for both VHF and UHF antennas, and axial ratio is recognized as the CP measure of quality.

Type JRP - Ring Panel

When a directional pattern is required, a JAMPRO Ring Panel CP TV antenna fills the specifications. Panels of this antenna may be arranged to fit an existing tower, or as required to produce a needed pattern.



CP/TV rotation saturates receivers



CP/TV loves rabbit ears

Type JSDP - Hybrid Dipole

Available as a omni-directional or directional antenna, the outstanding new broadband crossed dipole is offered in a cavity to control beamwidth. This system brings flat impedance to over 23 percent bandwidth for use by one or more stations. Custom design of a high power feed system makes operation trouble-free and long lasting.

These antennas for CP TV show the experience and careful design and production of JAMPRO ANTENNAS. Personal attention to details by a staff long associated with high quality antenna production pays off in rapid delivery and long, trouble free service. Complete testing on JAMPRO's all year antenna range proves all parameters.

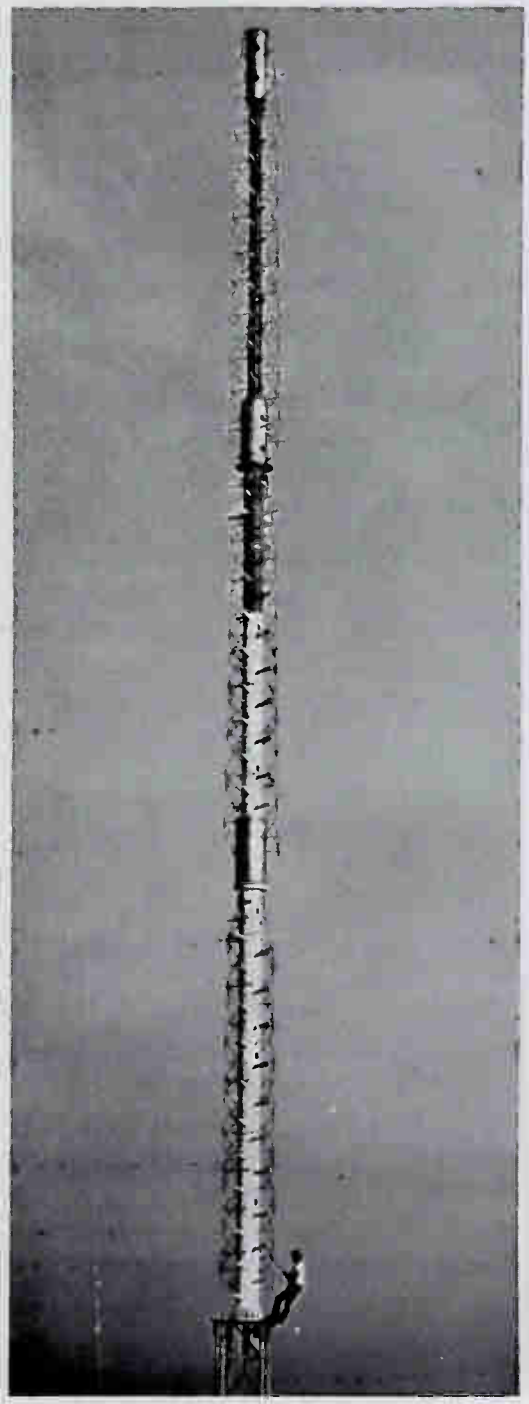
For over 28 years Jampro has been building quality broadcast antennas. For FM and TV, more and more it is JAMPRO ANTENNAS, INC. the LEADING EDGE in CP!

Tune us in on FM in major cities everywhere. Watch our CP TV in Chicago, San Francisco, Phoenix, Houston, and more . . .

The CP TV Spiral

The outstanding CP TV antenna available today is the SPIRAL by JAMPRO ANTENNAS, INC. It alone benefits from several exclusive features which give it performance that is unrivaled.

1. A tapered wrap for uniform radiation across its aperture.
2. Custom design of each antenna:
   a) Customer specified Gain
   b) Customer specified Beam tilt / null fill
   c) Customer specified Wind speed / ice load
3. Exclusive all band optimum performance.
4. Circularity as low as +/- 0.5 dB.



Pat. No. 3,906,509 9/16/75

The uniform radiation across the aperture of each JAMPRO SPIRAL means increased efficiency and the highest gain of any CP antenna. Elevation patterns are produced which accurately duplicate computer design. Individual design to the station specification means you do not have to accept a stock pattern or antenna, not suited to your particular needs.

The JAMPRO SPIRAL is a travelling wave antenna, which means a minimum number of feed points across a large aperture. The clean physical construction of this antenna offers a weight/windload specification to directly replace a batwing of the equivalent aperture.

And of course, only the JAMPRO SPIRAL is made to all television bands.

The SPIRAL feed system is all internal for maximum protection against lightning damage, and all pressurized by dry air from the transmission line. Each radiating arm is directly grounded also. Although the service record shows this antenna to be relatively insensitive to icing, each stainless steel radiating arm contains its own deicer. A complete radome cover was provided for the WLS-TV antenna in Chicago, and this option is also available.

The SPIRAL CP TV by JAMPRO is a very exceptional omni-directional antenna for both VHF and UHF. Circularities as low as +/- 0.5 dB are commonly achieved in production. Close conformity of HPOL and VPOL fields means low axial ratios, also. True CP is radiated from the arms of this antenna. Circularity does not depend upon addition of patterns from several panels. All these features and more are proven and documented on the JAMPRO antenna range before shipping, and proven in operation too. The production guarantee on all JAMPRO antennas is two years.

Get full details on this state of the art antenna. It is the answer to the need for improved service for today's television. Call JAMPRO ANTENNAS, INC. today.

VHF/UHF Specifications JTC Spiral Antenna 50/33 psf, no ice

Channel	CP Gain	Height (ft)	Diam (ft)	Estim. Wt. (lbs)	Shear (lbs)	Mom. (kip)
2/3	3.0	110	4.5	13,250	4,530	240.
4-6	3.0	82	3.5	5,450	2,950	117.
7-13	5.5	60	2.8	3,435	2,100	63.
7-13	7.8	85	2.8	6,745	3,470	137.
14-40	5.0	64	2.5	3,600	2,250	75.
41-70	15.0	50	2.0	2,800	1,750	45.

CP TV Ring Panel Antenna

The CP TV Ring Panel Antenna by JAMPRO Antennas can be either directional or non-directional due to its basic building-block construction. Unequal power may be split to faces of the antenna, or orientations arranged according to pattern needs. When power must be limited due to protection needs or due to population concentration, the Ring Panel antenna fills the bill.

Additional flexibility allows the choice of top mounting as a self-supporting structure or the option of side mounting below tower top. This may allow multiple use of a tower usually at less cost than candelabra arrangements atop a tower.

Particularly for the UHF broadcaster, the choice of directional pattern is often made to allow higher peak gain. By reducing coverage over areas of no population such as water, desert or mountains, the advantage is taken of the increase of azimuth gain to provide more erp over the desired areas.

The Ring Panel antenna is a travelling wave antenna composed of several panels, each of which has only one feed point. There are two advantages to this. Reduction of the number of feed points, as well as high power handling ability is facilitated by the smaller number of insulators required. A 110KW JAMPRO CP TV Ring Panel is presently in operation.

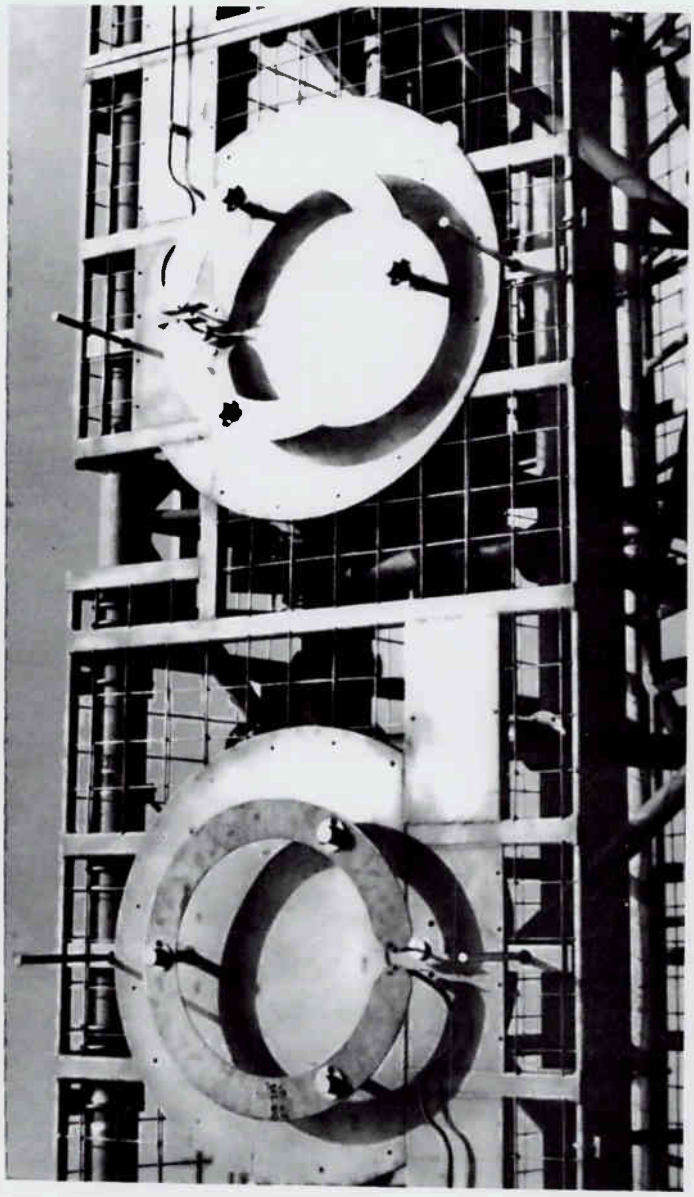
Radomes may be used to provide freedom from ice and snow, or to protect from corrosive atmospheres. This means long life and lower winter operating costs along with uniform operation season after season. Radomes are glass reinforced polymer, low loss into the super high frequencies, resistant to ultra-violet and structurally strong far below freezing.

Because of its ability to control patterns and beam width, the axial ratio of the Ring Panel antenna is excellent. Beam tilt and null fill are accomplished by standard techniques, so optimum signal can be directed as required by location or terrain. Of course, the final pattern is proven on JAMPRO's all year test range.

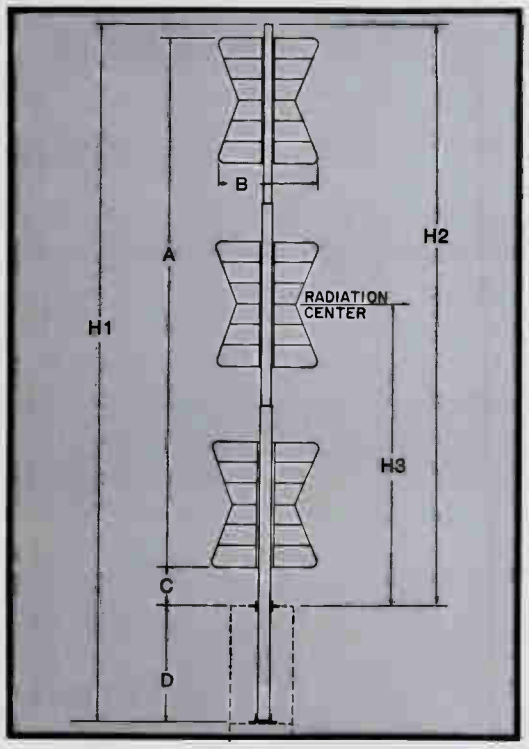
VHF/UHF Specifications JRP Ring Panel Antenna 50/33 psf, no ice

Channel	CP Gain	Height (ft)	Estim Wt. (lbs)	Shear (lbs)
2/3	2.7	100	6,700	24,000
4-6	2.7	73	5,220	20,900
7-13	5.4	61	4,115	18,000
7-13	7.2	81	5,415	24,000
14-40*	25	64	2,265	8,050
41-70*	25	52	1,875	7,300
14-40*	33	86	2,985	11,600
41-70*	33	72	2,550	9,700

***UHF Antennas based on Cardioid Pattern - Gain 1.4**



Pat. No. 4,160,978 7/10/79



A Ft. Antenna Aperture
B Ft. Antenna Width
C Ft. Clearance, tower top to batwing
D Ft. Bury length*
H1 Ft. Overall pole length, includes bury
H2 Ft. Pole length above tower top
H3 Ft. Center radiation above tower
E In. Pole dia. at tower top
F Lbs. Wind force at radiation center
G KIP FT. Overturn moment, tower top
H Lbs. Weight of complete antenna
* No bury section if ant. flange mount

Deicers:	CH 2-3	3 KW per bay
	CH 4-6	2 KW per bay
	CH 7-13	0.8 KW per bay
Voltage:	120 volts To ground	Special deicer requirements available. Contact factory

MECHANICAL DATA 50/33 psf, no ice

	A	B	C	D*	H1*	H2	H3	E	F	G	H*
JAT 2/2-3	27.6	9.	3.5	6.	38.1	32.1	17.3	8.6	1600	29.0	2150
JAT 2/4-6	22.7	6.9	2.7	6.	32.4	26.4	14.1	7.6	1400	16.5	1650
JAT 2/7-13	9.2	3.2	2.5	6.	18.9	12.9	7.1	6.6	700	4.0	1000
JAT 3/2-3	44.6	9.	3.5	8.	57.1	49.1	25.8	11.8	2600	54.0	4600
JAT 3/4-6	36.7	6.9	2.7	8.	48.4	40.4	21.1	10.8	1800	33.5	3500
JAT 3/7-13	14.8	3.2	2.5	6.	24.3	18.3	9.9	8.6	800	7.8	1500
JAT 4/2-3	61.6	9.	3.5	12.	78.1	66.1	34.3	16.0	3700	100.0	7000
JAT 4/4-6	50.7	6.9	2.7	10.	64.4	54.4	28.1	14.0	2750	69.0	750
JAT 4/7-13	20.4	3.2	2.5	8.	31.9	23.9	12.7	8.6	900	21.0	2500
JAT 5/2-3	78.6	9.	3.5	16.	99.1	83.1	42.8	18.0	5000	190.0	10000
JAT 5/4-6	64.7	6.9	2.7	16.	84.4	68.4	35.1	14.0	3700	115.0	7000
JAT 6/2-3	95.6	9.	3.5	20.	120.1	100.1	51.3	20.0	6600	287.0	14000
JAT 6/4-6	78.7	6.9	2.7	18.	100.4	82.4	42.1	18.0	4700	173.0	12000
JAT 6/7-13	31.6	3.2	2.5	10.	45.1	35.1	18.3	8.6	1600	31.0	2800
JAT 8/7-13	42.8	3.2	2.5	10.	56.3	46.3	23.9	10.8	2200	55.0	4800
JAT 10/7-13	54.0	3.2	2.5	10.	67.5	57.5	29.5	12.8	3200	94.0	8500
JAT 12/7-13	65.2	3.2	2.5	2.	80.7	68.7	35.1	12.8	4000	127.0	11000

VHF Batwing Antenna

The JAMPRO Batwing antenna has many construction features making it outstanding for the VHF broadcaster.

The entire structure, pole and batwings are hot-dipped galvanized for long life and reliable contact at important current carrying points. This means unchanging operation over the years for JAMPRO batwing antennas. Trouble free service is a trademark for JAMPRO antennas.

All connections are bolted. Not the batwings alone, but the fanners also. Securely bolted at these vital current points. Berrylium copper is used for strength and resistance to wind and weather. They are backed by soldered brass reinforcing at all bolted points, also.

At JAMPRO Antennas the entire antenna is assembled and tuned before shipment. There is no question about its performance. It has been thoroughly checked, range tested before shipment.

Directional batwings are a custom design feature at JAMPRO. Ask for details.

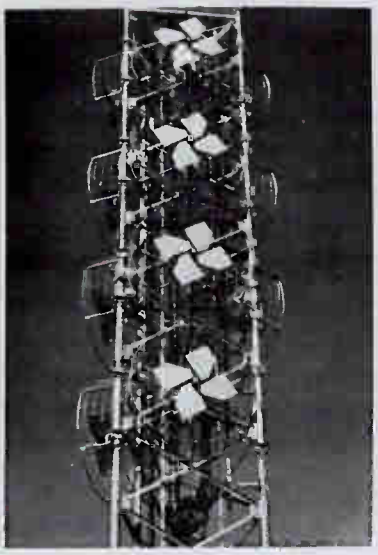
Beam tilt and null fill to your specifications is available without additional cost. Antennas may be mounted by bury into your tower top, or they may be flange mounted on the top plate. Check at the factory with your design specs for the antenna of your choice.

JAMPRO provides batwing reharness kits and service, also.

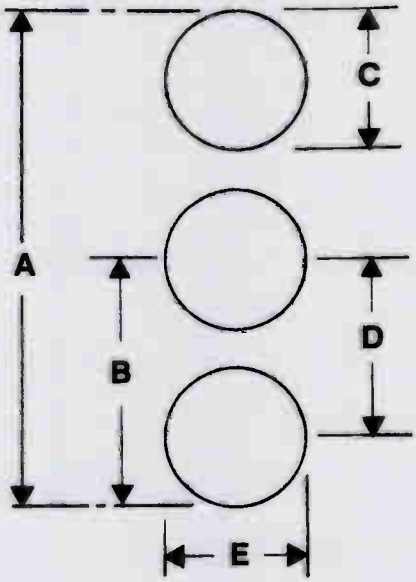
Power Gain Chart vs. Channel

Channel	2	3	4	5	6	7	8	9	10	11	12	13
JAT 2/	1.9	2.1	1.9	2.1	2.2	2.1	2.1	2.2	2.2	2.2	2.3	2.4
JAT 3/	2.9	3.1	2.9	3.1	3.3	3.1	3.1	3.2	3.2	3.2	3.2	3.3
JAT 4/	4.0	4.1	4.0	4.2	4.4	4.1	4.1	4.2	4.2	4.2	4.2	4.3
JAT 5/	5.1	5.3	4.9	5.3	5.4							
JAT 6/	6.0	6.2	5.1	6.5	6.6	6.3	6.3	6.7	6.7	6.8	6.8	6.9
JAT 8/						7.8	7.9	8.3	8.4	8.4	8.3	8.3
JAT 10/						9.9	10.1	10.5	10.7	10.5	10.3	10.3
JAT 12/						11.9	12.2	12.6	12.9	12.6	12.3	12.2

HYBRID Broadband Panel Antenna Circular Polarization or Horizontal Polarization



FOR FM AND TV



* Pat. App. For and Accepted.

The JAMPRO BROADcaster* is a major step ahead in broadband panel antennas. It features a new spiral design dipole which has a low uniform impedance across a 23 percent bandwidth, covering the entire FM band, or CH-7 through CH-13.

The flat response of its new dipole means that now uniform pattern and a low axial ratio are available to all stations using a community antenna — whether at center band or near the band edges. Many other exclusive features are offered in this antenna for FM or Television. Options include full radomes, directional design, high or low power interbay harness and split antennas. Ask JAMPRO for details.

NO. OF BAYS:	1	2	3	4	5	6	8	10	12
CPOL Gain	0.5	1.0	1.5	2.1	2.7	3.2	4.4	5.7	6.8
CP Gain, dB	-3.01	0.0	1.76	3.22	4.31	5.05	6.43	7.56	8.33
HPOL Gain	1.0	2.0	3.0	4.2	5.4	6.4	8.8	11.4	13.6
HP Gain, dB	0.0	3.01	4.77	6.23	7.32	8.06	9.44	10.57	11.34
PHYSICAL DIMENSIONS									
CH-2 or -3									
A - Overall Height, Ft.	10.5	23.5	36.5	49.5	62.50	75.5	101.5	127.5	153.5
B - Center Radiation, Ft.	5.25	11.75	18.25	24.75	31.25	37.75	50.75	63.75	76.75
CH 4 - 5 - 6									
A - Overall Height, Ft.	8.25	18.25	28.25	38.25	48.25	58.25	78.25	98.25	118.25
B - Center Radiation, Ft.	4.13	9.13	14.13	19.13	24.13	29.13	39.13	49.13	59.13
FM-88 to 108 MHz									
A - Overall Height, Ft.	6.5	14.5	22.5	30.5	38.5	46.5	62.5	78.5	94.5
B - Center Radiation, Ft.	3.25	7.25	11.25	15.25	19.25	23.25	31.25	39.25	47.25
CH 7 - 13									
A - Overall Height, Ft.	3.25	7.25	11.25	15.25	19.25	23.25	31.25	39.25	47.25
B - Center Radiation, Ft.	1.63	3.63	5.63	7.63	9.63	11.63	15.63	19.63	23.63

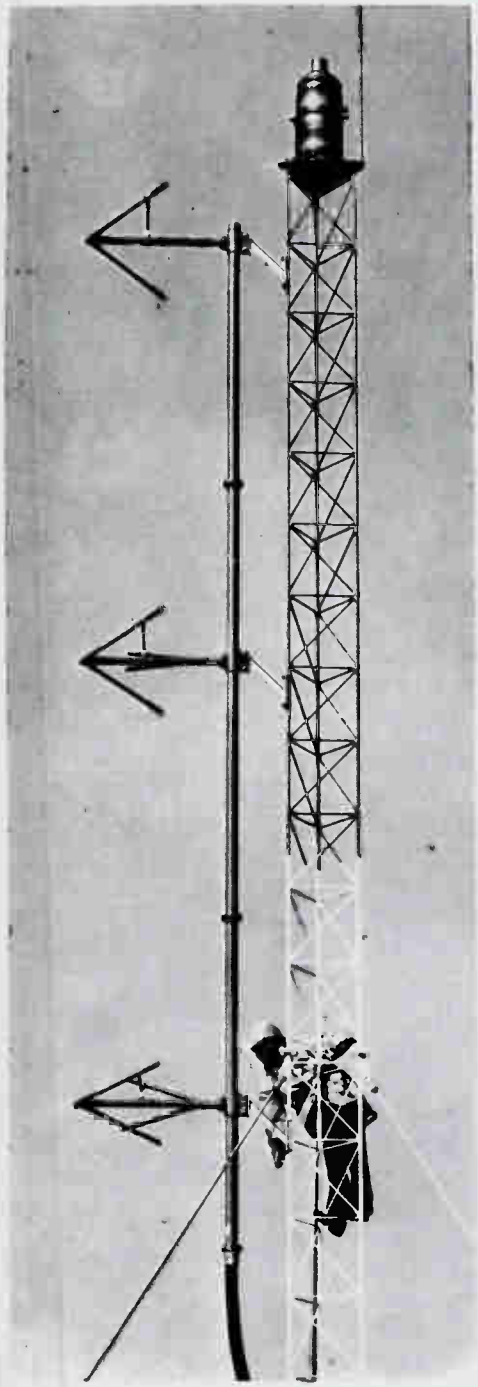
	(C) Cavity Diam.	(D) C-C Spacing	(E) Tower Face
CH-2 or -3	10.5 Ft.	13.0 Ft.	10.0 Ft.
CH 4 - 5 - 6	8.25	10.0	8.0
FM	6.5	8.0	6.0
CH 7 - 13	3.25	4.0	3.0

JSCP Series B FM Broadcast Antennas

- 40 KW Antenna System for four bays or more. 10 KW per bay, four bays or less.
- Excellent Performance for Stereo, SCA and Quadraphonic Broadcasting
- VSWR, wide Bandwidth
- Rugged Mechanical Construction and Mounting
- Clean design for low windload
- True Circular Polarization
- Two-Year Material and Workmanship Warranty
- Factory-Tuned on a "Customer" Structure
- Many Custom Options Available
- Special RFR models with half wave spacing

Ask about the JSLP Series. Same Radiating Element on a 10KW 1 5/8" Support Line or a JHCP for Brute Power on a 6 1/8" Line.

