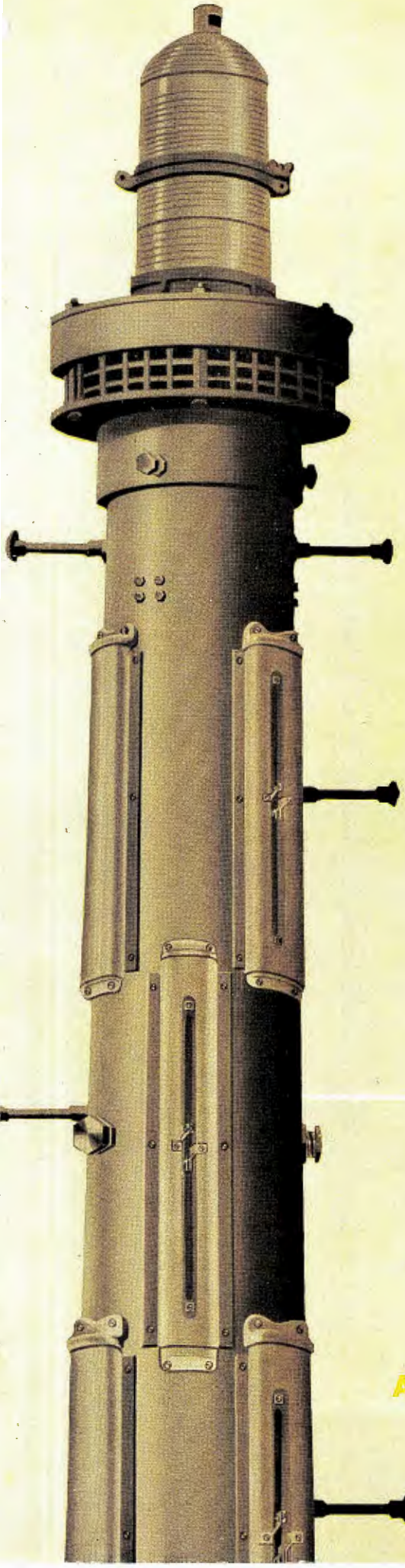
2
EDITION



RCA

BROADCAST ANTENNA EQUIPMENT

for

UHF • VHF • TELEVISION

VHF SUPERTURNSTILES
UHF PYLONS
ANTENNA ACCESSORIES

CUSTOM ANTENNAS
TOWERS
DIPLEXERS

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BROADCAST ANTENNA EQUIPMENT CATALOG

for UHF and VHF TELEVISION

(Second Edition)

PRICE $1.00

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BROADCAST AND TELEVISION EQUIPMENT DEPT.

RADIO CORPORATION OF AMERICA

Commercial Electronic Products Camden, N. J.

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ABOUT THIS CATALOG

This Catalog is devoted solely to information on RCA television antenna equipment designed especially for broadcast station use. Other RCA Broadcast Equipment Catalogs contain similar information on TV, AM and FM transmitting equipment, transmission line, test equipment, audio equipment and video equipment.

The information contained in this catalog is intended to serve as a buying guide for the users of this type of equipment. In the belief that broadcast engineers want facts, rather than generalities, the content has purposely been kept brief and factual. Readers who desire more information or individual bulletins on particular equipment items are invited to write to the RCA Broadcast Representative in the RCA Regional Office nearest them (see opposite page).

OTHER RCA TECHNICAL PRODUCTS

The RCA equipment described in this catalog is specifically designed for broadcast station use. In similar manner RCA builds electronic equipment for many other industries. These include: two-way radio and microwave relay communications equipment; a complete line of equipment for theatres; optical and magnetic film recording equipment; sound systems of all types; 16mm projectors and magnetic recorders; high-fidelity components for home music system; industrial inspection equipment; scientific equipment, such as the electron microscope; industrial television systems; intercoms; tape recorders; TV Eye; Antenaplex systems; and many types of custom-built equipment for industry and the military services. Information, and catalogs or bulletins, describing these may be obtained from RCA Regional Offices.

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HOW TO ORDER

The RCA Broadcast Antenna Equipment shown in this catalog is sold directly through RCA Broadcast Representatives, who are familiar with broadcast equipment and related problems. One or more of these RCA Representatives are located in each of the RCA Regional Offices listed below. Orders for equipment shown in this catalog, or requests for additional information, should be directed to the nearest one of these offices.

PRICES

The prices of the various equipment units shown in this catalog are given in a separate price list. Prices are listed in the order in which they are shown in the catalog. To determine the price of any equipment first note the page on which it is shown in the catalog, then consult the price list in accordance with this page number. Equipments are identified by type and MI (Master Item) numbers which are used to identify apparatus on invoices and packing slips.

YOU CAN LOCATE YOUR NEAREST RCA REPRESENTATIVE FROM THIS LIST

REGIONAL OFFICES

Front and Cooper Streets
CAMDEN 2, NEW JERSEY
Woodlawn 3-8000

•

36 West 49th Street
NEW YORK 20, NEW YORK
Judson 6-3800

•

7901 Freeway #183
DALLAS 35, TEXAS
Fleetwood 2-3911

•

1600 Keith Building
CLEVELAND 15, OHIO
Cherry 1-3450

200 Berkeley Street
BOSTON 16, MASSACHUSETTS
Hubbard 2-1700

•

522 Forsyth Building
Forsyth and Luckie Streets, N.W.
ATLANTA 3, GEORGIA
Jackson 4-7703

•

1006 Grand Avenue
KANSAS CITY 6, MISSOURI
Harrison 1-6480

•

1560 North Vine Street
HOLLYWOOD 28, CALIFORNIA
Hollywood 9-2154

420 Taylor Street
SAN FRANCISCO 2, CALIFORNIA
Ordway 3-8027

•

1186 Merchandise Mart Plaza
CHICAGO 54, ILLINOIS
Delaware 7-0700

•

1625 K Street, N.W.
WASHINGTON 6, D. C.
District 7-1260

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2250 1st Avenue, South
SEATTLE 4, WASHINGTON
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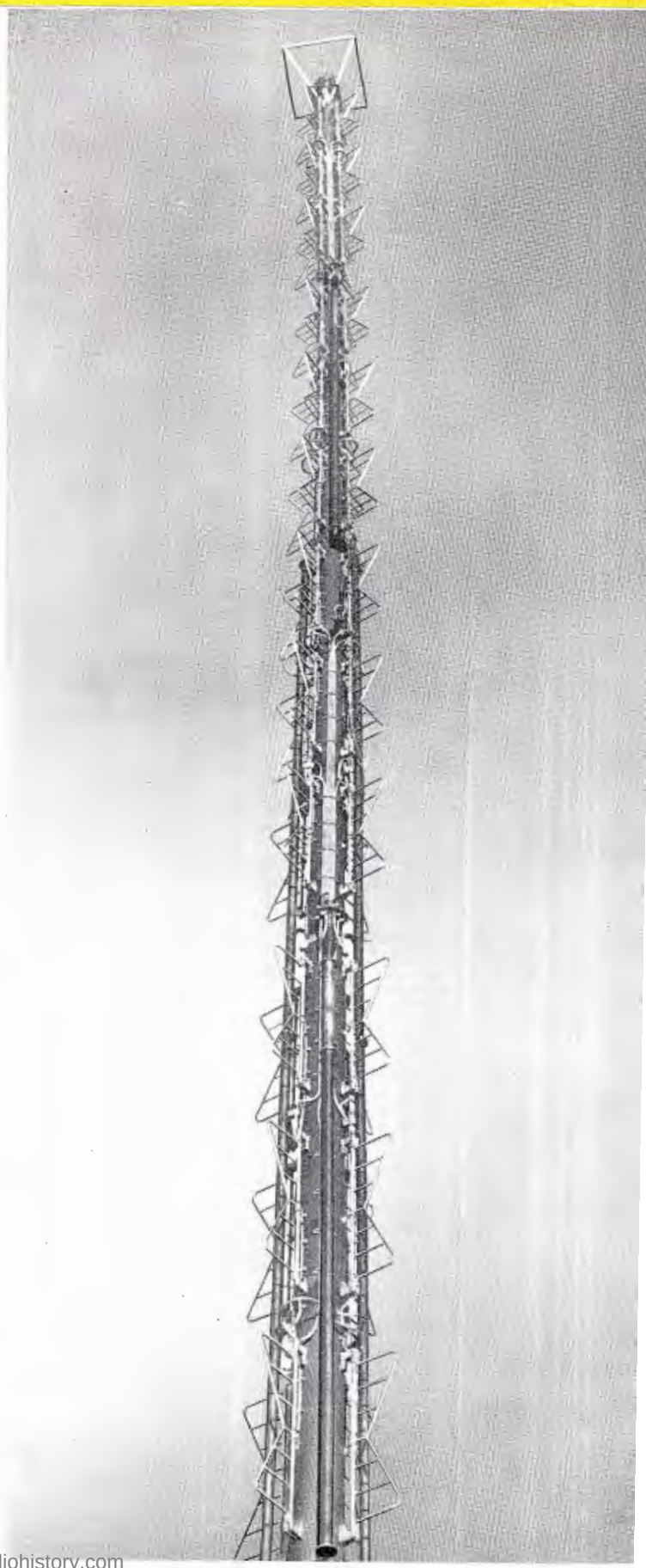
VHF SUPERTURNSTILE ANTENNAS

FEATURES

- Complete line of antennas for gains of 3 to 17½ and power ratings to 100 kw
- High gains available for all channels
- 50 kw antennas for high power
- Tailored vertical patterns for high gain antennas
- Stacking and candelabra arrangements for "community" operation
- Adjustable beam tilting puts signal where it counts
- Versatile feed system permits optimum "power-split" for more uniform coverage
- Rugged mechanical construction
- Radiators attached directly to steel pole (top and bottom)—no weight supported by insulators
- Grounded for lightning protection



USES

RCA Superturnstile Antennas are designed for operation on TV channels 2-13. The Superturnstile radiates well in all directions and provides power gains up to 17½. These antennas together with RCA Transmitters make possible allowable radiated powers. Because of its high gain, exceptional coverage, and rugged construction, the Superturnstile has become the standard antenna of "present-day" television.

Superturnstile Antennas are available for use by the television broadcaster in a variety of ratings. There are two-section low power Superturnstiles with power ratings between 3 kw and 5 kw and medium power Superturnstile antennas with power ratings from 25 to 50 kw. RCA's high power Superturnstiles are available in 6 to 18 sections with power ratings from 50 kw to 100 kw.

Special vertical pattern shaping is provided in the high gain antennas for uniform close-in coverage—and adjustable beam tilting yields stronger signals in a desired segment or location.

RCA Superturnstile Antennas are separately mounted on their own supporting towers, or may be employed in a variety of combinations with AM Antennas, FM Pylons, VHF Supergain Antennas, UHF Pylons—and even with other Superturnstiles in stacking or candelabra arrangements.

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DESCRIPTION

RCA Superturnstile Antennas are made up of a series of radiating elements in which increased gain is accomplished by concentrating the radiation at a low vertical angle. The gain increases with the number of sections or layers used in the antenna.

Each section of the Superturnstile Antenna consists of four radiators, mounted at 90-degree intervals around the pole. Sections are mounted approximately a wavelength above each other, center to center. Electrical feed is by means of coaxial transmission lines. Each radiator has its own feedline, the impedance of which is carefully matched to that of the radiator. The line feeds the center of the radiator, at low impedance, so that ice formation has little or no detrimental effect. Such ice formation can be alleviated by the use of sleet melting resistors which are available as accessories.

Feedlines are combined in sets at junction boxes which perform two functions: (1) feed power simultaneously to all feedlines, and (2) transform the combined impedance of these lines to 51½ ohms, an exact match with the transmission line carrying power from the base of the antenna. The latter is achieved by three-stage transformers located immediately below the junction box.

At the base of the antenna, the transmission lines are combined by appropriate coaxial networks with transmission lines carrying power from the transmitter up the supporting tower. This "combining" network makes possible a number of desirable features of the RCA Superturnstile.

TF-6AL Superturnstile is hoisted to top of a Philadelphia tower.

Versatility—Flexibility

One of the most outstanding of these features is versatility. With transmission lines leading directly to the base of the antenna instead of combining on the antenna structure, it is possible to feed 12-Section antennas with one, two, or four tower lines—and 6-section antennas with one or two lines.

In addition to a choice of methods of feed and provision for emergency operation—the combining network incorporates two other outstanding features—unequal power division to achieve more uniform coverage and beam tilt for special requirements.

Durability—Stability

All components of the antenna are designed of the finest materials obtainable and are specially selected for their ability to withstand severe weather conditions. Virtually no change is experienced due to changing temperatures, or to rain or snow.

Radiators, radiator supporting brackets, feedline clamps, and hardware are hot-dip galvanized to provide against the effects of weather. The pole is painted during manufacture and again upon erection.

All antenna components are designed to withstand the windloading resulting from an actual (not "indicated") wind velocity of 110 miles per hour without ice, or 85 miles per hour with 1 inch of radial ice on all members.

Wide Choice of Types

There are many different RCA standard Superturnstile Antennas from which the TV Broadcaster may make his selection (see Table A). The choice of course will depend upon one or more of the following factors: (1) power gain needed, (2) coverage pattern desired, (3) input power to be handled, (4) channel or frequency, and (5) nature of surrounding terrain.

RCA Superturnstiles are available to meet almost any particular requirement such as: (a) special fringe area per-

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formance, (b) close-in coverage, and (c) null fill-in and pattern reinforcement.

Low Power Superturnstile Antennas

A series of two section antennas (TF-2BL, TF-2BM and TF-2BH) is also available for operation at power levels of 5 kw on channels 2 and 3, 4.0 kw on channels 4, 5 and 6 and 2.5 kw on channels 7 through 13. These antennas are similar in design and construction to the 12 section, 50 kw type. The electrical specifications are the same, having a VSWR of 1.1/1.0 over a specified channel.

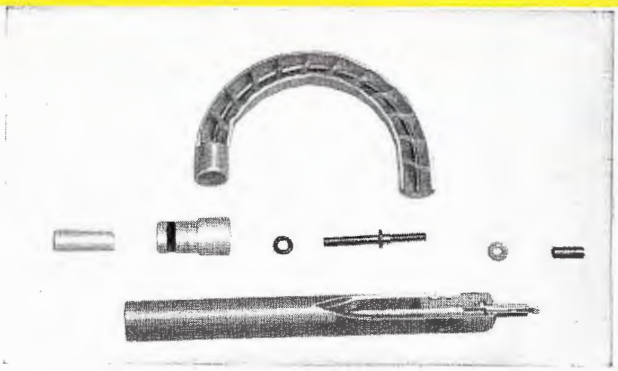
These antennas are designed for 50/30 psf loading. Provisions are made for sleet melting by means of heater units which can be inserted in the riser tubes of the batwing radiators. The input connections are located below the lower section of radiators and are designed to mate with ¾", 50 ohms Styroflex or an approved adaptor.

25 kw and 50 kw Antennas

In addition to the familiar medium gain (2 to 5 section) Superturnstile Antennas which are so widely used RCA has designed a complete line of high gain Superturnstiles for channels 2-13. Available in gains of 6, 12 and up to 17.5 in the case of the 18 section Superturnstile, these antennas offer many exclusive features not provided by any other antenna. Capable of high gain and correspondingly higher power handling, they more than meet FCC maximum limits when used with RCA high power TV transmitters. Some of the features resulting from the design of these antennas are: (1) Styroflex feedlines for better flexibility, greater protection and low "VSWR", (2) versatile feed systems, (3) suitable power division for vertical pattern shaping, (4) Null fill-in built into 12-section antennas, and can be provided on others, (5) special phasing available for ideal vertical pattern shape, certification for 50/30 wind loading on standard antennas.

Pattern Shaping for Uniform Field Strength

RCA 12-section VHF antennas can be furnished to provide a substantially uniform service throughout the primary service area of the TV station. This assures effective "close-in" coverage and is accomplished by two methods: (1) use of optimum power ratios between upper and lower halves of the antenna, and (2) special phasing between sections.

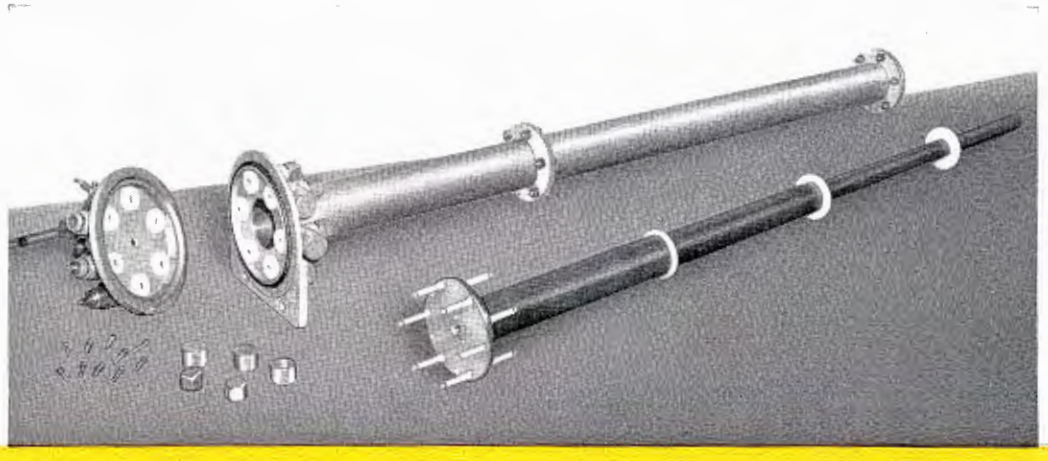


View of a section of Styroflex feedline with segments cut out to illustrate construction.

The TF-12BH antenna is an example of one which employs phasing for pattern shaping. It makes possible better fringe area and close-in coverage than that obtained from other types. The TF-12BH which has a lower resultant gain (approximately 9) requires greater power input but has fewer areas of minimum signal strength. The TF-12BH does have ample gain to achieve 316 kw ERP on a 1000-foot tower using existing RCA transmitters. (See Field Strength vs Distance.)

Unless otherwise specified by the customer, TF-12AL, TF-12AM and TF-12AH 12-section VHF antennas will be supplied with a 70/30 ratio of power division between upper and lower sections. This is a discreet choice which applies for the majority of applications.

Combining tees are used to divide the power from the transmitter in any desired ratio between two sections of the antenna. With the power split of 70/30 ratio, the first null is almost completely eliminated with practically no sacrifice in gain.



For Superturnstile Antennas, except for 3-section types, the "combined" feedline impedance is different from 51.5 ohms and therefore requires the coaxial transformer shown here which results in an exact impedance match.

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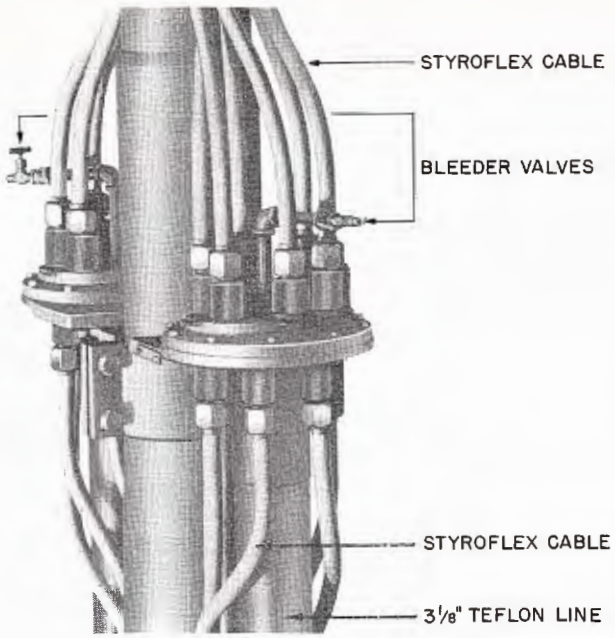


The versatile combining network in the top of the tower is designed for flexibility to permit single, dual, or four line transmission from the transmitter to the antenna and to provide flexibility in power division and phasing between the upper and lower half for pattern shaping and beam tilt.

Advanced Junction Box Design

A junction box of advanced design is used in RCA Superturnstile Antennas. It is constructed of cast brass with the required number of feedline outlets and with 3⅛" transmission line feeding them. Special flare fittings assure water-tight and air-tight connections to the junction box. The method of connection at this point is such that it permits slight axial movements of the inner conductor to occur during extreme temperature changes.

Beam Tilting for Special Conditions

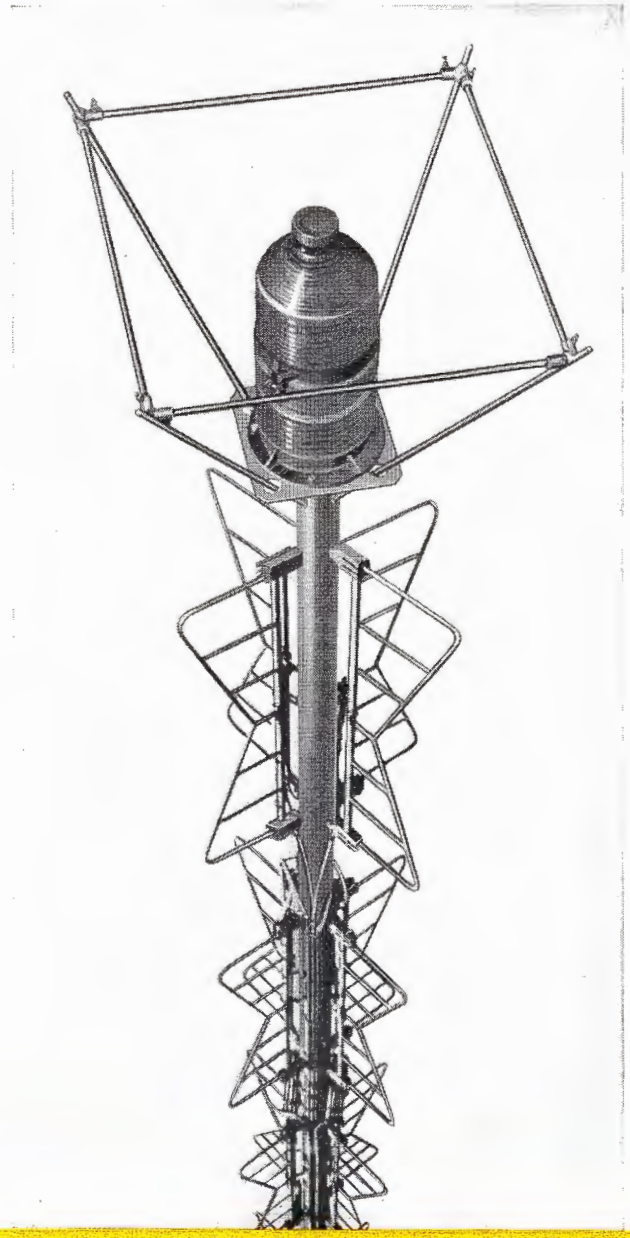
The beam tilting feature, easily obtained with RCA 12-section Superturnstile Antennas, provides greater field strength for selected portions of the primary service area. This is obtained by changing the phasing between the upper and lower halves of the antenna with the standard feed system (see tilting adjustment in "antenna feeding" charts).

A change in the tilt angle is made by exchanging the sections of line labeled "T" for other sections to provide the desired tilt. All 12-section antennas can readily be provided with beam tilt of one or two degrees as desired by specifying the corresponding tilt lines.

Versatile Feed Systems

All 12-section antennas have four transmission lines brought down through the tower top. A feature of these antennas which permits sectionalized connections is the separately fed upper and lower layers. This plus the advanced junction box design permits the switching of transmitter power to another part of the antenna for lower power operation, should the occasion arise. Four separate methods of feeding power to the antenna are illustrated by charts included here. The proper choice of feed system will depend upon individual station requirements and the type of diplexer or filterplexer employed.

RCA Superturnstile antennas include the new "Lightning Protector" for the protection of the antenna feedlines and beacon.



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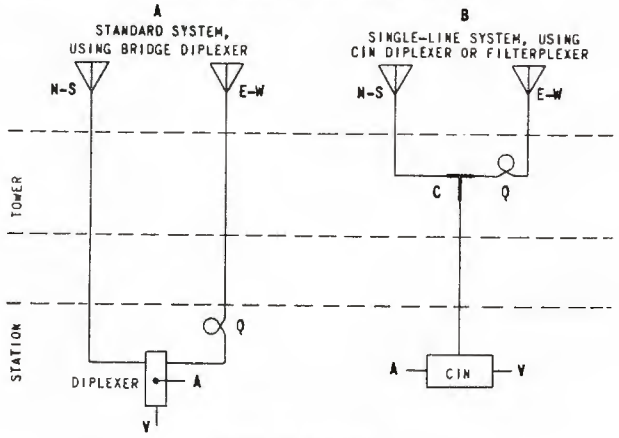
Versatile Feed Systems (cont'd)

TRANSMISSION LINE SYSTEMS FOR FEEDING ANTENNAS OF SIX OR LESS LAYERS OF RADIATORS



EMERGENCY OPERATION

FIGURE-8 PATTERN FROM ANTENNA	NONE

The standard system is used in most cases since it provides for emergency operation and uses the bridge diplexing system for combined visual and aural operation into the antenna. For emergency operation in case of failure of the E-W transmission line (for instance), the E-W transmission line is replaced at the diplexer by a R-f Load and Wattmeter, so that the N-S side of the antenna continues to radiate with a figure-8 coverage pattern. The bridge diplexer is the least expensive type of diplexer.

The single-line system is used where the transmission line length is very great and where other emergency antenna facilities are available.

LEGEND:

CIN.....Constant impedance notch diplexer or filterplexer
C.....Combining tee
A.....Aural input
V.....Visual input
Q.....Quadrature phasing length
Filterplexer.....Combination vestigial sideband filter and constant impedance notch diplexer.

The (A) standard system is used in most cases since it provides for emergency operation and uses the bridge diplexing system for combined visual and aural operation into the antenna. If one line fails it is replaced at the diplexer by a R-f Load and Wattmeter.

The (B) system provides greater flexibility by the addition of two more transmission lines.

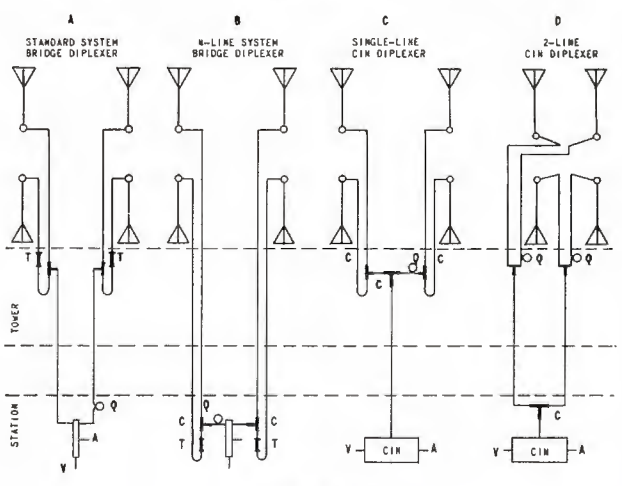
The (C) system can be used where the transmission line length is very great and where other emergency antenna facilities are available.

The (D) system results in a half-power circular pattern for emergency operation.

LEGEND:

C.....Combining tee
T.....Beam tilting adjustment
Q.....Quadrature phasing length
A.....Aural input
V.....Visual input
CIN.....Constant impedance notch diplexer. A filterplexer (combined vestigial sideband filter and diplexer) may also be used.

TRANSMISSION LINE SYSTEMS FOR FEEDING ANTENNAS OF MORE THAN SIX LAYERS



EMERGENCY OPERATION

FIGURE-8 PATTERN	MODIFIED FIGURE-8 PATTERN	NONE	CIRCULAR, HALF POWER

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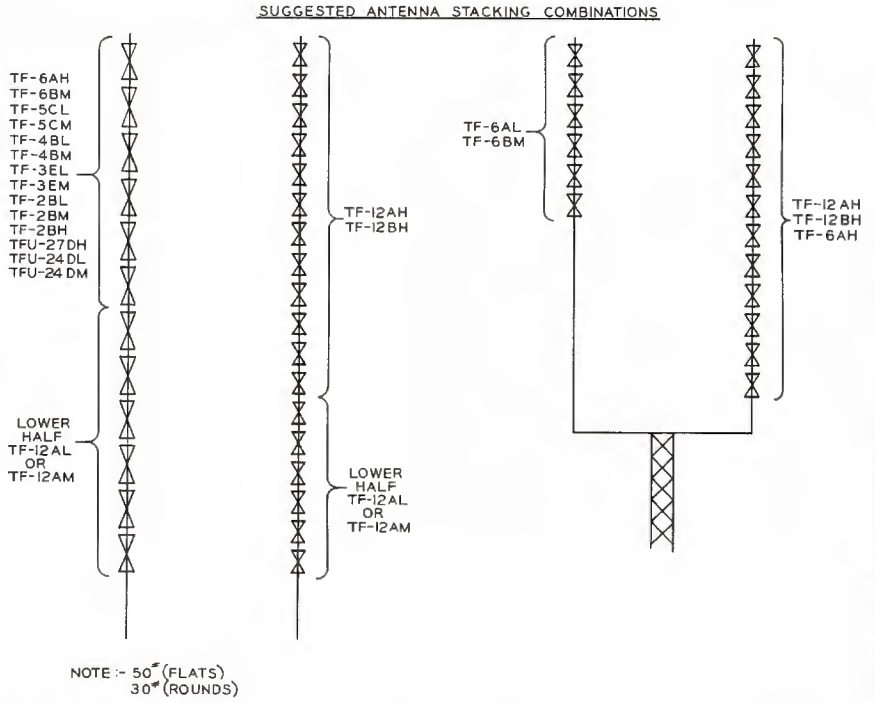
Antenna Stacking

Various combinations of stacking RCA antennas are illustrated by the accompanying chart. All combinations shown are certified for 50/30 wind loading as indicated and make possible divided antennas for "two-station" operation. Additional combinations to permit a common tower for several stations can be obtained with the "Supergain" Antenna.

For other combinations or multi-station operation from the same tower supergain or rectangular slot antennas can be mounted on the face of the supporting tower below the stacked superturnstile antennas.

Maximum capacities and deflections as certified for the combinations available on request.



SPECIFICATIONS

Antenna Equipment Supplied

RCA standard Superturnstile Antennas may be ordered by specifying the "MI" or Stock Identification number shown on the Specification sheets to follow.

In general, the antenna equipment supplied will consist of the following: (a) antenna pole, (b) radiator sections or batwings, (c) necessary hardware for assembly, (d) lightning protector, (e) feedlines, (f) junction boxes and (g) combining networks for 12-section antennas, and (h) complete assembly instructions.

The assembly and erection of the antenna are not included as a part of the services supplied, however, assembly supervision and electrical checkout by a qualified RCA Service Co. engineer is provided. This will include tests made before the antenna is raised to the tower top. The services of the RCA Service Co. engineer assure the customer of minimum assembly time, correct installation and a comprehensive final test. All antennas are shipped disassembled. The pole is shipped in two or more sections, depending on its length and weight. Sections do not exceed 8000 pounds in weight or 30 feet in length.

Accessories

RCA has a complete line of antenna equipment for the broadcaster. A few such items are: Sleet Melters, Antenna Warning Beacons, Diplexers, Beam Tilting Sections, R-F Loads, Transmission Line and Transmission Line Accessories.

Technical Specifications and Design Data

The various types of RCA Superturnstile Antennas are illustrated on the specification and data sheets which follow. Ordering information, accessories, wind loading, gain, and electrical and mechanical data are included. In order to assist the reader, the accompanying abbreviations and terms normally used are listed here as a reference.

ABBREVIATIONS AND TERMS USED:

#	Pounds
psf	Pounds per square foot
psi	Pounds per square inch
o.d.	Outside diameter
mph	Miles per hour (actual velocity)
agc	Automatic gain control
Diplexer	R-f network to permit use of single antenna for visual and aural transmission.

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Technical Specifications and Design Data—(Cont'd)

Filterplexer.....R-f network which combines functions of constant impedance notch diplexer and vestigial sideband filter.

Power rating.....KW (TV rating)

50/30 psf (etc.).....Wind load. The wind load on a square foot of projected area is greater for flat surfaces than for cylindrical surfaces. The first number in this case (50) denotes the pressure for a square foot of flat surface and the second number (30) denotes the pressure for a square foot of cylindrical surface.

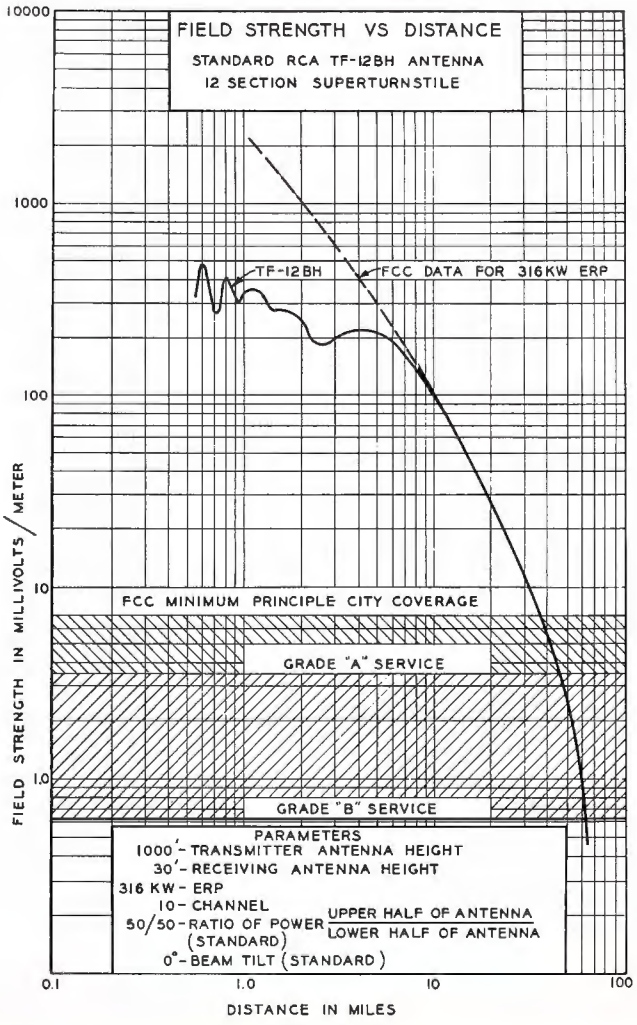
Mechanical Specifications

RCA VHF Superturnstile antennas are designed for 50/30 psf loading. "Recommended Base Stability" is the recommended maximum variation from horizontal of the tower top, measured in degrees, at the rated wind velocity. This is not directly related to the design wind load which is the wind velocity at which the maximum bending stress in the steel is 20,000 psi. The rated wind velocity is the velocity at which the rated base stability occurs. This "Recommended Base Stability" is important in maintaining signal stability of the received picture in the service area due to the bending deflection of the antenna and the tilting of the tower top. The choice of the rated wind velocity should be determined by consideration of the magnitude and frequency of occurrance of extreme wind velocities in the area where the antenna will be installed and the greatest permissible number of times per year that partially degraded service is acceptable.

In determining the rated wind velocity, it is desirable to consult the local weather bureau records, recognizing that the wind pressure increases with elevation above ground. The following table, taken from AMERICAN STANDARD BUILDING CODE REQUIREMENTS FOR MINIMUM LOADS IN BUILDINGS AND OTHER STRUCTURES, (Nat'l Bur. of Standards Misc. Publication M179) shows the design wind pressure at various elevations for a surface wind pressure of 20 psf.

Height Zone	Wind Pressure	Height Zone	Wind Pressure
Less than 50 feet	20 psf	600 to 799	35 psf
50 to 99	24 "	800 to 999	36 "
100 to 199	28 "	1000 to 1199	37 "
200 to 299	30 "	1200 to 1399	38 "
300 to 399	32 "	1400 to 1599	39 "
400 to 499	33 "	1600 and over	40 "
500 to 599	34 "		

"Field Strength vs Distance" curve for the TF-12BH as compared to the ideal FCC curve for 316 kw ERP.



LIGHTNING PROTECTION for the Superturnstile TV Antennas is provided by means of a four-pronged assemblage at the top of the pole. The prongs extend outward and upward at about 45 degrees, and are in the planes of the radiators. The prongs are long enough to extend above a 300mm beacon, if one is installed. This arrangement is very successful in reducing damage to beacons and antenna r-f components due to lightning hits.

SLEET MELTING is accomplished by the use of enclosed heater units which are inserted in the riser tube of the radiator. The riser is the vertical member of the radiator which is closest to the pole. Application of heat to the riser is an aid to the prevention of ice formation in the slot between radiator and pole. Inasmuch as this is the only region in which a large r-f gradient exists, the rest of the antenna need not be heated to prevent an impedance mismatch on the antenna or echoes in the received picture during sleet storm.

Sleet melter kits are available for each size of antenna. One kit provides the four resistor units, connecting cables, and junction for one section of radiators, together with a riser cable for interconnection between sections.

Sleet melting is usually considered necessary in the range of 25 F to 35 F since at other temperatures sleet does not form readily. The control for the sleet melters is usually

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accomplished by a thermostat located at the same elevation as the antenna. In order to eliminate the human factor in turning on or off the antenna sleet melter, an automatic control, MI-27369, can be provided. It prevents the waste of power during cold dry weather. It is essential to avoid prolonged operation of the sleet melters during warm weather as the feed lines may be raised to a temperature beyond the rating.

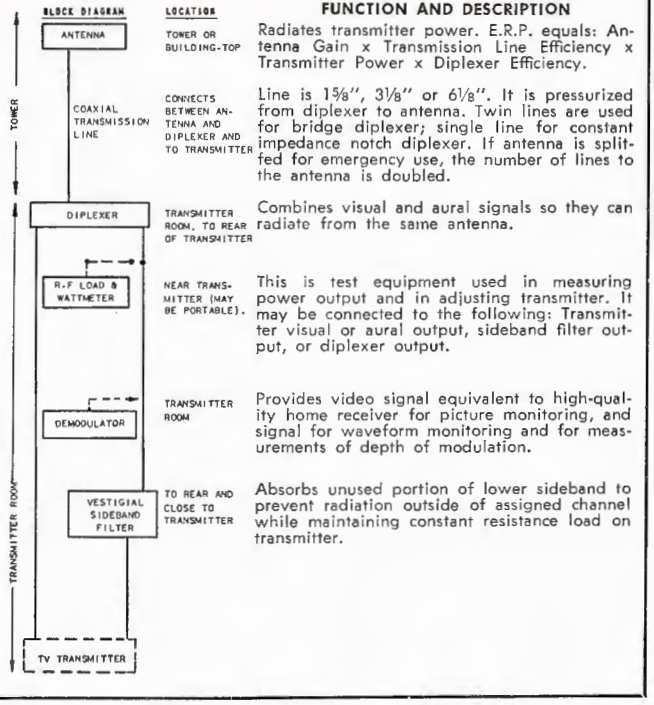
THE WIND VELOCITIES listed on the accompanying Engineering Data sheets are actual and not indicated values. A velocity of 110 mph results in a pressure on a square foot of projected area of 50 pounds for a flat surface and 30 pounds for a cylindrical surface; hence the 50/30 designation used in the Engineering Data sheets.

Electrical Specifications and Features

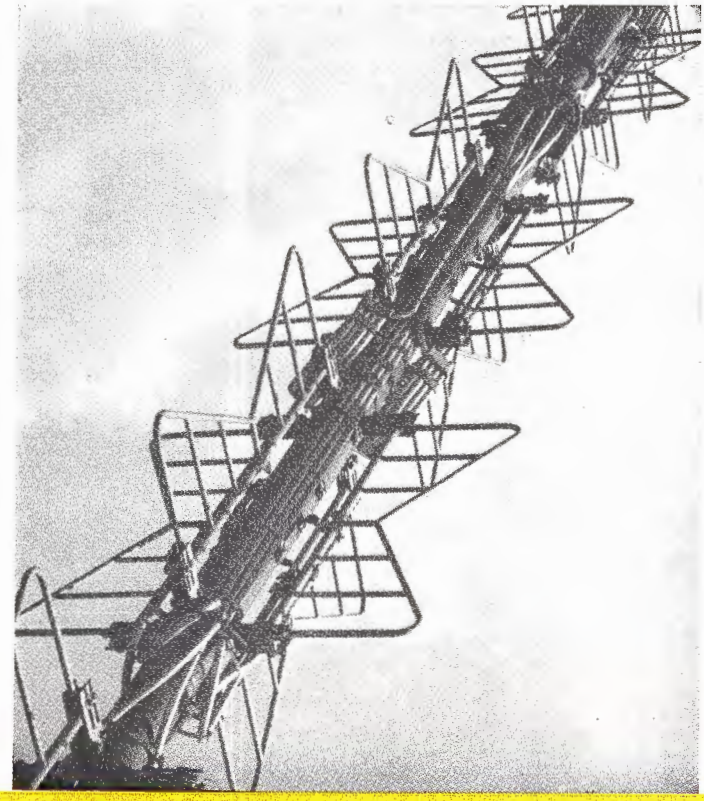
All antennas will provide an impedance match with a VSWR of 1.1/1.0 or better when connected to the designated transmission line. Swivel flanges are used at the feed points.

Transmission line systems, for the line connecting between the transmitter room and the antenna can be chosen from several available types. Normally a bridge diplexer with twin transmission lines is used. Other systems are available using either a bridge diplexer, or a Filterplexer.

VHF Antenna Equipment



Closeup of 50 kw Superturnstile showing typical feedline dress (TF-12AH).



THE ANTENNA POWER RATING is the TV rating of the r-f power fed to the antenna. For instance an antenna rated at 50 kw will take the output of a 50 kw television transmitter. The antenna is limited by heating due to the r-f power and not by voltage considerations. The maximum average power for the 50 kw transmitter occurs at black level. Under this conditions the visual power is 30 kw. This added to the 25 kw of aural (the aural is one-half of the peak visual) results in an average power of 55 kw. This is within the rating of the 50 kw antenna.

RCA antenna power ratings are based on continuous black level picture, aural power 50% of TV peak, ambient temperature 110° F with still air.

EMERGENCY CONNECTIONS can be made with most transmission line arrangements to provide temporary service when a fault occurs in one of the transmission lines. Systems which use the bridge-type diplexer and two transmission lines are changed to emergency operation by substituting the R-f Load and Wattmeter for the faulty transmission line at the diplexer. Systems using the Filterplexer can also be connected for emergency use if two or more transmission lines have been installed. R-f switches of several types are available to aid in rapid transition of connections.

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ANTENNA SUMMARY
TABLE A

Type No.	Number of Sections	H_3	H_2	Channel	Db Gain	Power‡ Gain	**TV Power Rating KW	Dbk
TT-2BL	2	16′ 6″	32′	2	2.79	1.9	5.0	7.0
				3	3.22	2.1	5.0	7.0
TF-2BM	2	14′	26′ 9″	4	2.79	1.9	4.0	6.0
				5	3.22	2.1	4.0	6.0
				6	3.42	2.2	4.0	6.0
TF-2BH	2	7′ 7 15/16″	13′ 9 1/4″	7	3.22	2.1		
				8	3.22	2.1	All Channels	
				9	3.42	2.2	2.5	3.98
				10	3.42	2.2		
				11	3.42	2.2		
				12	3.62	2.3		
				13	3.80	2.4		
TF-3EL	3	26′	50′	2	4.62	2.9	All Channels	
				3	4.91	3.1	25.0	13.98
TF-3EM	3	22′	41′ 9″	4	4.62	2.9	All Channels	
				5	4.91	3.1	25.0	13.98
				6	5.18	3.3		
TF-4BL	4	33′ 6″	66′	2	6.02	4.0	All Channels	
				3	6.12	4.1	33.3	15.22
TF-4BM	4	28′	54′ 9″	4	6.02	4.0	All Channels	
				5	6.23	4.2	33.3	15.22
				6	6.43	4.4		
TF-5CL	5	42′	83′	2	6.90	4.9	All Channels	
				3	7.08	5.1	41.6	16.2
TF-5CM	5	35′	68′ 9″	4	6.90	4.9	All Channels	
				5	7.24	5.3	41.6	16.2
				6	7.32	5.4		
TF-6AL	6	50′ 6″	101′	2	7.71	5.9	50.0	17.0
				3	7.85	6.1	50.0	17.0
TF-6BM	6	42′	82′ 9″	4	7.78	6.0	50.0	17.0
				5	8.06	6.4	50.0	17.0
				6	8.13	6.5	50.0	17.0
TF-6AH	6	19′ 3″	37′ 3″	7	7.92	6.2	All Channels	
				8	7.99	6.3	35.0	15.4
				9	8.26	6.7		
				10	8.26	6.7		
				11	8.33	6.8		
				12	8.33	6.8		
				13	8.39	6.9		
TF-12AL†	12	121′ 11″	202′	2	10.57	11.5	All Channels	
				3	10.61	11.5	50.0	17.0
TF-12AM†	12	100′ 10″	166′ 9″	4	10.72	11.8	All Channels	
				5	10.79	12.0	50.0	17.0
				6	10.83	12.1		
TF-12AH†	12	44′ 3 1/8″	72′ 11″	7	10.61	11.5	All Channels	
(Pedestal Mtg. TF-12AH-P)				8	10.68	11.7	50.0	17.0
				9	10.83	12.1		
				10	10.93	12.4		
				11	10.83	12.1		
				12	10.72	11.8		
				13	10.68	11.7		
TF-12BH	12	37′ 2 15/16″	72′ 11″	7	9.82	9.6	All Channels	
(Pedestal Mtg. TF-12BH-P)				8	9.82	9.6	50.0	17.0
				9	10.00	10.0		
(SPECIAL VERTICAL PATTERN)				10	10.21	10.5		
				11	10.21	10.5		
				12	9.91	9.8		
				13	9.91	9.8		

General Notes

H_3: Height of radiation center above top of tower.

