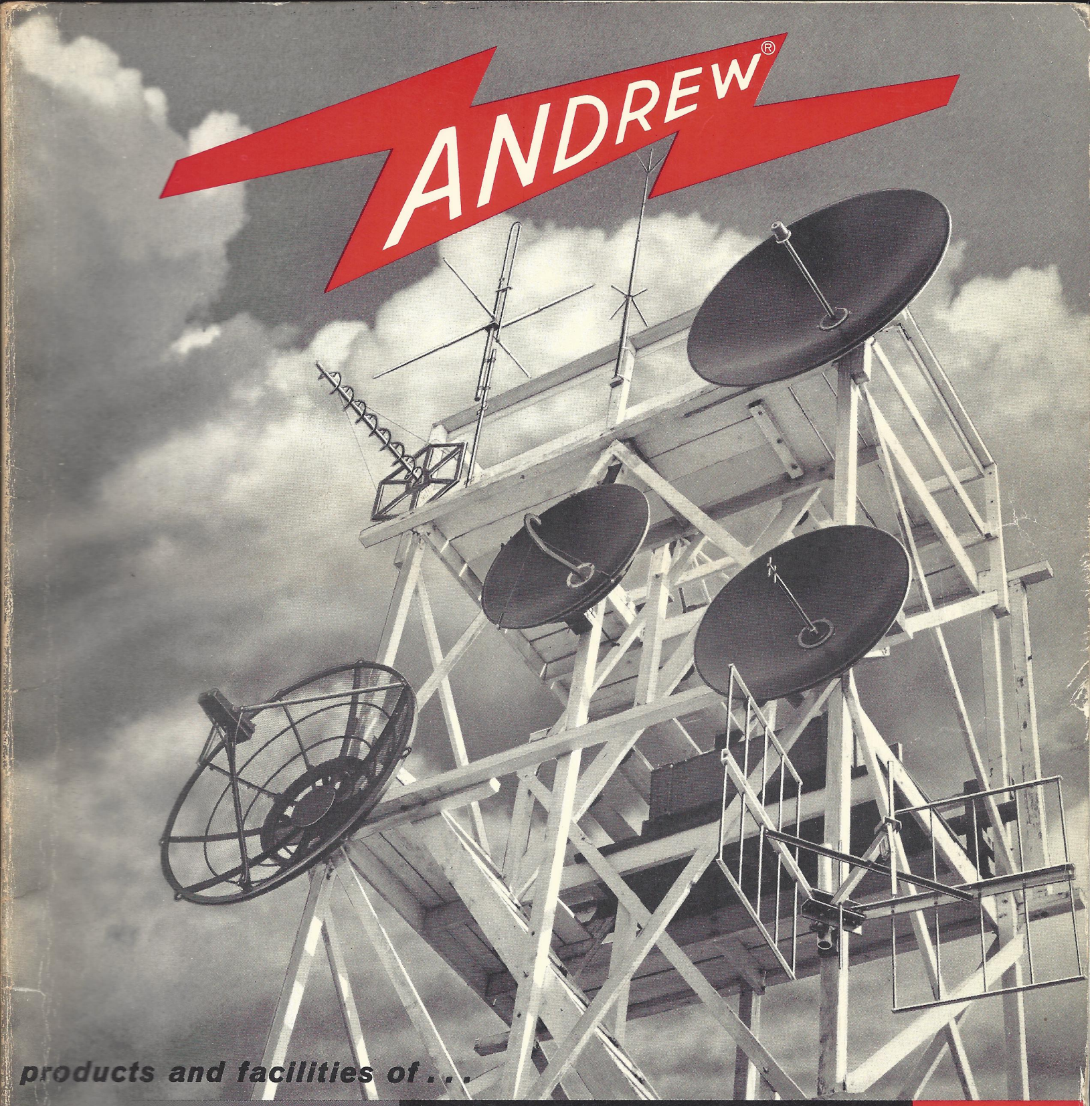
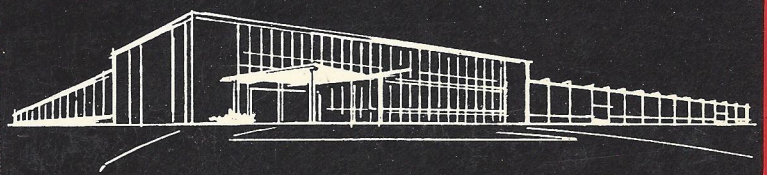
ANDREW®



products and facilities of . . .

Andrew® CORPORATION



CATALOG NO.

22

ANTENNAS • ANTENNA SYSTEMS • TRANSMISSION LINES

A FIELD ORGANIZATION TO SERVE YOU

Contact the ANDREW office most convenient to you. All are prepared to serve you.

With exceptions as noted in the price list, products are available from any of our factories. Shipments to other countries can generally be made from either the United States or Canada, if there is an advantage to you.

British Commonwealth business may sometimes be more advantageously handled by ANDREW Antenna Corporation, Ltd.

The eastern states are normally served by our Westwood, Massachusetts, or Ridgewood, New Jersey offices.

The western states are normally served by ANDREW California Corporation in Claremont, California.

The balance of the United States and other countries except Latin America are normally served by ANDREW Corporation, Chicago, Illinois.

Latin America is normally served by ANDREW International Corporation in Chicago, Illinois.

ANDREW CORPORATION

MAIN OFFICE

ANDREW CORPORATION
363 East 75th Street
Chicago 19, Illinois
Phone: TRiangle 4-4400
Cable: Andcorp
TWX: CG 2864

MAIN FACTORY

ANDREW CORPORATION
10500 West 153rd Street
Orland Park, Illinois
Phone: Fieldbrook 9-3300

EASTERN REGION

NEAR NEW YORK CITY

ANDREW CORPORATION
P. O. Box 416
Ridgewood, New Jersey
Phone: GIlbert 5-2500
TWX: Ridgewood, N.J. 535

NEAR BOSTON

ANDREW CORPORATION
P. O. Box 296
Westwood, Massachusetts
Phone: DAvis 6-6500

AFFILIATES

WEST COAST

ANDREW CALIFORNIA CORPORATION
OFFICES & FACTORY
941 East Marylind Avenue
Claremont, California
Phone: NAtional 6-3505
TWX: Pomona, Cal. 7090

CANADA

ANDREW ANTENNA CORPORATION, LTD.
OFFICES & FACTORY
606 Beech Street
Whitby, Ontario, Canada
Phone: MOhawk 8-3348
Toronto Phone: EMpire 4-1972

LATIN AMERICA

ANDREW INTERNATIONAL CORPORATION
361 East 75th Street
Chicago 19, Illinois
Phone: TRiangle 4-4400
Cable: Andcorp

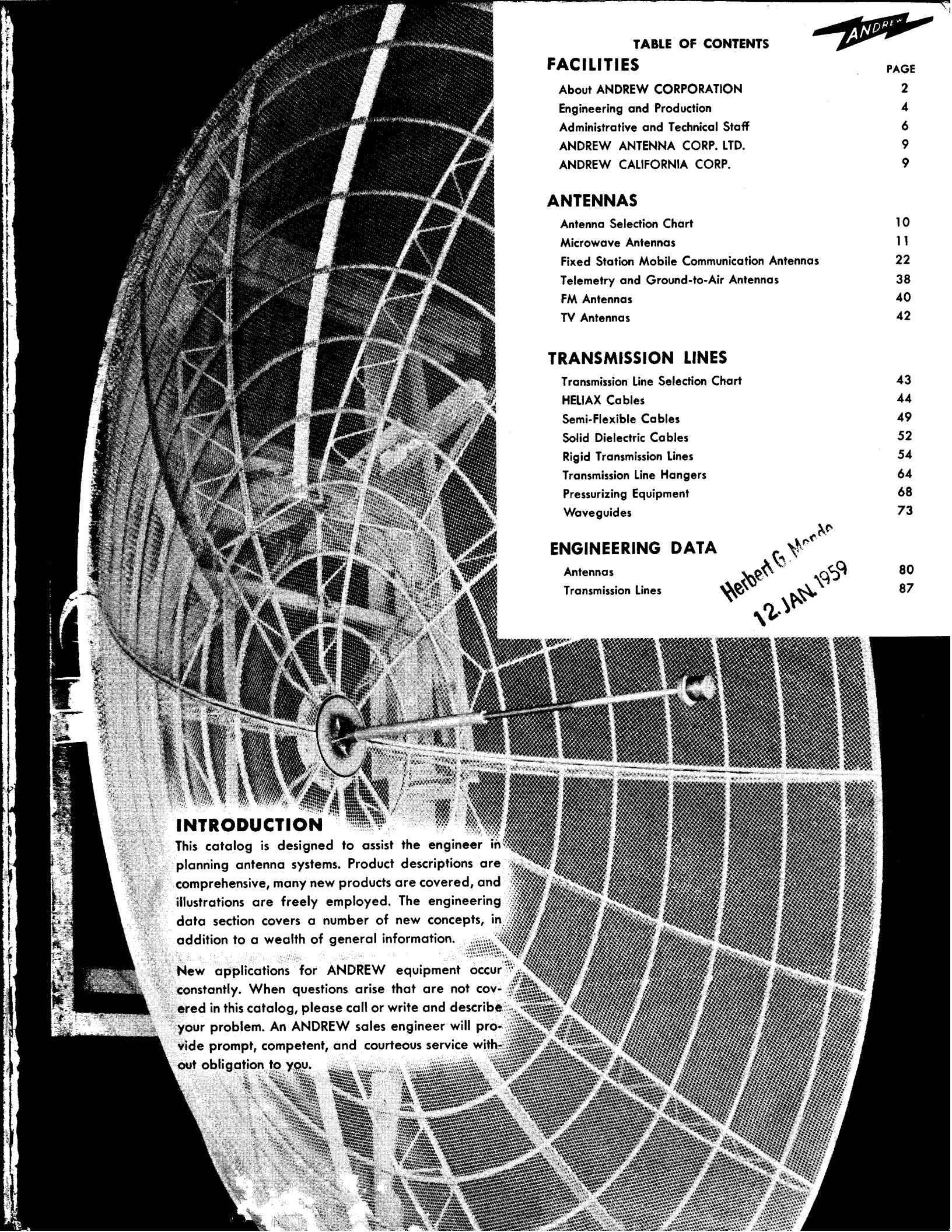


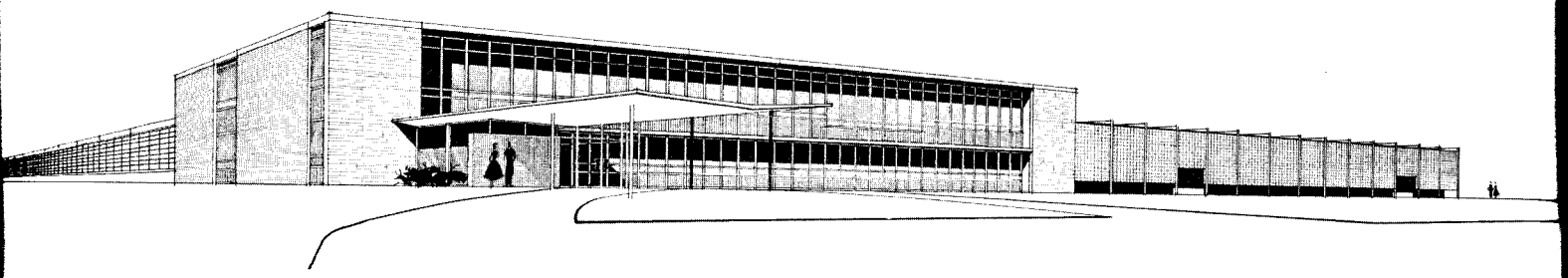
TABLE OF CONTENTS

INTRODUCTION

This catalog is designed to assist the engineer in planning antenna systems. Product descriptions are comprehensive, many new products are covered, and illustrations are freely employed. The engineering data section covers a number of new concepts, in addition to a wealth of general information.

New applications for ANDREW equipment occur constantly. When questions arise that are not covered in this catalog, please call or write and describe your problem. An ANDREW sales engineer will provide prompt, competent, and courteous service without obligation to you.

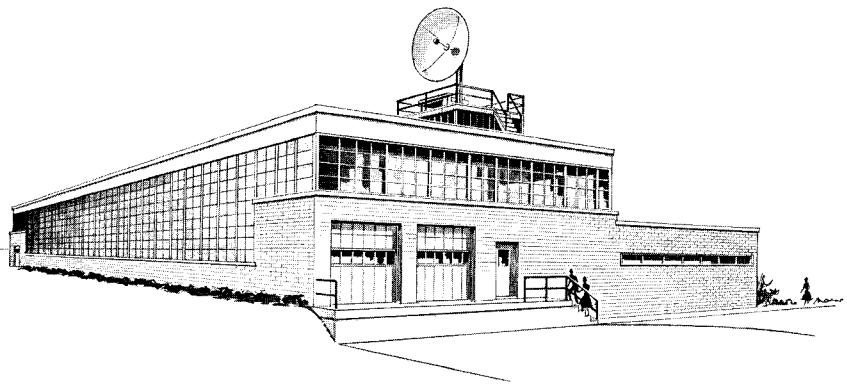
about ANDREW



Andrew CORPORATION
CHICAGO 19, ILLINOIS

Plant 27 miles southwest of Chicago (Route 7)

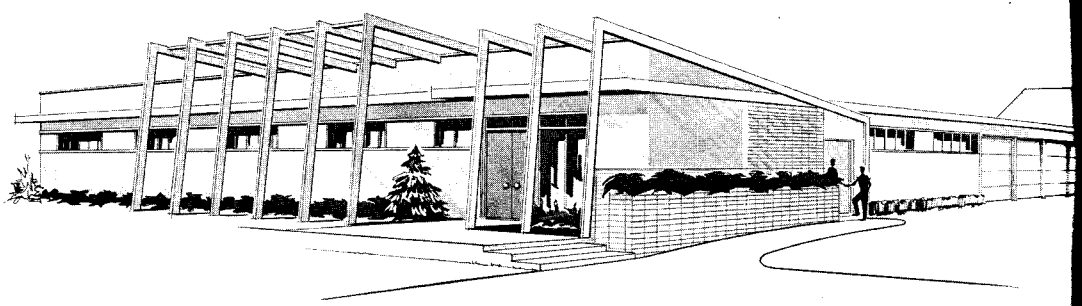
ANDREW has been serving the antenna field for 22 years. From a humble beginning as a basement workshop operation, it has advanced to its present dominant position and has become known and respected by radio engineers throughout the world. Its substantial accomplishments are built on a solid foundation—concentration of effort in a narrow field, dedication to high engineering standards, and sincerity and integrity in dealing with customers.



Andrew ANTENNA CORP., LTD.
WHITBY, ONTARIO, CANADA

25 miles east of Toronto (Highway 101)

A construction program presently under way will enlarge the Orland Park plant to 123,800 square feet, approximately twice its present size. In addition, plants are operated at Whitby, Ontario, Canada (near Toronto) by ANDREW ANTENNA CORPORATION, LTD., and at Claremont, California (near Los Angeles) by ANDREW CALIFORNIA CORPORATION. Regional sales offices are maintained near Boston and New York. Whether you require custom designed equipment or standard catalog items, the ANDREW facilities stand ready to serve you.



Andrew CALIFORNIA CORPORATION
CLAREMONT, CALIFORNIA

25 miles east of Los Angeles (Route 66)

and about OUR PRODUCTS

The ANDREW product line thoroughly covers the following two closely related fields:

1. Radio antennas for communications and broadcasting and—
2. Transmission lines used to interconnect radio frequency equipment.

Most of the antennas listed in this catalog are intended for application in the mobile radio services, microwave point-to-point communications, and radio broadcasting. In the mobile radio field and ground-to-air service, for example, we offer omnidirectional, directional, and gain antennas of various types to serve every conceivable need in fixed station installations, plus several high performance antennas for installation on vehicles. Our line includes a series of parabolic antennas of all sizes, covering all standard frequencies for point-to-point systems. For broadcasting service, there are FM transmitting antennas, low power VHF-TV transmitting antennas, and UHF-TV translator antennas. Specialized coaxial cables, transmission lines, and waveguides have been developed for most of these applications and are fully described in this catalog.

Our established policy is to serve a narrow market, and to serve it well. Everything we manufacture is related to the field of antennas and transmission lines. Within that field, we offer everything required for a complete system.

To describe the ANDREW product in purely physical terms is to overlook its most important ingredient. Simply stated, that ingredient is service. At ANDREW the flow of service often begins long before an order is entered, and frequently continues long after it is shipped. The process normally starts with engineering assistance in systems planning, and continues with preparation of installation drawings and recommended bills of material. In some cases, experimental studies are conducted to determine the feasibility of proposed solutions to unusual problems. After shipment immediate attention is given to field problems. When questions arise concerning installations, a factory engineer may be sent to provide on-the-spot assistance. In a highly technical field, service of this kind can mark the difference between successful and inadequate performance of an entire system.

ENGINEERING Know-How and Facilities . . .

MAKE THE DIFFERENCE IN ANDREW DESIGNS

Engineering facilities have long been a cornerstone of ANDREW leadership in the antenna field. These facilities are being continuously enlarged. Ovens, cold chambers, and vibration testing equipment permit environmental testing of equipment during the design phase. Important additions in instrumentation and test facilities cover the spectrum more completely than ever before.

ANDREW engineers have an accumulation of knowledge gained from many years of research and development experience devoted exclusively to antennas and transmission lines. Our engineers stay abreast of the field by participation in industry committees and professional societies. They make frequent trips to follow the performance of new designs and assist in application problems.

Design and development projects at frequencies up to 35 kmc have been successfully completed. Parabolic antennas up to 30 feet in diameter have been designed and produced. Coaxial transmission lines from $\frac{3}{8}$ inch to 9 inches in diameter are in regular production. Large waveguides up to $10\frac{1}{2}$ by 21 inches are standard items with ANDREW. High speed, high power waveguide switches, manually-operated receiver switching arrangements, and crane-operated high power 9-inch coaxial transfer switches give some idea of the breadth of our engineering design facilities.

PRINCIPAL LABORATORY EQUIPMENT

SIGNAL GENERATORS AND OSCILLATORS

Forty-nine signal generators and oscillators provide coverage through 36 kmc. In the more commonly used bands, several sets of equipment are maintained.

FREQUENCY METERS AND WAVEMETERS

Twenty-seven frequency meters and wavemeters cover the spectrum to 40 kmc.

BRIDGES

Eleven RF bridges include four HF and three VHF models.

SLOTTED LINES AND MAGIC TEES

Thirty-one coaxial slotted lines in standard sizes from $\frac{3}{8}$ inch to 9-inch diameters permit direct attachment of components under test without additional adaptors. Seventeen waveguide slotted sections and magic tees cover frequency ranges from 400 mc to 40 kmc.

Ten waveguide slotted sections in standard sizes from WR-975 to WR-4500 and four magic tees from WR-975 to WR-2100 permit extreme versatility in large waveguide work.

POWER SUPPLIES AND AMPLIFIERS

Eighteen power supplies and fourteen amplifiers permit simultaneous operation of a number of test setups. Twelve of the amplifiers are used in standing wave indication circuits.

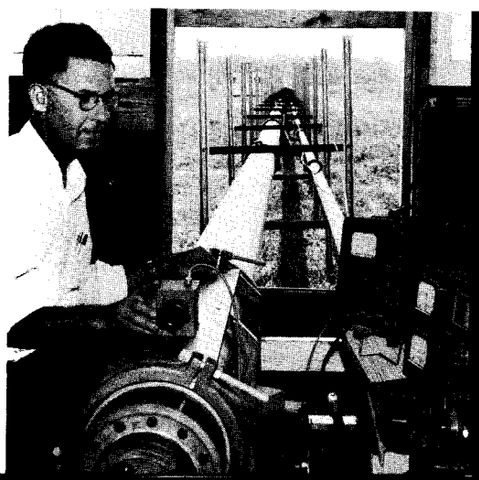
SWEEP MEASURING EQUIPMENT

Sweep measurements permit visual display and automatic recording of VSWR characteristics. Sweep setups are maintained for development and production testing in all of the commonly used frequency ranges.

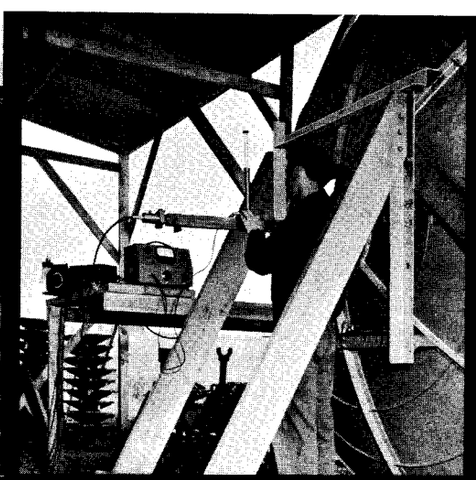
MISCELLANEOUS

Directional and dual directional couplers—distortion analyzers—field intensity meters—vacuum tube voltmeters—tube testers—attenuators—adaptors—terminations—vacuum, vibration and high voltage (140 kv peak) testers—polar and logarithmic rectangular recorders—oscilloscopes—variacs—transitions—tuners—sweep drives—ratio meters—receivers—Q meters—ovens—and freezers are some of the additional equipment in regular laboratory use at ANDREW.

DEVELOPMENT



TESTING



FIELD APPLICATION

PRODUCTION

Know-How and Facilities...

ASSURE TOP QUALITY AND PERFORMANCE

A measure of the production facilities is provided by the following recent production rates:

- 3 1/8-inch rigid coaxial lines—*75,000 feet per month*
- 9-inch coaxial line—*10,000 feet per month*
- WR-975 (9¾ inch) waveguide—*5,000 feet per month*
- Flexible and semi-flexible air dielectric cables—*100,000 feet per month*
- Fixed station communications antennas—*1,000 antennas per month*

In addition, seven to eight hundred catalog items are regularly manufactured and stocked.

PRINCIPAL MANUFACTURING EQUIPMENT

LATHES AND SCREW MACHINES

2	1″ South Bend screw machines	2	South Bend
3	1″ Hardinge screw machines	1	17″ American
1	8″ Sundstrand automatic	2	Logan
1	2½″ Gisholt turret	2	19″ LeBlonde
2	14″ LeBlonde stub	1	16″ South Bend

MILLING MACHINES

2	Gorton vertical	1	Cincinnati horizontal
2	Bridgeport vertical	2	bench mills
1	Brown & Sharpe horizontal		

DRILL PRESSES

1	12 spindle, NATCO ⅜″ capacity
10	single spindle, ⅜″ capacity
1	single spindle Fosdick, 1″ capacity

GRINDERS

1	Brown & Sharpe surface grinder
1	Brown & Sharpe tool grinder
1	Hisey Wolf 24″ disc grinder

WELDERS

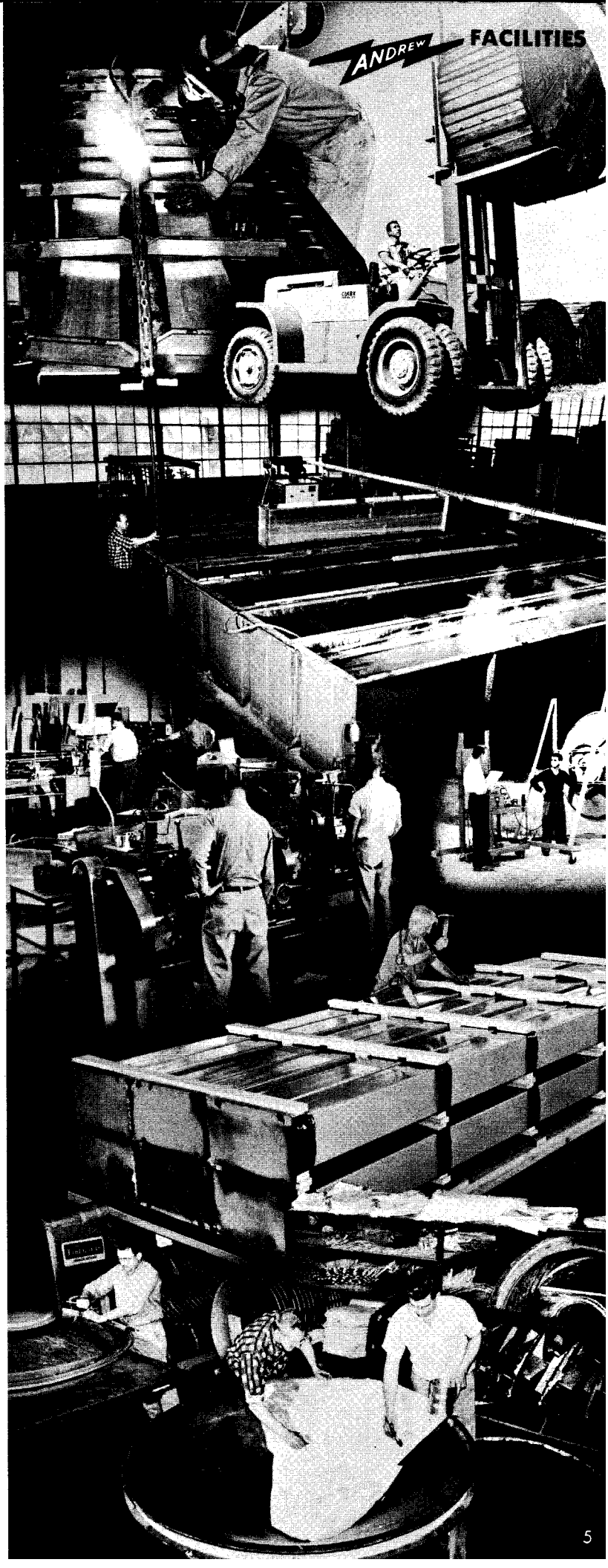
6	Midstate & Miller Heliarc welders
3	P&H consumable electrode Heliarc welders
3	Airco consumable electrode Heliarc welders
2	GE DC arc welders

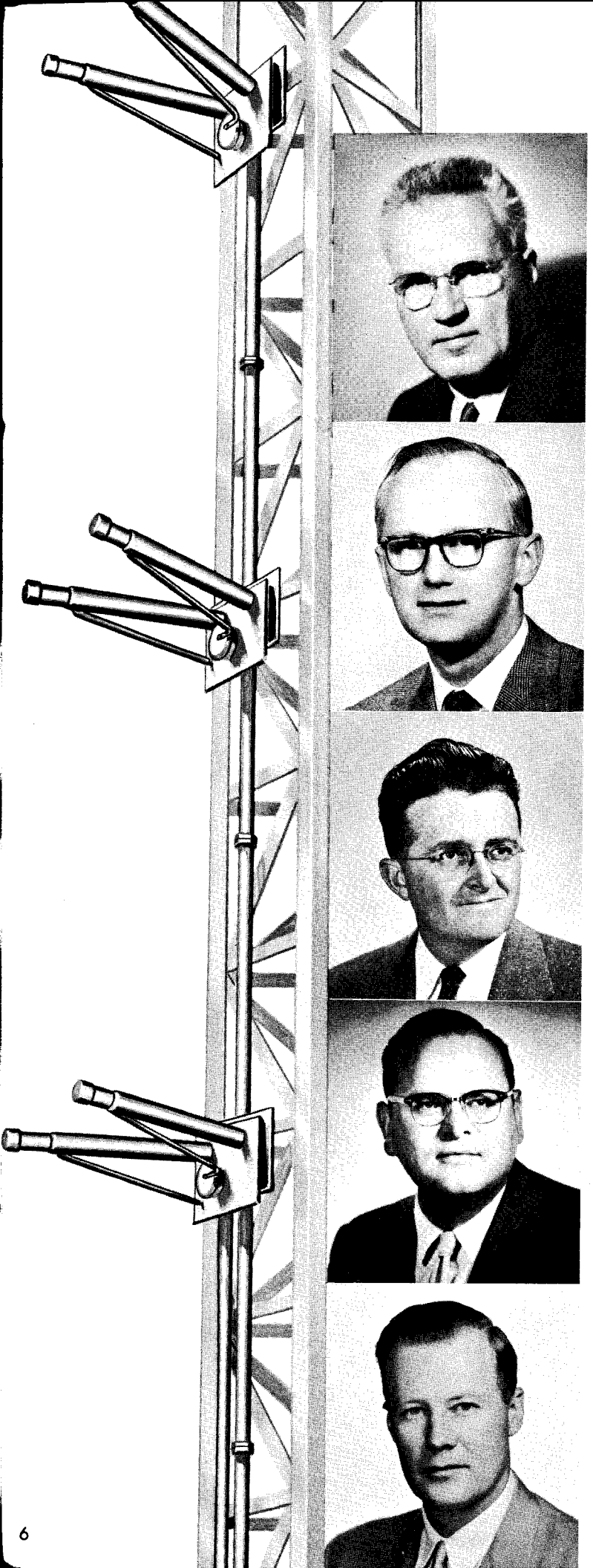
MISCELLANEOUS

6	3½x4x21-foot chromate conversion coating tanks
1	45-ton press

Spinning chucks in standard and special sizes and focal lengths.