JSCP "PENETRATOR"



Pat. No. 3,541,570

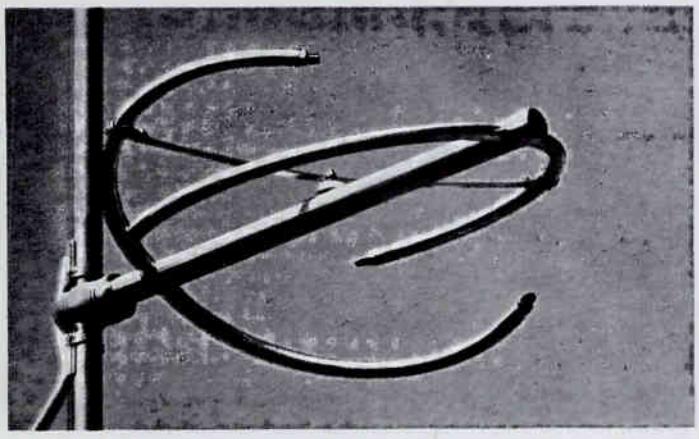
Type No. Bays	Power Gain Ratio	Gain in dB	Net Weight With Mounting Brackets	Windloads At 50/33 PSF (112 mph/180 kmh) With Mounting Brackets
JSCP-1	0.46	-3.37	25 lbs.	48 lbs.
with deicers			34 lbs.	57 lbs.
with radomes			55 lbs.	128 lbs.
JSCP-2	1.0	0.0	125 lbs.	195 lbs.
with deicers			143 lbs.	219 lbs.
with radomes			185 lbs.	355 lbs.
JSCP-3	1.5	1.76	199 lbs.	320 lbs.
with deicers			225 lbs.	368 lbs.
with radomes			289 lbs.	560 lbs.
JSCP-4	2.1	3.22	274 lbs.	443 lbs.
with deicers			308 lbs.	516 lbs.
with radomes			394 lbs.	763 lbs.
JSCP-5	2.7	4.31	350 lbs.	568 lbs.
with deicers			393 lbs.	664 lbs.
with radomes			500 lbs.	968 lbs.
JSCP-6	3.2	5.05	498 lbs.	730 lbs.
with deicers			506 lbs.	851 lbs.
with radomes			678 lbs.	1210 lbs.
JSCP-7	3.8	5.80	532 lbs.	854 lbs.
with deicers			591 lbs.	999 lbs.
with radomes			742 lbs.	1414 lbs.
JSCP-8	4.3	6.34	609 lbs.	979 lbs.
with deicers			677 lbs.	1148 lbs.
with radomes			849 lbs.	1619 lbs.
JSCP-9	4.9	6.90	713 lbs.	1122 lbs.
with deicers			796 lbs.	1316 lbs.
with radomes			1025 lbs.	1842 lbs.
JSCP-10	5.5	7.40	774 lbs.	1265 lbs.
with deicers			859 lbs.	1483 lbs.
with radomes			1074 lbs.	2065 lbs.
JSCP-12	6.6	8.20	929 lbs.	1514 lbs.
with deicers			1032 lbs.	1780 lbs.
with radomes			1289 lbs.	2475 lbs.
JSCP-14	7.8	8.92	1051 lbs.	1760 lbs.
with deicers			1158 lbs.	2077 lbs.
with radomes			1473 lbs.	2885 lbs.
JSCP-16	8.9	9.49	1175 lbs.	2010 lbs.
with deicers			1285 lbs.	2375 lbs.
with radomes			1657 lbs.	3295 lbs.

JBCP FM Antenna

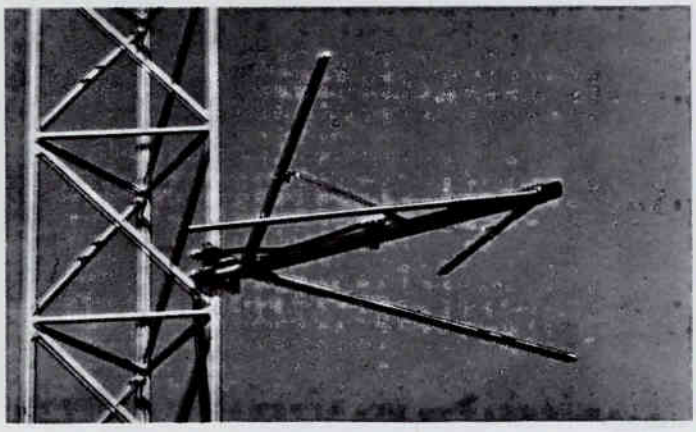
The model JBCP antenna, manufactured by JAMPRO Antennas, is a circularly polarized FM antenna designed for applications requiring relative insensitivity to icing along with high antenna input power. The antenna elements are fabricated of high strength thick wall brass and copper with a 3⅛ inch outside diameter. The JBCP antenna will handle up to 40 KW per bay and up to 120 KW per system, depending upon the number of bays, shunt line size and input connector.

VSWR Rating

The JBCP antenna is inherently broadband, using an internal pressurized feed system. VSWR is 1.07 to 1 plus or minus 200 KHz of carrier with field tuning; deicers are not normally required, as the typical VSWR is 1.4 to 1 or better with up to ½ inch of radial ice. The individual radiating elements may be field tuned for best VSWR. The VSWR at the antenna input without field tuning will be 1.1 to 1 or less when side mounted on a tower.



JAMPRO JLCP Series-2 FM Broadcast Antennas



JAMPRO JLLP FM Broadcast Antennas

Two Low Power Models

Count on JAMPRO Antennas to provide the low power broadcaster with high quality, truly circularly polarized antennas. The JLCP Series-2, pictured here (top), gives the Class-A station several good choices. Power rating is 3 KW per bay or maximum 7.5 KW above two bays. Standard or radome cover is provided if needed. The JLLP series elements are cable fed from a central power divider. This is rated 1 KW per bay and provided as a standard antenna or with deicers. It makes a good system for a low power station, or try it for an inexpensive standby antenna! Call for specifications or other details.

- Circular Polarization
- Factory tuned on a "Customer" Structure
- Custom Options Available
- Two-Year Material and Workmanship Warranty

TELEVISION CORNER REFLECTOR

The JAMPRO model JCR antenna is a building block system that may be adapted to a great variety of needs. Mainly supplied for high band VHF use, it is also custom made to lower or higher channels. Unit gain is 6.1 or 8.0 dB and four at right angles give good omni-directional coverage. They may be stacked in a variety of ways to produce high gain directional patterns. Ask factory sales for computed patterns and a quotation with full details.

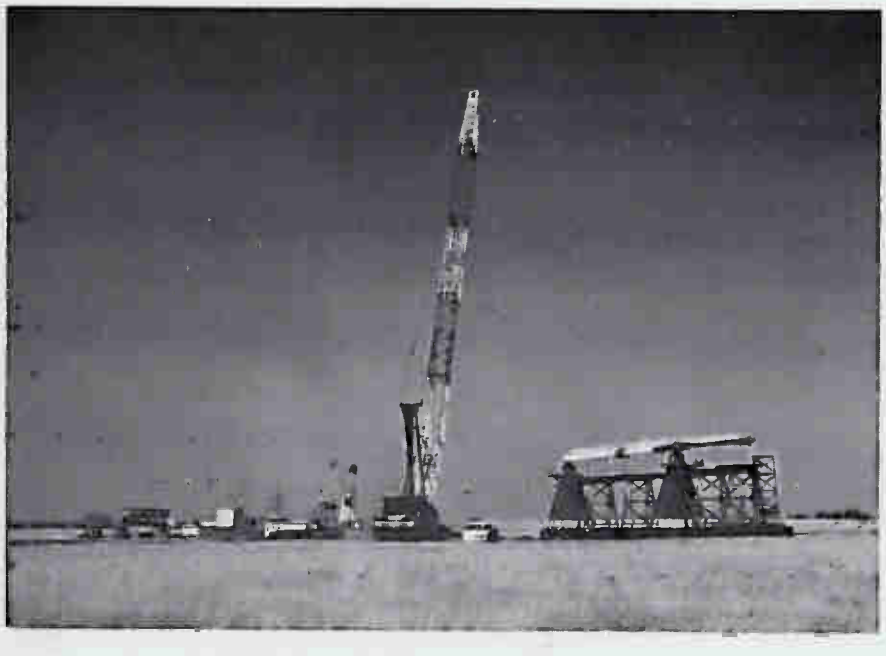
* RUGGED KNOCK-DOWN CONSTRUCTION
* HOT DIPPED GALVANIZED
* PRESSURIZED DIPOLE
* COMPUTER DESIGNED PATTERNS
* TWO YEAR WARRANTY

JAMPRO ANTENNA RANGE

The final proof of antenna design is actual operation at the station. JAMPRO provides the step ahead of that which checks design by full scale measurement on its 7,000 foot antenna range. Modern equipment by Scientific-Atlanta and Hewlett-Packard plus automated hydraulic turntables makes accurate testing of large and small antennas routine.

120 foot long turntable
pictured with Channel 3 Spiral

Vertical mounting of antenna facilitates azimuth check as well as vswr and other tests.



Several turntables makes possible simultaneous measurements along with other checks.

FM Directional Antennas

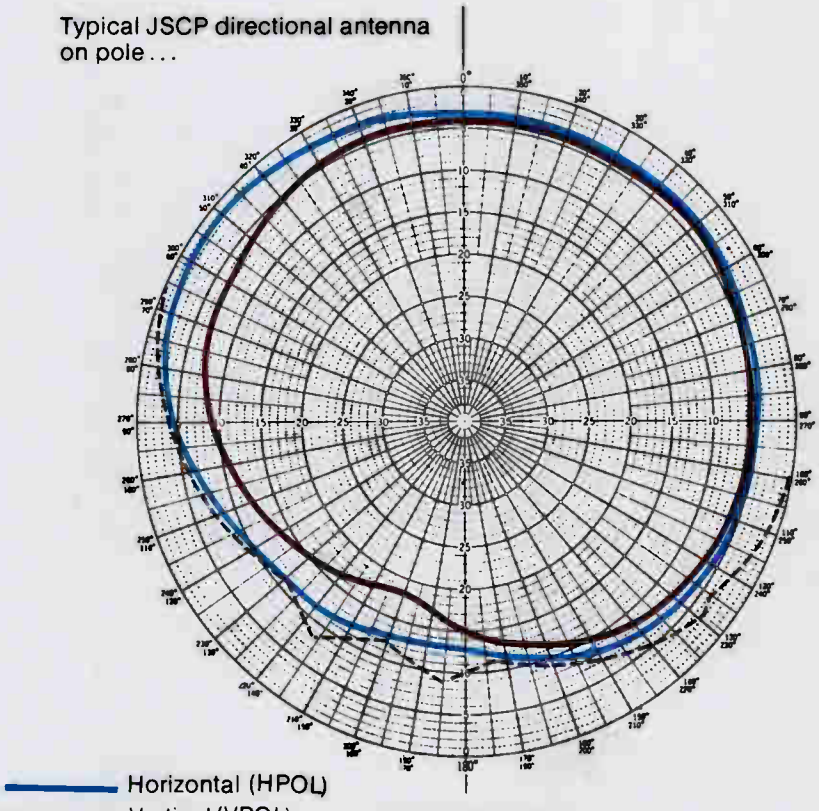
FCC (DA) directional antennas are created by JAMPRO ANTENNAS with any standard model antenna. Precisely placed parasitic elements are used to create desired nulls as required by protection limits. JAMPRO is highly qualified and experienced in the manufacture of successful full scale FCC directional antennas.

Manufacturer's certification is supplied following final work on the antenna. This is prepared for presentation directly to the FCC for final licensing of the antenna.

Directional antenna work is performed at full scale with exact tower duplication. Measurement on the modern and fully equipped JAMPRO 7,000 foot antenna range with single or multi-elements, as required.

Simple pattern measurement and pattern optimization available. Contact factory sales.

Typical JSCP directional antenna on pole . . .



Horizontal (HPOL)
Vertical (VPOL)
FCC Limits

Typical FCC (DA) Directional Antenna Relative Field in dB

JAMPRO Antennas has other products and services of interest to you

- VHF/UHF TV Corner Reflector Antennas
- FM Multi-Station Combiners & Filters
- Panel Antenna Systems for TV & FM
- VHF/UHF TV Notch Diplexers & Filters
- TV & FM Hybrids & DB Couplers
- Turnkey Installation, Tower & Antenna

Custom antennas designed for high windload areas
Medium power UHF slot antennas

JAMPRO Antennas warrants to all original purchasers that new products shall be free from defects in material and workmanship for twenty four months after date of delivery. A full statement of these terms can be had upon request.

JAMPRO ANTENNAS, INC.

JAMPRO ANTENNAS INC.

6939 Power Inn Road, Sacramento, California 95828
(916) 383-1177 Telex: 377321
Fax: (916) 383-1182

JAMPRO
ANTENNAS, INC.

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JAMPRO Antennas — The Leading Edge!

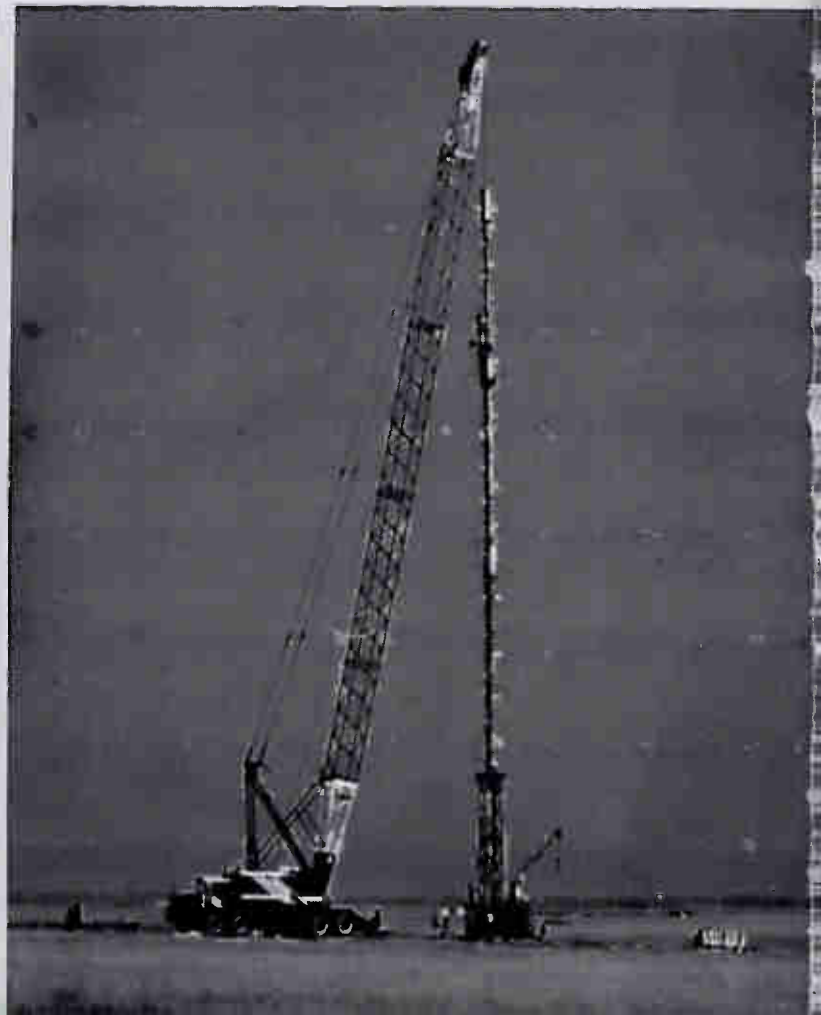
We take pride in presenting the complete product line of JAMPRO Antennas in this short form catalog. For over 28 years, JAMPRO has specialized in high quality broadcast antennas for the TV and FM broadcasting industry. In 1967 we introduced the JSCP "Penetrator" FM CP antenna series. It is now broadcasting around the world as over 1,500 have been delivered. Their long and reliable service has helped establish the reputation of Jampro's high quality production and engineering. By 1974 we were testing CP television on the air under FCC authorization. When CP TV was first permitted in 1977, JAMPRO was ready with the patented SPIRAL antenna. Since then it has proven its outstanding qualities in many major cities and installations. A new advancement in broadband dipoles was announced by JAMPRO in 1985, and since then the SPIRAL DIPOLE has added a major improvement of uniform impedance to the wide band antenna. Several have been placed in service by Jampro Antennas offering many improvements over other models.

UHF slot antennas by Jampro are in service at a number of stations, and now a development program has resulted in several improvements in this television antenna. An extended range of various gains and several patterns is now available.

JAMPRO ANTENNAS, INC. manufacturing and sales facilities are located in Sacramento, California, near major shipping facilities for world-wide distribution. A flat 7,000 foot antenna range with two elevation and five azimuth turntables is used by Jampro for testing. There, modern testing and measuring equipment is used in the test of all television antennas as well as all FM directional production. Antennas such as the SPIRAL CP TV made for ABC's WLS-TV and mounted on the Sears Building in Chicago have been given their final production proof there. This antenna is pictured on our front cover in a helicopter photo taken at installation time in early 1982.

Currently, R & D work continues at JAMPRO to improve already existing models of antennas as well as to increase its antenna offering. In its over 28 years of growth, Jampro has truly become a major supplier of high quality broadcast antennas to the television and FM industry. In 1986, the company returned to independent status and its original corporate name, JAMPRO ANTENNAS, INC.

JAMPRO Offices, Factory, and Test Range located in Sacramento, California



Why Circular Polarization?

The CP TV Story

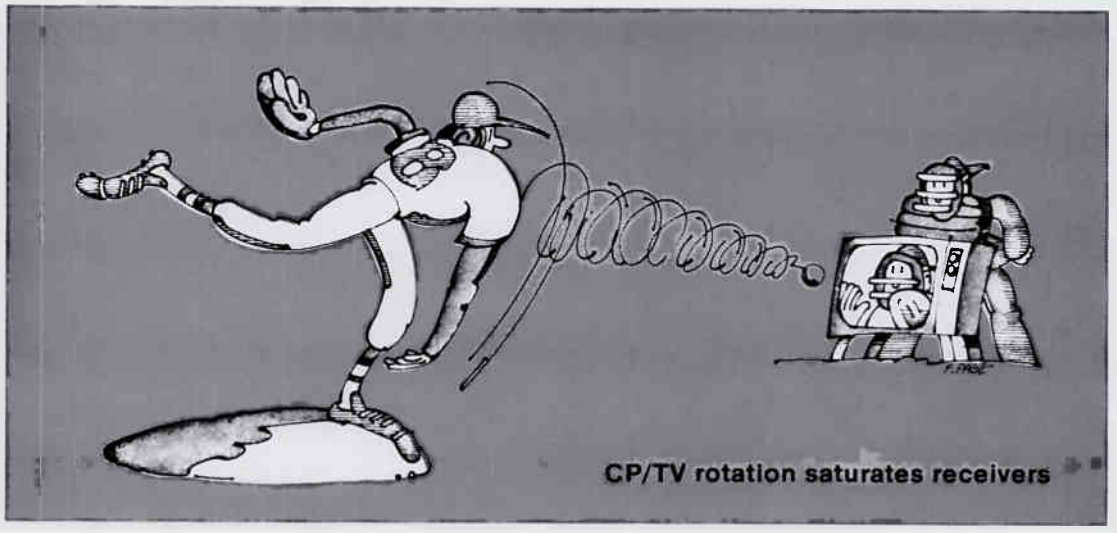
First permitted by the FCC in 1977, CP TV transmission has since been adopted by many leading stations. This has outstandingly benefitted these stations with increased pictured quality. Viewers have experienced less critical tuning and other adjustments. And of course, CP TV can give outstanding ghost reduction. In one word: CP TV EXCELS. It has increased audience share at station after station due to its exclusive advantages over horizontal polarization. Wise broadcasters agree, CP TV pays off, and JAMPRO is the EDGE in CP antennas.

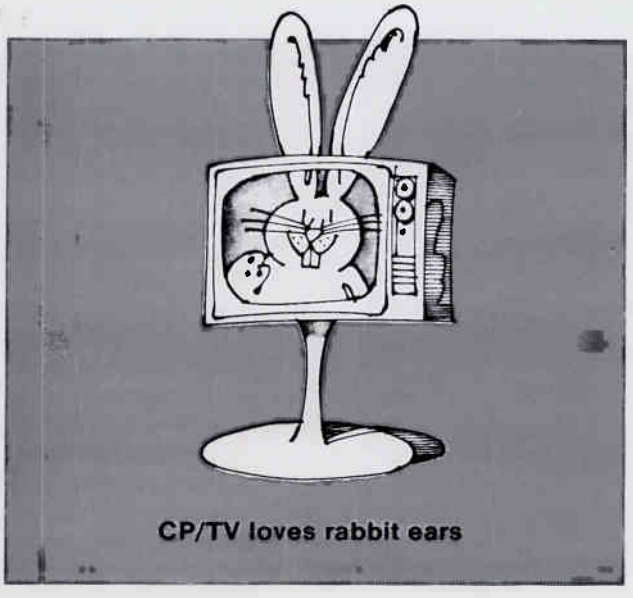
Type JTC - Spiral

The patented Spiral CP TV antenna by JAMPRO ANTENNAS gives unmatched omni-directional operation. It has the highest gain per wavelength plus smooth control over null fill and beam tilt. Axial ratio lower than 2.0 dB is achieved for both VHF and UHF antennas, and axial ratio is recognized as the CP measure of quality.

Type JRP - Ring Panel

When a directional pattern is required, a JAMPRO Ring Panel CP TV antenna fills the specifications. Panels of this antenna may be arranged to fit an existing tower, or as required to produce a needed pattern.





Type JSDP - Hybrid Dipole

Available as a omni-directional or directional antenna, the outstanding new broadband crossed dipole is offered in a cavity to control beamwidth. This system brings flat impedance to over 23 percent bandwidth for use by one or more stations. Custom design of a high power feed system makes operation trouble-free and long lasting.

These antennas for CP TV show the experience and careful design and production of JAMPRO ANTENNAS. Personal attention to details by a staff long associated with high quality antenna production pays off in rapid delivery and long, trouble free service. Complete testing on JAMPRO's all year antenna range proves all parameters.

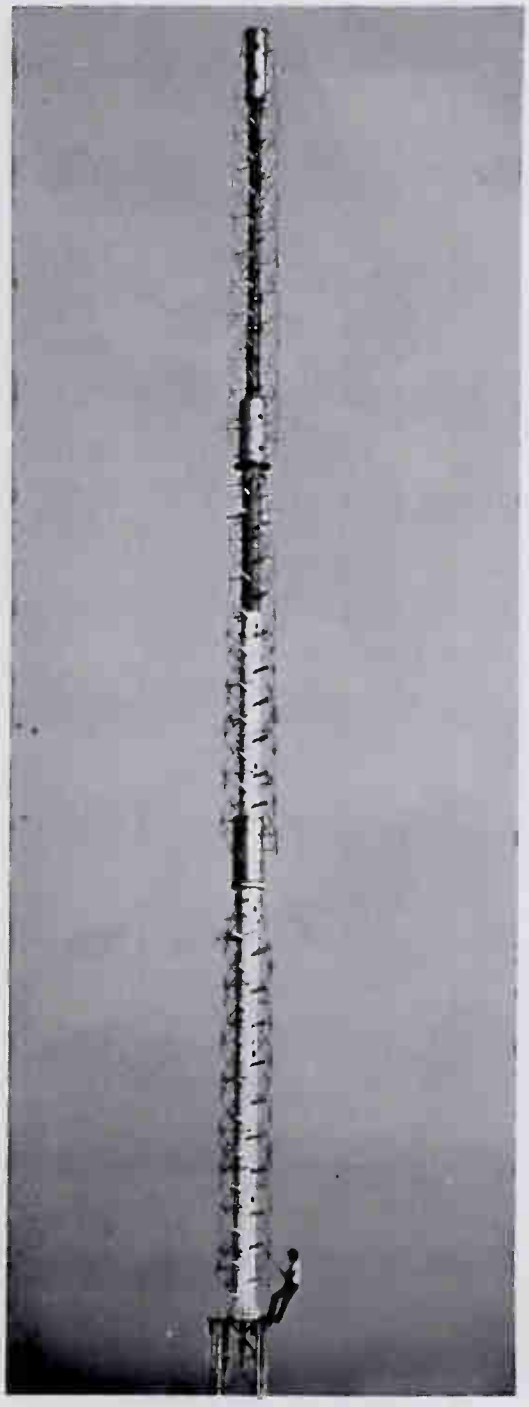
For over 28 years Jampro has been building quality broadcast antennas. For FM and TV, more and more it is JAMPRO ANTENNAS, INC. the LEADING EDGE in CP!

Tune us in on FM in major cities everywhere. Watch our CP TV in Chicago, San Francisco, Phoenix, Houston, and more . . .

The CP TV Spiral

The outstanding CP TV antenna available today is the SPIRAL by JAMPRO ANTENNAS, INC. It alone benefits from several exclusive features which give it performance that is unrivaled.

1. A tapered wrap for uniform radiation across its aperture.
2. Custom design of each antenna:
   a) Customer specified Gain
   b) Customer specified Beam tilt / null fill
   c) Customer specified Wind speed / ice load
3. Exclusive all band optimum performance.
4. Circularity as low as +/- 0.5 dB.