H_2: Overall height above top of tower (does not include any necessary obstruction lighting).

** The power rating shown is the "TV Power" rating and represents the power at peak of Synch. of the visual carrier at the equipment input. With black level condition, the average visual power is 0.6 times the rating shown. To this is added the aural power of one half the value at peak of Synch. is assumed, giving a total average power of 1.1 times the "TV Power" rating indicated in the chart. Under conditions other than as assumed, the total average power must not be larger than the above value times 1.1, as otherwise the rating will be exceeded.

† The TF-12AL, TF-12AM and TF-12AH incorporate with provision for power splitting for null fill-in, and phasing for beam tilt.

‡ Gain Figures above are for 70/30 power division. For 50/50 power division Power gain is 4% higher and electrical center (H3) is reduced to the following heights: TF-12AL—101′ 6″, TF-12AM—84′ 0″, TF-12AH—37′ 3″, TF-12AH-6—39′ 9″.

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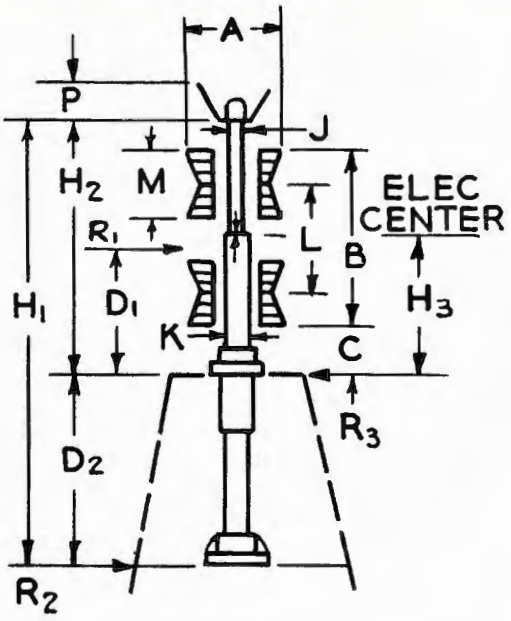

TYPE TF-2BL

TOWER MOUNTED

Mechanical Specifications

Weight	2400 lbs.		
A	9′-0″	H_3	16′-6″
B	27′-7″	J	7⅝″ O.D.
C	2′-8½″	K	8⅝″ O.D.
D_1	18′-0″	L	17′-0″
D_2	6′-0″	M	10′-7″
H_1	38′-0″	P	5′-6½″
H_2	32′-0″		
Shipping Lengths	(19′-6″)		(20′-0″)
Shipping Weight (Pole only)	464 lbs.		880 lbs.

LOADS, REACTIONS AND MOMENTS

$R_1 = 1620$ lbs.

$R_2 = 4680$ lbs.

$R_3 = 6480$ lbs.

$M = R_1 \times D_1 = 29{,}160$ ft. lbs.

Note: These values are for a 50 psf wind pressure on flats (values for other pressures may be obtained by proportion).

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure.....50 psf on flats (30 psf on cylindrical surfaces)

All antenna numbers are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice).....110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses.....A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability.....2°

Electrical Specifications

Power Rating.....5 kw

Circularity.....±2 db or better

Input Impedance.....50 ohms (VSWR 1.1 or better)

Gain (at visual carrier):

Channel	2	3
Power Gain	1.9	2.1
DB Gain	2.79	3.22

Stock Identification.....ES-27246

TRANSMISSION LINE CONNECTION

¾″ dia. 50 ohm styroflex cable with flared fitting connection 3″ below tower top.

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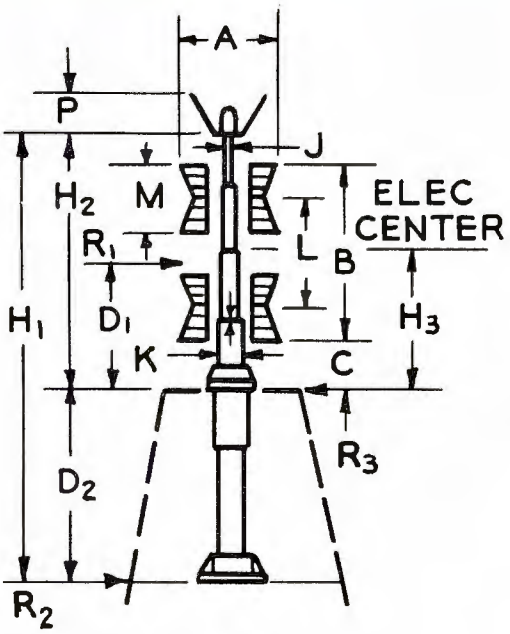

TYPE TF-2BM

TOWER MOUNTED

Mechanical Specifications

Weight	1710 lbs.		
A	6'-11"	H_3	14'-0"
B	22'-8"	J	5" O.D.
C	2'-8"	K	7⅝" O.D.
D_1	12'-0"	L	14'-0"
D_2	8'-0"	M	8'-8"
H_1	34'-9"	P	4'-4½"
H_2	26'-9"		
Shipping Lengths	(21'-6")		(14'-9")
Shipping Weights (Pole only)	384 lbs.		370 lbs.

LOADS, REACTIONS AND MOMENTS

$R_1 = 1370$ lbs.

$R_2 = 2055$ lbs.

$R_3 = 3425$ lbs.

$M = R_1 \times D_1 = 16{,}440$ ft. lbs.

Note: These values are for a 50 psf wind pressure on flats (values for other pressures may be obtained by proportion).

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure: 50 psf on flats (30 psf on cylindrical surfaces)

All antenna numbers are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice): 110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses: A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability: 2°

Electrical Specifications

Power Rating: 4 kw

Circularity: ±2 db or better

Input Impedance: 50 ohms (VSWR 1.1 or better)

Gain (at visual carrier):

Channel	4	5	6
Power Gain	1.9	2.1	2.2
DB Gain	2.79	3.22	3.42

Stock Identification: ES-27269

Accessories

Sleet Melters: 3 of MI-19009-C-1

Power Required: 4 kw, 230 v. 1 phase or 3 phase, or 460 v. 1 phase or 3 phase

TRANSMISSION LINE CONNECTIONS

¾" dia. 50 ohm styroflex cable with flared fitting connection 6" below tower top.

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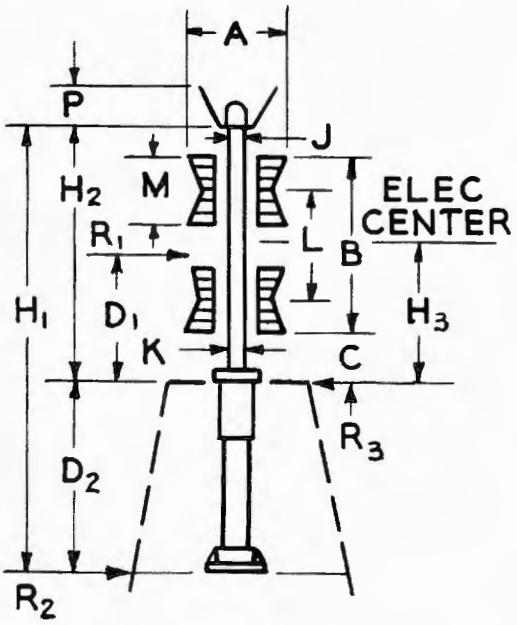

TYPE TF-2BH

TOWER MOUNTED

Mechanical Specifications

Weight	2400 lbs.		
A	3'-2"	H_3	7'-7 15/16"
B	9'-3 3/8"	J	7 5/8" O.D.
C	3'-0 1/4"	K	8 5/8" O.D.
D_1	6'-0"	L	5'-8"
D_2	6'-0"	M	3'-7 3/8"
H_1*	19'-9 1/4"	P	2'-8 1/2"
H_2	13'-9 1/4"		
Shipping Length	19'-9 1/4"		
Shipping Weight (Pole only)	252 lbs.		

LOADS, REACTIONS AND MOMENTS

R_1 = 660 lbs.
R_2 = 660 lbs.
R_3 = 1320 lbs.
$M = R_1 \times D_1$ = 3,960 ft. lbs.

Note: These values are for a 50 psf wind pressure on flats (values for other pressures may be obtained by proportion).

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure: 50 psf on flats (30 psf on cylindrical surfaces)

All antenna numbers are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice): 110 mph (true extreme)

Loadings with ice must be calculated with consideratian given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses: A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability: 2°

Electrical Specifications

Power Rating: 2.5 kw

Circularity: ±2 db or better

Input Impedance: 50 ohms (VSWR 1.1 or better)

Gain (at visual carrier):

Channel	7	8	9	10	11	12	13
Power Gain	2.1	2.1	2.2	2.2	2.2	2.3	2.4
DB Gain	3.22	3.22	3.42	3.42	3.42	3.62	3.80

Stock Identification: ES-27270

Accessories

Sleet Melters: 2 of MI-19009-J-2

Power Required: 1.6 kw, 230 v. 1 phase or 3 phase, or 460 v. 1 phase or 3 phase

TRANSMISSION LINE CONNECTIONS

3/4" dia. 50 ohm styroflex cable with flared fitting connection 6" below tower top.

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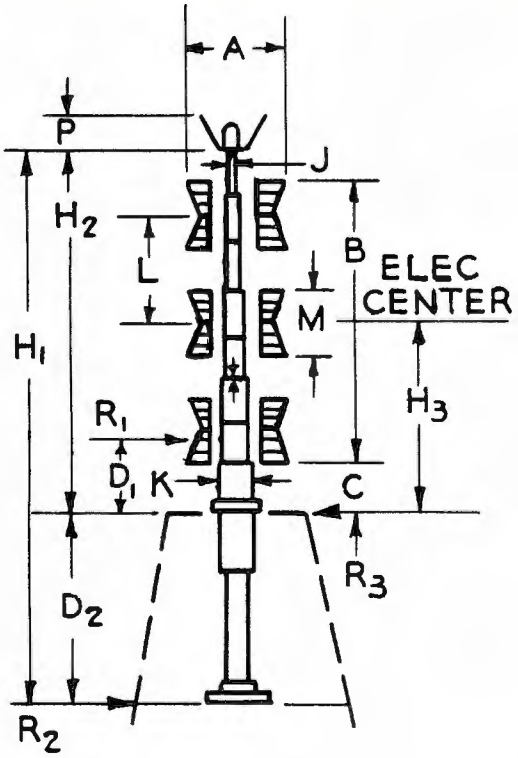

TYPE TF-3EL

TOWER MOUNTED

Mechanical Specifications

Weight	4700 lbs.		
A	9′-0″	H_2	50′-0″
B	44′-7″	H_3	26′-0″
C	3′-8½″	J	5″ O.D.
D_1	21′-0″	K	11¾″ O.D.
D_2	8′-0″	L	17′-0″
H_1	58′-0″	M	10′-7″
		P	66½″
Shipping Lengths	(32′-0″)		(27′-11⅜″)
Shipping Weights	787 lbs.		1754 lbs.
Transmission Line Conn.	11′-7⅝″ below tower top		

LOADS, REACTIONS AND MOMENTS
FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 2580$ lbs.
$R_2 = 6772$ lbs.
$R_3 = 9352$ lbs.
$M = R_1 \times D_1 = 54{,}180$ ft. lbs.

Note: These values are for o 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure.....50 psf on flats (30 psf on cylindrical surfaces)

All antenno members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice).....110 mph (true extreme)

Loadings with ice must be calculated with consideratian given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses.....A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability.....2°

Electrical Specifications

Circularity.....±2 db or better

Input Impedance.....To match 51.5 ohm MI-19313 lines over designated channel with trans. line conn. shown below.....(V.S.W.R. 1.1 or better)

Gain (at visual carrier) and Power Rating (kw):

Channel	2	3
Power Gain	2.9	3.1
DB Gain	4.62	4.91
Power Rating	25	25

Stock Identification.....ES-27265

Accessories

Sleet Melters.....3 of MI-19009-B-1
Power Required.....9 kw, 230 v. 3 phase, or 460 v. 1 phase or 3 phase

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*
TF-3EL	Two 3⅛	Bridge	B-464591-A

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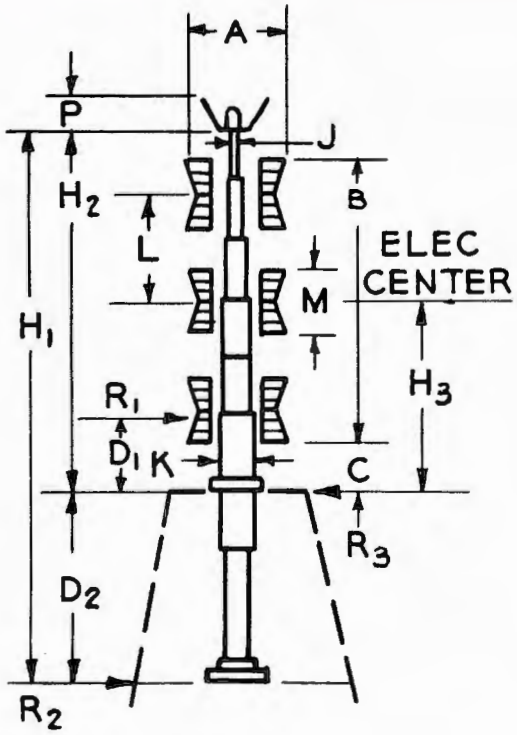

TYPE TF-3EM

TOWER MOUNTED

Mechanical Specifications

Weight	3050 lbs.		
A	6′-11″	H_2	41′-9″
B	36′-8″	H_3	22′-0″
C	3′-8″	J	5″ O.D.
D_1	18′-0″	K	9⅝″ O.D.
D_2	8′-0″	L	14′-0″
H_1	49′-9″	M	8′-8″
		P	52½″

Shipping Lengths	(28′-8″)	(22′-6⅜″)
Shipping Weights	590 lbs.	790 lbs.

Transmission Line Conn. ..... 9′-7 15/16″ below tower top

LOAD, REACTIONS AND MOMENTS
FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 1860$ lbs.
$R_2 = 4185$ lbs.
$R_3 = 6045$ lbs.
$M = R_1 \times D_1 = 33{,}480$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure ..... 50 psf on flats (30 psf on cylindrical surfaces)
All antenna members are considered cylindrical but rating for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice) ..... 110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses ..... A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability ..... 2°

Electrical Specifications

Circularity ..... ±2 db or better

Input Impedance ..... To match 51.5 ohm MI-19313 lines over designated channel with trans. line conn. shown below (V.S.W.R. 1.1 or better)

Gain (at visual carrier) and Power Rating (kw):

Channel	4	5	6
Power Gain	2.9	3.1	3.3
DB Gain	4.62	4.91	5.18
Power Rating	25	25	25

Stock Identification ES-27266

Accessories

Sleet Melters ..... 3 of MI-19009-C-1
Power Required ..... 9 kw, 230 v. 3 phase, or 460 v. 1 phase or 3 phase

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*
TF-3EM	Two 3⅛	Bridge	B-464591-A

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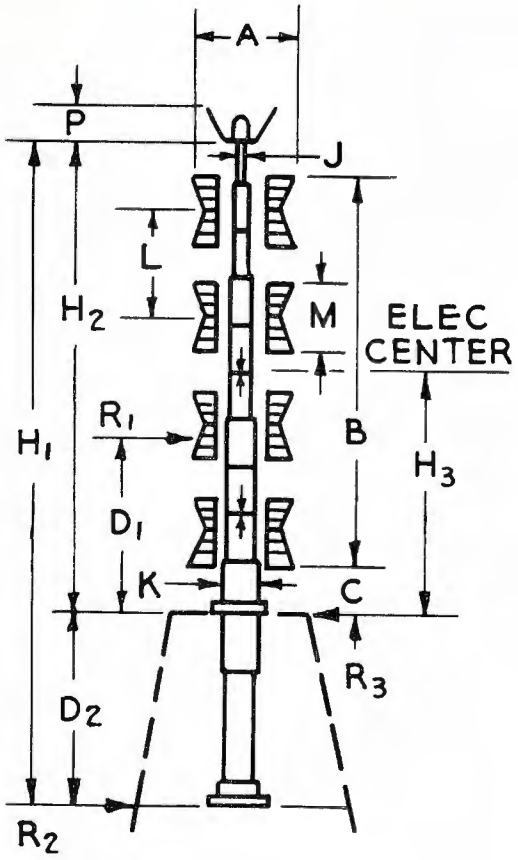

TYPE TF-4BL

TOWER MOUNTED

Mechanical Specifications

Weight	7200 lbs.		
A	9′-0″	H_2	66′-0″
B	61′-7″	H_3	33′-6″
C	2′-8½″	J	5″ O.D.
D_1	27′-0″	K	14″ O.D.
D_2	12′-0″	L	17′-0″
H_1	78′-0″	M	10′-7″
		P	66½″

Shipping Lengths	(32′-0″)	(24′-3″)	(25′-9″)	(29′-11¼″)
Shipping Weights	787 lbs.	1444 lbs.	2085 lbs.	3048 lbs.

Transmission Line Conn. ..... 3′-10⅜″ above tower top

LOADS, REACTIONS AND MOMENTS
FOR MAXIMUM DESIGN CONDITIONS

R_1 = 3720 lbs.
R_2 = 8370 lbs.
R_3 = 12,090 lbs.
$M = R_1 \times D_1$ = 100,440 ft. lbs.

Note: These values are for a 50 lbs/sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure ..... 50 psf on flats (30 psf on cylindrical surfaces)

All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice) ..... 110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses ..... A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability ..... 2°

Electrical Specifications

Circularity ..... ±2 db or better

Input Impedance ..... To match 51.5 ohm MI-19313 lines of designated channel with trans. line conn. shown below ..... (V.S.W.R. 1.1 or better)

Gain (at visual carrier) and Power Rating (kw):

Channel	2	3
Power Gain	4.0	4.1
DB Gain	6.02	6.12
Power Rating	33.3	33.3

Stock Identification ES-27267

Accessories

Sleet Melters ..... 4 of MI-19009-B-1
Power Required ..... 12 kw, 230 v. 3 phase, or 460 v. 1 or 3 phase

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*
TF-4BL	Two 3⅛	Bridge	B-464591-A

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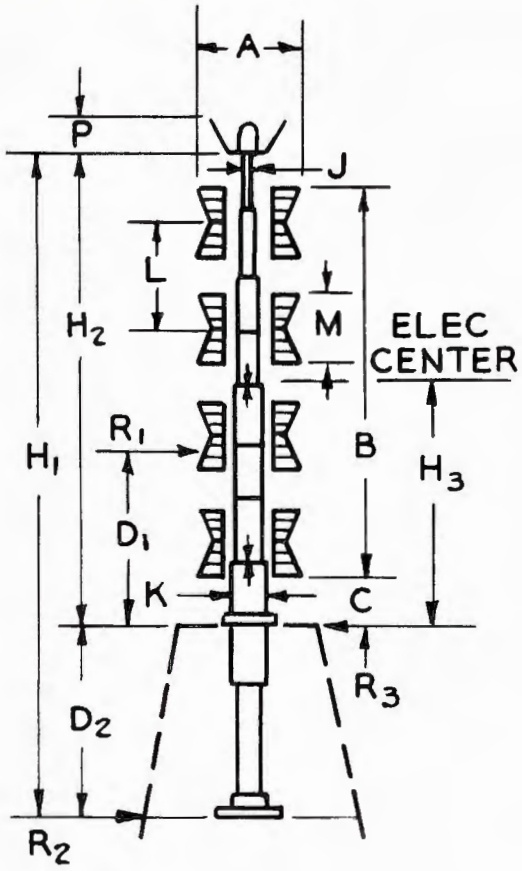

TYPE TF-4BM

TOWER MOUNTED

Mechanical Specifications

Weight			4850 lbs.
A	6′-11″	H_2	54′-9″
B	50′-8″	H_3	28′-0″
C	2′-8″	J	5″ O.D.
D_1	25′-0″	K	11¾″
D_2	10′-0″	L	14′-0″
H_1	64′-9″	M	8′-8″
		P	52½″

Shipping Lengths	(28′-8″)	(23′-6″)	(16′-0⅜″)
Shipping Weights	598 lbs.	1112 lbs.	1063 lbs.

Transmission Line Conn. ..... 3′-4$\frac{1}{16}$″ above tower top

LOAD, REACTIONS AND MOMENTS
FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 2760$ lbs.
$R_2 = 6900$ lbs.
$R_3 = 9660$ lbs.
$M = R_1 \times D_1 = 69{,}000$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure ..... 50 psf on flats (30 psf on cylindrical surfaces)

All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice) ..... 110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses ..... A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability ..... 2°

Electrical Specifications

Circularity ..... ±2 db or better

Input Impedance ..... To match 51.5 ohm MI-19313 lines over designated channel with trans. line conn. shown below ..... (V.S.W.R. 1.1 or better)

Gain (at visual carrier) and Power Rating (kw):

Channel	4	5	6
Power Gain	4.0	4.2	4.4
DB Gain	6.02	6.23	6.43
Power Rating	33.3	33.3	33.3

Stock Identification ES-27268

Accessories

Sleet Melters ..... 4 of MI-19009-C-1
Power Required ..... 8 kw 230 v 3 phase, or 460 v. 1 phase or 3 phase

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*
TF-4BM	Two 3⅛	Bridge	B-464591-A

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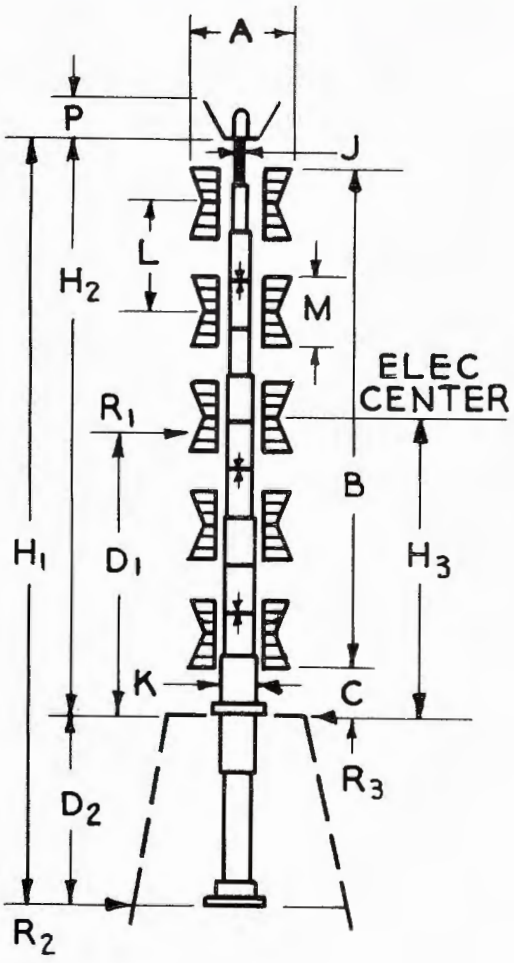

TYPE TF-5CL

TOWER MOUNTED

Mechanical Specifications

Weight	10,500 lbs.		
A	9′-0″	H_2	83′-0″
B	78′-7″	H_3	42′-0″
C	2′-8½″	J	5″ O.D.
D_1	37′-0″	K	18′-0″ O.D.
D_2	16′-0″	L	17′-0″
H_1	99′-0″	M	10′-7″
		P	66½″

Shipping Lengths	(17′-6″)	(31′-0″)	(26′-0″)	(29′-0¼″)
Shipping Weights	323 lbs.	1343 lbs.	2035 lbs.	3048 lbs.

Transmission Line Conn. ..... 10′-4½″ above tower top

LOADS, REACTIONS AND MOMENTS FOR MAXIMUM DESIGN CONDITIONS

R_1 = 5160 lbs.
R_2 = 11,932 lbs.
R_3 = 17,092 lbs.
$M = R_1 \times D_1$ = 190,920 ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure ..... 50 psf on flats (30 psf on cylindrical surfaces)

All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice) ..... 110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses ..... A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability ..... 2°

Electrical Specifications

Circularity ..... ±2 db

Input Impedance ..... To match 51.5 ohm MI-19313 lines over designated channel with trans. line conn. shown below ..... (V.S.W.R. 1.1 or better)

Gain (at visual carrier) and Power Rating (kw):

Channel	2	3
Power Gain	4.9	5.1
DB Gain	6.90	7.08
Power Rating	41.6	41.6

Stock Identification ES-27264

Accessories

Sleet Melters ..... 5 of MI-19009-B-1
Power Required ..... 15 kw, 230 v. 3 phase or 460 v. 1 phase or 3 phase

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*
TF-5CL	Two 3⅛	Bridge	B-464591-A

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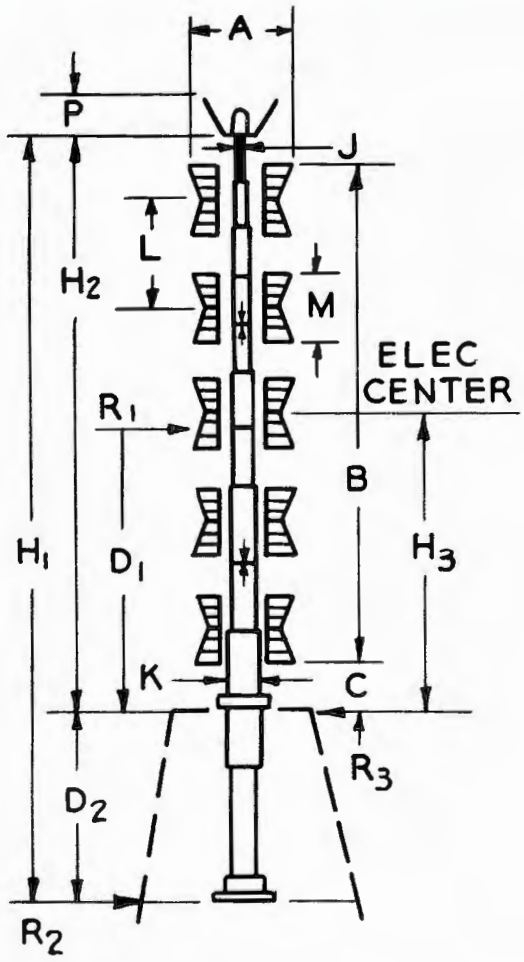

TYPE TF-5CM

TOWER MOUNTED

Mechanical Specifications

Weight	7500 lbs.		
A	6′-11″	H_2	68′-9″
B	64′-8″	H_3	35′-0″
C	2′-8″	J	5″ O.D.
D_1	31′-0″	K	14′-0″ O.D.
D_2	16′-5″	L	14′-0″
H_1	85′-2″	M	8′-8″
		P	52½″

Shipping Lengths	(28′-8″)	(31′-0″)	(28′-11¼″)
Shipping Weights	589 lbs.	1681 lbs.	2279 lbs.
Transmission Line Conn.	2′-8″ below tower top		

LOAD, REACTIONS AND MOMENTS
FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 3720$ lbs.
$R_2 = 7030$ lbs.
$R_3 = 10{,}780$ lbs.
$M = R_1 \times D_1 = 115{,}320$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure.....50 psf on flats (30 psf on cylindrical surfaces)

All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice).....110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses.....A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability.....2°

Electrical Specifications

Circularity .....±2 db

Input Impedance.....To match 51.5 ohm MI-19313 lines over designated channel with trans. line conn. shown below.....(V.S.W.R. 1.1 or better)

Gain (at visual carrier) and Power Rating (kw):

Channel	4	5	6
Power Gain	4.9	5.3	5.4
DB Gain	6.90	7.24	7.32
Power Rating	41.6	41.6	41.6

Stock Identification ES-27245

Accessories

Sleet Melters.....5 of MI-19009-C-1
Power Required.....10 kw 230 v. 3 phase, or 460 v. 1 phase or 3 phase

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*
TF-5CM	Two 3⅛	Bridge	B-464591-A

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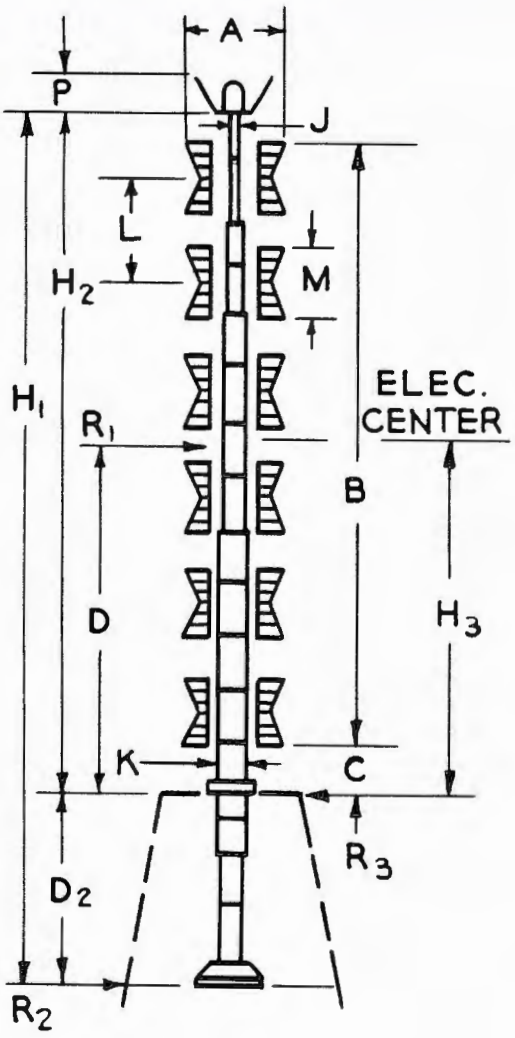

TYPE TF-6AL

TOWER MOUNTED

Mechanical Specifications

Weight	14,000 lbs.		
A	9′-0″	H_2	101′-0″
B	95′-7″	H_3	51′-6″
C	3′-8½″	J	5″ O.D.
D_1	43′-4″	K	20″ O.D.
D_2	20′-0″	L	17′-0″
H_1	121′-0″	M	10′-7″
		P	66½″

Shipping Lengths..(17′-6″) (23′-0″) (25′-9″) (26′-3″) (20′-0″) (18′-0″)
Shipping Weights..322 lbs. 758 lbs. 1820 lbs. 2760 lbs. 2200 lbs. 1958 lbs.
Transmission Line Conn. ..... 1′-9″ above tower top

LOADS, REACTIONS AND MOMENTS
FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 6630$ lbs.
$R_2 = 14{,}380$ lbs.
$R_3 = 21{,}010$ lbs.
$M = R_1 \times D_1 = 287{,}700$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure..... 50 psf on flats (30 psf on cylindrical surfaces)
All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.
Wind Velocity (no ice)..... 110 mph (true extreme)
Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.
Design Stresses..... A.I.S.C. 20,000 psi (in bending)
Suggested Antenna Bose Stability..... 2°

Electrical Specifications

Power Rating..... 50 kw
Circularity ..... ±2 db
Input Impedance..... To match 51.5 ohm MI-19113 lines over designated channel with trans. line conn. shown below (V.S.W.R. 1.1 or better)
Gain (at visual carrier):

Channel	2	3
Power Goin	5.9	6.1
DB Gain	7.71	7.85

Stock Identification ES-19292

Accessories

Sleet Melters..... 6 of MI-19009-B-1
Power Required..... 18 kw, 230 v. 3 phase, or 460 v. 1 phase or 3 phase

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*
TF-6AL	Two 3⅛	Bridge	B-464591-A
TF-6AL-A	One 3⅛	Notch	B-464591-B
TF-6AL	One 6⅛	Notch	B-464591-B

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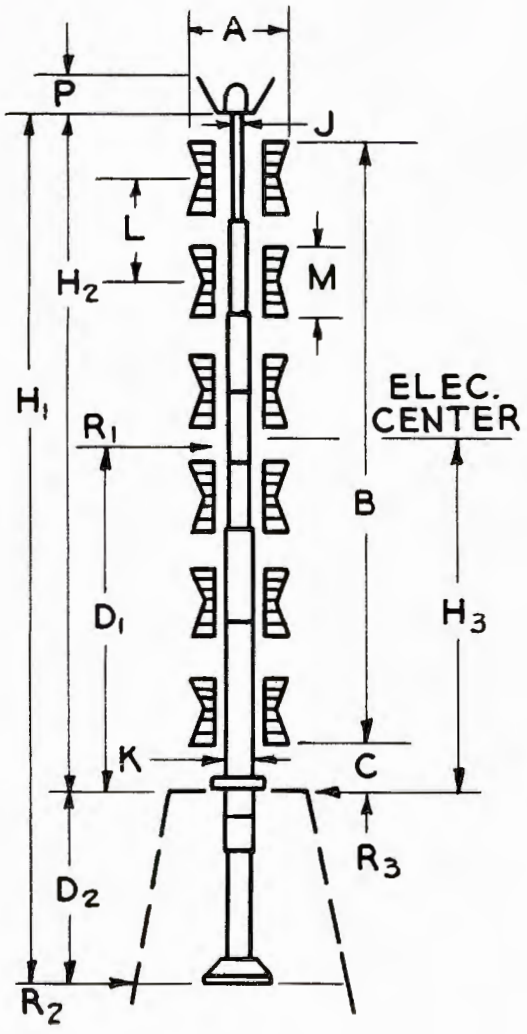

TYPE TF-6BM

TOWER MOUNTED

Mechanical Specifications

Weight	10,000 lbs.			
A	6′-11″	H_2	82′-9″	
B	78′-8″	H_3	42′-0″	
C	2′-8″	J	5″ O.D.	
D_1	36′-6″	K	16″ O.D.	
D_2	16′-5″	L	14′-0″	
H_1	99′-2″	M	8′-8″	
		P	52½″	
Shipping Lengths	(28′-8″)	(23′-6″)	(23′-6″)	(29′-0″)
Shipping Weights	590 lbs.	1090 lbs.	1858 lbs.	2588 lbs.

Transmission Line Conn. ..... 6′-8″ below tower top

LOADS, REACTIONS AND MOMENTS
FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 4740$ lbs.
$R_2 = 10,540$ lbs.
$R_3 = 15,280$ lbs.
$M = R_1 \times D_1 = 173,000$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure ..... 50 psf on flats (30 psf on cylindrical surfaces)

All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice) ..... 110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses ..... A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability ..... 2°

Electrical Specifications

Power Rating ..... 50 kw

Circularity ..... ±2 db

Input Impedance ..... To match 51.5 ohm MI-19113 lines over designated channel with trans. line conn. shown below (V.S.W.R. 1.1 or better)

Gain (at visual carrier):

Channel	4	5	6
Power Gain	6.0	6.4	6.5
DB Gain	7.78	8.06	8.13

Stock Identification ES-19291

Accessories

Sleet Melters ..... 6 of MI-19009-C-1

Power Required ..... 12 kw, 230 v. 3 phase, or 460 v. 1 phase or 3 phase

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*
TF-6BM	Two 3⅛	Bridge	B-46459-1A
TF-6BM-A	One 3⅛	Notch	B-464591-B
TF-6BM-B	One 6⅛	Notch	B-464591-B

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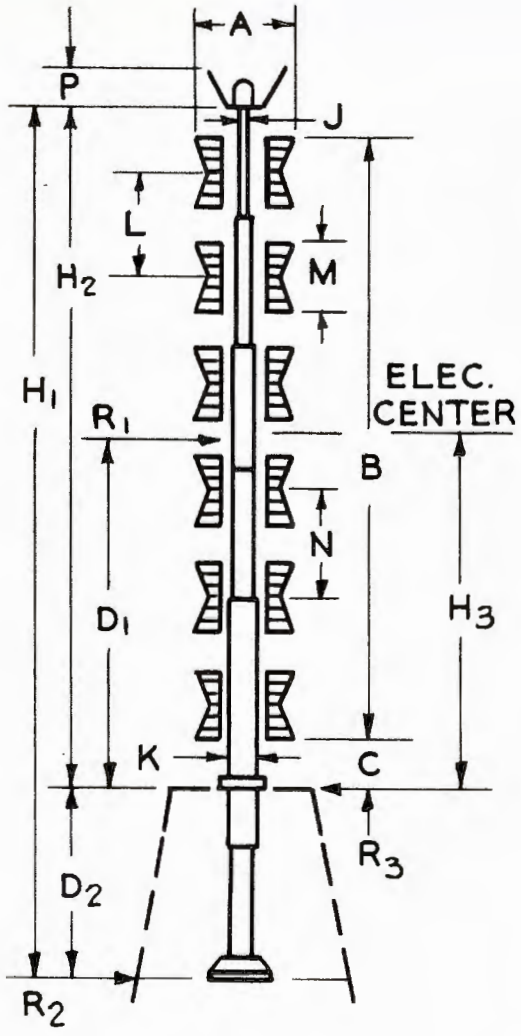

TYPE TF-6AH

TOWER MOUNTED

Mechanical Specifications

Weight	3,000 lbs.		
A	3′-2″	H_3	19′-2 15/16″
B	33′-2 3/8″	J	5″ O.D.
C	2′-7 3/4″	K	8 5/8″ O.D.
D_1	18′-7″	L	5′-8″
D_2	10′-0″	M	3′-7 3/8″
H_1	47′-3″	N	6′-11″ (at center)
H_2	37′-3″	P	32 1/2″
Shipping Lengths	(26′-8″)		(22′-1″)
Shipping Weights	491 lbs.		996 lbs.
Transmission Line Conn.	1′-0″ above tower top		

LOADS, REACTIONS AND MOMENTS
FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 1680$ lbs.
$R_2 = 3125$ lbs.
$R_3 = 4805$ lbs.
$M = R_1 \times D_1 = 31{,}250$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure....50 psf on flats (30 psf on cylindrical surfaces)
All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.
Wind Velocity (no ice)....110 mph (true extreme)
Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.
Design Stresses....A.I.S.C. 20,000 psi (in bending)
Suggested Antenna Base Stability....2°

Electrical Specifications

Power Rating....35 kw
Circularity....±2 db
Input Impedance....To match 51.5 ohm MI-19313 lines over designated channel with trans. line conn. shown below (V.S.W.R. 1.1 or better)

Gain (at visual carrier):

Channel	7	8	9	10	11	12	13
Power Gain	6.2	6.3	6.7	6.7	6.8	6.8	6.9
DB Gain	7.92	7.99	8.26	8.26	8.33	8.33	8.39

Stock Identification....ES-19213-C

Accessories

Sleet Melters....6 of MI-19009-J-2
Power Required....4.8 kw, 230 v. 1 phase or 3 phase, or 460 v. 1 or 3 phase

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*
TF-6AH	Two 3 1/8	Bridge	B-464591-A

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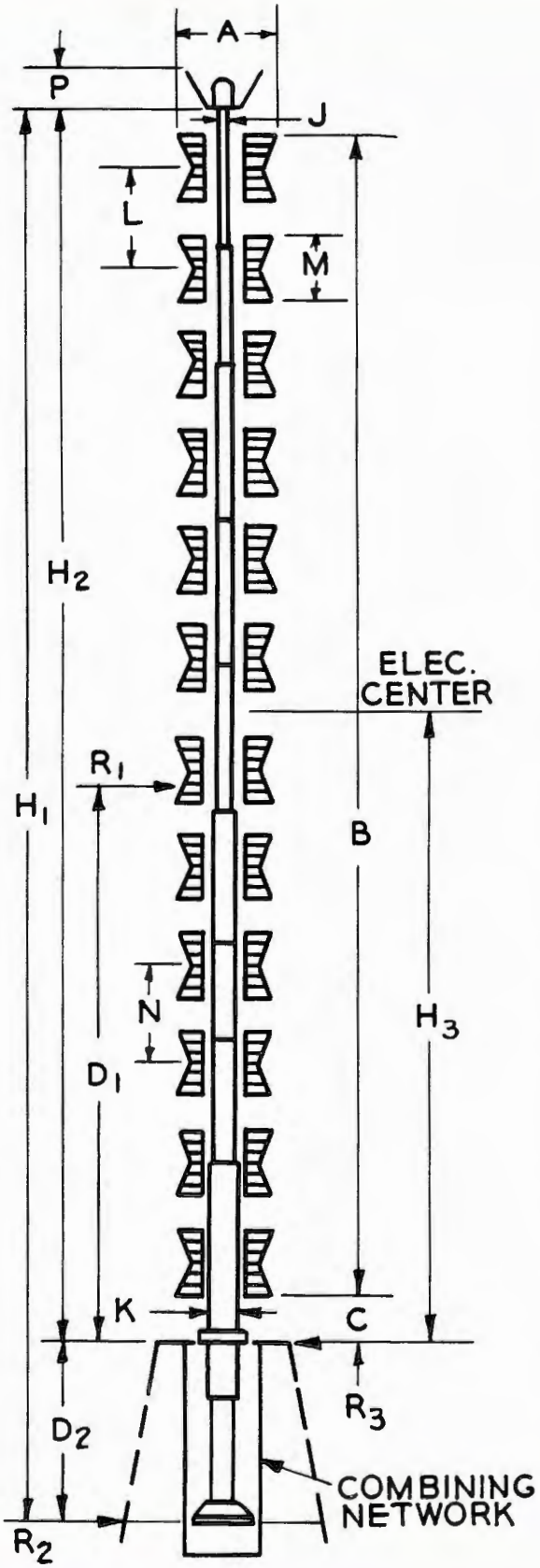

TYPE TF-12AL

TOWER MOUNTED

Mechanical Specifications

Weight	80,000 lbs.		
A	9′-0″	H_2	202′-0″
B	197′-7″	H_3*	121′-10¾″
C	2′-8½″	J	5″ O.D.
D_1	85′-0″	K	26½″ O.D.
D_2	30′-0″	L	17′-0″
H_1	232′-0″	M	10′-7″
		P	66½″

Shipping Lengths: 16 sections
Greatest Length: 26′-0″
Heaviest Section: 6982 lbs.
Transmission Line Conn.: 24′-11⅝″ below tower top

LOADS, REACTIONS AND MOMENTS FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 16{,}800$ lbs.
$R_2 = 47{,}600$ lbs.
$R_3 = 64{,}400$ lbs.
$M = R_1 \times D_1 = 1{,}428{,}000$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure: 50 psf on flats (30 psf on cylindrical surfaces)
All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.
Wind Velocity (no ice): 110 mph (true extreme)
Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.
Design Stresses: A.I.S.C. 20,000 psi (in bending)
Suggested Antenna Base Stability: 2°

Electrical Specifications

Power Rating: 50 kw (50 kw each half)
Circularity: ±2 db
Input Impedance: To match 51.5 ohm MI-19113 lines over designated channel with trans. line conn. shown below (V.S.W.R. 1.1 or better)

Gain (at visual carrier):		
Channel	2	3
Power Gain**	11.4	11.5
DB Gain	10.57	10.61

Stock Identification: ES-19294

Accessories

Sleet Melters: 12 of MI-19009-B-1
Power Required: 36 kw, 230 v. 3 phase, or 460 v. 1 phase or 3 phase
Beam Tilt Sections: For 1°, 1 of MI-19395-C; for ½°, 1 of MI-19395-D

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*	*Combining Network Dwg.*
TF-12AL	Two 3⅛	Bridge	B-464592-A	634441
TF-12AL-A	Four 3⅛	Bridge	B-465492-B	634441
TF-12AL-D	Two 6⅛	Bridge	B-464592-A	634441
TF-12AL-E	Four 6⅛	Bridge	B-464592-B	634441

* H_3 for 70-30 power division. H_3 for 50-50 power division: 101′-6″.
** Gains are for 70-30 power division (standard antenna). Gains are 4% higher for 50-50 power division.