Extensive specialized tooling has been developed for specific antenna and transmission line fabrication operations. Complete facilities are available for brazing, soldering, degreasing, etching, painting, and carpentry. Fiberglas and sheet metal fabricating tools are also maintained. Conventional tooling, such as punch presses, band saws, cutoff machines, lift trucks, overhead monorail, etc., are available for special and general purpose work.





ADMINISTRATIV

DR. VICTOR J. ANDREW, *Chairman of the Board of Directors*

Dr. Andrew, B.S., M.Sc., Ph.D., D.Sc., received bachelor's and doctor's degrees from Wooster College and master's and doctor's degrees from The University of Chicago. After a brief career at Westinghouse and as chief engineer of Doolittle Radio, he launched his own business as a manufacturer and engineering consultant, specializing in antenna equipment. He has guided this enterprise into what today is ANDREW CORPORATION. A participant in industry committees, he has been one of the leading forces for industry standardization. Dr. Andrew is a Fellow of the IRE.

C. RUSSELL COX, *Vice President and General Manager*

Mr. Cox, B.S., M.S., M.B.A., University of Chicago, has been with ANDREW since 1940, holding successive positions as chief engineer, sales manager, director of sales and engineering, and Vice President and General Manager. Mr. Cox is responsible for all operations of ANDREW CORPORATION and its affiliates. He has written numerous technical papers and has served on several industry committees. He is a director and vice president of the Technical Products Division of the EIA, and he is a senior member of the IRE.

JOHN S. BROWN, *Director of Engineering*

Mr. Brown, B.S., E.E., M.S., received his bachelor's and professional degrees from Purdue University and his master's degree from Northwestern University. After several years as a power engineer with a midwestern utility, he joined ANDREW as a design engineer. He became chief engineer in 1948 and Director of Engineering in 1952. Mr. Brown is the author of numerous papers on antennas and transmission lines. He is a member of Tau Beta Pi, Eta Kappa Nu, Sigma Xi, AIEE, senior member of the IRE, and a registered professional engineer in the State of Illinois.

ROBERT P. LAMONS, *Director of Marketing*

Mr. Lamons, B.S.E.E., Illinois Institute of Technology, has prior experience as an engineer for Western Electric Company, district manager for Link Radio, and regional sales manager for Federal Telephone and Radio Corporation. He joined ANDREW CORPORATION in 1945 as a design engineer and subsequently had assignments as eastern regional manager and sales manager. His present assignment includes responsibility for the operation of ANDREW CALIFORNIA CORPORATION of which he is Vice President. Mr. Lamons is a registered professional engineer in the State of Illinois and a senior member of the IRE.

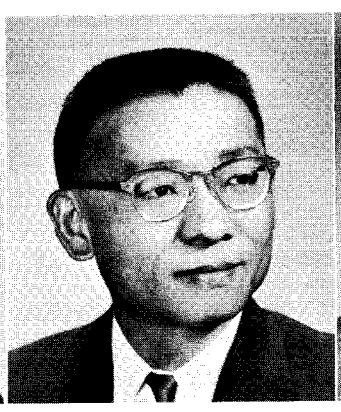
WILLIAM J. MORGAN, *Controller*

Mr. Morgan, B.S.B.A., Northwestern University, M.B.A., University of Chicago, is a certified public accountant. Prior to joining ANDREW, he was an accountant at Borg Warner, tax department manager at General Finance, and division controller at Great Lakes Carbon Corporation. He is a member of the National Association of Accountants and the Illinois Society of Certified Public Accountants.

AND TECHNICAL STAFF

Although the preceding pages will give the reader some idea of our physical facilities, the real strength of ANDREW CORPORATION lies in its people. More than 10% are graduate engineers. Although the company is but 22 years old, over 10% of the employees have ten years or more of service. The specialized knowledge and experience of our personnel are unique in the industry. Brief resumes of a few of our key personnel are presented here.

MARVEL W. SCHELDORF



DR. RICHARD F. H. YANG

ERNEST H. JOHNSON

HARRY HIRST

JOHN V. SCHNEIDER

MARVEL W. SCHELDORF, *Engineering Consultant*

Mr. Scheldorf, B.S.E.E., Iowa State College, has had considerable experience in development work with Radio Corporation of America, General Electric Company, and ANDREW CORPORATION. He is an inventor of renown, holds more than twenty patents on antennas and transmission lines, and has authored scores of technical papers. Mr. Scheldorf is a member of Eta Kappa Nu, AIEE, and a Fellow of the IRE.

DR. RICHARD F. H. YANG, *Chief, Antenna Design Group*

Dr. Yang, B.S., M.S., Ph.D., received his bachelor's degree from National Wu Han University and master's and doctor's degrees from the University of Illinois. At ANDREW, he specializes in mathematical analysis of complex antenna systems. He has made numerous significant contributions to the antenna art, inventing more than a score of important military and commercial antennas. He has authored several technical articles. Dr. Yang is a senior member of the IRE.

ERNEST H. JOHNSON, *Chief, Electrical Design Group*

Mr. Johnson, B.S.E.E., Illinois Institute of Technology, joined ANDREW as a design engineer, specializing in transmission lines. He has supervised the development of a series of broadband rigid coaxial lines and large high speed waveguide and coaxial switching devices. Mr. Johnson has been Electrical Design Chief since 1953.

HARRY HIRST, *Chief, Mechanical Design Group*

Mr. Hirst, B.S.M.E., Illinois Institute of Technology, joined ANDREW in 1946 as a mechanical engineer. He has had project management assignments and is currently responsible for the mechanical design of commercial, as well as military products. Mr. Hirst has had considerable field experience in the supervision of complex and difficult installations. His activities include the co-chairmanship of the Chicago section of ASME. Mr. Hirst became Mechanical Design Chief in 1953.

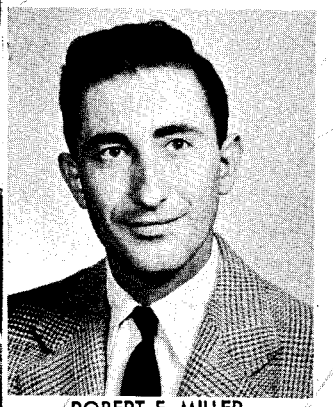
JOHN V. SCHNEIDER, *Quality Control Manager*

Mr. Schneider, B.S.M.E., University of Illinois, joined ANDREW in 1958. Prior to joining ANDREW, he was a mechanical design engineer at Ford Aircraft, and held supervisory quality control positions at Continental Can Company and at Rheem Manufacturing Company. Mr. Schneider is a senior member of American Society of Quality Control.

ADMINISTRATIVE AND TECHNICAL STAFF (Continued)

EVERT A. KOOYMAN

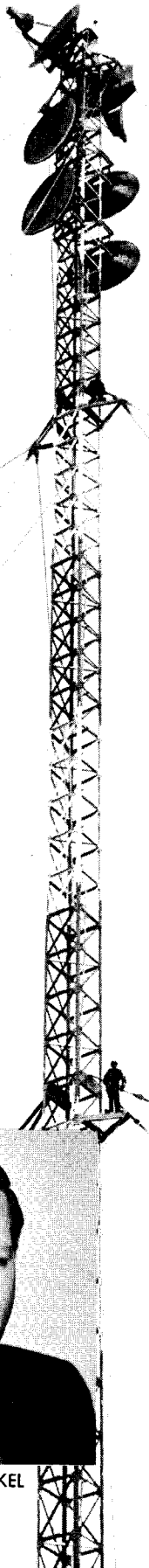
JOSEPH F. BELL



ROBERT F. MILLER

C. ROBERT LANE

ROBERT C. BICKEL



EVERT A. KOOYMAN, *Manufacturing Manager*

Mr. Kooyman has had extensive experience in manufact ing at the International Harvester Company, where he a division superintendent, and at the Davidson Manuf turing Company, as works manager. At ANDREW, M Kooyman is responsible for all manufacturing operatio His knowledge of tool design and manufacturing proces insures a smooth transition from design stage to finish product. Mr. Kooyman is a member of ASME.

JOSEPH F. BELL, *Plant Engineer*

Mr. Bell, B.S.M.E., Purdue University, joined ANDRE in 1956. He was formerly with Inland Steel Company, an industrial engineer, and Western Electric Company, a design engineer and cable production engineer. A ANDREW, he is responsible for engineering of plant equi ment, production, and maintenance. Mr. Bell is a memb of ASTE and ASPE.

ROBERT F. MILLER, *Production Coordinator*

Mr. Miller, B.M.E., University of Detroit, joined ANDRE in 1952 as a design engineer. He was formerly with Inter national Harvester as a mechanical engineer. Mr. Miller' past assignments have included mechanical design an project management. He is currently responsible for co ordinating contract and standard product manufacturing Mr. Miller is a member of ASME.

C. ROBERT LANE, *Eastern Regional Manager*

Mr. Lane, B.S.E.E., University of California, M.B.A., Boston University, was formerly a project engineer with General Communications Company. Prior to joining ANDREW, he was commercial sales manager for Gabriel Electronics. He has had wide experience in the microwave communications field. Mr. Lane is a member of Eta Kappa Nu, Tau Beta Pi, and a senior member of the IRE.

ROBERT C. BICKEL, *Marketing Manager*

Mr. Bickel, B.S.E.E., Illinois Institute of Technology, was formerly with Commonwealth Edison Company. He joined ANDREW in 1946 and has held positions as sales engineer; manager, ANDREW CALIFORNIA CORPORATION; eastern regional manager; and sales manager. He became Marketing Manager in 1958. Mr. Bickel has served on several EIA committees and is a member of the IRE.

CANADA

ANDREW ANTENNA CORPORATION, LTD.

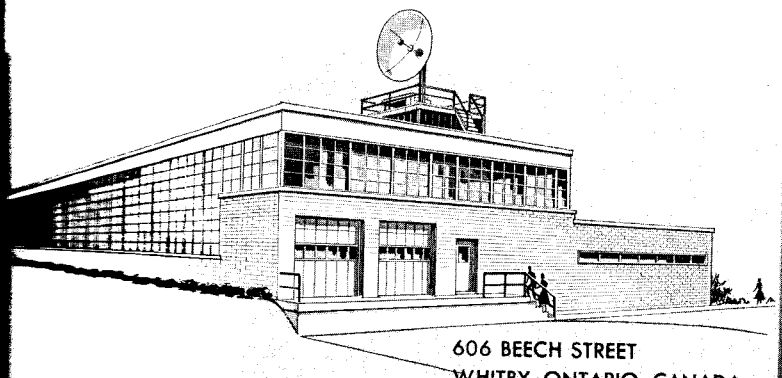
was organized in 1953, to provide better service to ANDREW customers in Canada. Initial activities included sales and warehousing. Manufacturing facilities were added in 1954. Present manufacturing operations include sheet metal work, machining, welding, brazing, and fabricating.

A strong and versatile group of subcontractors has been developed to augment the AACL facilities, when required. AACL manufacturers most of the ANDREW products commonly used in Canada. In addition, AACL performs considerable prime contract work for the Canadian Government and subcontract work for principal Canadian electronics manufacturers.

ANDREW ANTENNA CORPORATION, LTD. is operated by Canadian management.

RICHARD P. MATTHEWS, *Manager*

Mr. Matthews, B.A. (Math & Phys), B.E. (Eng. Phys.), University of Saskatchewan, joined ANDREW Antenna Corporation, Ltd., in December 1954. Previously, he was chief engineer with Federal Electric Mfg. Co., Ltd. (I.T.&T.) and project engineer with RCA Victor Co., Ltd., both in Montreal. Mr. Matthews is a registered professional engineer in the Province of Ontario, a senior member of the IRE, and a member of AIEE.



606 BEECH STREET
WHITBY, ONTARIO, CANADA

RICHARD P. MATTHEWS

CALIFORNIA

ANDREW CALIFORNIA CORPORATION

was incorporated in 1951 to serve the western states. Initial activities were confined to sales and warehousing; however, in 1955, engineering and special manufacturing facilities were added. Further expansion of both these facilities took place in 1957.

Current activity includes design and fabrication of special cable assemblies and antenna systems, as well as same-day shipment on standard antennas and components and installation of antennas and antenna masts. The factory is equipped for brazing, machining, and fabricating. Complete instrumentation for VHF, UHF, and microwave and a newly installed antenna pattern range permit complete electrical testing.

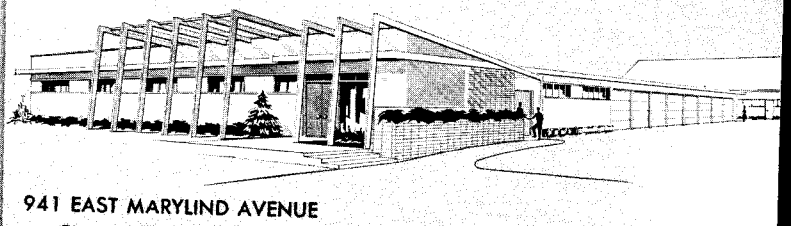
At ANDREW CALIFORNIA, particular emphasis has been placed on ground-to-air and telemetry antennas. A number of standard items have been developed for these applications.

JEFF D. MONTGOMERY, JR., *Manager*

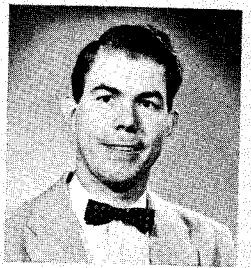
Mr. Montgomery, B.S.E.E., Illinois Institute of Technology, has been with ANDREW since 1953. Prior to his present assignment, he served in the engineering department as a design engineer, specializing in transmission lines, and as a sales engineer in the Chicago office. Mr. Montgomery is a member of the IRE.

ALFRED G. HOLTUM, *Chief Engineer*

Mr. Holtum, B.A. Mathematics, New York University, M.S.E.E., Rutgers University, was with the Signal Corps Engineering Laboratories for eight years and with the Army Electronic Proving Grounds for three years. During this period, he was actively engaged in the design and evaluation of both ground and airborne antennas. He joined ANDREW in 1957. Mr. Holtum is a senior member of the IRE and a member of Sigma Xi.



941 EAST MARYLIND AVENUE
CLAREMONT, CALIFORNIA

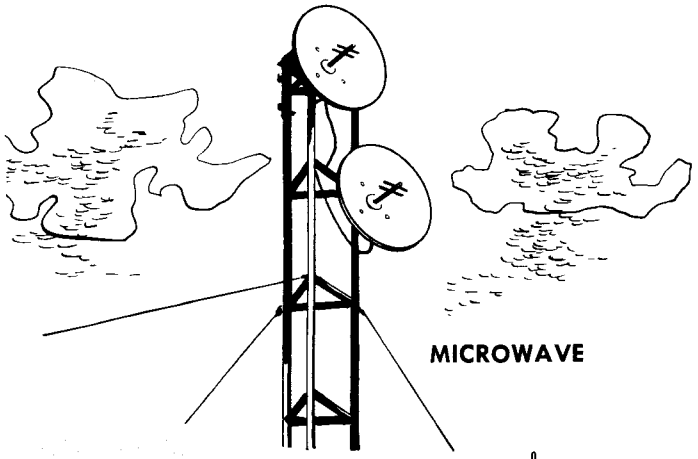


JEFF D. MONTGOMERY, Jr.

ALFRED G. HOLTUM

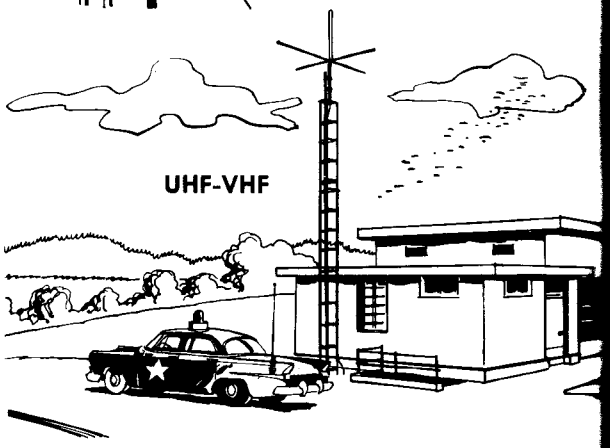
ANTENNAS

ANDREW is synonymous with antennas. Twenty-two years of engineering leadership in this field have resulted in an outstanding record of design innovation and professional recognition. The selection chart below tabulates currently available standard designs. The catalog section following describes each of these designs in detail and, in addition, covers a few of the special antennas recently produced.



MICROWAVE

The selection chart below is arranged by frequency bands. Note that there is some overlap between these bands on certain models. The following catalog section is arranged by basic antenna types. Refer to the chart for the page number covering the frequency, service, coverage, and antenna type you require.



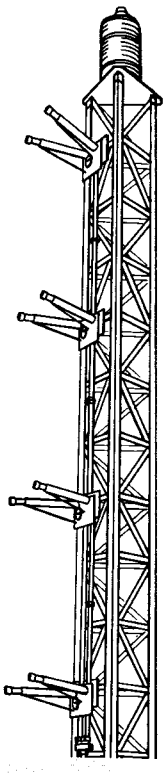
UHF-VHF

ANTENNA SELECTION CHART

Frequency	Service	Coverage	Antenna Type	Page No.
25-54 mc	Two-way Radio Base Station	Omnidirectional	Folded UNIPOLE	22-24
			High Gain Collinear Array	27
		Unidirectional	Cardioid	25
			Corner Reflector	28-31
		Bidirectional	Bidirectional	26
54-88 mc	Low Power TV	Omnidirectional Unidirectional	Corner Reflector Array	42
72-76 mc	Operational Fixed	Omnidirectional	Folded UNIPOLE	22-24
		Unidirectional	Corner Reflector	28-31
88-108 mc	FM Broadcast	Omnidirectional	Multi-V	40-41
108-500 mc	Ground-to-Air	Unidirectional	Helical	38
108-144 mc	Ground-to-Air	Omnidirectional	Folded UNIPOLE	22-24
144-174 mc	Two-way Radio Base Station	Omnidirectional	Folded UNIPOLE	22-24
			High Gain Collinear Array	34-37
		Unidirectional	Corner Reflector	28-31
			Cardioid	25
		Bidirectional	Bidirectional	26
			Corner Reflector	28-31
174-216 mc	Low Power TV	Omnidirectional	Corner Reflector Array	42
216-420 mc	Ground-to-Air	Omnidirectional	Discone	38
		Unidirectional	Corner Reflector	38
			Helical	38-39
400-420 mc	Ground-to-Air	Omnidirectional	High Gain Collinear Array	34-37
		Unidirectional	Corner Reflector	28-31
450-470 mc	Two-way Radio Base Station	Omnidirectional	High Gain Collinear Array	34-37
			1.5 db Gain	33
		Unidirectional	Corner Reflector	28-31
			Yagi	32
	Mobile	Omnidirectional	Mobile Gain	37
812-890 mc	TV Translator	Unidirectional	Parabolic	42
890-13,200 mc	Operational Fixed	Unidirectional	Parabolic	11-21

See Page 43 for Transmission Line Selection Chart

BROADCAST
FM-TV



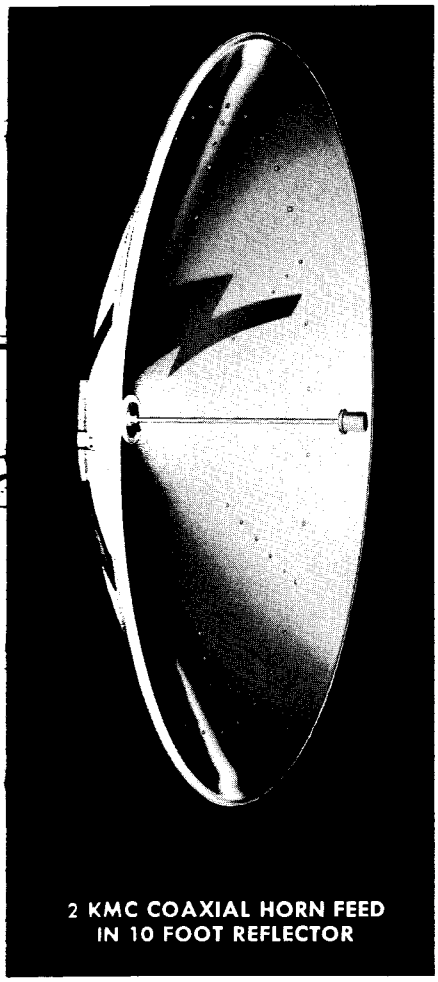
Auxiliary equipment such as impedance matching equipment, diplexers, duplexers, switching systems, and transmission lines are also offered. See the table of contents on page 1.

Special antennas are available for many requirements not covered by one of our standard units. In many cases, we have already designed and produced an antenna conforming to your needs; in other cases, modifications of one of our present designs may fill your requirement. In addition, we are well equipped to create entirely new designs for many applications.

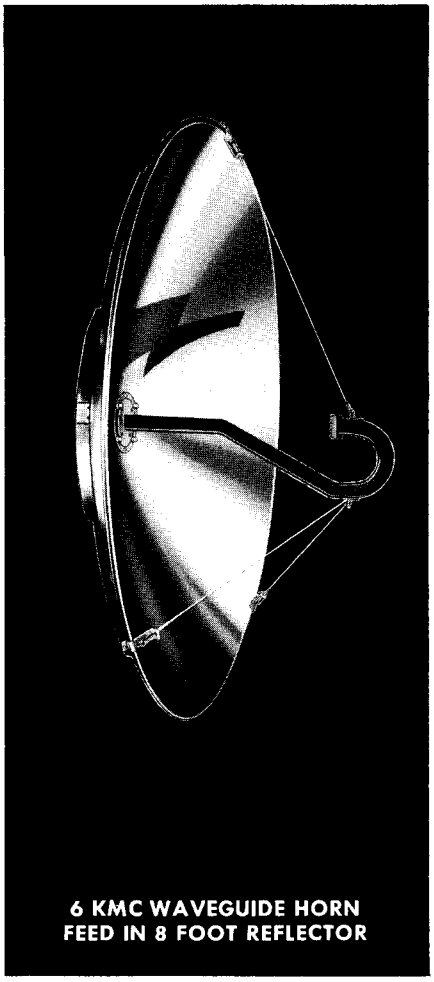
Systems and coverage problems are discussed in further detail in the Engineering Data Section.

MICROWAVE ANTENNAS

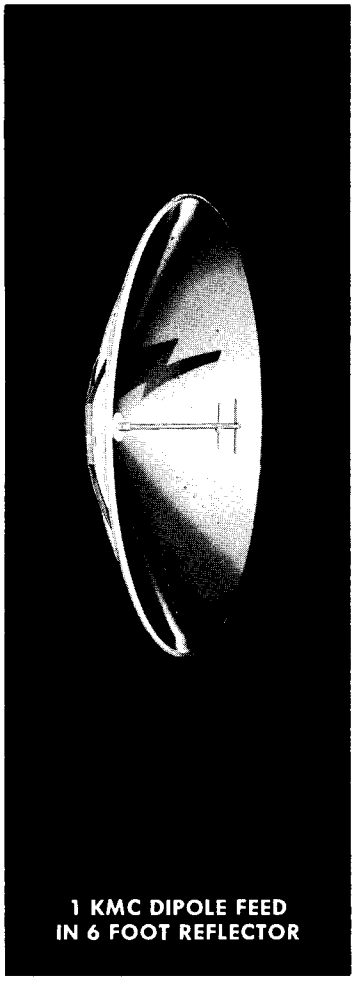
Standard models are stocked for immediate shipment. Special models are promptly produced. Custom models are designed and fabricated to order.



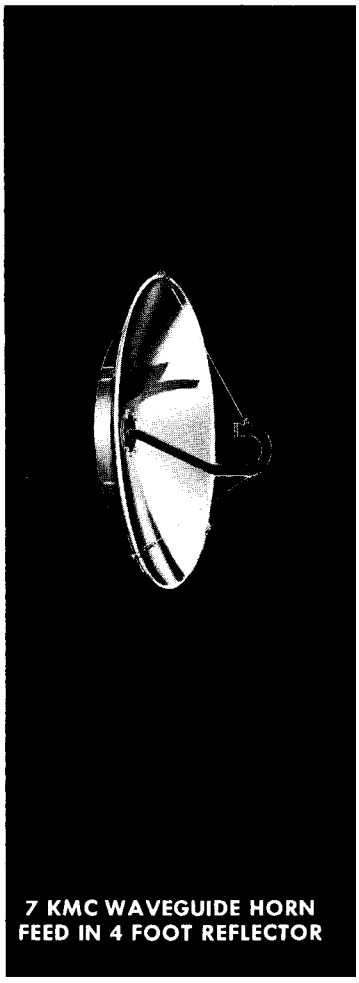
2 KMC COAXIAL HORN FEED IN 10 FOOT REFLECTOR



6 KMC WAVEGUIDE HORN FEED IN 8 FOOT REFLECTOR



1 KMC DIPOLE FEED IN 6 FOOT REFLECTOR



7 KMC WAVEGUIDE HORN FEED IN 4 FOOT REFLECTOR

DESIGN

In the designs shown in this section, careful attention has been paid to system requirements. Special emphasis has been given to control of side and back lobes and polarization discrimination. Engineers planning microwave systems will find that ANDREW guaranteed specifications make their task easier and the results more reliable.

REFLECTORS

Spun aluminum reflectors are used on all regular production antennas. The solid surface and extremely close tolerances insure higher gain, better control of side lobes, and greater polarization discrimination than is possible with mesh, grid, or other types of reflecting surfaces. Reflector size is determined by gain requirements. For mechanical and electrical characteristics, refer to pages 12 & 13.

FEEDS

Operating frequency determines the type of feed supplied for standard antennas. All feeds can be installed or removed from the rear of the reflector. All feeds are pressure tight and have provision for continuous polarization adjustment. See page 14 for further details on standard feeds.

ACCESSORIES

Mountings are covered on page 17. Deicing equipment is shown on page 18 and 19.

SPECIAL FEATURES

Special features regularly supplied include mesh reflectors, special frequencies, spot tuning, high power models, special sizes, extra heavy wind loading, and many others. Your inquiries are invited.

GUARANTEED MICROWAVE ANTENNA SPECIFICATIONS

Every ANDREW parabolic antenna is guaranteed to meet these specifications. Any antenna found not to meet the specifications will be replaced at no charge, in accordance with our regular warranty. Since these figures are guaranteed, they have been derated to account for production variations and to cover entire frequency ranges. Individual units at specific frequencies are better than the figures shown. In critical cases, consult your ANDREW sales engineer.

Each type number listed in the table below includes one of the standard feeds described on page 14 and a reflector assembly as indicated. Mounts and heaters or radomes are not included and should be ordered separately. These accessories are fully described on the following pages.