Pat. No. 3,906,509 9/16/75

The uniform radiation across the aperture of each JAMPRO SPIRAL means increased efficiency and the highest gain of any CP antenna. Elevation patterns are produced which accurately duplicate computer design. Individual design to the station specification means you do not have to accept a stock pattern or antenna, not suited to your particular needs.

The JAMPRO SPIRAL is a travelling wave antenna, which means a minimum number of feed points across a large aperture. The clean physical construction of this antenna offers a weight/windload specification to directly replace a batwing of the equivalent aperture.

And of course, only the JAMPRO SPIRAL is made to all television bands.

The SPIRAL feed system is all internal for maximum protection against lightning damage, and all pressurized by dry air from the transmission line. Each radiating arm is directly grounded also. Although the service record shows this antenna to be relatively insensitive to icing, each stainless steel radiating arm contains its own deicer. A complete radome cover was provided for the WLS-TV antenna in Chicago, and this option is also available.

The SPIRAL CP TV by JAMPRO is a very exceptional omni-directional antenna for both VHF and UHF. Circularities as low as +/- 0.5 dB are commonly achieved in production. Close conformity of HPOL and VPOL fields means low axial ratios, also. True CP is radiated from the arms of this antenna. Circularity does not depend upon addition of patterns from several panels. All these features and more are proven and documented on the JAMPRO antenna range before shipping, and proven in operation too. The production guarantee on all JAMPRO antennas is two years.

Get full details on this state of the art antenna. It is the answer to the need for improved service for today's television. Call JAMPRO ANTENNAS, INC. today.

VHF/UHF Specifications JTC Spiral Antenna 50/33 psf, no ice

Channel	CP Gain	Height (ft)	Diam (ft)	Estim. Wt. (lbs)	Shear (lbs)	Mom. (kip)
2/3	3.0	110	4.5	13,250	4,530	240.
4-6	3.0	82	3.5	5,450	2,950	117.
7-13	5.5	60	2.8	3,435	2,100	63.
T-13	7.8	85	2.8	6,745	3,470	137.
14-40	5.0	64	2.5	3,600	2,250	75.
41-70	15.0	50	2.0	2,800	1,750	45.

CP TV Ring Panel Antenna

The CP TV Ring Panel Antenna by JAMPRO Antennas can be either directional or non-directional due to its basic building-block construction. Unequal power may be split to faces of the antenna, or orientations arranged according to pattern needs. When power must be limited due to protection needs or due to population concentration, the Ring Panel antenna fills the bill.

Additional flexibility allows the choice of top mounting as a self-supporting structure or the option of side mounting below tower top. This may allow multiple use of a tower usually at less cost than candelabra arrangements atop a tower.

Particularly for the UHF broadcaster, the choice of directional pattern is often made to allow higher peak gain. By reducing coverage over areas of no population such as water, desert or mountains, the advantage is taken of the increase of azimuth gain to provide more erp over the desired areas.

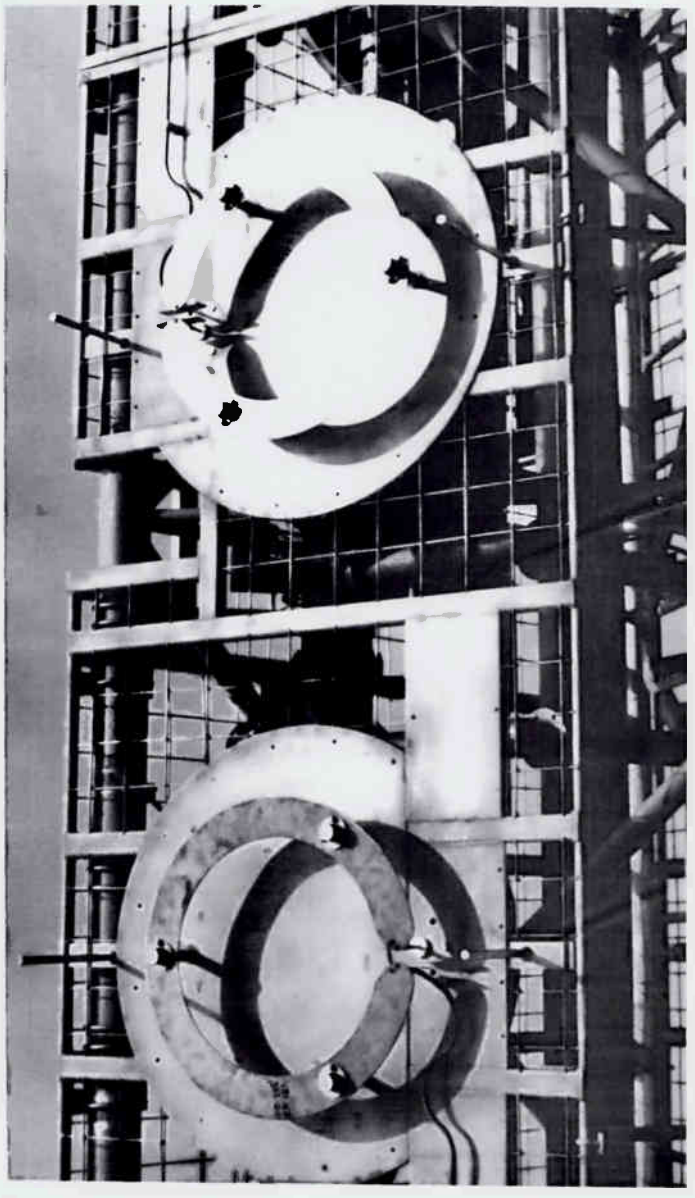
The Ring Panel antenna is a travelling wave antenna composed of several panels, each of which has only one feed point. There are two advantages to this. Reduction of the number of feed points, as well as high power handling ability is facilitated by the smaller number of insulators required. A 110KW JAMPRO CP TV Ring Panel is presently in operation.

Radomes may be used to provide freedom from ice and snow, or to protect from corrosive atmospheres. This means long life and lower winter operating costs along with uniform operation season after season. Radomes are glass reinforced polymer, low loss into the super high frequencies, resistant to ultra-violet and structurally strong far below freezing.

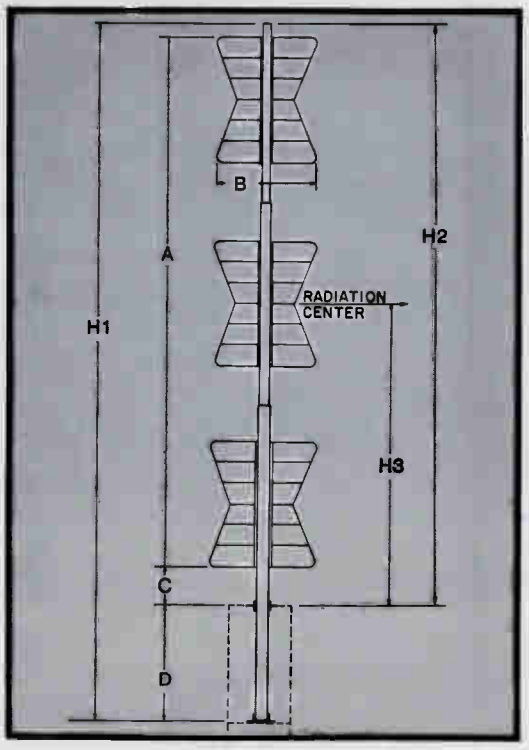
Because of its ability to control patterns and beam width, the axial ratio of the Ring Panel antenna is excellent. Beam tilt and null fill are accomplished by standard techniques, so optimum signal can be directed as required by location or terrain. Of course, the final pattern is proven on JAMPRO's all year test range.

VHF/UHF Specifications JRP Ring Panel Antenna 50/33 psf, no ice				
Channel	CP Gain	Height (ft)	Estim Wt. (lbs)	Shear (lbs)
2/3	2.7	100	6,700	24,000
4-6	2.7	73	5,220	20,900
7-13	5.4	61	4,115	18,000
7-13	7.2	81	5,415	24,000
14-40*	25	64	2,265	8,050
41-70*	25	52	1,875	7,300
14-40*	33	86	2,985	11,600
41-70*	33	72	2,550	9,700

***UHF Antennas based on Cardioid Pattern - Gain 1.4**



Pat. No. 4,160,978 7/10/79



A Ft. Antenna Aperture
B Ft. Antenna Width
C Ft. Clearance, tower top to batwing
D Ft. Bury length*
H1 Ft. Overall pole length, includes bury
H2 Ft. Pole length above tower top
H3 Ft. Center radiation above tower
E In. Pole dia. at tower top
F Lbs. Wind force at radiation center
G KIP FT. Overturn moment, tower top
H Lbs. Weight of complete antenna
* No bury section if ant. flange mount

Deicers:	CH 2-3	3 KW per bay
	CH 4-6	2 KW per bay
	CH 7-13	0.8 KW per bay
Voltage:	120 volts	Special deicer requirements
	To ground	available. Contact factory

MECHANICAL DATA 50/33 psf, no ice

	A	B	C	D*	H1*	H2	H3	E	F	G	H*
JAT 2/2-3	27.6		3.5		38.1	32.1	17.3	8.6	1600	29.0	2150
JAT 2/4-6	22.7	6.9	2.7	6.	32.4	26.4	14.1	7.6	1400	16.5	1650
JAT 2/7-13	9.2	3.2	2.5	6.	18.9	12.9	7.1	6.6	700	4.0	1000
JAT 3/2-3	44.6		3.5		57.1	49.1	25.8	11.8	2600	54.0	4600
JAT 3/4-6	36.7	6.9	2.7	8.	48.4	40.4	21.1	10.8	1800	33.5	3500
JAT 3/7-13	14.8	3.2	2.5		24.3	18.3	9.9	8.6	800	7.8	1500
JAT 4/2-3	61.6		3.5	12.	78.1	66.1	34.3	16.0	3700	100.0	7000
JAT 4/4-6	50.	6.9	2.7	10.	64.4	54.4	28.1	14.0	2750	9.0	4750
JAT 4/7-13	20.4	3.2	2.5	8.	31.9	23.9	12.7	8.6	900	21.0	2500
JAT 5/2-3	78.6	9.	3.5	16.	99.1	83.1	42.8	18.0	5000	190.0	10000
JAT 5/4-6	64.7	6.9	2.7	16.	84.4	68.4	35.1	14.0	3700	115.0	7000
JAT 6/2-3	95.6		3.5	20.	120.1	100.1	51.3	20.0	6600	287.0	14000
JAT 6/4-6	78.7	6.9	2.7	18.	100.4	82.4	42.1	18.0	4700	173.0	12000
JAT 6/7-13	31.6	3.2	2.5	10.	45.1	35.1	18.3	8.6	1600	31.0	2800
JAT 8/7-13	42.8	3.2	2.5	10.	56.3	46.3	23.9	10.8	2200	55.0	4800
JAT 10/7-13	54.0	3.2	2.5	10.	67.5	57.5	29.5	12.8	3200	94.0	8500
JAT 12/7-13	65.2	3.2	2.5	12.	80.7	68.7	35.1	12.8	4000	127.0	11000

VHF Batwing Antenna

The JAMPRO Batwing antenna has many construction features making it outstanding for the VHF broadcaster.

The entire structure, pole and batwings are hot-dipped galvanized for long life and reliable contact at important current carrying points. This means unchanging operation over the years for JAMPRO batwing antennas. Trouble free service is a trademark for JAMPRO antennas.

All connections are bolted. Not the batwings alone, but the fanners also. Securely bolted at these vital current points. Berrylium copper is used for strength and resistance to wind and weather. They are backed by soldered brass reinforcing at all bolted points, also.

At JAMPRO Antennas the entire antenna is assembled and tuned before shipment. There is no question about its performance. It has been thoroughly checked, range tested before shipment.

Directional batwings are a custom design feature at JAMPRO. Ask for details.

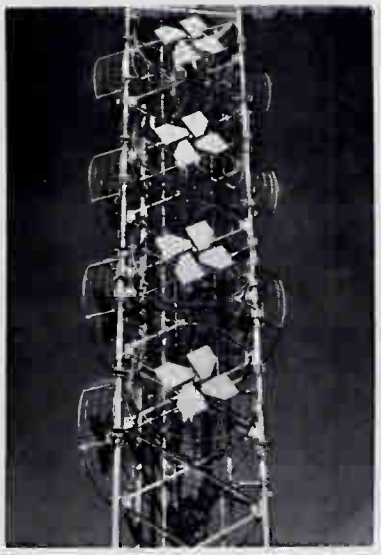
Beam tilt and null fill to your specifications is available without additional cost. Antennas may be mounted by bury into your tower top, or they may be flange mounted on the top plate. Check at the factory with your design specs for the antenna of your choice.

JAMPRO provides batwing reharness kits and service, also.

Power Gain Chart vs. Channel

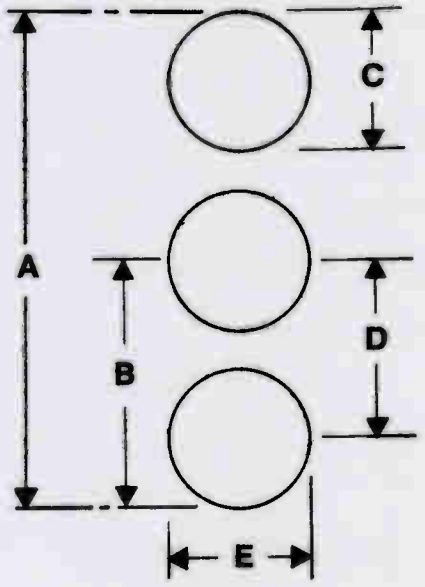
Channel	2	3	4	5	6	7	8	9	10	11	12	13
JAT 2/	1.9	2.1	1.9	2.1	2.2	2.1	2.1	2.2	2.2	2.2	2.3	2.4
JAT 3/	2.9	3.1	2.9	3.1	3.3	3.1	3.1	3.2	3.2	3.2	3.2	3.3
JAT 4/	4.0	4.1	4.0	4.2	4.4	4.1	4.1	4.2	4.2	4.2	4.2	4.3
JAT 5/	5.1	5.3	4.9	5.3	5.4							
JAT 6/	6.0	6.2	6.1	6.5	6.6	6.2	6.3	6.7	6.7	6.8	6.8	6.9
JAT 8/						7.8	7.9	8.3	8.4	8.4	8.3	8.3
JAT 10/						9.9	10.1	10.5	10.7	10.5	10.3	10.3
JAT 12/						11.9	12.2	12.6	12.9	12.6	12.3	12.2

HYBRID Broadband Panel Antenna Circular Polarization or Horizontal Polarization



* Pat. App. For and Accepted.

FOR
FM
AND
TV



The JAMPRO BROADcaster* is a major step ahead in broadband panel antennas. It features a new spiral design dipole which has a low uniform impedance across a 23 percent bandwidth, covering the entire FM band, or CH-7 through CH-13.

The flat response of its new dipole means that now uniform pattern and a low axial ratio are available to all stations using a community antenna — whether at center band or near the band edges. Many other exclusive features are offered in this antenna for FM or Television. Options include full radomes, directional design, high or low power interbay harness and split antennas. Ask JAMPRO for details.

NO. OF BAYS:	1								
CPOL Gain	0.5	1.0	1.5	2.1	2.7	3.2	4.4	5.7	6.8
CP Gain, dB	-3.01	0.0	1.76	3.22	4.31	5.05	6.43	7.56	8.33
HPOL Gain	1.0	2.0	3.0	4.2	5.4	6.4	8.8	11.4	13.6
HP Gain, dB	0.0	3.01	4.77	6.23	7.32	8.06	9.44	10.57	11.34
PHYSICAL DIMENSIONS									
CH-2 or -3									
A - Overall Height, Ft.	10.5	23.5	36.5	49.5	62.50	75.5	101.5	127.5	153.5
B - Center Radiation, Ft.	5.25	11.75	18.25	24.75	31.25	37.75	50.75	63.75	76.75
CH 4 - 5 - 6									
A - Overall Height, Ft.	8.25	18.25	28.25	38.25	48.25	58.25	78.25	98.25	118.25
B - Center Radiation, Ft.	4.13	9.13	14.13	19.13	24.13	29.13	39.13	49.13	59.13
FM-88 to 108 MHz									
A - Overall Height, Ft.	6.5	14.5	22.5	30.5	38.5	46.5	62.5	78.5	94.5
B - Center Radiation, Ft.	3.25	7.25	11.25	15.25	19.25	23.25	31.25	39.25	47.25
CH 7 - 13									
A - Overall Height, Ft.	3.25	7.25	11.25	15.25	19.25	23.25	31.25	39.25	47.25
B - Center Radiation, Ft.	1.63	3.63	5.63	7.63	9.63	11.63	15.63	19.63	23.63

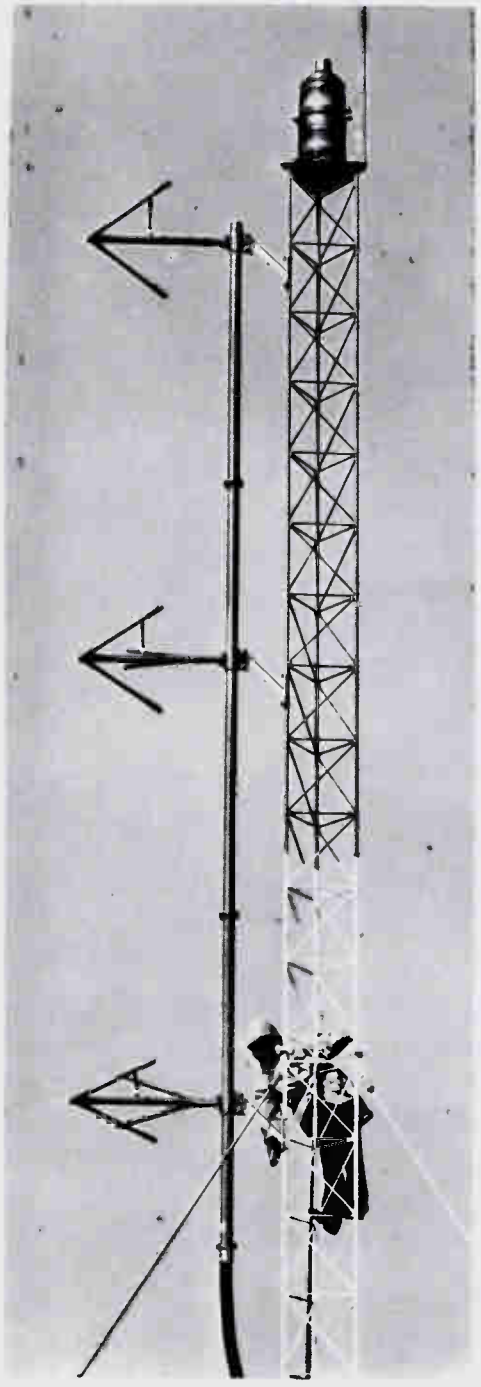
	(C) Cavity Diam.	(D) C-C Spacing	(E) Tower Face
CH-2 or -3	10.5 Ft.	13.0 Ft.	10.0 Ft.
CH 4 - 5 - 6	8.25	10.0	8.0
FM	6.5	8.0	6.0
CH 7 - 13	3.25	4.0	3.0

JSCP Series B FM Broadcast Antennas

- 40 KW Antenna System for four bays or more. 10 KW per bay, four bays or less.
- Excellent Performance for Stereo, SCA and Quadraphonic Broadcasting
- VSWR, wide Bandwidth
- Rugged Mechanical Construction and Mounting
- Clean design for low windload
- True Circular Polarization
- Two-Year Material and Workmanship Warranty
- Factory-Tuned on a "Customer" Structure
- Many Custom Options Available
- Special RFR models with half wave spacing

Ask about the JSLP Series. Same Radiating Element on a 10KW 1 5/8" Support Line or a JHCP for Brute Power on a 6 1/8" Line.

JSCP "PENETRATOR"



Pat. No. 3,541,570

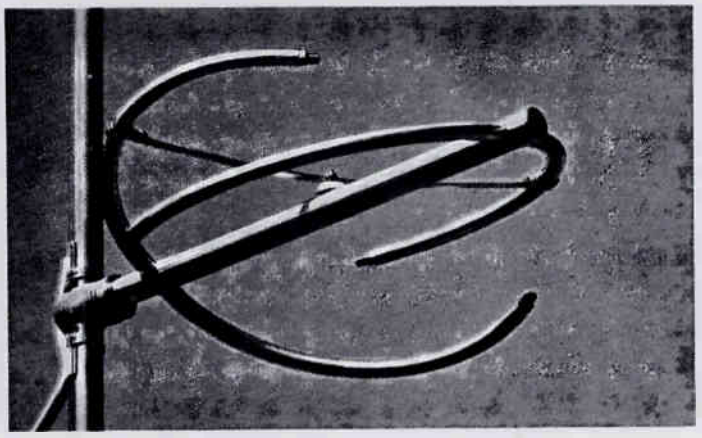
Type No. Bays	Power Gain Ratio	Gain in dB	Net Weight With Mounting Brackets	Windloads At 50/33 PSF (112 mph/180 kmh) With Mounting Brackets
JSCP-1	0.46	-3.37	25 lbs.	48 lbs.
with deicers			34 lbs.	57 lbs.
with radomes			55 lbs.	128 lbs.
JSCP-2	1.0	0.0	125 lbs.	195 lbs.
with deicers			143 lbs.	219 lbs.
with radomes			185 lbs.	355 lbs.
JSCP-3	1.5	1.76	199 lbs.	320 lbs.
with deicers			225 lbs.	368 lbs.
with radomes			289 lbs.	560 lbs.
JSCP-4	2.1	3.22	274 lbs.	443 lbs.
with deicers			308 lbs.	516 lbs.
with radomes			394 lbs.	763 lbs.
JSCP-5	2.7	4.31	350 lbs.	568 lbs.
with deicers			393 lbs.	664 lbs.
with radomes			500 lbs.	968 lbs.
JSCP-6	3.2	5.05	498 lbs.	730 lbs.
with deicers			506 lbs.	851 lbs.
with radomes			678 lbs.	1210 lbs.
JSCP-7	3.8	5.80	532 lbs.	854 lbs.
with deicers			591 lbs.	999 lbs.
with radomes			742 lbs.	1414 lbs.
JSCP-8	4.3	6.34	609 lbs.	979 lbs.
with deicers			677 lbs.	1148 lbs.
with radomes			849 lbs.	1619 lbs.
JSCP-9	4.9	6.90	713 lbs.	1122 lbs.
with deicers			796 lbs.	1316 lbs.
with radomes			1025 lbs.	1842 lbs.
JSCP-10	5.5	7.40	774 lbs.	1265 lbs.
with deicers			859 lbs.	1483 lbs.
with radomes			1074 lbs.	2065 lbs.
JSCP-12	6.6	8.20	929 lbs.	1514 lbs.
with deicers			1032 lbs.	1780 lbs.
with radomes			1289 lbs.	2475 lbs.
JSCP-14	7.8	8.92	1051 lbs.	1760 lbs.
with deicers			1158 lbs.	2077 lbs.
with radomes			1473 lbs.	2885 lbs.
JSCP-16	8.9	9.49	1175 lbs.	2010 lbs.
with deicers			1285 lbs.	2375 lbs.
with radomes			1657 lbs.	3295 lbs.

JBCP FM Antenna

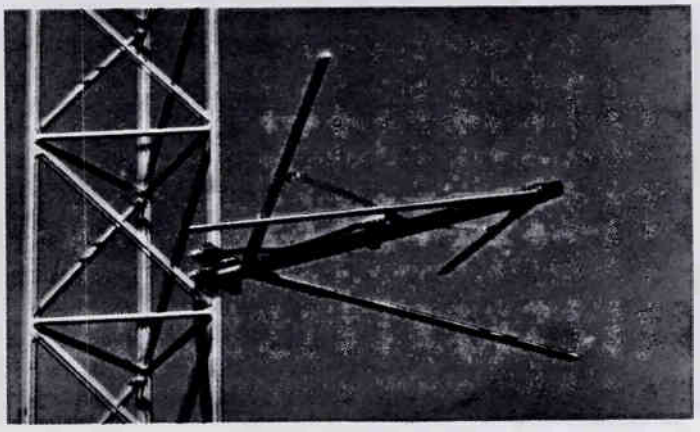
The model JBCP antenna, manufactured by JAMPRO Antennas, is a circularly polarized FM antenna designed for applications requiring relative insensitivity to icing along with high antenna input power. The antenna elements are fabricated of high strength thick wall brass and copper with a 3⅛ inch outside diameter. The JBCP antenna will handle up to 40 KW per bay and up to 120 KW per system, depending upon the number of bays, shunt line size and input connector.