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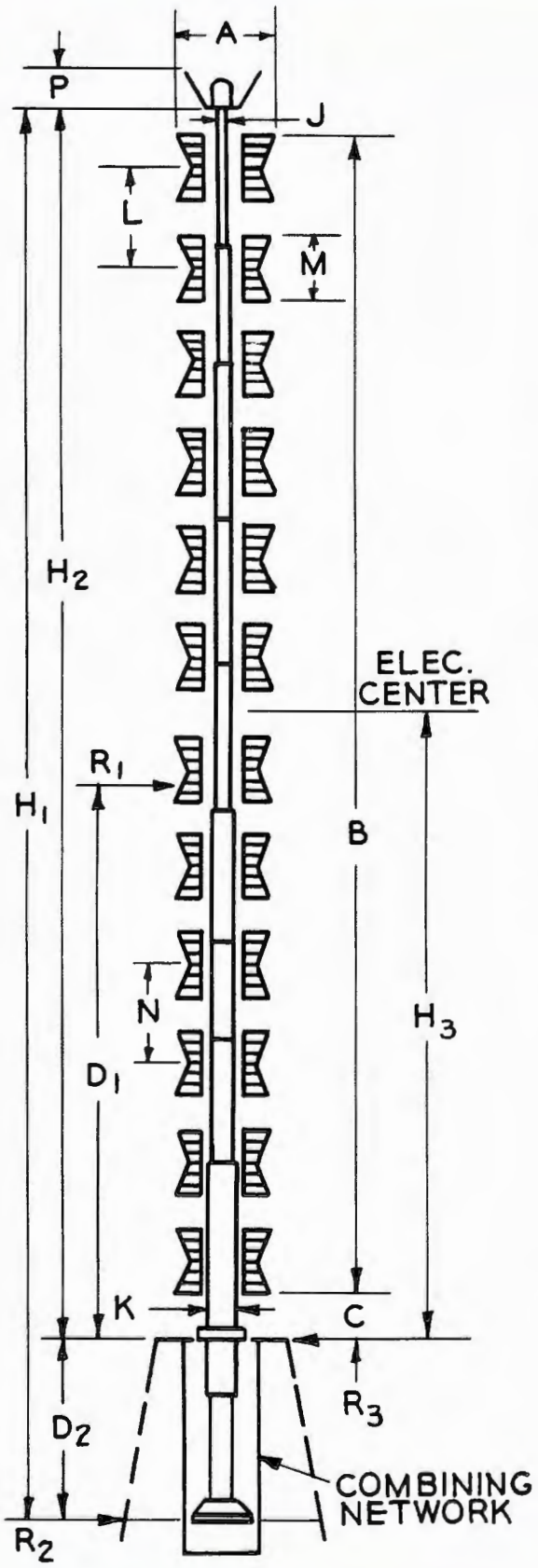

TYPE TF-12AM

TOWER MOUNTED

Mechanical Specifications

Weight	44,000 lbs.		
A	6′-11″	H_2	166′-9″
B	162′-8″	H_3*	100′-9⅝″
C	2′-8″	J	5″ O.D.
D_1	68′-6″	K	25″ O.D.
D_2	24′-0″	L	14′-0″
H_1	190′-9″	M	8′-8″
		P	52½″

Shipping Lengths ..... 11 sections
Greatest Length ..... 28′-8″
Heaviest Section ..... 5648 lbs.
Transmission Line Conn. ..... 12′-2⅛″ below tower top

LOADS, REACTIONS AND MOMENTS FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 12{,}540$ lbs.
$R_2 = 35{,}800$ lbs.
$R_3 = 48{,}340$ lbs.
$M = R_1 \times D_1 = 860{,}000$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure ..... 50 psf on flats (30 psf on cylindrical surfaces)
All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.
Wind Velocity (no ice) ..... 110 mph (true extreme)
Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.
Design Stresses ..... A.I.S.C. 20,000 psi (in bending)
Suggested Antenna Base Stability ..... 1°

Electrical Specifications

Power Rating ..... 50 kw (50 kw each half)
Circularity ..... ±2 db
Input Impedance ..... To match 51.5 ohm MI-19113 lines over designated channel with trans. line conn. shown below (V.S.W.R. 1.1 or better)

Gain (at visual carrier):

Channel	4	5	6
Power Gain**	11.8	12.0	12.1
DB Gain	10.72	10.79	10.83

Stock Identification ES-19295

Accessories

Sleet Melters ..... 12 of MI-19009-C-1
Power Required ..... 24 kw, 230 v. 3 phase, or 460 v. 1 phase or 3 phase
Beam Tilting Sections ..... For 1°, 1 of MI-19395-E; for ½°, 1 of MI-19395-F

TRANSMISSION LINE CONNECTION

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*	*Combining Network Dwg.*
TF-12AM	Two 3⅛	Bridge	B-464592-A	631151
TF-12AM-A	Four 3⅛	Bridge	B-464592-B	631151
TF-12AM-D	Two 6⅛	Bridge	B-464592-A	631151
TF-12AM-E	Four 6⅛	Bridge	B-464592-B	631151

* H_3 is for 70-30 power Division. H_3 for 50-50 power division is 84′-0″.
** Gains are for 70-30 power division (standard antenna). Gains for 50-50 power division are 4% higher.

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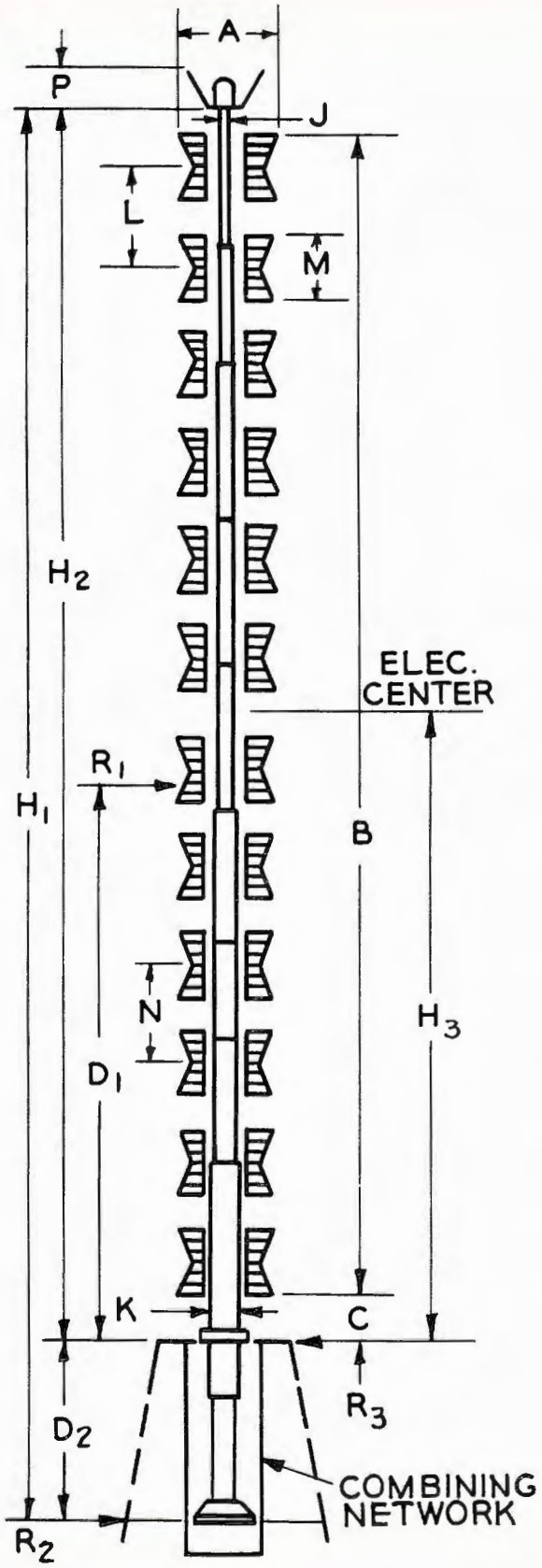

TYPE TF-12AH

TOWER MOUNTED

Mechanical Specifications

Weight	8,000 lbs.		
A	3′-2″	H_3*	44′-3 7/16″
B	68′-5 3/8″	J	5″ O.D.
C	3′-0 1/4″	K	12 3/4″ O.D.
D_1	32′-2″	L	5′-8″
D_2	11′-6″	M	3′-7 3/8″
H_1	84′-5″	N	6′-11″ (at center)
H_2	72′-11″	P	32 1/2″
Shipping Lengths	(26′-8″)	(23′-9″)	(17′-8″) (21′-10″)
Shipping Weights	491 lbs.	1226 lbs.	1749 lbs. 2213 lbs.

Transmission Line Conn. ..... 16′-3 1/8″ below tower top Flanges, MI-19313 type.

LOADS, REACTIONS AND MOMENTS FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 3950$ lbs.
$R_2 = 11{,}070$ lbs.
$R_3 = 15{,}020$ lbs.
$M = R_1 \times D_1 = 127{,}000$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure ..... 50 psf on flats (30 psf on cylindrical surfaces)

All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice) ..... 110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses ..... A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability ..... 1°

Electrical Specifications

Power Rating ..... 50 kw (35 kw each half)

Circularity ..... ±2 db

Input Impedance ..... 51.5 ohms (actual) (V.S.W.R. 1.1 or better)
For MI-19113 line use MI-19113B-53 transformers

Gain (at visual carrier):

Channel	7	8	9	10	11	12	13
Power Gain**	11.5	11.7	12.1	12.4	12.1	11.8	11.7
DB Gain	10.61	10.68	10.83	10.93	10.83	10.72	10.68

Stock Identification ES-19296

Accessories

Sleet Melters ..... 12 of MI-19009-J-1
Power Required ..... 12 kw, 230 v. 3 phase, or 460 v. 1 phase or 3 phase

Beam Tilting Sections ..... For 1°, 1 of MI-19395-A; for 1/2°, 1 of MI-19395

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*	*Combining Network Dwg.*
TF-12AH	Two 3 1/8	Bridge	B-464592-A	627844
TF-12AH-A	Four 3 1/8	Bridge	B-464592-B	627844
TF-12AH-D	Two 6 1/8	Bridge	B-464592-A	627844
TF-12AH-E	Four 6 1/8	Bridge	B-464592-B	627844

* H_3 is for 70-30 power division (standard antenna). H_3 for 50-50 power division is 37′-2 15/16″.

** Goin figures are for 70-30 power division. Gains for 50-50 power division are 4% higher.

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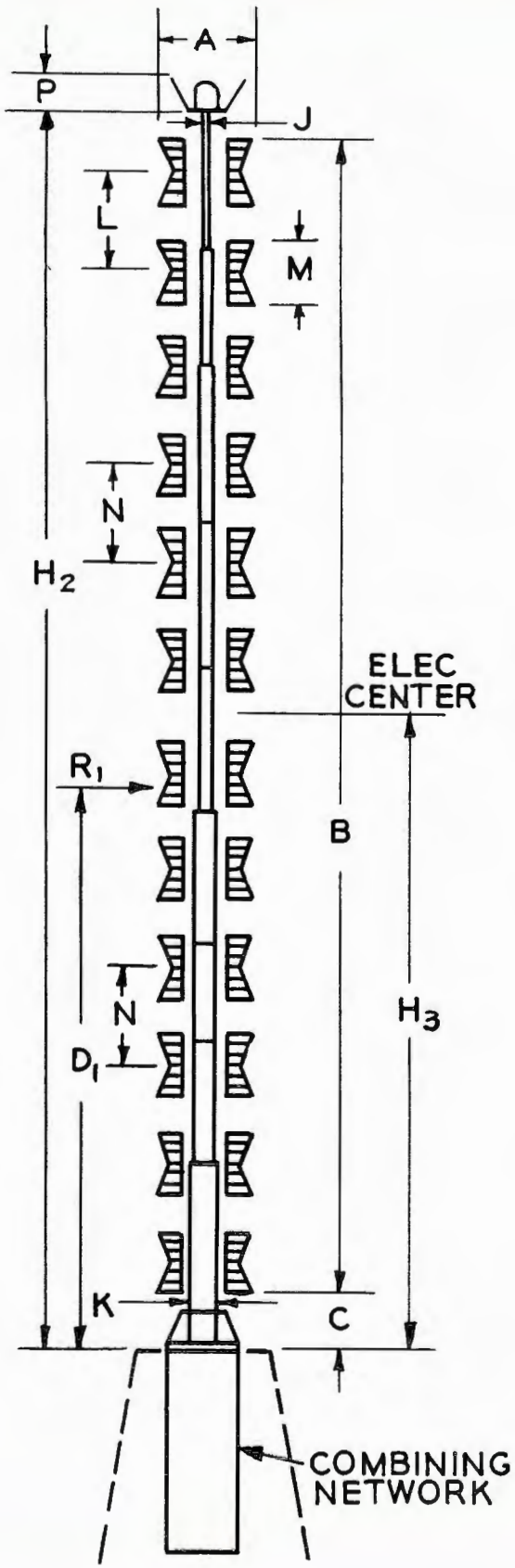

TYPE TF-12AH-P

PEDESTAL MOUNTED

Mechanical Specifications

Weight	7,675 lbs.			
A	3'-2"	J	5" O.D.	
B	68'-5⅜"	K	12¾" O.D.	
C	5'-5⅞"	L	5'-8"	
D_1	34'-0"	M	3'-7⅜"	
H_2	75'-4⅝"	N	6'-11" (at center)	
H_3*	46'-9 1/16"	P	32½"	
Shipping Lengths	(26'-8")	(23'-9")	(17'-8")	(10'-9⅝")
Shipping Weights	491 lbs.	1226 lbs.	1749 lbs.	1112 lbs.

Transmission Line Conn. ..... 4'-9⅜" below tower top
Dwg. Flanges MI-19313 Type

LOADS, REACTIONS AND MOMENTS
FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 3900$ lbs.
$M = R_1 \times D_1 = 132{,}700$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure ..... 50 psf on flats (30 psf on cylindrical surfaces)
All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.
Wind Velocity (no ice) ..... 110 mph (true extreme)
Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.
Design Stresses ..... A.I.S.C. 20,000 psi (in bending)
Suggested Antenna Base Stability ..... 1°

Electrical Specifications

Pawer Rating ..... 50 kw (35 kw each half)
Circularity ..... ±2 db
Input Impedance ..... 51.5 ohms actual (V.S.W.R. 1.1 or better)
For MI-19113 line use MI-19113B-53 transformer

Gain (at visual carrier):

Channel	7	8	9	10	11	12	13
Power Gain***	11.5	11.7	12.1	12.4	12.1	11.8	11.7
DB Gain	10.61	10.68	10.83	10.93	10.83	10.72	10.68

Stock Identification ES-19296-M

Accessories

Sleet Melters ..... 12 of MI-19009-J-2
Power Required ..... 9.6 kw, 230 v. 1 phase, or 460 v. 1 phase or 3 phase
Beam Tilting Sections ..... For 1°, 1 of MI-19395-A; for ½°, 1 of MI-19395

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*	*Combining Network Dwg.*
TF-12AH-P	Two 3⅛	Bridge	B-464592-A	627884
TF-12AH-PA	Four 3⅛	Bridge	B-464592-B	627884
TF-12AH-PD	Two 6⅛	Bridge	B-464592-A	627884
TF-12AH-PE	Faur 6⅛	Bridge	B-464592-B	627884

* H_3 for 70-30 power division. H_3 for 50-50 power division is 39'-8 9/16".
** Subject to pedestal design for higher loading.
*** Gains are for 70-30 power division (standard antenna). Gains are 4% higher for 50-50 power division.
For vertical pattern data see B-466344.

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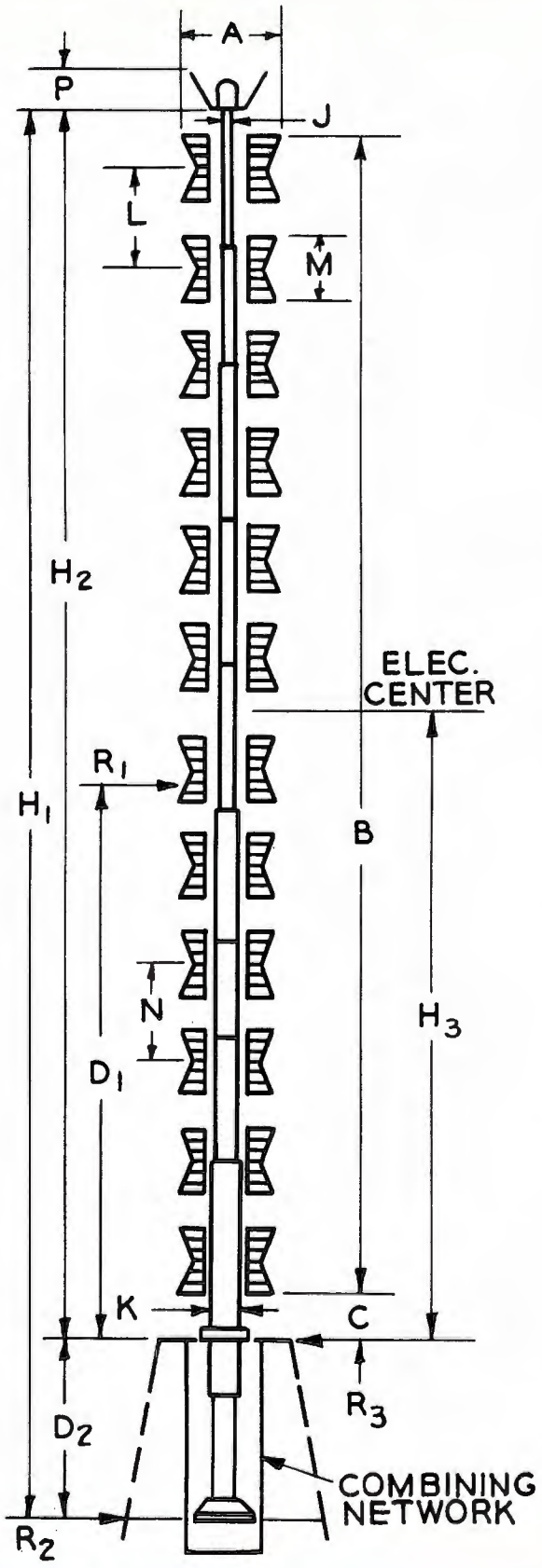

TYPE TF-12BH

TOWER MOUNTED

Mechanical Specifications

Weight	8,000 lbs.		
A	3′-2″	H_3	37′-2 15/16″
B	68′-5 3/8″	J	5″ O.D.
C	3′-0 1/4″	K	12 3/4″ O.D.
D_1	32′-2″	L	5′-8″
D_2	11′-6″	M	3′-7 3/8″
H_1	84-5″	N	6′-11″ (at center)
H_2	72′-11″	P	32 1/2″

Shipping Lengths	(26′-8″)	(23′-9″)	(17′-8″)	(21′-10″)
Shipping Weights	491 lbs.	1226 lbs.	1749 lbs.	2213 lbs.

Transmission Line Conn. ..... 16′-3 7/8″ below tower top
Flanges, MI-19313 type

LOADS, REACTIONS AND MOMENTS
FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 3950$ lbs.
$R_2 = 11{,}070$ lbs.
$R_3 = 15{,}020$ lbs.
$M = R_1 \times D_1 = 127{,}000$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure ..... 50 psf an flats (30 psf on cylindrical surfaces)

All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice) ..... 110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses ..... A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability ..... 1°

Electrical Specifications

Power Rating ..... 50 kw

Circularity ..... ±2 db

Input Impedance ..... 51.5 ohms (actual) (V.S.W.R. 1.1 or better)
For MI-19113 line use MI-19113-853 transformers

Gain (at visual carrier):

Channel	7	8	9	10	11	12	13
Power Gain	9.6	9.6	10.0	10.5	10.5	9.8	9.8
DB Gain	9.82	9.82	10.00	10.21	10.21	9.91	9.91

Stock Identification ES-19297

Accessories

Sleet Melters ..... 12 of MI-19009-J-2
Power Required ..... 9.6 kw, 230 v. 1 phase, or 460 v. 1 phase or 3 phase

Beam Tilting Sections ..... For 1°, 1 of MI-19395-A; for 1/2°, 1 of MI-19395

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*	*Combining Network Dwg.*
TF-12BH	Two 3 1/8	Bridge	B-464592-A	634908
TF-12BH-A	Four 3 1/8	Bridge	B-464592-B	634908
TF-12BH-D	Two 6 1/8	Bridge	B-464592-A	634908
TF-12BH-E	Four 6 1/8	Bridge	B-464592-B	634908

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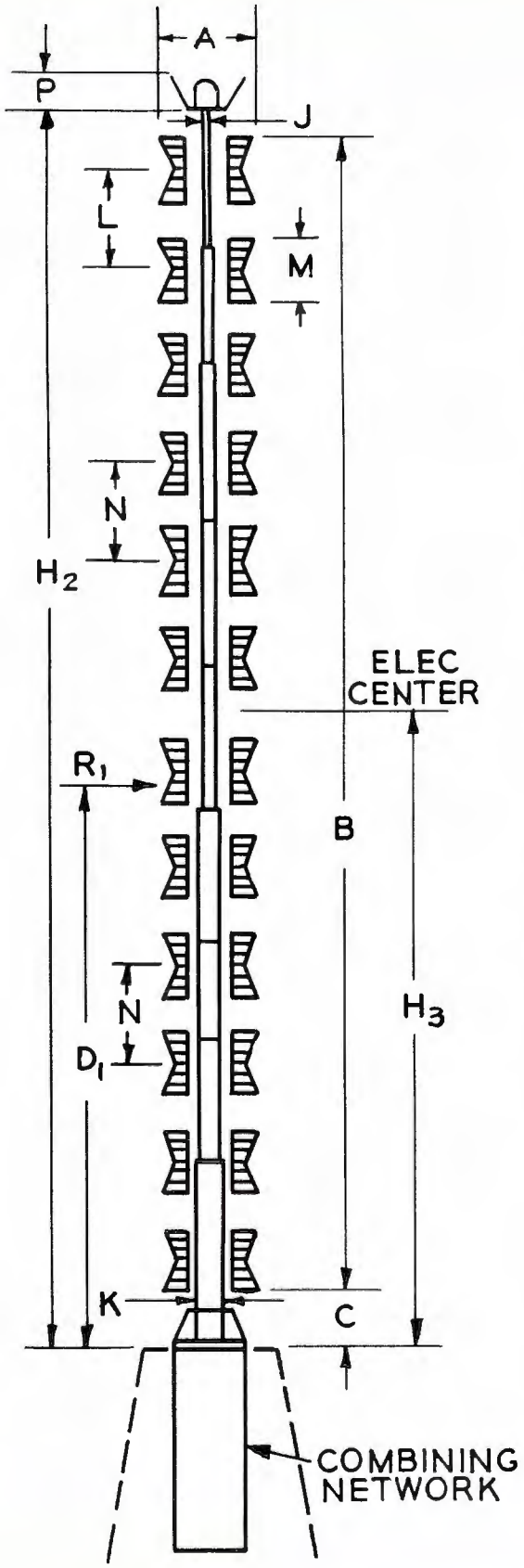

TYPE TF-12BH-P

PEDESTAL MOUNTED

Mechanical Specifications

Weight	7,675 lbs.		
A	3′-2″	J	5″ O.D.
B	68′-5⅜″	K	12¾″ O.D.
C	5′-5⅞″	L	5′-8″
D_1	34′-0″	M	3′-7⅜″
H_2	75′-4⅝″	N	6′-11″ (at center)
H_3	39′-8$^{9}/_{16}$″	P	32½″

Shipping Lengths	(26′-8″)	(23′-9″)	(17′-8″)	(10′-9⅝″)
Shipping Weights	491 lbs.	1226 lbs.	1749 lbs.	1112 lbs.

Transmission Line Conn. ..... 4′-9⅜″ below tower top Flanges, MI-19313 type

LOADS, REACTIONS AND MOMENTS FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 3900$ lbs.

$M = R_1 \times D_1 = 132{,}700$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure..... 50 psf on flats (30 psf on cylindrical surfaces)

All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice)..... 110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses..... A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability..... 1°

Electrical Specifications

Power Rating..... 50 kw

Circularity ..... ±2 db

Input Impedance..... 51.5 ohms actual (V.S.W.R. 1.1 or better) For MI-19113 line use MI-19113-B53 transformers

Gain (at visual carrier):

Channel	7	8	9	10	11	12	13
Power Gain	9.6	9.6	10.0	10.5	10.5	9.8	9.8
DB Gain	9.82	9.82	10.00	10.21	10.21	9.91	9.91

Stock Identification ES-19297-H

Accessories

Sleet Melters..... 12 of MI-19009-J-2
Power Required..... 9.6 kw, 230 v. 1 phase, or 460 v. 1 phase ar 3 phase

Beam Tilting Sections..... For 1°, 1 of MI-19395-A; for ½°, 1 of MI-19395

TRANSMISSION LINE CONNECTIONS

Type No.	*Lines*	*Diplexer*	*Dwg. & Type*	*Combining Network Dwg.*
TF-12BH-P	Two 3⅛	Bridge	B-464592-A	634908
TF-12BH-PA	Four 3⅛	Bridge	B-464592-B	634908
TF-12BH-PD	Two 6⅛	Bridge	B-464592-A	634908
TF-12BH-PE	Four 6⅛	Bridge	B-464592-B	634908

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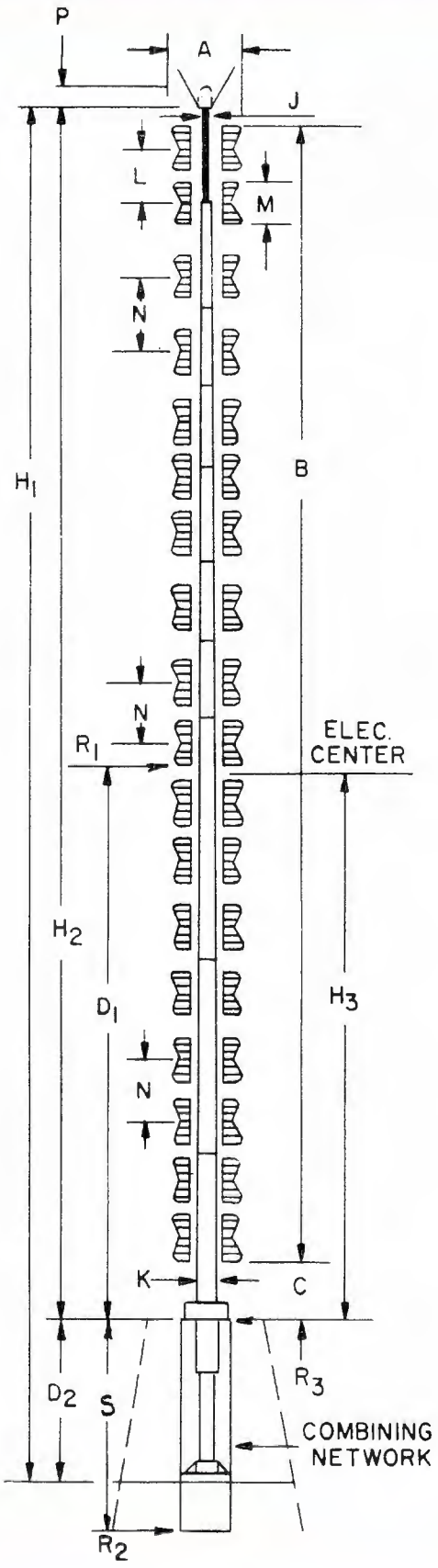

18 SECTION CUSTOM SUPERTURNSTILE

(Channels 7-13)

TOWER MOUNTED

Mechanical Specifications

Weight ..... 21,500 lbs.

A	3′-2″	J	5″ O.D.
B	103′-8⅜″	K	16″ O.D.
C	3′-0¼″	L	5′-8″
D_1	48′-8″	M	3′-7⅜″
D_2	20′-0″	N	6′-11″
H_1	128′-2″	P	0′-32½″
H_2	108-2″	S*	
H_3	54′-10$\frac{7}{16}$″		

Shipping Lengths..(26′-8″) (30′-8″) (17′-0¾″) (21′-9″) (26′-6″) (15′-0″)
Shipping Weights..546 lbs. 2802 lbs. 1954 lbs. 4431 lbs. 7104 lbs. 2355 lbs.
Transmission Line Conn. ..... 4′-1$\frac{15}{16}$″ below tower top Flanges, MI-19313 type.

LOADS, REACTIONS AND MOMENTS
FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 7165$ lbs.
$R_2 = 17{,}446$ lbs.
$R_3 = 24{,}611$ lbs.
$M = R_1 \times D_1 = 348{,}935$ ft. lbs.

Note: These values are for a 50 lbs./sq. ft. wind pressure on flats. Values for other pressures may be obtained by proportion.

STRUCTURAL DESIGN ASSUMPTIONS

Wind Pressure..... 50 psf on flats (33 psf on cylindrical surfaces)

All antenna members are considered cylindrical but ratings for flat surfaces should be used when comparing antenna and tower specifications.

Wind Velocity (no ice)..... 110 mph (true extreme)

Loadings with ice must be calculated with consideration given to weather records, highest wind velocity and maximum ice coating experienced or anticipated.

Design Stresses..... A.I.S.C. 20,000 psi (in bending)

Suggested Antenna Base Stability..... 1°

Electrical Specifications

Power Rating..... 50 kw
Circularity ..... ±2 db
Input Impedance..... 51.5 ohms (actual) (V.S.W.R. 1.1 or better)
For MI-19113 line use MI-19113-B53 transformer
Gain (at visual carrier):
Gain depends on channel and amount of nullfill desired.
Stock Identification ..... Custom built

Accessories

Sleet Melters..... 18 of MI-19009-J-2
Power Required....12.8 kw, 230 v. 3 phase, or 460 v. 1 phase or 3 phase

* For information of combining network refer to RCA Sales Div.

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VHF TRAVELING WAVE ANTENNA

FEATURES

- **Rugged, simple design**
- **Ideal vertical pattern**
- **Large power-handling capacity**
- **Single feed point**
- **Inherently low-standing wave ratio**
- **No external feed systems**
- **Available in gains between 6 and 18 on VHF channels 7 through 13**

USES

The RCA Traveling Wave Antenna is designed for operation on VHF channels 7 through 13 and can provide power gains between 6 and 18. At the higher gains this antenna provides an economical way for the TV broadcaster to achive 316 KW ERP when using a 25 KW transmitter. The Traveling Wave Antenna is also ideal for those broadcasters who prefer to use less gain in the antenna and higher transmitter power to achieve 316 KW ERP.

The vertical pattern provides excellent close-in coverage resulting in a uniformly high field strength throughout the service area. Also beam-tilt can be provided if necessary.

Horizontal circularity is excellent with a guaranteed specification of ± 1.0 db. Power rating of this antenna is 50 KW at all channels and gains.

The Traveling Wave Antenna is normally mounted on a supporting tower, however it may be mounted adjacent to other Traveling Wave Antennas or Superturnstile Antennas in a candelabra configuration.

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View showing relative size of new Traveling Wave Antenna during moving operation at RCA's antenna test yard.

DESCRIPTION

The RCA Traveling Wave Antenna is a slotted cylindrical radiator with an internal feed system consisting of capacitive probes to couple the energy from a center conductor to the individual radiating slots. The length and diameter of this cylinder depends upon the channel and gain of the individual antenna. (Representative physical sizes are given in table.) This antenna is designed for tower mounting with part of the cylinder being buried in the tower structure. Besides providing support, this buried section forms a coaxial transmission line leading into the radiating portion of the antenna. Power is fed into the antenna near the bottom end by means of a tee section.

The radiating slots in the outer cylinder are in pairs positioned every quarter wavelength with every other pair in one vertical plane and the remaining pairs in a vertical plane perpendicular to this. Each pair of opposite radiating slots are coupled to the inner conductor in opposite phase by means of capacitive probes resulting in all slots being fed in phase. At the top of the antenna the inner conductor is short-circuited to the outer conductor by means of a sliding contact to allow for differential expansion between the outer cylinder and the inner conductor.

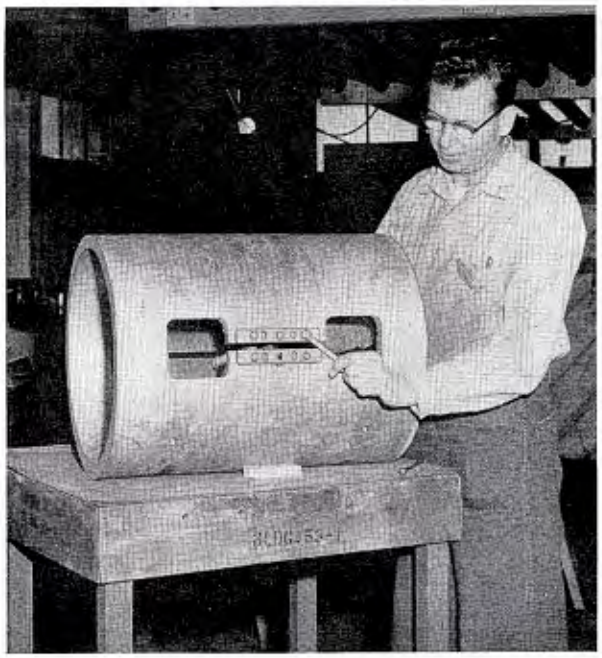
Weather Protection

Like all broadcast antennas exposed to the elements great care must be exercised to design for wind, snow, rain, ice, lightning, electrolysis, sun rays and sudden changes in temperature.

The steel outer conductor, after fabrication, is hot dip galvanized for both better conductivity and weather protection.

Slot covers are fastened to the pole over each slot. They are made of special polyethylene that is not affected by ultraviolet rays from the sun, nor embrittled from the cold. To take care of condensation inside the antenna provisions are made for drainage. The materials used for component items are selected to insure no corrosion effects from electrolysis due to dissimilar metals or chemical action due to industrial areas.

Since slot radiators are used, it is highly improbable that lightning will damage the antenna. However, to protect the 300-mm code beacon at the top of the antenna, provision is made for lightning by installation of a lightning protector which also supports the beacon. The grounding of the inner conductor at each end of the antenna provides further protection for the transmission line and transmitter.



An experimental short section of 18 inch diameter pole having a pair of capacitively tuned slots for a high gain antenna.

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If ice is collected on the antenna it lowers the resonant frequency of the slots thus affecting the performance of the antenna, mainly at aural carrier. Therefore, in areas of heavy icing, sleet melters (optional item) are recommended to avoid excessive accumulation of ice.

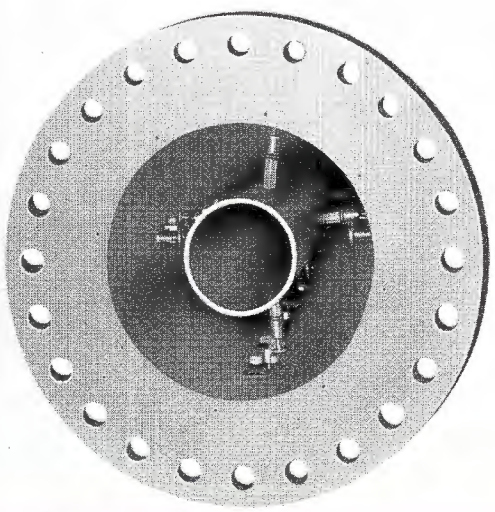
The pole is designed with a buried section extending into the tower. A guide flange at the tower top guides the pole into the tower during erection and prevents the pole from swaying. The pole socket carries the dead weight of the antenna.

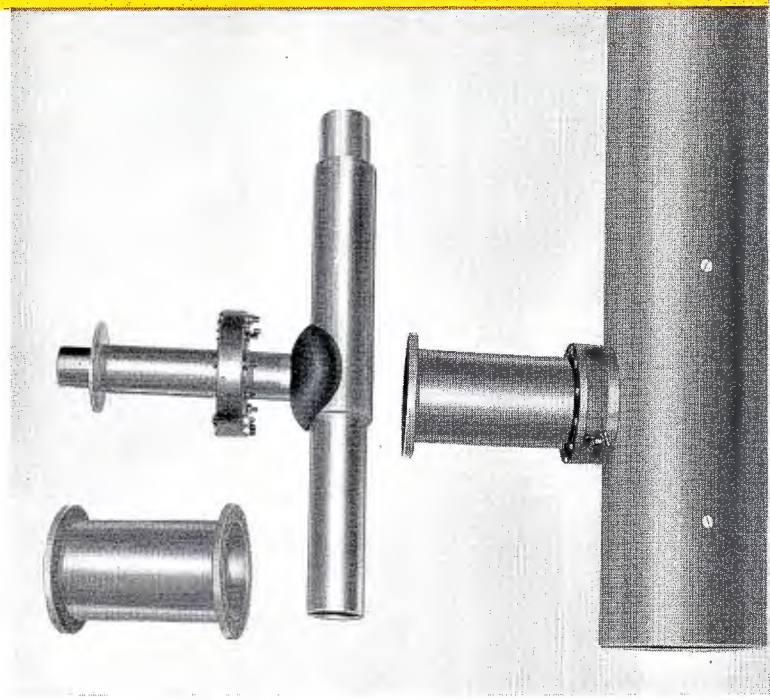
All welding is done by certified welders and all welds on the pole are subjected to X-ray examination in order to eliminate any bad welds.

The inner conductor of the antenna is rigidly supported at the bottom end without having to rely on any insulator type of support to carry the dead weight. The inner conductor can be removed from the bottom if required. The coupling capacitor probes besides being used for electrical coupling, also provide centering support for the inner conductor. This is accomplished by insulator pins which are built into the probes and form a portion of the dielectric of the coupling capacitors. The connection at the top of the antenna has a sliding contact to allow for any thermal differential expansion between the inner conductor and the pole.

Connection to the Traveling Wave Antenna is by means of a 6⅛", 50 ohm transmission line fitting located in the bury portion below the tower top. This antenna is fed by means of a single transmission line from either a Filterplexer or notch diplexer. This antenna is shipped in either two, three or four sections depending upon the gain and channel. These sections are assembled and adjusted at the customer's site under the supervision of a field representative of the RCA Service Company.

End view of Traveling Wave Antenna showing capacitors inside the pole supporting the inner conductor.





Input tee of a Traveling Wave Antenna showing location of gas stop next to pole and at left inner conductor of the input tee with transformers, stub and gas stop. The outer conductor for the input tee is shown at lower left.

Accessories for this antenna include a top beacon and sleetmelting equipment if the antenna is to be installed in an area subject to icing conditions.

The Traveling Wave Antenna provides an answer for the need of a VHF high-band antenna which combines appreciable improvements of electrical characteristics with mechanical simplicity and economy, especially in high-gain, high-power applications.

The improved characteristics, most of them inherent to the principle, derive from the unique combination of supporting structure, transmission line and radiators. The horizontal pattern is formed on the turnstile principle from the excellent patterns of single-slot pairs even at large pole diameters. The smooth vertical pattern, which helps to achieve an even field strength within the service area, is based on the exponentially decaying traveling-wave feed. The proper electrical characteristics of the simple slot radiators maintain constant wavelength instead of velocity in the transmission line for frequencies in the channel. This assures proper bandwidth. The input VSWR is due to the traveling-wave nature of feed in the antenna. Simplicity of the antenna and low wind load result in economy of both the antenna and the supporting structure.

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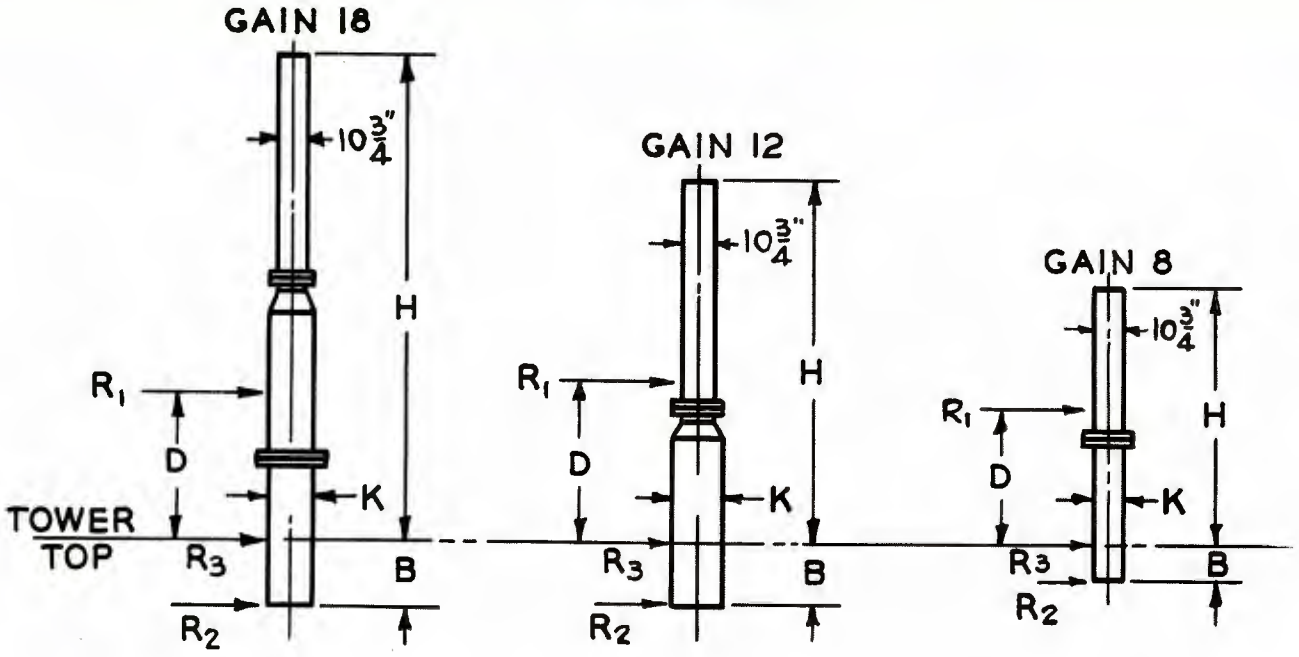
SPECIFICATIONS



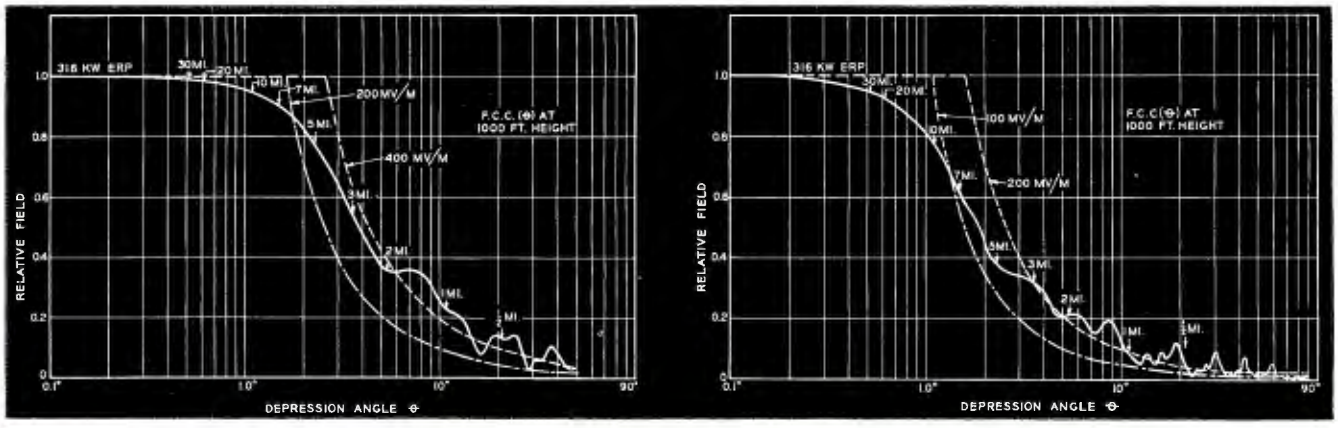
Mechanical Specifications

	GAIN 18		GAIN 12		GAIN 8	
	Ch. 7	Ch. 13	Ch. 7	Ch. 13	Ch. 7	Ch. 13
Weight	32,000 lbs.	24,000 lbs.	20,200 lbs.	12,100 lbs.	10,800 lbs.	8,000 lbs.
Height H (less beacon)	130.2′	105.6′	90.3′	72.6′	62.3′	52.3′
Bury B	20′	16′	15′	12′	10′	9′
D	69.8′	41.8′	39.6′	48.8′	36.7′	26.1′
Diameter K	18″	18″	18″	14″	14″	10¾″
R_1	4,510 lbs.	4,509 lbs.	3,723 lbs.	2,979 lbs.	2,497 lbs.	1,629 lbs.
R_2	15,746 lbs.	11,780 lbs.	9,829 lbs.	12,114 lbs.	9,164 lbs.	4,724 lbs.
R_3	20,256 lbs.	16,290 lbs.	13,552 lbs.	15,093 lbs.	11,661 lbs.	6,353 lbs.
50/33 Moment Ft. Lbs.	314,927	188,700	148,000	146,000	92,000	42,600
Ht. Elect. Center	64.6′	53.8′	44.6′	37.3′	30.6′	25.6′

Electrical Specifications

VSWR 1.1
Power Rating ..... 50 kw
Pattern ..... See calculated typical patterns for gains of 8 and 18 below
Circularity ..... ±1 db
Method of Feed ..... Notch diplexer, single line
Input ..... 6⅛″ dia. 50 ohm or 75 ohm

Calculated vertical patterns of medium and high gain traveling wave antennas. Gain of 8 antenna pattern at 176.5 mc/s shown at left, and gain of 18 antenna pattern at 194.5 mc/s on the right.



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VHF CUSTOM ANTENNAS

FEATURES

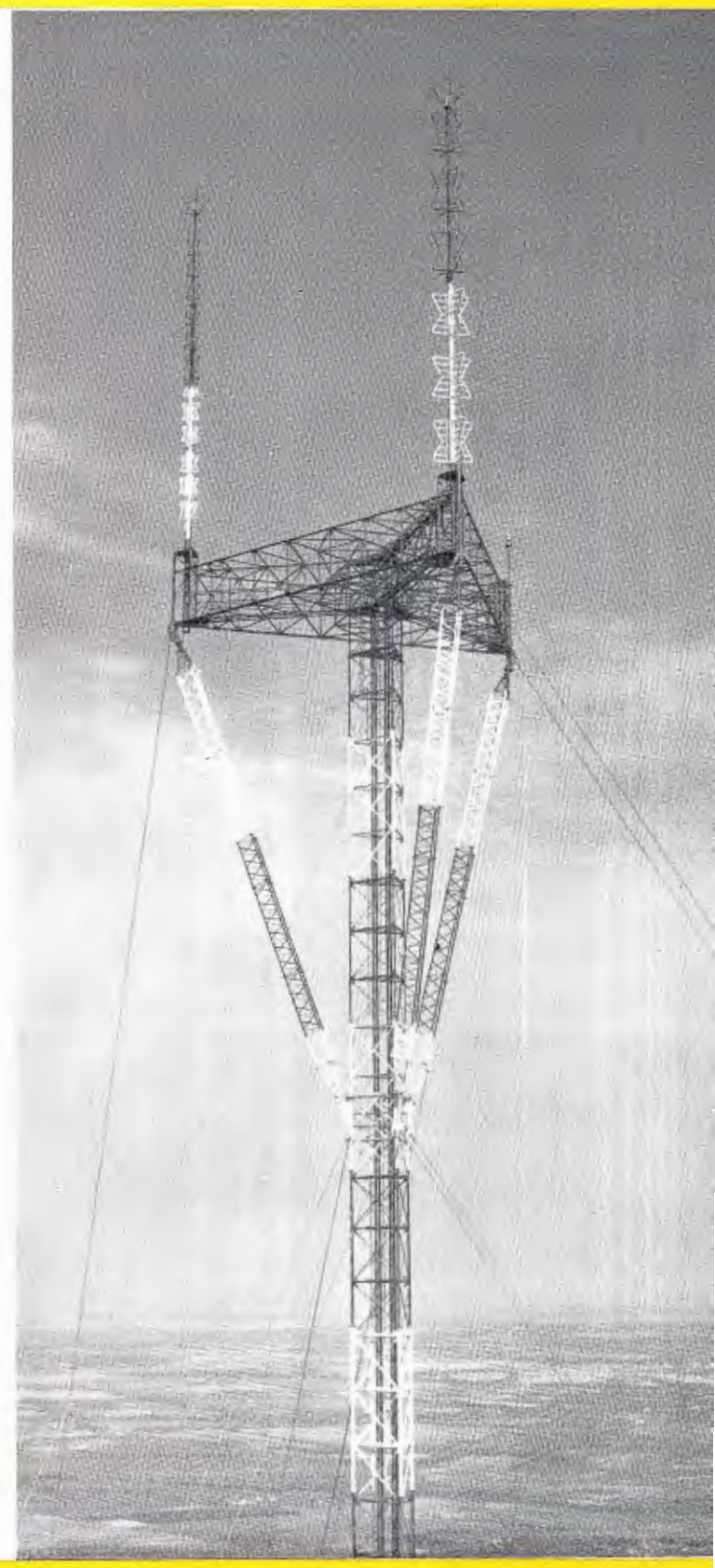
- Provide precise tailored vertical patterns
- Designs engineered to meet special power, gain and/or terrain conditions
- Superturnstile, supergain, or rectangular slot types available
- Useful for "Antenna Farm" type installations with common tower supporting two or more antennas
- All antennas backed by vast design and engineering experience of RCA broadcast antenna engineers
- RCA engineers, TV consulting engineers, and TV station engineers collaborate on special antenna designs

USES

All RCA Custom Built VHF Television Antennas are especially engineered by RCA Broadcast Antenna engineers to meet unique specifications or television coverage requirements. There are a great many cases where the use of a custom antenna will result in improved coverage and more economical operation. RCA Custom Antennas fall into three categories: (1) Supergain antennas, (2) Superturnstile antennas, and (3) Rectangular Slot antennas.