Frequency, mc	Type No.	Reflector Diameter, Feet	Gain,* db	Input Connection	Half Power Beam-width,† degrees	First Side‡ Lobe, db	Wide Angle Radiation**	Front to Back§ Ratio, db	Maximum VSWR
UHF-TV	21202††	6	21.0	7/8" EIA	15.0	−20	−21	25.0	1.1▲
890-960	P4-9	4	18.9	7/8" EIA	18.6	−18	−19	23.0	1.3
	P6-9	6	22.4	7/8" EIA	12.4	−19	−22	30.0	1.3
	P10-9	10	26.9	7/8" EIA	7.4	−20	−24	35.0	1.3
	PX10-9 (DUAL POLARIZATION)	10	26.0	7/8" EIA	7.6	−18	−24	32.0	1.1▲
1700-2400	PX6-17 (DUAL POLARIZATION)	6	28.6	7/8" EIA	6.2	−20	−31	34.0	1.1▲
1700-1850	P4-17	4	24.2	7/8" EIA	10.0	−17	−28	29.0	1.3
2100-2300	P6-17	6	28.0	7/8" EIA	6.2	−18	−31	35.0	1.3
	P10-17	10	32.3	7/8" EIA	3.2	−19	−34	41.5	1.3
1850-2110	P4-18	4	25.4	7/8" EIA	9.2	−17	−28	29.0	1.3
	P6-18	6	28.8	7/8" EIA	6.0	−18	−31	37.5	1.3
	P10-18	10	33.2	7/8" EIA	3.0	−19	−34	41.5	1.3
2450-2700	P4-24	4	28.4	7/8" EIA	6.5	−19	−27	33.0	1.3
	P6-24	6	31.2	7/8" EIA	4.5	−20	−33	38.0	1.3
	P10-24	10	35.6	7/8" EIA	2.7	−21	−37	42.0	1.3
3700-4200	P8-37	8	37.1	Choke flange for WR-229	2.2	−22	−36	44.0	1.15
	P10-37	10	39.0		1.8	−22	−37	45.0	1.15
5925-6525	P4-59	4	35.2	UG-343A/U broadband choke flange	2.8	−20	−36	40.0	1.1
	P6-59	6	38.7		1.9	−21	−37	45.0	1.1
	P8-59	8	41.0		1.4	−22	−38	45.0	1.1
	P10-59	10	43.1		1.1	−22	−40	45.0	1.1
6525-7125	P4-65	4	35.9	UG-343A/U broadband choke flange	2.5	−20	−36	40.0	1.1
	P6-65	6	39.4		1.7	−21	−38	47.0	1.1
	P8-65	8	41.9		1.3	−22	−38	47.0	1.1
	P10-65	10	43.9		1.0	−22	−42	42.0	1.1
7125-7425	P4-71	4	36.4	UG-343A/U broadband choke flange	2.4	−20	−36	40.0	1.1
	P6-71	6	40.0		1.6	−21	−40	47.0	1.1
	P8-71	8	42.5		1.2	−22	−41	47.0	1.1
	P10-71	10	44.4		0.95	−22	−43	48.0	1.1
10700-11700	P4-107	4	40.0	WR-90 choke flange	1.6	−20	−36	40.0	1.15
12700-13200	P4-127	4	41.5	WR-62 choke flange	1.35	−20	−36	40.0	1.15

*Gain is db over isotropic radiator at center of band. For gain over half-wave dipole, subtract 2.15 db.
†Measured between the two half-power points of main beam.
**Ratio of main lobe to largest lobe which is more than plus or minus 45 degrees from main beam.
‡Relative to main beam.
††Specify channel number, see page 42.
§180 degrees plus or minus 5 degrees.
▲Spot tuned.

All antennas listed in the table, except those otherwise noted, have broadband feeds for stability of operation under severe environmental conditions. The VSWR shown in each case is the maximum in the entire frequency range listed.

For narrow band critical VSWR applications, antennas for use below 2700 mc can be spot tuned for 1.05 VSWR at a specific frequency at a slight extra charge. Order PR4, PR6, or PR10, instead of P4, P6, or P10, and specify spot tuning and frequency on your order.

For antennas which are fed by coaxial cable, a stock program based on 10-foot incremental lengths assures quick delivery on cables, as well as antennas and accessories. See pages 44 to 48 for details. Dehydrators for pressurizing cables and antennas are shown on pages 68 and 69.

Tower Mount	Roof Mount	Max. Safe Wind Pressure psf (flat)▲▲ No Ice	Max. Safe Wind Pressure psf (flat)▲▲ ½" Ice	Thrust at Wind of 30 psf (flat) lbs.▲▲▲ No Ice	Thrust at Wind of 30 psf (flat) lbs.▲▲▲ ½" Ice	Weight Lbs. Net	Weight Lbs. Packed	Volume Packed Cu. Ft.	Type No.	Frequency, mc
T4	M4	59	57	1070	1100	110	290	54	21202††	**UHF-TV**
T4	M4	62	60	480	500	50	70	19.5	P4-9	
T4	M4	59	57	1070	1100	110	290	54	P6-9	**890-960**
T8A	M8	55	53	2990	3050	225	800	340	P10-9	
T8A	M8	55	53	2990	3050	225	800	340	PX10-9 (DUAL POLARIZATION)	
T4	M4	59	57	1070	1100	110	290	54	PX6-17 (DUAL POLARIZATION)	**1700-2400**
T4	M4	62	60	480	500	50	70	19.5	P4-17	**1700-1850**
T4	M4	59	57	1070	1100	110	290	54	P6-17	**2100-2300**
T8A	M8	55	53	2990	3050	250	825	340	P10-17	
T4	M4	62	60	480	500	50	70	19.5	P4-18	
T4	M4	59	57	1070	1100	110	290	54	P6-18	**1850-2110**
T8A	M8	55	53	2990	3050	250	825	340	P10-18	
T4	M4	62	60	480	500	50	70	19.5	P4-24	
T4	M4	59	57	1070	1100	110	290	54	P6-24	**2450-2700**
T8A	M8	55	53	2990	3050	250	825	340	P10-24	
T8A	M8	57	57	1910	1950	200	470	150	P8-37	**3700-4200**
T8A	M8	55	53	2990	3050	250	825	340	P10-37	
T4	M4	62	60	480	500	44	64	19.5	P4-59	
T4	M4	59	57	1070	1100	100	280	54	P6-59	**5925-6525**
T8A	M8	57	56	1910	1950	180	450	150	P8-59	
T8A	M8	55	53	2990	3050	225	800	340	P10-59	
T4	M4	62	60	480	500	44	65	19.5	P4-65	
T4	M4	59	57	1070	1100	100	280	54	P6-65	**6525-7125**
T8A	M8	57	56	1910	1950	180	450	150	P8-65	
T8A	M8	55	53	2990	3050	225	800	340	P10-65	
T4	M4	62	60	480	500	44	64	19.5	P4-71	
T4	M4	59	57	1070	1100	100	280	54	P6-71	**7125-7425**
T8A	M8	57	56	1910	1950	180	450	150	P8-71	
T8A	M8	55	53	2990	3050	225	800	340	P10-71	
T4	M4	62	60	480	500	44	64	19.5	P4-107	**10700-11700**
T4	M4	62	60	480	500	44	64	19.5	P4-127	**12700-13200**

▲▲See Engineering Data Section for equivalent wind velocities and interpretation of data.
▲▲▲Determines required strength of supporting structure.

STANDARD MICROWAVE ANTENNA FEEDS

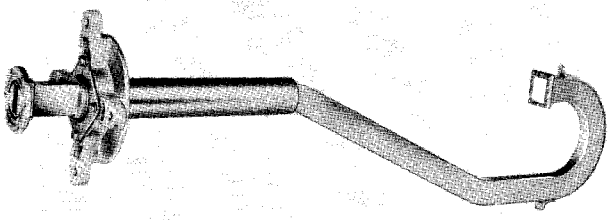
ANDREW parabolic antennas use one of the following standard feeds, as determined by the operating frequency. The table on page 12 shows the various combinations of frequency, reflector size, and gain.

New models are constantly being created as additional frequency bands come into use.

All the standard feeds are pressure tight at 10 pounds per square inch and include a gas port with $\frac{1}{8}$" standard pipe plug. Feeds are installed from the rear of the reflector. All feeds have provisions for continuous polarization adjustment and include horizontal and vertical indexing.

Feeds with coaxial input connections include a $\frac{7}{8}$" EIA miter elbow to permit convenient connection to the transmission line.

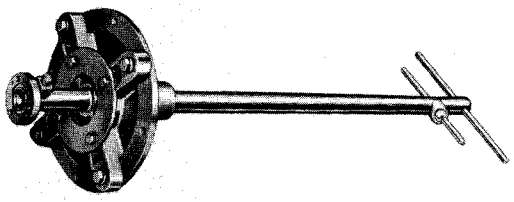
WAVE-GUIDE HORN.
3700-13,200 mc



A rectangular horn is directly fed by an accurately formed section of waveguide. The flared horn end, designed for optimum reflector illumination, is pressure sealed. The shape and position of this feed provide protection against weather, minimizing the effects of rain, ice, and snow on electrical performance. Guy wires mechanically stabilize the waveguide feeds.

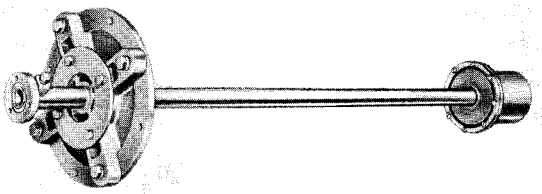
Models in the 5925-7425 mc ranges use WR-137 waveguide with a broadband choke flange input. A choke flange also terminates the WR-229 waveguide used in the 3700-4200 mc range.

DIPOLE
400-960 mc



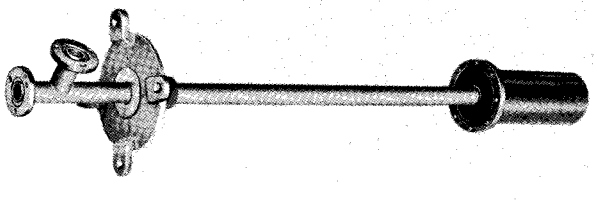
This coaxial fed dipole-reflector is well suited for operation in the 890-960 mc band and at lower frequencies. The pressure tight $\frac{7}{8}$" coaxial feed line provides dipole-reflector support. The input connection is a $\frac{7}{8}$" EIA flange.

COAX HORN
1700-2700

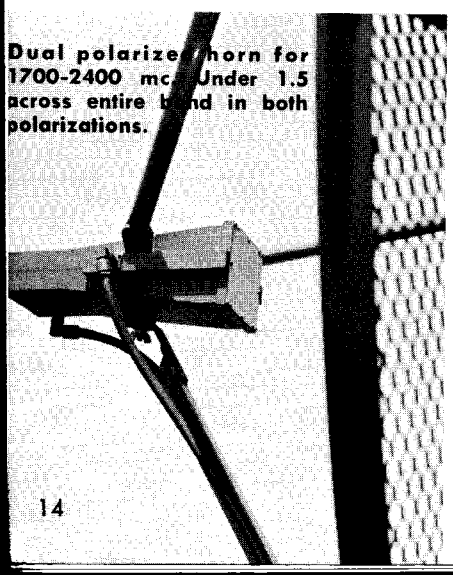


Mechanically simple, the slot excited coaxial horn utilizes the feed line as the horn support. The feed end is enclosed by a pressure-tight metal radome, covered with a plastic window which is bolted in place and pressure sealed with "O" rings. A $\frac{7}{8}$" EIA flange terminates the coaxial horn.

TRIAXI HORN.
1700-2700 n



This horn provides the effectiveness and diversity of two separate antennas, while using a single reflector. Dual feed has two channels, polarized at 90 degrees with respect to each other. Isolation between inputs is 35 db or higher. This feed consists essentially of two coaxial horns. Input connections to both polarizations are $\frac{7}{8}$" EIA flanges.



Dual polarized horn for 1700-2400 mc. Under 1.5 across entire band in both polarizations.

SPECIAL PARABOLIC ANTENNAS AND FEEDS

For applications outside the scope of the standard models, ANDREW manufactures hundreds of special antennas per year to meet individual requirements.

ANDREW engineers have a large storehouse of special designs to draw upon in the solution of unusual problems. Completely new designs are also created, either on a contract basis or in connection with production orders.

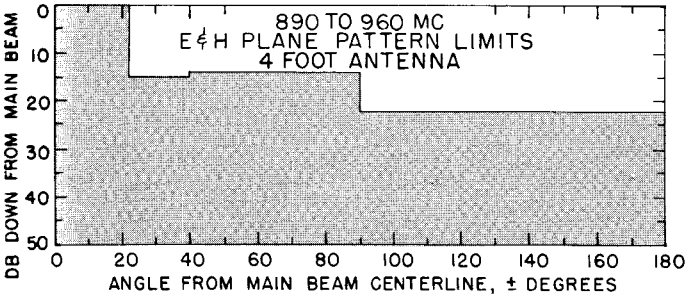
Unexcelled physical facilities, a large engineering staff, and instrumentation covering virtually the entire spectrum, enable ANDREW to accept almost any parabolic antenna project, regardless of size and complexity.

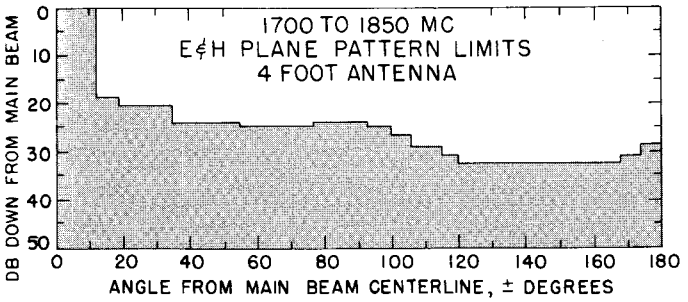
Rectangular horn for UHF scatter service has 30% bandwidth under 1.10. Horn is fed by ANDREW WR-975 waveguide.

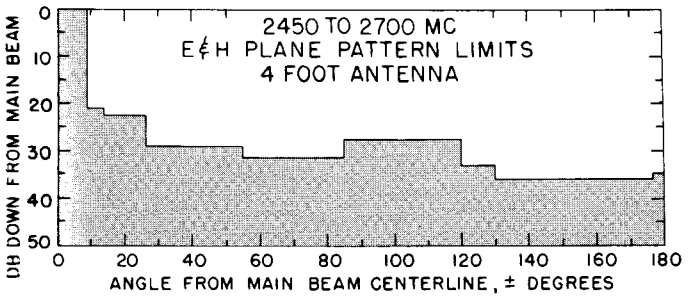
MICROWAVE ANTENNA PATTERNS

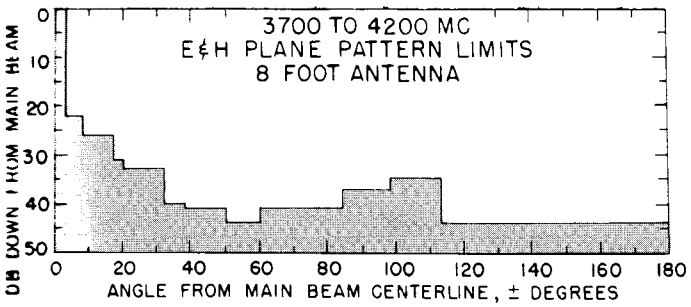
In the past, antenna manufacturers have published typical patterns measured in one or both principal planes. Here, to the best of our knowledge, is the first set of guaranteed pattern limits ever published. Every production antenna manufactured by ANDREW is guaranteed to have patterns equal to or better than those shown below.

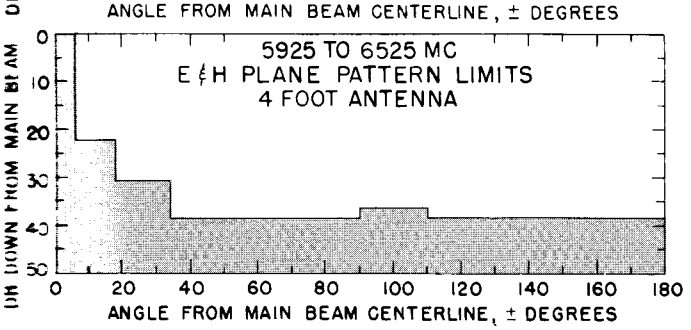
Patterns do not exceed the limits shown below at any azimuth angle in either principal plane. For clarity, only certain models are shown. At higher frequencies, the 4-foot antenna patterns are shown. At a given frequency, patterns improve as antenna size is increased. Large scale guaranteed patterns are available for all standard antennas.





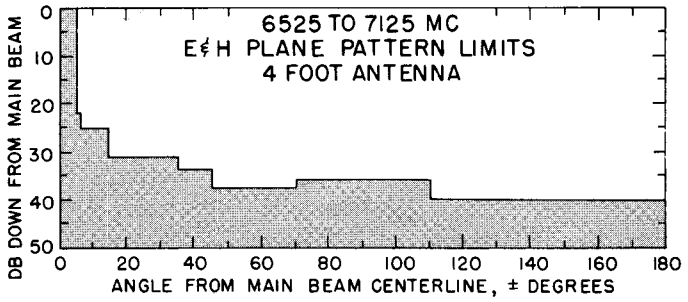


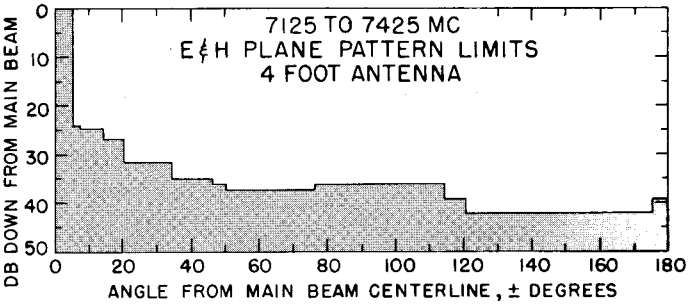


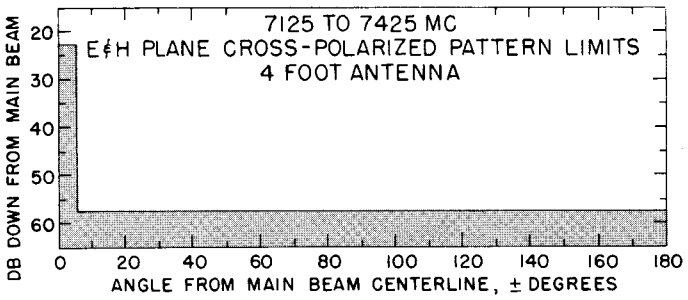


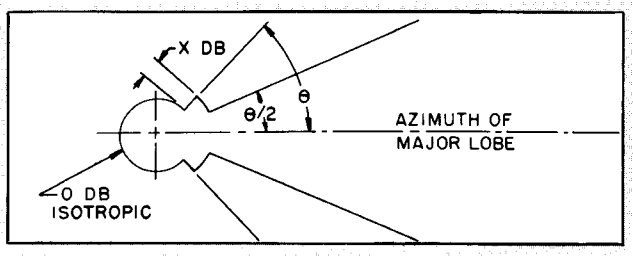
CROSS POLARIZATION

The operation of many systems has been hampered by response to spurious, cross polarized signals. Polarization discrimination is a fundamental design objective at ANDREW. A cross polarized pattern for 7125-7425 mc is shown below. Cross polarized pattern measurements are available on all standard ANDREW parabolic antennas.









EIA "KEYHOLE" PATTERN

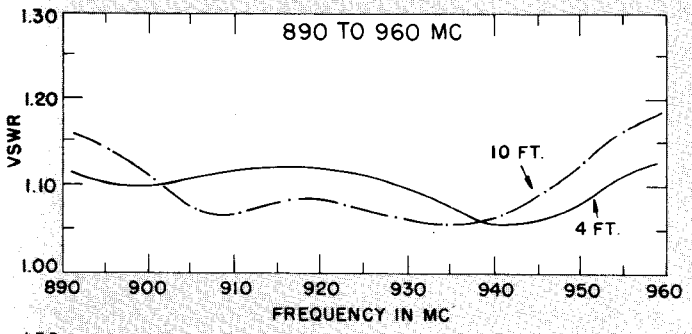
The EIA has standardized microwave systems units and terms to provide the user with a better basis for understanding the microwave communication process. The antenna system concept which has been standardized is based on the "keyhole" pattern.

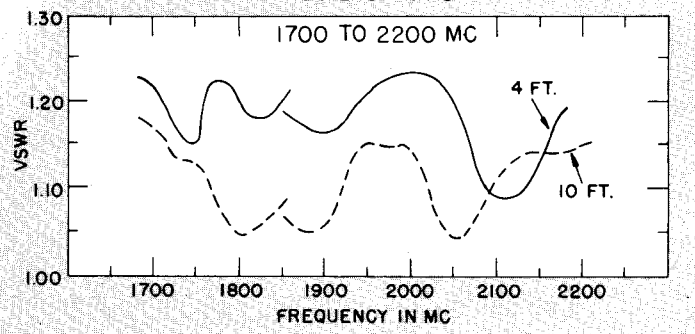
This pattern is named for its shape. The angle θ is equal to 30 degrees divided by the frequency in kmc and X db is equal to $2 + 17 \log_{10} F$ (kmc). The maximum power density in the main beam is obtained with a 10-foot antenna and maximum power transmitter. If radiation exceeds the limit shown, it is reduced to the limit by reduction of transmitter output.

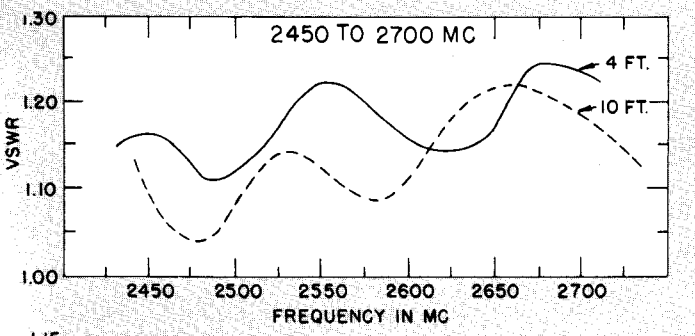
All standard ANDREW parabolic antennas are within FCC specifications, as well as EIA recommendations.

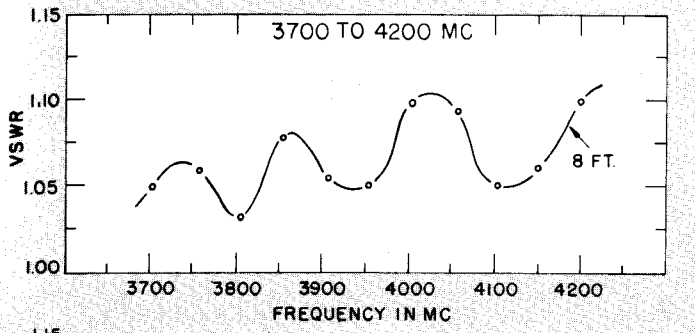
MEASURED VSWR CURVES

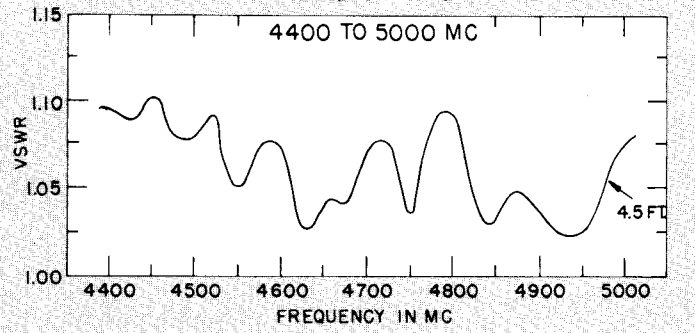
The VSWR curves shown below are typical and are plotted from data measured on production antennas. For guaranteed maximum VSWR values, see the specification table on pages 12 and 13. The antennas covered by these measurements were each designed for a specific frequency range. However, in many cases, these antennas can be used over a greater frequency range with only slight degradation of VSWR. Measurements covering greater bandwidths are available on most of the antennas shown. Feeds are serially numbered, and measured VSWR is recorded for each individual unit. For greater clarity, VSWR is shown for 4 and 10-foot antennas only. In general, the VSWR curves for 6 and 8-foot antennas lie in the area between the curves shown for 4 and 10-foot antennas.

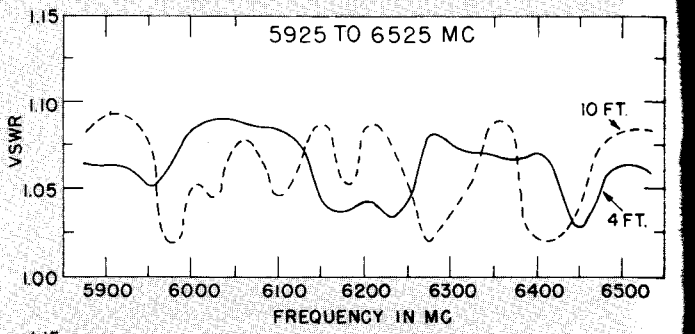


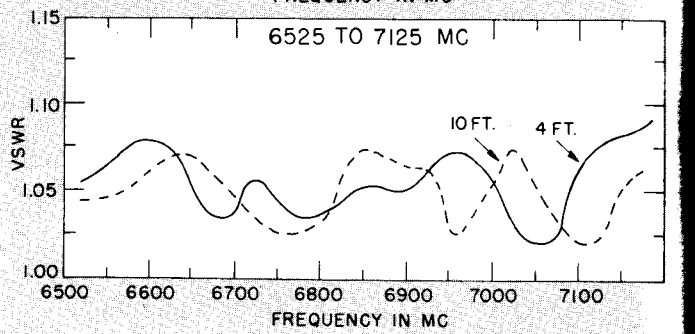


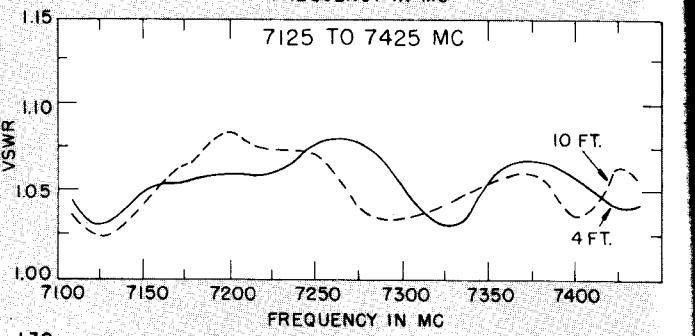


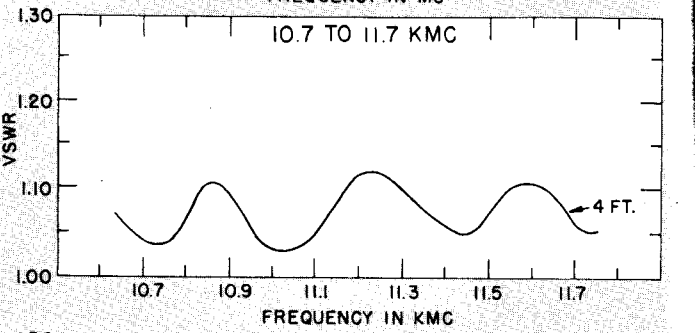


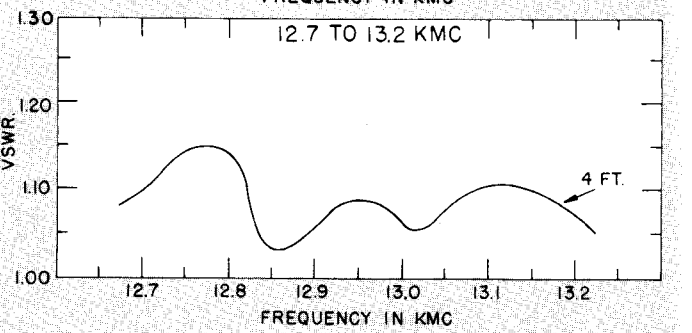












MICROWAVE ANTENNA MOUNTS

This page shows the standard ANDREW mounting and adjustment features. Special mountings are available to meet installation problems outside the scope of the standard mounts.

All mounts shown adjust plus or minus 5 degrees in both azimuth and elevation. Threaded studs provide smooth, positive motion, ease of alignment, and keep the antennas physically secure during adjustment. All studs not of stainless steel are zinc plated and further treated for corrosion resistance. Frames and brackets are galvanized after fabrication.

FOUR AND SIX-FOOT ANTENNA MOUNTS

The 4 and 6-foot antennas have identical mounting rings on the back. The rings have seven holes to allow for either 3 point or 4 point mounting. The T4 mount for towers and the M4 mount for horizontal surfaces each fit this mounting ring, using 3 point attachment.

The T4 mount, shown at the right, fits 4″ standard pipe and provides independent adjustment of elevation and azimuth.

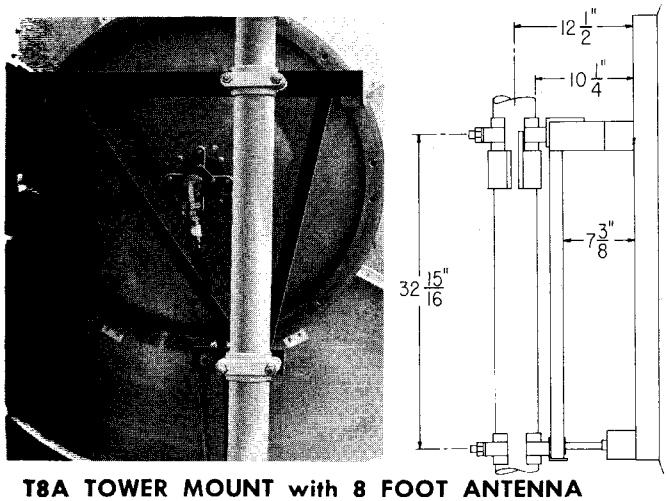
The M4 mount, shown at the right, is normally mounted on the roof of the microwave equipment building. The threaded adjustment parts of the M4 are stainless steel. Attachment to the dish ring is accomplished by sliding ball and socket joints to allow the necessary angular and lateral movement during adjustment.