VSWR Rating

The JBCP antenna is inherently broadband, using an internal pressurized feed system. VSWR is 1.07 to 1 plus or minus 200 KHz of carrier with field tuning; deicers are not normally required, as the typical VSWR is 1.4 to 1 or better with up to ½ inch of radial ice. The individual radiating elements may be field tuned for best VSWR. The VSWR at the antenna input without field tuning will be 1.1 to 1 or less when side mounted on a tower.



JAMPRO JLCP Series-2 FM Broadcast Antennas



JAMPRO JLLP FM Broadcast Antennas

Two Low Power Models

Count on JAMPRO Antennas to provide the low power broadcaster with high quality, truly circularly polarized antennas. The JLCP Series-2, pictured here (top), gives the Class-A station several good choices. Power rating is 3 KW per bay or maximum 7.5 KW above two bays. Standard or radome cover is provided if needed. The JLLP series elements are cable fed from a central power divider. This is rated 1 KW per bay and provided as a standard antenna or with deicers. It makes a good system for a low power station, or try it for an inexpensive standby antenna! Call for specifications or other details.

- Circular Polarization
- Factory tuned on a "Customer" Structure
- Custom Options Available
- Two-Year Material and Workmanship Warranty

TELEVISION CORNER REFLECTOR

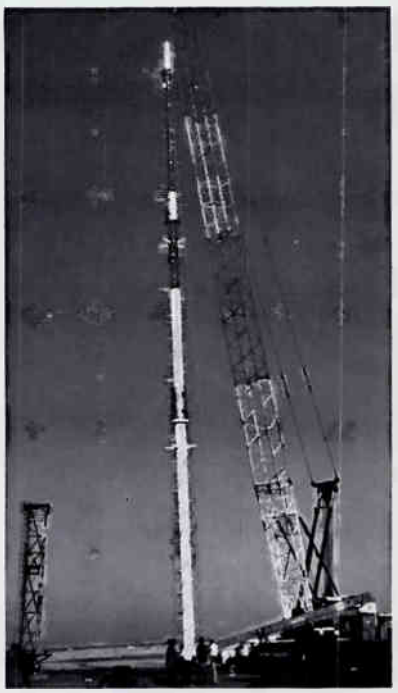
The JAMPRO model JCR antenna is a building block system that may be adapted to a great variety of needs. Mainly supplied for high band VHF use, it is also custom made to lower or higher channels. Unit gain is 6.1 or 8.0 dB and four at right angles give good omni-directional coverage. They may be stacked in a variety of ways to produce high gain directional patterns. Ask factory sales for computed patterns and a quotation with full details.

* RUGGED KNOCK-DOWN CONSTRUCTION
* HOT DIPPED GALVANIZED
* PRESSURIZED DIPOLE
* COMPUTER DESIGNED PATTERNS
* TWO YEAR WARRANTY

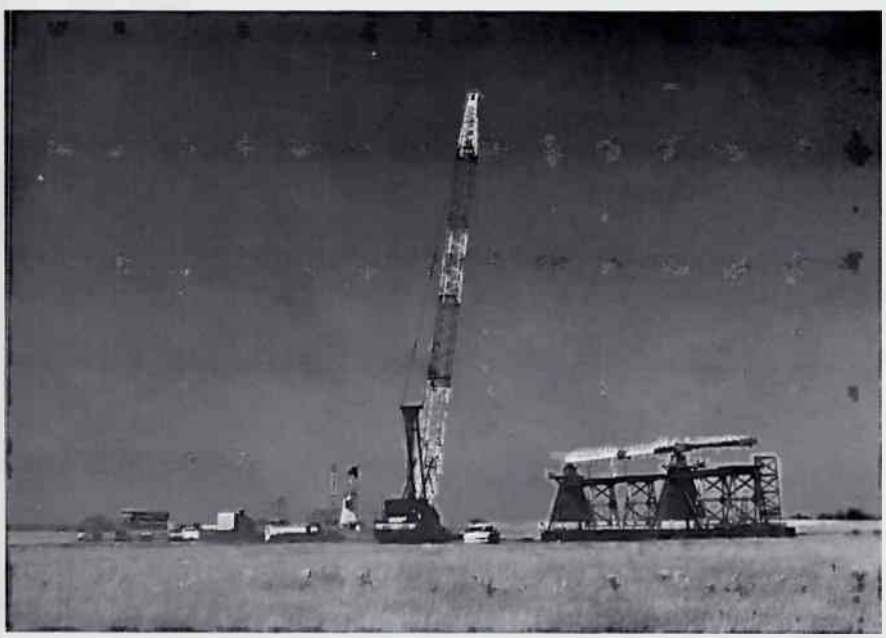
JAMPRO ANTENNA RANGE

The final proof of antenna design is actual operation at the station. JAMPRO provides the step ahead of that which checks design by full scale measurement on its 7,000 foot antenna range. Modern equipment by Scientific-Atlanta and Hewlett-Packard plus automated hydraulic turntables makes accurate testing of large and small antennas routine.

120 foot long turntable
pictured with Channel 3 Spiral



Vertical mounting of antenna facilitates azimuth check as well as vswr and other tests.



Several turntables makes possible simultaneous measurements along with other checks.

FM Directional Antennas

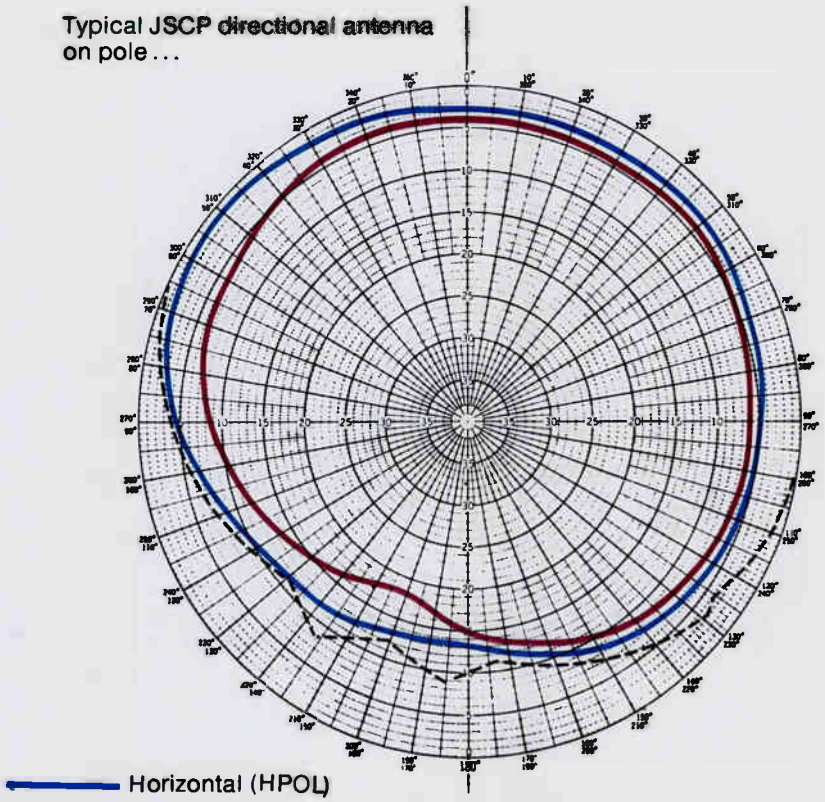
FCC (DA) directional antennas are created by JAMPRO ANTENNAS with any standard model antenna. Precisely placed parasitic elements are used to create desired nulls as required by protection limits. JAMPRO is highly qualified and experienced in the manufacture of successful full scale FCC directional antennas.

Manufacturer's certification is supplied following final work on the antenna. This is prepared for presentation directly to the FCC for final licensing of the antenna.

Directional antenna work is performed at full scale with exact tower duplication. Measurement on the modern and fully equipped JAMPRO 7,000 foot antenna range with single or multi-elements, as required.

Simple pattern measurement and pattern optimization available. Contact factory sales.

Typical JSCP directional antenna on pole . . .



Typical FCC (DA) Directional Antenna Relative Field in dB

JAMPRO Antennas has other products and services of interest to you

- VHF/UHF TV Corner Reflector Antennas
- FM Multi-Station Combiners & Filters
- Panel Antenna Systems for TV & FM
- VHF/UHF TV Notch Diplexers & Filters
- TV & FM Hybrids & DB Couplers
- Turnkey Installation, Tower & Antenna

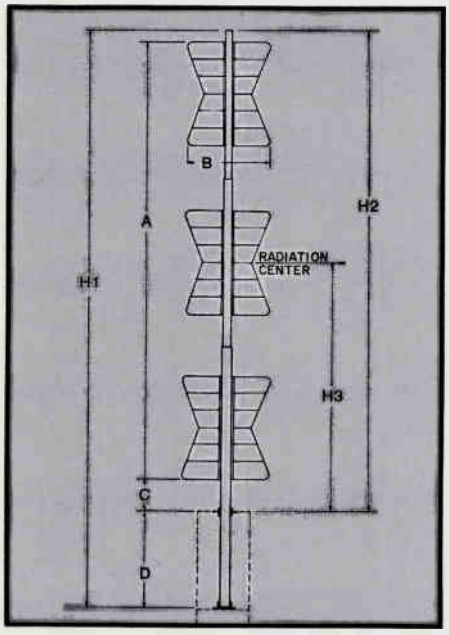
Custom antennas designed for high windload areas
Medium power UHF slot antennas

JAMPRO Antennas warrants to all original purchasers that new products shall be free from defects in material and workmanship for twenty four months after date of delivery. A full statement of these terms can be had upon request.

JAMPRO ANTENNAS INC.

6939 Power Inn Road, Sacramento, California 95828
(916) 383-1177 Telex: 377321
Fax: (916) 383-1182

JAMPRO Model JAT VHF Batwing Antenna



- **A** Ft. Antenna Aperture
- **B** Ft. Antenna Width
- **C** Ft. Clearance, tower top to batwing
- **D** Ft. Bury length*
- **H1** Ft. Overall pole length, includes bury
- **H2** Ft. Pole length above tower top
- **H3** Ft. Center radiation above tower
- **E** In. Pole dia. at tower top
- **F** Lbs. Wind force at radiation center
- **G** KIP FT. Overturn moment, tower top
- **H** Lbs. Weight of complete antenna
- * No bury section if ant. flange mount

Deicers:	CH 2-3	3 KW per bay
	CH 4-6	2 KW per bay
	CH 7-13	0.8 KW per bay
Voltage:	120 volts	Special deicer requirements
	To ground	available. Contact factory

MECHANICAL DATA 50/33 psf, no ice

	A	B	C	D*	H1*	H2	H3	E	F	G	H*
JAT 2/2-3	27.6	9.	3.5	6.	38.1	32.1	17.3	8.6	1600	29.0	2150
JAT 2/4-6	22.7	6.9	2.7	6.	32.4	26.4	14.1	7.6	1400	16.5	1650
JAT 2/7-13	9.2	3.2	2.5		18.9	12.9	7.1	6.6	700	4.0	1000
JAT 3/2-3	44.6	9.	3.5	8.	57.1	49.1	25.8	11.8	2600	54.0	4600
JAT 3/4-6	36.7	6.9	2.7	8.	48.4	40.4	21.1	10.8	1800	33.5	3500
JAT 3/7-13	14.8	3.2	2.5	6.	24.3	18.3	9.9	8.6	800	7.8	1500
JAT 4/2-3	61.6	9.	3.5	12.	78.1	66.1	34.3	16.0	3700	100.0	7000
JAT 4/4-6	50.7	6.9	2.7	10.	64.4	54.4	28.1	14.0	2750	69.0	4750
JAT 4/7-13	20.4	3.2	2.5	8.	31.9	23.9	12.7	8.6	900	21.0	2500
JAT 5/2-3	78.6	9.	3.5	16.	99.1	83.1	42.8	18.0	5000	190.0	10000
JAT 5/4-6	64.7	6.9	2.7		84.4	68.4	35.1	14.0	3700	115.0	7000
JAT 6/2-3	95.6		3.5	20.	120.1	100.1	51.3	20.0	6600	287.0	14000
JAT 6/4-6	78.7	6.9	2.7	18.	100.4	82.4	42.1	18.0	4700	173.0	12000
JAT 6/7-13	31.6	3.2	2.5	10.	45.1	35.1	18.3	8.6	1600	31.0	2800
JAT 8/7-13	42.8	3.2	2.5	10.	56.3	46.3	23.9	10.8	2200	55.0	4800
JAT 10/7-13	54.0	3.2	2.5	10.	67.5	57.5	29.5	12.8	3200	94.0	8500
JAT 12/7-13	65.2	3.2	2.5	12.	80.7	68.7	35.1	12.8	4000	127.0	11000

JAMPRO ANTENNAS, INC.

Excellence In Antennas

Jampro Antennas 6939 Power Inn Road, P.O. Box 28425, Sacramento, Ca 95828 (916) 383-1177 Telex: 377321

The JAMPRO VHF-TV Batwing Antenna Model JAT

- Available for all US and CCIR VHF Channels
- Hot dipped galvanized before assembly
- Semi flexible smooth copper interbay lines
- Assembled and range measured before shipping
- Beam tilt and null fill as specified
- Two year warranty

The Jampro Batwing has many outstanding features that mean great value to today's broadcaster.

The entire structure, pole and batwings, are hot-dipped galvanized before assembly. This is important not only for long life, but also means reliable contact at important current carrying points. High strength beryllium copper with soldered brass terminal material is used for fanner straps. All connections in a JAMPRO Batwing are bolted. No hose clamps in these vital places.

Add complete assembly, tuning and range measurement of your antenna before shipping and you see why there's no questions about its performance.

Directional batwings are a custom feature, also batwing reharness kits are available for any antenna from JAMPRO. Call for details.

Power Gain Chart vs. Channel

Channel	2	3	4	5	6	7	8	9	10	11	12	13
JAT 2/		2.1	1.9	2.1			2.1	2.2		2.2	2.3	2.4
JAT 3/										3.2	3.2	3.3
JAT 4/						4.1	4.1			4.2	4.2	4.3
JAT 5/												
JAT 6/										6.8	6.8	6.9
JAT 8/										8.4	8.3	8.3
JAT 10/										10.5	10.3	10.3
JAT 12/						11.9	12.2			12.6	12.3	12.2

Jampro Antennas 6939 Power Inn Road, P.O. Box 28425, Sacramento, Ca 95828 (916) 383-1177 Telex: 377321

CIRCULARLY POLARIZED FM ANTENNAS

JAMPRO ANTENNA COMPANY
Subsidiary of Computer Equipment Corporation

FEATURES

RADIATES TRUE CIRCULAR POLARIZATION

CHOICE OF SHUNT OR PARALLEL FEEDS

ADJUSTABLE POLARIZATION POWER RATIOS

EXCELLENT PATTERN CIRCULARITIES

LOW WIND LOADING AND DEAD WEIGHT

HIGH POWER HANDLING CAPABILITY

MORE SIGNAL INTO HOME FM RECEIVERS

RUGGED MECHANICAL CONSTRUCTION

LOW Q AND EXCELLENT VSWR BANDWIDTH

COMPUTER EQUIPMENT CORPORATION
subsidiaries with broadcast products include:

JAMPRO ANTENNA COMPANY
(TV and FM antenna systems)
6939 Power Inn Road
Sacramento, California 95828

JAMPRO de MEXICO, S. A.
(Mexico — Latin America Sales Office)
Genova, 20
Mexico City 6, D. F. Mexico

SPARTA ELECTRONIC CORPORATION
(Professional Broadcast Audio Products)

BAUER TRANSMITTING PRODUCTS
(AM and FM Broadcast Transmitters)
5851 Florin Perkins Road
Sacramento, California 95828

VEGA ELECTRONICS CORPORATION
(Wireless Mikes, Tone Signaling Products)
2115 De La Cruz Blvd.
Santa Clara, California 95050

JAMPRO CIRCULARLY POLARIZED FM ANTENNAS

TRUE CIRCULARLY POLARIZED FM ANTENNA

The best state of the art FM transmitting antenna, the JAMPRO CP*, is now available. Producing circular polarization, the JAMPRO CP provides improved reception for car radios and for home receivers using built-in or line-cord antennas.

In the past, dual polarization has been used, produced by the use of separate vertical and horizontal antennas, or by the use of vertical stubs on ring type antennas. Circularly polarized transmitting antennas have the advantage of assuring reception with any logical orientation of linear receiving antennas.

In addition to providing the technically superior circular polarization in all directions of azimuth, the construction of the JAMPRO CP antenna results in less complex installation requirements and lower wind loading and net weight. Also, the JAMPRO CP antenna produces excellent radiation patterns when side mounted on a tower.

CHOOSE BETWEEN SHUNT OR PARALLEL FEEDS

Now choose between two time proven feed systems. Only JAMPRO, manufacturers of FM and TV antennas, and other peripheral equipment, offers you this choice.

DIRECT ENGINEERING SERVICES

Jampro antenna engineers are available for direct assistance with any antenna problem.

LOW PRICE — QUICK DELIVERY

The CP antenna is designed for highest performance at the lowest price. Customized service for fast delivery.

JAMPRO JSCP 3 bay shunt fed antenna using 3⅛″ rigid line. Note deicer cables.

* Patented in the U.S. Other patents pending.

JAMPRO CIRCULARLY POLARIZED FM ANTENNAS

DESIGN

These circularly polarized FM antennas consist of four quarter wave arms, which form the four sides of a square. The square has two hot and two cold sides. The feed system is such that the radiation is in 90 degree phase quadrature. When the square is flat and parallel to the ground, nearly 100 percent of the radiation is horizontally polarized. The construction permits the two opposite corners of the square to be rotated. When the angle between the opposite corners is 45 degrees, 50% of the radiation is horizontally polarized and 50% is vertically polarized.

When the angle is less than 45 degrees, there is more horizontally polarized radiation than vertically polarized. This change of angle, and the ratio of the horizontal to vertical polarized radiation is unique with JAMPRO CP antennas.

RUGGED CONSTRUCTION

These JAMPRO CP antennas are made of thick wall brass tubing. They will not be bent out of shape during installation, high winds or ice loads. The four quadrant arms are 1 inch in diameter while the center support tube is 2 inches. The thick brass metal used provides protection against corrosive atmospheres.

In the shunt fed types, the element is terminated in a 1⅝" EIA flange. This flange is welded with a process which does not reduce the strength of the brass. In the parallel feed types, the basic element is fed through an LC female connector which is an integral part of the element. The element is supported and mounted to the tower by a galvanized steel bracket.

Mounting hardware made specifically to mount these antennas to the tower is supplied. The mounting brackets are chosen to provide the best radiation pattern from the particular tower used. Both the shunt and parallel fed elements permit dry air pressurization up to the teflon feed points.

ANTENNA MOUNTING

Galvanized steel mounting brackets with stainless steel hardware are furnished with these antennas. They may be mounted on the faces of towers, or on the legs. On special order, a pole can be furnished to mount on top of a tower or building. If a tapering self supporting tower is to be used, JAMPRO will furnish extensions for vertical alignment, at slight additional cost.

FACTORY TESTS:

During mechanical fabrication, continuous quality control checks are made to insure conformity to rigid standards.

After fabrication, the antenna system is mounted on a tower similar to that to be used by the customer. The horizontal to vertical power gain ratios are then adjusted to meet the purchase order specifications. After this, the VSWR of the system is adjusted and a VSWR plot taken. A complete instruction book containing step-by-step installation instructions, mounting sketch, de-icer wiring information, and a final measured VSWR plot, is included with each antenna system shipped.

FEED SYSTEMS

The JAMPRO CP antenna is available in two different types of inter-bay feed systems — The shunt and the parallel types.

The broadcaster has the choice between either of these types of feed systems, both of which have proven themselves in over 20 years of service in literally hundreds of installations.

PARALLEL

The parallel feed system uses separate feed cables from a power divider. Fourteen or less bays use a single power divider, while those with 15 to 20 bays use two power dividers in conjunction with a power splitter. The input is supplied with either a 3⅛″ or a 1⅝″ EIA connector, depending on the number of bays and power rating. The inter-bay feed cables are 50 ohm, and their length is such as to provide equal phase currents to all radiating elements. The antenna may be leg mounted without interference with tower guys, or may be face mounted.

The parallel feed system has some electrical advantages; the relative phase of all the radiating elements remains the same over the entire FM channel and presents a flatter transmitter load. The advantage of the shunt feed system is that it is mechanically simpler in construction and is easier to install. The antenna costs are identical.

SHUNT

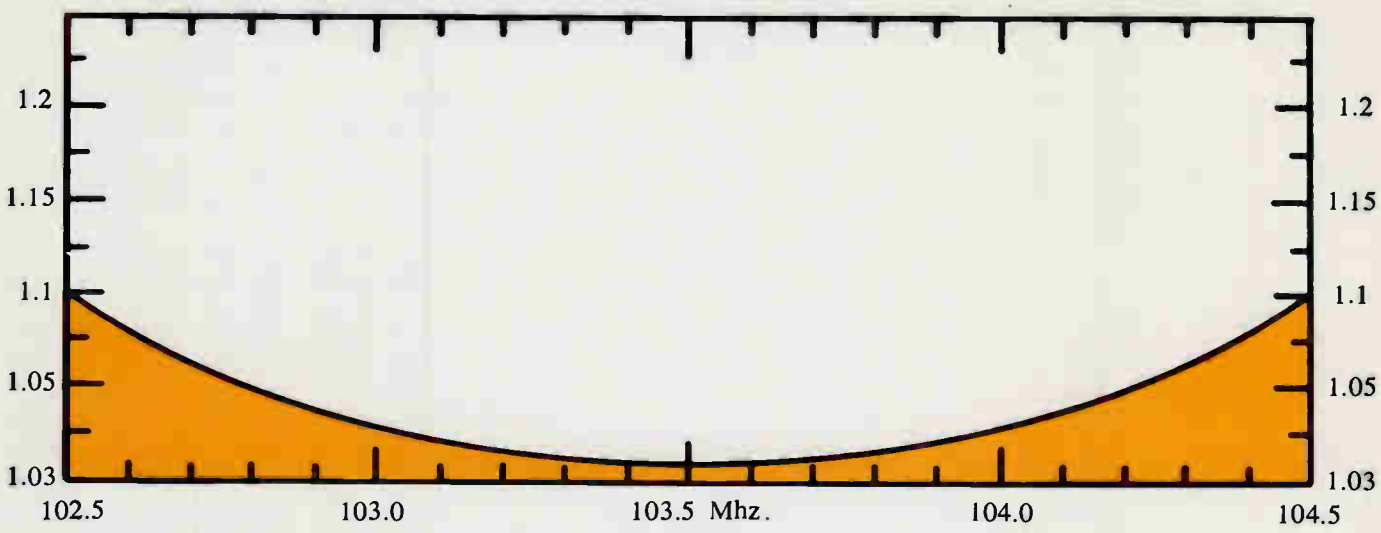
The shunt fed system uses a single vertical run of 3⅛″ line, across which are shunted the various bays, located approximately 10 feet apart. Of sectionalized construction, each section consists of one radiator and 10 feet of rigid coax line. The antenna input is 3⅛″ EIA flange, with adaptors available for other sizes. Antennas of 8 or less bays are fed from the bottom, while those with more than 8 bays are fed from the center using a power splitter to feed the upper and lower sections.

DEICING PROVISIONS

Where regular icing and sleet conditions prevail, deicing equipment is recommended as an accessory item. It must be ordered with the antenna. Electrical rod heaters are installed in the four quadrant arms, as well as in the center feed-support arm. Each radiating bay requires 500 watts of power, at 208/240 volts, AC. These heaters can be operated at 104/120 volts, AC for reduced deicing requirements.

The electrical deicers are insulated from the metal radiator, and meet all known US electrical codes. A waterproof pigtail, is brought out from the element support arm and connects to a bay junction box. An ice and sleet sensitive switch is furnished with a complete interbay wiring kit.

JAMPRO CIRCULARLY POLARIZED FM ANTENNAS



MEASURED VSWR TYPE JSCP-3 STATION KOST
MOUNT WILSON, LOS ANGELES, CALIF.

VERTICAL PATTERNS

The half power beamwidth of both the horizontal and vertical fields is a function of the number of bays in the antenna system. It is approximately equal to 61 divided by the number of bays. A six bay antenna has a half power vertical pattern of approximately 10 degrees. Where null fill-in is desirable, it may be furnished without additional cost in the parallel feed antenna. In the shunt feed antenna, a 10% additional charge is made for beam tilt of up to 1.5 degrees and or null fill-in of up to 15%.

HORIZONTAL PATTERN CIRCULARITY

The radiation pattern for side mounted antennas is subject to azimuthal distortion by the reflection effects from the steel tower. The JAMPRO CP antenna is not greatly affected, because the basic radiator is both physically and electrically large — more than three times larger than any competitive antenna. This large illuminating source reduces the effects of the supporting steel tower. Typical pattern circularities of $\pm$ 2 DB for both the horizontal and vertical fields have been measured with towers 15 to 48 inches wide.