Generally the three type of antennas are used as follows: Superturnstile antennas are best used where custom vertical patterns for special terrain conditions are required; for special power gain requirements; for heavy-duty wind loading requirements; and where special power handling requirements are desired. They also are specified for a combination of two or more of the above requirements.

Supergain antennas can be specified for most multiple station installations where it is desirable to mount an antenna on a tower below stacked Superturnstile antennas, and in installations were stacked arrangements of three or more antennas are specified.



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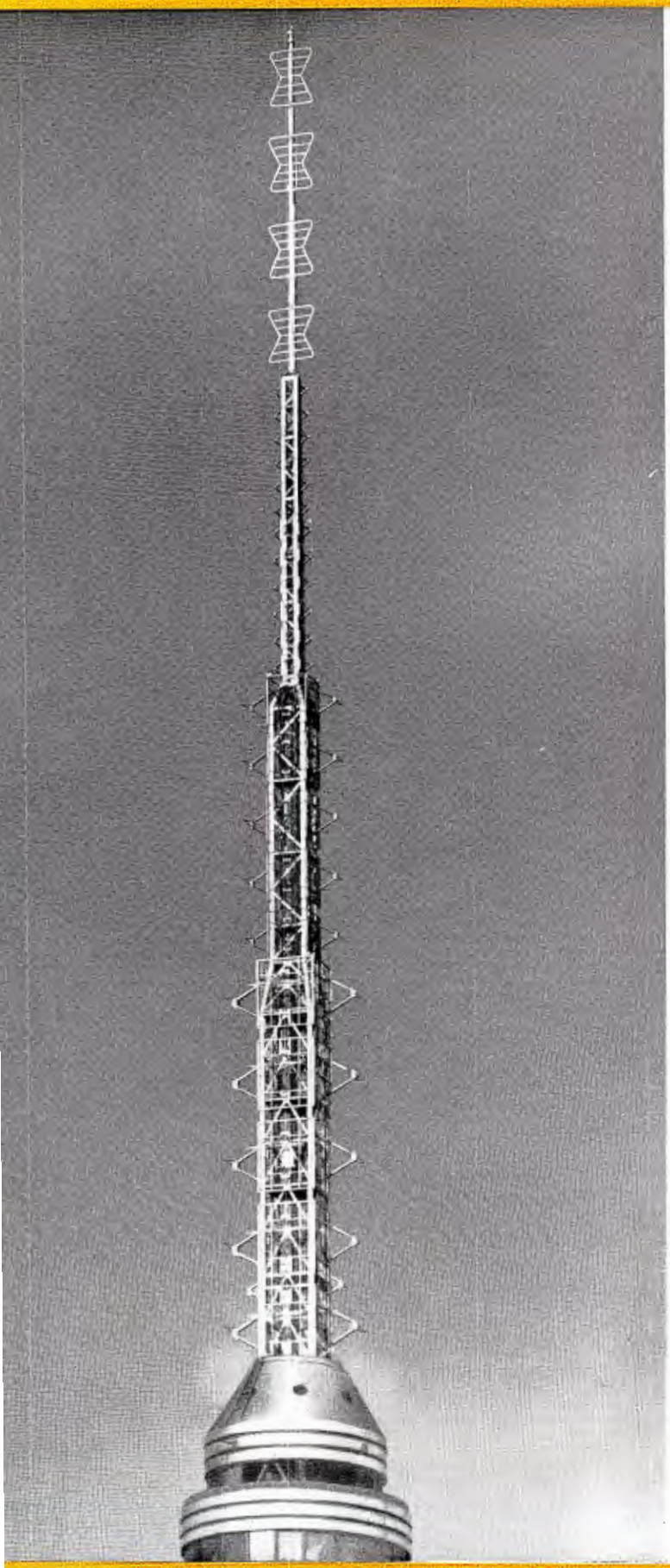

Rectangular Slot antennas can be useful in multiple station installations where it is desirable to mount an antenna on a tower below stacked Superturnstile antennas, and for side mounting an antenna on a tower that is supporting an existing operating antenna.

Perhaps one of the best known examples of RCA custom antenna engineering is the multiple TV-FM antenna installation atop the Empire State Building in New York City, which combines Superturnstile and Supergain arrays. Complete description of this installation is impossible here because of limited space, however—the Empire State Television System was designed with special consideration being given to the following factors.

1. Provision for five TV and three FM services.
2. Coupling effects between the eight antennas involved.
3. Bandwidth sufficient for television transmission.
4. Maximum gain in the aperture available.
5. Horizontal pattern suitable for area to be covered.
6. Power handling for 100 kw, ERP for TV services.

Another example of an RCA Superturnstile and Supergain mounted on a single tower is the Foshay installation which is pictured on these pages. An "Antenna Farm" type installation is that at Dallas, Texas, pictured on cover page.

DESCRIPTION

The **Custom-built Superturnstile Antennas** are basically modifications of the standard line of TV antennas and are made up of a series of radiating elements in which increasing gain is accomplished by vertical stacking of a number of sections. Each section consists of four radiators mounted in 90° intervals around the pole. Sections are mounted approximately a wave length above each other center to center.

Electrical feed to both types of antennas is by means of coaxial transmission lines. The main transmission lines terminate in a junction box from which branch coaxial feed lines are in parallel and feed the center of the individual radiators at a low impedance point.

The feed systems for RCA Custom Antennas normally employ ¾ inch Styroflex line. Four lines are required for each antenna section. Heating of feed lines is the limiting factor in the power rating of an antenna. Accordingly, a high-gain antenna can normally be rated for a higher maximum power input than antennas with fewer sections and fewer feed lines. Where greater power handling is required, larger size Stylroflex may be employed, or in some cases 1⅝ inch copper coaxial transmission line.

Close-up view of the Empire State Custom TV and FM installation.

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Superturnstiles may be unique designs or may be electrical modifications or mechanical reinforcements of the RCA standard types. Mechanical dimensions for the standard line of Superturnstiles are contained under "VHF Superturnstile Antennas".

RCA custom-built Superturnstile antennas have been designed and built having various gains and power handling capabilities. Single-section Superturnstile antennas having a power handling capacity are in general use throughout the TV industry as standby antennas. Custom built, multiple-section Superturnstile antennas utilizing the upper half for visual radiation and the lower half for aural radiation and having a power capability of 100 kw are currently in use. Gains as high as 17.5 can also be achieved by means of custom built 18-section antennas. The vertical pattern of this type of antenna can be specified to meet the individual requirements of a particular installation. Mechanical specifications for the 18-section Superturnstile antenna are contained under standard VHF Superturnstile Antennas.

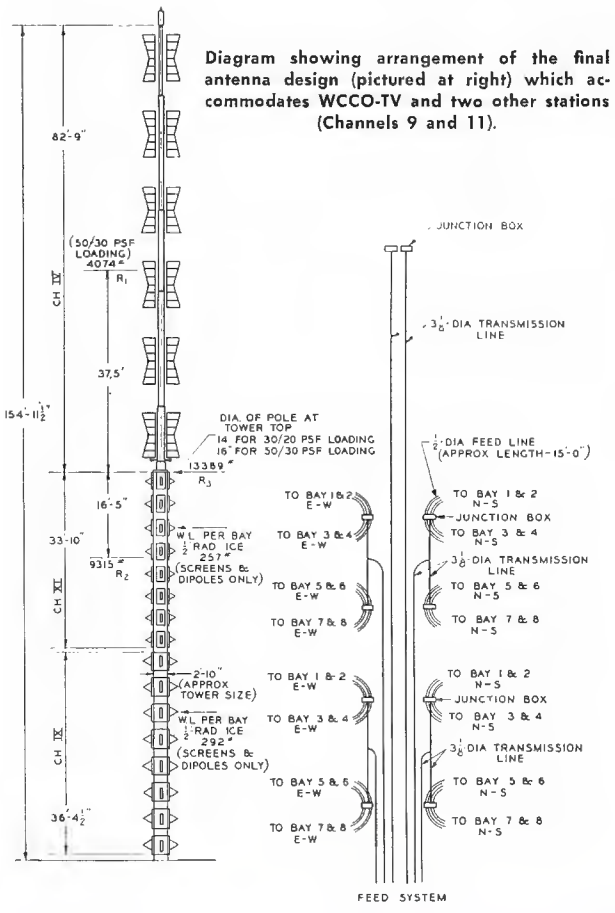

Diagram showing arrangement of the final antenna design (pictured at right) which accommodates WCCO-TV and two other stations (Channels 9 and 11).

Closeup of the Foshay Tower Building which shows an RCA six-section antenna mounted on the "multiple use" structure. The nine-section Supergain is used to accommodate Channels 9 and 11.

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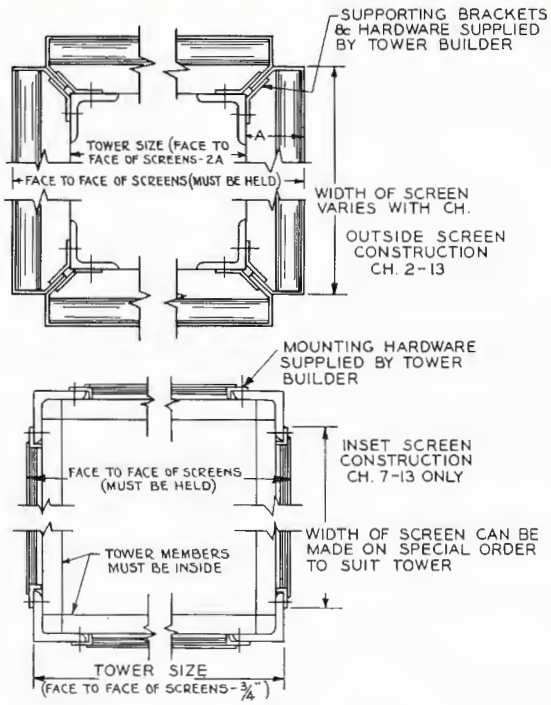
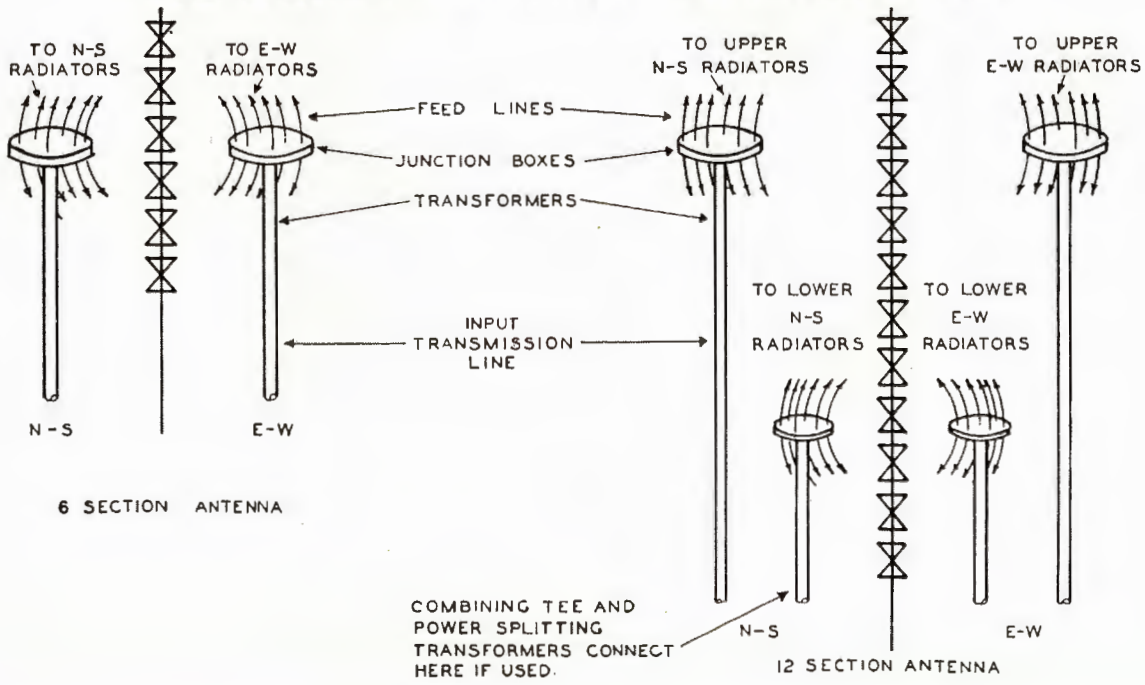
Closeup photo showing the construction of a special copper feedline dress for a custom designed RCA Superturnstile Antenna.



Sketch showing the detail of the RCA Supergain screen which varies from approximately 2½ feet face-to-face width for Channel 12 to 9 feet for Channel 2.

6- AND 12-SECTION SUPERTURNSTILE ANTENNA FEED SYSTEMS



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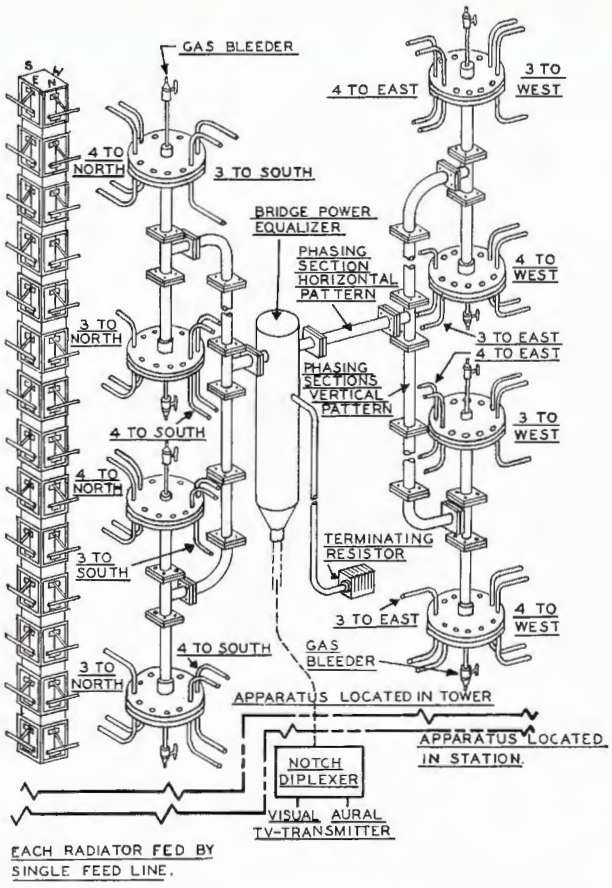
Supergain Antenna

The RCA Supergain Antenna is used for special requirements of gain and pattern and in multiple stacked antenna systems. The antenna consists of dipoles mounted a quarter-wave in front of a reflecting screen. Four of these dipole screen combinations are used in a square for each section of the antenna. The required number of sections are stacked vertically to achieve the desired power gain. Phasing between adjacent sections may be adjusted for vertical pattern shaping. The antenna is fed by single transmission line on Channels 2-6 and dual line on Channels 7-13.

The gain of the antenna is determined by the number of layers and is approximately 0.8 times the number of layers. Directional patterns, providing much higher gain values in favored directions can be obtained by grouping dipoles on one or more sides of the tower or by dispersing them to obtain desired pattern. Additional feature of controlled vertical pattern to provide constant field strength through the coverage area of the antenna can be provided, as well as beam tilting to increase field strength in desired close-in area. For emergency operation, r-f switching to sectionalize the antenna can be supplied.

A notch diplexer or filterplexer is needed to feed aural and visual signals to the Supergain Antenna when a single line is used. A bridge power equalizer in the antenna system tends to make all dipoles take equal power. For Channels 7-13 a bridge diplexer is used to feed dual transmission line. Either 3⅛", 6⅛" or 9³⁄₁₆" transmission line can be used depending on power to be handled.



Detailed sketch showing layout of the feed system for an RCA Supergain—14 layers—non-directional.

SUPER GAIN ANTENNA HEIGHTS VS CHANNEL

Sections	CHANNEL 2	3	4	5	6	7	8	9	10	11	12	13	Approx. Gain
2	24′-8″	22′-2⅛″	20′-3⅝″	17′-7¾″	16′-5″	7′-9¹⁵⁄₁₆″	7′-8⅛″	7′-6⅝″	7′-1⅛″	6′-11¹¹⁄₁₆″	6′-10⅜″	6′-9¼″	1.6
3	37′-11⅜″	34′-2⅞″	31′-3¼″	27′-2½″	25′-4″	12′-1⅜″	11′-9¾″	11′-6¾″	10′-11¾″	10′-8⅜″	10′-6¼″	10′-4″	2.4
4	51′-2¾″	46′-2⅞″	42′-2⅞″	36′-9¼″	34′-3″	16′-4¹³⁄₁₆″	15′-11⅜″	15′-6⅞″	14′-10⅜″	14′-6¹⁄₁₆″	14′-2⅛″	13′-10¾″	3.2
5	64′-6⅛″	58′-2⅞″	53′-2½″	46′-4″	43′-2″	20′-8¼″	20′-1″	19′-7″	18′-9″	18′-3¼″	17′-10″	17′-5½″	4.0
6	77′-9½″	70′-2⅞″	64′-2⅛″	55′-10¾″	52′-1″	24′-11¹⁄₁₆″	24′-2⅝″	23′-7⅛″	22′-7⅝″	22′-7⁄₁₆″	21′-5⅜″	21′-¼″	4.8
7	91′-⅞″	82′-2⅛″	75′-1¾″	65′-5½″	61′	29′-3⅛″	28′-4¼″	27′-7¼″	26′-6¼″	25′-9⅝″	25′-1¾″	24′-7″	5.6
8	104′-4¼″	94′-2⅞″	86′-1⅜″	75′-¼″	69′-11″	33′-6⁹⁄₁₆″	32′-5⅞″	31′-7⅜″	30′-4⅞″	29′-6¹³⁄₁₆″	28′-9⅝″	28′-1¾″	6.4
9	117′-7⅝″	106′-2⅞″	97′-1″	84′-7″	78′-10″	37′-10″	36′-7½″	35′-7½″	34′-3½″	33′-4″	32′-5½″	31′-8½″	7.2
10	130′-11″	118′-2⅞″	108′-⅝″	94′-1¾″	87′-9″	42′-1⁷⁄₁₆″	40′-9⅛″	39′-7⅝″	38′-2⅛″	37′-1³⁄₁₆″	36′-1⅜″	35′-3¼″	8.0
11	144′-2⅜″	130′-2⅞″	119′-¼″	103′-8½″	96′-8″	46′-4⅞″	44′-10¾″	43′-7¾″	42′-¾″	40′-10⅜″	39′-9¼″	38′-10″	8.8
12	157′-5¾″	142′-2⅞″	129′-11⅞″	113′-3¼″	105′-7″	50′-8⁵⁄₁₆″	49′-⅜″	47′-7⅞″	45′-11⅜″	44′-7⁹⁄₁₆″	43′-5⅛″	42′-4¾″	9.6
14	184′-½″	166′-2⅞″	151′-11⅛″	132′-4¾″	123′-5″	59′-3³⁄₁₆″	57′-3⅝″	55′-8⅛″	53′-8⅝″	52′-1¹⁵⁄₁₆″	50′-8⅞″	49′-6¼″	11.2
18	237′-2″	214′-2⅞″	195′-9⅝″	170′-7¾″	59′-1″	76′-4¹⁵⁄₁₆″	73′-10⅛″	71′-8⅝″	69′-3⅛″	67′-2¹¹⁄₁₆″	65′-4⅜″	63′-9¼″	14.4
24	316′-10¼″	286′-2⅞″	261′-7⅜″	228′-¼″	212′ 7″	102′-1⁹⁄₁₆″	98′-7⅞″	95′-9⅜″	92′-6⅞″	89′-9¹³⁄₁₆″	87′-3⅝″	85′-1¾″	19.2

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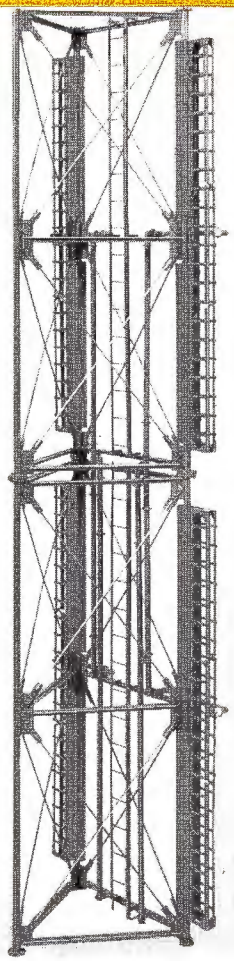


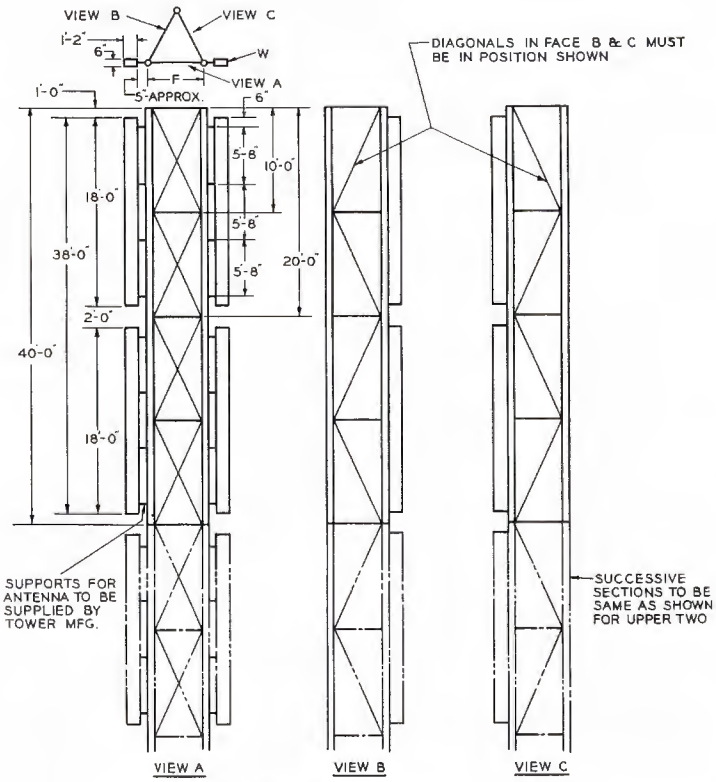
Two-section separate aural and visual Rectangular Slot Antenna.

Rectangular Slot Antennas

The RCA Rectangular Slot Antenna consists of 18-foot long radiators with two-foot spacing between sections. The sections are designed for mounting on the leg of a triangular tower. Two or more radiators can be stacked and fed in phase to achieve a required power gain. Shaping of the vertical pattern to attain null-fill and beam tilting is controlled by power division and relative phase between sections in the feed system. Gains between 2.3 and 2.5 per section depending upon the operating channel can be realized. Separate slot sections can be mounted on adjacent legs of a triangular tower with one set of radiators being fed from the visual transmitter and the opposite set of radiators fed from the aural transmitter thereby eliminating the use of a diplexer. However, a common set of radiators may be used for aural and visual power by the use of a filterplexer and a single-line feed.

The power handling capacity of the Rectangular Slot antenna is dependent upon the interconnecting feed system. By using 3⅛" rigid coaxial line a power handling capacity of 50 kw can be realized. The circulation of currents in the tower members in the area of the radiator have some effect upon the horizontal radiation patterns and as a result it is necessary for RCA to specify the basic design of the tower. Where the antenna is to be installed on an existing tower it is necessary to simulate a section of the antenna and associated tower structure in our engineering test yard to determine the horizontal circularity for a particular installation. Where the supporting tower to be used is of uniform triangular cross-sectional design in accordance with RCA Engineering Department specifications a horizontal circularity of plus or minus 2 db or better may be specified. Installations have been made that achieved 1.85 db as measured on RCA's turntable.

For channels 7 to 13 the Rectangular Slot antenna lends itself extremely well to installations involving special gains or vertical pattern shaping requirements and multiple antenna stacking installations. Each application is handled on a custom-built basis due to the many combinations of gain, power handling capability and type of feed possible with this type of antenna. Individual price quotations are made after the engineering department has evaluated the specific requirements and specifications of a particular application.



STRUCTURAL SPECIFICATIONS

F (Tower Face) 5'-6" to 7'-0".
W (Wind load per 18'-0" slot section—50 psf) 770 lbs. (in direction shown).
For fed system wind loading considerations, assume 40 ft. of 3⅛ transmission line per 20 ft. of tower.
Tower legs, struts and diagonal sizes to meet necessary structural design.
Weight per rectangular slot section—390 lbs.

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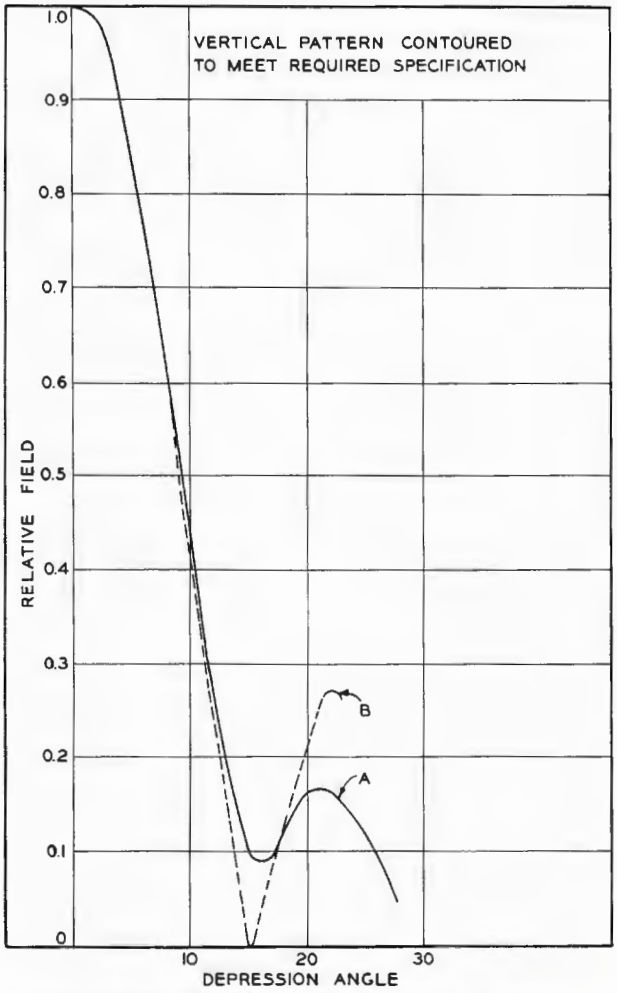
Multiple Station Installation

Many advantages may be derived from the common use of a single tower by two or more television stations. With a single high tower, the following benefits may result:

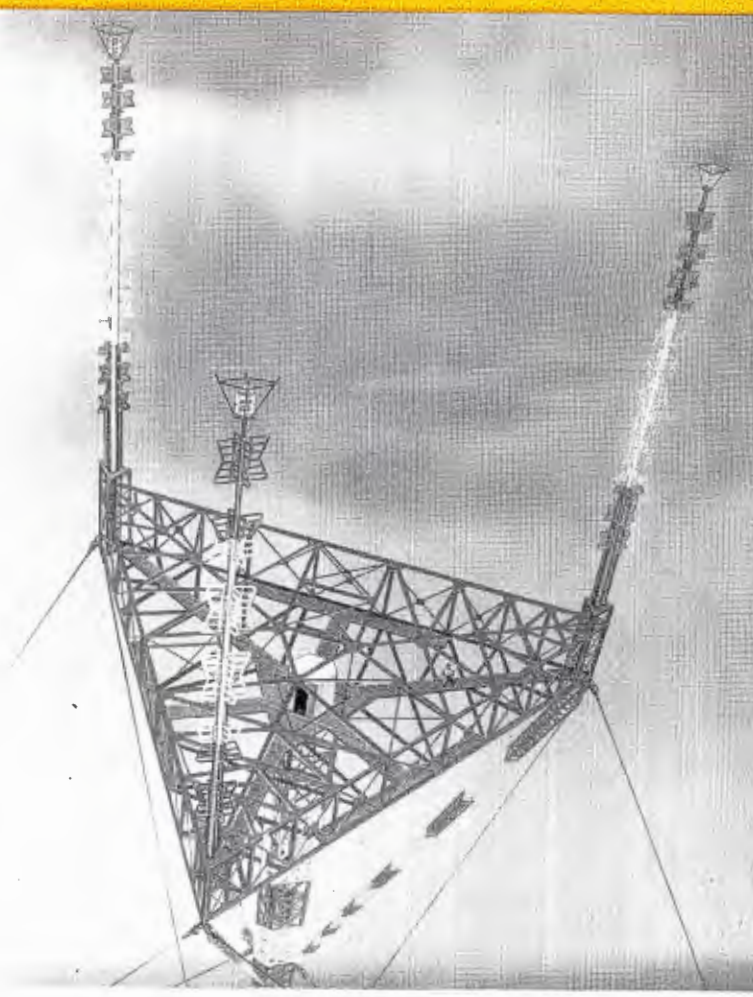
(a) Economy in sharing total investment costs (b) greater public satisfaction in a common receiving antenna orientation for receiving all stations and (c) may provide a solution where the number of locations with aeronautical approval is limited.

RCA 12-Section Superturnstile Antennas may in many instances be used,, or two 6-section antennas for different channels. Typical Superturnstile stacking combinations are illustrated in the Superturnstile Catalog description.

Other means of obtaining multiple antenna installations include "side-by-side" mounting of Standard Superturnstiles on a cross arm, or the use of one or more Supergains or rectangular slot antennas with Superturnstiles on top. Any combination of VHF channels may operate on a common tower.



VERTICAL PATTERN CONTOURED TO MEET REQUIRED SPECIFICATIONS (see curves at left). Curve A shows calculated vertical pattern of standard four-section antenna, with deep null at 15.1°. Curve B shows calculated vertical pattern of four-section antenna with unequal vertical spacing between sections of radiators. The spacing is calculated so that the specified field strength of 0.1 at 15° is obtained.



Typical "Antenna Farm" with multiple antennas sharing a common tower.

Custom Vertical Patterns

Frequently, special terrain conditions and/or unusually high mountain top elevations require special vertical pattern shaping for satisfactory coverage. Vertical pattern shaping may be achieved in either Superturnstile, Supergain or rectangular slot antennas by four methods:

(1) Unequal power distribution between antenna sections.

(2) Control of electrical phase relation between sections.

(3) Beam tilting.

(4) Combinations of (1) and (2) above.

The first method is used in RCA antennas which are sectionalized, for example, the 70-30 power division between upper and lower sections of the TF-12AL, AM, AH Antennas.

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Where greater minimum fill-in is desired, the second method is normally preferred—since unequal power division limits the antenna power rating by concentrating larger portions of power in a few feed lines. A considerable latitude of control in the vertical pattern shape can be exercised by phasing between sections, by unequal feed line lengths. The power gain in the main load is less than that achieved with uniform phasing and power distribution due to a greater power radiated in other directions. Special vertical patterns are furnished on request.

Special Gain Requirements

If a greater power gain than that obtainable in a standard antenna is required, additional gain may be achieved by vertical stacking of a greater number of sections. The Supergain antenna is offered in 18 and 24 sections with power gains of 14.4 and 19.2 respectively.

Heavy-Duty Wind Loading

The new line of RCA Standard Superturnstile Antennas is designed for 50/30 psf wind loading. This is equivalent to a wind velocity of 110 mph. For unusual mountain top locations, hurricane areas, or to meet requirements of special local building codes, the Superturnstile antenna may be reinforced by increasing the wall thickness of the supporting pole. Any RCA Superturnstile may be supplied in a heavy-duty design without altering the electrical performance and specifications or mechanical dimensions as listed under "VHF Superturnstiles". Heavy-duty antennas have previously been suppied for operation in wind velocities of as much as 150 mph, and with a heavy ice coating on the antenna. The wind load limitation of the Supergain is dependent upon the tower design and power specifications.

RCA Custom antennas can be designed to meet the same specifications that apply to the standard Superturnstile or Supergain antennas, except that components of greater power handling capability are required to permit the increased power rating.

This is achieved through the use of one or more of the following: A larger size of transmission line, junction boxes of larger size or constructed of materials which will either have lower losses or will carry more power without deterioration, feedlines of greater power handling capability, or a rearrangement of radiators to permit the use of a greater number of feedlines so that the power per feedline is reduced to a value which is within the safe rating.

WIND VELOCITIES AND CORRESPONDING PRESSURES

TRUE "EXTREME" VELOCITY MILES PER HOUR (Note No. 1) V_a	FLAT SURFACES Pressure in Lbs./Sq. Ft. of Projected Area $P = 0.0042V_a^2$	CYLINDRICAL SURFACES Pressure in Lbs./Sq. Ft. of Projected Area $P = 0.0025V_a^2$
10	.42	.25
15	.95	.56
20	1.7	1.00
25	2.6	1.6
30	3.8	2.3
35	5.2	3.1
40	6.7	4.0
45	8.5	5.1
50	10.5	6.3
55	12.7	7.6
60	15.1	9.0
65	17.8	10.6
70	20.6	12.3
75	23.6	14.1
80	26.9	16.0
85	30.4	18.1
90	34.0	20.3
95	37.9	22.6
100	42.0	25.0
105	46.3	27.6
110	50.8	30.3
115	55.5	33.1
120	60.5	36.0
125	65.6	39.1
130	70.9	42.3
135	76.5	45.6
140	82.3	49.0
145	88.3	52.6
150	94.5	56.3
155	100.9	60.1
160	107.5	64.0
165	114.3	68.1
170	121.4	72.3
175	128.6	76.6
180	136.1	81.0
185	143.7	85.6
190	151.6	90.3
195	159.7	95.1
200	168.0	100.0
205	176.5	105.1
210	185.2	110.3
215	194.1	115.6
220	203.3	121.0
225	212.6	126.0

NOTE No. 1—Since 1932 published weather data based on 5 minute average known as "Maximum" and frequently on fastest mile known as "Extreme." Selection of antenna loads should be based on Extreme (increase "Maximum" by 15% if no data on Extreme).

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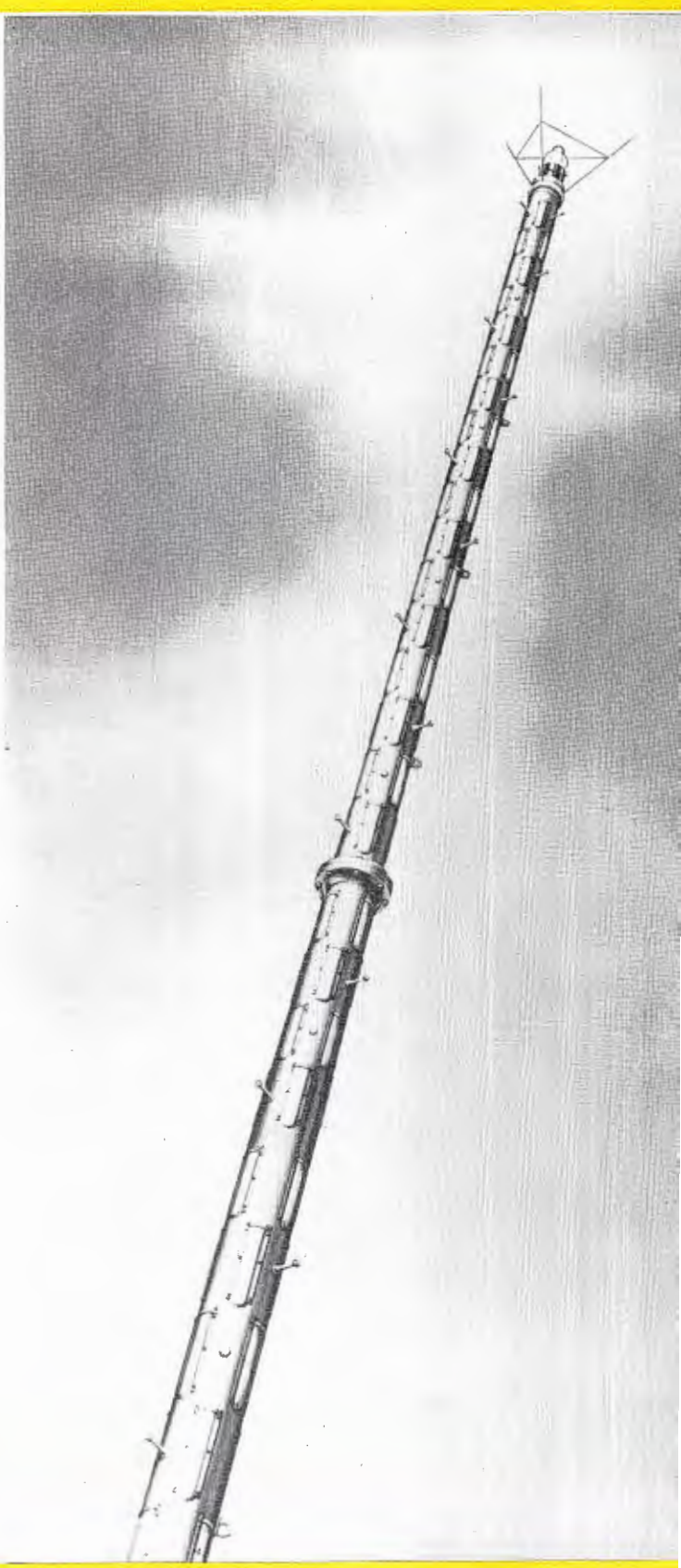
UHF TV PYLON ANTENNAS

FEATURES

- Rugged, simple construction—smooth surface of antenna is the radiator
- No protruding elements or complicated appendages
- Only one feedpoint for line input
- Uniform signal strength in all directions for circular patterns
- "Contour-engineered" coverage pattern—circular or directional
- Null fill-in, beam tilt, and pattern shaping combine to assure uniform coverage
- Choice of gains and power ratings available
- Complete RCA Matched UHF Systems available—transmitter, antenna, transmission line and accessories
- Easy to assemble and erect



USES

The RCA UHF Pylon is the antenna being used by majority of today's UHF stations for operation on television channels 14 to 83. Antennas are available with power input ratings up to 60 kw and power gains up to 60. Television stations can choose from a wide variety of vertical patterns and horizontal patterns (circular or directional) to provide "contour-engineered" coverage. All the Pylons have built-in "Beam-Tilt". This assures best possible coverage with minimum power lost to radiation above the horizon. RCA can also furnish a complete matched system —from transmitter to antenna to assure maximum performance for any station.

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View taken at the 300-foot level of WKNB-TV's (New Britain, Connecticut) tower where the RCA UHF Pylon is shown "on-the-way-up". Note that erectors easily handle the RCA antenna as a single unit, thereby reducing precious installation time.

RCA's Ultra-Gain antennas are especially intended for operation with transmitters rated at 12 kw or more. When used with the 12½ kw transmitter they will provide an effective radiated power of 500 to 600 kw. The design of the ultra-gain antenna is based on vertical pattern requirements and optimum gain for essentially constant field strength versus distance for a fixed primary service area. The field strength, as well as being uniform, is at a sufficiently high level to assure noise-free pictures throughout metropolitan areas. The distance and field strength achieved for a given pattern shape, gain and antenna height are dependent upon the power input to the antenna, and optimum performance is obtained when the antenna is operated with 10 to 60 kw input.

Pattern shaping employed permits the most efficient use of r-f power, minimizes unnecessary close-in saturation, and extends the primary service area. High angle radiation is practically negligible, thus avoiding interference and loss of signal.

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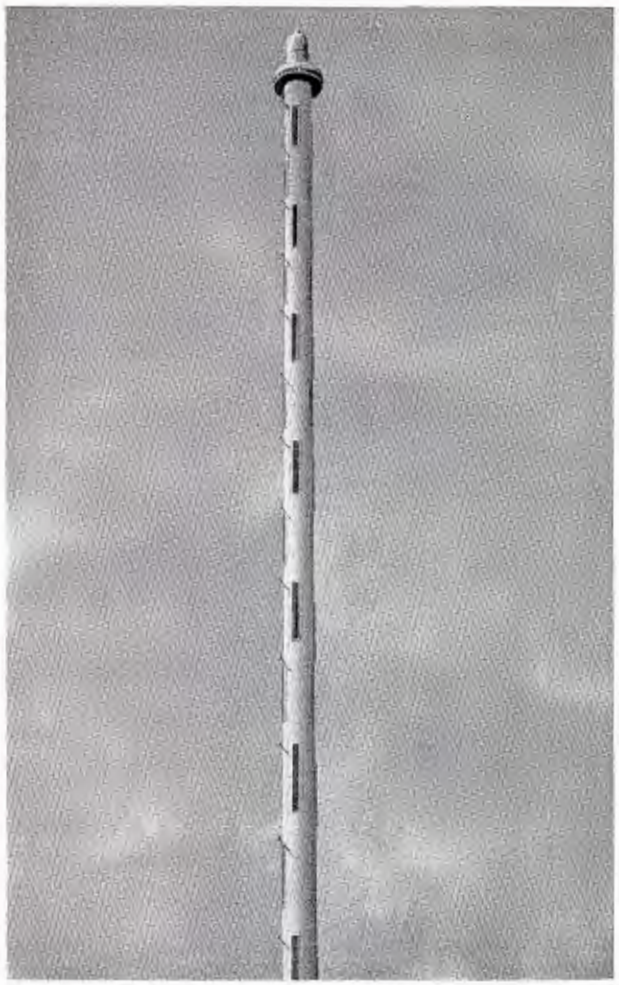
DESCRIPTION

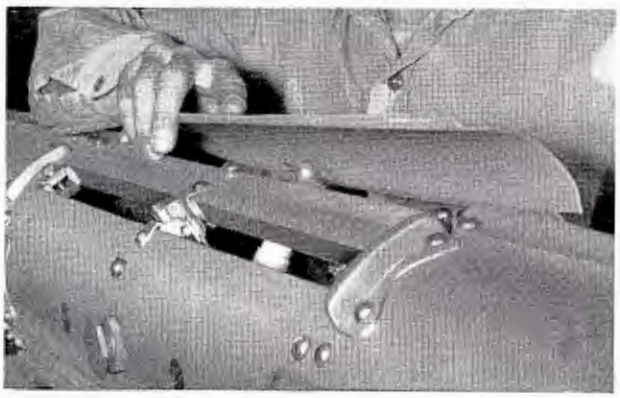
The RCA UHF Pylon Antenna employs a slotted cylinder, thus the smooth surface of the antenna itself is the radiating element. This ruggedly constructed antenna is free from complicated appendages or protruding elements. There are no fragile parts to bend or break under strong wind loads. All elements are completely enclosed by protective slot covers. Each radiating layer consists of one-inch wide slots approximately 1.3 wavelengths long, parallel to the axis of the cylinder, and equally spaced around the circumference. The r-f energy is fed to the layers of slots by means of a single coaxial line feed system within the self-supporting, slotted-cylinder radiator. A coaxial line is installed within the inner conductor to the feedpoint, near the antenna center, with the attendant benefits of improved bandwidths obtained with center fed antennas.

The RCA Ultra-Gain series of antennas consists of two sections, a 16" O.D. lower section and a 14" O.D. upper section, thus keeping size, weight, and wind load to a minimum. Ultra-Gain pylon antennas are mechanically strong and are capable of withstanding very severe wind conditions. Special techniques of phase and amplitude distribution of the input power to the antenna results in a vertical pattern designed to yield essentially constant high-level signals to all receivers in a large metropolitan area.

The slotted radiator is constructed of hot-dip galvanized open-hearth structural steel to obtain extremely long life.



Typical UHF Pylon Antenna.



View illustrating how polyethylene protective covers are placed over all slots to protect the inside harness.

Particular attention has been paid to all parts of the antenna to assure maximum durability and all hardware and metal parts are made of corrosion-resistant metals. For example, pole steps are hot-dipped galvanized forged steel; mounting flange bolts stainless steel or hot-dip galvanized high strength alloy steel; leveling plates hot-dip galvanized steel; transmission line copper with brass or bronze parts and teflon insulators; coupling loop capacitors use teflon dielectric; shorting spokes brass and bronze; beacon mounting and ventilator grills aluminum or hot-dip galvanized steel; and slot covers polyethylene containing anti-oxidant and ultra-violet inhibiting dye. The pole mounting flange is of special high strength alloy steel having high impact resistance at temperatures of —60° C.