EIGHT AND TEN-FOOT ANTENNA MOUNTS

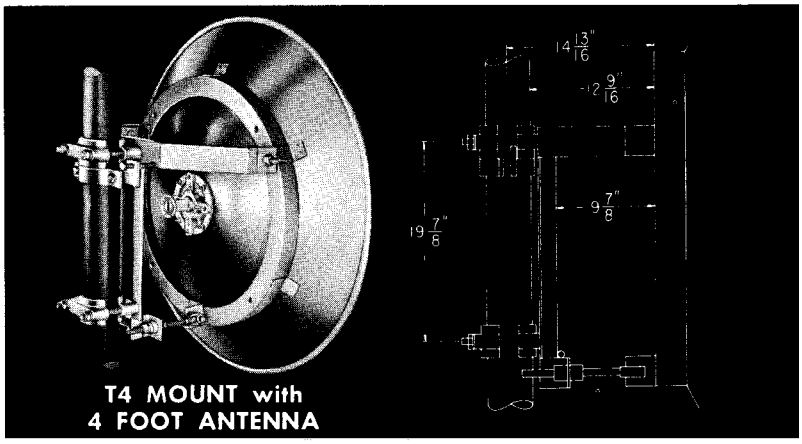
8 and 10-foot dishes have the same mounting ring and use the T8A mount for towers or the M8 mount for horizontal mounting.

The M8 mount attaches to any flat surface and uses sliding ball and socket joints for independent control of antenna orientation in two planes.

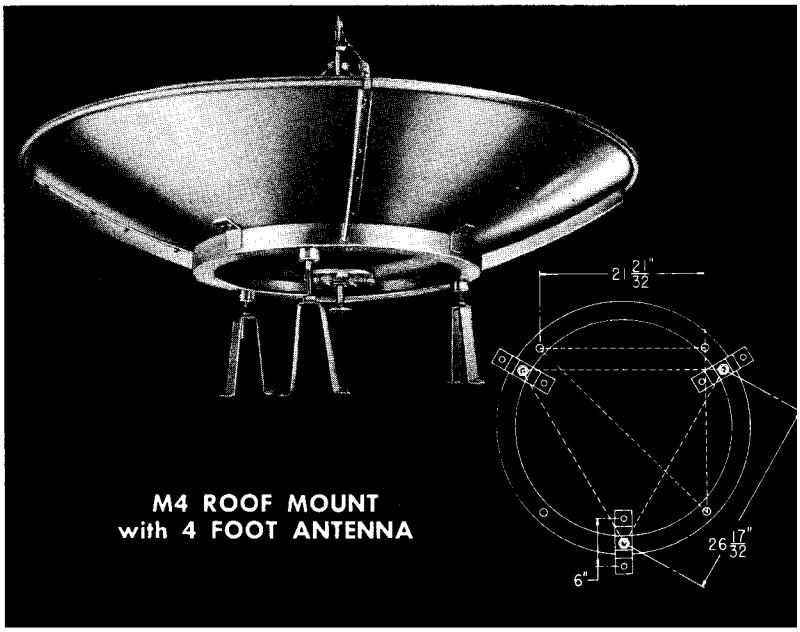
The T8A mount fits 4″ standard pipe. A stabilizing rod to the reflector rim prevents sway. Independent adjustment of elevation and azimuth is by means of threaded studs.



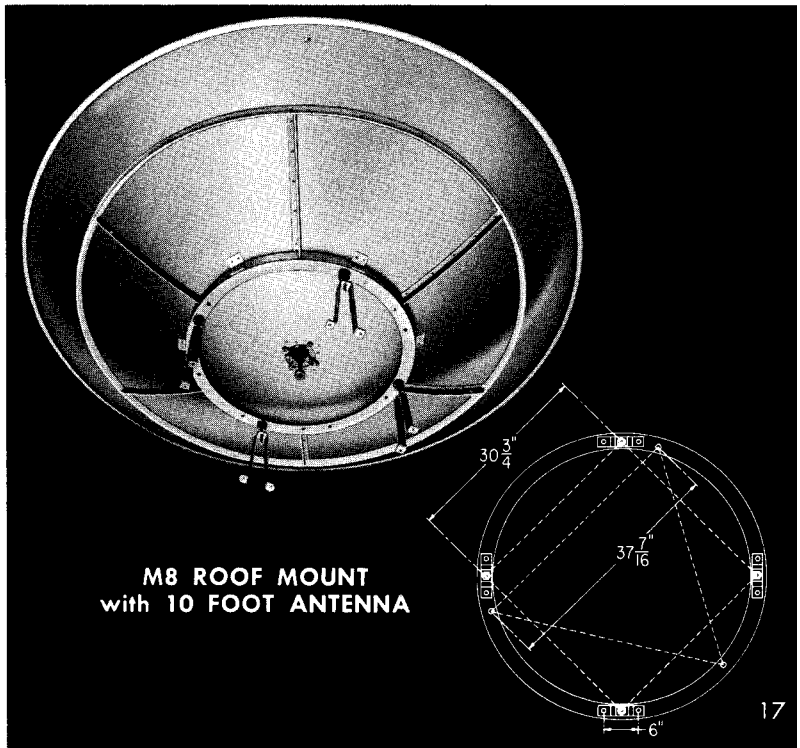
T8A TOWER MOUNT with 8 FOOT ANTENNA



T4 MOUNT with 4 FOOT ANTENNA



M4 ROOF MOUNT with 4 FOOT ANTENNA



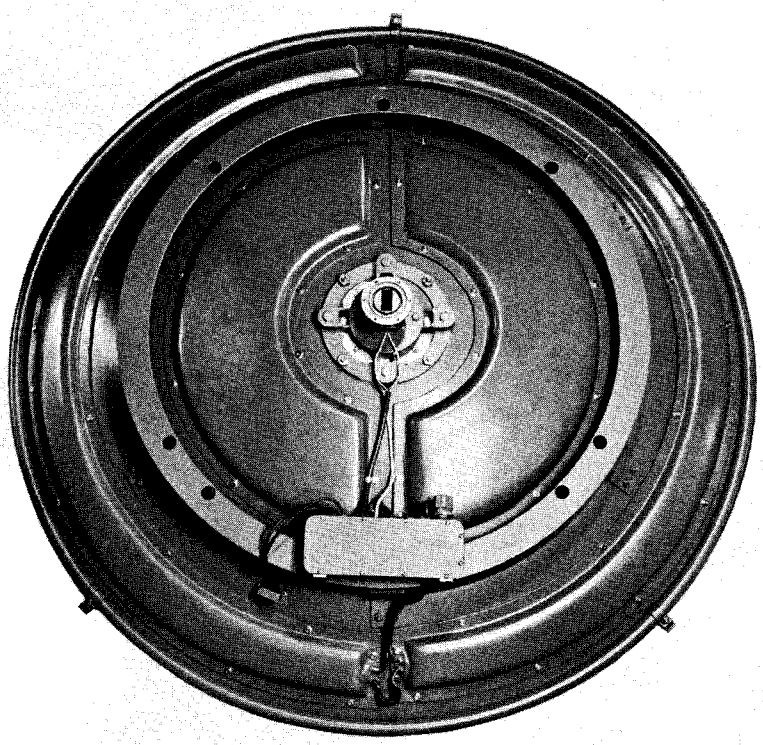
M8 ROOF MOUNT with 10 FOOT ANTENNA

DEICING EQUIPMENT

ANTENNA HEATERS

Deicing or heating equipment is recommended for antennas for 5 kmc range and above in icing areas. These heaters require less power to operate than other deicing methods. Thus, operating costs are lower. In addition, they have no significant effect on antenna characteristics.

Antenna heaters of the PH series consist of reflector, vertex, and feed heaters; junction box; and thermostats for antennas in the 5925-7425 mc range. Reflector heaters are fiberglas shells containing an insulating blanket and nichrome heating wire. AC power requirements vary with dish size. These heaters are factory attached to the rear surface of the reflector. Feed and vertex heaters consist of nichrome wires imbedded in a flexible silicone rubber pad. These are held in place by clamps and are also factory attached. Rim heaters, center heaters, and thermostats are factory wired to the junction box as is the power cord. Field wiring consists of connecting feed and vertex heaters to the junction box.



ANTENNA HEATERS

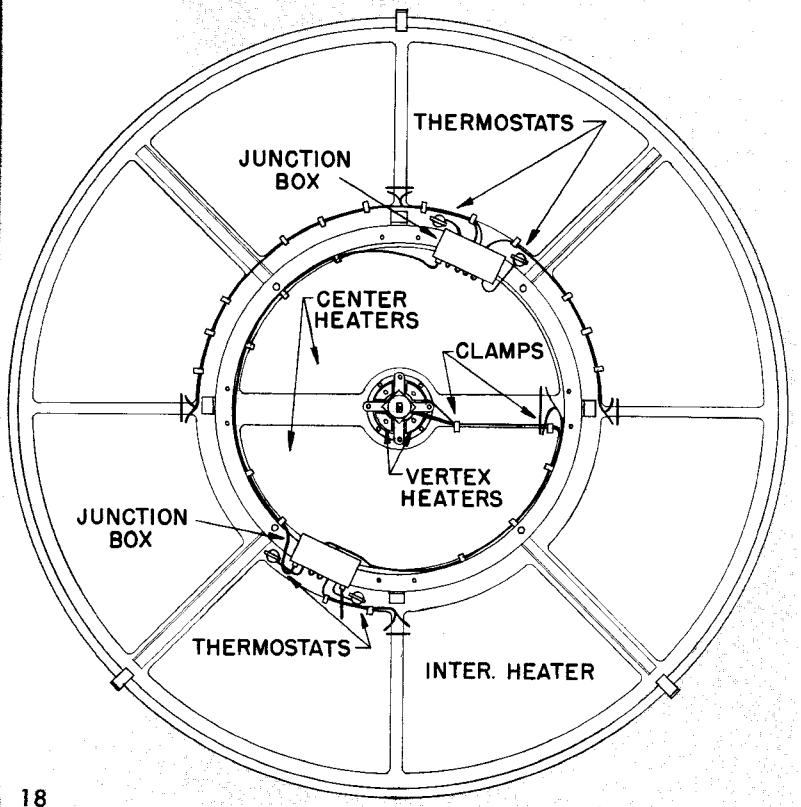
Antenna Size	Heater Part Number	Power Requirements* Watts		
		Reflector	Vertex	Feed
4	PH4	600	60	30
6	PH6	1200	60	30
8	PH8	2400	60	30
10	PH10	3600	60	30

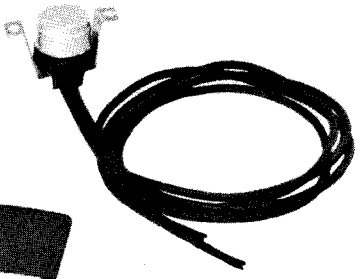
*Power requirements for PH4 and PH6 are single phase, 60 cycle, 115 volts. Power requirements for PH8 and PH10 are 3 wire, single phase, 60 cycle, 220 volts.

OPERATION

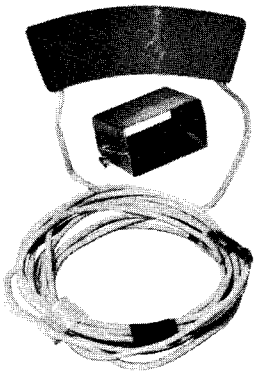
PH series heaters are operated by contact sensitive thermostats which sense reflector temperature. Heaters are turned on when dish temperature drops to 35 degrees F and stay on until dish temperature reaches 55 degrees F.

Type PH10, 10-foot antenna heater, illustrated at left, includes reflector, vertex, and feed heaters; junction box; and thermostats. Other antenna heaters are similar except for size. See table.



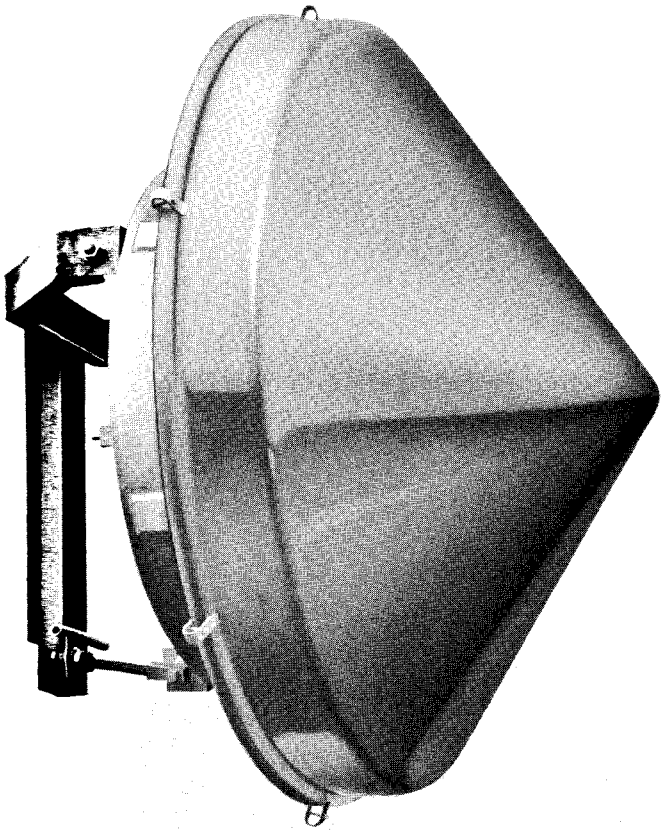


THERMOSTAT USED WITH 6KMC ANTENNA HEATER



6KMC FEED HEATER and CLAMP ASSEMBLY

RADOMES



Clip type mounting permits easy installation on existing units.

Radomes provide protection of feed and prevent accumulation of leaves, sand, and other debris in horizontally mounted antennas. Initial cost of radomes is lower than dish heaters. For tower mounted antennas, thrust on the tower is 50 per cent less with a radome than with a parabolic surface because of the more favorable shape factor. ANDREW radomes are constructed of fiberglas reinforced plastic. Heated radomes also include spiral heating wire and air sensing thermostat, which turns heaters on when air temperature is in the 25 to 35 degree F range. Radomes are particularly suited where fading margins are sufficient to permit the small gain reduction introduced by the radome. These units clip directly to the dish rim and are easily installed on existing units.

Type R4, 4-foot radome, is shown at the left. Other models are similar except for size. See table below. Heated radomes are designed to keep radomes free of ice at sub-freezing temperatures with winds up to 30 mph (actual). Higher wattage heaters are available for areas where more severe conditions prevail. Advise us of your requirements.

RADOME CHARACTERISTICS

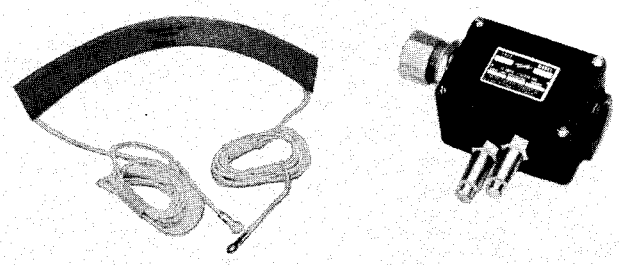
Type Number	Gain Reduction at 6 kmc, db	VSWR Contribution at 6 kmc	Thrust at † 30 psf (flats)	Power Requirements*
R8	.3	.03	955	.....
R6	.3	.03	535	.....
R4	.3	.03	240	.....
HR8	1.0	.04	955	2500 watts
HR6	1.0	.04	535	1400 watts
HR4	1.0	.04	240	800 watts

*Power requirements for HR4 and HR6 are single phase, 60 cycle, 115 volts. Power requirements for HR8 are 3 wire, single phase, 60 cycle, 220 volts.
†Including antenna.

2 KMC DEICING EQUIPMENT

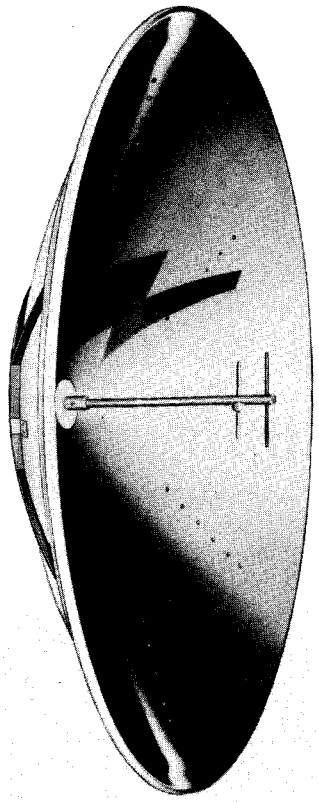
Type 20712 is a feed heater for coaxial horn radiators. These heaters consist of nichrome wires imbedded in a flexible silicone rubber pad. The heater is clamped to the horn and is turned on by thermostatic control when air temperature is in the 25 to 35 degree F range. Type 20712 is for 4, 6, and 10-foot antenna feeds.

Below 5 kmc, parabolic antenna characteristics are usually not adversely affected by snow or ice. For light to medium icing conditions, Type 20712 feed heater is generally sufficient. Under heavy icing conditions or in critical paths, the heaters or radomes described above may be used.



Type 20712 deicer for 2 kmc coaxial horn feeds.

400-1000 MC PARABOLIC ANTENNAS



The ANDREW "P" series antennas described on the pre ceding pages are regularly produced for special frequencies i the 400–1000 mc range. These antennas are available in th standard sizes and generally employ the dipole-reflector typ feed which is described on page 14.

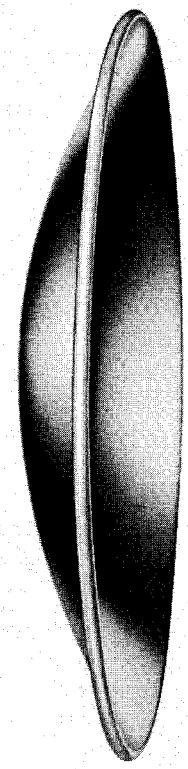
These antennas have the same mechanical characteristics a those shown on pages 12 and 13. Input connection is a 7/8" EIA flange. VSWR is 1.5 or better at a spot frequency for the models shown.

Type Number	Size, feet
21201	4
21202	6
21203	10

If lower VSWR levels are required, please consult the ANDREW office most convenient to you for price and delivery.

PARABOLIC REFLECTORS

ANDREW parabolic reflectors are heavy gauge aluminum spinnings. They are formed to close tolerances and are of the same quality as used in our microwave antennas. Packed dimensions and gross weights shown are for single units. Similarly, prices shown in the price list are for single units. Special prices are available on orders for two or more of the same reflector. Sizes other than those shown are available upon request.



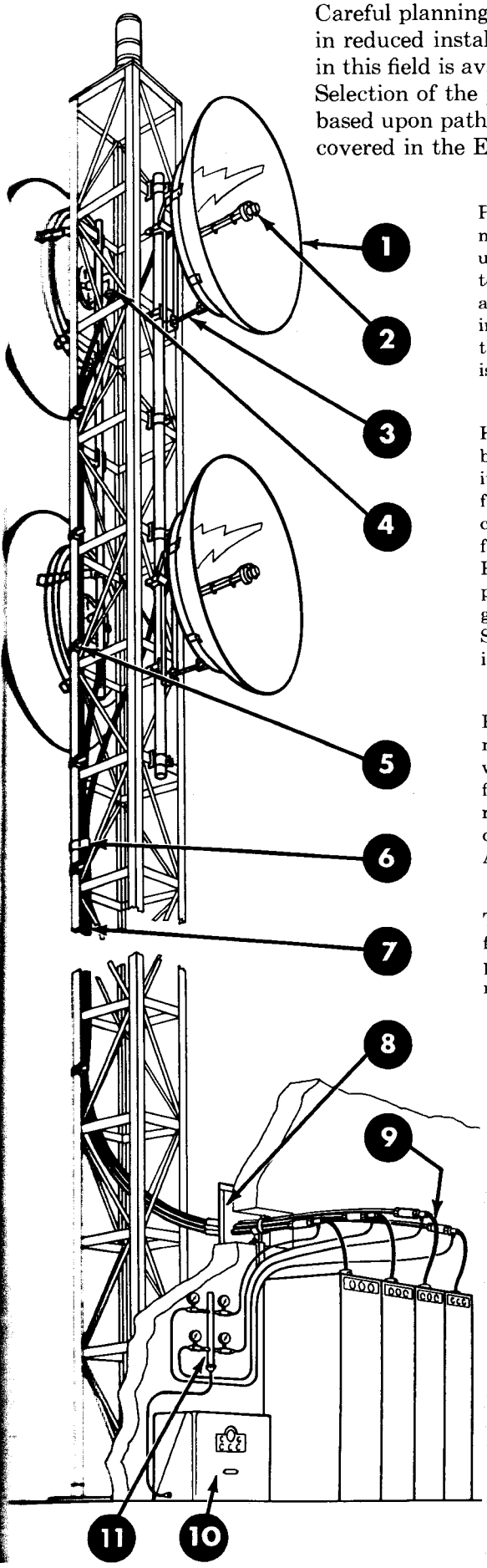
PARABOLIC REFLECTOR SPECIFICATIONS*

Type No.	Diameter	Focal Length	Surface Tolerance	Depth	Mandrel Hole Dia.	Thick-ness	Edge Bead Diameter	Net Wt., Lbs.	Gross Wt., Lbs.	Packed Dimensions
19875	20	4	± 1/32	6 1/4	1/4	14 ga.	3/8	3	25	24x24x 8
19876	20	5	± 1/32	5	1/4	14 ga.	3/8	3 1/2	25	24x24x 8
12982	24	7.2	± 1/32	5	1/4	16 ga.	3/8	3 1/2	25	28x28x 8
16907	40	18	± 1/16	5 9/16	6 1/4	11 ga.	7/16	12	30	44x44x 9
14865	48	12	± 1/16	12	5 7/8	11 ga.	7/16	22 1/2	40	50x50x14
17673	48	18	± 1/16	8	6 1/4	11 ga.	1	22 1/2	40	50x50x10
14558	72	18	± 1/16	18	5 7/8	1/8	5/8	71	220	74x74x20
18238	72	27.5	± 1/16	11 17/32	6 1/4	1/8	1	65	215	74x74x14
18242	96	35.8	± 1/8	16 3/32	6 1/4	1/8	1 1/2	117	360	98x98x19
18420-1**	120	35.8	± 1/8	25 1/8	6 1/4	1/8	1 1/2	186	700	96x96x124x124

*All dimensions are in inches unless otherwise indicated.

**Type 18420-1 is shipped in a triangular crate. Triangular sides are 96 x 96 x 124, slanted side is 124 x 124, other two sides are 96 x 124.

PLANNING A 2 KMC MICROWAVE INSTALLATION



Careful planning of your microwave antenna installation will bring dividends in reduced installation cost and maintenance expense. Our broad experience in this field is available without charge to assist you in planning your system. Selection of the proper antenna and transmission line for your installation is based upon path loss and equipment considerations. These considerations are covered in the Engineering Data Section beginning on page 79.

ANTENNA MOUNTING

Parabolic antennas are usually attached to the tower by means of mounts which incorporate elevation and azimuth adjustments. Antennas up to six feet in diameter mount to a 4″ standard pipe. Mounts for antennas larger than six feet in diameter also attach to a 4″ pipe and, in addition, utilize struts or sway braces to the edge of the reflector. Mounting pipes are usually built into the tower during fabrication. Alternately, the antenna can be bolted directly to a flat surface, provided that there is sufficient clearance for the feed cable.

FEED CABLES

HELIAX cable is preferred for antennas with coaxial terminations because of its flexibility, mechanical strength, and high electrical quality. The antenna end of the cable is usually fitted with an EIA flange for direct attachment to the antenna feed or elbow. The equipment end carries a Type N jack to permit use of a short RG-8/U jumper cable for the equipment connection.

HELIAX is hoisted and supported at the top of the tower by means of preformed cable grips. Cables are grounded to the tower by means of grounding kits which may be factory installed at specified intervals. Stainless steel wraplock is used to attach the cable to the tower at 5-foot intervals to prevent sway.

PRESSURIZATION

Pressurization of the cables can be accomplished by manual or automatic means, depending upon the amount of cable in use at the site and whether the site is attended or unattended. A hand pump is available for attended sites with a small amount of cable. Automatic units are recommended for unattended locations or for locations where larger quantities of cable are employed. See page 68 for ratings and accessories. Alternately, bottled nitrogen gas can be used.

The two-way radio portion of the installation includes antennas chosen from the table on page 10 and coaxial feed cables from the table on page 43. HELIAX is also recommended for this application. Accessories for these cables are the same as those shown below.

BILL OF MATERIALS

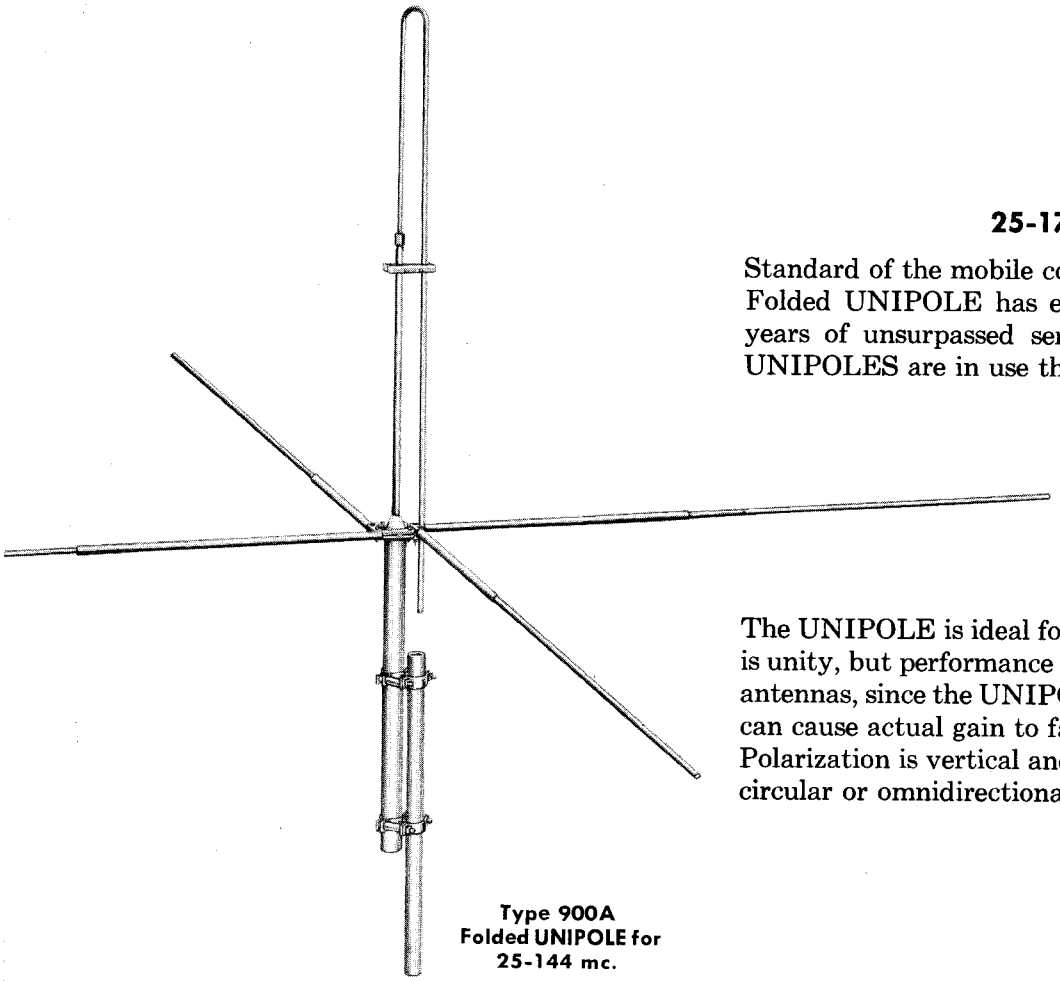
Item	Description	Andrew Type No.	Typical Quantity
1	6-foot parabolic antenna for 1850–2110 mc	P6-18▲	4
2	Feed deicer	20712 †	4
3	Tower mount for Item 1	T4▲	4
4	Cable hoist and hanger	19256	4
5	Wraplock, stainless steel	12395-1	*
6	Cable grounding kit	19248	*
7	7/8″ HELIAX microwave cable kit	HO-RN	*
8	Horizontal anchor and building entry kit	3900	4
9	2-foot RG-8/U microwave jumper cable	16253-8	4
10	Automatic dehydrator, or dry air pump	1910 878	1
11	Gas distribution manifold	6600**	1

*Variable quantity depending upon tower height.
**Number of outlets varies with detail number.
▲Or other appropriate model.
†For 2 kmc models only.