ANTENNA SYSTEM VSWR

Good stereo performance requirements are met with a VSWR of 1.1 to 1 over a 400 kilocycle bandwidth! The basic element is low Q since two half waves consisting of four quarter wave arms are used. The VSWR is not affected by rain, fog, or even slight coating of ice. After installation, the elements may be trimmed for the lowest possible VSWR if desired. A digital tuning device is included in two of the quadrant arms to allow field trimming for the closest possible match to the customer's tower.

STEREO OPERATION

JAMPRO circularly polarized FM antennas have good VSWR over a 400 kilocycle band. The antenna load is non-reactive for all significant FM sidebands. This antenna does not introduce measureable crosstalk between left and right stereo channels.

RATIOS OTHER THAN 50/50

To determine the antenna size, simply add the required horizontal and vertical power gain ratios. Then choose the catalog antenna whose added gain equals or exceeds that required. For example, horizontal gain of 6.0 and vertical gain of 2.5 is required. (6.0 + 2.5 = 8.5) The catalog antenna is the 8 bay whose doubled gain is 8.6.

ANTENNA SPECIFICATIONS AND PRICES

JSCP TYPE — SHUNT FED SYSTEM WITH ONE VERTICAL 3⅛" LINE

JCP TYPE — PARALLEL FEED SYSTEM WITH ALL INTERBAY CABLES

TYPE NO. AND BAYS	POWER GAIN	GAIN IN DB	FIELD GAIN	FS @ 1 MILE 1 KW, Mv/M	NET WEIGHT	SAFE POWER RATING	WINDLOAD 50/33 PSF	PRICE ANTENNA
JSCP-1	0.46	—3.37	0.678	93.2	38.25	10.0 KW	70.5 LBS.	$ 1,200
JCP-1	0.46	—3.37	0.678	93.2	26.0	5.0 KW	57 LBS.	$ 1,200
JSCP-2	1.0	0.0	1.0	137.6	121.5	20.0 KW	225.0 LBS.	$ 1,800
JCP-2	1.0	0.0	1.0	137.6	80.5	10.0 KW	145.0 LBS.	$ 1,980
JSCP-3	1.5	1.76	1.23	168.4	192.75	30.0 KW	315.0 LBS.	$ 2,600
JCP-3	1.5	1.76	1.23	168.4	114.5	15.0 KW	223.0 LBS.	$ 2,860
JSCP-4	2.1	3.22	1.45	199.2	264.0	40.0 KW	405.0 LBS.	$ 3,400
JCP-4	2.1	3.22	1.45	199.2	148.0	20.0 KW	302.0 LBS.	$ 3,740
JSCP-5	2.7	4.31	1.64	225.2	335.25	40.0 KW	495.0 LBS.	$ 4,200
JCP-5	2.7	4.31	1.64	225.2	212.0	25.0 KW	391.0 LBS.	$ 4,620
JSCP-6	3.2	5.05	1.79	246.0	406.5	40.0 KW	588.0 LBS.	$ 4,900
JCP-6	3.2	5.05	1.79	246.0	251.0	30.0 KW	491.0 LBS.	$ 5,390
JSCP-7	3.8	5.80	1.95	268.0	477.75	40.0 KW	678.0 LBS.	$ 5,800
JCP-7	3.8	5.80	1.95	268.0	299.0	35.0 KW	592.0 LBS.	$ 6,380
JSCP-8	4.3	6.34	2.07	285.2	549.0	40.0 KW	768.0 LBS.	$ 6,400
JCP-8	4.3	6.34	2.07	285.2	337.0	40.0 KW	736.0 LBS.	$ 7,040
JSCP-10	5.5	7.40	2.35	322.4	701.5	40.0 KW	948.0 LBS.	$ 8,400
JCP-10	5.5	7.40	2.35	322.4	437.0	40.0 KW	903.0 LBS.	$ 9,240
JSCP-12	6.6	8.20	2.57	353.2	844.2	40.0 KW	1131.0 LBS.	$10,000
JCP-12	6.6	8.20	2.57	353.2	555.0	40.0 KW	1122.0 LBS.	$11,000
JSCP-14	7.8	8.92	2.79	383.9	986.7	40.0 KW	1314.0 LBS.	$11,700
JCP-14	7.8	8.92	2.79	383.9	671.0	40.0 KW	1348.0 LBS.	$12,870
JSCP-16	8.9	9.49	2.98	410.2	1129.2	40.0 KW	1494.0 LBS.	$13,000
JCP-16	8.9	9.49	2.98	410.2	831.0	80.0 KW	1930.0 LBS.	$14,300
JSCP-18	10.3	10.13	3.21	441.7	1277.7	40.0 KW	1677.0 LBS.	$15,000
JCP-18	10.3	10.13	3.21	441.7	914.5	80.0 KW	2090.0 LBS.	$16,500
JSCP-20	11.3	10.53	3.36	462.3	1414.2	40.0 KW	1860.0 LBS.	$17,000
JCP-20	11.3	10.53	3.36	462.3	982.9	80.0 KW	2395.0 LBS.	$18,700

1) Power gains are for 50/50 horizontally and vertically polarized ratios. Other ratios available.
2) Antenna polarization is circular clockwise, in all directions of azimuth.
3) Prices include complete galvanized mounting hardware for leg mounting on uniform guyed towers.
4) Brackets for face mounting or self supporting towers are extra. Prices on request.
5) Tower space required, in feet is 984 divided by freq. in MHz × number of bays less 1.
6) Antenna input location on JCP series is three feet below antenna array center.
7) Windload ratings are 50/33 PSF, 110 miles per hour.
8) Antenna weights include standard mounting hardware. Add 10 Lbs/bay for deicers.

WHEN ORDERING BE SURE TO SPECIFY

A. Antenna type number
B. Deicers, if any, add $180/bay
C. Channel, (between 88-108 Mhz)
D. Horizontal and vertical power gains
E. Description of tower — make and model
F. Beam tilt and null fill-in, if any

CIRCULARLY POLARIZED FM ANTENNAS

TV ANTENNAS

FM ANTENNAS

HARMONIC FILTERS

MILITARY ANTENNAS

NOTCH DIPLEXERS

VSB FILTERS

FILTERPLEXERS

JAMPRO

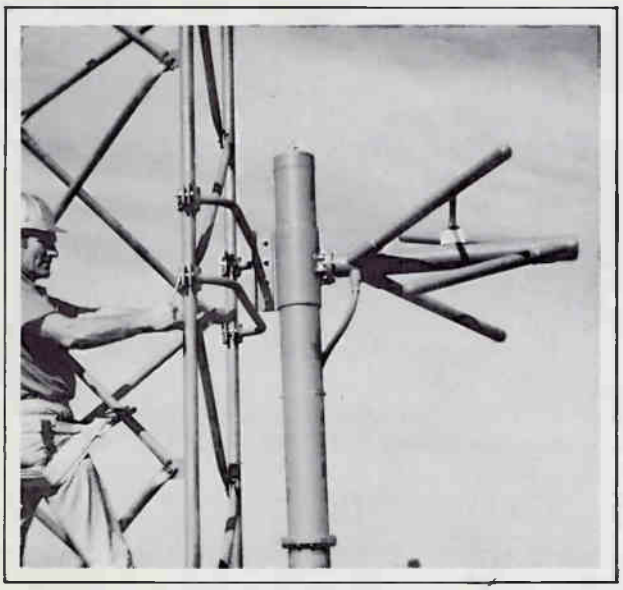
ANTENNA COMPANY
subsidiary of Computer Equipment Corporation
6939 POWER INN ROAD
SACRAMENTO, CALIF. 95828

JAMPRO
Subsidiary of Cetec Corporation
ANTENNA COMPANY
6939 POWER INN ROAD
SACRAMENTO, CALIFORNIA 95828
Phone: (916) 383-1177

CIRCULARLY POLARIZED

HIGH POWER

FM ANTENNAS



Typical tower face mounting

- **EXTREMELY HIGH POWER**
- **CORONA FREE OPERATION**
- **BEST VSWR BANDWIDTH**
- **LOWEST Q IN THE INDUSTRY**

DESCRIPTION Extremely high power capacity FM antennas are now available from Jampro. These are wide band, circularly polarized antennas, of the latest patented design.

They are conservatively rated **at 40 KW per bay,** with an upper limit of 80 KW.

POWER RATING The high power capacity is achieved by using a 6 1/8" EIA shunt fed line, with 3-1/8" individual bay feeds. Power is limited only by coax line power handling capacity.

Corona and high voltage arcing problems have been eliminated using very low "Q" radiating elements. This lowers the surface charge density over the radiating surface areas preventing corona at 40KW levels, even during rain or fog.

VSWR BANDWIDTH With the unique low Q design, the antenna has a single channel bandwidth of ±200 KHz 1.07/1 or better.

These antennas employ simple field adjustable tuning, for trimming VSWR during initial installation.

STANDBY ANTENNAS Because a single radiator will accept as much as 40 KW, they make excellent standby antennas. When pole mounted as shown, the azimuth circularity is better than ±0.5DB! These standby antennas can be mounted on top of buildings or other suitable supports, and are available with six foot long pipe stems.

DEICING Electrical deicing is sufficient for all ice conditions. Factory installed, these internal ice melting heaters operate on 220 volts, using one KW of power for each bay. A complete interbay kit is furnished for wiring the deicers of the antenna. Deicer control is an accessory, and available with a high-low cold sensing thermostat, with power relay.

Single bay 40KW standby antenna

RUGGED CONSTRUCTION ■ Made of high strength brass, with large diameters, these antennas will withstand the most severe weather conditions, and winds to 160 MPH. The unit construction permits easy installation. The main 6⅛" interbay shunt feed line is supported by a heavy casting at the element location. Air bleed valves and large teflon insulators are used where required. Internal transformers insure proportional power for each bay.

MOUNTING ■ The antenna is designed for installation on the sides of existing steel towers. Face, leg or leg-skewed mounting may be used. On special order Jampro will furnish suitable steel poles for mounting these antennas, on top of towers. Leg mounting or face mounting (illustrated) brackets are included with each antenna. Poles and pole mounting brackets are available as accessory items.

FEED POINT ■ These antennas are bottom fed thru the 6⅛" EIA input flange, for most models, including 6 bays. Antennas with 8, 10, 12 and 14 bays have their inputs six feet below the center of the antenna. The larger antennas have built in VSWR tuners for fine matching the antenna to the transmission line.

SPLIT ANTENNAS ■ These antennas can be supplied with an upper and lower half, in the six, eight, ten and twelve bay models. This method is currently used by nearly all European TV and FM stations. It provides 100% back up against transmitters, transmission line and antenna, permitting maintenance on one amplifier. It also eliminates the combiner in 40 KW transmitters. The upper half of the antenna is fed thru its own transmision line to one 20 KW amplifier. The lower half is fed in a similar manner. When one amplifier, line or antenna half is inoperative, there is only a 6 DB loss in signal.

RADIATION PATTERNS ■ The horizontal plane radiation pattern is typical of all side mounted CP polarized FM antennas. Horizontal polarization pattern circularities of ±2DB are normal for towers from 24 to 60 inches wide. If larger towers are to be used, Jampro pattern service is recommended. A mockup of the tower on which the antenna is to be installed, is made at the Jampro factory. This includes about 15 feet of the tower, with all ladders, lighting and other conduits, coax lines and other items in the antenna aperture. The pattern is measured, adjustments made to insure a useful final radiation pattern for omni or directional service requirements. Contact Jampro for this service.

The vertical plane pattern can be tailored to fit the service area. Beam tilt and null fill in are designed by Jampro engineers, using a computer. This service is available to Jampro customers without cost.

CIRCULARLY POLARIZED - HIGH POWER FM ANTENNAS

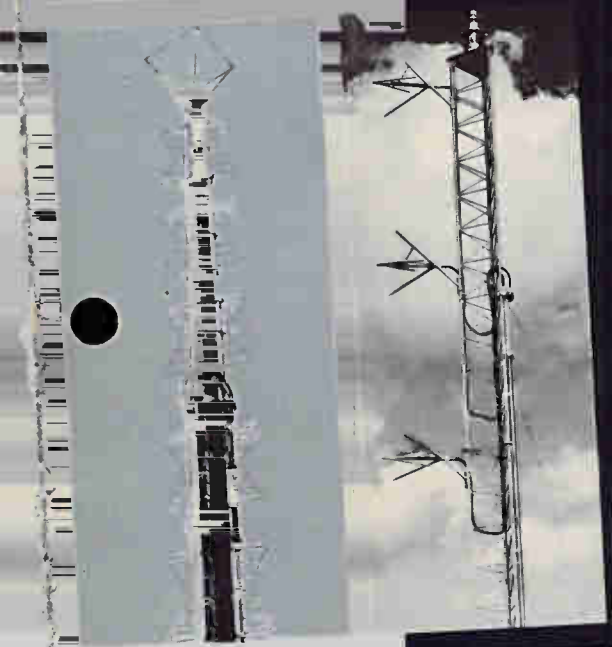
TYPE NO. AND BAYS	POWER GAIN	GAIN IN DB	FIELD GAIN	FS @ 1 MILE 1 KW, Mv/M	NET WEIGHT	SAFE POWER RATING	WINDLOAD 50/33 PSF	PRICE ANTENNA
JHCP-1	.46	-3.37	0.678	93.2	212 Lbs.	40 KW	269 Lbs.	$ 2,150
JHCP-2	1.0	0	1.0	137.6	425 Lbs.	60 KW	540 Lbs.	$ 4,300
JHCP-3	1.6	1.98	1.25	172.	634 Lbs.	60 KW	806 Lbs.	$ 6,400
JHCP-4	2.1	3.30	1.46	201.	1007 Lbs.	80 KW	1254 Lbs.	$ 8,900
JHCP-5	2.7	4.35	1.65	227.	1167 Lbs.	80 KW	1460 Lbs.	$10,750
JHCP-6	3.3	5.20	1.82	250.	1320 Lbs.	80 KW	1662 Lbs.	$12,450
JHCP-7	3.9	5.90	1.97	271.	1540 Lbs.	80 KW	1970 Lbs.	$14,850
JHCP-8	4.5	6.50	2.11	291.	1758 Lbs.	80 KW	2245 Lbs.	$16,400
JHCP-10	5.7	7.53	2.38	328.	2202 Lbs.	80 KW	2827 Lbs.	$20,500

1. Antenna polarization is circular clockwise, in all directions of azimuth; 2. Price includes complete galvanized mounting hardware for leg or face mounting on uniform cross section towers; 3. Brackets for tapered self-supporting towers are extra. Prices on request; 4. Tower space required, in feet is 984 divided by frequency in MHz x number of bays less 1; 5. Antenna input on 1 thru 6 bays at base of antenna. Inputs on 7 thru 14 bays are located six feet below the center of the antenna; 6. Windload ratings are 50/33 PSF, 110 miles per hour; 7. Antenna weights include standard mounting hardware. 8. Special single bay standby antenna, pole mounted as illustrated, model JHCP-1S, 4 inch pipe, 3-1/8 inch input, $2,500.

ORDERING INFORMATION

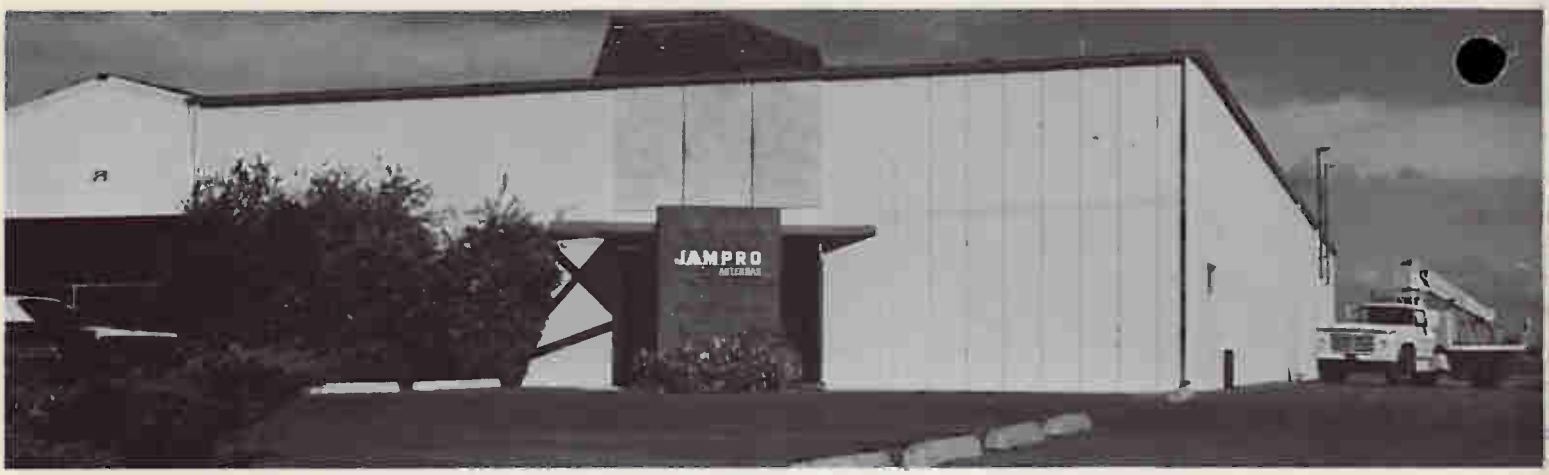
A) Antenna type number. B) Deicers, add $340 for complete kit, per bay. C) Deicer control $395 per antenna. D) Channel (between 88-108 MHz). E) Description of tower, make and model. F) Cost of beam tilt and/or null fill included. G) Taper—adaptors, 6 1/8" to 3 1/8" inputs are $340 each. H) Add $750 for radomes, per bay.

SHORT FORM CATALOG



BROADCASTING ANTENNAS

JAMPRO



ABOUT JAMPRO

We at Jampro take pride in offering this short form catalog of some of our products, so that you may know of our capabilities. We are specialists in three major fields. These are TV and FM broadcasting antennas, and associated components. These include filterplexers, harmonic filters, notch diplexers, switches and other devices used between transmitters, and antennas.

Jampro Antenna Company is dedicated to the design and manufacturing of antennas and associated equipment. Our staff includes antenna design engineers with television and radio broadcasting backgrounds. These people are aware of the extremely high reliability demanded by today's broadcaster. Jampro is a subsidiary of Computer Equipment Corporation, with divisions in the United States and Europe. CEC stock is actively traded on the American Stock Exchange. Other CEC Subsidiaries include Sparta Electronic Corporation (broadcast — audio equipment), Bauer (FM and AM transmitters) and Vega (wireless microphones).

COMPUTER DESIGN

The Jampro in-house computer terminal provides rapid antenna designs. Vertical and horizontal radiation patterns are programmed and checked with fast print outs. Trained Jampro engineers save many man hours, using the computer, to design antennas and RF networks to exacting requirements.

TURNKEY INSTALLATION

Jampro designs, manufactures and installs complete transmitting packages. This includes antennas, towers, transmission lines, diplexers, as well as AM, FM and TV transmitters. The Jampro worldwide installation service is available with factory supervisory personnel.

JAMPRO

A Division of Computer Equipment Corporation
6939 Power Inn Road
Sacramento, California 95828, U.S.A.
Telephone (916) 383-1177 • Telex 377-321

JAMPRO

ANTENNAS FOR UHF TELEVISION BROADCASTING

DESCRIPTION

The popular Jampro Zig Zag antenna consists of a number of panels arranged around a steel supporting tower. Each panel may be treated as a separate unit of the antenna. Great flexibility of horizontal patterns and vertical patterns is available. The antenna can be custom made for each coverage requirement at great savings in price over a slot, dipole or side fire helical antenna.

BASIC RADIATING ELEMENT

The element of the zig zag panel consists of 16 linear radiators, each a half wavelength long and arranged in a zig zag form, hence the name.

SINGLE PANEL CONSTRUCTION

The Jampro series of UHF zig zag antennas are made in modular units, consisting of a series of panels and feed systems. Various configurations of panels and feeds result in different patterns and gains. The panel consists of a rugged steel frame, with a heavy gauge plate reflector. The entire assembly is hot dip galvanized after fabrication, not only for corrosion resistance, but also for electrical purposes.

POWER GAINS

Extremely high gains are available from zig zag antennas, due to their nearly perfect aperture current illumination. The eight wavelength vertical aperture is most desirable to reduce the number of feed points. Omni gains to 48 and higher directional gains are readily available.

COMPUTERIZED PATTERNS

To facilitate pattern computations, two different computer programs are used. More than a thousand vertical patterns have been plotted. Jampro offers an exclusive service to consultants and chief engineers who want a computerized breakdown of vertical and horizontal plots.

FEATURES

Rigid radomes, essentially transparent to the RF energy are available for ice protection. Radomes protect the antenna elements from falling ice as well as electric VSWR detuning. A central 6-1/8" rigid coaxial line runs up the center of all omnidirectional antennas. High power antennas are split fed, with a choice of 50, 60 or 75 ohms input impedance. Directional antennas, consisting of a number of panels may be side mounted to existing towers, or mounted on pole supports furnished by Jampro. Panels may also be side mounted on suitable square faced towers for omnidirectional patterns. All Jampro zig zag antennas are completely fabricated, assembled, adjusted and pattern range tested, prior to shipping.

TYPICAL JAMPRO UHF OMNIDIRECTIONAL ANTENNAS

TYPE No.	Bays	Gain	Max. Input Power
JZZ-1-OB	1	8.0	40 KW
JZZ-2-OB	2	16.0	60 KW
JZZ-3-OB	3	24.0	60 KW
JZZ-4-OB	4	32.0	120 KW
JZZ-5-OB	5	40.0	120 KW
JZZ-6-OB	6	48.0	120 KW

JZZ-5-OB ANTENNA

JAMPRO

ANTENNAS FOR VHF TELEVISION

FCC CHANNELS 2-13 • CCIR BANDS I and III
POPULAR TURNSTILE DESIGN • POWER RATINGS TO 100 KW
WIDE VARIETY OF GAINS • BEAM TILTING AND NULL FILL AVAILABLE

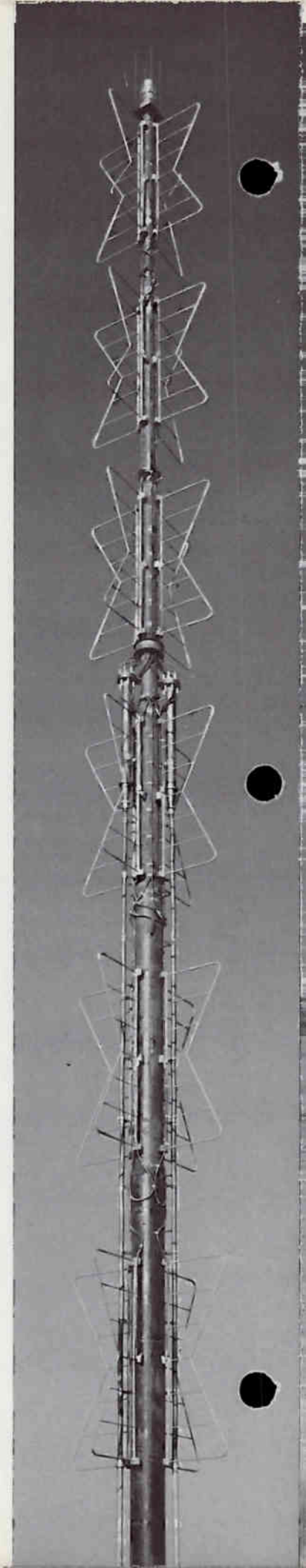
DESCRIPTION

The JAMPRO JAT series of VHF low and high channel antennas feature time proven superturnstile design to radiate high power television signals on FCC channels 2-13. These superturnstile antennas are of time proven design with excellent horizontal pattern circularity. A simple hybrid diplexer or 3 DB coupler is used to feed both visual and aural power through two transmission lines to the antenna. Both are available from Jampro. Or, the antennas may be supplied with a single input, for use with a single line and a filterplexer. The antennas are supplied with stiff steel supporting poles. They vary in length from 11 feet to 121 feet, but are supplied in short field weldable sections for easy transportation and installation.