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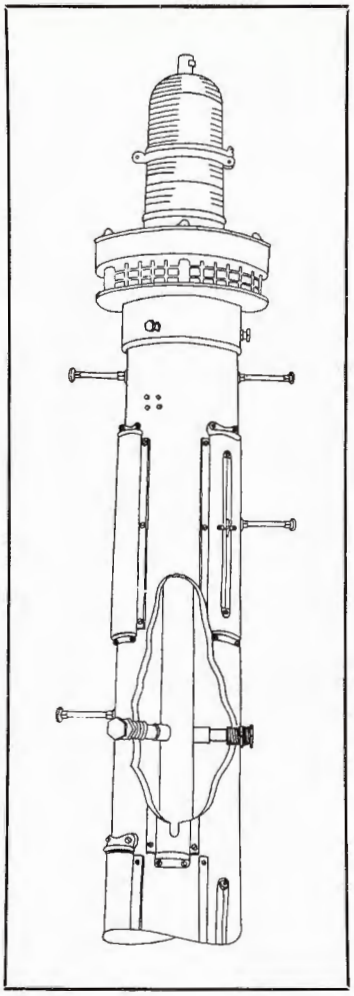
All the RCA Pylons are supplied with beacon lighting cable installed for connection to the top beacon lamp and to tower lighting wiring at the tower top. The beacon lamp is not supplied with the antenna, but is normally a part of of the tower lighting equipment. Lightning protection facilities are supplied with all antennas.

RCA's UHF transmitting antennas are supplied with measured vertical radiation patterns; and, in the case of directional antennas, measured horizontal radiation patterns are also supplied with the antenna. Electrical ground check of each RCA UHF antenna at the station site, prior to erection, is a service feature included with the antenna.

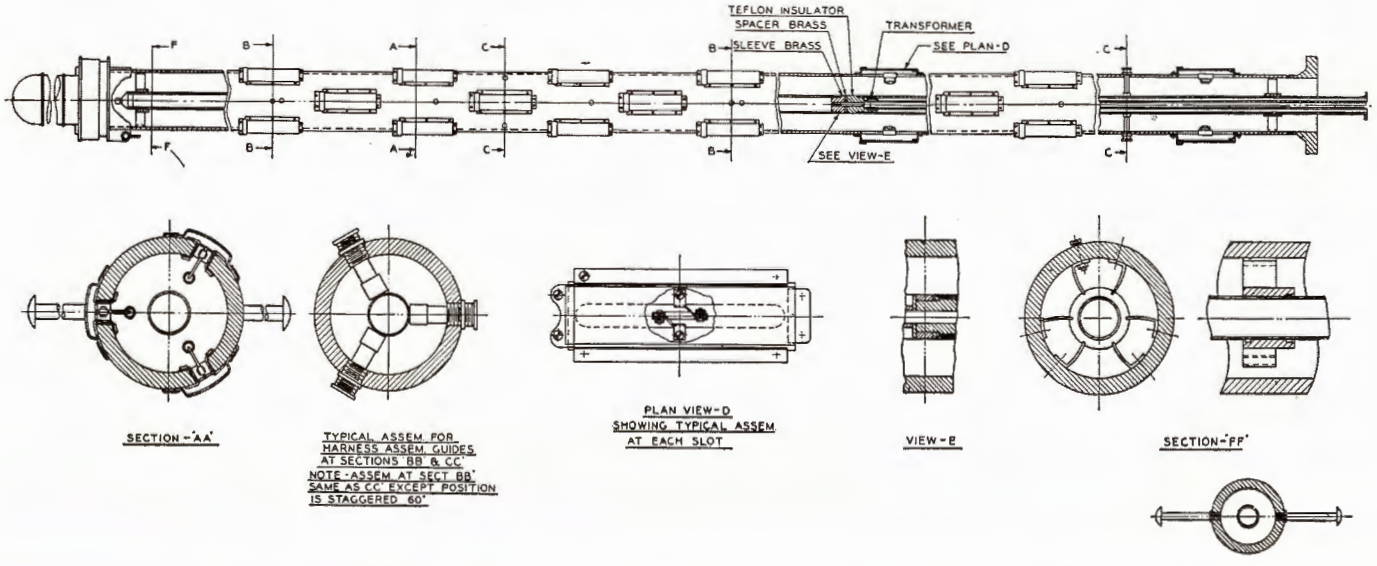
RCA UHF transmitting pylon antennas are available in various power gains and input power ratings (see Table I). All antennas listed produce essentially circular horizontal patterns except those listed as "directional". The "D" series of Antennas shown employ two layer "off-set" center feed with uniform phase distribution to effect special vertical pattern null fill-in. The "C" series of medium power-medium gain antennas employ uniform phase distribution and "stepped' power distribution to attain excellent null fill and pattern shape characteristics.

SIMPLICITY IS THE KEYNOTE

Shown here is a cross-sectional sketch of the RCA UHF Pylon Antenna. Note how sturdiness and simplicity are highlights of the design. The inner-conductor of the antenna is centered in the cylinder by Teflon centering pins. Slot covers provide complete protection to all elements within the antenna cylinder. Picture quality is assured since the RCA UHF Pylon is unaffected by ice and snow.



CONSTRUCTIONAL DETAILS OF THE RCA UHF PYLON



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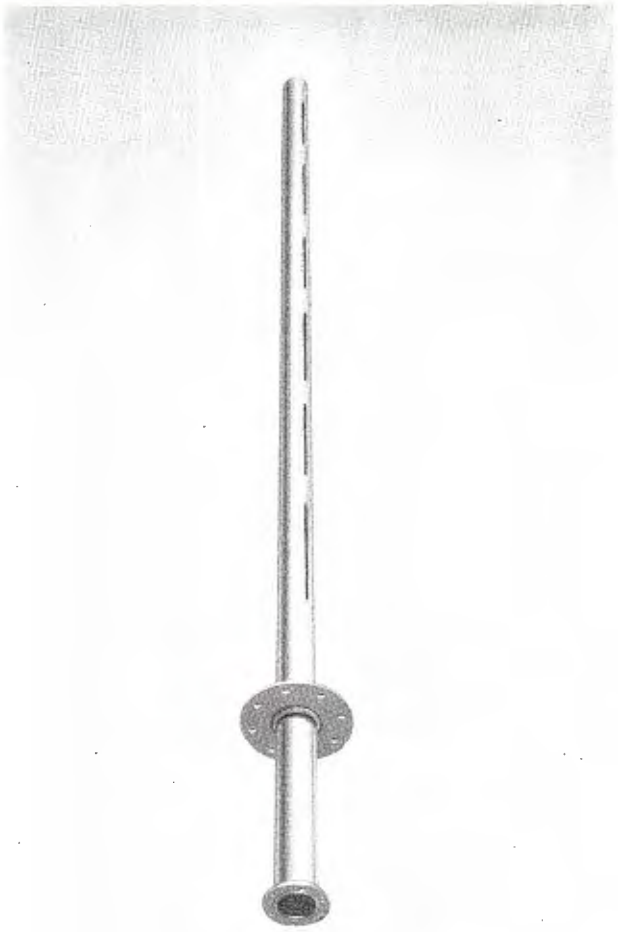
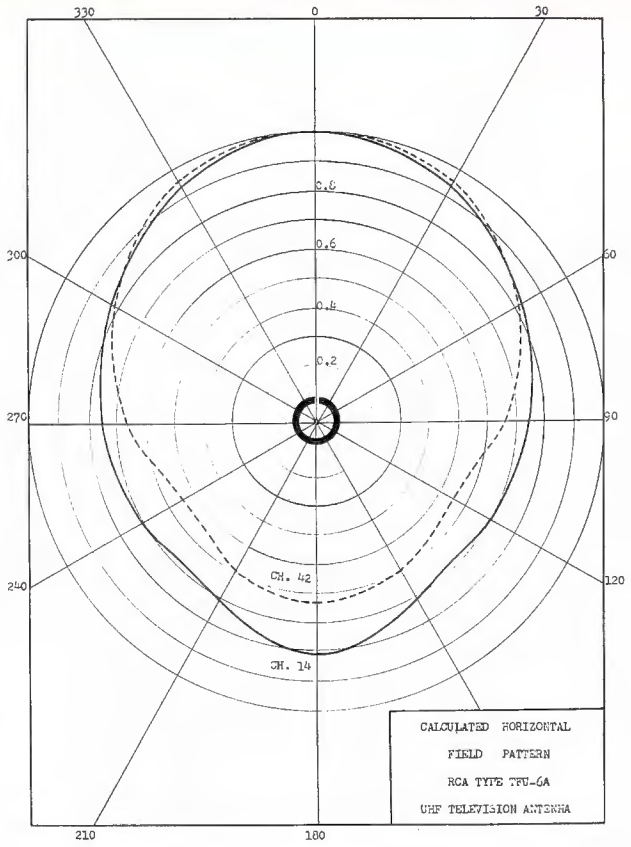
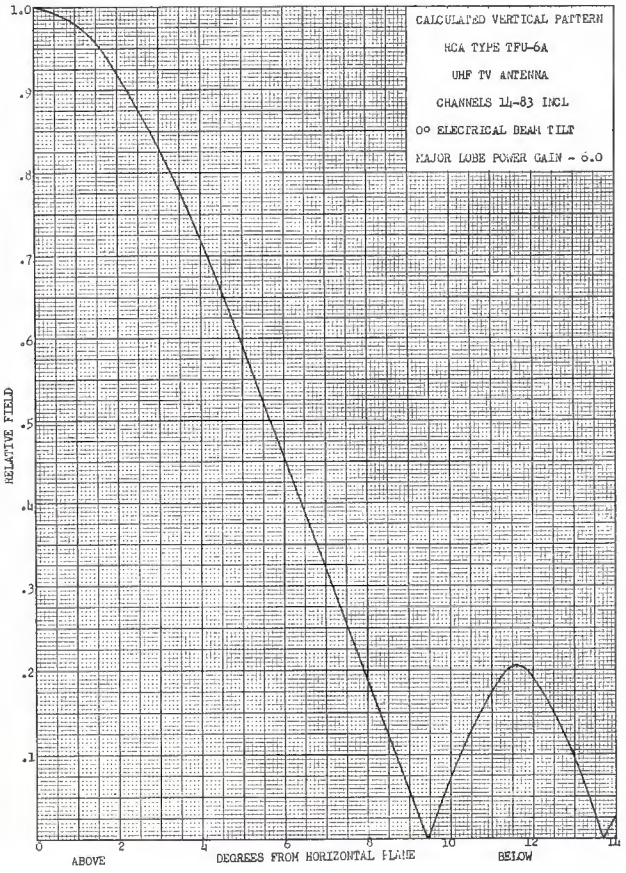


TFU-6A UHF Antenna.





Type TFU-6A UHF Antenna

The Ultra-Gain series of high power-high gain antennas employ non-uniform phase and amplitude distribution to attain a nearly ideal vertical pattern shape. The TFU-6A low gain antenna is of the single slot per layer, end-fed type for simplicity of design and installation, and low cost.

A low gain, lightweight, omni-directional antenna is available in the type TFU-6A for installations as a stand-by or emergency antenna, or for low power applications such as satellite stations. This antenna has a vertical directivity power gain of 6 with a relatively broad vertical pattern shape affording excellent service over a metropolitan area. The horizontal pattern is essentially circular at the lower UHF channels and approaches an elliptical pattern at the higher UHF channels.

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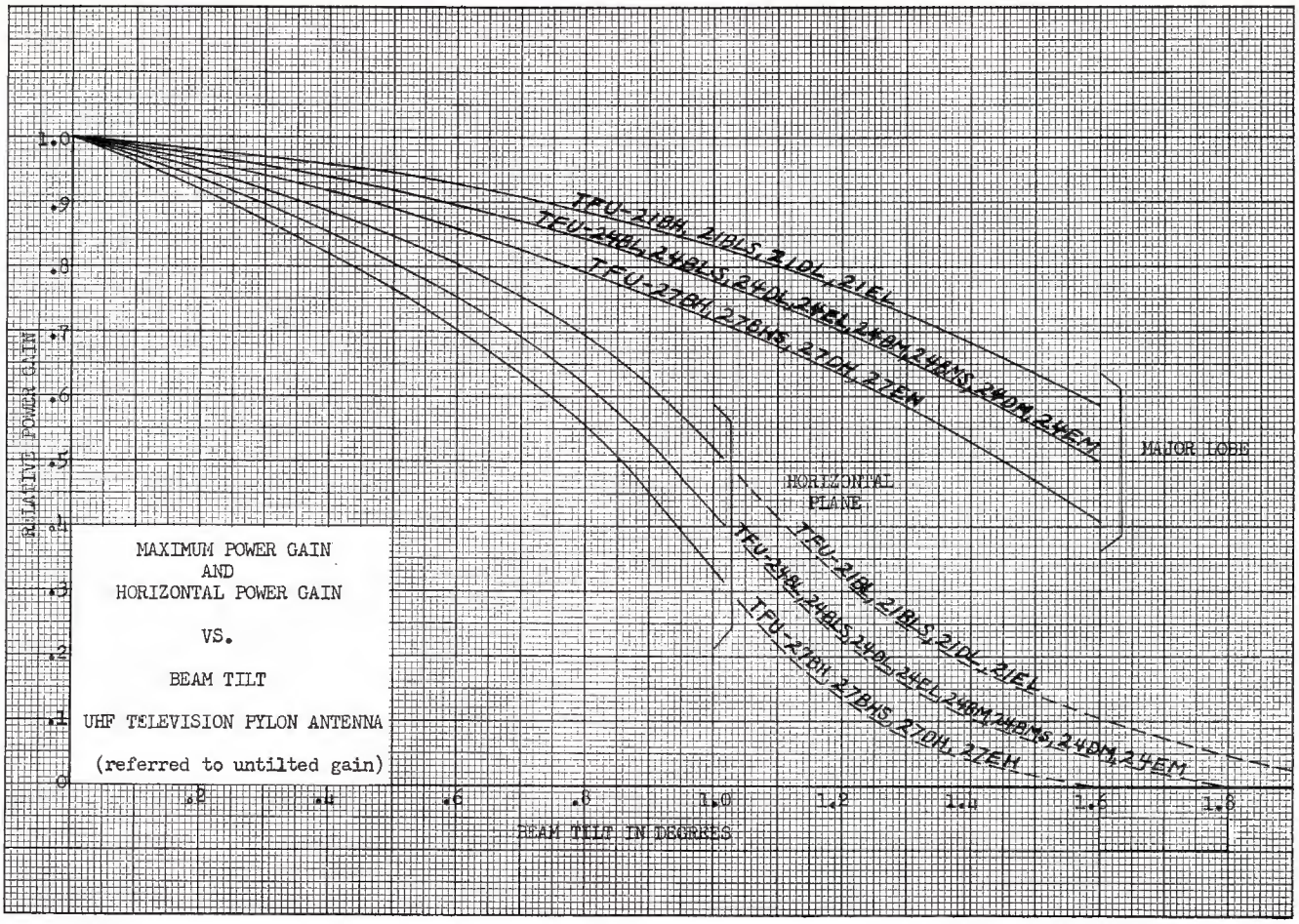

The TFU-6A is a slotted cylinder type, having an outside diameter of 4½" O.D. and weighs approximately 100 pounds. A mounting flange is provided for mounting at a tower top or for mounting on an outrigger plate at the side of a tower or inside the tower. The input terminal is a standard 3⅛" UHF flange input, for direct connection to a run of 3⅛" UHF transmission line.

No provision is made for mounting obstruction lighting, since the beacon lamp may be mounted at the tower top for an antenna of this height; where used in a side mounted application on a tower, the normal tower lighting equipment is sufficient to meet marking requirements.

Bottom view of an RCA UHF Pylon Antenna showing the mounting flange and the transmission line connection.

Directional UHF Antennas

Four directional antenna types are listed; these type numbers identify the antenna as directional for the channel

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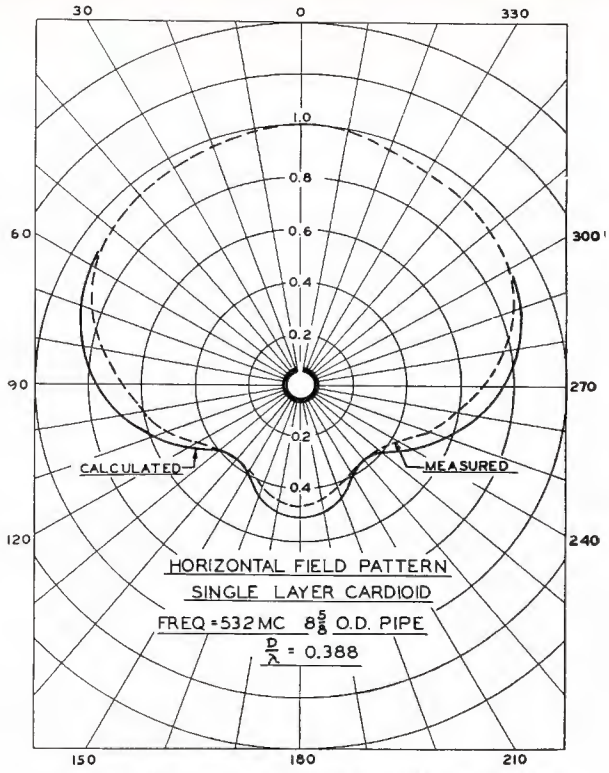
coverages as shown. Each type is available with either uni-directional or bi-directional pattern, specific pattern characteristics and filing data are dependent upon channel and are supplied upon request for directional applications. The type numbers refer to the nominal RMS gains, the maximum horizontal directivity gains are dependent upon pattern shape chosen and the channel of operation.

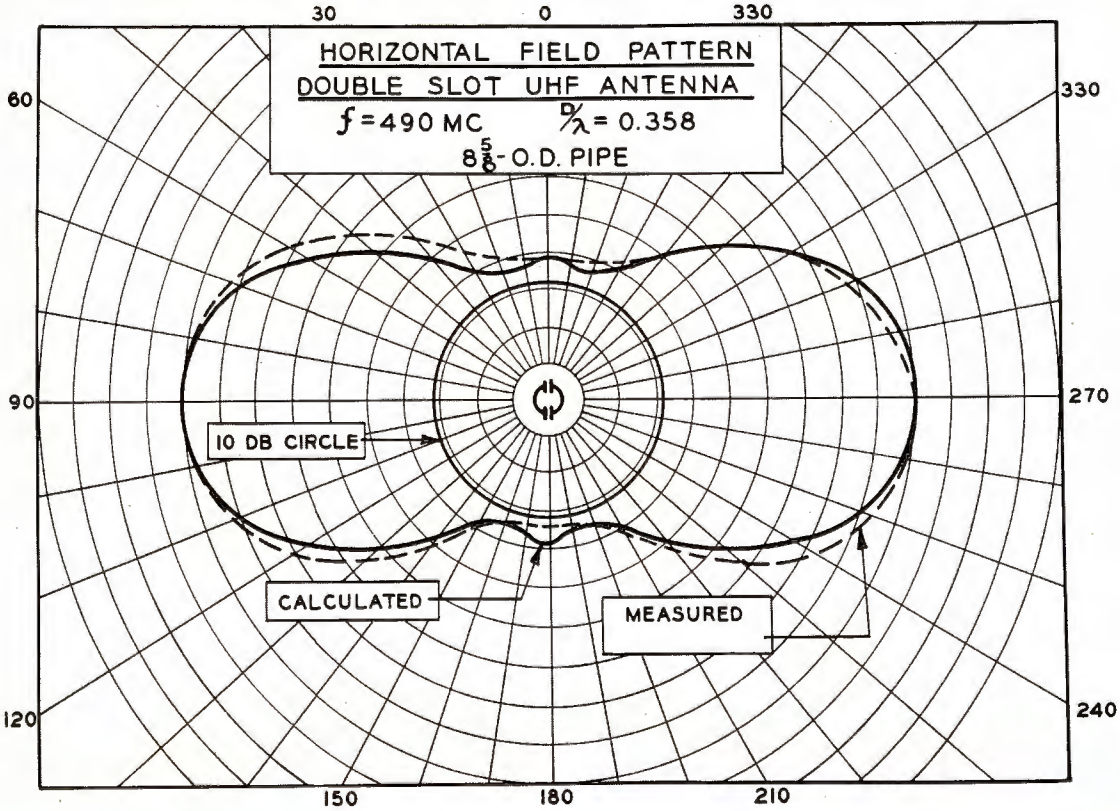
Beam Tilt

Electrical beam-tilting for the medium gain antennas of the "D" and "C" series is accomplished by a shift of the feed point from the electrical center between layers thus producing a fixed phase difference between layers below and above the feed point. The beam tilt may be changed in the field by a change of harness position, thus changing the fixed phase difference. Changing the beam tilt from its original adjustment will usually require re-adjustment of the impedance matching transformers to correct the input VSWR to its original optimized value.



Calculated Pattern and a measured model pattern of a "Cardioid Directional" UHF Pylon.

Calculated Pattern and a measured model pattern of a "Peanut Directional" UHF Pylon.



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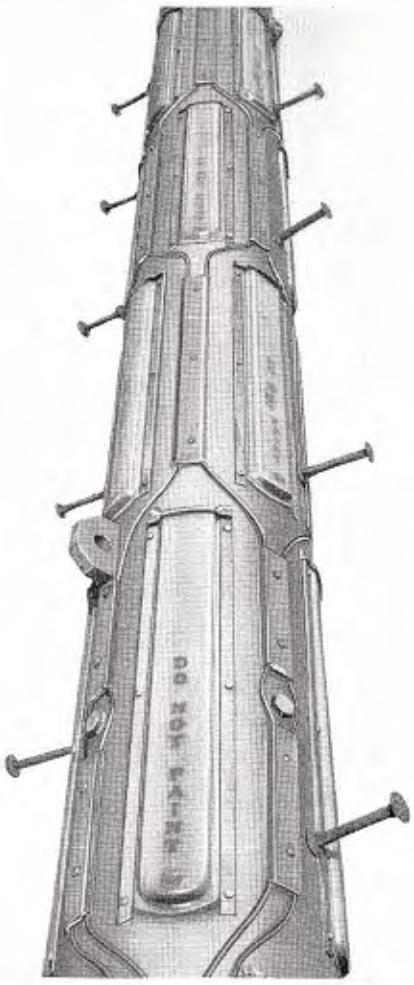

De-Icing Chromalax strip heaters shown clamped to pylon antenna surface longitudinally between rows of slots. Note asbestos lined covers, and pole steps for use of maintenance personnel.

Electrical beam-tilt as required may be incorporated with the Ultra-Gain series antennas (TFU-46AL, TFU-52AM, TFU-60AH) however the electrical beam tilt cannot be altered once selected due to the asymmetrical phase and amplitude design employed. The TFU-6A end-fed type low gain antenna does not employ electrical beam tilt due to the wide beam width employed.

Mechanical beam tilting may be incorporated in all RCA pylon types of antennas with a pair of tapered levelling rings supplied with each antenna. These levelling rings permit the positioning of the antenna off the vertical in any azimuth direction for all values of normal mechanical tilting requirements. The levelling rings may also be used to permit vertical alignment of the antenna when the tower top plate is not perfectly horizontal. Combination of mechanical and electrical tilt may often be employed advantageously to improve signal level in particular directions, or where the terrain is sloping in one general direction.

De-Icing Equipment

Heating systems for preventing the formation of ice or the removal of existing ice on the slotted cylinder types of UHF Antennas previously described are available. The de-icing equipment consists of Chromalax strip heaters clamped to the antenna surface longitudinally between rows of slots. Asbestos strip covers are provided on the outer surface of the heater strips to minimize direct heat loss to surrounding air, thus confining the heat to direct contact with the antenna surface. Heater strips are available for 110, 220-240, or 440-460 volt operation. For 220 or 440 volt primary supplies the heaters are normally connected in a three phase three wire circuit to distribute the load equally between primary phases and to reduce the wire size for feeder circuits on the tower.

The de-icing system is supplied, on separate order, installed on the antenna at time of antenna shipment. If de-icing equipment is required it must be ordered with the antenna; field installation of the system is not practicable.

The installed de-icing system includes a protective over-temperature relay, installed in contact with the copper feed system of the antenna, to open the primary power circuit in the event continuous operation of the de-icer heaters raises the antenna temperature above a safe operating value for antenna components. An accessory relay is provided for use with the over temperature antenna relay, for operation of a solenoid at the heater system primary switch. A separate temperature operated automatic on-off switch MI-27369 is available as an accessory for operation of the de-icing system at pre-set temperature range limits where ice formation is apt to occur. The use of this temperature operated switch thus assures operation of the system during hours when the transmitter plant is un-attended.

For the TFU-46AL/52AM/60AH Antenna series the de-icing system requires 65 kw at 440-460 volts, 3 phase. For the TFU-21C/24C/27C/30C Antenna series the de-icing system requires 30 kw at 440-460 volts, 3 phase. For the TFU-21DL/24DL/24DM/27DH Antenna series the de-icing system requires 18 kw at 220-240 volts, 3 phase.

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SPECIFICATIONS

The mechanical and electrical specifications vary with antenna type and by channels within any given type. All applicable mechanical dimensions and electrical ratings are shown in tabular form for each type on following pages. Vertical radiation patterns for each type antenna at representative values of electrical tilt are also shown on following pages.

Table I below is a quick selection chart listing all UHF antennas by type numbers, channels covered, power gains, and input power rating.

TABLE I

Channel	*Type*	*Gain in db*	**Power Gain*	***TV Power Rating*	
				kw	*dbk*
14-50	TFU-6A	7.78	6.0	1.0	0
14-30	TFU-21DL	13.22	21	15	11.76
14-30	TFU-24DL	13.80	24	15	11.76
31-50	TFU-24DM	13.80	24	13.5	11.30
51-83	TFU-27DH	14.31	27	12.5	10.97
14-19	TFU-21C	13.22	21	50	16.99
20-30	TFU-24C	13.80	24	44	16.43
31-50	TFU-27C	14.31	27	40	16.02
51-83	TFU-30C	14.77	30	35	15.44
14-30	TFU-46AL	16.62	46	60	17.78
31-55	TFU-52AM	17.16	52	55	17.40
56-83	TFU-60AH	17.78	60	50	16.99
14-30	TFU-21DAL (Directional)				
14-30	TFU-24DAL (Directional)				
31-50	TFU-24DAM (Directional)				
56-83	TFU-27DAH (Directional)				

THESE ARE DIRECTIONAL TYPES. HORIZONTAL PATTERN SHAPES, RMS POWER GAIN ARE DEPENDENT UPON CHANNEL. BEAM TILTING AND NULL FILL-IN FEATURES OPTIONAL. ALL DIRECTIONAL ANTENNAS ARE CUSTOM BUILT AND SPECIFICATIONS ARE SUBJECT TO INDIVIDUAL REVIEW. SPECIFICATIONS AND FILING DATA SUPPLIED FOR EACH APPLICATION.

* Power gain refers to the major lobe power gain, with no electrical beam tilt. With electrical beam tilt the null fill-in is increased and the power gain reduced approximately proportional to the beam tilt. See graph page 6 and individual patterns for representative patterns and tilted gain values.

** Power ratings given are maximum visual power input to antenna and assume aural carrier power of one half of peak of sync visual power input.

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MECHANICAL SPECIFICATIONS AND ELECTRICAL RATINGS OF RCA PYLON UHF ANTENNAS

In the following specification tables for the various types of RCA UHF antennas, column one denotes the frequency by channel number, Hc is height to center of radiation; H is the overall height, not including obstruction lighting. Add 2.66 feet to top of obstruction lighting and lighting protectors for TFU-21DL, 24DL, 24DM, and 27DH antenna types or 4.3 feet for Type TFU-21C, 24C, 27C, 30C, 46AL, 52AM and 60AH antennas. The column headed R_1 represents wind reaction in pounds per square foot at 30/20 psf wind load, while M is the overturning moment in foot pounds at 30/20 psf wind load.

TYPE TFU-21DL UHF TELEVISION ANTENNA, MI-19304-D/A

Number of Sections: 14
Input VSWR: 1.1/1.0 or less
Circularity: Within ±0.5 db
Input Terminal: 3⅛" UHF RETMA flange, 50 ohms

Channel	Hc (Ft.)	H (Ft.)	Weight (lbs.)	R_1 (lbs.)	M (Ft. lbs.)	Safe Wind Load (PSF)	Gain db	Gain power	Power Rating kw	Power Rating dbk
14	23.85	46.83	2880	1595	39,790	40	13.22	21	15	11.76
15	23.65	46.25	2855	1585	39,460	40	13.22	21	15	11.76
16	23.50	45.83	2835	1575	38,930	40	13.22	21	15	11.76
17	23.10	45.42	2800	1550	37,680	40	13.22	21	15	11.76
18	22.80	44.75	2760	1530	36,740	40	13.22	21	15	11.76
19	22.55	44.08	2740	1515	36,000	45	13.22	21	15	11.76
20	22.35	43.75	2710	1500	35,370	45	13.22	21	15	11.76
21	22.15	43.33	2690	1490	34,840	45	13.22	21	15	11.76
22	21.80	42.75	2650	1485	33,680	45	13.22	21	15	11.76
23	21.60	42.25	2630	1455	33,160	45	13.22	21	15	11.76
24	21.40	41.75	2610	1440	32,530	50	13.22	21	15	11.76
25	21.20	41.42	2590	1425	31,950	50	13.22	21	15	11.76
26	20.95	40.92	2560	1415	31,360	50	13.22	21	15	11.76
27	20.75	40.50	2540	1400	30,730	50	13.22	21	15	11.76
28	20.55	40.00	2515	1385	30,200	50	13.22	21	15	11.76
29	20.30	39.75	2485	1370	29,560	55	13.22	21	15	11.76
30	20.15	39.25	2470	1360	29,140	55	13.22	21	15	11.76

TYPE TFU-24DL UHF TELEVISION ANTENNA, MI-19304-A/A

Number of Sections: 16
Input VSWR: 1.1/1.0 or less
Circularity: Within ±0.5 db
Input Terminal: 3⅛" UHF RETMA flange, 50 ohms

Channel	Hc (Ft.)	H (Ft.)	Weight (lbs.)	R_1 (lbs.)	M (Ft. lbs.)	Safe Wind Load (PSF)	Gain db	Gain power	Power Rating kw	Power Rating dbk
14	27.023	53.08	3090	1820	51,800	30	13.80	24	15	11.76
15	26.668	52.42	3052	1795	50,550	30	13.80	24	15	11.76
16	26.417	51.83	3015	1775	49,550	30	13.80	24	15	11.76
17	26.083	51.42	2988	1755	49,000	35	13.80	24	15	11.76
18	25.750	50.75	2980	1735	48,500	35	13.80	24	15	11.76
19	25.417	49.92	2950	1720	47,750	35	13.80	24	15	11.76
20	25.167	49.58	2900	1695	44,550	35	13.80	24	15	11.76
21	24.917	49.08	2875	1680	43,650	35	13.80	24	15	11.76
22	24.584	48.42	2850	1665	42,850	35	13.80	24	15	11.76
23	24.334	47.83	2820	1645	42,000	40	13.80	24	15	11.76
24	24.000	47.25	2800	1625	41,250	40	13.80	24	15	11.76
25	23.750	46.92	2770	1615	40,450	40	13.80	24	15	11.76
26	23.500	46.25	2750	1600	40,000	40	13.80	24	15	11.76
27	23.250	45.83	2720	1590	39,250	40	13.80	24	15	11.76
28	23.000	45.25	2690	1570	38,800	40	13.80	24	15	11.76
29	22.750	45.00	2660	1550	38,300	40	13.80	24	15	11.76
30	22.500	44.42	2630	1540	37,750	45	13.80	24	15	11.76

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TYPE TFU-24DM UHF TELEVISION ANTENNA, MI-19304-B/A

Number of Sections: 16
Input VSWR: 1.1/1.0 or less
Circularity: Within ±0.5 db
Input Terminal: 3⅛" UHF RETMA flange, 50 ohms

Channel	Hc (Ft.)	H (Ft.)	Weight (lbs.)	R_1 (lbs.)	M (Ft. lbs.)	Safe Wind Load (PSF)	Gain db	Gain power	Power Rating kw	Power Rating dbk
31	22.250	43.33	2440	1275	30,750	35	13.80	24	15	11.76
32	22.000	43.00	2400	1265	30,300	35	13.80	24	15	11.76
33	21.834	42.75	2340	1255	29,750	35	13.80	24	15	11.76
34	21.584	42.08	2320	1245	29,300	35	13.80	24	15	11.76
35	21.417	41.83	2300	1235	28,750	35	13.80	24	15	11.76
36	21.167	41.58	2280	1225	28,300	40	13.80	24	15	11.76
37	20.917	40.92	2260	1215	27,800	40	13.80	24	15	11.76
38	20.750	40.58	2250	1205	27,250	40	13.80	24	15	11.76
39	20.584	40.33	2230	1195	26,750	40	13.80	24	15	11.76
40	20.334	39.92	2210	1185	26,350	40	13.80	24	15	11.76
41	20.167	39.58	2200	1175	25,950	40	13.80	24	15	11.76
42	20.000	39.25	2180	1165	25,450	40	13.80	24	15	11.76
43	19.834	38.83	2160	1155	25,000	45	13.80	24	15	11.76
44	19.584	38.67	2150	1145	24,700	45	13.80	24	15	11.76
45	19.417	38.25	2140	1135	24,250	45	13.80	24	15	11.76
46	19.250	38.00	2120	1125	23,900	45	13.80	24	15	11.76
47	19.000	37.67	2100	1110	23,400	45	13.80	24	15	11.76
48	18.751	37.25	2090	1095	23,000	45	13.80	24	15	11.76
49	18.584	37.08	2080	1085	22,600	45	13.80	24	15	11.76
50	18.414	36.75	2070	1075	22,300	50	13.80	24	15	11.76

TYPE TFU-27DH UHF TELEVISION ANTENNA, MI-19304-C/A

Number of Sections: 18
Input VSWR: 1.1/1.0 or less
Circularity: Within ±0.5 db
Input Terminal: 3⅛" UHF RETMA flange, 50 ohms

Channel	Hc (Ft.)	H (Ft.)	Weight (lbs.)	R_1 (lbs.)	M (Ft. lbs.)	Safe Wind Load (PSF)	Gain db	Gain power	Power Rating kw	Power Rating dbk
51	20.584	40.08	1910	985	22,600	30	14.31	27	12.5	10.97
52	20.417	39.58	1895	980	22,500	30	14.31	27	12.5	10.97
53	20.250	39.33	1875	970	22,000	30	14.31	27	12.5	10.97
54	20.083	39.00	1860	965	21,780	30	14.31	27	12.5	10.97
55	19.917	38.66	1850	955	21,350	30	14.31	27	12.5	10.97
56	19.750	38.42	1840	950	21,000	30	14.31	27	12.5	10.97
57	19.584	38.18	1830	945	20,800	30	14.31	27	12.5	10.97
58	19.417	38.00	1820	940	20,450	35	14.31	27	12.5	10.97
59	19.250	37.58	1800	930	20,100	35	14.31	27	12.5	10.97
60	19.083	37.33	1785	925	19,950	35	14.31	27	12.5	10.97
61	18.917	37.08	1775	920	19,650	35	14.31	27	12.5	10.97
62	18.750	36.92	1760	915	19,250	35	14.31	27	12.5	10.97
63	18.584	36.66	1755	905	19,000	35	14.31	27	12.5	10.97
64	18.500	36.42	1750	900	18,850	35	14.31	27	12.5	10.97
65	18.334	36.08	1740	895	18,550	35	14.31	27	12.5	10.97
66	18.167	35.92	1730	890	18,200	35	14.31	27	12.5	10.97
67	18.000	35.58	1715	885	17,990	35	14.31	27	12.5	10.97
68	17.917	35.42	1700	880	17,800	35	14.31	27	12.5	10.97
69	17.834	35.18	1690	870	17,500	40	14.31	27	12.5	10.97
70	17.668	35.00	1675	865	17,100	40	14.31	27	12.5	10.97
71	17.500	34.92	1660	860	16,990	40	14.31	27	12.5	10.97
72	17.417	34.58	1655	855	16,840	40	14.31	27	12.5	10.97
73	17.250	34.25	1650	850	16,460	40	14.31	27	12.5	10.97
74	17.083	34.08	1640	845	16,240	40	14.31	27	12.5	10.97
75	17.000	33.92	1630	840	16,000	40	14.31	27	12.5	10.97
76	16.917	33.58	1620	835	15,850	40	14.31	27	12.5	10.97
77	16.751	33.42	1610	830	15,600	40	14.31	27	12.5	10.97
78	16.668	33.33	1600	825	15,400	40	14.31	27	12.5	10.97
79	16.584	33.00	1590	820	15,100	40	14.31	27	12.5	10.97
80	16.417	32.75	1580	815	14,950	45	14.31	27	12.5	10.97
81	16.334	32.66	1575	810	14,750	45	14.31	27	12.5	10.97
82	16.167	32.50	1570	805	14,500	45	14.31	27	12.5	10.97
83	16.083	32.25	1560	800	14,350	45	14.31	27	12.5	10.97

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TYPE TFU-21C UHF TELEVISION ANTENNA, MI-27766-L/A

Number of Sections: 16
Input VSWR: 1.1/1.0 or less
Circularity: Within ±1.0 db
Input Terminal: 6⅛" UHF RETMA flange, 75 ohms

Channel	Hc (Ft.)	H (Ft.)	Weight (lbs.)	R_1 (lbs.)	M (Ft. lbs.)	Gain db	Gain power	Power Rating kw	Power Rating dbk
14	26.5	54.0	4800	2025	55,500	13.22	21	50	16.99
15	26.5	54.0	4800	2025	55,500	13.22	21	50	16.99
16	26.5	54.0	4800	2025	55,500	13.22	21	50	16.99
17	25.5	52.0	4650	1950	51,675	13.22	21	50	16.99
18	25.5	52.0	4650	1950	51,675	13.22	21	50	16.99
19	25.5	52.0	4650	1950	51,675	13.22	21	50	16.99

TYPE TFU-24C UHF TELEVISION ANTENNA, MI-27766-L/B

Number of Sections: 18
Input VSWR: 1.1/1.0 or less
Circularity: Within ±1.0 db
Input Terminal: 6⅛" UHF RETMA flange, 75 ohms

Channel	Hc (Ft.)	H (Ft.)	Weight (lbs.)	R_1 (lbs.)	M (Ft. lbs.)	Gain db	Gain power	Power Rating kw	Power Rating dbk
20	27.5	56.0	4950	2100	59,850	13.80	24	44	16.43
21	27.5	56.0	4950	2100	59,850	13.80	24	44	16.43
22	27.5	56.0	4950	2100	59,850	13.80	24	44	16.43
23	26.5	54.0	4800	2025	55,500	13.80	24	44	16.43
24	26.5	54.0	4800	2025	55,500	13.80	24	44	16.43
25	26.5	54.0	4800	2025	55,500	13.80	24	44	16.43
26	26.5	54.0	4800	2025	55,500	13.80	24	44	16.43
27	25.5	52.0	4650	1950	51,675	13.80	24	44	16.43
28	25.5	52.0	4650	1950	51,675	13.80	24	44	16.43
29	25.5	52.0	4650	1950	51,675	13.80	24	44	16.43
30	25.5	52.0	4650	1950	51,675	13.80	24	44	16.43

TYPE TFU-27C UHF TELEVISION ANTENNA, MI-27766-M

Number of Sections: 20
Input VSWR: 1.1/1.0 or less
Circularity: Within ±1.0 db
Input Terminal: 6⅛" UHF RETMA flange, 75 ohms

Channel	Hc (Ft.)	H (Ft.)	Weight (lbs.)	R_1 (lbs.)	M (Ft. lbs.)	Gain db	Gain power	Power Rating kw	Power Rating dbk
31	27.5	56.0	4800	2100	59,850	14.31	27	40	16.02
32	27.5	56.0	4800	2100	59,850	14.31	27	40	16.02
33	26.5	54.0	4800	2025	55,500	14.31	27	40	16.02
34	26.5	54.0	4650	2025	55,500	14.31	27	40	16.02
35	26.5	54.0	4650	2025	55,500	14.31	27	40	16.02
36	26.5	54.0	4650	2025	55,500	14.31	27	40	16.02
37	25.5	52.0	4500	1950	51,675	14.31	27	40	16.02
38	25.5	52.0	4500	1950	51,675	14.31	27	40	16.02
39	25.5	52.0	4500	1950	51,675	14.31	27	40	16.02
40	25.5	52.0	4500	1950	51,675	14.31	27	40	16.02
41	24.5	50.0	4350	1875	47,810	14.31	27	40	16.02
42	24.5	50.0	4350	1875	47,810	14.31	27	40	16.02
43	24.5	50.0	4350	1875	47,810	14.31	27	40	16.02
44	24.5	50.0	4350	1875	47,810	14.31	27	40	16.02
45	23.5	48.0	4200	1800	44,100	14.31	27	40	16.02
46	23.5	48.0	4200	1800	44,100	14.31	27	40	16.02
47	23.5	48.0	4200	1800	44,100	14.31	27	40	16.02
48	23.5	48.0	4200	1800	44,100	14.31	27	40	16.02
49	23.5	48.0	4200	1800	44,100	14.31	27	40	16.02
50	23.5	48.0	4200	1800	44,100	14.31	27	40	16.02
51	22.5	46.0	4050	1725	40,550	14.31	27	40	16.02
52	22.5	46.0	4050	1725	40,550	14.31	27	40	16.02
53	22.5	46.0	4050	1725	40,550	14.31	27	40	16.02
54	22.5	46.0	4050	1725	40,550	14.31	27	40	16.02
55	22.5	46.0	4050	1725	40,550	14.31	27	40	16.02

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TYPE TFU-30C UHF TELEVISION ANTENNA, MI-27766-H

Number of Sections: 24
Input VSWR: 1.1/1.0 or less
Circularity: Within ±1.0 db
Input Terminal: 6⅛" UHF RETMA flange, 75 ohms

Channel	Hc (Ft.)	H (Ft.)	Weight (lbs.)	R_1 (lbs.)	M (Ft. lbs.)	Gain		Power Rating	
						db	power	kw	dbk
56	25.5	52.0	4350	1950	57,675	14.77	30	35	15.44
57	25.5	52.0	4350	1950	57,675	14.77	30	35	15.44
58	25.5	52.0	4350	1950	57,675	14.77	30	35	15.44
59	25.5	52.0	4350	1950	57,675	14.77	30	35	15.44
60	25.5	52.0	4350	1950	57,675	14.77	30	35	15.44
61	25.5	52.0	4350	1950	57,675	14.77	30	35	15.44
62	24.5	50.0	4200	1875	47,810	14.77	30	35	15.44
63	24.5	50.0	4200	1875	47,810	14.77	30	35	15.44
64	24.5	50.0	4200	1875	47,810	14.77	30	35	15.44
65	24.5	50.0	4200	1875	47,810	14.77	30	35	15.44
66	24.5	50.0	4200	1875	47,810	14.77	30	35	15.44
67	23.5	48.0	4050	1800	44,100	14.77	30	35	15.44
68	23.5	48.0	4050	1800	44,100	14.77	30	35	15.44
69	23.5	48.0	4050	1800	44,100	14.77	30	35	15.44
70	23.5	48.0	4050	1800	44,100	14.77	30	35	15.44
71	23.5	48.0	4050	1800	44,100	14.77	30	35	15.44
72	23.5	48.0	4050	1800	44,100	14.77	30	35	15.44
73	22.5	46.0	3900	1725	40,550	14.77	30	35	15.44
74	22.5	46.0	3900	1725	40,550	14.77	30	35	15.44
75	22.5	46.0	3900	1725	40,550	14.77	30	35	15.44
76	22.5	46.0	3900	1725	40,550	14.77	30	35	15.44
77	22.5	46.0	3900	1725	40,550	14.77	30	35	15.44
78	22.5	46.0	3900	1725	40,550	14.77	30	35	15.44
79	22.5	46.0	3900	1725	40,550	14.77	30	35	15.44
80	22.5	46.0	3900	1725	40,550	14.77	30	35	15.44
81	22.5	46.0	3900	1725	40,550	14.77	30	35	15.44
82	22.5	46.0	3900	1725	40,550	14.77	30	35	15.44
83	22.5	46.0	3900	1725	40,550	14.77	30	35	15.44

TYPE TFU-46AL UHF TELEVISION ANTENNA, MI-27373-*

Number of Sections: 38
Input VSWR: 1.2/1.0 or less
Circularity: Within ±1.0 db
Input Terminal: 6⅛" UHF RETMA flange, 75 ohms

Channel	Hc (Ft.)	H (Ft.)	Weight (lbs.)	R_1 (lbs.)	M (Ft. lbs.)	Safe Wind Load (PSF)	Gain		Power Rating	
							db	power	kw	dbk
14	60.7	121.9	22,000	3620	218,300	35	16.62	46	60	17.78
15	59.8	120.3	21,850	3570	212,400	35	16.62	46	60	17.78
16	59.4	118.8	21,600	3530	207,600	35	16.62	46	60	17.78
17	58.4	117.4	21,350	3490	193,200	40	16.62	46	60	17.78
18	57.8	116.2	21,150	3450	198,700	40	16.62	46	60	17.78
19	57.0	114.7	20,900	3410	194,000	40	16.62	46	60	17.78
20	56.3	113.3	20,650	3370	189,400	40	16.62	46	60	17.78
21	55.7	112.1	20,450	3330	185,500	45	16.62	46	60	17.78
22	55.0	110.8	20,200	3290	181,000	45	16.62	46	60	17.78
23	54.5	109.6	20,000	3260	177,700	45	16.62	46	60	17.78
24	53.8	108.2	19,800	3220	173,300	45	16.62	46	60	17.78
25	53.2	107.1	19,600	3180	169,500	50	16.62	46	60	17.78
26	52.7	106.0	19,400	3150	166,400	50	16.62	46	60	17.78
27	52.2	104.9	19,250	3120	163,200	50	16.62	46	60	17.78
28	51.6	103.8	19,050	3090	160,100	50	16.62	46	60	17.78
29	51.0	102.6	18,850	3050	156,200	55	16.62	46	60	17.78
30	50.5	101.6	18,700	3020	153,100	55	16.62	46	60	17.78

* MI number must include customer's assigned channel.