FOLDED UNI

25-174 MC RANGE

Standard of the mobile communications field, the ANDRE Folded UNIPOLE has earned its position through thirte years of unsurpassed service. More than twenty thousa UNIPOLES are in use throughout the world.



Type 900A
Folded UNIPOLE for
25-144 mc.

The UNIPOLE is ideal for all fixed station installations. Gai is unity, but performance is vastly superior to most unity gai antennas, since the UNIPOLE minimizes mast coupling whic can cause actual gain to fall far below expected or rated gain Polarization is vertical and the horizontal radiation pattern i circular or omnidirectional.

The grounded radiating element minimizes lightning damage. A static charge drain path to the ground to reduce static noise is provided by the grounded radiating element, thus improving signal-to-noise ratio when receiving and providing lightning protection for the antenna, transmission line, and RF equipment.

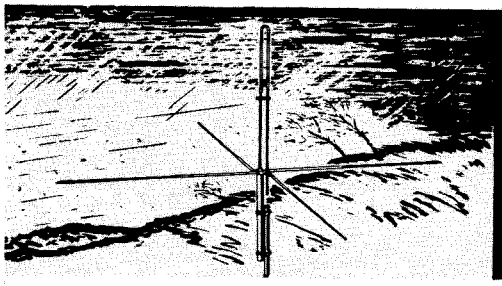
Mechanical features of the Folded UNIPOLE include high strength aluminum alloy components. Mounting parts are either stainless or heavily galvanized steel.

Impedance matching characteristics and excellent bandwidth of the Folded UNIPOLE improve line efficiency and eliminate transmitter loading problems. Both the 900 and 925 series UNIPOLES match 50 ohm line.

Power rating of UNIPOLES is limited by rating of associated line and fittings as listed in the Engineering Data Section. Approximate limits are 250 watts for RG-8/U, 500 watts for RG-17/U, and 1500 watts for $\frac{7}{8}$" air dielectric cable.

Frequency ranges include all standard communication bands. The Folded UNIPOLE is supplied in two basic models. Type 900A antennas (five separate details) cover the 25-148 mc range. Each detail is supplied with a vertical radiating element long enough for the lowest frequency in its operating range. Complete assembly and adjustment instructions are furnished with each antenna.
Type 925A antennas cover the 148-174 mc range and may be used at any frequency in the band without further adjustment.
When ordering, please specify the exact model desired or specify operating frequency, and we will supply the proper model.

Mounting clamps must be ordered separately. See page 24 for standard mountings.



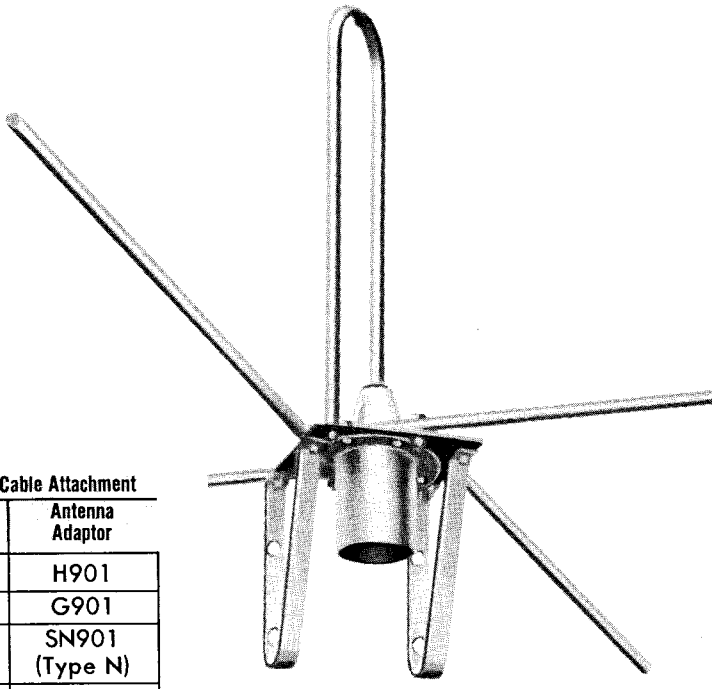
HURRICANE MODELS

Folded UNIPOLE antennas are available either as standard models or as hurricane models. The hurricane models are constructed almost entirely of stainless steel, being designed for the salt spray and high wind velocity of hurricane areas. These extremely rugged antennas are finding ever wider application for all installations.

UNIPOLE ANTENNAS

FEED CONNECTION

Standard UNIPOLE terminations mate with a UHF plug Type 10805-1). When other than RG-8/U is used, a preferred and convenient method of attachment is by means of an 8-foot jumper cable of RG-8/U. See the table below for a tabulation of jumper cables and main cables. For high power applications where direct attachment of the main cable to the antenna is required, adaptors are available and should be ordered separately from the table below. In this case, use the "B" suffix with the antenna type number. For example, order 925B instead of 925A. Select adaptors and fittings from the table below and order separately.



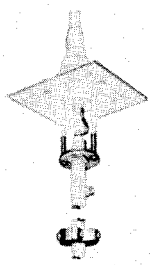
Type 925A Folded UNIPOLE for 148-174mc.

TYPICAL COAXIAL CABLES AND FITTINGS

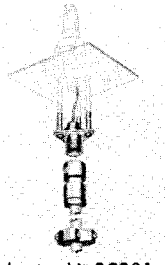
Cable	ANDREW Type No.	For Attachment by Jumper Cable		For Direct Main Cable Attachment	
		Main Cable End Fitting	Jumper Cable	Main Cable End Fitting	Antenna Adaptor
7/8" HELIAX	HO	20U	16253-2	20T	H901
7/8" Copper	740	4855	16253-2	1703AP	G901
RG-8/U	10791-1	10805-1	None	10804-6 (Type N)	SN901 (Type N)
RG-17/U	10791-7	12418-12	16253-2 and 10805-6	12418-12	SC901

CABLE ADAPTORS

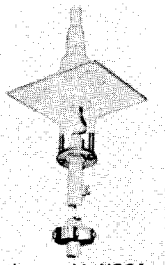
If cables other than RG-8/U with UHF plug 10805-1) are used, substitute the "B" suffix to the antenna type number, and select and order the appropriate adaptor from those shown at the right.



Adaptor kit G901 for 7/8" Copper

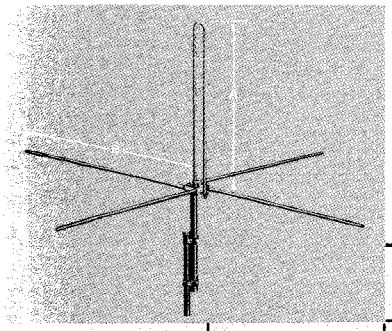


Adaptor kit SC901 for RG-17/U



Adaptor kit H901 for 7/8" HELIAX

Adaptor kit SN901 for RG-8/U with Type N pl



FOLDED UNIPOLE SPECIFICATIONS

Type Number	Frequency Range	Reference Dimensions A* Inches	Reference Dimensions B* Inches	Max. Safe Wind Pressure† Lbs./Sq. Ft. (flat) No Ice	Max. Safe Wind Pressure† Lbs./Sq. Ft. (flat) ½" Ice	Thrust** at Wind of 20 lbs./Sq. Ft. (flat), lbs. No Ice	Thrust** at Wind of 20 lbs./Sq. Ft. (flat), lbs. ½" Ice	Net Weight, (lbs.)	Shipping Weight‡, (lbs.)
900A-0	25-30	120	114	45	20	36	84	38	84
900A-1	30-44	101	95	20	10	29	68	24	38
900A-2	44-54	63	80	45	16	22	52	20	34
900A-3	72-76	37	47	85	36	19	30	14	25
900A-4	108-148	24	35	128	37	15	30	10	19
925A	148-174	17	29	175	59	12	20	7	16
HURRICANE MODELS									
H900A-0	25-30	120	114	48	23	36	84	47	93
H900A-1	30-44	101	95	52	23	31	70	38	52
H900A-2	44-54	63	80	77	30	23	53	32	46
H900A-3	72-76	37	47	97	42	19	30	20	29
H900A-4	108-148	24	35	207	80	15	30	19	28
H925A	148-174	17	29	184	62	12	20	13	22

* Maximum dimension (lowest frequency).

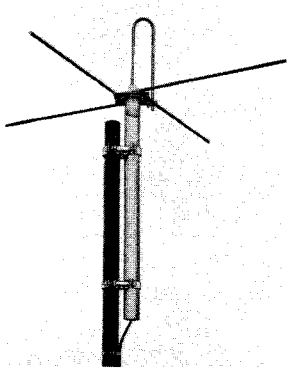
† See Engineering Data Section for equivalent wind velocities and interpretation of data.

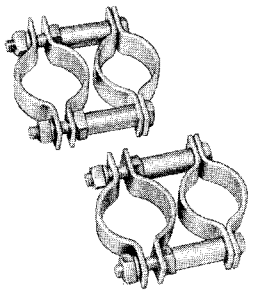
** Determines required strength of supporting structure.

‡ Shipping weight includes adaptor and mounting clamps.

TYPE 900 UNIPOLE MOUNTINGS

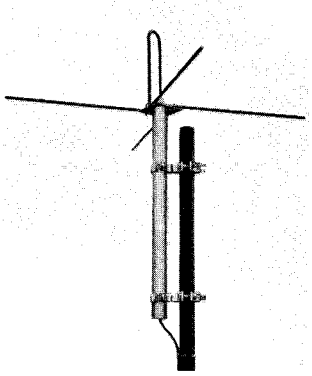
2″ STANDARD PIPE

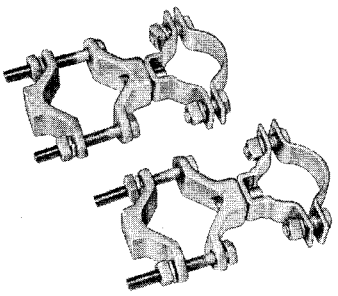




This is the most common installation. Type 900A attaches to the pipe by means of Type 10674 clamps. The pipe in turn is attached to the supporting structure by means of clamps, bolts, welding, or other convenient means.

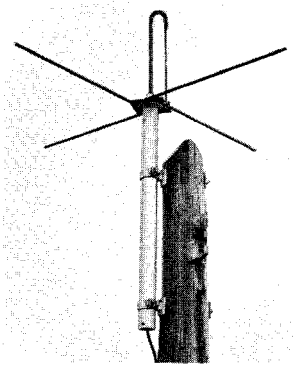
OTHER PIPE SIZES

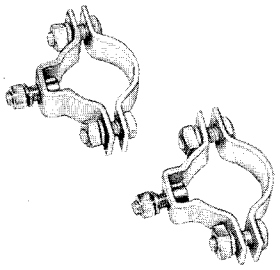




Type 20898 clamps can be used to attach the Type 900A UNIPOLE to any tube or pipe having an outside diameter from ¾″ to 3″. The smaller sizes are accommodated by reversing one clamp member.

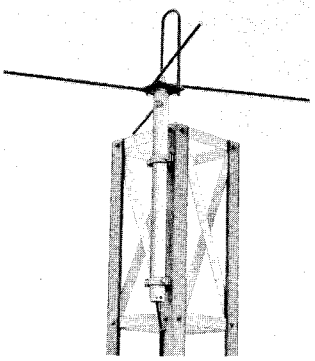
FLAT SURFACES OR WOOD POLES

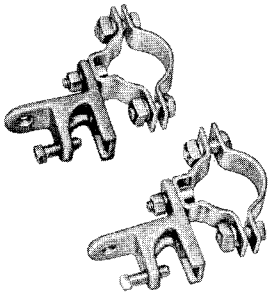




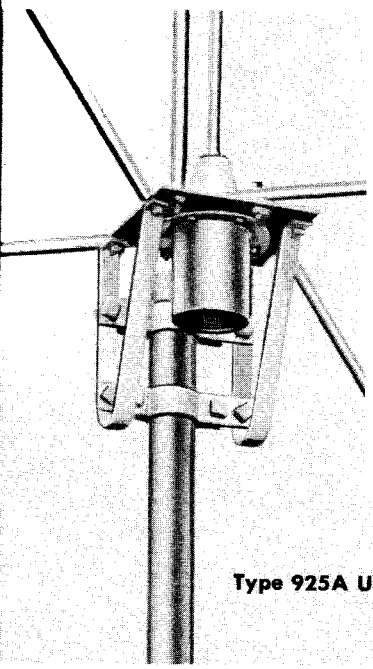
Type 20896 clamps are supplied with ½″ bolts for direct attachment to predrilled tower members. Alternately, expansion bolts or long through-bolts can be procured locally for mounting on masonry surfaces or wood poles.

ANGLE TYPE MEMBERS

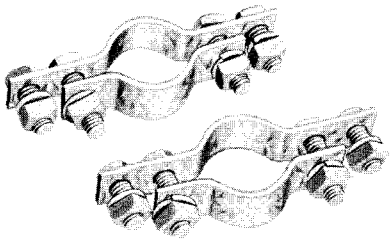




Type 20897 clamps are designed to provide for direct attachment to angle type tower members. By changing the clamp position, horizontal, vertical, or diagonal members can be accommodated.



Type 925A UNIPOLE Mounted on 1″ Standard Pipe



Type 21208 clamps

TYPE 925A UNIPOLE MOUNTINGS

Type 21208 clamps are used to attach 925A or H925A UNIPOLES to 1″ standard pipe or 1½″ O.D. tubing. The pipe or tube in turn is attached to the supporting structure by means of clamps, bolts, welding, or other convenient means. The new mounting bracket, plus the light weight and size of Type 925A make it easy to improvise other mountings. For example, lag screws or machine bolts through the mounting brackets can be used to attach the antenna to a wood surface or to a predrilled tower member or plate.

CARDIOID UNIPOLES

This antenna provides a cardioid shaped radiation pattern with gain over an angle of 180 degrees. The gain in the direction of maximum signal is 3 db. Gain at plus or minus 90 degrees from the axis of the main beam is unity or 0 db, while the front-to-back ratio is 15 db.

The Cardioid UNIPOLE is ideal for mobile services operating along city or state borders, shorelines, or back-to-back with other services.

UNIPOLES may be converted to cardioid antennas in the field using conversion kit Type 14142-2 for 37-44 mc, or Type 14142-3 for 44-50 mc.

Type 920C has five separate details covering the 30-54 mc band and 144-148 mc band. Construction is similar to Type 900 UNIPOLE. Radiating and reflecting elements are cut to frequency in the field. Simple instructions accompany antenna.

Type 926C has three details which cover the 148-174 mc band without field cutting or adjustment.

CARDIOID ANTENNA SPECIFICATIONS

Type Number***	Frequency Range, mc	A* Inches	B* Inches	Weight, Lbs. Net	Weight, Lbs. Packed**
920C-1	30-37	86	114	57	106
920C-2	37-44	74	95	46	70
920C-3	44-50	57	79	42	64
920C-4	50-54	49	68	37	58
920C-5	144-148	16	30	7	16
926C-0	148-152	16	30	8	17
926C-1	152-162	15	30	8	17
926C-2	162-174	14	27	8	17
H920C-1	30-37	86	114	66	115
H920C-2	37-44	74	95	60	84
H920C-3	44-50	57	79	52	74
H920C-4	50-54	49	68	46	67
H920C-5	144-148	16	30	14	23
H926C-0	148-152	16	30	14	23
H926C-1	152-162	15	30	14	23
H926C-2	162-174	14	27	14	23

*Maximum dimension (lowest frequency).
**Includes adaptor and mounting clamps.
***If cable other than RG-8/U is used, substitute "D" suffix on antenna part number for the "C" suffix, and order appropriate adaptor from the table on page 23.

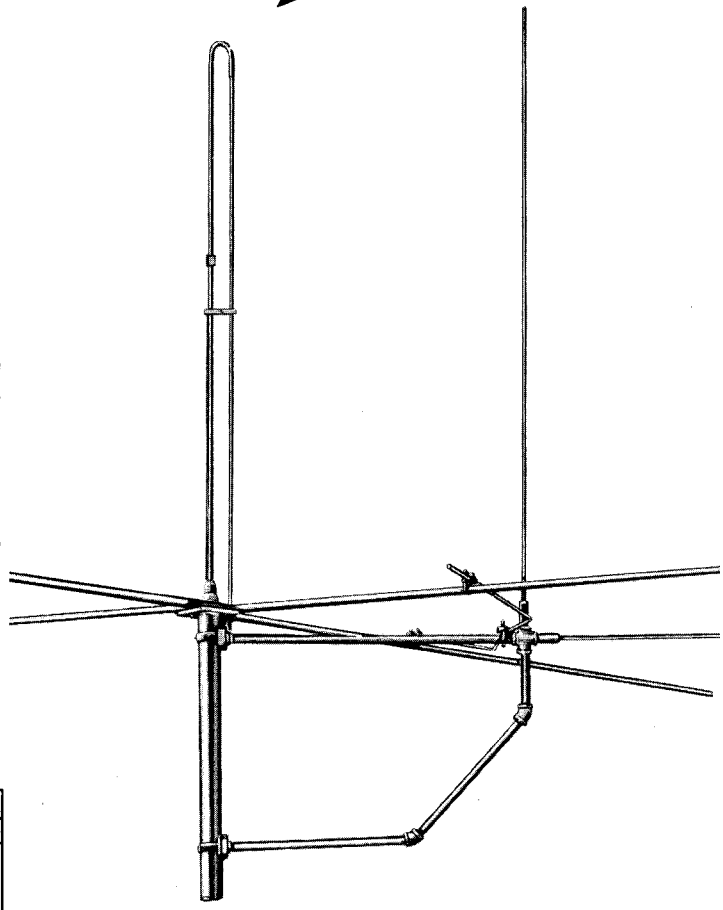
Forward gain: 3 db **Half power angle: 180 degrees**

Front-to-back ratio: 15 db **Impedance: 50 ohms**

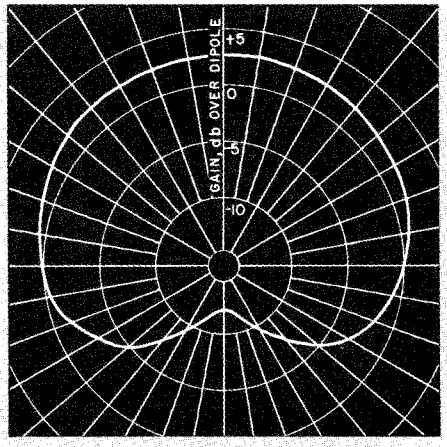
Termination included is for RG-8/U cable with UHF plug Type 10805-1). If other main cables are used, a convenient and preferred method of attachment is by means of Type 16253-2 jumper cable. See page 23 for details.

Hurricane models are corrosion resistant and will withstand hurricane wind velocities. Add prefix "H" when ordering.

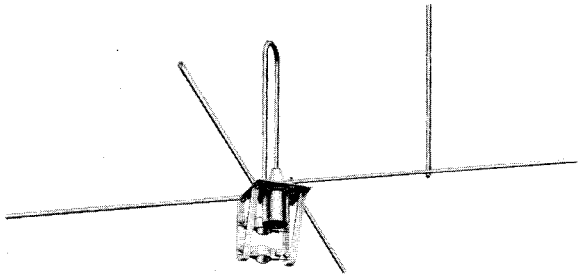
Mounting clamps attach 920C to 2″ standard pipe, order Type 10674. Type 21208 clamps attach 926C to 1″ standard pipe. See page 24 for other mountings.



Type 920C Cardioid—Five details cover the 30-148 mc band. Specify frequency when ordering.

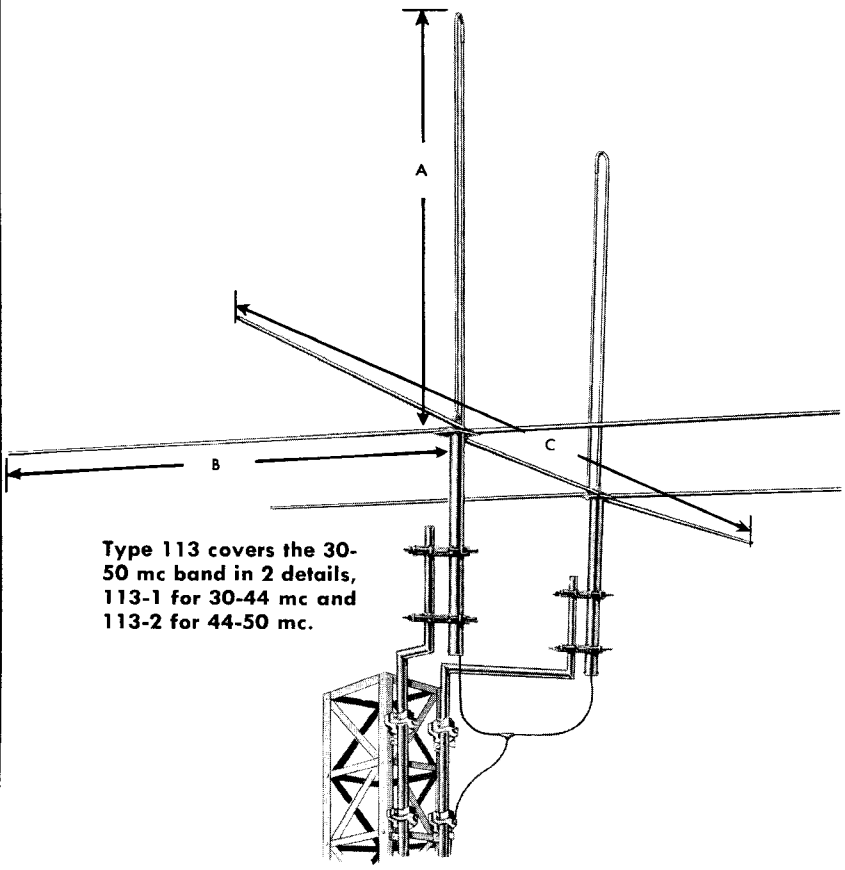


HORIZONTAL GAIN PATTERN
CARDIOID ANTENNA



Type 926C—Three separate details cover the 148-174 mc band without field cutting.

BIDIRECTIONAL UNIPOLES



Type 113 covers the 30-50 mc band in 2 details, 113-1 for 30-44 mc and 113-2 for 44-50 mc.

Select an ANDREW bidirectional antenna when communication along a linear route is required. Radiating two major lobes spaced 180 degrees apart, this antenna is recommended for transmitting and receiving along railroads, pipelines, electric transmission lines, and for similar applications.

It consists of two Folded UNIPOLES spaced and fed so as to produce the desired radiation pattern. This array provides a gain of 3.2 db in the direction of each major lobe with moderate side coverage.

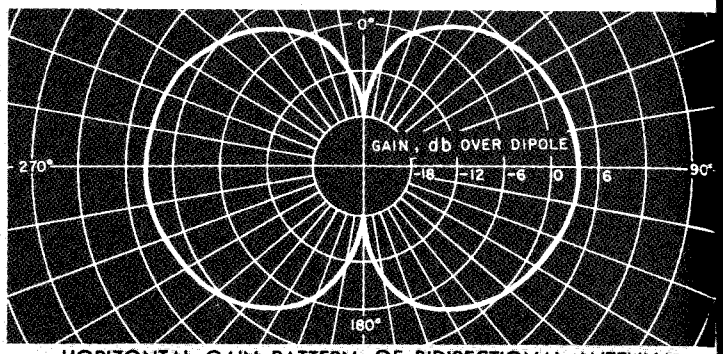
The antenna is factory tuned and is supplied complete with phasing harness. Specify frequency when ordering.

The input connection on all models is a UHF plug (10805-1). UHF junction (10805-6) is included.

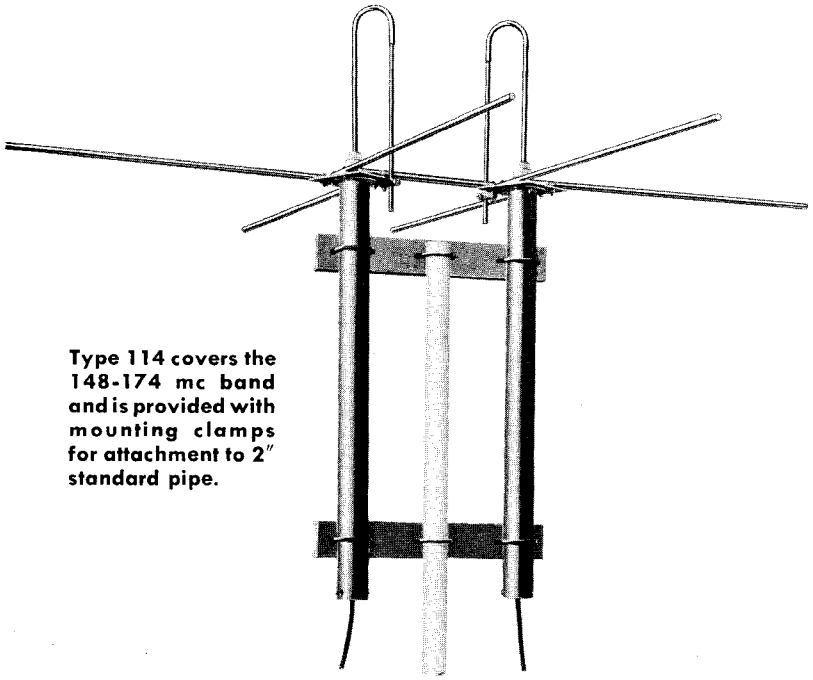
SPECIFICATIONS

Type Number	Frequency Range, mc	A* Inches	B* Inches	C* Inches	Weight, Lbs. Net*	Packed*
113	30-50	101	95	271	125	150
114	148-174	16	29	76	30	40

*Weights and dimensions are maximum (lowest frequency).



HORIZONTAL GAIN PATTERN OF BIDIRECTIONAL ANTENNA



Type 114 covers the 148-174 mc band and is provided with mounting clamps for attachment to 2″ standard pipe.

MOUNTING KIT

Type 14672 will support Type 113 bidirectional antenna on towers made of formed or rolled angles.

Where towers are made of round members from 1″ to 3″ in diameter, order Type 14671 for attaching Type 113 to tower.

FEED CABLES

When cables other than RG-8/U are used to feed Types 113 or 114 antennas, a jumper cable should be ordered separately from the table on page 23. The jumper cable is used between the antenna termination and the main cable end fitting.

POWER RATING

Both 113 and 114 bidirectional arrays are suited for use with 250 watt transmitters.

TYPE 262 SIDE MOUNTED ARRAY SOLVES TOWER SPACE PROBLEMS

This versatile 25-50 mc antenna array mounts on the side of a tower, permitting the top to be used for other antennas. Numerous mounting and gain combinations are available.

Type 262 consists of two center-fed folded dipoles spaced one wavelength apart. Type 262-4 consists of four such elements similarly spaced. The pattern is influenced by the tower size. By proper distribution of the radiating elements, the pattern can be controlled. The table below is based on extensive measurements under each of the conditions shown.

Actual gain in a given horizontal direction is the sum of average gain and deviation from circularity as shown in the table below. For example, with a two-element array and a 20″ triangular tower with both elements mounted on the same corner of the tower at 25 mc, actual gain in the direction of the elements is 2.5 db plus 2.4 db or 4.9 db. In the opposite direction, actual gain is 2.5 db minus 2.4 db or 0.1 db. Vertical shading in the coverage areas indicates gain because of deviation from circularity while horizontal shading represents loss of gain because of deviation from circularity.

Power rating is limited by the harness of feed cable. Standard units are rated at 500 watts.

Constant low VSWR under changes in wind loading is assured by mechanical stability.

AVERAGE GAIN

Type Number:	262	262-4
Number of Elements:	2	4
Gain, db*:	2.5	5.7

*Referred to half-wave dipole

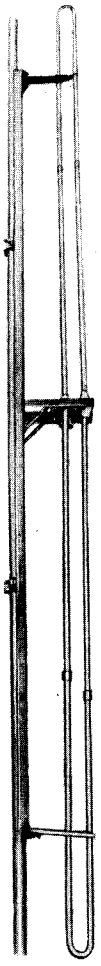
Simplified tuning with positive locking of sliding elements assures quick and accurate adjustment and installation.