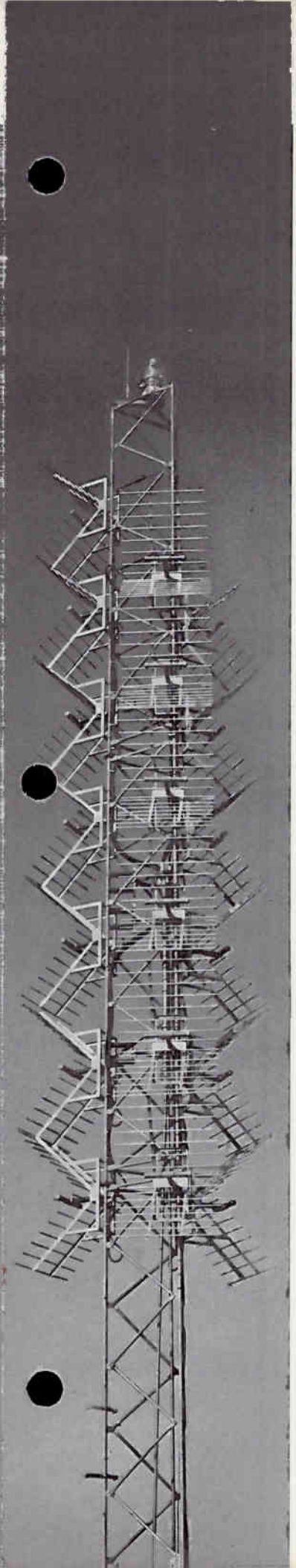
All JAMPRO superturnstile antennas have galvanized steel supporting poles. The batwing radiators are also hot dip galvanized after fabrication. All hardware is zinc plated or of stainless steel. The interbay feed lines are of 0.75 inch copper heliax. The galvanizing and copper cables insure long corrosion free service. The heliax cable is dry air pressurized with appropriate cable end seals for high power operation.

SOME TYPICAL VHF TURNSTILE ANTENNAS

FCC Channels	No. of Bays	JAMPRO Type No.	Power Gain	Safe Power
2 - 6	3	JAT3	3.1	50 KW
2 - 6	6	JAT6	6.5	50 KW
7 - 13	8	JAT8	8.3	60 KW
7 - 13	12	JAT12	12.6	80 KW



Channel 6 Jampro Superturnstile Antenna



JAMPRO

STAND-BY ANTENNAS FOR VHF & UHF TELEVISION

CORNER REFLECTORS

- Omni-Directional – Low Cost
- Directional Type – High Gain
- Side Mount on Existing Tower
- Excellent Low Cost Stand-By Antenna
- For Channels 2-70

RELIABILITY

Jampro's years of experience in UHF and VHF corner reflector construction assures reliability. Components are chosen for proper power rating. Design and careful construction guarantees long life. Individual tuning provides BROAD BANDWIDTH and low VSWR. Each antenna system is constructed and customized to your individual requirements.

PATTERNS

These antennas are extremely versatile. They can be stacked for increased gains or arranged for any pattern desired. Four corners spaced 90 degrees apart will produce an omni-directional pattern. Orientation of the reflectors to other azimuths will produce a directional pattern. Just point the reflectors to the coverage area required.

CONSTRUCTION

Jampro corner reflector screens are constructed of steel tubing. After fabrication, all steel parts are hot dipped galvanized. Channel 2 and 3 corner reflectors screens are constructed of light weight aluminum. All nuts, bolts, etc. are stainless steel for years of trouble-free life.

FEED SYSTEM

The Jampro feed system utilizes the branching method so popular with batwing antennas. It is characterized by the uniform subdivision of antenna input power to the radiating elements through the use of a power divider. The power divider is fed from the main transmission line. Low loss 50 ohm-co-axial cable is used between the power divider and the individual corner element. The standard power divider input is 3-1/8" EIA. The feed cables are RG-218. Maximum power input is 25 KW. Input impedance is 50 ohms. Power dividers are made to be pressurized. On request, power divider can have an input of 6-1/8" EIA and feed cables of 7/8" copper heliax.

STAND-BY USE

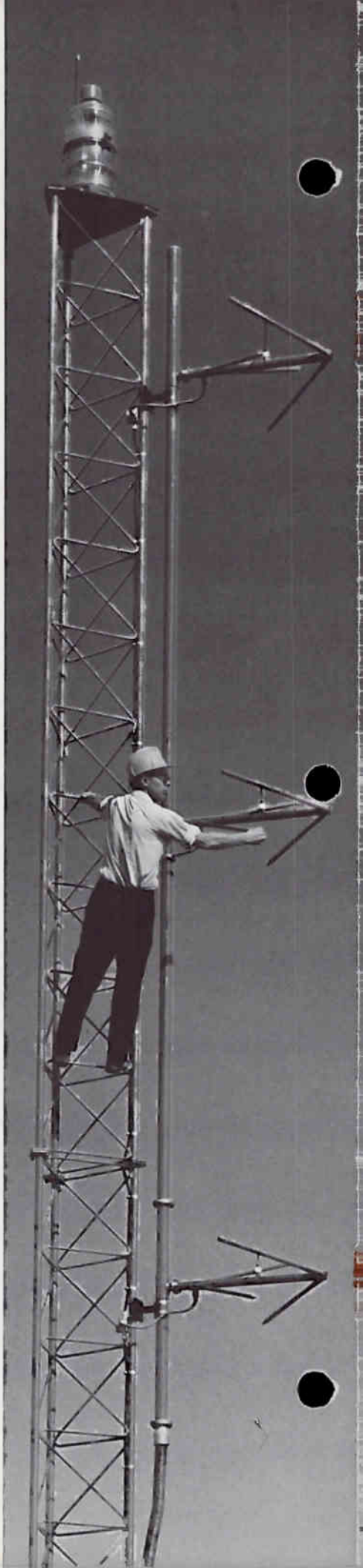
Regardless of the requirement, you may choose the Jampro corner reflector combination for your main transmitting antenna or as a low cost reliable stand-by antenna. Many markets can be served with an adequate signal from one or two corner reflectors. These can be mounted on your existing tower. Plan now so that you may have the security of a reliable Jampro corner reflector as a back-up.

Let Jampro design your corner reflector system. Measured patterns available on request. Write for price quotations.

Channel 10, 19 Corner Standby Antenna

JAMPRO

ANTENNAS FOR FM RADIO



JAMPRO CIRCULARLY POLARIZED FM ANTENNAS

The best state of the art FM transmitting antenna, the JAMPRO CP, is now available. Producing circular polarization, the PATENTED JAMPRO CP provides improved reception for car radios and for home receivers using built-in or line-cord antennas.

In addition to providing the technically superior circular polarization in all directions of azimuth, the construction of the JAMPRO CP antenna results in less complex installation requirements and lower wind loading and net weight. The antenna produces excellent radiation patterns when side mounted on a tower.

DESIGN

These circularly polarized FM antennas consist of four quarter wave arms, which form the four sides of a square. The square has two hot and two cold sides. The feed system is such that the radiation is in 90 degree phase quadrature. When the angle between the opposite corners is 45 degrees, 50% of the radiation is horizontally polarized and 50% is vertically polarized.

During mechanical fabrication, continuous quality control checks are made to insure conformity to rigid standards.

After fabrication, the antenna system is mounted on a tower similar to that to be used by the customer. A complete instruction book containing step-by-step installation instructions, mounting sketch, de-icer wiring information, and a final measured VSWR plot, is included with each antenna system shipped.

Galvanized steel mounting brackets with stainless steel hardware are furnished with these antennas. They may be mounted on the faces of towers, or on the legs.

Where regular icing and sleet conditions prevail, de-icing equipment is recommended as an accessory item. Electrical rod heaters are installed in the four quadrant arms, as well as in the center feed-support arm. Each bay requires 500 watts of power, at 208/240 volts. An ice and sleet sensitive switch is furnished with a complete interbay wiring kit.

PATTERNS

The half power beamwidth of the vertical field is a function of the number of bays in the antenna system. It is approximately equal to 61 divided by the number of bays.

The radiation pattern for side mounted antennas is subject to azimuthal distortion by the reflection effects from the steel tower. The JAMPRO CP antenna is not greatly affected, because the basic radiator is both physically and electrically large—more than three times larger than any competitive antenna! This large illuminating source reduces the effects of the supporting steel tower. Typical pattern circularities are ± 2 DB.

ANTENNA SYSTEM VSWR AND STEREO

Good stereo performance requirements are met with a VSWR of 1.1 to 1 over a 400 kilocycle bandwidth! The basic element is low Q since two half waves consisting of four quarter wave arms are used. The VSWR is not affected by rain, fog, or even slight coating of ice. After installation, the elements may be trimmed for the lowest possible VSWR if desired.

JAMPRO

CIRCULARLY POLARIZED FM ANTENNA SPECIFICATIONS & PRICES

JSCP TYPE — SHUNT FED SYSTEM WITH ONE VERTICAL 3⅛" LINE

JCP TYPE — PARALLEL FEED SYSTEM WITH ALL INTERBAY CABLES

TYPE NO. AND BAYS	POWER GAIN	GAIN IN DB	FIELD GAIN	FS @ 1 MILE 1 KW, Mv/M	NET WEIGHT	SAFE POWER RATING	WINDLOAD 50/33 PSF	PRICE ANTENNA
JSCP-1	0.46	—3.37	0.678	93.2	38.25	10.0 KW	70.5 LBS.	$ 1,200
JCP-1	0.46	—3.37	0.678	93.2	26.0	5.0 KW	57 LBS.	$ 1,200
JSCP-2	1.0	0.0	1.0	137.6	121.5	20.0 KW	225.0 LBS.	$ 1,800
JCP-2	1.0	0.0	1.0	137.6	80.5	10.0 KW	145.0 LBS.	$ 1,980
JSCP-3	1.5	1.76	1.23	168.4	192.75	30.0 KW	315.0 LBS.	$ 2,600
JCP-3	1.5	1.76	1.23	168.4	114.5	15.0 KW	223.0 LBS.	$ 2,860
JSCP-4	2.1	3.22	1.45	199.2	264.0	40.0 KW	405.0 LBS.	$ 3,400
JCP-4	2.1	3.22	1.45	199.2	148.0	20.0 KW	302.0 LBS.	$ 3,740
JSCP-5	2.7	4.31	1.64	225.2	335.25	40.0 KW	495.0 LBS.	$ 4,200
JCP-5	2.7	4.31	1.64	225.2	212.0	25.0 KW	391.0 LBS.	$ 4,620
JSCP-6	3.2	5.05	1.79	246.0	406.5	40.0 KW	588.0 LBS.	$ 4,900
JCP-6	3.2	5.05	1.79	246.0	251.0	30.0 KW	491.0 LBS.	$ 5,390
JSCP-7	3.8	5.80	1.95	268.0	477.75	40.0 KW	678.0 LBS.	$ 5,800
JCP-7	3.8	5.80	1.95	268.0	299.0	35.0 KW	592.0 LBS.	$ 6,380
JSCP-8	4.3	6.34	2.07	285.2	549.0	40.0 KW	768.0 LBS.	$ 6,400
JCP-8	4.3	6.34	2.07	285.2	337.0	40.0 KW	736.0 LBS.	$ 7,040
JSCP-10	5.5	7.40	2.35	322.4	701.5	40.0 KW	948.0 LBS.	$ 8,400
JCP-10	5.5	7.40	2.35	322.4	437.0	40.0 KW	903.0 LBS.	$ 9,240
JSCP-12	6.6	8.20	2.57	353.2	844.2	40.0 KW	1131.0 LBS.	$10,000
JCP-12	6.6	8.20	2.57	353.2	555.0	40.0 KW	1122.0 LBS.	$11,000
JSCP-14	7.8	8.92	2.79	383.9	986.7	40.0 KW	1314.0 LBS.	$11,700
JCP-14	7.8	8.92	2.79	383.9	671.0	40.0 KW	1348.0 LBS.	$12,870
JSCP-16	8.9	9.49	2.98	410.2	1129.2	40.0 KW	1494.0 LBS.	$13,000
JCP-16	8.9	9.49	2.98	410.2	831.0	80.0 KW	1930.0 LBS.	$14,300
JSCP-18	10.3	10.13	3.13	4.375	1277.7	40.0 KW	1677.0 LBS.	$15,000
JCP-18	10.3	10.13	3.13	4.37	914.5	80.0 KW	2090.0 LBS.	$16,500
JSCP-20	11.3	10.53	3.36	4.62	1414.2	40.0 KW	1860.0 LBS.	$17,000
JCP-20	11.3	10.53	3.36	4.62	982.9	80.0 KW	2395.0 LBS.	$18,700

1) Power gains are for 50/50 horizontally and vertically polarized ratios. Other ratios available.
2) Antenna polarization is circular clockwise, in all directions of azimuth.
3) Prices include complete galvanized mounting hardware for leg mounting on uniform guyed towers.
4) Add $25.00 per bay for mounting brackets on tapered self-supporting towers.
5) Space required on tower is 984 divided by freq. in Mhz X number of bays less 1.
6) Antenna input location on JCP series is three feet below antenna array center.
7) Windload ratings are 50/33 PSF, 110 miles per hour.
8) Antenna weights include standard mounting hardware. Add 10 Lbs/bay for deicers.

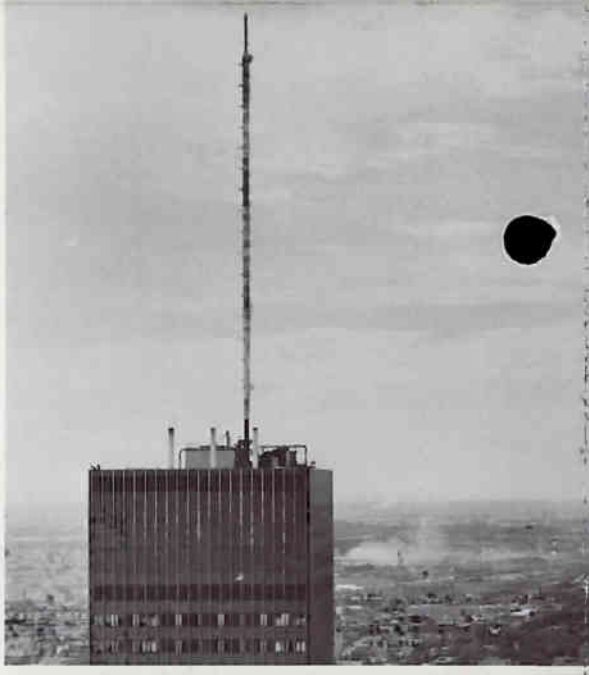
WHEN ORDERING BE SURE TO SPECIFY

A. Antenna type number
B. Deicers, if any, add $180/bay
C. Channel, (between 88-108 Mhz)
D. Horizontal and vertical power gains
E. Description of tower — make and model
F. Beam tilt and null fill-in, if any

JAMPRO

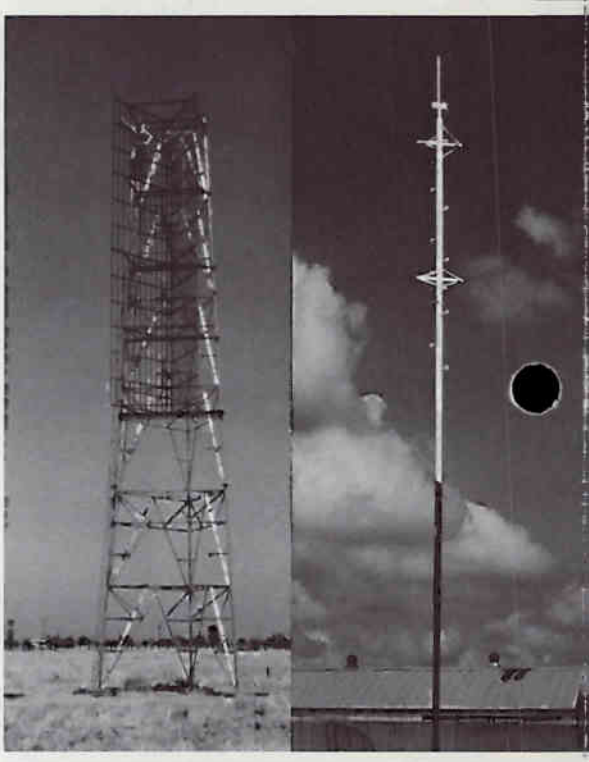
CUSTOM DESIGNED ANTENNAS

Full antenna capability permits fast design, fabrication, test and pattern measurement for special antennas, from 50 MHz to 2 GHz. Previous special design products include antennas and RF plumbing made to specifications for the US Navy, US Air Force, Department of Defense, FAA, NASA and other organizations. Many special products for various United States government agencies have been produced as well as items for commercial broadcasters in the United States and 70 foreign countries.



BUILDING TOP ANTENNAS

Complete roof top supporting structures and antennas are available from Jampro, for both FM and TV. Photo on top shows CKVL-FM, Montreal, Canada, using special Jampro multi-station FM antenna. With 614 KW ERP, this is the world's most powerful FM broadcasting station. The antenna was manufactured with the co-operation of the 54 story office building contractors. The antenna is circularly polarized.



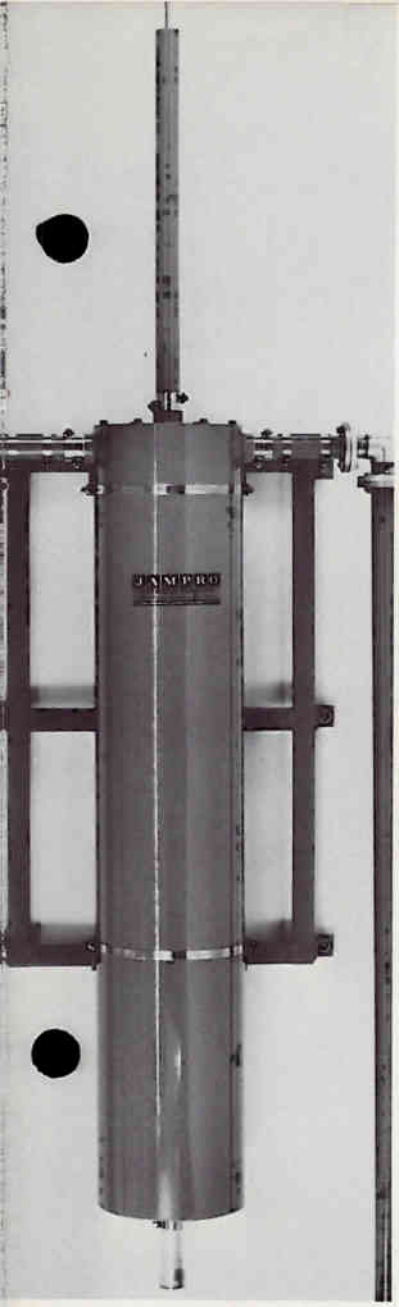
AERONAUTICAL - LONG RANGE ANTENNAS

Antennas for air/ground usage in the 118-136 MHz and 225-400 MHz bands, are designed for jet age requirements. They have excellent VSWR values and handle up to 5 KW of power. De-icers are available, as well as circular polarization. Photos show A/G directional antenna made for FAA with gain of 40/dipole, and a two bay omnidirectional circularly polarized antenna with a gain of 2/dipole.

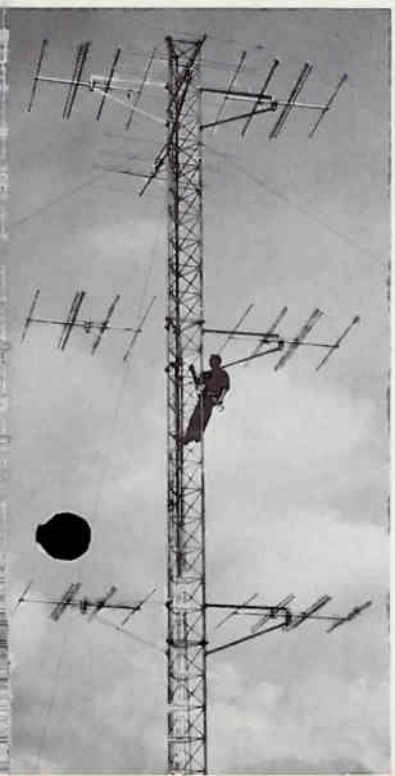
SPECIAL HEAVY DUTY ANTENNAS

Where required, Jampro can design and manufacture extremely heavy duty TV and FM antennas. Past projects include a 121 foot turnstile antenna made for 180 MPH winds. Another antenna for Iceland with 100 MPH wind rating with 4 inches of rim ice is in service. Photo shows a 2 bay turnstile antenna for CFTK-TV, Terrace, Canada. Rated at 120 MPH, it has survived ice coatings up to 15 inches!

JAMPRO



COLOR SUB-CARRIER TRAP



ANTENNA ACCESSORIES

HARMONIC FILTERS

Harmonic filters are available for FM and TV. Power ratings from 1.8 KW through 50 KW. Insertion loss 0.10 db. All Jampro filters have a second harmonic attenuation of at least 50 db. Operating frequency is spot tuned for FM. Each TV filter is designed for a specific channel and manufactured to order. VSWR at the design frequency is 1.05/1 or better.

THREE DB COUPLERS

Newly developed version of the VHF TV hybrid diplexer, dividing the input power into two equal outputs, with 90 degree phase difference. Requires less space than conventional hybrids and has better isolation values. Available in 10 KW through 100 KW models. These couplers are used in all Jampro UHF, and in some VHF filterplexers and notch diplexers.

COLOR SUB-CARRIER TRAPS

Designed to attenuate the TV lower color sub-carrier at least 42 db, below the peak visual carrier power. Factory tuned and field trimable. Available for use with 5 to 50 KW transmitters, operating in FCC channels 2 through 13 or CCIR band I and III. VSWR is 1.1/1 or better. Furnished with wall or ceiling mounting frames.

AERONAUTICAL ANTENNAS

For aeronautical service, in the 108 to 136 MHz band, Jampro manufactures a line of time tested long range, air ground receiving and transmitting antennas. Available in horizontal, vertical or circularly polarized types, with gains up to 10 over a dipole. Power capability up to 10 KW, and VSWR values are under 1.25 to 1. Directional and omni-directional types are available.

CATV ANTENNAS

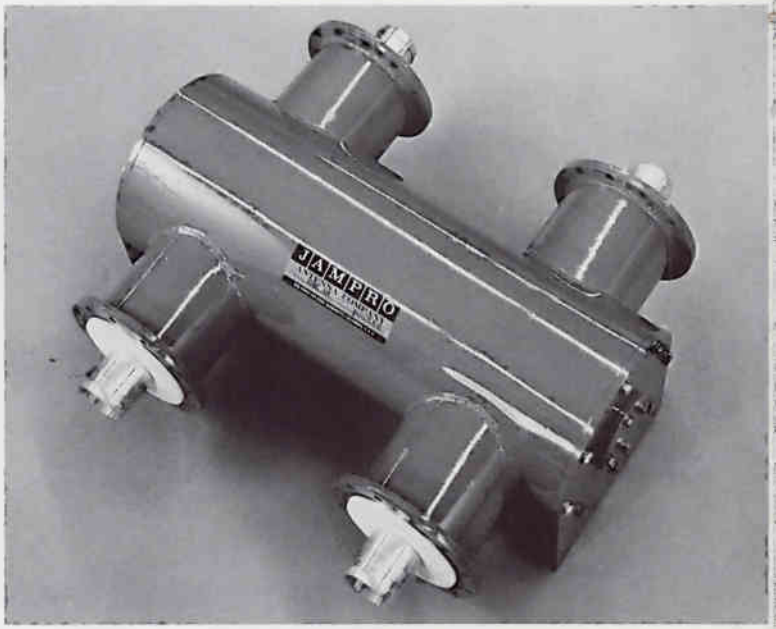
Extremely high quality CATV antennas, complete with towers and transmission line, are available from Jampro. Photo shows channel 4 pickup antenna system, with co-channel suppression antennas. Other CATV products include adjacent channel filters, high gain low noise preamplifiers and highly directive antennas. CATV antennas with de-icing equipment and VSWR values of 1.1/1 across any 6 megacycle channel are available.