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TYPE TFU-52AM UHF TELEVISION ANTENNA, MI-27373-*

Number of Sections: 44
Input VSWR: 1.2/1.0 or less
Circularity: Within ±1.0 db
Input Terminal: 6⅛" UHF RETMA flange, 75 ohms

Channel	Hc (Ft.)	H (Ft.)	Weight (lbs.)	R_1 (lbs.)	M (Ft. lbs.)	Safe Wind Load (PSF)	Gain db	Gain power	Power Rating kw	Power Rating dbk
31	57.8	116.0	20,600	3445	198,100	40	17.16	52	55	17.40
32	57.3	114.9	20,400	3410	194,400	40	17.16	52	55	17.40
33	56.7	113.8	20,200	3380	191,100	40	17.16	52	55	17.40
34	56.2	112.7	20,050	3350	187,600	40	17.16	52	55	17.40
35	55.6	111.6	19,850	3315	183,700	40	17.16	52	55	17.40
36	55.1	110.5	19,650	3285	180,300	45	17.16	52	55	17.40
37	54.6	109.5	19,500	3255	177,100	45	17.16	52	55	17.40
38	54.1	108.5	19,350	3225	174,200	45	17.16	52	55	17.40
39	53.6	107.5	19,200	3195	170,900	45	17.16	52	55	17.40
40	53.1	106.5	19,050	3170	168,000	50	17.16	52	55	17.40
41	52.7	105.5	18,900	3140	165,200	50	17.16	52	55	17.40
42	52.1	104.5	18,700	3110	162,000	50	17.16	52	55	17.40
43	51.7	103.6	18,550	3080	159,200	50	17.16	52	55	17.40
44	51.2	102.7	18,400	3055	156,700	55	17.16	52	55	17.40
45	50.7	101.8	18,250	3030	153,900	55	17.16	52	55	17.40
46	50.3	100.9	18,100	3005	151,500	55	17.16	52	55	17.40
47	48.8	100.0	17,950	2975	148,800	55	17.16	52	55	17.40
48	49.4	99.1	17,850	2950	146,300	55	17.16	52	55	17.40
49	49.0	98.2	17,700	2930	144,200	60	17.16	52	55	17.40
50	48.6	97.3	17,550	2905	142,000	60	17.16	52	55	17.40
51	48.0	96.4	17,400	2875	138,900	60	17.16	52	55	17.40
52	47.6	95.6	17,250	2845	136,300	60	17.16	52	55	17.40
53	47.2	94.8	17,100	2825	134,200	60	17.16	52	55	17.40
54	46.9	94.1	17,000	2805	132,400	60	17.16	52	55	17.40
55	46.5	93.4	16,900	2785	130,600	65	17.16	52	55	17.40

TYPE TFU-60AH UHF TELEVISION ANTENNA, MI-27373-*

Number of Sections: 54
Input VSWR: 1.2/1.0 or less
Circularity: Within ±1.0 db
Input Terminal: 6⅛" UHF RETMA flange, 75 ohms

Channel	Hc (Ft.)	H (Ft.)	Weight (lbs.)	R_1 (lbs.)	M (Ft. lbs.)	Safe Wind Load (PSF)	Gain db	Gain power	Power Rating kw	Power Rating dbk
56	56.2	112.9	19,560	3360	189,900	40	17.78	60	50	16.99
57	55.7	112.0	19,420	3330	186,500	40	17.78	60	50	16.99
58	55.3	111.1	19,280	3300	183,500	45	17.78	60	50	16.99
59	54.8	110.2	19,140	3275	180,450	45	17.78	60	50	16.99
60	54.4	109.4	19,000	3250	177,800	45	17.78	60	50	16.99
61	54.0	108.6	18,875	3225	175,200	45	17.78	60	50	16.99
62	53.6	107.8	18,750	3200	172,500	45	17.78	60	50	16.99
63	53.2	107.0	18,625	3175	169,900	45	17.78	60	50	16.99
64	52.7	106.1	18,500	3150	167,300	50	17.78	60	50	16.99
65	52.3	105.3	18,375	3130	165,000	50	17.78	60	50	16.99
66	51.9	104.5	18,250	3110	162,700	50	17.78	60	50	16.99
67	51.5	103.7	18,125	3090	160,400	50	17.78	60	50	16.99
68	51.1	102.9	18,000	3065	157,800	50	17.78	60	50	16.99
69	50.7	102.1	17,875	3045	155,600	55	17.78	60	50	16.99
70	50.3	101.4	17,750	3020	153,100	55	17.78	60	50	16.99
71	49.9	100.7	17,625	3000	159,900	55	17.78	60	50	16.99
72	49.5	100.0	17,500	2975	148,500	55	17.78	60	50	16.99
73	49.1	99.3	17,390	2955	146,600	55	17.78	60	50	16.99
74	48.8	98.6	17,280	2935	144,600	55	17.78	60	50	16.99
75	48.5	97.9	17,170	2915	143,000	60	17.78	60	50	16.99
76	48.2	97.2	17,060	2895	142,000	60	17.78	60	50	16.99
77	47.9	96.5	16,960	2875	139,200	60	17.78	60	50	16.99
78	47.5	95.8	16,860	2855	137,000	60	17.78	60	50	16.99
79	47.2	95.2	16,760	2835	135,200	60	17.78	60	50	16.99
80	46.9	94.6	16,660	2815	133,400	65	17.78	60	50	16.99
81	46.6	94.0	16,560	2800	131,900	65	17.78	60	50	16.99
82	46.3	93.4	16,460	2780	130,100	65	17.78	60	50	16.99
83	46.0	92.8	16,360	2760	128,400	65	17.78	60	50	16.99

* MI number must include customer's assigned channel.

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TYPE TFU-6A TELEVISION ANTENNA, MI-27918-*

Number of Sections: 6
Circularity: Channels 14-25 incl. within ±2 db
Channels 26-53 incl. within ±3 db

Channel	Hc (Ft.)	H (Ft.)	Gain*		Power Rating	
			db	Power	kw	dbk
14	6.85	13.70	7.78	6.0	1.0	0
15	6.75	13.50	7.78	6.0	1.0	0
16	6.70	13.40	7.78	6.0	1.0	0
17	6.60	13.20	7.78	6.0	1.0	0
18	6.55	13.10	7.78	6.0	1.0	0
19	6.45	12.90	7.78	6.0	1.0	0
20	6.40	12.80	7.78	6.0	1.0	0
21	6.30	12.60	7.78	6.0	1.0	0
22	6.25	12.50	7.78	6.0	1.0	0
23	6.15	12.30	7.78	6.0	1.0	0
24	6.10	12.20	7.78	6.0	1.0	0
25	6.05	12.10	7.78	6.0	1.0	0
26	5.95	11.90	7.78	6.0	1.0	0
27	5.90	11.80	7.78	6.0	1.0	0
28	5.85	11.70	7.78	6.0	1.0	0
29	5.80	11.60	7.78	6.0	1.0	0
30	5.70	11.40	7.78	6.0	1.0	0
31	5.65	11.30	7.78	6.0	1.0	0
32	5.60	11.20	7.78	6.0	1.0	0
33	5.55	11.10	7.78	6.0	1.0	0
34	5.50	11.00	7.78	6.0	1.0	0
35	5.45	10.90	7.78	6.0	1.0	0
36	5.40	10.80	7.78	6.0	1.0	0
37	5.35	10.70	7.78	6.0	1.0	0
38	5.30	10.60	7.78	6.0	1.0	0
39	5.25	10.50	7.78	6.0	1.0	0
40	5.20	10.40	7.78	6.0	1.0	0
41	5.15	10.30	7.78	6.0	1.0	0
42	5.10	10.20	7.78	6.0	1.0	0
43	5.05	10.10	7.78	6.0	1.0	0
44	5.00	10.00	7.78	6.0	1.0	0
45	4.95	9.90	7.78	6.0	1.0	0
46	4.90	9.80	7.78	6.0	1.0	0
47	4.85	9.70	7.78	6.0	1.0	0
48	4.85	9.70	7.78	6.0	1.0	0
49	4.80	9.60	7.78	6.0	1.0	0
50	4.75	9.50	7.78	6.0	1.0	0
51	4.70	9.40	7.78	6.0	1.0	0
52	4.65	9.30	7.78	6.0	1.0	0
53	4.60	9.20	7.78	6.0	1.0	0
54	4.55	9.10	7.78	6.0	1.0	0
55	4.55	9.10	7.78	6.0	1.0	0
56	4.50	9.00	7.78	6.0	1.0	0
57	4.45	8.90	7.78	6.0	1.0	0
58	4.45	8.90	7.78	6.0	1.0	0
59	4.40	8.80	7.78	6.0	1.0	0
60	4.35	8.70	7.78	6.0	1.0	0
61	4.35	8.70	7.78	6.0	1.0	0
62	4.30	8.60	7.78	6.0	1.0	0
63	4.25	8.50	7.78	6.0	1.0	0
64	4.25	8.50	7.78	6.0	1.0	0
65	4.20	8.40	7.78	6.0	1.0	0
66	4.15	8.30	7.78	6.0	1.0	0
67	4.15	8.30	7.78	6.0	1.0	0
68	4.10	8.20	7.78	6.0	1.0	0
69	4.05	8.10	7.78	6.0	1.0	0
70	4.05	8.10	7.78	6.0	1.0	0
71	4.00	8.00	7.78	6.0	1.0	0
72	4.00	8.00	7.78	6.0	1.0	0
73	3.95	7.90	7.78	6.0	1.0	0
74	3.95	7.90	7.78	6.0	1.0	0
75	3.90	7.80	7.78	6.0	1.0	0
76	3.90	7.80	7.78	6.0	1.0	0
77	3.85	7.70	7.78	6.0	1.0	0
78	3.85	7.70	7.78	6.0	1.0	0
79	3.80	7.60	7.78	6.0	1.0	0
80	3.80	7.60	7.78	6.0	1.0	0
81	3.75	7.50	7.78	6.0	1.0	0
82	3.75	7.50	7.78	6.0	1.0	0
83	3.70	7.40	7.78	6.0	1.0	0

Note 1. No beam tilt is provided in the type TFU-6A due to broad vertical beam shape for this gain.
Note 2. For Channels 54-83 inclusive the circularity is greater than ±3 db, and is considered directional in this channel group.
Note 3. H is overall height of antenna above top of tower. No provision is made for mounting obstruction lighting on the antenna. Hc is height of radiation center above top of tower.
* MI number must include customer's assigned channel.

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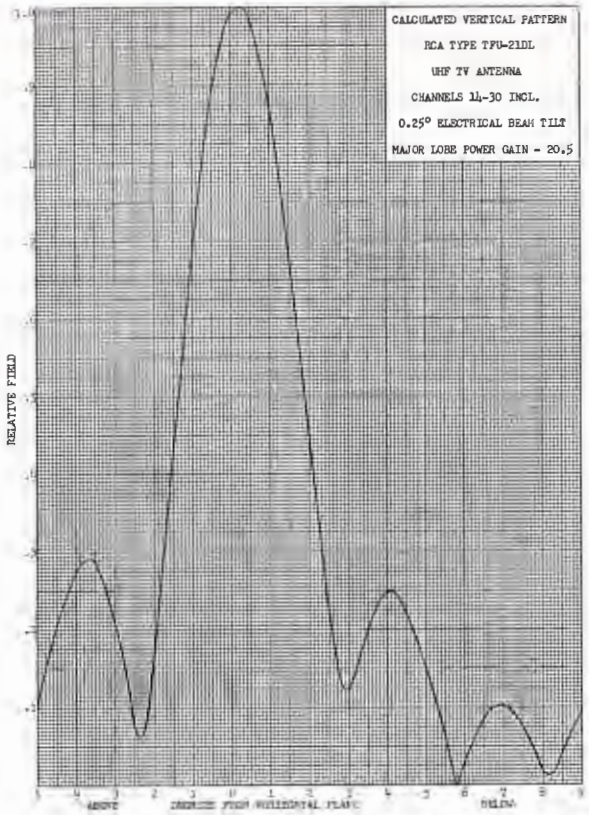

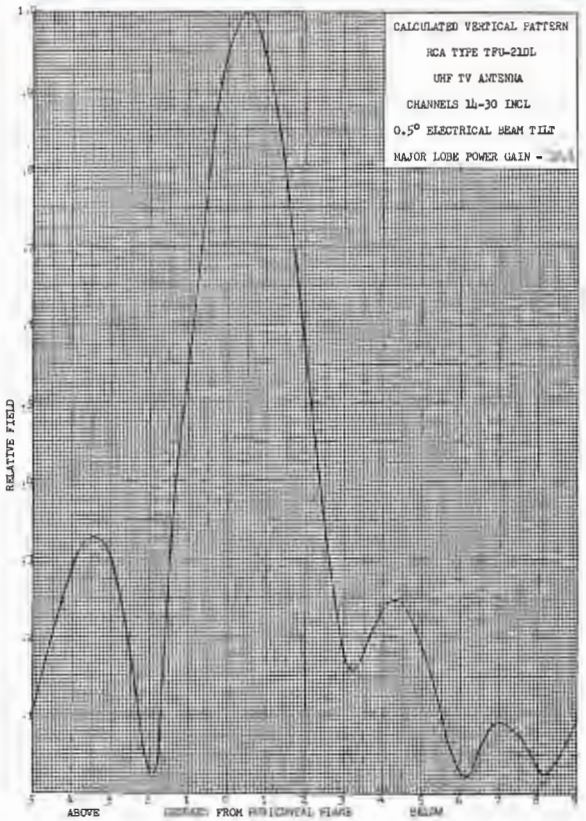

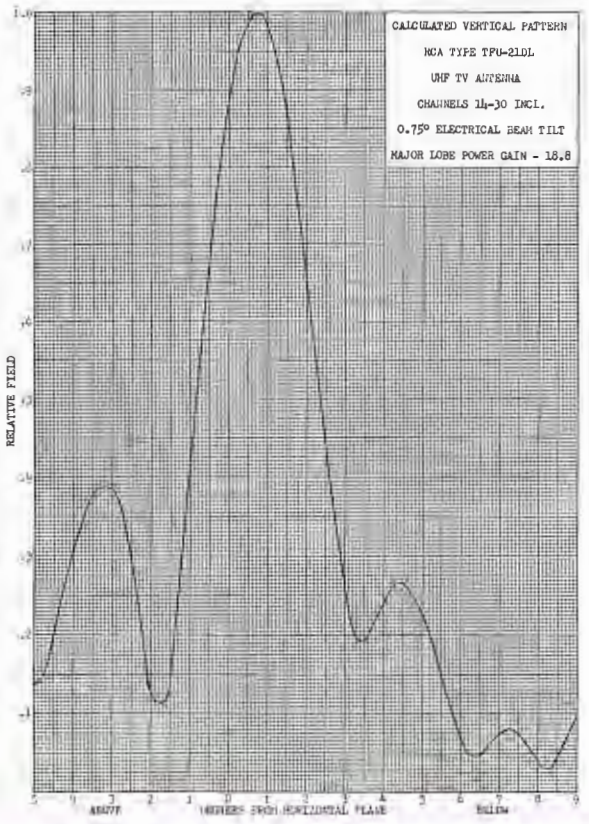

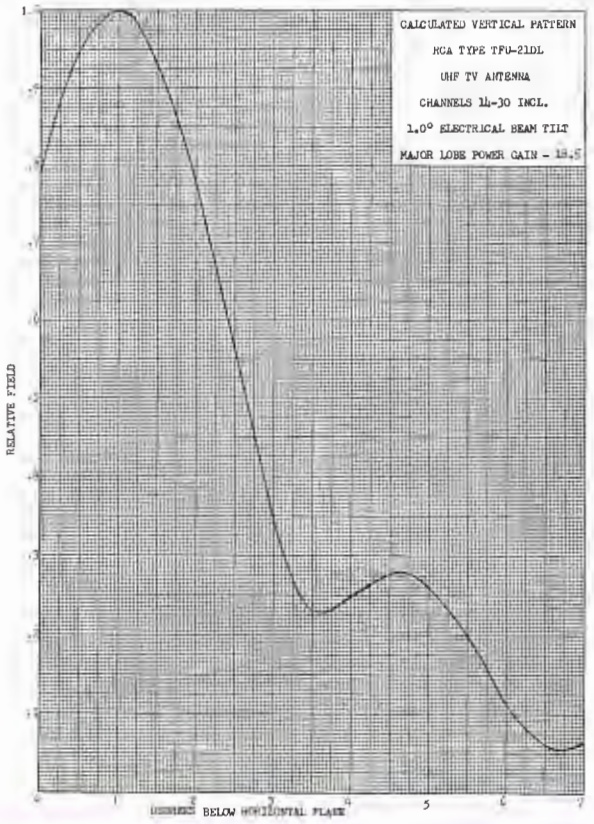

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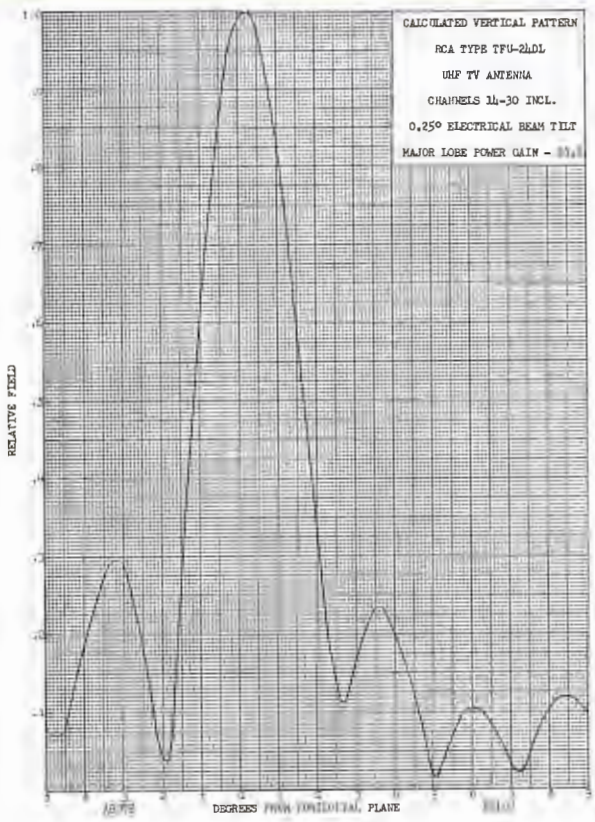

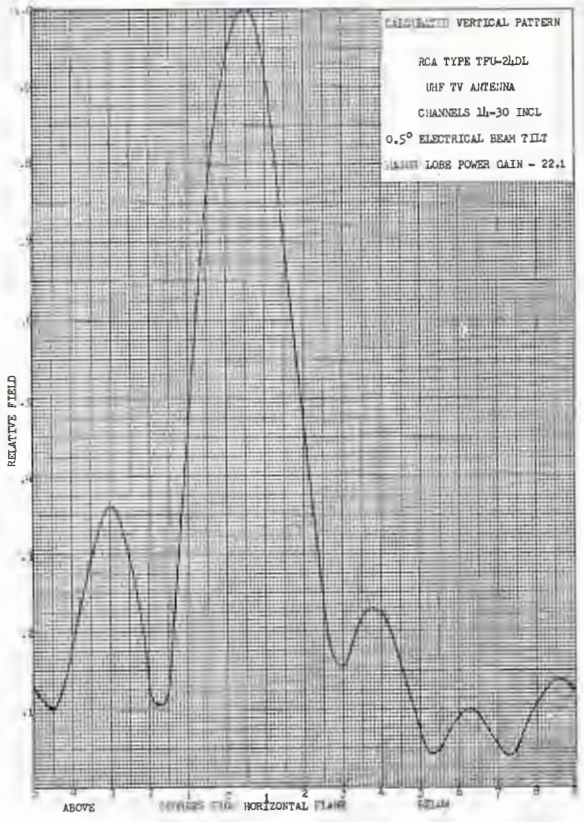

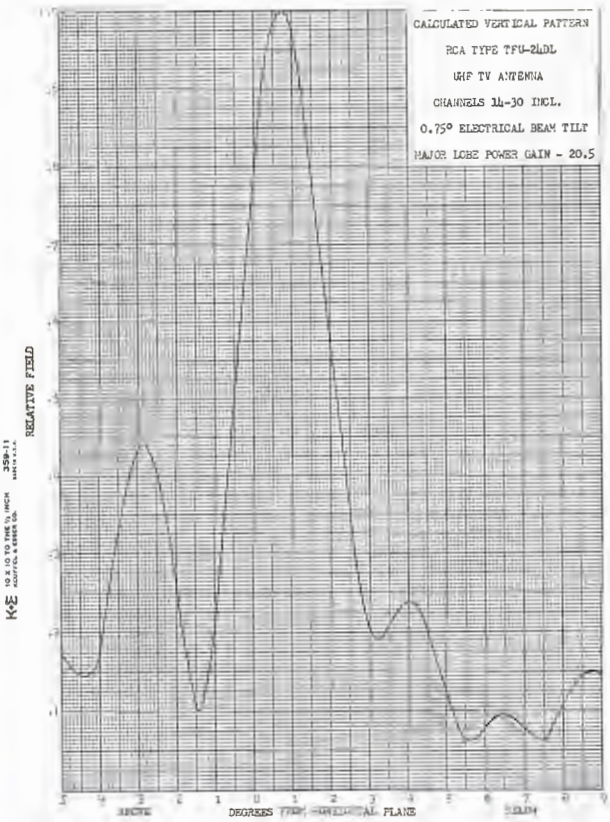

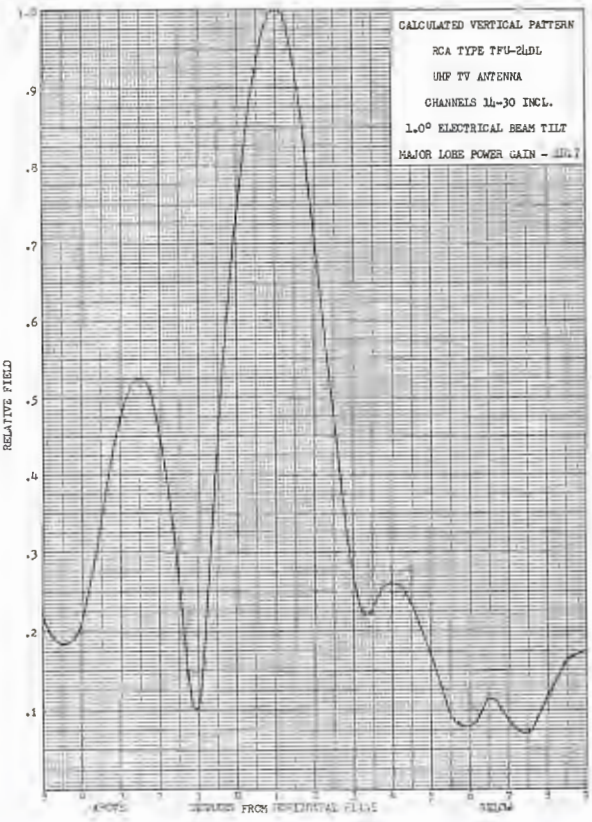

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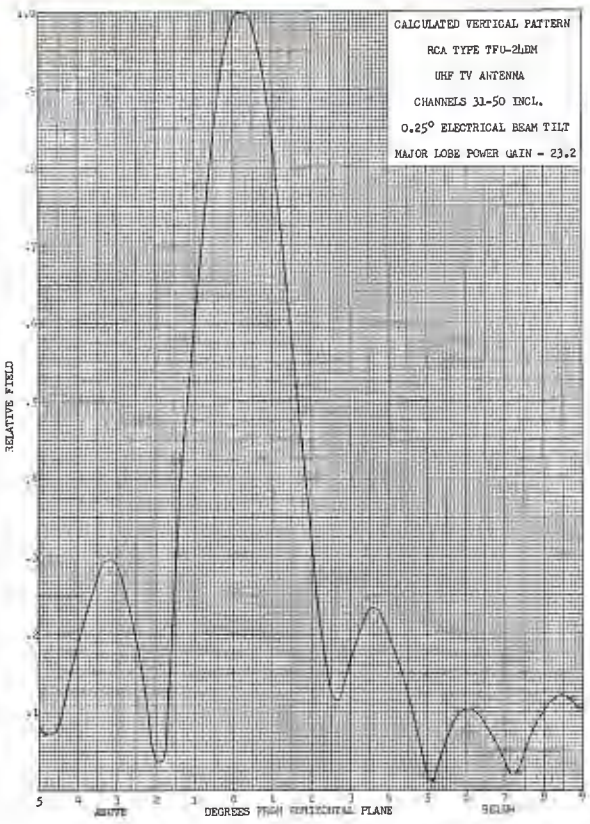

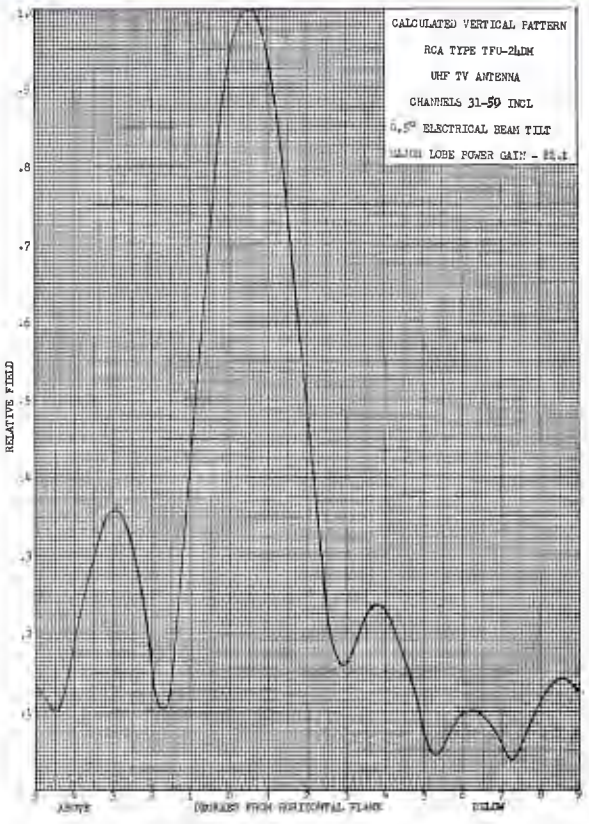

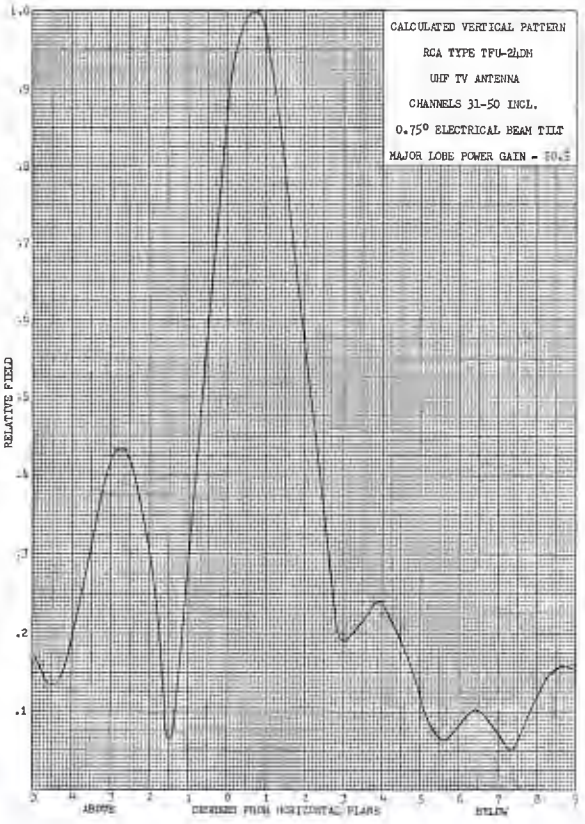

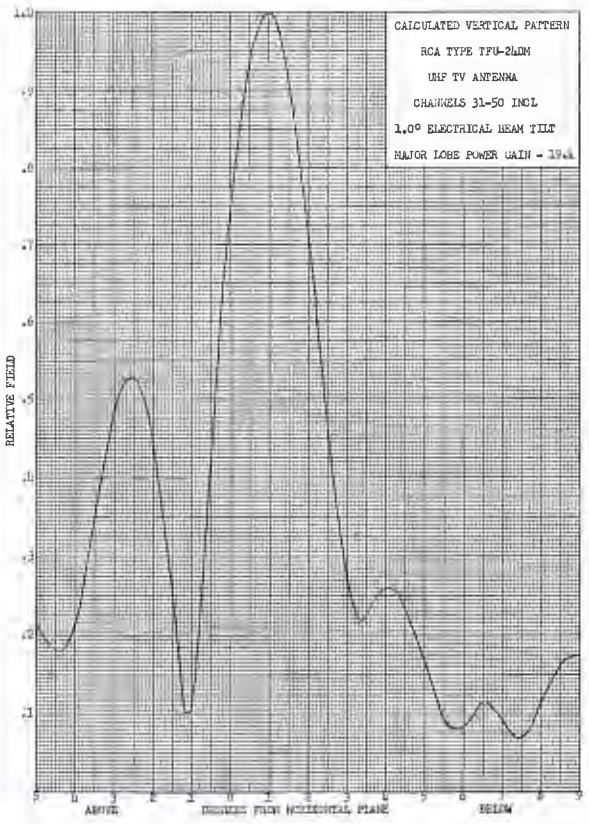

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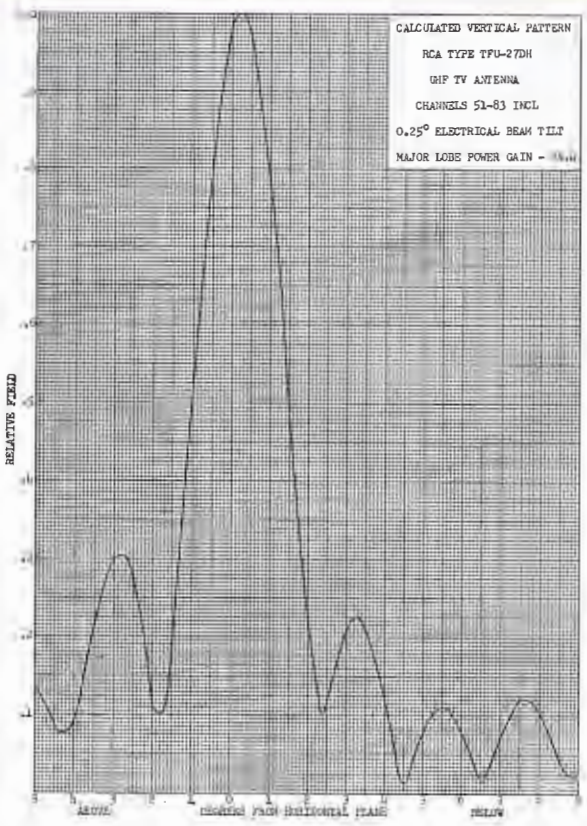

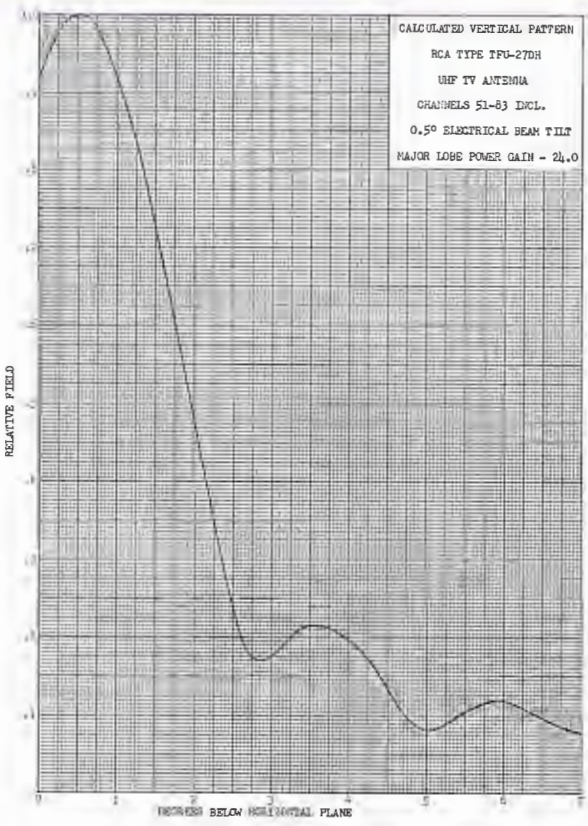

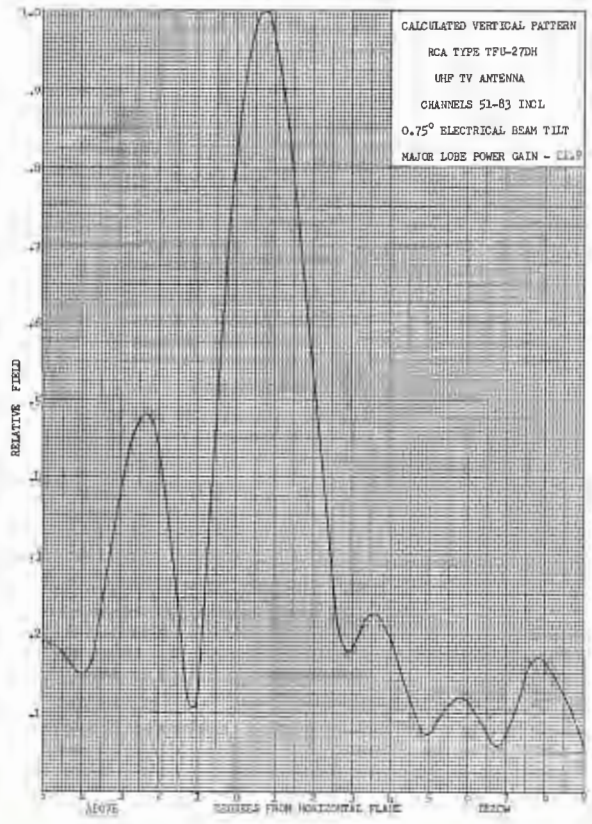

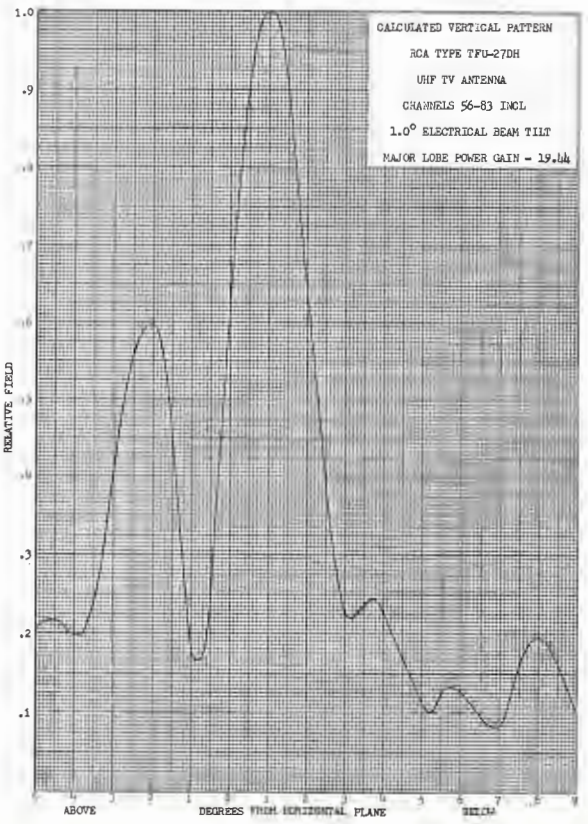

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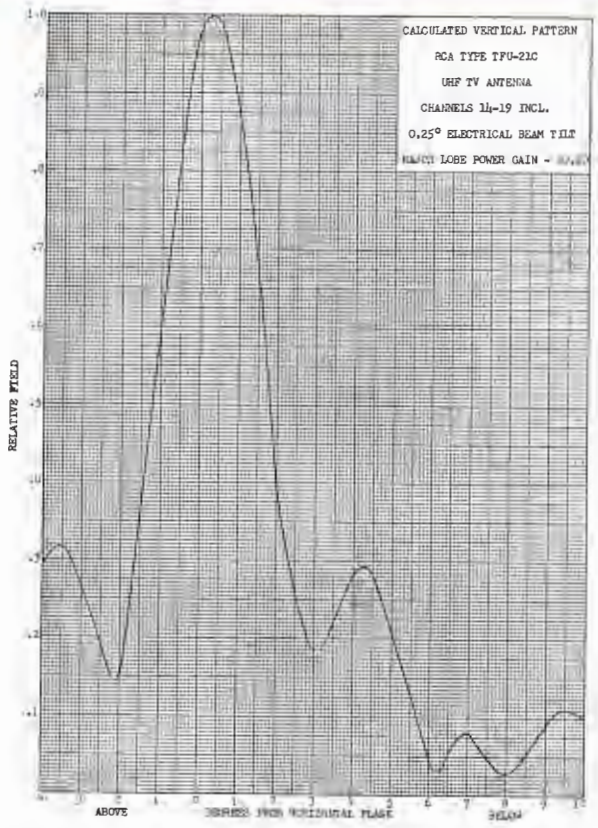

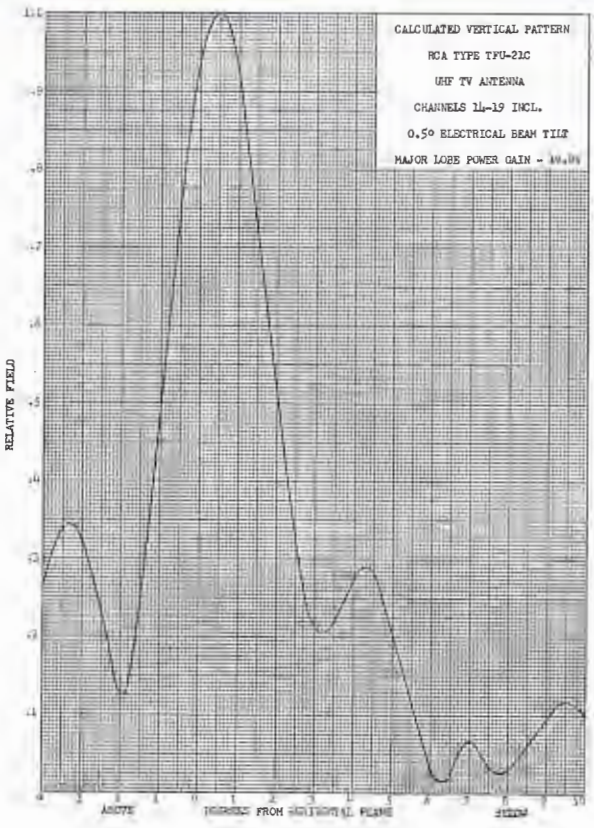

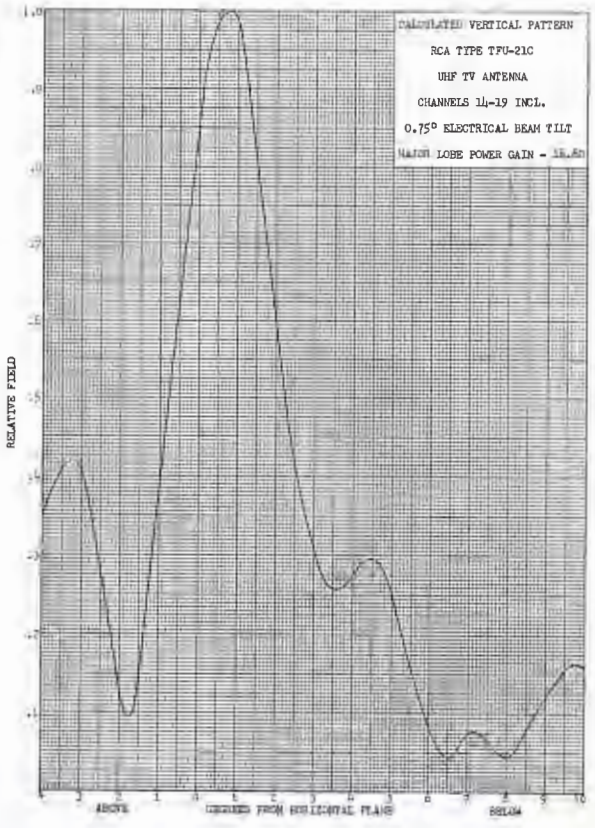

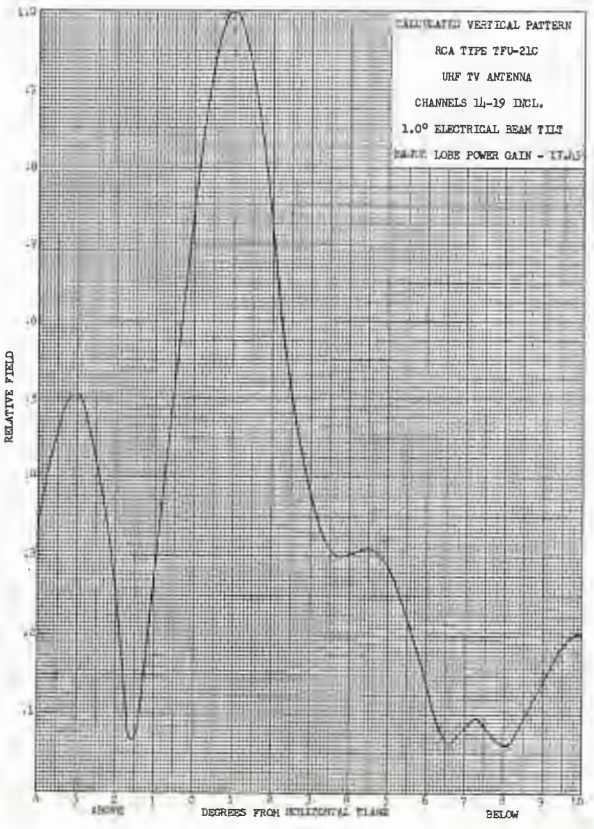

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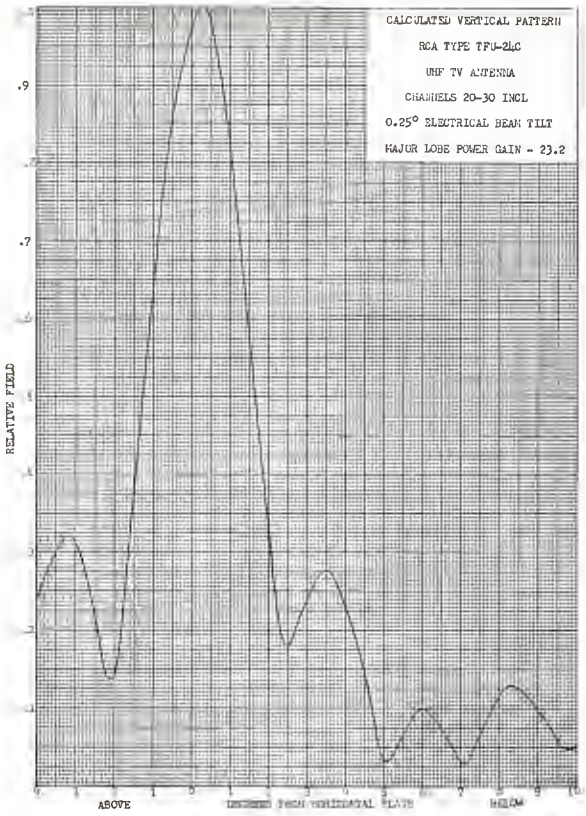