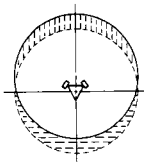
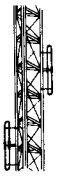
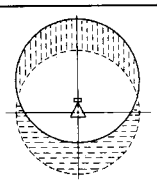
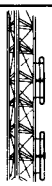
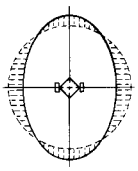
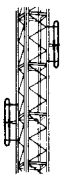
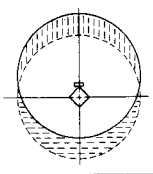
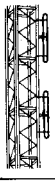
Input connection is a UHF plug (10805-1) with UHF junction included. If cables other than RG-8/U are used, use jumper cable Type 16253-2 and appropriate fittings on cable as shown on page 23 or select an adaptor from page 53.

Mounting hardware is provided for attachment to round or angle member tower legs. Mounting to a 12″ diameter wood pole will yield approximately the same results as a 20″ cross section tower, provided that the pole is wrapped with wire mesh in the area of the dipoles. Full instructions are supplied with each antenna.

MECHANICAL SPECIFICATIONS

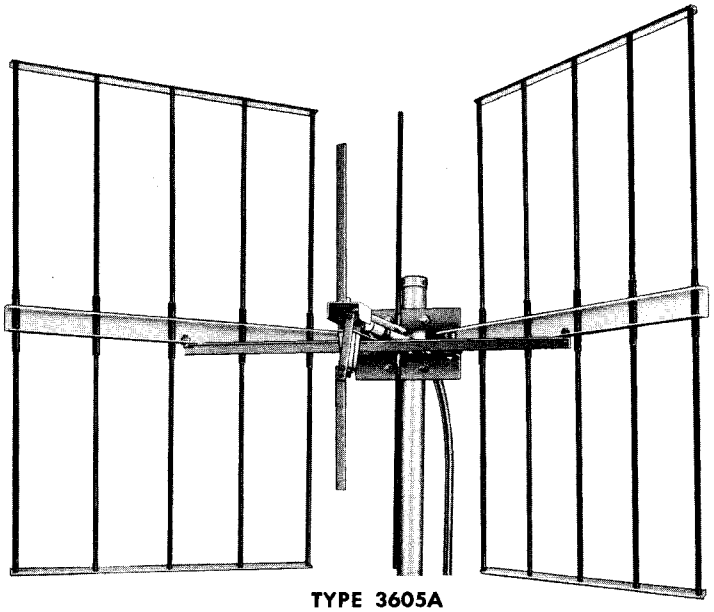
Wind Load Rating: *30 psf (flat) with ½″ ice*
Construction: *Aluminum alloy for elements*
Mounting Framework: *Galvanized steel*
Net Weight: *140 lbs. (2 bays)*
Gross Weight: *190 lbs. (2 bays)*



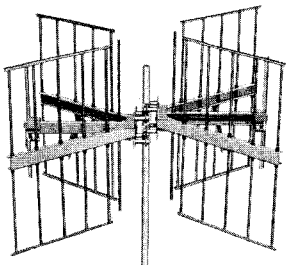
Tower Shape	Coverage Provided	Mounting Arrangement	Cross Section	Frequency, mc	Average Deviation
Triangular			20	25 50	±1.6 db ±3.3 db
			40	25 50	±3.3 db ±3.4 db
			20	25 50	±2.4 db ±4.6 db
			40	25 50	±4.6 db ±5.1 db
Square			20	25 50	± .2 db ± .8 db
			40	25 50	± .8 db ±3.2 db
			20	25 50	±3.1 db ±4.9 db
			40	25 50	±4.9 db ±5.3 db

CORNER REFLECTOR ANTENNAS

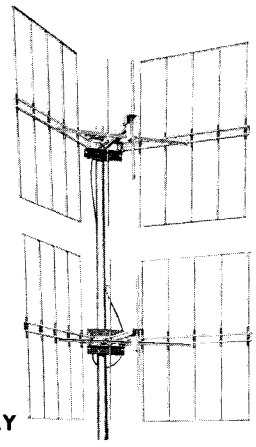
High Gain Directional Antennas for 25-470 mc Range



TYPE 3605A



TYPE 3625
BI-DIRECTIONAL



TYPE 3625
STACKED ARRAY

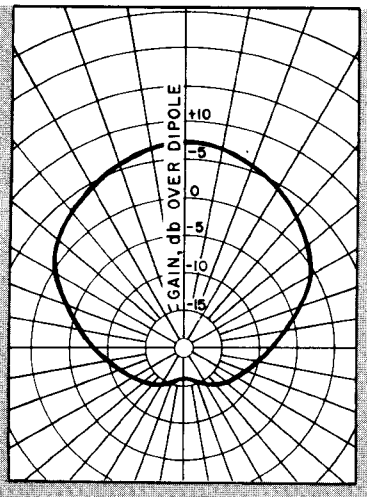
The ANDREW Corner Reflector Antennas are the ideal solution to the directional coverage problems in the VHF-UHF frequency range. They are preferred for their high gain and stable operation under icing and other severe weather conditions. This stability results from the inherent broadband characteristic of the design (see VSWR curve below).

Radiation is concentrated in the forward direction, making the antenna useful for point-to-point and special coverage problems. Limited signal to the side and rear usually permits adequate range around the main station, combined with extended coverage in the desired direction (see Engineering Data Section for typical coverage plot).

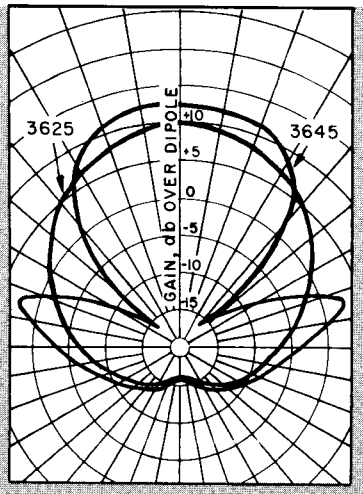
144-174 MC RANGE

Type 3605A Corner Reflector Antennas for use in this range employ two banks of reflecting rods, each supported at the center by a channel brace. Vibration of the rods is eliminated by angle section dampeners at the ends and concentric sleeves at the center. Construction is all aluminum. Over ten thousand of these units presently in service attest to the excellence of both electrical and mechanical design.

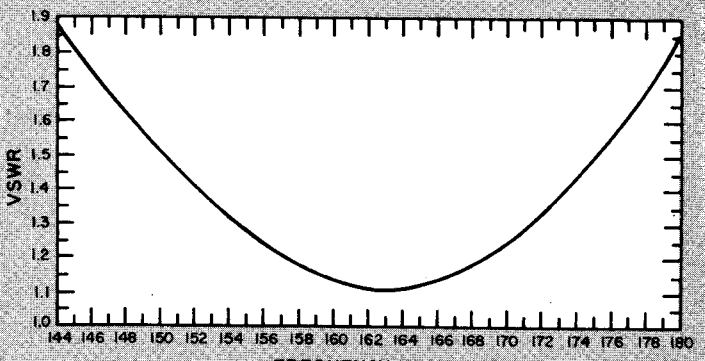
VSWR is under 1.5 from 150-175 mc, under 2.0 from 144-150 mc and 175-180 mc, without field tuning or adjustment. See the VSWR curve below. When lower VSWR is required for specific applications, contact your ANDREW sales engineer.



HORIZONTAL GAIN PATTERN
OF TYPE 3605A



HORIZONTAL GAIN PATTERNS
OF TYPES 3625 and 3645

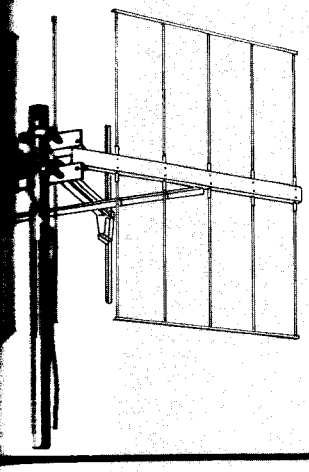


MEASURED VSWR FOR TYPE 3605

Television Corner Reflectors with extra low VSWR are also available. See page 42 for details.

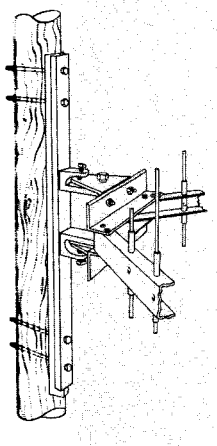
Stacking harnesses for conversion of single corner reflectors to multi-element arrays are available from stock. Order Type 17526 to connect two Type 3605A corner reflectors in parallel.

MOUNTINGS FOR TYPE 3605A



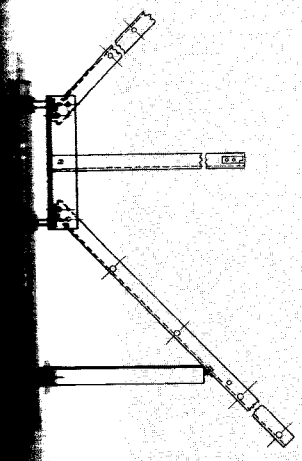
2″ STANDARD PIPE MOUNT

Type 3605A includes mounting clamps for attachment to 2″ standard pipe. For other mountings, see the alternatives shown below. These must be purchased separately.



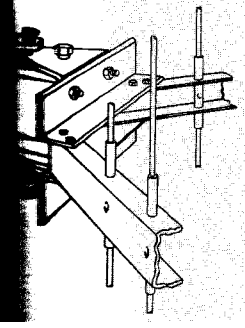
WOOD POLE MOUNT

Type 13575 kit includes a 4-foot mounting channel which attaches to pole 7″ to 12″ diameter by four 14″ x ½″ bolts. Swivel mount allows plus or minus 60 degrees azimuth adjustment.



HORIZONTAL MOUNT

Type 16018 mounting kit provides for horizontal polarization of Type 3605A. Mounting is to 2″ standard pipe. Kit consists of a horizontal brace and clamps for attachment to the pipe. Holes are provided in corner reflector for both horizontal and vertical orientation of main clamps supplied with the antenna.



TOWER MOUNT

Type 12613 attaches directly to tower with vertical angle member of ¼″ to ½″ thickness. Swivel mount allows for plus or minus 60 degrees azimuth adjustment.

FEED CONNECTION FOR TYPE 3605A

Standard units are supplied with a UHF jack for use with RG-8/U cable and a bracket for ⅞″ HELIAX. A convenient and preferred method of connecting to other types of main cables is by means of an RG-8/U jumper cable. See the table below for a tabulation of jumper and main cables. When direct main cable attachment is required, order an adaptor from the table and use the "B" suffix with the antenna type number.

CABLE AND FITTINGS

For Attachment by Jumper Cable			
Cable	ANDREW Type No.	Main Cable End Fitting	Jumper Cable
⅞″ HELIAX	HO	20U	16253-2
⅞″ Copper	740	4855	16253-2
RG-8/U	10791-1	10805-1	None
RG-17/U	10791-7	12418-12 and 10805-6	16253-2

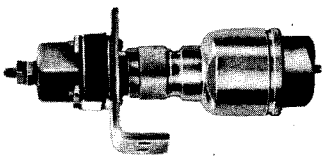
For Direct Main Cable Attachment			
Cable	ANDREW Type No.	Main Cable End Fitting	Cable Adaptor
⅞″ HELIAX	HO	20T	None
⅞″ Copper	740	1703AP	None
RG-8/U	10791-1	Supplied with adaptor	13074A-1
RG-17/U	10791-7	Supplied with adaptor	13074A

SPECIAL CABLE ADAPTORS

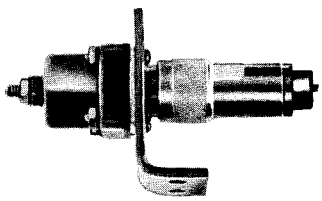
The following adaptors provide for applications where the main cable is attached directly to the antenna.

Type 13074A has Type N jack (10804-4) and Type N plug (12418-5) for RG-17/U cable.

Type 13074A-1 has Type N jack (10804-4) and Type N plug (10804-6) for RG-8/U cable.

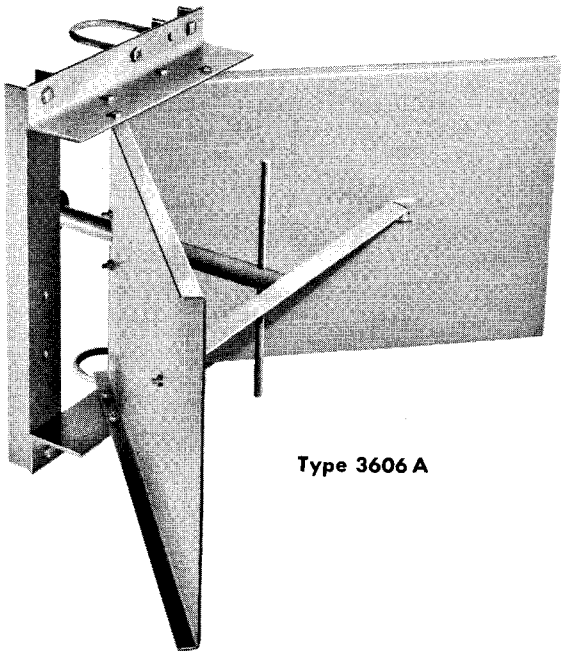


For RG-17/U cable Type 13074A



For Type N fittings with RG-8/U cable Type 13074A-1

CORNER REFLECTOR ANTENNAS



Type 3606 A

STACKED ARRAYS FOR 450-470 MC

Type 3626 is a two-element Corner Reflector for 450-470 mc. This unit may be mounted for unidirectional or bidirectional operation. In bidirectional operation, the signal divides between halves of the array. Type 3646 is a four-element array. This array can also be mounted for unidirectional or bidirectional operation. Both arrays include the individual elements, all interelement cabling, and complete installation instructions. The input connection is a Type N plug with a Type N junction included. For connection to HELIAX, specify Type 20N on antenna end of cable.

STACKED ARRAYS FOR 400-420 MC

These are similar to the arrays described above. Type 3628 is a two-element array, while Type 3648 is a four-element array.

CONNECTING HARNESS

An adaptor kit including harness and instructions, plus an additional corner reflector, is sufficient to convert your present corner reflector to a higher gain two-element array.

Type	For use with
19452	3606A-2
21209	3608A-2

400-420 MC AND 450-470 MC RANGES

Type 3608A-2 Corner Reflector Antenna covers the 400-420 mc range, while Type 3606A-2 covers the 450-470 range. Both models are equipped with "U" bolts for attachment to 2″ standard pipe. Either horizontal or vertical polarization can be accomplished with the clamps provided.

CONSTRUCTION

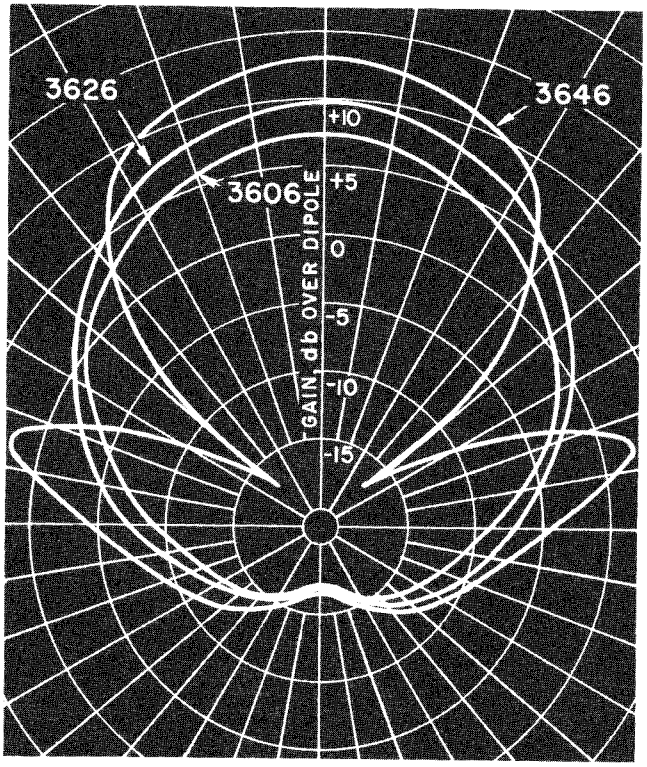
These antennas are fabricated from high strength aluminum alloy. Reflector assembly is chemically treated for corrosion resistance. Bracing anchors the feed rigidly with respect to reflector elements. The mounting backup similarly contributes to reflector strength resulting in a mechanically stable unit.

Input connection to these antennas is a Type N jack. RG-8/U is normally used for very short cable runs. For cable lengths greater than 25 feet, HELIAX is the preferred cable. Order a Type 16253-20 and Type 20N on the antenna end of the HELIAX.

Impedance of these antennas is 50 ohms. VSWR is under 1.5.

MOUNTING

All basic elements include individual mounting hardware for mounting to 2″ standard pipe. Elements can be mounted for either horizontal or vertical polarization with hardware provided.

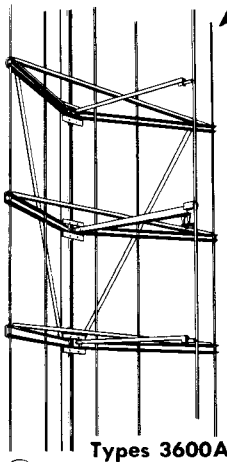


HORIZONTAL GAIN PATTERNS
OF TYPES 3606A, 3626, and 3646

CORNER REFLECTOR ANTENNAS

25-50 MC RANGE

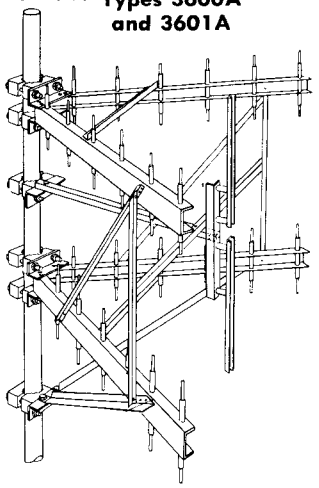
Types 3600A and 3601A antennas cover the 25-40 and 40-50 mc ranges, respectively. These antennas are similar to Type 3605A which is described on page 28 except for size. Both units include input connections which mate with a UHF plug (10805-1). The adaptors shown on page 29 for other main cables can also be used with Type 3600A or 3601A. Both models include mountings for 4" standard pipe. Length of pipe required for mounting Type 3600A is twelve feet. Type 3601A requires six feet of pipe for mounting. Specify frequency.



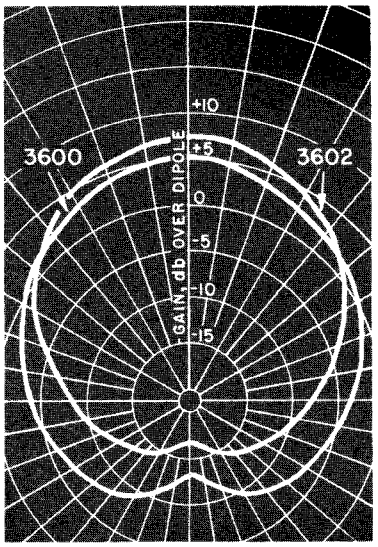
Types 3600A and 3601A

72-76 MC RANGE

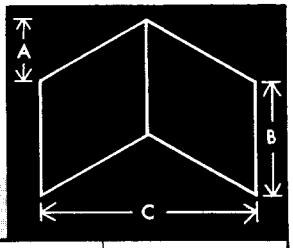
Type 3602A Corner Reflector Antenna covers the 72-76 mc range. Construction is similar to Type 3605A, except that more extensive bracing is used and mounting hardware supplied is for 4" standard pipe. Over-all pipe length required is eight feet. Feed connection includes end terminal, UHF jack, and plug for RG-8/U cable. When other main cables are used, select cable and adaptors or jumper cables from those listed on page 29. Horizontal mounting is available at a slight extra charge. Stacked models of the 3602A are also available. Hurricane models are also listed.



Type 3602A



HORIZONTAL GAIN PATTERNS OF TYPES 3600A and 3602A



CORNER REFLECTOR SPECIFICATIONS

Type Number	Frequency Range, mc	Gain Over Dipole, db 0°	90°	180°	½ Power Angle, Degrees	Max. Safe Wind** (Flat), psf No Ice	½" Ice	Thrust▲ at 20 psf (Flat), Lbs. No Ice	½" Ice	Max. Over-all Dimension, Inches A	B	C	Weight, Lbs. Net	Packed
3600A	25–40	5.2	−4.0	−14.0	100	33	13	230	410	70	240	145	176	340
3601A	40–50	5.2	−4.0	−14.0	80	57	22	130	225	50	144	90	114	230
3602A	72–76	7.5	−8.5	−17.0	60	62	24	185	415	65	120	129	125	275
3605A‡	144–174	7.5	−8.5	−17.0	60	92	25	40	100	31	47	62	26	35
3625▲▲‡	148–174	10.0 4.5	−6.5 −5.5	−14.5 4.5	†	92	25	80	200	31	114	62	55	73
3645▲▲‡	148–174	12.5 7.0	−4.0 −3.0	−12.0 7.0	†	92	25	160	400	62	114	62	115	152
3608A-2*	400–420	7.7	−8.5	−17.0	60	133	36	90	95	15	21	30	22	27
3606A-2*	450–470	8.0	−9.0	−17.0	60	133	36	60	65	15	21	30	19	24
3626▲▲	450–470	10.5 5.0	−6.5 −6.0	−14.5 5.0	†	133	36	120	130	15	38	30	40	50
3646▲▲	450–470	13.0 7.5	−4.0 3.5	−12.0 7.5	†	133	36	240	260	15	38	60	80	100
HURRICANE MODELS														
S3602A	72–76	7.5	−8.5	−17.0	60	166	66	188	415	65	120	129	258	410
S3605A	144–174	7.5	−8.5	−17.0	60	255	68	40	100	31	47	62	55	65
S3625	148–174	Same as 3625				255	68	80	200	31	114	62	115	135
S3645	148–174	Same as 3645				255	68	160	400	62	114	62	235	265

When cable other than RG-8/U is used, use suffix "B" with antenna part number, and order adaptor separately from those shown on page 29

▲Has Type N jack input.

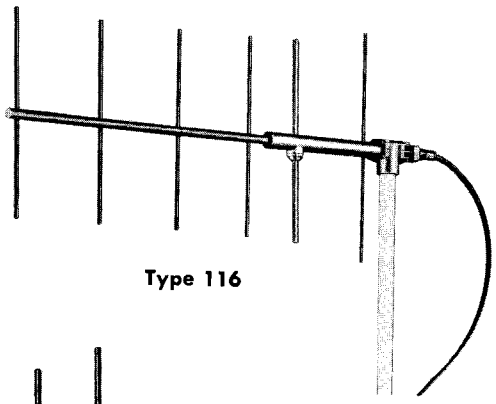
▲▲Multiple array. Dimensions are over-all. Gain figures in first line are for unidirectional operation. Gain figures in second line are for bidirectional operation. Vertical stacking provides 60 ½ power angle. Horizonal stacking provides 30 ½ power angle for 2 elements, 15 for 4 elements.

**See Engineering Data Section for equivalent wind velocities and interpretation of data.

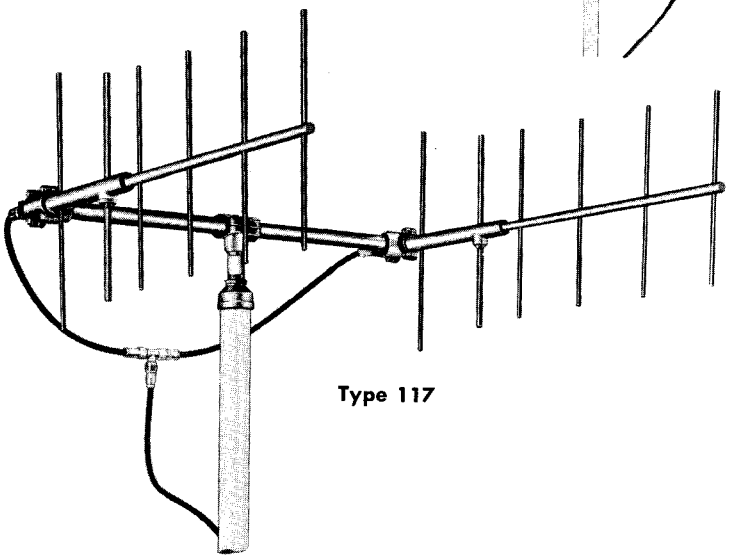
*Determines required strength of supporting structure.

‡ Specify frequency if below 152mc.

YAGI ANTENNAS



Type 116



Type 117

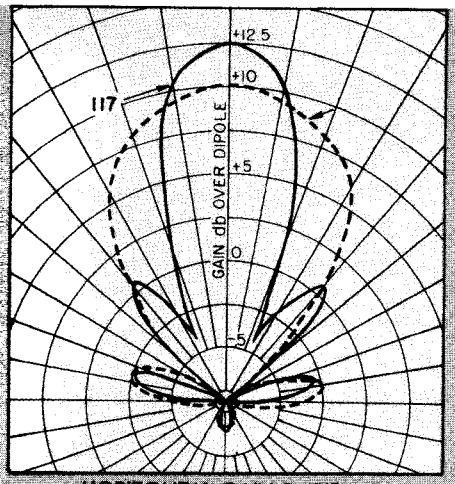
450-470 MC DIRECTIONAL ARRAYS

ANDREW Yagi Antennas are recommended for directional and point-to-point applications where light weight and minimum wind loading are prime considerations. These antennas are not suited for operation under ice load. Where icing conditions prevail, Type 3606A Corner Reflector, described on page 30, should be used.

These antennas are fabricated from corrosion resistant brass. Elements are brazed to support boom. The coaxial section to the feed point is solid dielectric to eliminate moisture-collecting voids. Wind load rating is in excess of 140 mph.

Input connection is a Type N jack on Type 116. Type 117 has a Type N plug and includes a Type N junction. For either antenna 7/8" HELIAX cable is recommended. Order a Type 20N connector on the antenna end of the HELIAX, plus Type 16253-8 jumper cable (2 feet) for connection between cable and antenna. With Type 117, 20N connects directly.

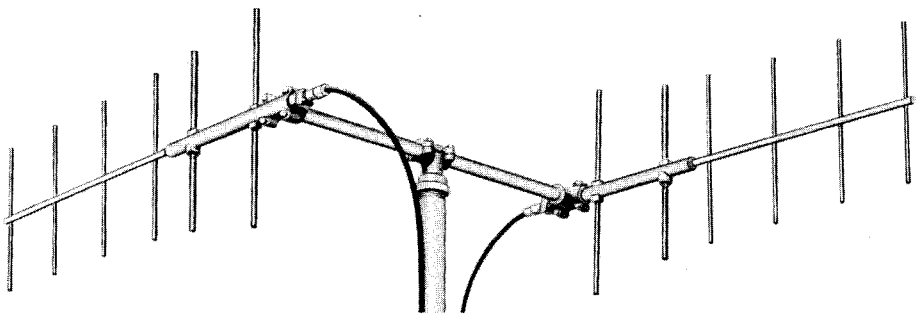
Mountings are included with antennas. Type 116 has a socket which receives threaded 3/4" standard pipe. Type 117 has a similar socket for threaded 1-1/2" standard pipe.



HORIZONTAL GAIN PATTERNS OF TYPES 116 and 117 ANTENNAS

YAGI ANTENNA SPECIFICATIONS

	Frequency, mc	Maximum VSWR	Gain Over Dipole, db. 0°	90°	180°	Support Pipe Size (Standard Pipe)	Wind Load Rating psf	Net Weight, Lbs.	Shipping Weight, Lbs.
Type 116	450-470	1.5	10	−6	−8	3/4"	90	5	9
Type 117 UNIDIRECTIONAL	450-470	1.5	12.5	−10	−6.2	1 1/2"	90	14	24
Type 117 BIDIRECTIONAL	450-470	1.5	7	−3	7	1 1/2"	90	14	24



Type 117 is shown at the right arranged for bidirectional operation.

TYPE 225A 1.5 DB GAIN ANTENNA

Omnidirectional 1.5 db Gain Antenna for 450-470 mc

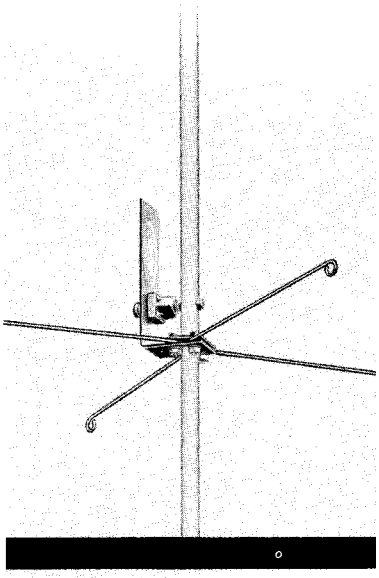
This electrically superior antenna combines a half-wavelength radiator with a ground plane and a unique feed system which provides optimum isolation (decoupling) from the supporting structure. Gain is 1.5 db over a half-wave dipole.