JAMPRO

ANTENNAS

3DB COUPLERS-DIPLEXERS

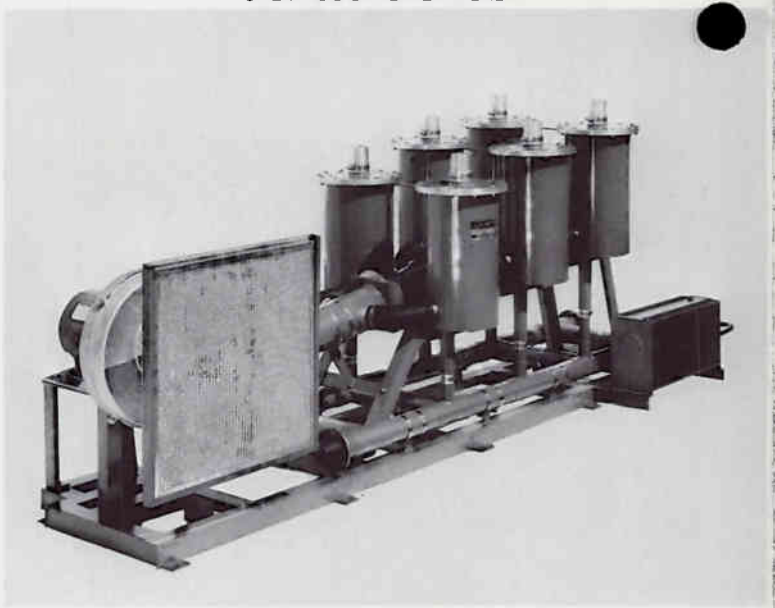
The latest state of the art diplexers, using the new 3DB couplers, are available from Jampro. These couplers are used in the new Jampro notch diplexers and filterplexers. The 3 DB couplers have one octave bandwidth, isolation in excess of 30 DB and excellent power split and phase characteristics. The photo on the right shows a 100 KW coupler-diplexer. It is used to feed a 12 bay high power JAMPRO turnstile antenna, from a 35 KW channel 8 and another 35 KW channel 10 transmitter, thru filter-plexers!



3 DP COUPLER-DIPLEXER

VHF FILTERPLEXERS

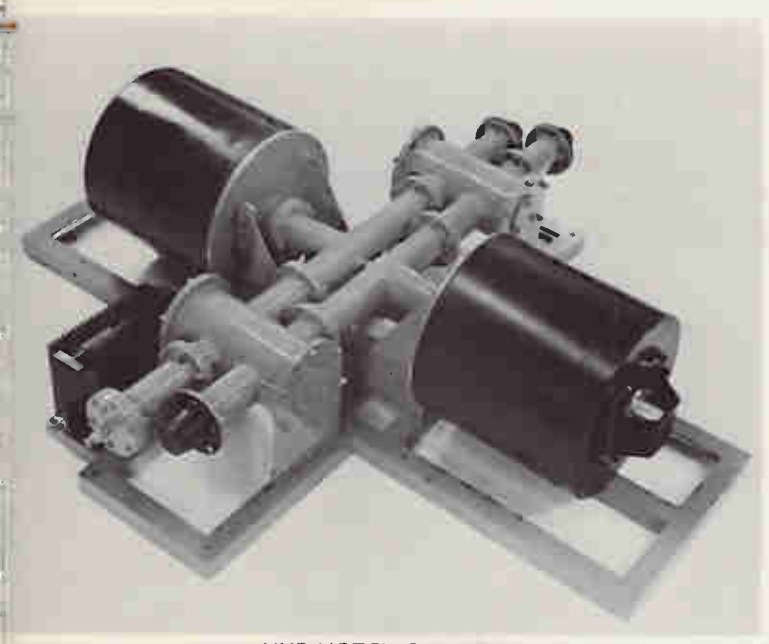
These filterplexers are used to combine the visual and aural transmitter powers of VHF television transmitters, into one transmission line. Using Jampro 3DB couplers, the isolation between visual and aural transmitters is 30 DB or better. They are available in power ratings of 5, 10, 25 and 50 KW. They meet both FCC and CCIR specifications, and recommendations for sideband shaping. Low insertion loss and excellent input VSWR values are features of these Jampro units. The output VSWR is better than 1.1 to 1, thereby improving antenna performance.



FILTERPLEXER

JAMPRO

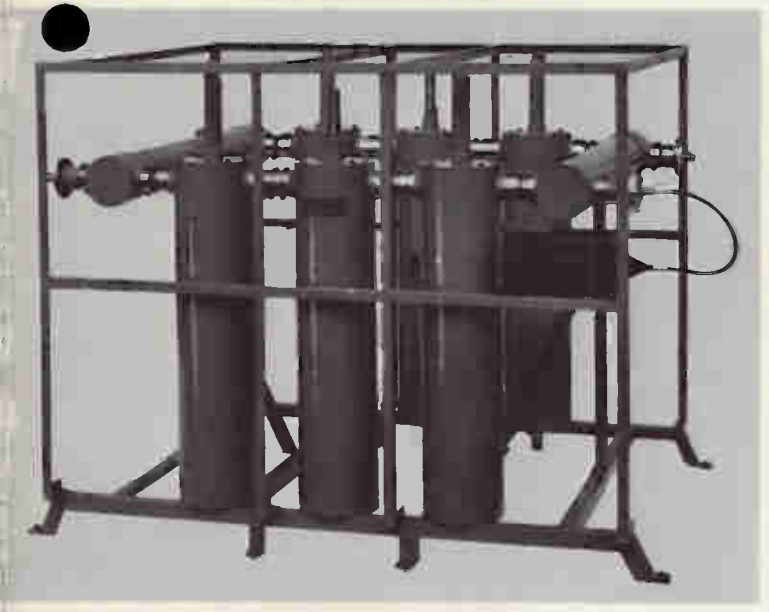
ACCESSORIES



UHF NOTCH DIPLEXER

UHF NOTCH DIPLEXERS

Used with UHF transmitters, these Jampro notch diplexers combine the visual with aural powers into one common coaxial line. They do not provide vestigial sideband shaping. Using 3 DB couplers, the isolation between transmitters is greater than 30 DB. Temperature compensated special alloy cavities, with high Q values, provide excellent aural band pass and insertion loss. These diplexers are available in power ratings of 15, 30 and 60 KW. They meet or exceed FCC and CCIR color specifications and recommendations.



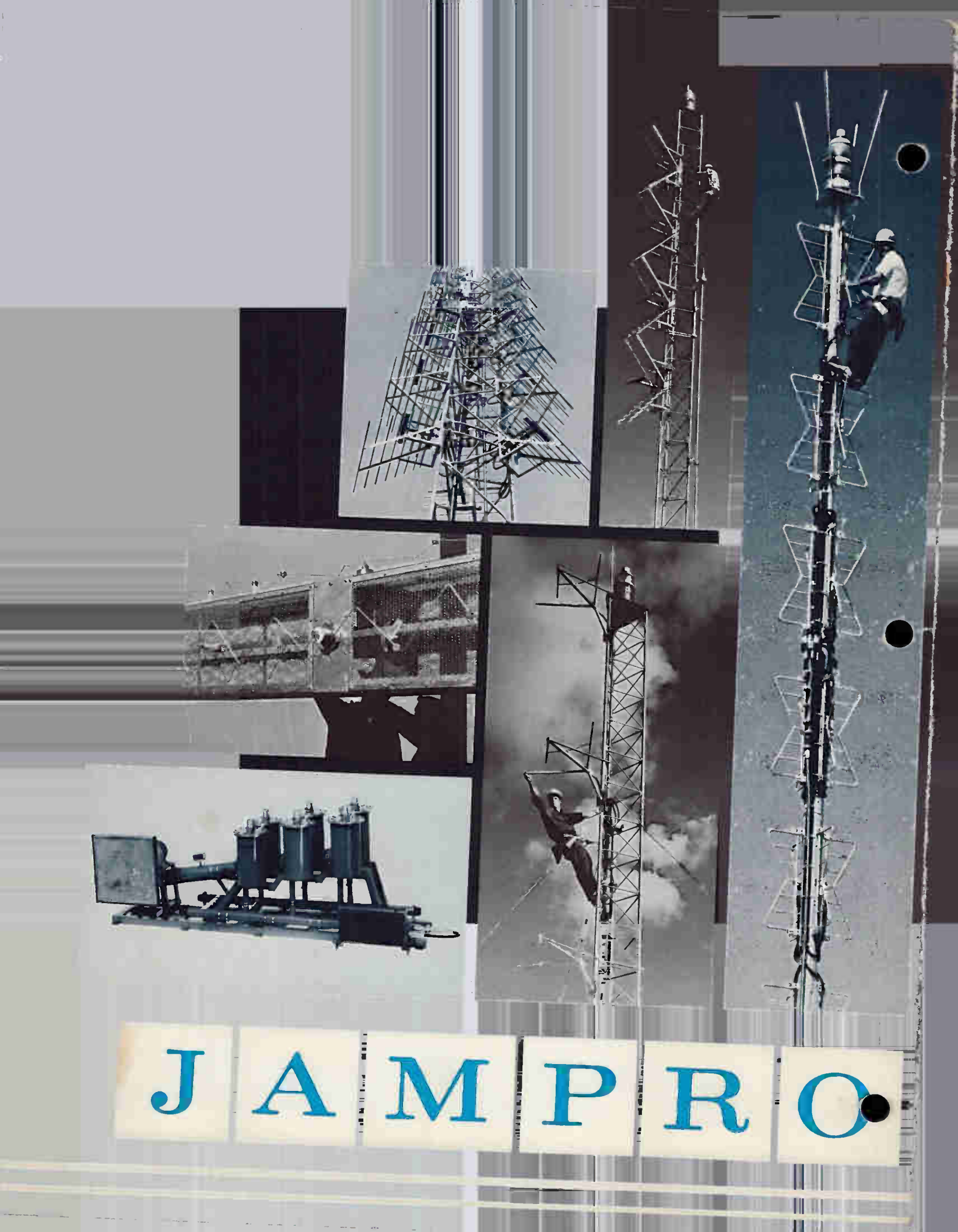
VHF NOTCH DIPLEXER

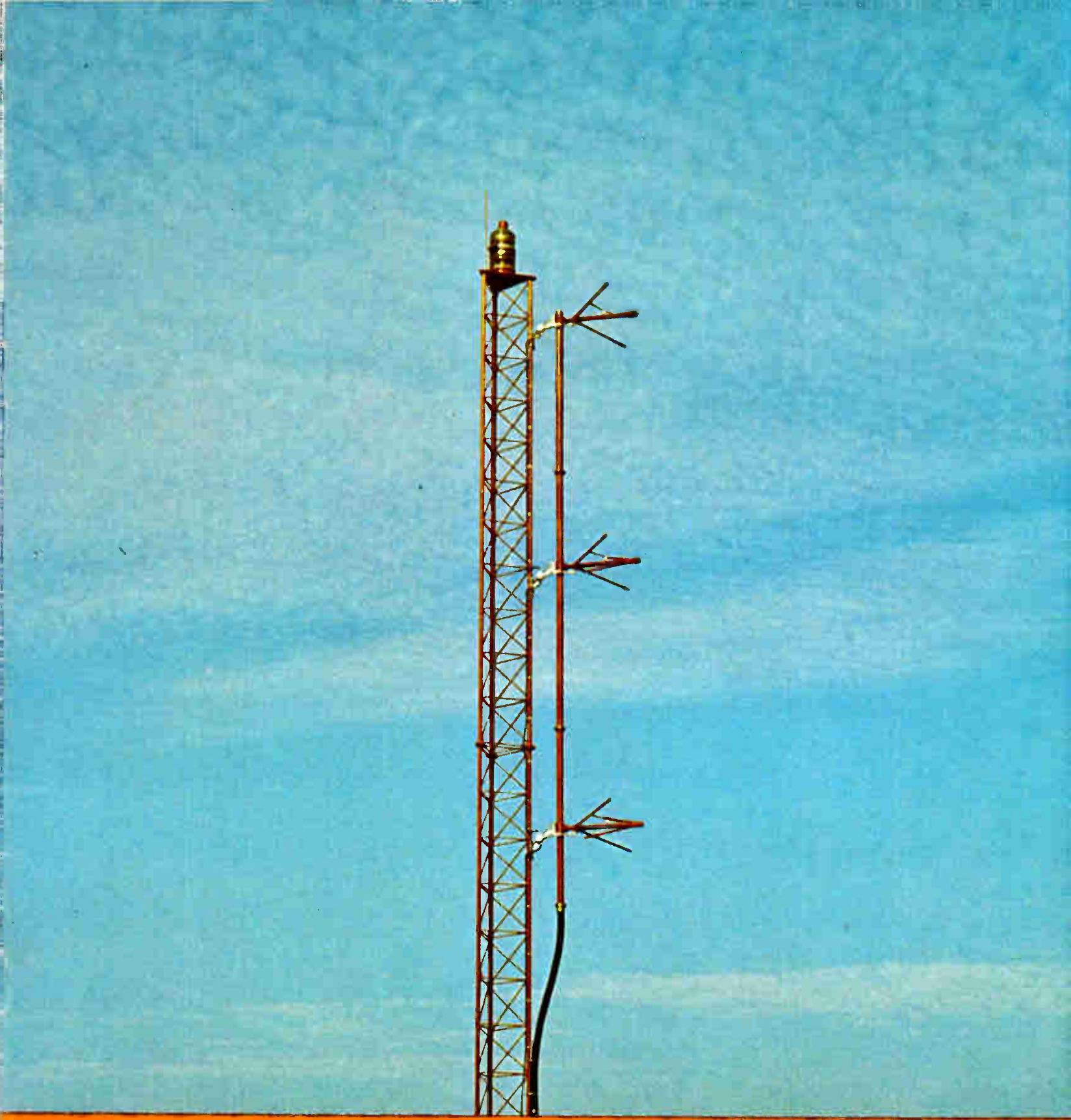
VHF NOTCH DIPLEXERS

These are similar to the UHF notch diplexers described above, except that they are for use on channels 2 - 13 and CCIR bands I and III. They may also be used to combine two FM station transmitters into a common antenna. Special alloy metal cavities are used with 3 DB couplers to provide excellent isolation between visual and aural transmitters. The input VSWR as well as the output, are better than 1.1 to 1, providing excellent antenna matching. These constant impedance diplexers provide excellent color response.

BROADCASTING DIVISIONS OF COMPUTER EQUIPMENT CORPORATION

JAMPRO — FM and TV broadcasting antennas
SPARTA — professional audio products
VEGA — wireless mikes, professional tape recorders
BAUER — AM and FM broadcasting transmitters


JAMPRO



CIRCULARLY POLARIZED PENETRATOR FM ANTENNAS

JAMPRO ANTENNA COMPANY

Subsidiary of Cetec Corporation

FEATURES:

RADIATES TRUE CIRCULAR POLARIZATION

ADJUSTABLE POLARIZATION POWER RATIOS

EXCELLENT PATTERN CIRCULARITIES

LOW WIND LOADING AND DEAD WEIGHT

HIGH POWER HANDLING CAPABILITY

MORE SIGNAL INTO HOME FM RECEIVERS

RUGGED MECHANICAL CONSTRUCTION

LOW Q AND EXCELLENT VSWR BANDWIDTH

2-YEAR LABOR AND MATERIALS WARRANTY

WRITE FOR ANY OF THE FOLLOWING CATALOGS DESCRIBING OUR OTHER TYPES OF FM ANTENNAS:

- **JLCP** Low power, elliptically polarized, for tower side mounting. From 2 to 10 KW input rating.
- **JHCP** Moderate power, circularly polarized for pole or tower side mounting. 60 to 80 KW rating.
- **JSD** Multi-station antenna, for up to 8 FM stations. Mounts on sides of square or triangular towers, with power ratings of 90 to 360 KW!
- **JSFM** Multi-station antenna, circularly polarized and pole mounted. Power ratings to 200KW.

JAMPRO CIRCULARLY POLARIZED PENETRATOR FM ANTENNAS

ANTENNA DESIGN

The PENETRATOR antenna is designed to be mounted to the side of a steel tower or pole, which is not supplied with the antenna. Although non-symmetrical in mounting and physical appearance, this antenna radiates a very omni-directional horizontal plane pattern, when properly treated.

These circularly polarized FM antennas consist of two half wave dipoles whose four quarter wave arms form the four sides of a square. The square has two hot and two cold sides. The feed system is such that the two dipoles are fed in phase quadrature. When the square is flat and parallel to the ground, nearly 100 percent of the radiation is horizontally polarized. The construction permits the two opposite corners of the square to be rotated. When the angle between the opposite corners is 45 degrees, 50% of the radiation is horizontally polarized and 50% is vertically polarized.

The ratio of polarized radiation varies with the arm angles. It is set at the factory for circular ratios of 50/50. Elliptically polarized antennas with power ratios up to 75/25 may be furnished on special order.

Each radiating element is a 50 ohm input antenna with a very wide bandwidth VSWR, 6MHz under 1.1/1 being typical. The bandwidth is due to the two half wave dipoles in each bay, and small length to diameter ratio.

AZIMUTH PATTERN CIRCULARITY

The radiation from side mounted antennas is subject to azimuthal pattern distortion by steel tower reflection effects. Type of cross bracing, width sizes, rails for tower elevators, coaxial lines for other antennas, conduits for electrical lighting and deicing and other items, all cause the vertically polarized radiation to vary from a circle. In a similar manner, the horizontal tower braces, mounting brackets and other horizontal steel members distort the horizontally polarized energy. Generally, the larger the tower section, the more distorted the shape of the resulting azimuth pattern, from a circle. Jampro offers azimuth pattern service at additional cost for side mounted tower, and pole mounted antennas. Azimuth patterns from ± 4 DB or better can be achieved, depending on the actual configuration of the supporting structure. Contact Jampro for details and prices of this service.

Rigger field tuning a JSCP-3 antenna. Note electrical deicers and insulated guys.

Patented in the United States, United Kingdom and other countries.

JAMPRO CIRCULARLY POLARIZED PENETRATOR FM ANTENNAS

Rigger installing deicer cables on a tower, with insulated guys.

FEED SYSTEM

The shunt fed system uses a single vertical run of 3⅛" line (7.9CM) across which are shunted the various bays, approximately 10 feet (3M) apart. Of sectionalized make-up, each section consists of one radiator and 10 feet of rigid coax line. The antenna input is 3⅛" EIA flange, with adaptors available for other sizes. Antennas of 8 or less bays are fed from the bottom, while those with more than 8 are fed from the center, using a power splitter to feed the upper and lower sections.

The power gain of a single CP element is about 0.54, so these elements are stacked vertically to increase the power gain. For example, a six bay array has a gain of 3.2 while increasing the stack to ten will increase the gain to 5.5. In order to achieve this gain, the radiating elements must be fed power with correct phase and amplitude. By spacing the elements approximately one wavelength, the correct in phase current is present. With four or more bays, internal impedance matching transformers are used at each bay feed point to insure correct current by proper impedance match. This exclusive PENETRATOR design feature insures the correct vertical pattern, so that the highest possible gain is achieved. Impedance transformers also increase the bandwidth.

All antennas are tested at the factory for proper phase and amplitude at all bay feed flanges, across the shunt main line. Without beam tilt or null fill, all phases are 0 and all the amplitudes are equal. Those with null fill and/or beam tilt are checked and adjusted if need to be to meet the computer designed phasings and amplitudes.

DEICING PROVISIONS

Where regular icing and sleet conditions prevail, deicing equipment is recommended as an accessory item. It must be ordered with the antenna. Electrical rod heaters are installed in the four quadrant arms, as well as in the center feed-support arm. Each radiating bay requires 500 watts of power at 208/240 volts 50/60 Hz. These heaters may be operated at 110/120 volts, for one quarter of the wattage, in order to conserve energy, if icing conditions are light. Simple relay circuits may be used to switch from one voltage to another, depending on the temperature and humidity conditions, if desired by operating personnel.

The electrical deicers are insulated and meet all known US electrical codes. A water proof pigtail is brought out from the element support and connects to a bay junction box. Inter junction boxes and cable are furnished with the complete deicing kit.

These internal heaters are of the highest quality and may be operated in water, as the electrical leads are sealed in glass. They are quality controlled items and meet MIL specifications. They have proven to be trouble free during many years of operation. If, however, they fail for any reason, they may be replaced in the field.

Two options are available when thermostat deicer control is desired. Item I is a unit to be mounted indoors, with a five foot long flexible tube to the outdoor temperature sensing bulb. This unit closes the circuit to deicer power as temperature falls and opens again only on rising temperature. It will control a maximum of ten bays. The Ice Melter Control, item G, will turn the heaters on through a relay, only during icing temperature conditions ranging approximately from 32 to 23 degrees Fahrenheit (0, −5°C). The Ice Sensing Control, Item H, will energize the deicing relay, only when the right temperature and humidity occur to form ice. The Ice Sensing Control saves considerable power, in areas where icing is frequent. Both controls are complete with 220 Volt 50/60 Kz power control relays, in water tight protective boxes for indoor or outdoor installation.

PENETRATOR antenna mounted on a pole supplied by JAMPRO.

RUGGED CONSTRUCTION

These JAMPRO antennas are made of thick wall marine type brass tubing. They will not bend out of shape during installation, high winds or heavy ice loads. The four quadrant arms are one inch (2.54CM) in diameter, while the center support tube is 2 inches (5.08CM). The marine type brass provides protection against corrosive atmospheres.

The radiating element terminates in a standard 1⅝" EIA flange. This flange is welded by a process which does not reduce the strength of the tube. The element is supported by this EIA flange, with another, which is part of a heavy machined casting, through which the main 3⅛" coaxial feed line passes vertically. See the photo to the right. The radiating element is dry air pressurized up to the teflon feed bushing by the transmission line pressure.

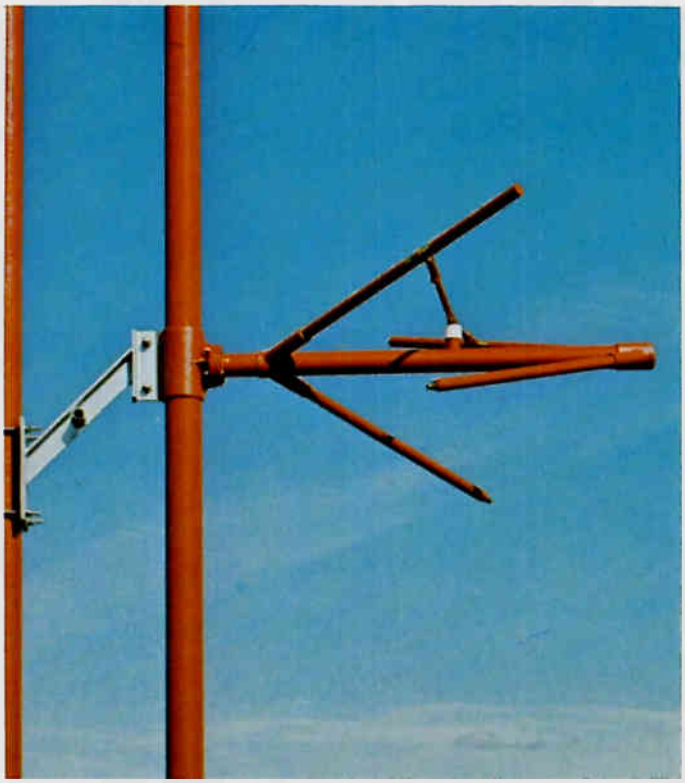
ANTENNA MOUNTING

A standard type of galvanized steel mounting brackets to fit most sizes of tower legs, are supplied with these PENETRATOR antennas, complete with stainless steel hardware. Special galvanized brackets can be made to order, to fit any non-standard tower leg, or for face mounting, at additional cost. If a tapering, self supporting tower is to be used, extension mounting brackets are available at additional cost, for vertical alignment. Leg mounting brackets permit guy cable attachment to the leg without interference. On special order, a suitable steel pole can be furnished to support the antenna on top of a tower, or building.

FACTORY TESTS

During mechanical fabrication, continuous quality control checks are made to insure conformity to rigid standards. Electrical phase, amplitude and VSWR tests are made before the elements are put on the main feed line.

After fabrication, the antenna system is mounted on a tower similar to that to be used by the customer. The horizontal to vertical power gain ratios are then tested to meet the purchase order specs, if for elliptical polarization. After this, the VSWR of the system is adjusted and a plot taken. Two copies of a complete instruction book containing step-by-step installation instructions, mounting sketches, de-icer wiring and a final measured VSWR plot, are included with each antenna shipped.



Heavy one piece casting holds coax line and element to bracket for typical leg mounting.