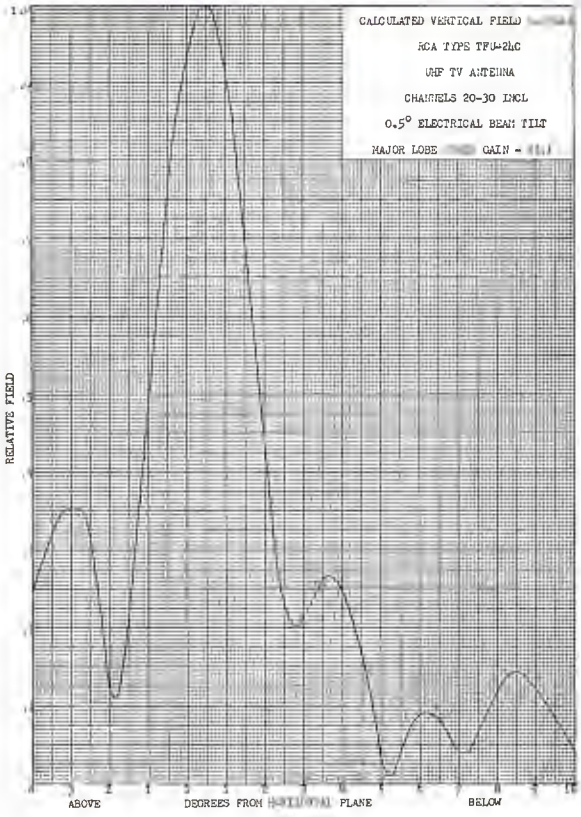

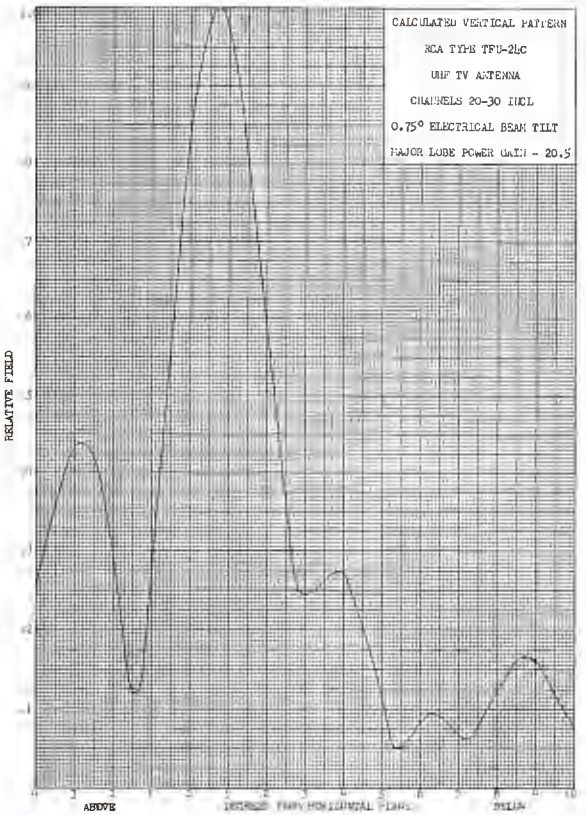

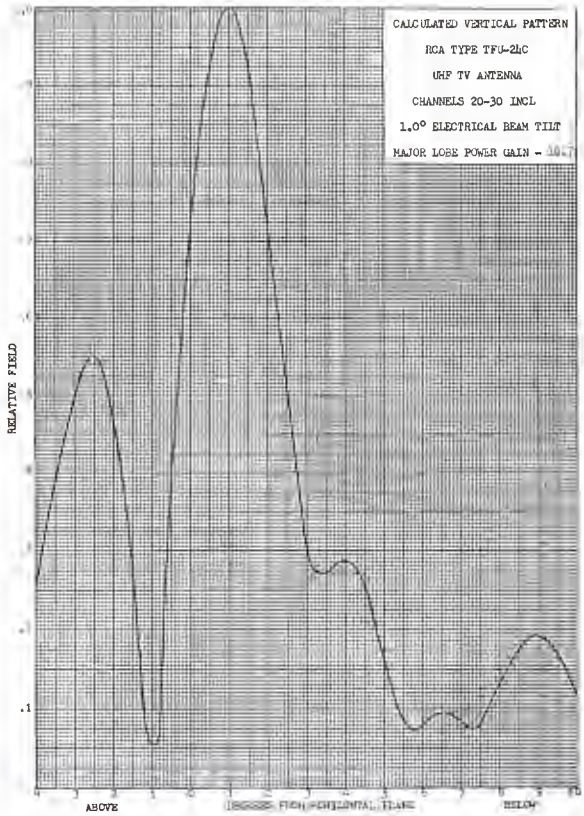

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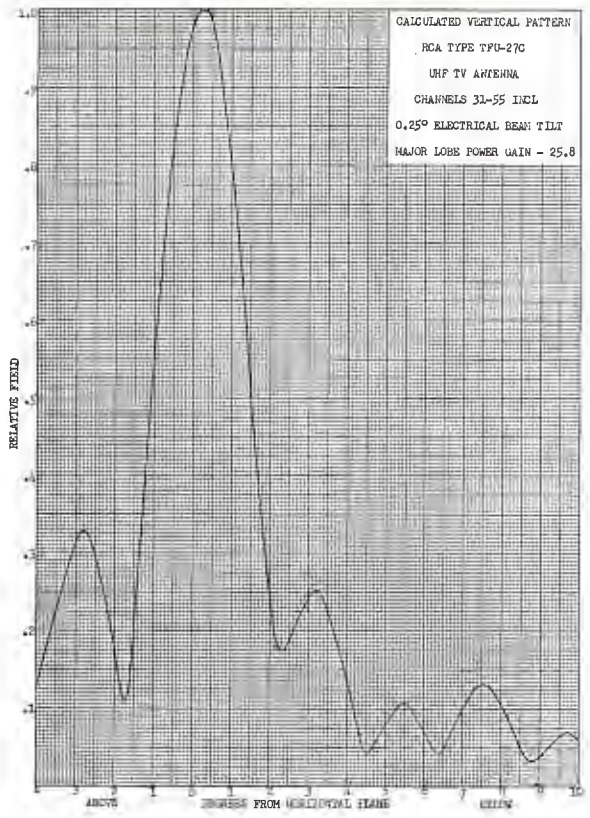

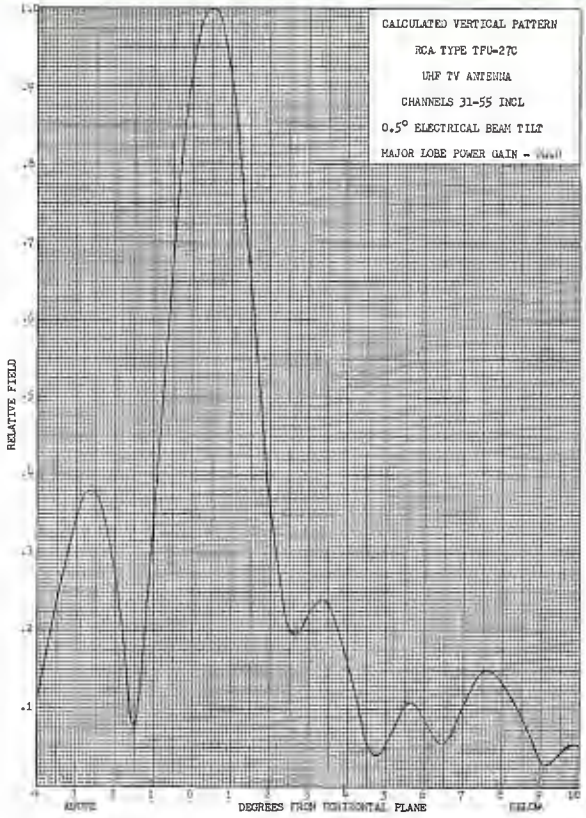

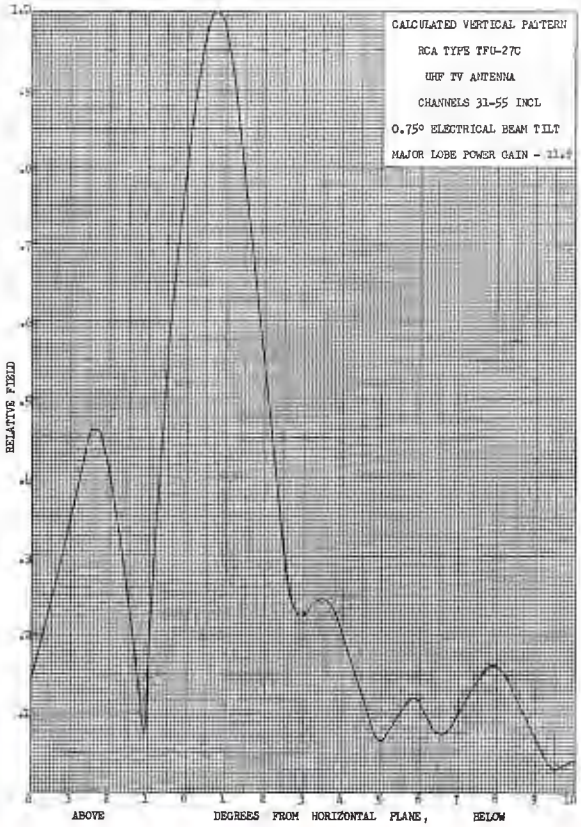

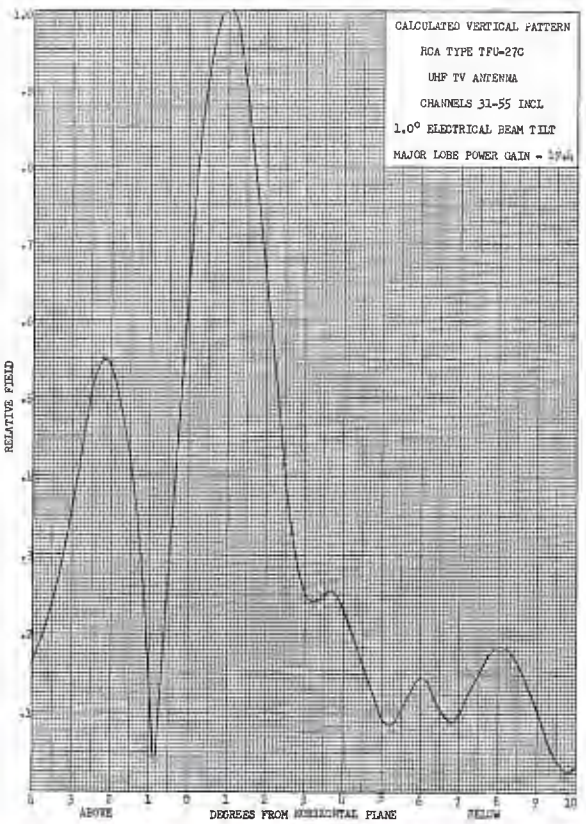

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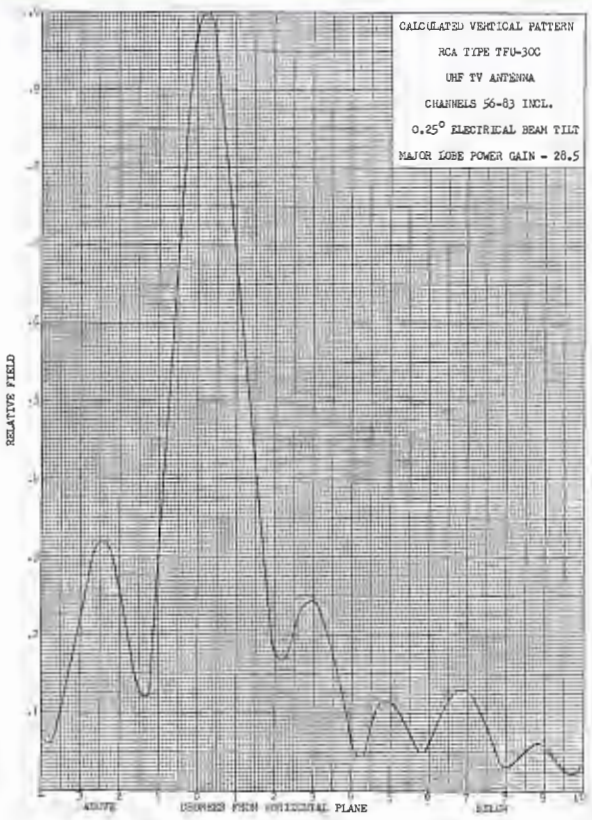

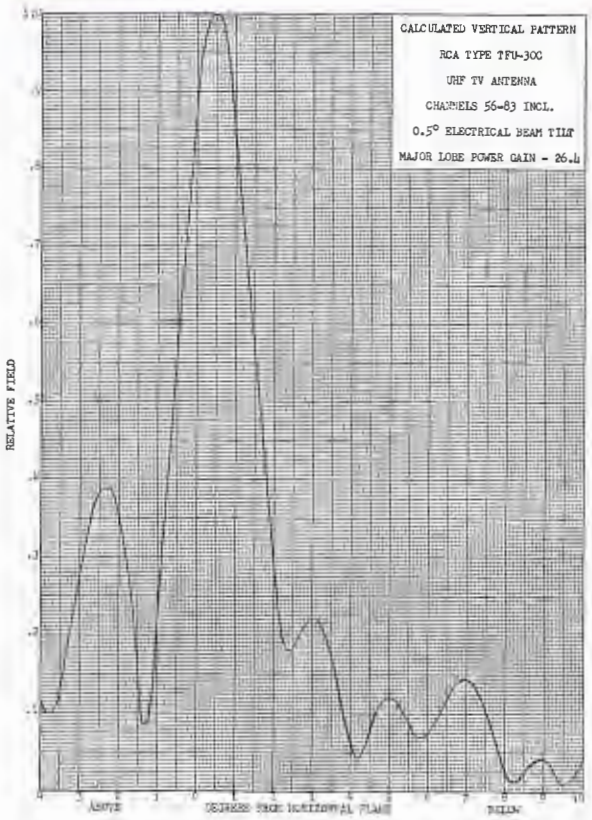

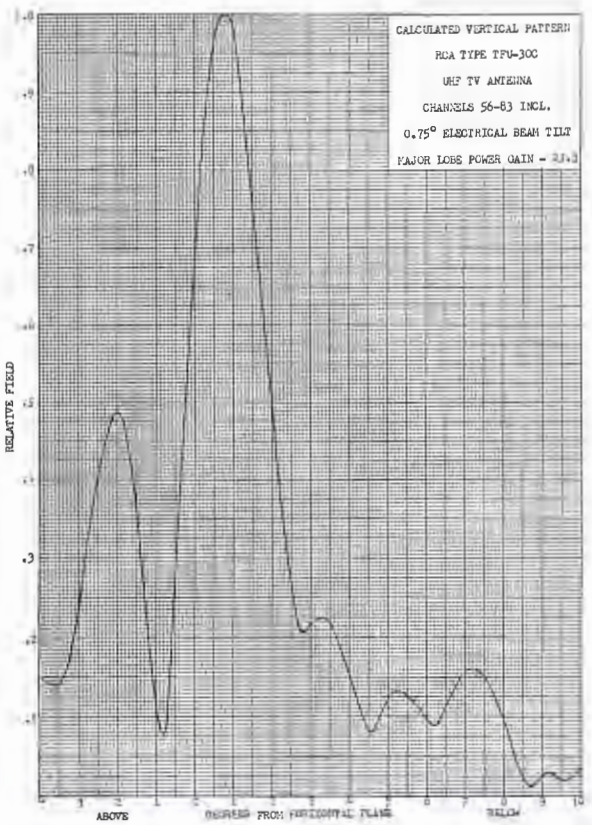

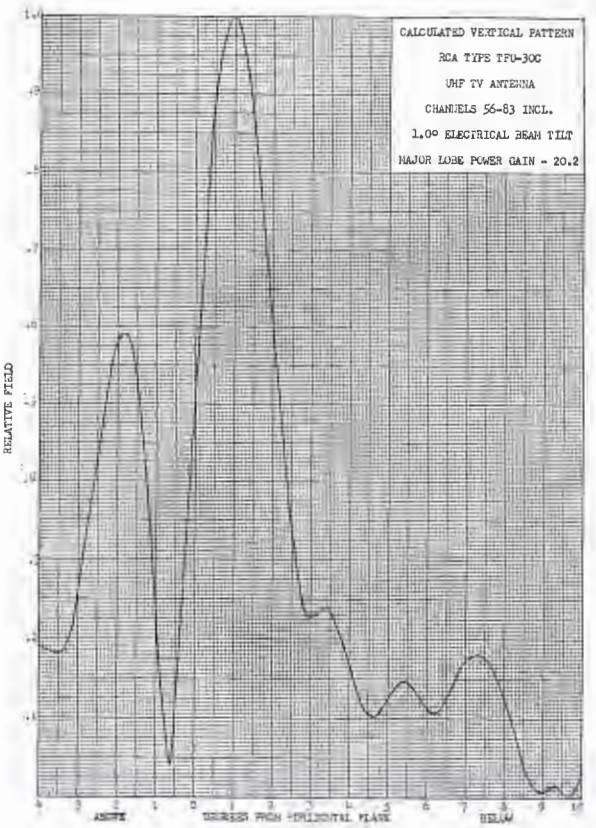

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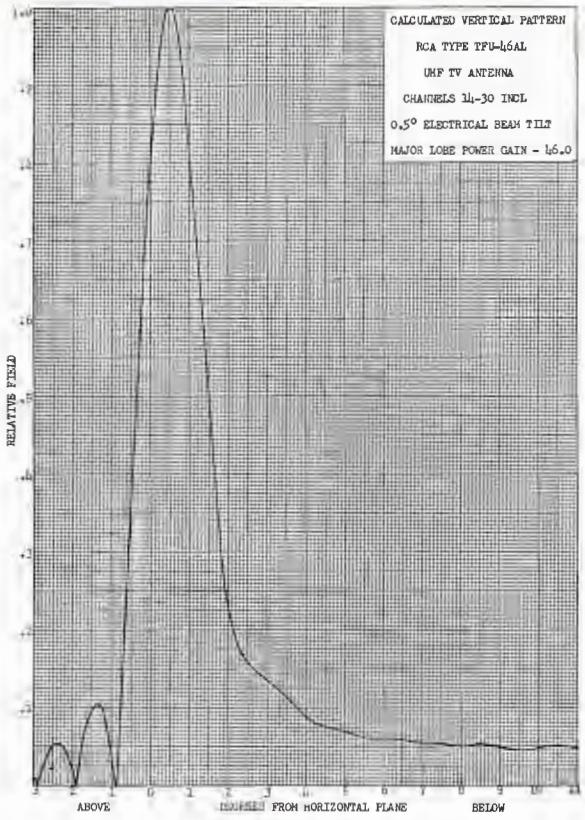

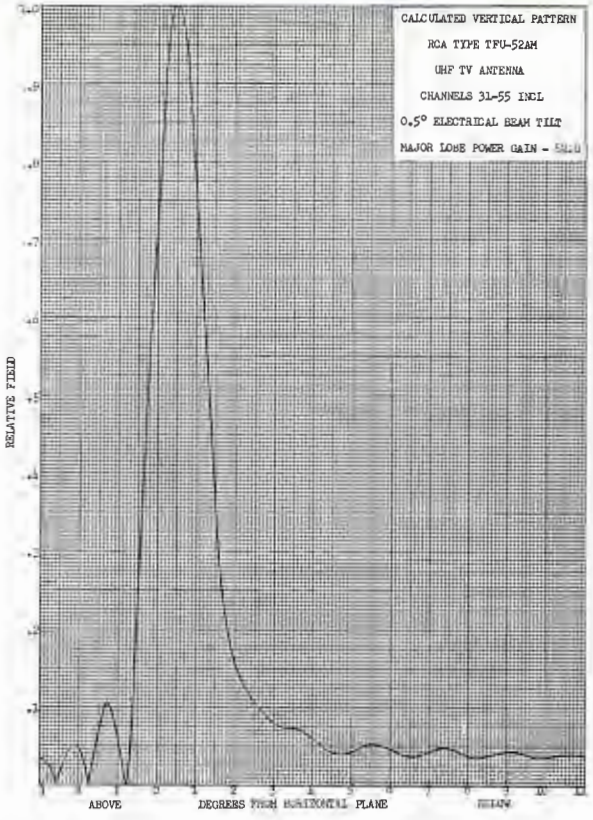

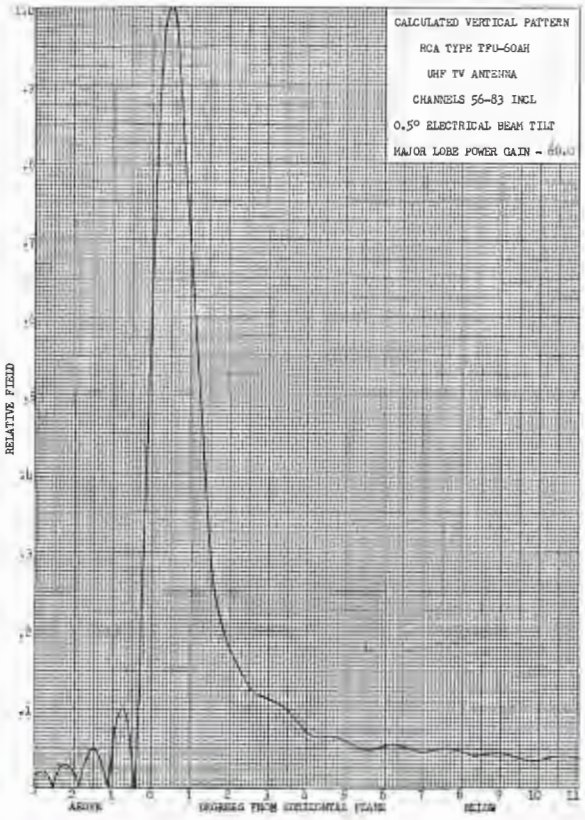

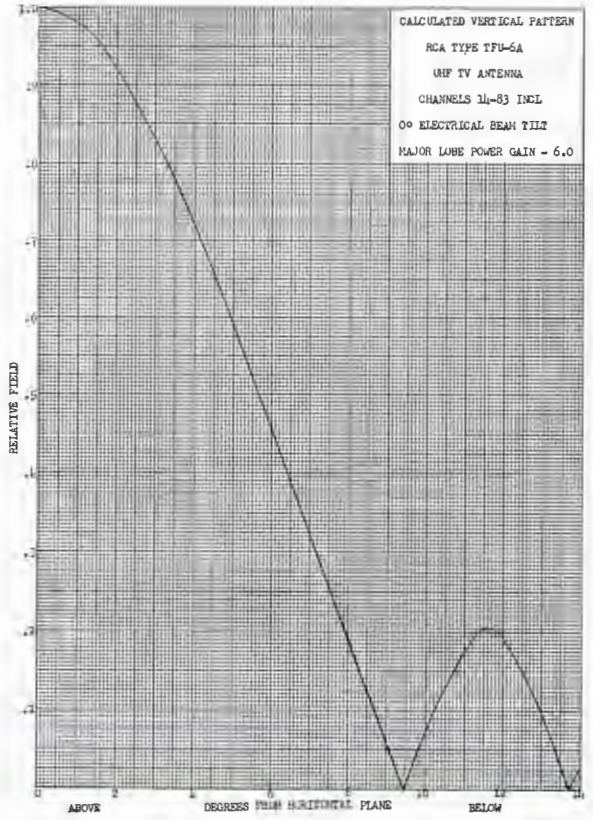

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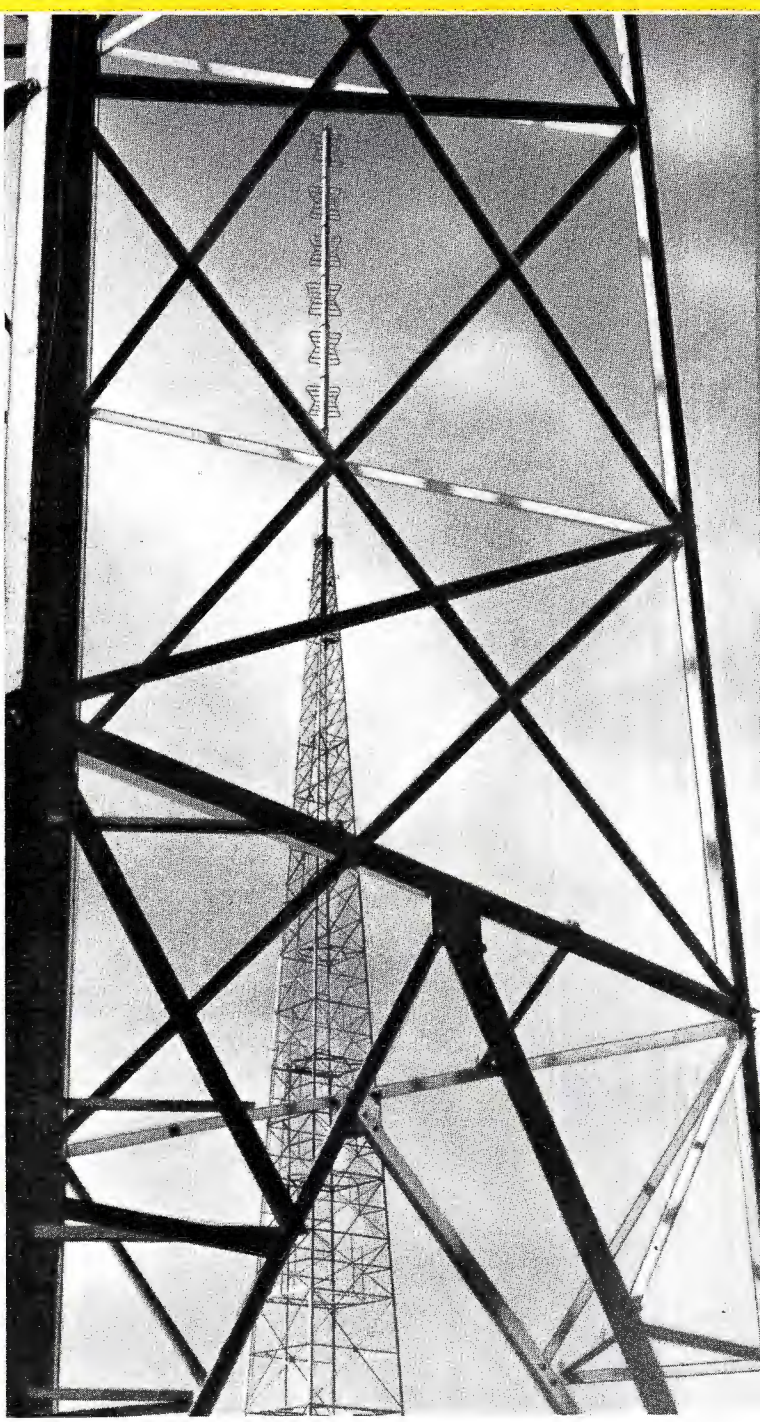
TELEVISION ANTENNA TOWERS

FEATURES

- Designs by the most experienced tower engineers
- One contract service—complete tower planning, design, fabrication, installation and inspection under one contract, one responsibility
- Variety of types and heights to fit site, particular antenna, accessory and load requirements
- Wide selection of standard types for economy, quick delivery
- Custom designed structures to meet special or unusual requirements
- Complete package of tower accessories



USES

A wide selection of towers to support the various type RCA UHF and VHF Television Antennas is available for all applications—these include standard self-supporting and guyed designs as well as custom towers. In general, self-supporting towers are used where space for the tower base is limited—on small city lots, building tops, mountain peaks, etc. Guyed towers are generally preferred where the land area for the installation is relatively unrestricted, since they are less expensive and easier to erect than self-supporting towers.

RCA can also furnish custom-built towers. Custom shared towers for multiple antenna applications are becoming popular, and it is good engineering from the standpoint that all receiving antennas will automatically be oriented in the right direction for all channels. The sharing of operational expenses will normally offset the expense of such a structure.

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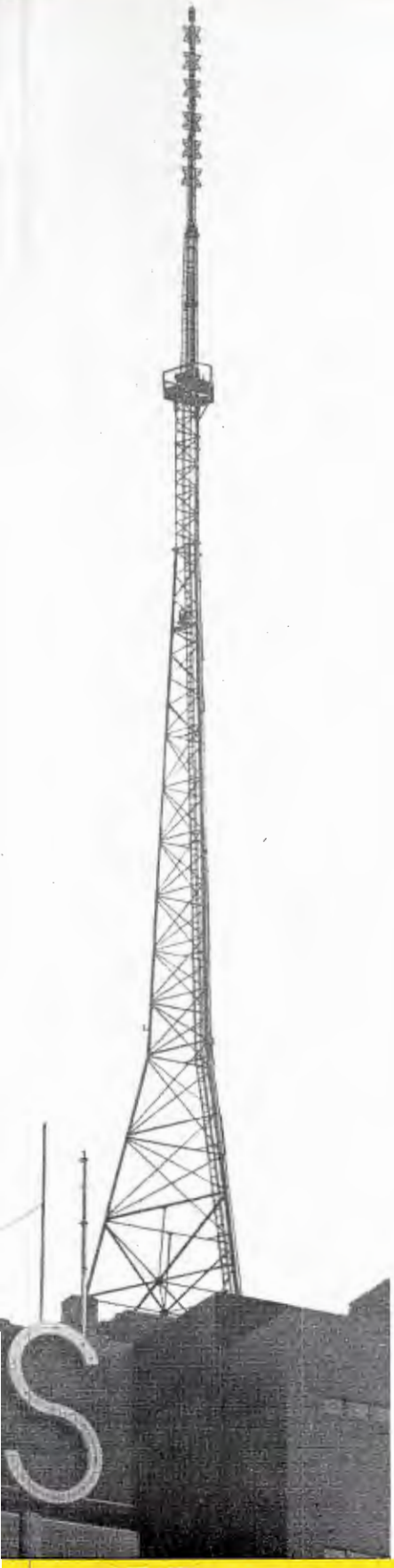
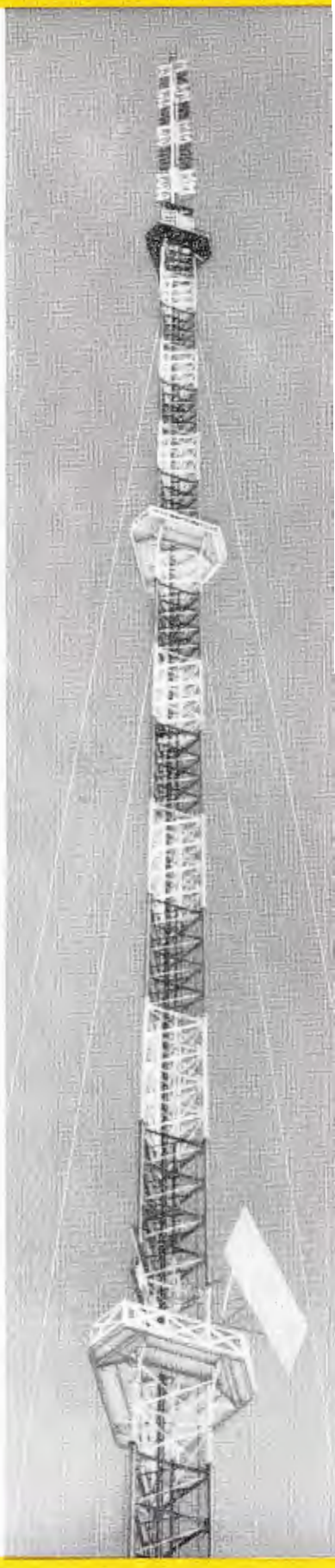


TOWERS FOR EVERY APPLICATION

◀ Self Supporting. • Guyed. ▶

EXCEPTIONAL HEIGHTS

Multiple Uses.



Improper or insufficient tower designs and poor erection and installation techniques are to be avoided since they can be very costly to TV stations. RCA, as a representative of tower manufacturers, is qualified to assist the Broadcaster in the planning and selection of the proper tower and a qualified erector. Experienced engineers are able to assess station needs and recommend from the wide selection of standard types for economy, quick delivery, or custom designed structures to meet special or unusual requirements. A popular one contract service is available offering complete tower planning, design, fabrication, installation and inspection under one contract, one responsibility. RCA also supplies (as part of the antenna purchase) antenna assembly supervision, and electrical checkout both before and after erection by a qualified RCA Service Company engineer.

In order to facilitate selection of the tower most suitable, and as an aid to the station in determining specific requirements, a sample check list and questionnaire are included on the back page in lieu of the usual specifications.

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DESCRIPTION

Relatively flat country with low surrounding hills lends itself well to the installation of tall supporting structures. Towers over 500 feet in height are usually guyed and the usual cross sectional shape is triangular so that three point guying can be used. Guyed tower costs are normally lower than for self-supporting structures because less steel is used. The availability of land and the area involved for guy anchorage are the main disadvantages of this type of tower. A useful method for estimating the land required for a guyed structure is to consider the distance to the farthest guy anchorage as being approximately 70% the tower height.

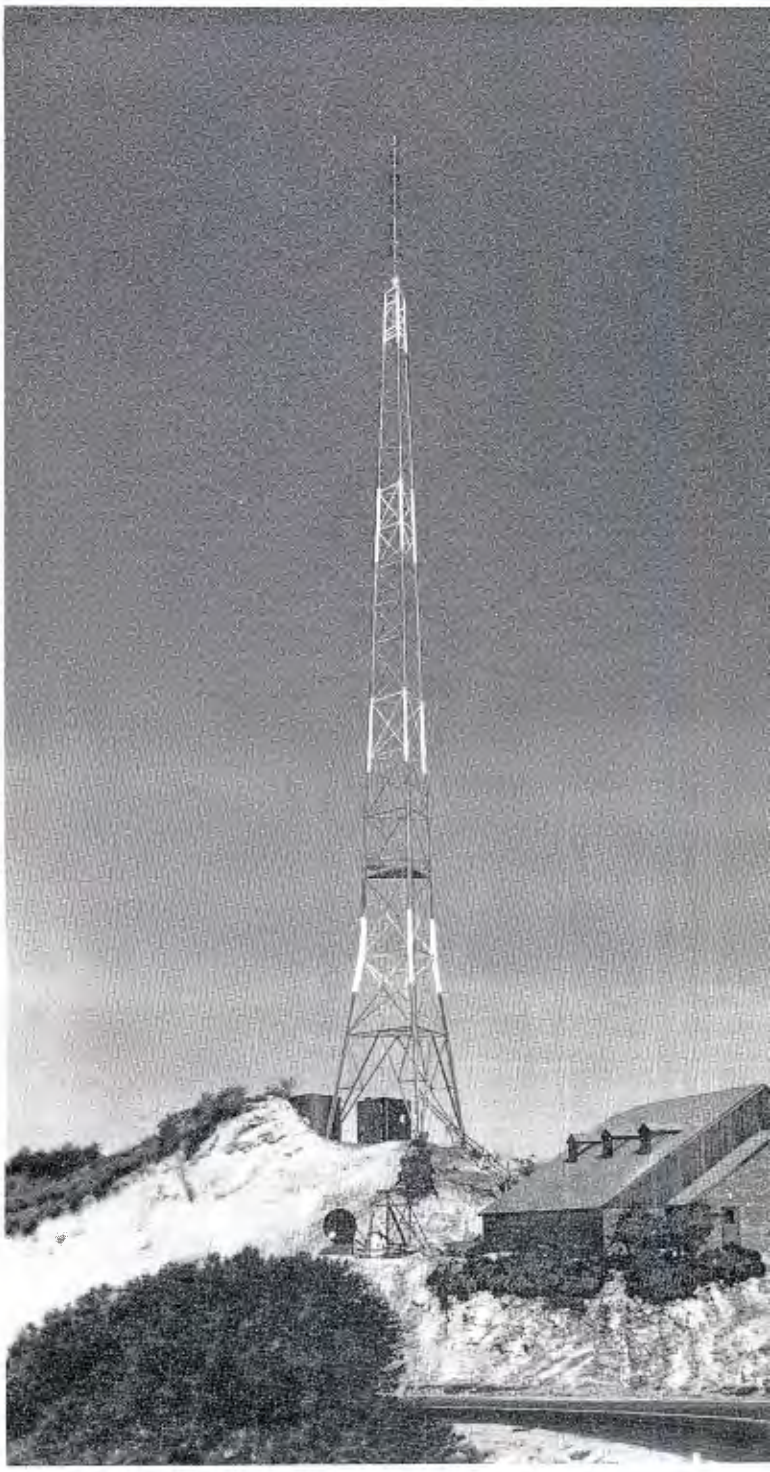
Guyed towers normally do not taper from base to top but are consistent in width along their entire height. They are supported by steel guy cables which span out to steel reinforced concrete anchors buried in the earth. Such towers are available with either fixed or pivoted bases. Each has certain advantages. A pivoted base tower tapers to a point at the bottom. The tower and the foundation are connected at this single point. The tower will remain upright and plumb even if the foundation sinks unevenly since the foundation will "rotate" about the pivot point. Because of this feature, pivoted base towers are normally used when the soil at the site has poor load-bearing qualities. Each leg of a fixed base tower is bolted to the foundation making the tower-to-foundation connection a rigid one. Fixed base towers permit easy, direct installation of transmission lines at the ground level. They also permit installation of the elevator bottom landing closer to the ground. If there is no likelihood of foundation sinking, normally a fixed base tower is best.

Self-Supporting Towers

Self-supporting towers are wide at the base and taper gradually to the top. They are not supported by guy cables but depend upon their tapered configuration for stability. For estimating required space for a self-supporting tower, the distance between tower legs can normally be considered as equal to about ten per cent of the height. Such towers are especially advantageous in city and congested districts where land is expensive.

The use of towers upon tall buildings is often quite practical. This normally results in smaller towers and shorter transmission lines, especially if the building is high enough to conform to the desired antenna height. Building frameworks, however, must usually be reinforced and erection problems sometimes become quite serious.

The mountain top tower is most often of the self-supported type. The transmission of television signals requires the transmitting antenna to be mounted as high in the air as



A typical mountain top tower installation requiring self-supporting tower. Self-supporting towers are also preferred in congested urban areas and roof-top installations as shown on opposite page.

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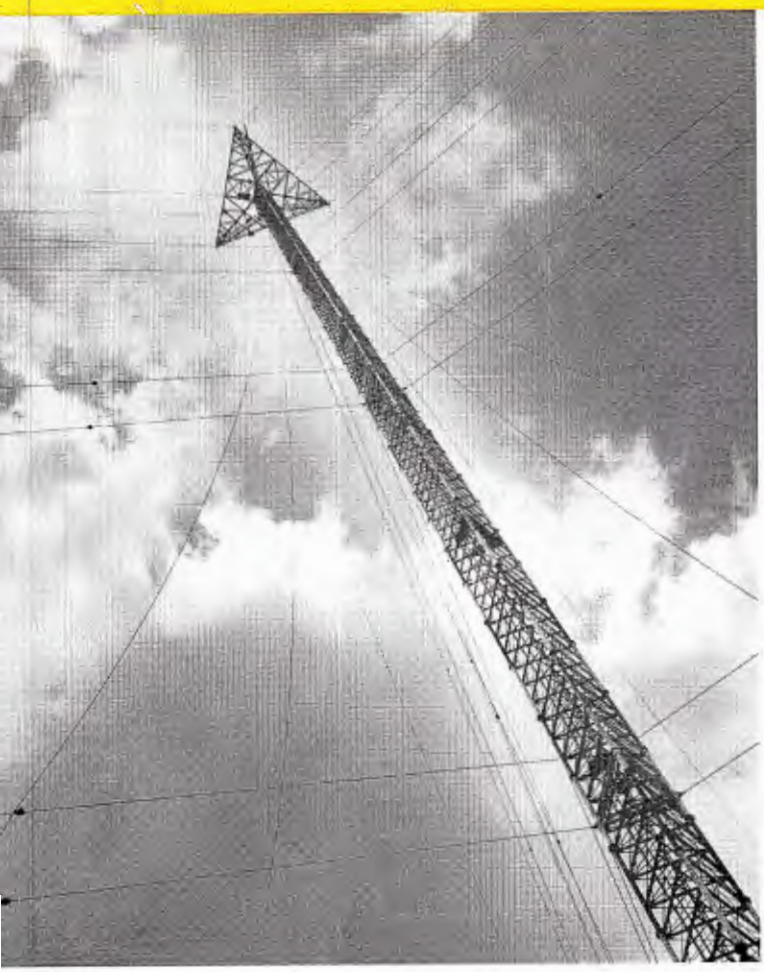


Soaring 1521 feet into Texas skies, this RCA custom tower with "candelabra" antenna system for stations WFAA-TV and KRLD-TV is securely held by 2-inch guy wires which form interesting pattern in picture above. Tower lighting is accomplished by eleven sets of lights at eleven levels including the beacons on top of the antennas. Lights and 80-foot triangular platform are clearly seen in picture.

possible because field strength at the receiver location is proportional to antenna height. The antenna should also be mounted in the clear so that the transmitted signal will not be reflected by close in objects. Mountain top installations are of course ideal from the standpoint of elevation and non-interfering objects. Wind and ice conditions, however, as well as accessibility in bringing up equipment, may present problems.

Some towers presently used for AM or FM can be modified to support TV antennas. These structures must be checked by the manufacturer to find out if they are capable of supporting the antenna to be used. It may be necessary to replace the upper sections of the tower with heavier sections or reduce the tower height.

Multiple Antenna Towers

Towers carrying a number of antennas, either in a stacked arrangement or with all antennas at the same height on a top platform or with a combination of platform and side mounted, antennas, can be supplied. Multiple antenna towers save each station on land cost, enable each station to utilize the area's best site, and simplify airspace clearance problems.

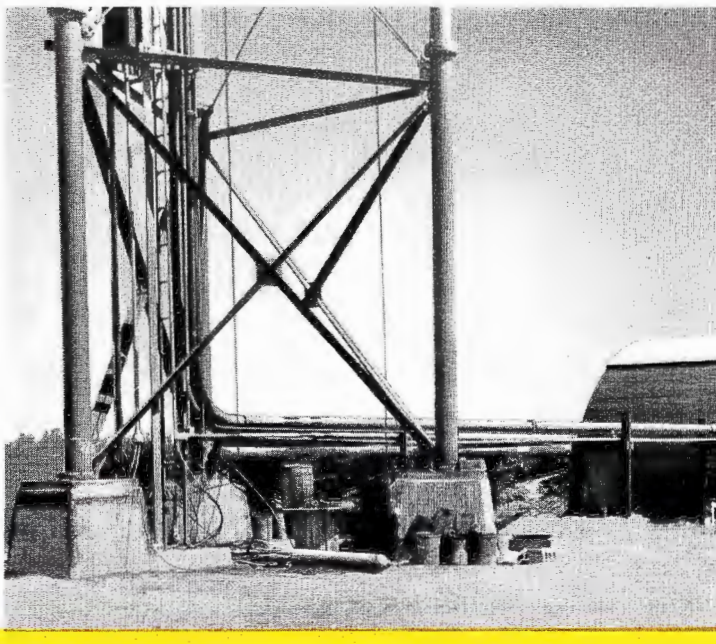
Design Considerations

Tower foundation design is based upon a laboratory analysis of the load bearing capacity of the soil in which the foundation will be placed, together with a determination of the uplift the foundation will be required to withstand. It is sometimes necessary to reinforce foundations with steel, wood or concrete piling. Swampy land provides a poor foundation base. Sand, gravel and clay soils are normally satisfactory. Shale or rock are good. A steel reinforced concrete foundation supports and fixes the base of most towers. Anchor bolts for the tower are cast right into the foundation with just the threaded ends protruding.

The steel superstructure may be hot dip galvanized steel where corrosive action due to fumes, salt air, etc. are likely to occur. When CAA regulations require painting, galvanizing can be omitted if the tower sections are heavy and painting is done frequently. Climbing ladders should be located inside the tower if at all possible and preferably near the tower legs. By placing the ladder within the tower, the lattice braces form a safety cage for the serviceman. Rungs are spaced for easy climbing or descent.

Tower elevators are recommended on tower of 700 feet or more in height. They eliminate the danger of long periods of interrupted service through making it possible

Steel-reinforced concrete foundations for fixed base this guyed tower and typical transmission line run from transmitter to antenna is shown above.



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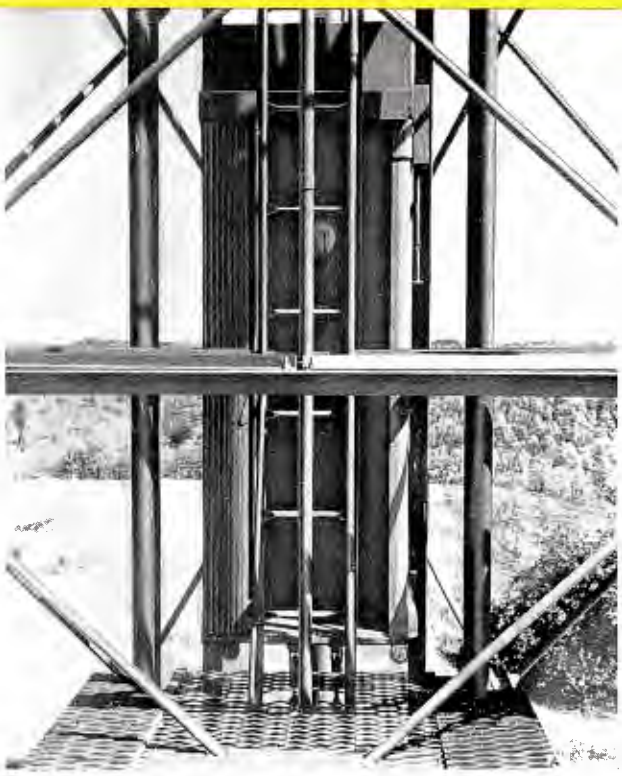

Tower elevators greatly simplify maintenance and should be considered for all towers of great height.

Typical tower showing constructional details. By placing service ladder within the tower, the lattice braces form a safety cage for serviceman.

for a technician to get up the tower fast in any kind of weather. They also enable the engineer or station manager to give on-the-spot supervision to work performed on the tower, without climbing. Finally, elevators greatly simplify routine maintenance. Conventional passenger elevator safety devices should be a part of every tower elevator system.

Tower platforms are featured in most tower designs. Inside platforms are located at each light level to provide a safe rest and work area for the tower maintenance workers. Outside platforms with railings can be installed at any level required to provide convenient access to side mounted equipment. Top platforms to carry multiple antenna installations are fitted with catwalks, railings and ladders to provide easy access to antennas and transmission lines.

Telephone lines and jack boxes can be installed on the tower to provide quick communication between maintenance workers on the tower and the ground.

Complete tower lighting systems, dsigned in accordance with FCC and Civil Aeronautics Authority requirements, are supplied with each tower. Lighting systems contain a series of flashing beacons and obstruction lights at intermediate levels. The number of beacons and lights required varies with the tower height. A photo-electric lighting control, to automatically turn the tower lights on at sunset, off at sunrise, can be supplied as a part of each lighting system. A lamp failure indicator panel can be installed in the transmitter building as auxiliary equipment.

Typical anchorage for pivoted base type of guyed tower. The tower and the foundation are connected at this single point. The tower will remain upright and plumb even if foundation sinks unevenly.