Grounded radiating element reduces static noise and provides lightning protection for other RF equipment.

Construction is of brass and stainless steel. Wind load rating is 120 mph (60 psf flats) or 80 mph (27 psf flats) with ½" radial ice.

Input connection is a Type N jack. Connecting cable requires a Type N right angle plug (10804-10). When cable runs are more than 25 feet, ⅞" HELIAX cable is recommended. Order a Type 20N termination on the HELIAX and jumper cable 16253-8 for connection between main HELIAX cable and antenna.

Mounting clamps must be purchased separately. Type 225A may be mounted to a 1½" or 2" standard pipe by means of Type 13967 clamps.



TYPE 15010 DRILLING RIG ANTENNA

Heavy duty fixed station antenna for 25-50 mc

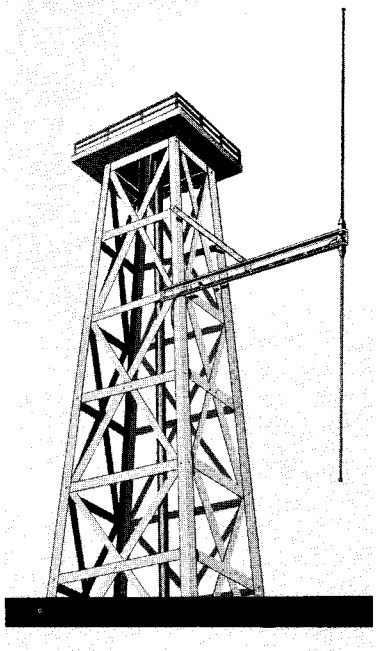
This extremely rugged antenna with shock resistant spring-type mounts is designed for use on oil derrick rigs or any structure that is subject to severe vibration.

Antenna mounts to side of tower. Radiation pattern varies with tower size, but usually provides adequate general coverage.

Mounting hardware is included for bolting or clamping to tower.

Input connection is a UHF jack. Cable requires UHF plug, 10805-1, (not incl.).

When ordering, specify Type 15010 for 25-50 mc, (net weight, 55 lbs.; shipping weight, 85 lbs.). Purchaser cuts radiators per instructions.

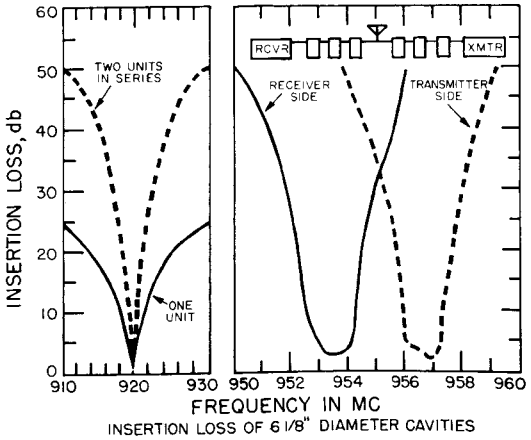


CAVITY FILTERS FOR 890-960 MC

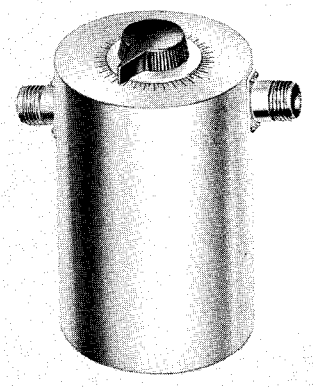
These resonant cavities are ideally suited for filtering duplexing and diplexing applications in the 890-960 mc range.

Single 6⅛" diameter units with 0.6 db insertion loss at the pass frequency give 20 db rejection 10 mc away from the pass frequency. Two or more units can be cascaded for higher rejection. Six units can be connected to form a duplexer with 50 db rejection, 3.6 mc away from resonance. Insertion loss across each branch is less than 2 db.

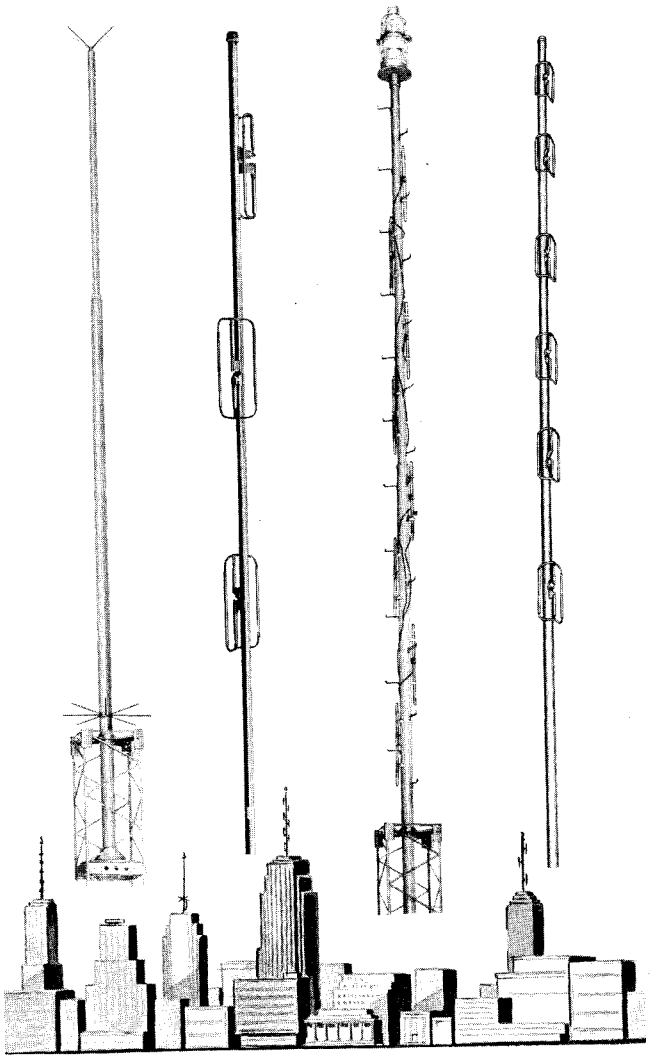
The above will give an idea of the results which can be obtained. Advise us concerning your filter requirements. A combination of existing units may provide a ready answer to your problem.



INSERTION LOSS OF 6 1/8" DIAMETER CAVITIES



HIGH GAIN ANTENNAS



MODELS AVAILABLE

Frequency	Coverage	Type	Gain	Page
148-174	Circular	3000A	6.3 db	35
		3006	9.0 db	35
		3008*	3.0 db	35
	Offset	3004	8.0 db Forward	35
400-420	Circular	4010	7.5 db	37
450-470	Circular	212	10.0 db	36
		213	10.0 db	36
		4000	7.6 db	37
		4002	5.0 db	37
	Offset	201	10.8 db Forward	37

*Dual Frequency

INCREASE COVERAGE—CUT INITIAL AND OPERATIONAL COSTS WITH THESE HIGH GAIN OMNIDIRECTIONAL ANTENNAS

These antennas increase the effectiveness of eve mobile unit, as well as the base station transmitte

Initial and maintenance costs of a given coverage i a mobile communication system are almost alwa lower when a high gain antenna is used. Increasi coverage with a high gain antenna is less costly th making the same increase with a taller tower or higher power transmitter. Furthermore, a high ga antenna increases talk-back range, while increas base station transmitter power does not.

All ANDREW High Gain Antennas Have These Features

High gain is achieved by proper vertical spacin and phasing of radiating elements. Wasted hig angle radiation is eliminated because the pattern i beamed at the horizon.

Isolation from mast insures rated gain. ANDREW high gain antenna elements are isolated from th support mast,* so that the effect of the supportin structure on the radiation of the antenna is mini- mized. Mast coupling can seriously reduce rated o expected gain in conventional designs. ANDREW high gain arrays deliver full rated gain due t superior isolation from the support mast.

Extra rugged construction of these antennas en- ables them to perform under severe weather con- ditions. They will withstand high winds even when covered with ice and still deliver the signal.

Lightning protection is provided by a positive DC ground which runs from the extreme top of the antenna directly to the tower. This provides a path to ground for lightning surges, thereby protecting the antenna, transmission line, and other RF equipment.

No field adjustments are required. The 150 mc models are factory tuned for minimum VSWR at your exact operating frequency. The 400-470 mc units are broadband and require no adjustments.

Impedance of all units is 50.0 ohms.

*U.S. PATENT 2,757,371

HIGH GAIN ANTENNAS FOR THE 148-174 MC RANGE

These antennas consist of a tubular steel mast which supports folded dipole radiating elements stacked and phased to produce a narrow vertical angle of radiation providing gain in all horizontal directions. Total height of all models without lighting fixture is 33 feet except Type 3006, which is 66 feet high.

All models will withstand wind velocities in excess of 100 mph with ½" radial ice and with lighting fixture attached. The masts are heavily primed and painted to resist corrosion. Climbing steps are provided for access to lighting fixture.

HELIAX cable with 20U connectors is recommended for feeding the 148-174 mc antennas. All models are supplied with a UHF plug for direct attachment to Type 20U. A UHF junction is also provided for use where cable runs are very short and RG-8/U is employed as the main feed cable.

Mounting of antennas in the 3000 series is usually to the top of a tower with the bottom of the mast set 5 feet into the tower. Fittings to support the mast are not included since their design depends upon the type of tower used. Fittings and brackets are usually fabricated locally.

Tower lighting fixtures can be mounted on 3000 series antennas. All 148-174 mc models are available with a mounting plate for a 300 m/m code beacon or a hub for either a single or double obstruction light. Specify which is required.

Power rating of all 3000 series antennas is 250 watts.

Auxiliary VHF antenna may be mounted on top of 3000 series antennas provided that the bending moment is less than 5 foot-lbs. The ratings shown include the effects of such an antenna.

CIRCULAR PATTERN—6.3 DB GAIN

Type 3000A has eight folded dipole elements, distributed on opposite sides of the antenna mast to achieve circular coverage. Variation of gain with frequency is shown in the curve at the right.

CIRCULAR PATTERN—9 DB GAIN

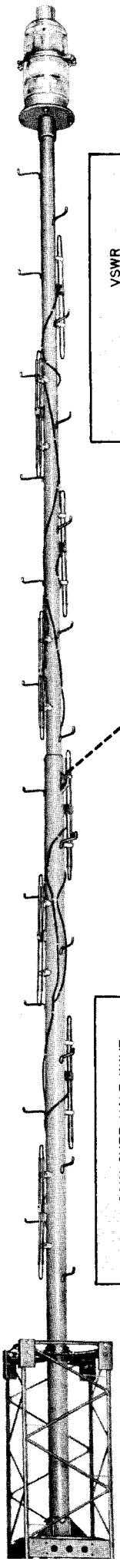
Type 3006 has sixteen radiating elements. Over-all length is 66 feet. This antenna can also be supplied with a special harness to provide two separate antennas each having 6 db gain or four separate antennas each having 3 db gain. In either of these cases, decoupling between the separate antennas is in excess of 50 db.

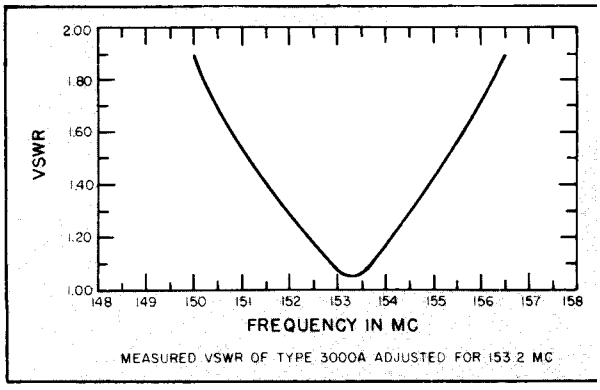
DUAL FREQUENCY—3 DB GAIN ON EACH CHANNEL

Type 3008 uses a modified harness which provides individual feed points for the upper and lower halves of the antenna. Decoupling between the halves is in excess of 50 db. See also Type 3006 above for this same feature with higher gain.

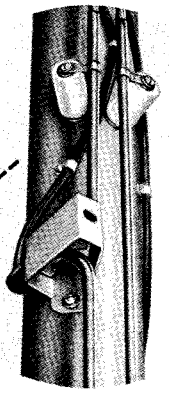
OFFSET PATTERN—8 DB FORWARD

Type 3004 is a directional version of Type 3000A. All radiating elements in this antenna are mounted on the same side of the mast to provide an offset pattern. Forward gain is 8 db, gain at 90 degrees is 6.3 db, and gain at 180 degrees is 4.6 db.

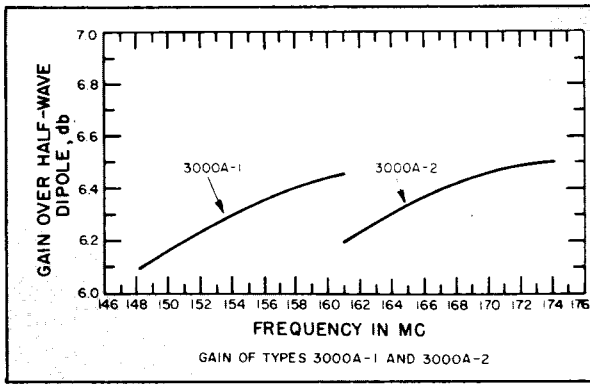




MEASURED VSWR OF TYPE 3000A ADJUSTED FOR 153.2 MC



Radiating elements—due to the unique design of the radiating elements, coupling to mast and to other elements is eliminated. Elements are grounded to minimize lightning damage. Weather shields are provided to protect feed points. Elements are fabricated of non-ferrous metals.



GAIN OF TYPES 3000A-1 AND 3000A-2

Type 3000A

10 DB GAIN ANTENNAS FOR 450-470 MC

Types 212 and 213 are omnidirectional 10 db antennas based on the new ANDREW Suppressor* element. The Suppressors do not radiate, but control radiation from the mast. This new principle in antenna design now makes it possible to achieve high aperture efficiency by controlling illumination to give maximum gain across the band with a single feed point.

Power ratings are 200 watts for Type 212 and 250 watts for Type 213.

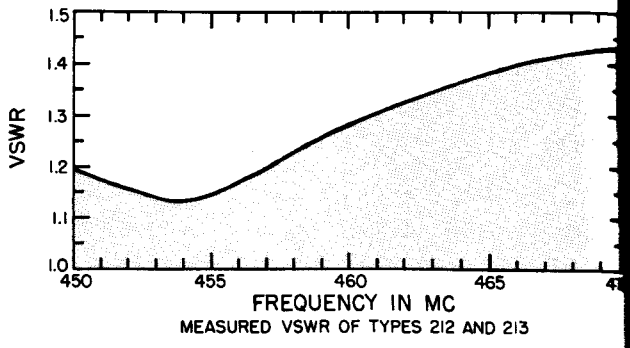
VSWR is less than 1.5 for both models.

Input connections are a Type N plug with a Type N junction for Type 212, and a 7/8" EIA flange for Type 213. HELIAX cable should be used for all but the shortest cable runs. Type 20R HELIAX fitting connects directly to Type 213. For Type 212, order Type 20N on the antenna end of the HELIAX.

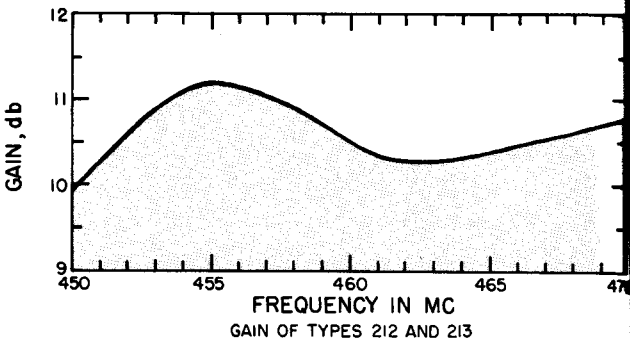
Fiberglas radomes completely protect these antennas. Elements are weather-proof within the radome. Wind load rating is 38 psf with 1/2" radial ice.

Sectionalized construction is used on both antennas. The longest section is twelve feet. Over-all length is twenty-three feet.

*Pat. pending.

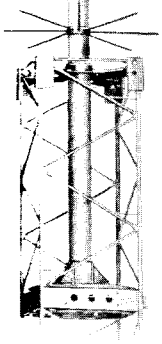


MEASURED VSWR OF TYPES 212 AND 213



GAIN OF TYPES 212 AND 213

Mounting clamps must be ordered separately. Type 21131 clamps attach either antenna to 4" standard pipe.


Type 212

HIGH GAIN ANTENNA SPECIFICATIONS

Frequency Range, mc / Type Number	Gain over dipole, db	Total mast length, Feet	Maximum mast diameter, Inches	Recommend mast engagement, Feet	Bending* moment at tower top, Ft.-Lbs.	Thrust at* 30 psf (flat) Lbs.	Max. safe wind** pressure (flat) no ice Lbs.	Max. safe wind** pressure (flat) 1/2" ice Lbs.	Input fitting	Net Weight, Lbs.	Ship Wt. Lbs.
148-174 †											
3000A	6.3	33	5.62	5	8050	405	48	42	UHF plug	575	11
3004***	8.0 at 0° 6.3 at 90° 4.6 at 180°	33	5.62	5	6450	360	63	53	UHF plug	550	10
3006	9.0	66	6.625	5	21,400	806	43	36	UHF plug	2384	45
3008*** Dual freq.	3.0 each channel	33	5.62	5	6450	360	63	53	UHF plug	550	10
400-410											
4010-1	7.5	18	1.9	4	724	87	55	36	N plug	80	1
410-420											
4010-2	7.5	18	1.9	4	724	87	55	36	N plug	80	1
450-470											
212	10.0	23	3.5	2.5	875	120	45	38	N plug	54	1
213	10.0	23	3.5	2.5	875	120	45	38	7/8" EIA	54	1
4000▲	7.6	18	1.9	4	724	87	55	36	N plug	80	1
4002▲	5.0	9	1.05	3	124	29	41	35	N plug	13	3
201▲	10.8 at 0° 6.1 at 90° 3.3 at 180°	18	1.9	4	724	87	55	36	N plug	80	1

*Determines required strength of supporting structure. Calculations based on 30 psf wind loading with 1/2" radial ice and include effect of lighting fixtures, although these are not supplied with antenna.

**Calculations include effect of lighting fixtures. See Engineering Data Section for equivalent wind velocities and interpretation of data.

***Loading factors based on double obstruction light. If beacon is used, use figures shown for Type 3000A.

▲Specify frequency when ordering. Detail -1 covers 450-460 mc. Detail -2 covers 460-470 mc.

†Specify frequency and lighting fixture mount for 3000 series.

5 and 7.5 DB GAIN ANTENNAS for 400-420 and 450-470 MC

These antennas consist of a galvanized steel mast with folded dipole elements stacked and phased to produce a narrow vertical angle of radiation.

Broadband models each cover a full 10 mc range. No adjustment required.

Input connection is a Type N plug with Type N junction included. HELIAX cable is recommended for feeding these antennas. Order Type 20N on the antenna end of the HELIAX.

CIRCULAR PATTERN—7.5 DB GAIN

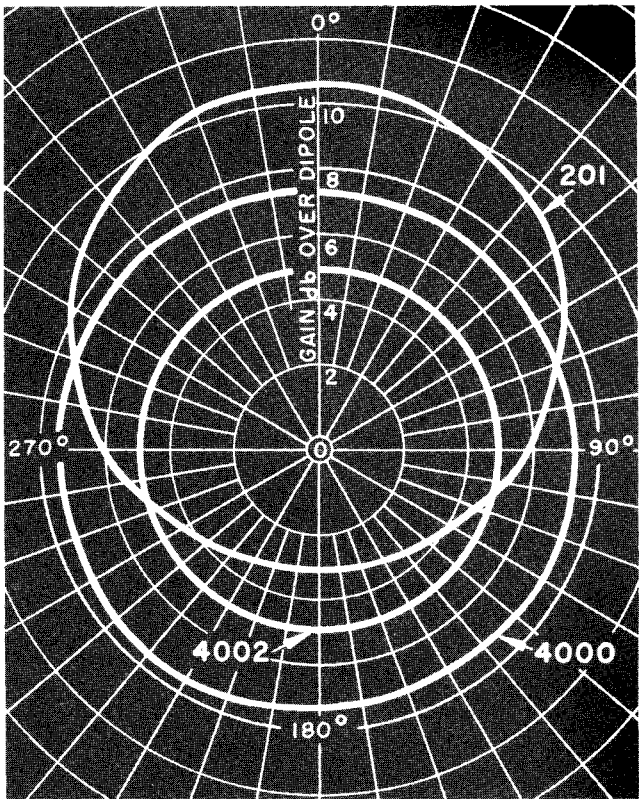
Type 4010-1 covers 400-410 mc, Type 4010-2 covers 410-420 mc, Type 4000-1 covers 450-460 mc, and Type 4000-2 covers 460-470 mc. Each of these types has six radiating elements mounted on a 1.9 inch diameter mast.

CIRCULAR PATTERN—5 DB GAIN

Type 4002-1 covers 450-460 mc and Type 4002-2 covers 460-470 mc. Each of these models has three radiating elements on a 1.05 inch steel mast.

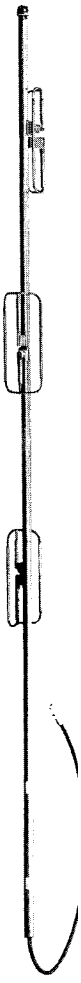
OFFSET PATTERN—10.8 DB FORWARD GAIN

Type 201 is a directional version of the Type 4000 antenna in which all radiating elements are mounted on the same side of the mast to achieve an offset pattern. These antennas are ideally suited for stations not in the center of their coverage area. Type 201-1 covers 450-460 mc and Type 201-2 covers 460-470 mc. Forward gain is 10.8 db, gain at 90 degrees in each direction is 6.1 db, and gain at 180 degrees is 3.3 db.



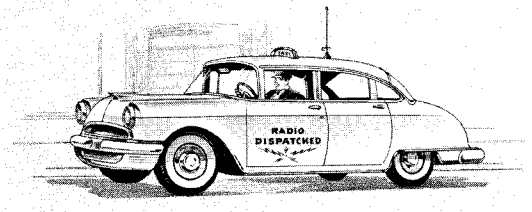
HORIZONTAL GAIN PATTERNS
OF TYPES 4000, 4002 and 201

Mounting clamps must be ordered separately. For Types 4000, 4010, or 201, order Type 14671-2 for attachment to 2″ standard pipe. For Type 4002, order Type 15681 for attachment to any round member from ¾″ to 3″ diameter.



Type 400

MOBILE 1.3 DB GAIN ANTENNA



The ANDREW car top antenna for 450-470 mc range increases effective mobile transmitter power more than 50%. This new ANDREW antenna effectively multiplies mobile transmitter power by 1.5 without adding to the cost of the mobile unit or increasing battery drain. The inductive-tuned 9/16 wavelength radiator has 1.3 db measured gain. Use of RG-8/U feed cable (optional) gives an additional .5 db gain, making a total effective gain of 1.8 db (1.5 power gain) compared to conventional quarter-wave car top antenna with RG-58/U cable.

Stainless spring steel radiator is supported by molded plastic insulator which mounts in a single ⅞″ hole. Height above car top is 17″. The antenna includes a 12-foot length of coaxial cable, which is factory soldered to antenna input.

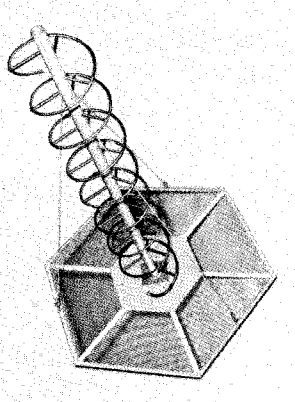
Installation is made in the conventional manner with feed line fished between car top and upholstery "headlining." Extensive field tests have shown that while RG-8/U cable takes slightly longer to install, its use is well worthwhile.

Type 233A is supplied with RG-8/U cable; Type 234A is supplied with RG-58/U cable. See page 53 for fittings for equipment end of cable.

Replacement whip Type 16684 is available for either Type 233 or 234 antennas.

GROUND-TO-AIR ANTENNAS

BROADBAND HELICAL ANTENNAS FOR 108-500 MC



These dependable broadband helical antennas are designed to cover the 108-132 mc and 215-500 mc ranges. Both standard and hurricane constructions are available. Add prefix "H" to part number for hurricane model with 90 psf rating.

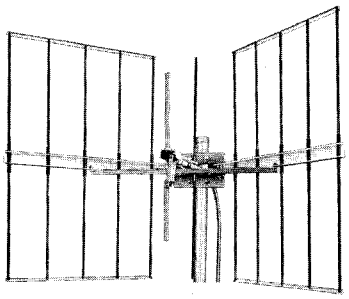
HELICAL ANTENNA SPECIFICATIONS

Type Number	Frequency Range, mc	Wind Load Rating psf (flats) No Ice	Gain, db*	Mounting	Weight, lbs. Net	Gross
19110N-1	108-132	60	13.0	to M8 mount	300	450
19110N-2	215-265	60	13.5	to T4 mount	45	90
50140	215-265	60	10.5	to T4 mount	40	80
19110N-3	260-320	60	13.5	to T4 mount	35	75
19110N-4	320-400	60	13.5	to 13550 clamps	20	50
19110N-5	400-500	60	13.5	to 13550 clamps	10	20

*Over circular polarized isotropic source, at center of band

Input Connection: Type N jack
Power Rating: 250 watts for 108-265 mc
150 watts for 265-500 mc
Impedance: 50 ohms
VSWR: less than 2.0:1 across band
Polarization: right hand circular (IRE definition)

Special helical antennas for other frequencies, higher power, or with polarization of left hand sense are also available. Contact your ANDREW sales engineer.



CORNER REFLECTOR ANTENNA

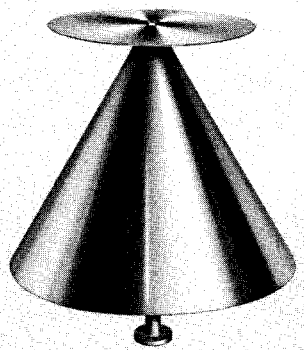
This antenna provides unidirectional coverage over the 215-265 mc range. Pattern and VSWR characteristics are similar to those shown for Type 3605A on page 28. Add prefix "H" to part number for stainless steel hurricane model with 40 psf windload rating with 2″ radial ice.

SPECIFICATIONS

Type Number: 19140
Frequency: 215-265 mc
Polarization: Linear
Gain: 7.5 to 8.5 db over a half-wave dipole
VSWR: Less than 2.0:1 over the band
Power Rating: 250 watts
Input Connection: Type N jack provided*
Wind Load Rating: 30 psf (flats) with ½″ radial ice
Mounting: Clamps to 2″ standard pipe.
Net Weight: 26 lbs.
Gross Weight: 35 lbs.

*See Type 3605A on page 28 & 31 for dimensions, adaptors, and other mountings.

DISCONE ANTENNAS



Three models of this unity gain omnidirectional discone antenna are available for the 108-420 mc range. Special discone antennas are available for applications not covered by the standard units.

SPECIFICATIONS

Frequency Range, mc	Type Number	VSWR Maximum	Power Rating, watts	Input Connection	Wind Load Rating, psf
108-215 mc	19050-1	2.0	1500	⅞″ EIA flange	30
108-215 mc Hurricane model	H19050-1	2.0	1500	⅞″ EIA flange	40*
215-420 mc Hurricane model	H19050-2	2.0	1000	⅞″ EIA flange	40*

*Including 1″ radial ice.

For Type N input, order Type 2260 adaptor. Mounting hardware is included. The 108–215 mc models thread to 2″ standard pipe. Type 19050-2 mounts to 1″ standard pipe. *Hurricane* models are suitable for use in highly corrosive atmospheres.

TRI-HELIX ANTENNA ARRAY

For long-range and medium-range missile tracking

The tri-helix antenna system provides the very high gain and easy operational control needed to maintain a reliable telemetry circuit between missile and ground station. The complete system consists of the antenna array with counterbalance, rotator, remote control unit, and remote position indicator.

Type 80420 antenna array consists of three eight-turn helical elements mounted on a mesh ground screen, and fed in phase to provide a narrow beam with a gain of 19.5 db at the design frequency. VSWR is low across the entire telemetry band. Typical gain and VSWR curves for array optimized for 225-235 mc are shown below. The array may be optimized for other frequencies.