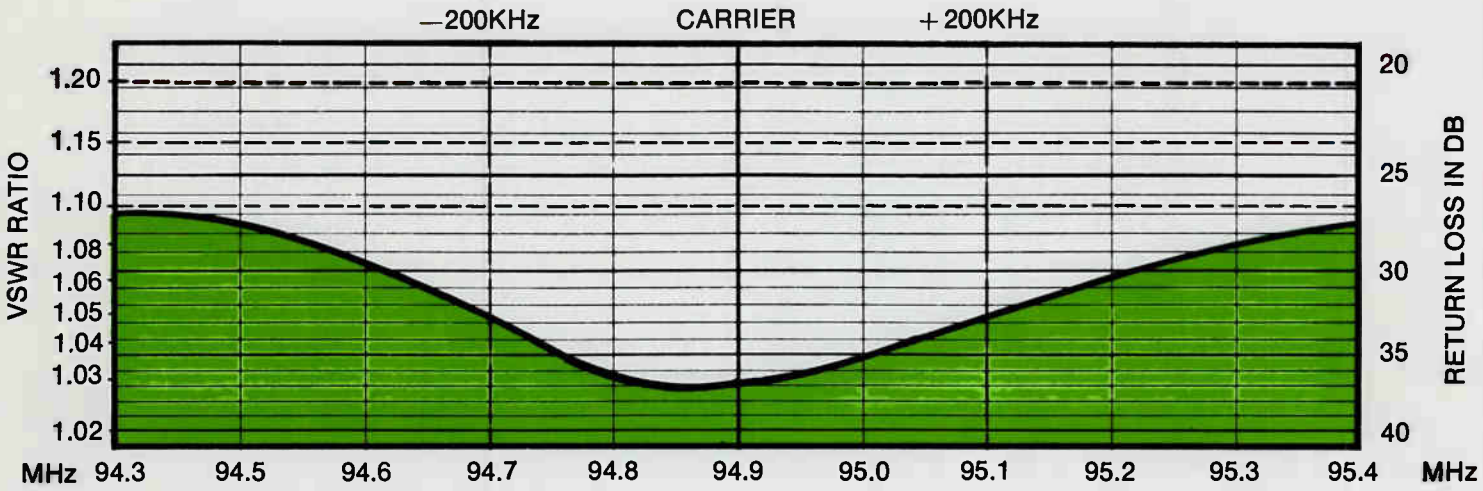
DUAL CHANNEL ANTENNAS

Two stations operating on different frequencies may be fed into the PENETRATOR antenna, if the two frequencies are close together. The minimum spread is 800 KHz, and the practical maximum is about 1.2MHz. Contact Jampro for details.

DIRECTIONAL ANTENNAS

Directional antenna patterns may be provided to meet FCC requirements, or for use in countries where such directional antennas may readily be used. One or two nulls can be produced, whose depth depends on the requirements. Antennas with major lobes are also offered. Full antenna range pattern test and measurement service is available. Write for details.

JAMPRO CIRCULARLY POLARIZED PENETRATOR FM ANTENNAS



TYPICAL MEASURED VSWR PLOT OF FOUR BAY TYPE JSCP-4 ANTENNA
(KSAN-FM, Metro Media Station, San Francisco)

STEREO AND QUADRAPHONIC OPERATION

The patented four quarter wavelength arms and internal power dividing transformers provide more than 400 KHz VSWR bandwidth under 1.1/1. This relatively flat non-reactive transmitter load keeps stereo and quadraphonic crosstalk to an absolute minimum. Since this load is flat throughout the significant FM sideband frequencies, this antenna does not contribute to synchronous AM noise.

VERTICAL PATTERNS

The half power beamwidth of both the horizontal and vertical fields is a function of the number of bays in the antenna system. It is approximately equal to 61 divided by the number of bays. Null fill-in, beam tilt or both may be put into the antenna without cost; if specified at time of order.

ANTENNA SYSTEM VSWR

Good stereo performance requirements are met with a VSWR of 1.1 to 1 over a 400 KHz bandwidth! The basic element is low Q, since each PENETRATOR radiating bay consists of two half wave dipoles. The VSWR is not affected by rain, fog, or even slight ice coatings. It may be trimmed after installation, for the lowest possible VSWR, values of 1.06 to 1 across 400 KHz being quite common. The antenna is completely assembled and VSWR tested at the factory on a tower quite similar to that to be used by the broadcaster. The mounting hardware is checked. The VSWR is adjusted, plotted and inserted in the instruction booklet. Two copies containing complete installation, VSWR trimming and operating instructions are included with each antenna.

RADOMES

When more than a slight coating of ice is routinely present during winter, plastic radomes are recommended, if the cost of electrical deicer operation is uneconomical. Shown below is a new two piece fiberglass reinforced plastic radome, (GRP) covering a specially shaped JSCP element. The radome is supported at both ends of the radiating element boom for strength. The specially designed radome shape yields a very low drag coefficient, resulting in light loading. Measured wind pressure at 112 MPH (50 PSF) for the antenna including radomes and normal mounting brackets are shown in the specifications. As with any FM installation, the tower must be checked by the broadcaster, using a qualified structural engineer to determine if it will safely hold the FM antenna system, deicers or radomes.

Radome enclosed radiating element.

PENETRATOR SERIES

ANTENNA SPECIFICATIONS AND PRICES

JSCP TYPE — SHUNT FED SYSTEM WITH ONE VERTICAL 3⅛" LINE

TYPE NO. — Bays	POWER GAIN RATIO	GAIN IN DB	FIELD GAIN	FS @ 1 MILE 1 KW, MV/M	NET WEIGHT WITH MOUNTING BRACKETS	SAFE POWER RATING	WINDLOAD 50/33 PSF WITH MOUNTING BRACKETS	MARCH 1976 PRICES
JSCP-1	0.46	—3.37	0.678	93.2	25 LBS.	10KW	48 LBS.	$ 1,775
with deicers					34 LBS.		57 LBS.	2,050
with radomes					55 LBS.		128 LBS.	2,225
JSCP-2	1.0	0.0	1.0	137.6	125 LBS.	20KW	195 LBS.	2,725
with deicers					143 LBS.		219 LBS.	3,275
with radomes					185 LBS.		355 LBS.	3,625
JSCP-3	1.5	1.76	1.23	168.4	199 LBS.	30KW	320 LBS.	4,000
with deicers					225 LBS.		368 LBS.	4,825
with radomes					289 LBS.		560 LBS.	5,350
JSCP-4	2.1	3.22	1.45	199.2	274 LBS.	40KW	443 LBS.	5,335
with deicers					308 LBS.		516 LBS.	6,435
with radomes					394 LBS.		763 LBS.	7,135
JSCP-5	2.7	4.31	1.64	225.2	350 LBS.	40KW	568 LBS.	6,675
with deicers					393 LBS.		664 LBS.	8,050
with radomes					500 LBS.		968 LBS.	8,925
JSCP-6	3.2	5.05	1.79	246.0	498 LBS.	40KW	730 LBS.	8,050
with deicers					506 LBS.		851 LBS.	9,700
with radomes					678 LBS.		1210 LBS.	10,750
JSCP-7	3.8	5.80	1.95	268.0	532 LBS.	40KW	854 LBS.	9,350
with deicers					591 LBS.		999 LBS.	11,275
with radomes					742 LBS.		1414 LBS.	12,500
JSCP-8	4.3	6.34	2.07	285.2	609 LBS.	40KW	979 LBS.	10,500
with deicers					677 LBS.		1148 LBS.	12,700
with radomes					849 LBS.		1619 LBS.	14,100
JSCP-10	5.5	7.40	2.35	322.4	774 LBS.	40KW	1265 LBS.	12,900
with deicers					859 LBS.		1483 LBS.	15,650
with radomes					1074 LBS.		2065 LBS.	17,400
JSCP-12	6.6	8.20	2.57	353.2	929 LBS.	40KW	1514 LBS.	15,100
with deicers					1032 LBS.		1780 LBS.	18,400
with radomes					1289 LBS.		2475 LBS.	20,500

1) Power gains are for circular polarization. Other ratios for elliptical polarization are available.
2) Antenna polarization is standard right hand circular clockwise, in all directions of azimuth.
3) Prices include complete galvanized mounting hardware for leg mounting on uniform width towers.
4) Price of galvanized brackets for face or leg mounting to tapered towers is $75 per bay.
5) Vertical tower space required in feet is 984 divided by frequency in MHz X number of bays less 1.
6) Antenna input connector and location:
   1 bay — input is 1⅝ inch EIA at bay 1. Add elbow $80.
   2 thru 5 bays — 3⅛ inch EIA — 3 Ft (1M) below — lowest bay.
   6 thru 8 bays — 3⅛ inch EIA — 8 Ft (2.4 M) below lowest bay.
   10 & 12 bays — 3⅛ inch EIA — 13 Ft (4M) below array center.
7) Windload ratings are for 50/33 PSF 110 MPH winds (175 KM/H) without ice, from measured values.

WHEN ORDERING BE SURE TO SPECIFY

A. Antenna type number
B. Operating Frequency
C. Tower Make & Model
D. Ratio — if elliptical
E. Beam tilt & null fill
F. Coax reducer 3⅛ to 1⅝. $105.
G. Deicer Ice Melter Control — see text — $385.
H. Ice Sensing Control — see text — $1,400.
I. Simple deicer control — see text — $145.

JAMPRO ANTENNA COMPANY

Subsidiary of CETEC Corporation

6939 POWER INN ROAD • SACRAMENTO, CALIFORNIA 95828 • (916) 383-1177

CIRCULARLY POLARIZED
FM & TV ANTENNAS
TV ANTENNAS
HARMONIC FILTERS
MILITARY ANTENNAS
NOTCH DIPLEXERS
VSB FILTERS
FILTERPLEXERS

JAMPRO

ANTENNA COMPANY
subsidiary of Cetec Corporation
6939 POWER INN ROAD
SACRAMENTO, CALIF. 95828

COMPARE FM ANTENNAS BEFORE YOU BUY!

Compare all elliptically or circularly polarized FM antennas and you'll find JAMPRO'S PENETRATOR leads the others in 19 important categories. It has more outstanding performance features than any other comparable FM antenna on the market today. The PENETRATOR has the widest VSWR bandwidth for best stereo now, and quadraphonic sound when you are ready! It is unique, it has a patent for five features not found in any other FM antenna. Only the PENETRATOR made by JAMPRO insures maximum power gain by using internal transformers together with phase and amplitude tests. It has the lowest windload, with and without deicers! It comes with a 2 year warranty, a first for the industry. Compare these six bay high power antennas offered for 50 KW and 100 KW ERP stations, taken from printed company literature in February, 1975.

	SUPPLIER	JAMPRO	RCA	GATES	COLLINS	SHIVELY	PHELPS DODGE	CCA
1.	Antenna Type Number	JSCP-6	BFG 6A	FMS-6	37CP6	6810-6	CFM HP-6	FMC-HP-6
2.	Safe input power rating	40 KW	36 KW	40 KW	40 KW	40 KW	30 KW	40 KW
3.	Power gain ratio DB	5.05	5.06	5.05	5.00	5.18	5.2	5.2
4.	Trimmed 1.1/1 VSWR bandwidth	±200KHz	±100KHz	±100KHz	±110KHz	±150KHz	±100 KHz	NS
5.	Axial ratio-polarization	2DB	NS	NS	NS	NS	NS	NS
6.	Impedance match at each bay?	Yes	No	No	No	No	No	No
7.	Factory VSWR plot in I.B.	Yes	No	No	No	No	No	No
8.	Factory phase/amplitude checks.	Yes	No	No	No	No	No	No
9.	Tuned on tower like customers?	Yes	No	No	No	No	No	No
10.	Antenna factory pre-tuned?	Yes	Yes	Yes	Yes	Yes	No	No
11.	Quadraphonic capability?	Yes	NS	NS	NS	NS	NS	NS
12.	Manufactured by seller?	Yes	No	No	No	Yes	Yes	Yes
13.	Dual Deicer wattage?	Yes	No	No	No	No	No	No
14.	Antenna shop painted?	Yes	Yes	No	No	No	No	No
15.	Weight with mtg. bckts.	498.5#	381#	496#	512#	NS	404#	404#
16.	Wind load 50/33 PSF, EIA	673#	920#	883#	1301#	727#	780#	780#
17.	Deicer wind load, 50/33 PSF	770#	1040#	NS	NS	NS	NS	NS
18.	Warranty - guarantee	2 Yr.	1 Yr.	1 Yr.	1 Yr.	1 Yr.	1 Yr.	1 Yr.
19.	Antenna List Price	$7,250	$7,642	$7,245	$6,900	$5,505	$5,000	$6,545
20.	Antenna price with deicers	$8,750	$11,421	$8,820	$8,400	$6,303	$5,660	$7,670

NS = Not Stated

Other exclusive reasons for choosing a PENETRATOR include dual wattage deicers for energy conservation, FAA color painting for longer antenna life, and a 15 page complete instruction booklet with measured factory VSWR!

EXCLUSIVE REPRESENTATIVE - CANADIAN GENERAL ELECTRIC COMPANY LIMITED
IN CANADA 97 Wingold Ave. Toronto. Ontario M6B 1P8 (416) 789-3281

JAMPRO

ANTENNA COMPANY

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(916) 383-1177
6939 POWER INN ROAD
SACRAMENTO, CALIF.
95828

COMPARE—NINETEEN GOOD REASONS FOR CHOOSING JAMPRO—

The full page ad on the reverse side, which ran in the trades recently, tells the story, by direct comparison of the JAMPRO PENETRATOR model JSCP, with those in the same class. Data was taken from competitors' literature in January and February, 1975. Be sure to compare similar models. You wouldn't compare a Ford Pinto with a GM Cadillac, would you? All FM antenna manufacturers have different models, so be sure you are comparing antennas in the same class. The following breakdown shows the comparative models.

CLASS	RATING	JAMPRO	RCA	GATES	COLLINS	SHIVELY	P.DODGE	CCA
Low Power	Good	JLCP	BFH	FMC-B	LPC	6813	CFM-LP	FMC-LP
High Power	Best	JSCP	BFG	FMS	37CP	6810	CFM-HP	FMC-HP
Super Power	Extreme Hi Power	JHCP	No Equal	No Equal	No Equal	No Equal	No Equal	No Equal

The box on the reverse side shows 19 good reasons why the JAMPRO PENETRATOR is superior to others when compared with similarly priced and power rated antennas. Nothing else comes close. Most importantly, notice that —

- JAMPRO has the widest VSWR bandwidth - for best stereo and SCA. It's ready for quadraphonic sound when you are!
- 2 DB axial ratio. Competition does not tell you what theirs is. This is a quality number for circular polarization. 2DB is excellent. The ring stub antennas can't even come close! This is real circular polarization, for best possible signal penetration.
- JAMPRO is the only one that tests and measures your antenna, on a similar tower like yours and puts the results in the instruction booklet. We measure the impedance, phase and amplitude in addition to the VSWR. This insures highest possible gain and best VSWR.
- Only JAMPRO: Uses dual wattage deicers to save on power bills
  Paints the antenna, for longer life
  Gives you a 15 page instruction booklet
  Has a 2 YEAR WARRANTY against defects
- JAMPRO has the lowest wind load of any antenna in its class. Makes it possible to mount on marginal strength towers, yet made strong enough not to come down in 110 MPH winds!
- Price! We are not the lowest. We're not the highest. But, we have the best antenna money can buy.

JAMPRO ANTENNA COMPANY

A SUBSIDIARY OF CETEC CORPORATION

6939 POWER INN ROAD • SACRAMENTO, CALIFORNIA 95828 • (916) 383-1177

JAMPRO
subsidiary of Computer Equipment Corporation
ANTENNA COMPANY
6939 POWER INN ROAD
SACRAMENTO, CALIFORNIA 95828
Phone: (916) 383-1177

ELLIPTICALLY POLARIZED

PERFORMER

FM ANTENNAS

- **Low VSWR**
- **Low Price**
- **Low Maintenance Cost**
- **Low Installation Cost**
- **Low Windload**
- **Low Weight**

NEW FROM JAMPRO!

ELLIPTICALLY POLARIZED FM ANTENNAS

Now Class A and educational broadcasting stations can take advantage of superior quality and craftsmanship of Jampro's latest contribution to FM broadcasting.

The introduction of the PERFORMER JLCP series, low power and low cost antenna will allow the Class A and educational stations a quality elliptically polarized FM antenna at a cost well within their budget.

The JLCP series is rated at 1 KW per bay and is available in models from 1 to 8 bays. Low VSWR over 200 KHz provides excellent conditions for stereo broadcasting service.

The JLCP is elliptically polarized for improved signal reception for car radios, and home receivers using built-in line cord antennas.

These PERFORMER antennas are designed for low VSWR values. Each antenna is complete with a VSWR tuner, which is adjusted for best operation after installation. The antenna is completely air tight and may be pressurized for long trouble free service.

These JLCP series antennas are rugged! Built of thick wall copper tubing, and marine brass, they will keep their shape during installation, high winds or ice loads.

Galvanized steel mounting brackets are included with each antenna for leg mounting on uniform cross section towers. Face mounting and tapered tower mounting brackets are priced on request. Other special mounting brackets are available.

The JLCP feed system consists of a vertical 1⅝" line, across which are shunted the various bays. The input of the antenna is a 1⅝" EIA flange.

Deicing is available at additional cost. Each radiating bay requires 360 watts of power at 220/240 volts. They can also be operated at 110/120 volts, AC, for reduced deicing requirements. Deicers are factory installed.

For HIGH POWER operation, investigate the standard of the industry. Write for a brochure on the JAMPRO PENETRATOR, circularly polarized FM antenna.

POLARIZATIONS:

The FCC permits the use of horizontally, elliptically, and circularly polarized FM broadcasting antennas. Experience has indicated that circularly polarized antennas put the most signal into a randomly polarized receiving antenna, with the elliptical antenna running a close second. Circular polarization is more difficult to achieve in a practical FM broadcasting antenna, and is thus more expensive.

CIRCULAR POLARIZATION

When the horizontally and vertically polarized components are nearly equal in strength in all azimuthal directions and the phase is nearly 90° quadrature, the antenna is circularly polarized. The patented JAMPRO PENETRATOR series of FM antennas, has excellent axial ratios and is truly a circularly polarized antenna.

ELLIPTICAL POLARIZATION

Like all ring-stub antennas, the PERFORMER, radiates different ratios of power in different azimuthal directions. The electrical phase of the two polarizations also varies with a change of azimuth. The resulting axial ratio of the horizontally and vertically polarized components makes this an excellent elliptically polarized antenna.

SPECIFICATIONS JLCP Series

Electrical:

Frequency Range:	**88 to 108 MHz**
Polarization:	Elliptical, Clockwise
Power Gain:	
Horizontal	See Table Below
Vertical	Same as Horizontal
Azimuthal Pattern:	±2.0 db in free space
VSWR at Input:	1.5:1 over ±200 KHz (Without field trimming)
VSWR at Input:	1.1:1 over ±200 KHz (With field trimming)
Power rating:	1 Kilowatt per Bay

Mechanical:

Input connection:	1⅝" EIA Flanges
Other	See Table Below

Deicers: (each bay)

Moderate:	90 watts @ 110-120 volts
Heavy Ice:	360 watts @ 220-240 volts

Type No. and Bays	Power Gain	Gain In DB	Field Gain	FS at 1 Mile 1 KW, MV/M	Net Weight	Safe Power Rating	Windload 50/33 PSF	Price Antenna
JLCP-1	0.475	−3.23	0.69	94.94	12 Lbs.	1 KW	15 Lbs.	$ 650.00
JLCP-2	0.955	− .20	0.977	134.44	51 Lbs.	2 KW	70 Lbs.	$1,200.00
JLCP-3	1.50	1.76	1.22	167.87	71 Lbs.	3 KW	130 Lbs.	$1,800.00
JLCP-4	2.05	3.12	1.43	196.77	90 Lbs.	4 KW	183 Lbs.	$2,400.00
JLCP-5	2.60	4.15	1.61	221.54	107 Lbs.	5 KW	242 Lbs.	$3,000.00
JLCP-6	3.15	4.98	1.77	243.55	132 Lbs.	6 KW	295 Lbs.	$3,600.00
JLCP-7	3.65	5.62	1.91	262.82	153 Lbs.	7 KW	350 Lbs.	$4,300.00
JLCP-8	4.20	6.23	2.05	282.08	174 Lbs.	8 KW	400 Lbs.	$4,800.00

1) Prices include complete mounting hardware for leg mounting, guyed towers only.

2) Mounting brackets not included in net weight or windloading.

3) Windload ratings are 50/33 PSF, 110 miles per hour.

4) Space required on tower is 984 divided by freq. in MHz × number of bays less 1.

——— WHEN ORDERING PLEASE BE SURE TO SPECIFY ———

(A) Antenna type number.

(B) Deicers, if any, add $120.00 per bay.

(C) Channel (Between 88-108 MHz).

(D) Description of tower (Make & Model).

Since the 1960's, JAMPRO ANTENNAS, INC. has been designing and building broadcast antennas and RF components. From concept to completion, each of JAMPRO's products receive the attention to detail and quality that have made us the world leader in the broadcast industry.

Excellence

From our first side-mounted FM antenna to our newest dual-mode HDTV antennas, JAMPRO's focus has always remained on the future of broadcasting. Research and development are made a priority, creating an environment where innovative ideas are frequent and excellence is our standard.

FM ANTENNA PRODUCTS

FM Sidemount Antennas

JMPC Medium Power
JSCP Original Penetrator
JHPC High Power
JBBP Multi-User
JBCP Internal Feed
JHCP Ultra-High Power
V-Pol and H-Pol arrays also available

The PENETRATOR Series of side-mount antennas is JAMPRO's most popular model, with over 3,500 installations worldwide. Power handling ranges from 1 KW to 80 KW. Some models allow two FM frequencies to be diplexed into one antenna.

FM Panel Antennas

JCPD C-Pol Flat Panel
JFHD H-Pol Flat Panel
JADP Cavity Dipole Panel
JAHD Arrowhead Dipole
JSDP Spiral Dipole Cavity

Choose from JAMPRO's selection of horizontally, vertically, or circularly polarized panel antennas. Designed to allow as much flexibility as possible, our panel antennas offer excellent bandwidth, rugged construction, multi-plexing capabilities and a variety of standard directional patterns. As with all of JAMPRO's products, broadcasters may choose to have a custom directional pattern designed on our 7,000 foot full-scale test range.

Other FM Antennas

JLST Translator-Booster
JLHP Translator-Booster
JLLP Low Power
JTC Top Mounted Spiral

TV ANTENNA PRODUCTS

TV Panel Antennas

JHD-LV Channels 2-6
JHD-HV Channels 7-13
JUHD Channels 14-69

JAMPRO's television broadcast panel antennas are available for UHF and VHF applications. Each of our panel antennas are built with rugged materials and offer the optional protection of fiberglass radomes. Power handling capability and polarization may be customized. JAMPRO's TV panel antennas are easily diplexed, making them an excellent choice for broadcasters with more than one channel. Coverage may be further improved by adding beam tilt and null fill or designing a custom directional pattern.

JAMPRO also designs and manufactures UHF slot antennas. Well known for their rugged construction and pattern flexibility, JAMPRO's slots are a favorite among broadcasters worldwide.

UHF Slot Antennas

PROSTAR Series
JA Series
JTW Travelling Wave

Choose from several series of slot antennas, each with low, medium and high power versions. JAMPRO's slots may be top-mounted or side-mounted, and custom azimuth patterns may be designed to best suit your needs.

Other TV Antennas

JAT VHF Batwing
JTC Spiral Antenna
JCR Corner Reflector

is

Because each broadcaster's needs are so individual to his station, JAMPRO employs a team of well-trained professional employees to assist you in designing the antenna system that is right for you. Our sales department is in constant consultation with our engineering staff to identify the best possible solution to suit your needs. Power handling, pattern requirements, antenna gain, weight, windload and budget are all considered equally when an antenna system is recommended. It is this commitment to service that has led thousands of broadcasters worldwide to choose JAMPRO for their broadcasting needs.

Timeless

JAMPRO ANTENNAS, INC.

6340 Sky Creek Drive
Sacramento, CA 95828 USA
(916) 383-1177
(916) 383-1182 fax

OTHER INNOVATIVE PRODUCTS

JAMPRO's line of HDTV antennas allow NTSC and HDTV signals to be simulcast from a common antenna.

JAMPRO's Common Aperture antennas are designed using the proven technology of existing antennas as well as new state of the art technology. These antennas are destined to be the favorite of HDTV broadcasters for decades to come.

HDTV Antennas

JDMB Dual Mode Batwing
JDMP Dual Mode Panel
JDMS Dual Mode Slot

RF Components

FM Combiners
TV Combiners
Patch Panels
Transmission Line
Power Dividers
Power Splitters

JAMPRO also manufactures a complete line of RF components. All of our products receive the same attention to detail and quality as our antennas.

TEST RANGE

Situated on 724 acres of undeveloped land, JAMPRO's test site is the ideal environment in which to generate custom azimuth patterns. With the assistance of the latest state of the art network analyzers and test equipment, JAMPRO's highly trained technicians are able to develop even the most specialized patterns. Great care is taken to eliminate signal reflection to ensure the accuracy of each pattern.

JAMPRO also offers pattern measurement service for FM antennas at our test range. The customer's antenna is mounted in ten different positions on a tower that best simulates the actual broadcast tower, and an azimuth pattern is measured at each position. Broadcasters may then review the patterns and make an educated decision as to how their antenna should be mounted for best performance. JAMPRO stocks most types of towers, and offers tower duplication service for tower types not in stock.