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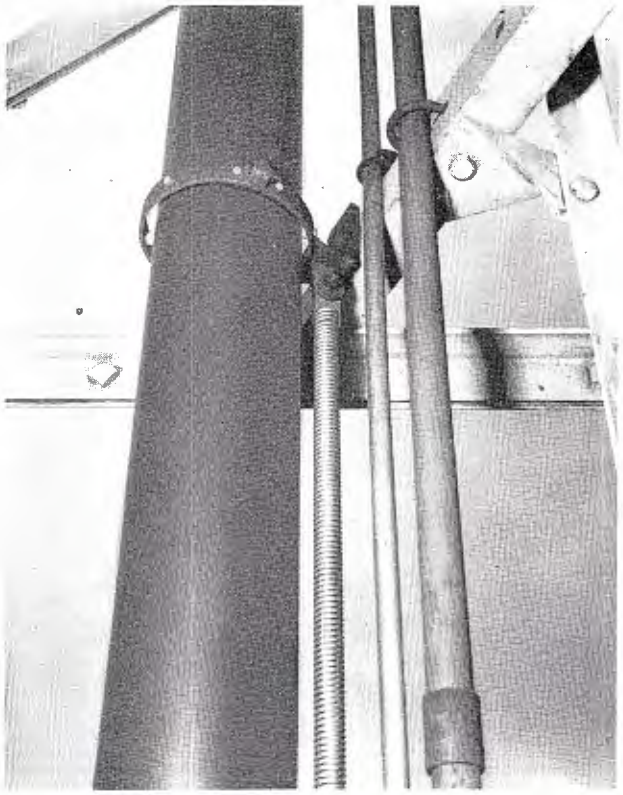
Superturnstile Antenna Mountings

RCA furnishes the mountings as used at the top of the tower to support and hold VHF antennas, except for the type TF-12AM and TF-12AL antennas which are supplied by the tower manufacturer. In the case of the VHF Superturnstile a guide flange holds the antenna pole perpendicular. A pole socket is mounted approximately 15% of the pole length below the tower top to support the antenna and balance the overturn moment. A pedestal type mounting is available.

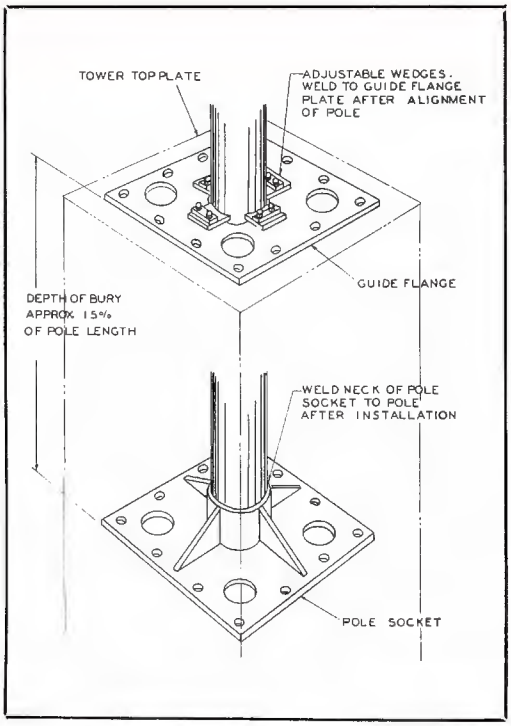
The twelve-section superturnstiles have an r-f combining network which is accommodated below the pole socket. Provisions are made so that tower cross bracing does not interfere. Mounting provisions are supplied for hangers to support this network.

Supergain Antennas

In the application of VHF supergain antennas, tower construction can be either square or triangular. If a triangular structure is used, outrigger framing or brackets attached to the screens will be necessary to permit a square screen array. Guys are permissible in the screen area if four point guying is used. By guying at the corners of the screen location (45° to face of screens) the guys will not cross the screen surface, thus any electrical effect is eliminated.



Detail view showing transmission line hangers which secure line to structural members of antenna tower. Expansion type hangers shown above or fixed hangers are most commonly used to assure permanent, reliable installation.



Sketch showing guide flange and pole socket installation.

UHF Antenna

The standard UHF transmitting antenna is the UHF Pylon. It is flange mounted directly to the tower top plate. A set of tapered leveling plates is provided to align the antenna vertically if the tower top plate is not exactly level. These plates are also used to obtain mechanical beam tilting of the antenna.

Transmission Lines

Careful consideration should be given to the layout and support of transmission line at the top of the tower. The tower manufacturer should consult with RCA engineers to be sure there is adequate support for the line and that a minimum number of elbows are used between the antenna input and the vertical run down the tower. The tower company must also supply supports for spring hangers from the top to the base of the tower. Outline drawings with dimensions are available for all types of transmission lines and should be used in making a layout. These are shown in the RCA Transmission Line Catalog which will be sent upon request.

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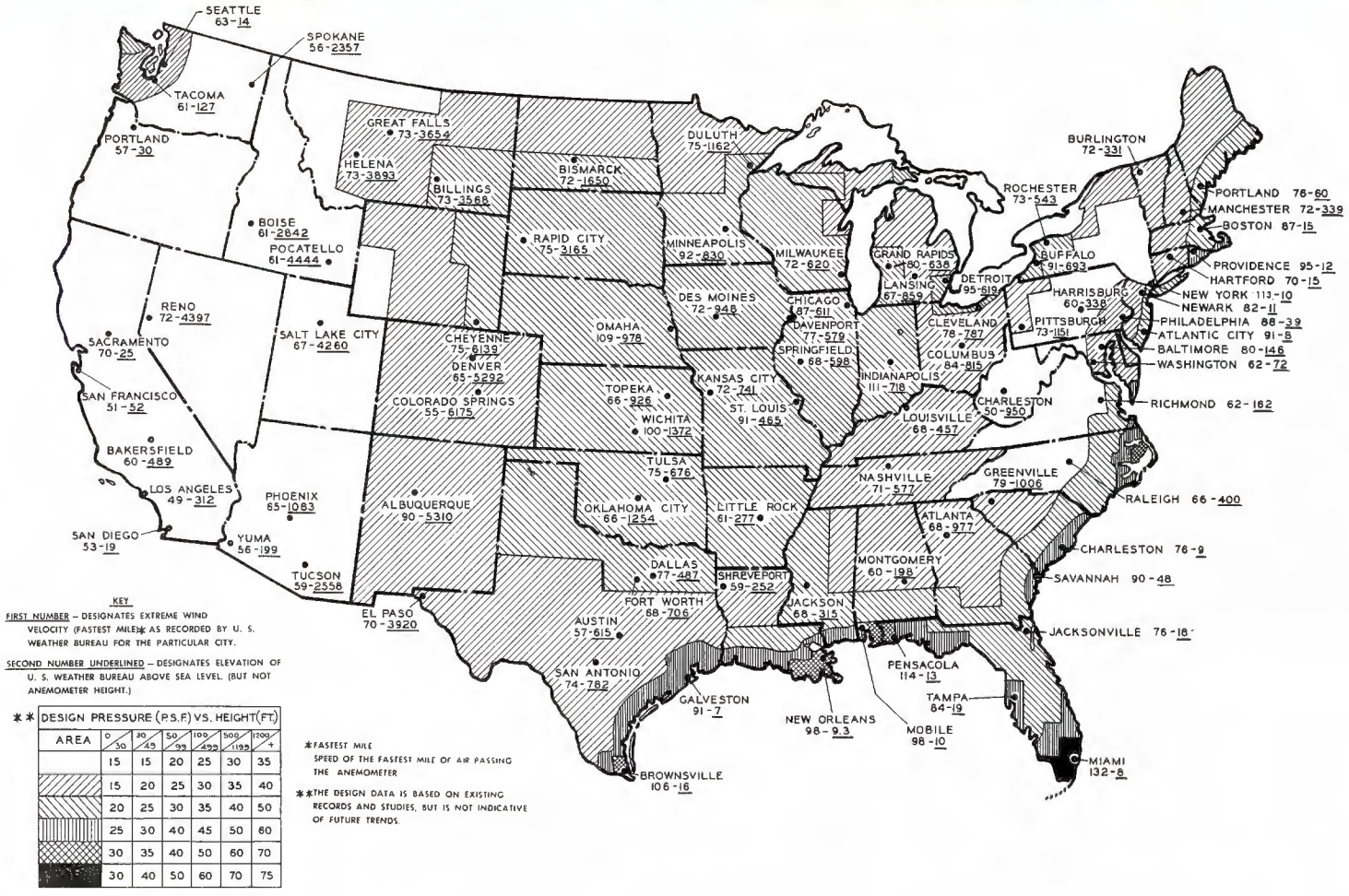
WIND VELOCITY AND PRESSURE MAP



KEY

FIRST NUMBER – DESIGNATES EXTREME WIND VELOCITY (FASTEST MILE* AS RECORDED BY U. S. WEATHER BUREAU FOR THE PARTICULAR CITY.

SECOND NUMBER UNDERLINED – DESIGNATES ELEVATION OF U. S. WEATHER BUREAU ABOVE SEA LEVEL. (BUT NOT ANEMOMETER HEIGHT.)

** DESIGN PRESSURE (P.S.F.) VS. HEIGHT (FT.)

AREA	0-30	30-49	50-99	100-499	500-1199	1200+
	15	15	20	25	30	35
	15	20	25	30	35	40
	20	25	30	35	40	50
	25	30	40	45	50	60
	30	35	40	50	60	70
	30	40	50	60	70	75

*FASTEST MILE SPEED OF THE FASTEST MILE OF AIR PASSING THE ANEMOMETER

**THE DESIGN DATA IS BASED ON EXISTING RECORDS AND STUDIES, BUT IS NOT INDICATIVE OF FUTURE TRENDS.

Published records of the U. S. Weather Bureau are given as "maximum" (5 minute average velocity) or "extreme" (the speed of the fastest mile of air passing the anemometer). The selection of design loads should be based on "extreme" velocity. If no data is available on "extreme", the published "maximum" figures should be increased by approximately 20%. The plotted areas shown on the map are derived from careful studies made by authorities in this field and the information is based on monthly and yearly average velocities, frequency of occurrence, probability of extremes, topographical conditions, etc. Installations on mountain tops and areas subject to heavy icing conditions should be given special consideration. Building codes and zoning ordinances should also be carefully investigated.

Wind Load

Experienced tower builders rarely design for less than a 30/20 lb. loading. This means that the tower members are designed to resist a horizontal wind pressure of 30 lbs. per square foot of projected area on all flat surfaces and 20 lbs. on round surfaces. This is the equivalent of an actual wind velocity of 85 miles per hour.

Provision should be made for all additional loadings caused by antenna, ladders, transmission and power lines, etc. and should be applied to the projected area of the structure. The total load specified should be applied in the direction which will cause the maximum stress in the various members. Where high winds or heavy icing is prevalent a 50/30 loading is often specified.

SPECIFICATIONS

Since every tower is custom built to meet station requirements no specific specifications are set up. RCA is equipped to supply from one dependable source a tower completely designed to match station antenna and transmitter to antenna integrated feed system requirements. By specifying RCA you are assured a satisfactory installation.

Towers are designed in accordance with RETMA Specifications. Consultation with RCA Broadcast Representatives will help to determine your requirements. Call or write your nearest representative. In order to facilitate selection of the tower most suitable, and as an aid to the station in determining specific requirements, a sample questionnaire is included here.

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Tower Considerations

The following procedure may be helpful as a check list in considering your tower requirements.

1. Determine station location with respect to service area. This study which will involve among other things joint operation with other stations, CAA approval, cost of land, zoning restrictions, local regulations, etc., will result in a decision to use:
   a. A self-supporting tower when land is unavailable as in city limits or on top of a building.
   b. Or a guyed tower where land is available and a greater height is desired.
   c. Or a multiple antenna tower.
2. Determine design parameters:
   a. Wind load for area in which tower is located.
   b. Deflection at tower top for type of service required.
   c. Type of antenna which is to be supported.
3. Determine tower accessories such as:
   a. Ladders.
   b. Platforms.
   c. Railings.
   d. Lighting.
   e. Microwave dishes.
4. Determine method of routing transmission line taking into account:
   a. Accessibility.
   b. Location of structural members.
   c. Location of special networks below tower top.

Accessories

RCA can furnish in addition to the antenna supporting tower, the following accessories:

(A) Tower lighting equipment.

(B) Special Antenna base mounting.

(C) Installation and Erection assistance.

Antenna Tower Erection

Do not try to economize on erection. Get the best erector you can. A little extra money spent for this purpose can possibly save you many dollars of time off the air. Failure of station equipment can keep you off the air only for a short time because your personnel is trained to repair this equipment. Also, you probably will have stand-by equipment. If your antenna system fails you may be off-air for hours because no one is immediately available to repair it.

RCA has experienced erection contractors who can furnish a complete installation.

An interesting tower view looking up through the supporting structure. Close inspection will reveal transmission line run and ladder on right.

Antenna Tower Questionnaire

LOCATION

City..... State.....

QUOTATIONS TO BE FURNISHED

(Check those required)

Tower — Guyed.....( )
Self-supporting.....( )

Tower Lighting Equipment.....( )

Tower Erection:
Antenna and Assembly Installation.....( )
Transmission Line Installation.....( )

SPECIFICATIONS

Tower Height: Ground to top of tower.....
Ground to top of base insulator.....

Tower Use: Antenna support.....

Channel or Frequency.....

TV Antenna: Type.....
Description.....

Transmission Lines:

	Size	No.
Design Load: B-1 Open Country.....		
B-2 Congested Area.....		

Remarks:
(Special requirements, site accessibility, etc.)

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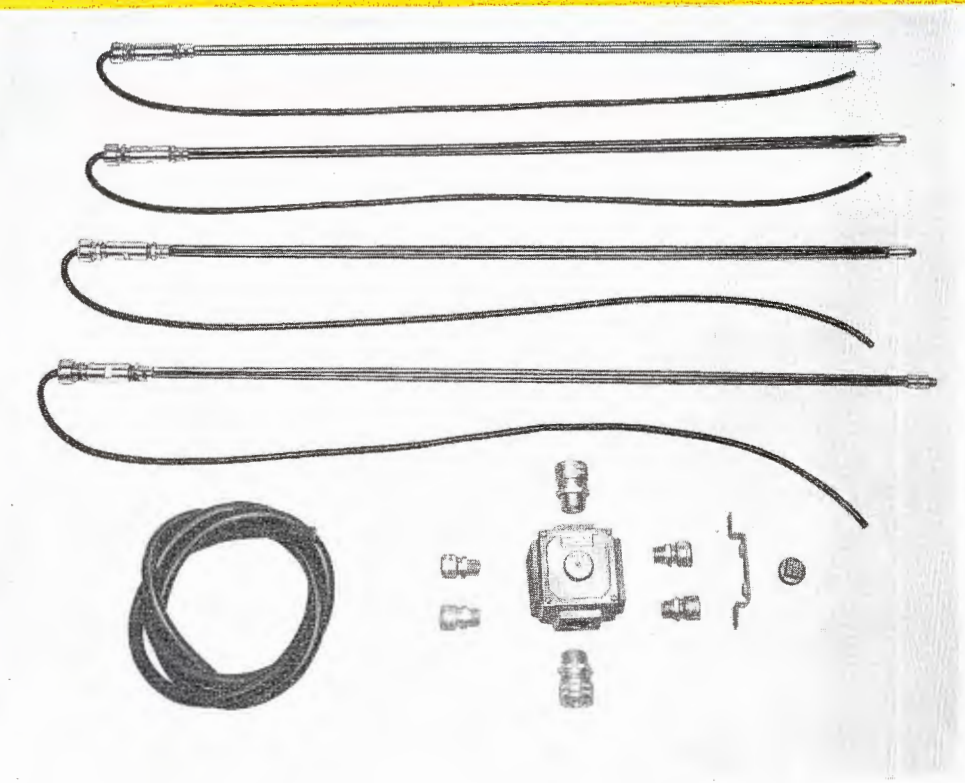
VHF ANTENNA SLEETMELTERS

MI-19009 Series

FEATURES

- Prevents ice impairing normal operating characteristics of VHF antennas
- Choice of sleetmelters available for all RCA Superturnstile antennas
- Durable metallic weatherproof construction
- Heaters can be connected to operate on 115, 230, 460 volt, single or 3 phase



USES

Sleetmelters are recommended for use on all RCA Superturnstile antennas in localities where formation of ice on the antenna can be expected, resulting in impairment of normal antenna operating characteristics. They also reduce hazards to ice-coated antennas and towers from high wind pressures. The antenna heating units are usually operated within the temperature range of 25° F to 35° F, since this is the range at which ice readily forms. It is recommended that the RCA MI-27369 Automatic Sleetmelter Control Unit be used with the VHF sleetmelters.

DESCRIPTION

The MI-19009 series of VHF Antenna Sleetmelters is made available for all RCA Superturnstile antennas. Each MI includes four heaters, a junction box, connecting cables, and necessary hardware—enough equipment to prevent icing on one section (four radiators) of the antenna. It is necessary to order one complete kit or MI for each section of the antenna. Thus three MI kits are required for a 3-section antenna.

Each sleetmelter heating unit is designed for 115 volts and may be connected in a junction box for 115, 230, or 460 volts. Power requirements range from 0.8 kw per section for channel 7-13 antennas to 3 kw per section on the larger antennas used on channels 2 and 3. For proper type sleetmelter consult the specifications below. The heating units are enclosed in a metallic sheath of weatherproof construction ranging in length from 42 inches to 110 inches. The heater elements have permanently attached 4-foot heater cords.

Other unassembled components of each MI include a galvanized cast-iron junction box 4⅜ inches square and 3⅜ inches high which accommodates four ½-inch weatherproof connectors for the heater cords and two 1-inch weatherproof connectors for the riser bus cable as well as a 1-inch pipe plug for use in top of junction box at uppermost end of riser bus. Necessary mounting hardware and a 20-foot length of 3-10 riser cable to connect to the next lower junction box is also supplied.

SPECIFICATIONS

Stock Identification	*Description*	*Power Requirements*
MI-19009-B-1	For use on channel 2-3 antennas	115 v., 6.5 amps., 750 watts each; 3 kw per section
MI-19009-C-1	For use on channel 4-6 antennas	115 v., 4.4 amps., 500 watts each; 2 kw per section
MI-19009-J-2	For use on channel 7-13 antennas	115 v., 1.7 amps., 200 watts each; 0.8 kw per section

Accessory Equipment

Automatic Sleetmelter Control Unit.....MI-27369

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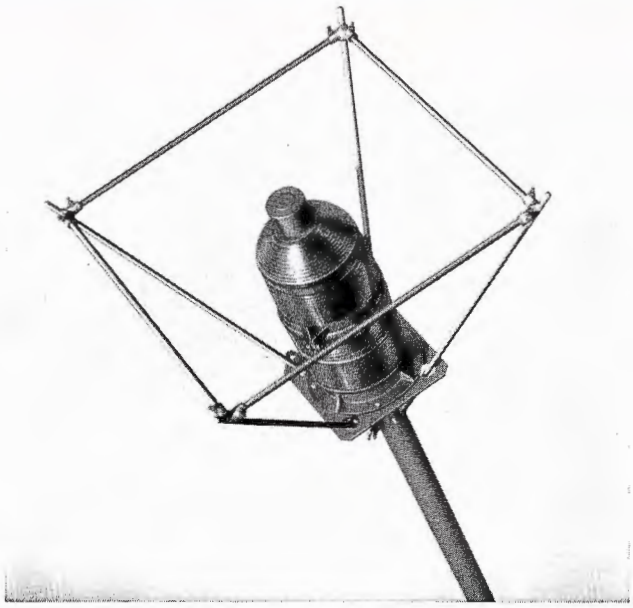
VHF ANTENNA LIGHTNING PROTECTORS

MI-27325 Series

FEATURES

- Sturdy steel construction heavily galvanized, with size range to fit any type RCA VHF Superturnstile Antenna
- Includes mounting plate for 300mm code beacon
- Cross arms for protection of personnel changing beacon bulbs
- Easy to assemble—little maintenance required
- Lifting lug with shackle for maintenance work



USES

Adequate lightning protection may be provided all VHF Antennas by the RCA MI-27325 series of Lightning Protectors. Each protector includes a beacon mounting plate for the mounting of a 300mm code beacon, and cross arms which may serve for protection of personnel changing beacon bulbs.

Lightning protectors are supplied as part of all current RCA Superturnstile Antennas. However, for broadcasters who may have earlier model antennas without suitable lightning protection, the following MI-'s are available:

MI-27325-L for Channels 2 and 3

MI-27325-M for Channels 4, 5 and 6

MI-27325-H for Channels 7 to 13

DESCRIPTION

VHF Antenna Lightning Protectors consist essentially of a base assembly equipped with beacon support plate and hoisting shackle, four ¾" diameter steel lightning rods grooved on one end, four tie rods groved on both ends, tie rod and deflection rod sleeves, and suitable fittings and assembly hardware. The lightning protector is shipped disassembled and must be assembled before mounting on the antenna.

The entire lightning protector is constructed of high-grade low carbon steel, the base mounting flange of 5½" O.D. steel pipe with ¼" wall, the lightning and tie rods of ¾" diameter steel ranging from 48" to 88½" long (depending on antenna channel), the beacon mounting flange of ¼" thick steel plate 16" square and properly drilled for mounting the beacon light. All protector elements are hot dip galvanized. Care must be exercised in the assembly of the lightning protector. Since it is used for support by personnel serving the beacon lamp, the set screws must fit in the grooves where specified, or a serious accident might result.

SPECIFICATIONS

Weight:

Ch. 2 and 3	160 lbs.
Ch. 4, 5 and 6	96 lbs.
Ch. 7 to 13	85 lbs.

Height Above Antenna:

Ch. 2 and 3	66½"
Ch. 4, 5 and 6	52½"
Ch. 7 to 13	52½"

Overall Dimensions:

Ch. 2 and 3	Height 76" x 102⅝" diagonal spread
Ch. 4, 5 and 6	Height 62" x 84⅝" diagonal spread
Ch. 7 to 13	Height 42" x 59" diagonal spread

Stock Identification:

Ch. 2 and 3	MI-27325-L
Ch. 4, 5 and 6	MI-27325-M
Ch. 7 to 13	MI-27325-H

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AUTOMATIC SLEETMELTER CONTROL UNIT

TYPE MI-27369

FEATURES

- Assures proper operation of antenna sleetmelters at all times
- Automatic weather monitoring at actual antenna location
- Adjustable temperature ranges to suit local weather conditions anywhere
- Water-proof aluminum housing
- Easy to install
- Prevents severe damage to transmission systems as a result of antenna icing

USES

The Automatic Sleetmelter Control Unit, MI-27369, is designed to prevent severe damage to transmission equipment as a result of inadequate manual control of antenna sleetmelters. The control allows sleetmelters to be left unattended at all times and proper operation will be assured. Furthermore the antenna will be free of ice and in condition for immediate operation following possible icing conditions during the night when the transmitter is normally unattended.

Extensive research with the United States Weather Bureau has indicated that precipitation and resultant ice formation will occur only between the temperatures of 10°F and 35°F. The only exception is "rime" ice which may form at any temperature below 35°F but is restricted to certain sections of the United States. The MI-27369 Sleetmelter Control has therefore been designed with adjustable temperature ranges so that it can cut off above and below the temperatures chosen to conserve power when temperatures are not within the ice-forming range.

DESCRIPTION

The Automatic Sleetmelter Control Unit, MI-27369, provides automatic weather monitoring at the antenna location for unattended operation of the broadcast stations' de-icing equipment. The unit is designed for mounting at the top of the tower, or preferably at the midpoint of the antenna pole on the larger antennas. Considerable temperature variations often exist between the antenna location at the top of the tower and the ground level, so that ice may be forming on the antenna while the temperature on the ground remains above freezing.

The control unit is approximately 6½ inches long, 4½ inches high and 3 inches deep and is housed in a cast aluminum box. A water-proof cover is sealed by a neoprene gasket and a convenient mounting bracket is furnished with the unit. Adjustable terminal connections for selection of temperature ranges have been provided in this model. The upper temperature limit may be set at 32° or 40° F. Whichever upper limit is chosen, the sleetmelters will automatically be turned on when the temperature falls

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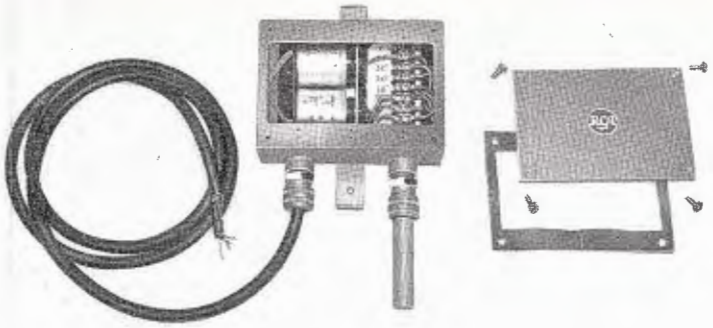


Sleetmelter Control Unit with water-tight cover removed.

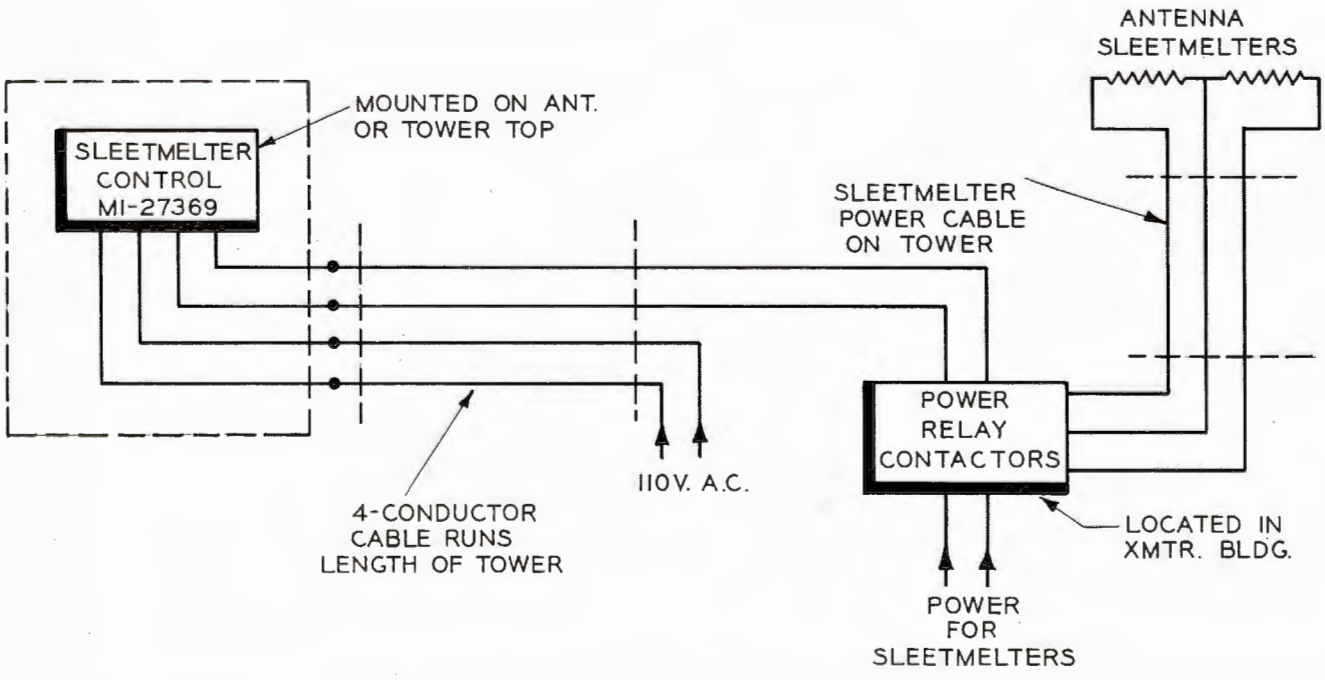
below that limit or automatically turned off when the temperature passes above that limit. The lower limit may be set at 10° or 20°F. Whichever lower limit is chosen, the sleetmelters will automatically be turned off when the temperature falls below that limit or turned on when the temperature is above that limit. For specific locations subject to "rime" ice, the lower limit includes a "stay-on" position to allow for continuous operation of the sleetmelters for all temperatures below the chosen upper limit of 32° or 40°F.

The Control Unit is furnished with a 4-conductor cable, six feet long. The cable should be terminated in an appropriate junction box where connections may be made for the main cable running down the tower. Two conductors are to be connected to 110 volts a-c for the relay coils and the remaining two are for the control circuit. The station is required to furnish the connecting cable from the transmitter building to the termination of the six-foot cable furnished with the control unit, as well as the actual relay contactors to switch power to the sleetmelters.

Various types of antennas, methods of sleetmelter connection, etc. will make it impractical to furnish the power relay contactors with the MI-27369 Control Unit. The contacts of the control relays are rated for 10 amperes.

SPECIFICATIONS

Automatic Temperature Limits (Adjustable):	
Upper Limit	32° or 40° F
Lower Limit	10° or 20° F, or no-cut-off
Power Line Requirements	110 volts, 60 cycle
Sleetmelter Control Relay Contact Rating	10 amperes
Dimensions	6½" x 4½" x 3"
Weight	5 lbs. (approx.)
Finish	Weatherproof aluminum box
Stock Identification	MI-27369



NORMAL APPLICATION OF SLEETMELTER CONTROL MI-27369

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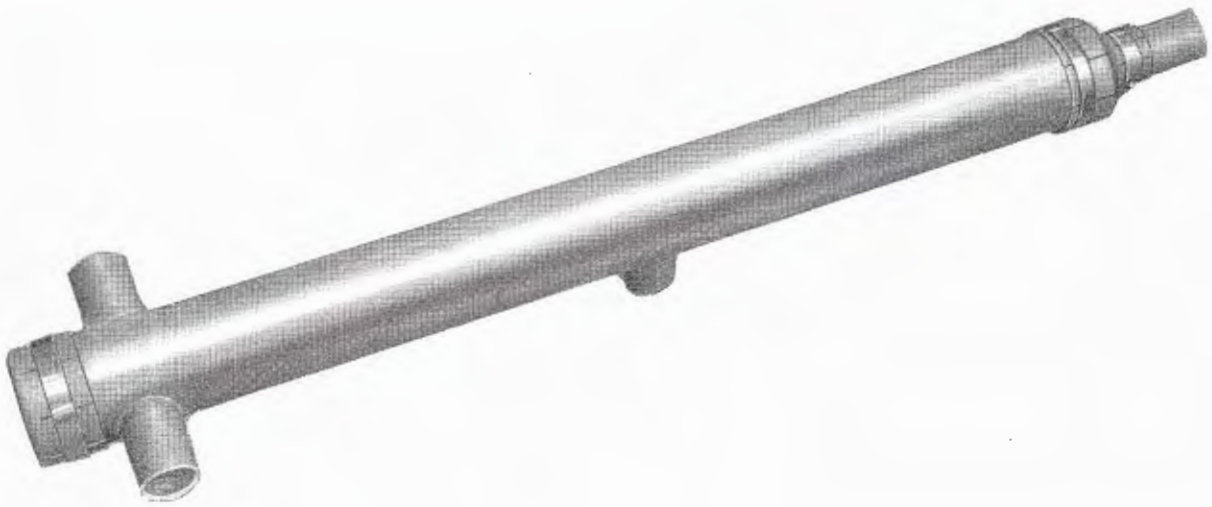
TV DIPLEXERS



FEATURES

- **Permits feeding both aural and visual signals to one transmitting antenna**
- **Compact, saves floor space—can be mounted overhead with transmission line**
- **Easy to install**
- **Enclosure keeps out dust**
- **Furnished precut to channel—no adjustment required**

USES

The Diplexer is a device constructed of transmission line sections which permits feeding both the aural and visual counterparts of the television signal to the same antenna without detrimental crosstalk. This makes it possible to use one antenna for radiating both the aural and visual signals. The Diplexer is designed particularly for use in transmission lines for Superturnstile and Super-Gain antennas; however, it can be used with any TV antenna which utilizes a quadrature phased dual transmission line.

The diplexing systems vary in size and weight dependent upon the frequency band used. The input and output impedances of each system matches the standard transmission line characteristic impendance. It has a low insertion loss—less than 0.1% because it uses no tuned traps or other circuits carrying high circulating current. The power handling capacity is correspondingly high because the power dissipated is roughly equivalent to that of an equal length of transmission line of the same dimensions.

The following diplexers are recommended for use with the various type RCA television transmitters.

MI-19390 Diplexer*	TT-500A/B	500 watts max. power
	TT-2AL/AH	2 kilowatts max. power
	TT-2BL	2 kilowatts max. power
	TT-5A	5 kilowatts max. power
	TT-6AL	6 kilowatts max. power
MI-19391 Diplexer	TT-10AL	10 kilowatts max. power
	TT-25BL	25 kilowatts max. power
MI-19394 Diplexer	TT-10AH	10 kilowatts max. power
	TT-25BH	25 kilowatts max. power
	TT-50AH	50 kilowatts max. power

* The MI-19390 Diplexer is rated for 10 kw use, however terminals of the TT-10AL/AH and associated VSBF are $3\frac{1}{8}$", hence the MI-19391 Diplexer with $3\frac{1}{8}$" terminals is recommended.

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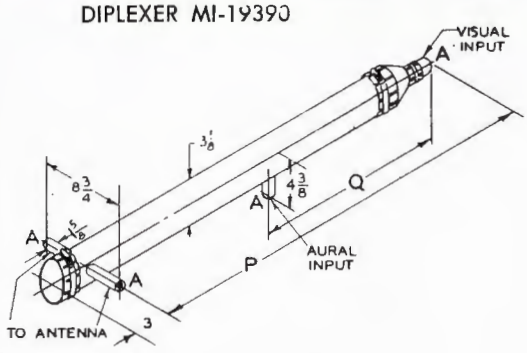
10 KW DIPLEXER
MI-19390

DIPLEXER MI-19390



CHANNEL	P	Q
2	107 7/16	55 5/8
3	97 9/16	50 11/16
4	89 7/16	46 5/8
5	78 5/16	41 3/16
6	73 5/16	38 9/16
7	37 9/16	20 11/16
8	36 5/16	20 1/16
9	35 5/16	19 9/16
10	34 5/16	19 1/16
11	33 9/16	18 11/16
12	32 9/16	18 3/16
13	31 13/16	17 13/16

DESCRIPTION

The MI-19390 Television Diplexer for use with transmitters having a maximum power output of 10 kw is a coaxial bridge-type unit—the type generally used with the Superturnstile Antenna which has equal input impedances at the two halves (North-South and East-West sides) of the antenna. The diplexer, together with the antenna circuit, is equivalent to a Wheatstone Bridge circuit. The two equal resistive arms of the bridge represent the N-S and E-W sides of the antenna respectively, while the diplexer contains the two equal reactive arms. The visual and aural inputs are connected as shown; and from each, the power divides equally to feed to the two sides of the antenna without interaction between visual and aural signals. An important feature of this type of diplexer is the ability to transmit visual and aural r-f energy of the same frequency; thus, the upper visual sideband at 4.5 megacycles modulation is the same as the aural carrier frequency, but both are transmitted without interaction.

The construction of the diplexer is based on the split balun in which the outer conductor of a coaxial line is split for a quarter wave-length, and the inner conductor is connected to one side of the end of the split section. The two ends of the split section assume opposite polarities, thus the single-ended input is converted to a double-ended circuit. This original outer conductor is surrounded by a coaxial shield which forms the new electrical outer conductor. The aural input circuit inner conductor is connected to the crotch of the split section so that the aural energy flows along as on two parallel conductors connected push-push (i.e. the aural signal is fed to the two antenna terminals in phase).

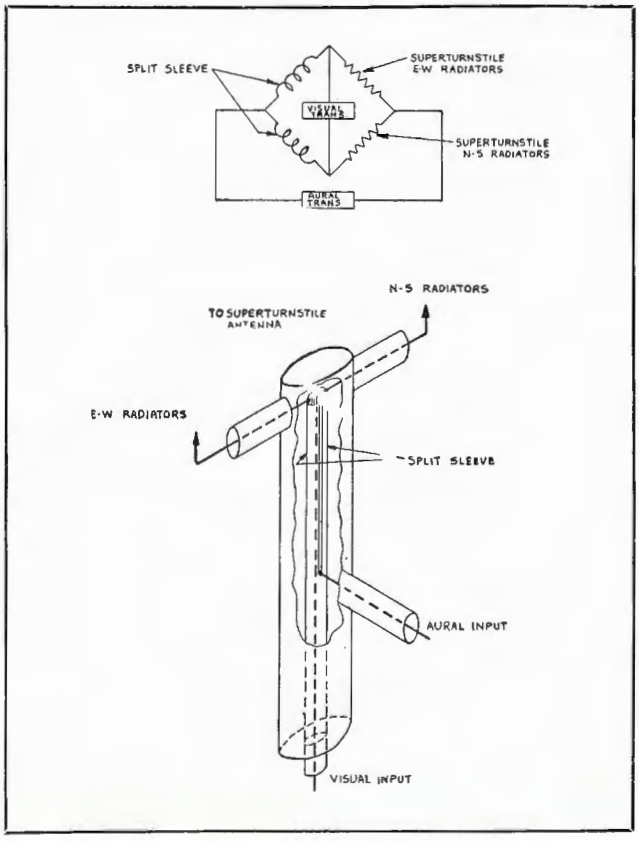
The electrical characteristics of the unit, as well as the physical dimensions are shown in the outline drawing. Note particularly that the physical dimensions of the diplexer will vary in accordance with the channel for which it is built. The unit may be mounted in any position. All input and output terminals are designed for use with 1⅝ ohm transmission line (RCA MI-19112).

SPECIFICATIONS

Frequency	54-216 MC
Maximum Power	10 KW
R.F. Input and Output	51.5 ohms—1⅝ inch coaxial line
R.F. Efficiency	99.9%
Attenuation	.004 db
Visual Input	VSWR less than 1.05
Aural Input	VSWR less than 1.15
Weight	12 to 30 pounds
Mounting	Any position
Dimensions	See outline drawing
Stock Identification	MI-19390-*

* MI number to include channel, i.e.: MI-19390-2 for channel #2, etc.

The bridge-type diplexer is simply constructed and equivalent to a Wheatstone Bridge.



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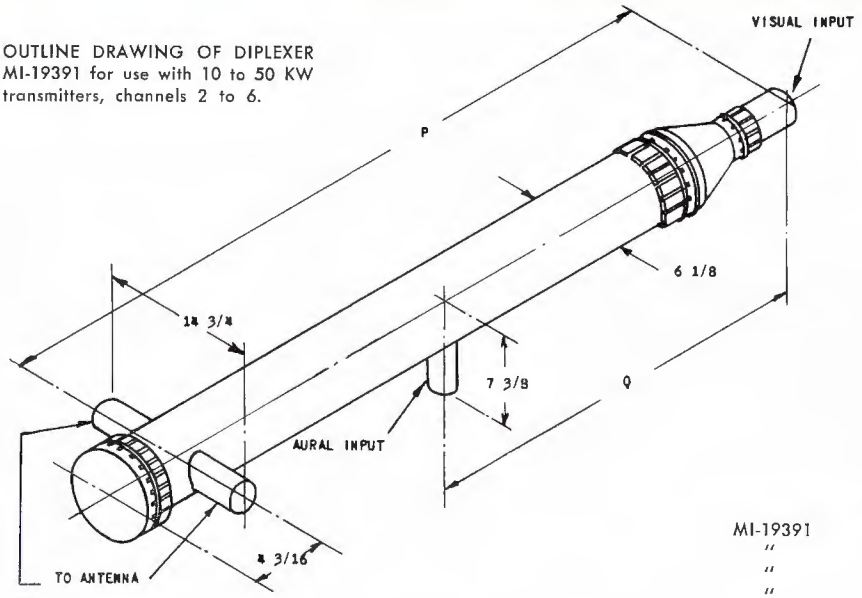
50 KW DIPLEXER
MI-19391

OUTLINE DRAWING OF DIPLEXER MI-19391 for use with 10 to 50 KW transmitters, channels 2 to 6.



	CHANNEL	P	Q
MI-19391	2	109 7/16	57 5/8
"	3	99 9/16	52 11/16
"	4	91 7/16	48 5/8
"	5	80 9/16	43 3/16
"	6	75 5/16	40 9/16

DESCRIPTION

The MI-19391 Television Diplexer is a coaxial bridge-type unit designed for operation on any one of the VHF television channels from channel 2 to channel 6. Each unit is pretuned and adjusted for the desired channel and requires no adjustments at the time of installation.

The diplexer is designed to handle r-f powers up to 50 KW and is used primarily with Superturnstile Antennas, hence two outputs are provided for feeding the East-West radiators and the North-South radiators respectively. In construction and principle it is identical to the type MI-19390 TV diplexer.

The insertion loss of this diplexer is very low, due to the fact that no tuned traps or other circuits carrying a high circulating current are used. The power handling capability is correspondingly high because the power dissipated is roughly equivalent to that of an equal length of transmission line of the same dimensions.

The electrical characteristics of the unit, as well as the physical dimensions, are shown on the accompanying outline drawing. Since the size of the diplexing system will vary with channel frequency, all orders must specify the operating frequency of the station.

The unit should be mounted near the transmitter, preferably ceiling mounted, but it may be mounted in any posiion. The two antenna transmission lines are connected to the diplexer output terminals. The output of the aural transmitter is attached to the aural input of the diplexer, and the output of the vestigial sideband filter to the visual input of the diplexer. All input and output terminals are designed for use with 3⅛ inch, 51½ ohm transmission line; (RCA MI-19113).

SPECIFICATIONS

Frequency	54-88 MC
Maximum Power	50 KW
R.F. Input and Output	51.5 ohms, 3⅛ inch coaxial line
R.F. Efficiency	99.9%
Attenuation	.004 db
Visual Input	VSWR less than 1.05
Aural Input	VSWR less than 1.15
Weight	48 to 175 pounds
Mounting	Any position
Dimensions	See outline drawing
Stock Identification	MI-19391-*

Accessory Equipment

Adaptor, Inner for MI-19313 Coaxial Line	MI-19313-10
Coupling, Straight	MI-19113-C8
Reducer, 6⅛" to 3⅛" Coaxial Line	MI-19314-C13

* MI number to include channel, i.e.: MI-19391-6 for channel #6, etc.

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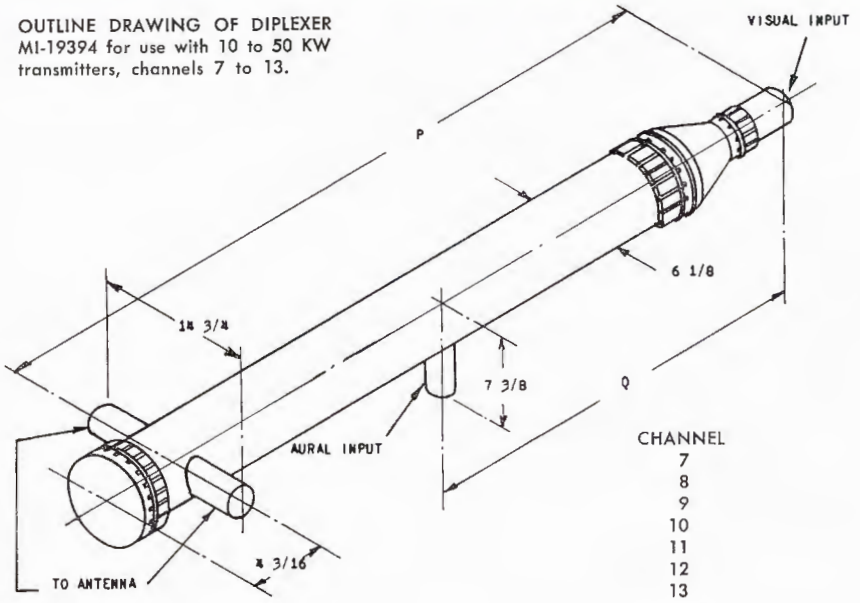
50 KW DIPLEXER
MI-19394

OUTLINE DRAWING OF DIPLEXER
MI-19394 for use with 10 to 50 KW transmitters, channels 7 to 13.



CHANNEL	P	Q
7	39 9/16	22 11/16
8	38 5/16	22 1/16
9	37 5/16	21 9/16
10	36 5/16	21 1/16
11	35 9/16	20 11/16
12	34 9/16	20 3/16
13	33 13/16	19 13/16

DESCRIPTION

The MI-19394 50 KW Television Diplexer is a coaxial bridge-type unit designed for operation on any one of the VHF television channels from channel 7 to channel 13. Each unit is pretuned and adjusted for the desired channel and requires no adjustments at the time of installation. The system has been designed primarily for use with Super-turnstile Antennas, hence two outputs are provided for feeding the East-West radiators and the North-South radiators respectively.

This diplexer is quite similar to the 50-KW unit (MI-19391), with proper dimensions for channels 7-13 and the inner conductor is silver-plated to permit a higher maximum temperature rise. Like the MI-19391 unit, the insertion loss of this diplexer is low, due to the fact that no tuned traps or other circuits carrying a high circulating current are used. The power handling capability is correspondingly high because the power dissipated is roughly equivalent to that of an equal length of transmission line of the same dimensions.

The electrical characteristics of the unit, as well as the physical dimensions, are shown in the outline drawing. Note particularly that the physical dimensions of the diplexer will vary in accordance with the channel for which it is built.

The principle of the diplexer unit and its construction is discussed under the description of the MI-19390 unit, which illustrates the electrical circuit and physical construction.

All input and output terminals are designed for use with 3⅛ inch, 51½ ohm transmission line (MI-19113). Special adaptors are included for use with MI-19313 VHF Teflon Line.

SPECIFICATIONS

Frequency	174-216 MC
Maximum Power	50 KW
R.F. Input and Output	51.5 ohms, 3⅛ inch coaxial line
R.F. Efficiency	99.9%
Attenuation	.004 db
Visual Input	VSWR less than 1.05
Aural Input	VSWR less than 1.15
Weight	48 to 60 pounds
Mounting	Any position
Dimensions	See outline drawing
Stock Identification	MI-19394-*

Accessory Equipment

Adaptor, Inner for MI-19313 Coaxial Line	MI-19313-10
Coupling, Straight	MI-19113-C8
Reducer, 6⅛" to 3⅛" Coaxial Line	MI-19314-C13

* MI number to include channel, i.e.: MI-19394-7 for channel #7, etc.

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83-84	.....	Inner Adaptor for MI-19313 Coaxial Line	MI-19313-10
83-84	.....	Straight Coupling	MI-19113-C8
83-84	.....	Reducer, 6⅛" to 3⅛" Coaxial Line	MI-19314-C13

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