Polarization is right hand circular. Input impedance is 50 ohms. Axial ratio is less than 1.5:1. Standard input is Type N jack (7/8" EIA flange input also available).

Type 80422 counterbalance is used to balance and mount the antenna array in the rotator.

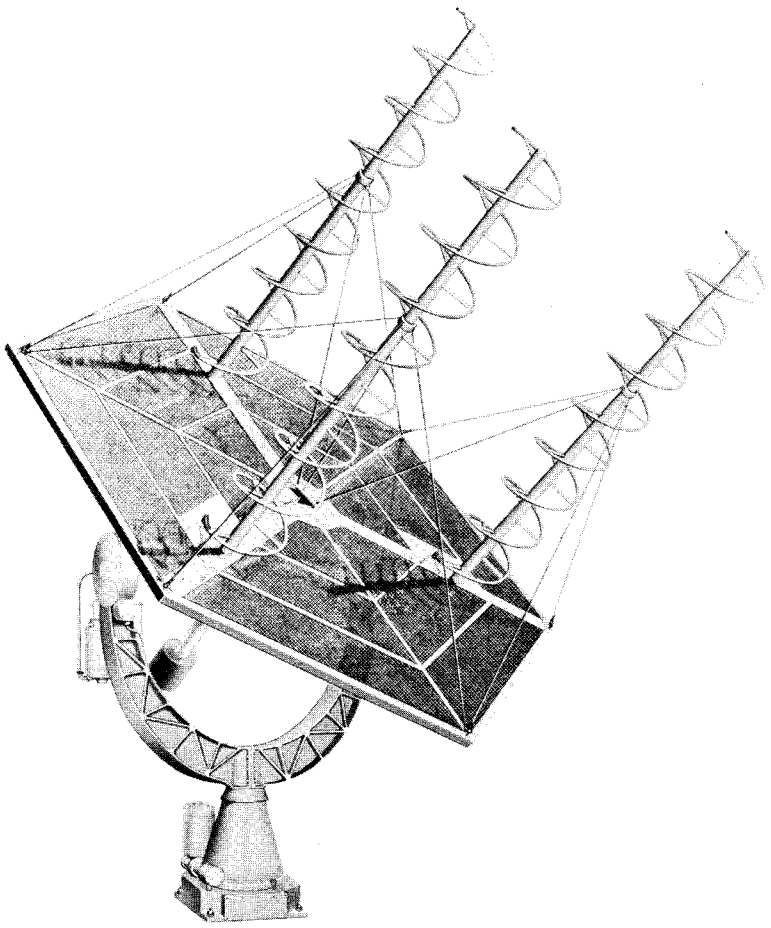
Type 80427 rotator provides 180 degrees elevation, 720 degrees azimuth tracking. Limit switches prevent over-ride. Dynamic braking prevents coasting. Tracking speed is variable 0-30 degrees per second in both elevation and azimuth. Acceleration is variable 0-30 degrees per second squared.

The remote control unit included permits simultaneous control of direction and speed of both azimuth and elevation rotation from a single lever. The remote position indicator shows relative position of the antenna beam. Both units with power supply fit standard 19" relay rack or may be console mounted. Control cable is included; specify length required.

The rotator mounts by four 3/4" diameter bolts on 18" centers. Operation is from 110 volt, 60 cycle, single phase, 10 ampere source.

Also available is Type 19122, which is the same as Type 80427 except rotational speed of azimuth and elevation of 1 rpm is constant. Independent control switches are included.

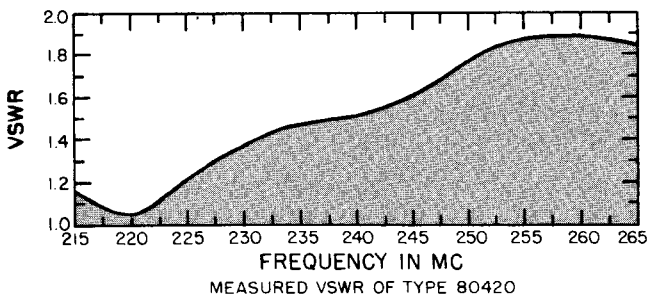
Slave units to track the antenna automatically in unison with a "master" tracker are available on special order.



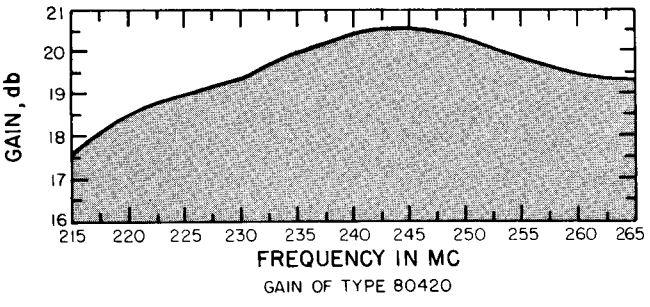
SPECIFICATIONS

Type Number:	80420
Frequency Range:	215-265 mc
Gain:	19.5 db at center of band
VSWR:	Less than 2.0:1
Beamwidth:	20° plus or minus 2° at center of band
Impedance:	50 ohms
Input Connection:	Type N jack or 7/8" EIA flange
Net Weight:	1100 lbs. (complete system)
Gross Weight:	1700 lbs. (complete system)
Wind Load Rating:	50 psf
Mounting:	Four 3/4" diameter bolts on 18" centers. (Rotator)

Modifications may easily be provided for different rotational speeds and angles.



MEASURED VSWR OF TYPE 80420



GAIN OF TYPE 80420

MULTI-V FM ANTENNAS

For more gain per dollar in FM broadcasting specify the ANDREW Multi-V.

The Multi-V antenna, proven by years of satisfactory field service, is one of the most effective FM antennas available today. Designed to produce an omnidirectional pattern when side mounted, this antenna frequently replaces a top mounted FM antenna, thus freeing the tower top for TV or communication antennas.

Multi-V antennas offer power gains ranging from 1.6 to 7.3 with a power rating of 10 kw. Impedance is 50 ohms.

These antennas are simple in design,* easy to install, lightweight, and rugged. They are tuned for low VSWR at the factory and require no further adjustment. The radiating elements are grounded for maximum protection from lightning.

MOUNTS TO EXISTING TOWER

The light weight of these antennas makes hoisting and attaching to the side of the tower a simple matter. The antenna elements bolt to a properly drilled support. Supports are not provided. They are normally fabricated locally and we will supply complete antenna dimensional information for this purpose.

CONSTRUCTION

Antenna elements are constructed of copper and brass, mounting plates of plated steel. Insulators are glazed ceramic.

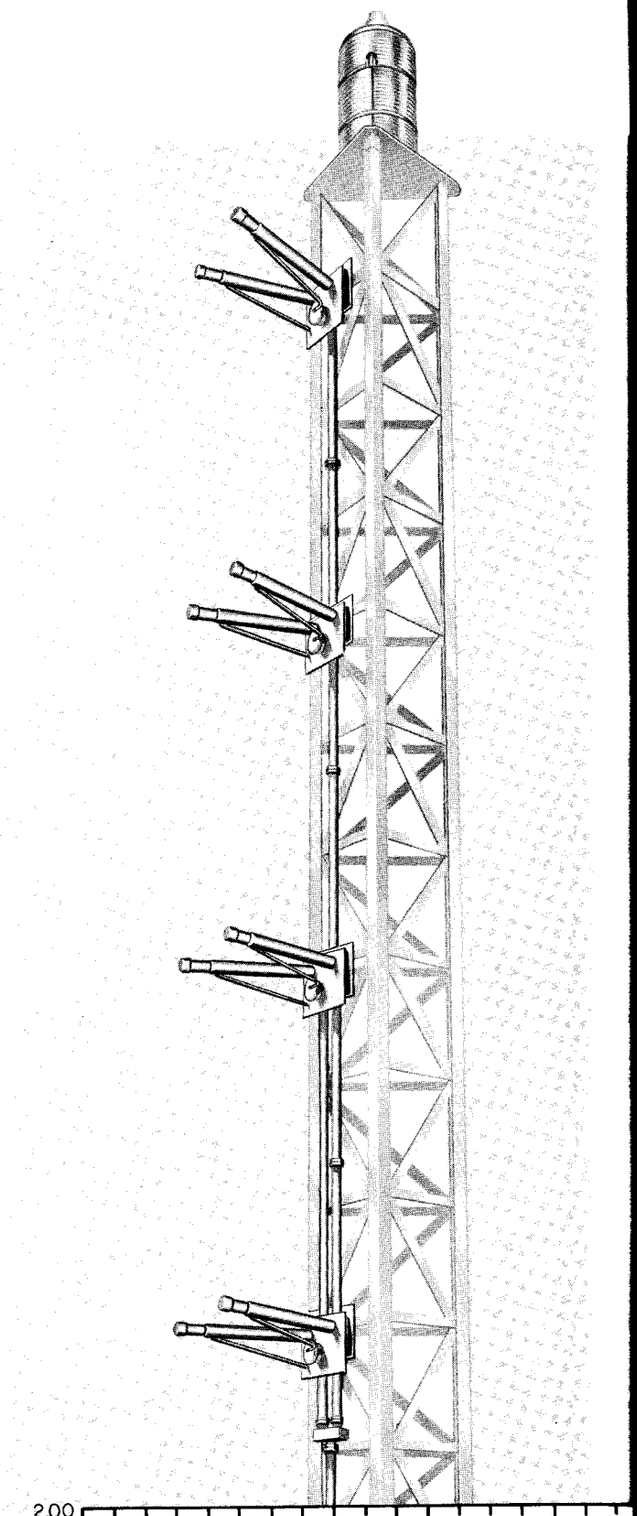
FEED CABLES

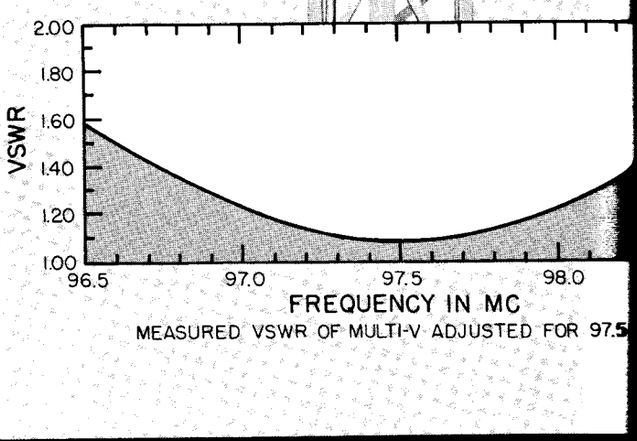
HELIAX is recommended for use with the Multi-V transmitter. Cable size depends upon transmitter power and systems considerations. See Engineering Data Section for transmission line ratings. Connection to the antenna is 1⅝″ flange at bottom of antenna. Order 21R and 4851 on antenna end of 1⅝″ HELIAX for direct attachment to antenna. When 3⅛″ HELIAX is used order 22R, 1861, and 4851 for the antenna end of the cable.

INSIDE TOWER MOUNTING

Under certain conditions, inside tower mounting is possible. The radiation pattern of the Multi-V is circular within 3 db when mounted on the outside of towers with less than 36″ cross section. For towers between three and six feet in cross section, the pattern is cardioid shaped, when the antenna is mounted on outside. For towers with cross sectional dimensions in excess of six feet, the Multi-V can frequently be mounted inside the tower to provide more nearly circular coverage. Consult your ANDREW sales engineer.

*U.S. PATENT 2,637,533





MEASURED VSWR OF MULTI-V ADJUSTED FOR 97.5

MULTI-V FM ANTENNAS

DUAL POLARIZATION

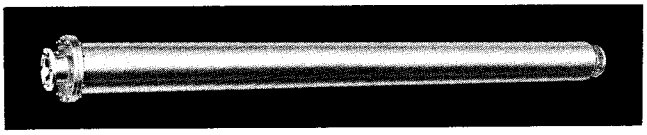
Type X1304 provides vertical as well as horizontal polarization for improved coverage of auto radios. The transmitter power is split equally between the Multi-V and a modified Type 262 array. (See page 27.) Four bays of each antenna are used.

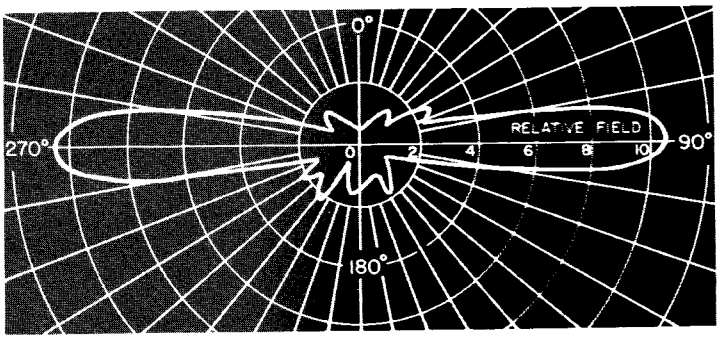
SPECIFICATIONS

Type Number:	X1304
Number of Bays:	Four bays horizontally polarized Four bays vertically polarized
Gain:	2.7 db in each polarization referred to half-wave dipole, based on equal power division
Power Gain:	1.85 each polarization
Field Gain:	1.35 each polarization

VSWR TUNER

Type 19893 can be used to tune out a VSWR as high as 2 to 1 at any frequency in the 88-108 mc. Ideal for multiplex systems, this tuner is fabricated from 3⅛" diameter line and has EIA flanges. It should be located as close to the antenna as possible. To use with the Multi-V, also order a Type 4851 connector and Type 1861 adaptor. Slotted outer conductor permits adjustment of the tuning slugs, which are then clamped in place. The entire assembly is sealed with a pressure tight cover. Nominal impedance is 50 ohms.





VERTICAL RADIATION PATTERN OF TYPE 1304

HIGH POWER MODEL

Modified Type 1308 (8 bays) is available with a 50 kw rating at a slight additional cost.

DEICING

Type 21210 deicing kit assures low VSWR under icing conditions. Kit consists of thermostat and wrap-around heating elements for radiators and end terminals.

HARMONIC FILTER

Type 15200 is a shorted stub, one quarter wavelength long at the pass frequency and one half wavelength at the second harmonic frequency. Rejection at the second harmonic frequency is 40 db or greater.

This unit is built into a 3⅛" tee section. Nominal impedance is 50 ohms. VSWR is less than 1.5. Flanges are 3⅛" flat type not EIA. Length between flange faces is 18 inches.

MULTI-V ANTENNA SPECIFICATIONS

	Type 1302-1	Type 1302-2	Type 1304-1	Type 1304-2	Type 1306-1	Type 1306-2	Type 1308-1	Type 1308-2
Frequency Range, mc:	88-98	98-108	88-98	98-108	88-98	98-108	88-98	98-108
Gain over Dipole, db:	2.0	2.0	5.7	5.7	7.5	7.5	8.6	8.6
Number of Elements:	2	2	4	4	6	6	8	8
Field Intensity mv/m:*	174	174	264	264	326	326	371	371
Field Gain:	1.26	1.26	1.92	1.92	2.37	2.37	2.70	2.70
Power Gain:	1.6	1.6	3.7	3.7	5.6	5.6	7.3	7.3
Length, Feet:	10.3	9.3	30.9	27.9	51.5	46.5	80.7	73.3
Maximum Safe Wind Pressure, Lbs. per square Foot (flat), no ice:**	36	36	36	36	36	36	36	36
Maximum Safe Wind Pressure, Lbs. per square Foot (flat), ½" ice:**	20	20	20	20	20	20	20	20
Thrust at Wind of 30 Lbs. per square Foot (flat), Lbs:***	180	185	210	205	280	270	330	320
Net Weight, Lbs.:	70	70	160	160	260	260	365	365
Shipping Weight, Lbs.:	300	300	520	520	810	810	1100	1100

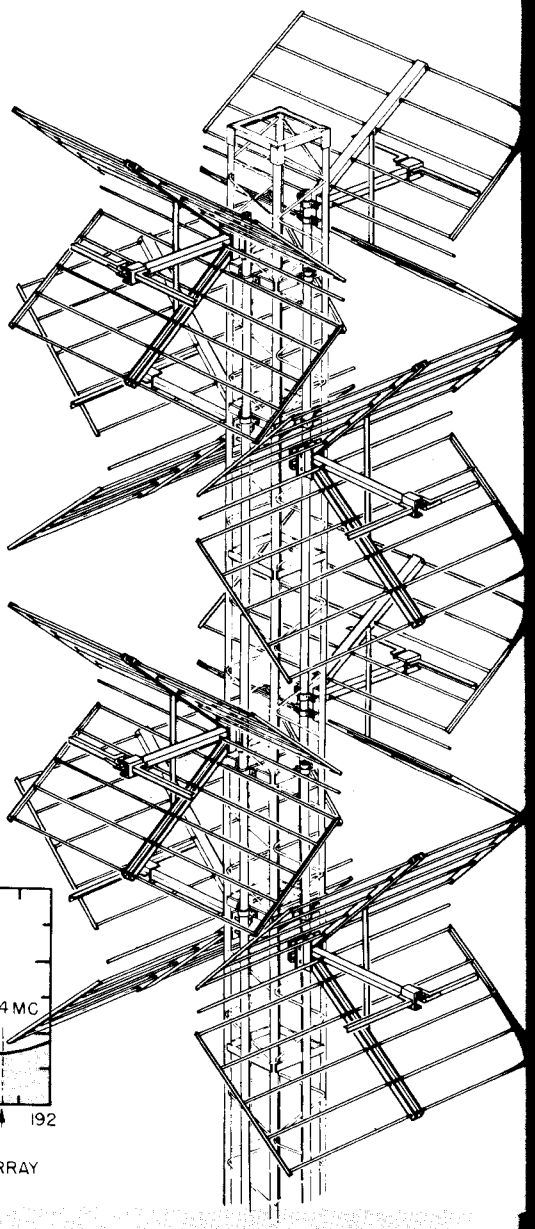
*Effective free space field intensity at one mile in mv/m for one kilowatt antenna input power.

**See Engineering Data Section for equivalent wire vendors and interpretation of data. Specify frequency when ordering.

***Determines required strength of supporting structure. Calculations based on 30 psf wind loading with ½" radial ice.

LOW — MEDIUM POWER TELEVISION TRANSMITTING ANTENN

These antennas are comprised of two separate four-element corner reflector arrays, one array for visual, the other for aural. Elements are arranged in a square and directed radially to achieve an array circularity of plus or minus 3 db or better. Basic elements are modified Type 3602A for channels 2 through 6 and modified Type 3605A for channels 7 through 13.

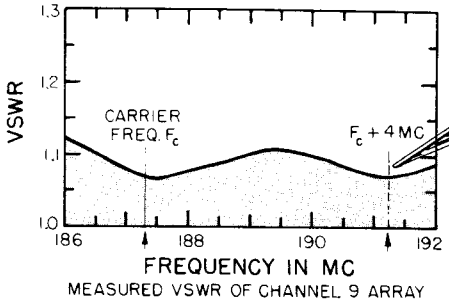


SPECIFICATIONS	
Type Numbers:	19890* (low power) 21156* (medium power)
Gain:	1.65 db over a half-wave dipole
VSWR:	1.1 at video carrier
Circularity:	±3 db
Power Rating†:	Type 19890 — 1 kw channels 2-6 750 watts channels 7-13 Type 21156 — 5 kw channels 2-6 2.5 kw channels 7-13
Input Connection:	Type LC plug (12418-1)
Wind Load Rating:	20 psf (flats) all channels
Thrust:	Channels 2-6 without ice, 835 lbs. with ½" ice, 1865 lbs. Channels 7-13 without ice, 160 lbs. with ½" ice, 400 lbs.
Net Weight:	Channels 2-6, 1040 lbs. Channels 7-13, 220 lbs.
Shipping Weight:	Channels 2-6, 2300 lbs. Channels 7-13, 300 lbs.

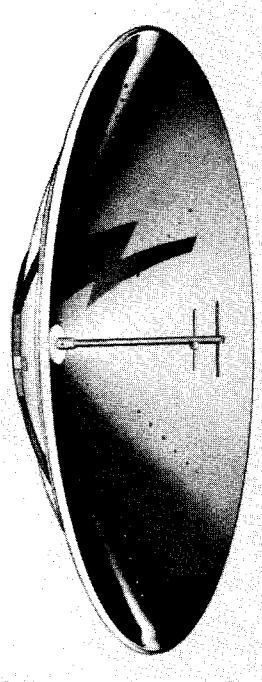
*Specify channel. †Stated in terms of peak video power.

Directional arrays are also available. Contact your ANDREW sales engineer.

HELIAX cable is recommended for transmission line runs. Order Type 20L or 21L on the antenna end of the HELIAX for direct connection to the antenna harness.



MEASURED VSWR OF CHANNEL 9 ARRAY

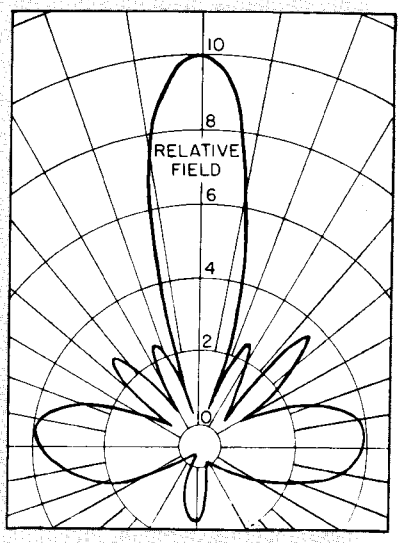


UHF TRANSLATOR ANTENNA

This parabolic antenna has the same mechanical and wind loading characteristics as Type P6-9, shown on page 12. The dipole-reflector feed is factory tuned for optimum performance at your channel. A ⅞" miter elbow is included with the feed. HELIAX cable with Type 20R end fitting is recommended for all cable runs.

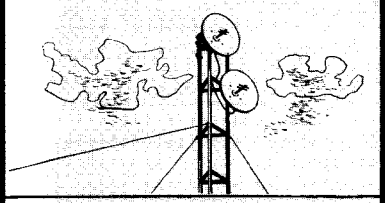
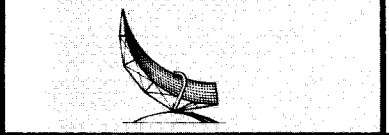
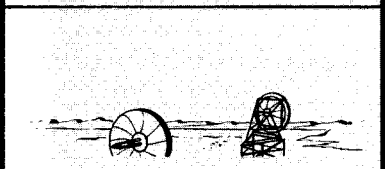
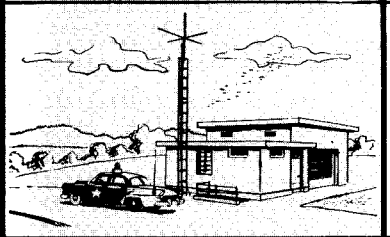
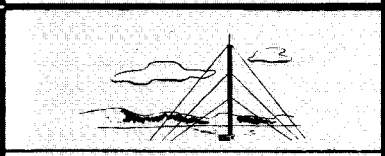
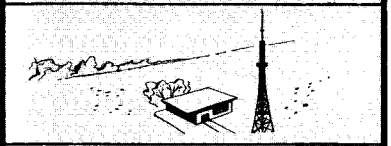
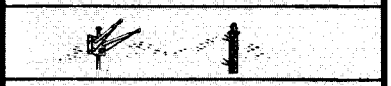
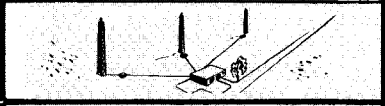
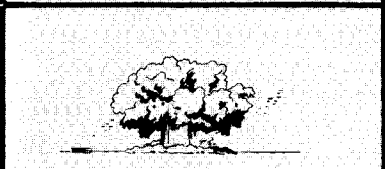
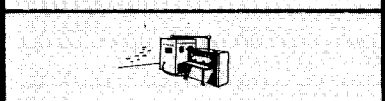
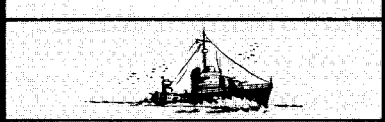
SPECIFICATIONS	
Type Number:	21202*
Diameter:	6 feet
Gain:	21 db minimum (over isotropic)
Beamwidth:	15 degrees
Power Rating:	1200 watts
Input Connection:	⅞" EIA flange
Net Weight:	150 lbs.
Shipping Weight:	400 lbs.

*Specify channel.



H-PLANE RADIATION PATTERN OF TYPE 21202

TRANSMISSION LINE SELECTION CHART

		Size, inches	Type Number	Frequency Range, mc	Impedance, ohms	Page Number
COMMUNICATIONS		**Microwave**	7/8	HO HELIAX	0–5200	50	45
			1 5/8	H1 HELIAX	0–2800	50	45
			0.622x1.37	137 Waveguide	5900–8200	—	73
		**High Power Radar**	6 1/8	583	0–750	50	55
			9	586	0–440	50	55
			10 1/2x21	2100 Waveguide	350–530	—	74
		**UHF High Power "Transhorizon"**	7 1/2x15	1500 Waveguide	470–750	—	74
			5 3/4x11 1/2	1150 Waveguide	640–960	—	74
			4 7/8x 9 3/4	975 Waveguide	750–1120	—	74
			3 1/8	562A	0–1600	50	55
			3 1/8	H2 HELIAX	0–1200	50	45
			6 1/8	573	0–750	50	55
		**VHF-UHF**	3/8	83A	0–3110	50	49
			3/8	H3 HELIAX	0–11800	50	48
			7/8	HO HELIAX	0–5200	50	45
			7/8	740	0–780	50	50
			1 5/8	H1 HELIAX	0–2800	50	45
			0.405	10791-1 (RG-8/U)	0–3000	50	52
			0.870	10791-7 (RG-17/U)	0–3000	52	52
BROADCASTING		**AM, FM, VHF, and UHF-TV**	3/8	H3 HELIAX	0–11800	50	48
			7/8	HO HELIAX	0–5200	50	45
			7/8	560	0–3000	50	55
			1 5/8	H1 HELIAX	0–2800	50	45
			1 5/8	561	0–2700	50	55
			3 1/8	562A	0–1600	50	55
			3 1/8	H2 HELIAX	0–1200	50	45
			6 1/8	563	0–890	75	55
			6 1/8	573	0–750	50	55
			9	586	0–440	50	55
			4 7/8x 9 3/4	975 Waveguide	750–1120	—	74
			5 3/4x11 1/2	1150 Waveguide	640–960	—	74
			7 1/2x15	1500 Waveguide	470–750	—	74
GENERAL		**Instrumentation**	3/8	H3 HELIAX	0–11800	50	48
			7/8	16431 (high velocity)	0–780	50	*
			7/8	HO HELIAX	0–5200	50	45
			1 5/8	H1 HELIAX	0–2800	50	45
		**Community TV**	3/8	83A	0–3110	50	49
			3/8	H3 HELIAX	0–11800	50	48
			7/8	HO HELIAX	0–5200	50	45
		**RF Heating**	3 1/8	562A	0–1600	50	55
			6 1/8	573	0–750	50	55
		**Naval Applications**	1 5/8	80810 HELIAX	0–30	100	*
			3 1/8	14208	0–30	180	62

*Contact your ANDREW sales engineer.

HELIAX®. . . THE FLEXIBLE AIR DIELECTRIC CABLE

LOW LOSS—LOW VSWR—FLEXIBILITY—MECHANICAL STRENGTH

HELIAX offers very low loss, great flexibility, and ease of installation. HELIAX is a continuous cable with a uniform cross section, thus, it has low VSWR. Its strength, flexibility, and electrical quality make it the preferred cable for RF applications.

LOW LOSS

The high efficiency of HELIAX is due to two important factors. First, high conductivity copper forms the conducting surface on both inner and outer conductors. Second, HELIAX construction permits use of a low loss polyethylene helical insulator of minimum cross section.

FLEXIBILITY

The corrugated outer conductor permits easy bending on a short radius without detrimental effect on VSWR. Unlike aluminum tubing, which work hardens after a few bending cycles, HELIAX may be flexed repeatedly. HELIAX construction minimizes forces applied to the insulation, prevents "cold flow" and inner conductor migration, and assures continuously low VSWR.

STRENGTH

The strength of HELIAX is due to the material and construction used in the outer conductor. The copper clad steel conductor combines the high conductivity of copper with the strength of steel. This strength is further enhanced by corrugation. The insulating helix firmly centers the inner conductor within the outer conductor.

PRESSURIZATION

HELIAX, like all air dielectric cables, should be maintained under dry pressure to prevent moisture from accumulating inside the cable. Both cable fittings are pressure-tight and factory tested prior to shipment. A gauge and valve assembly are included at no extra charge.

PACKAGING

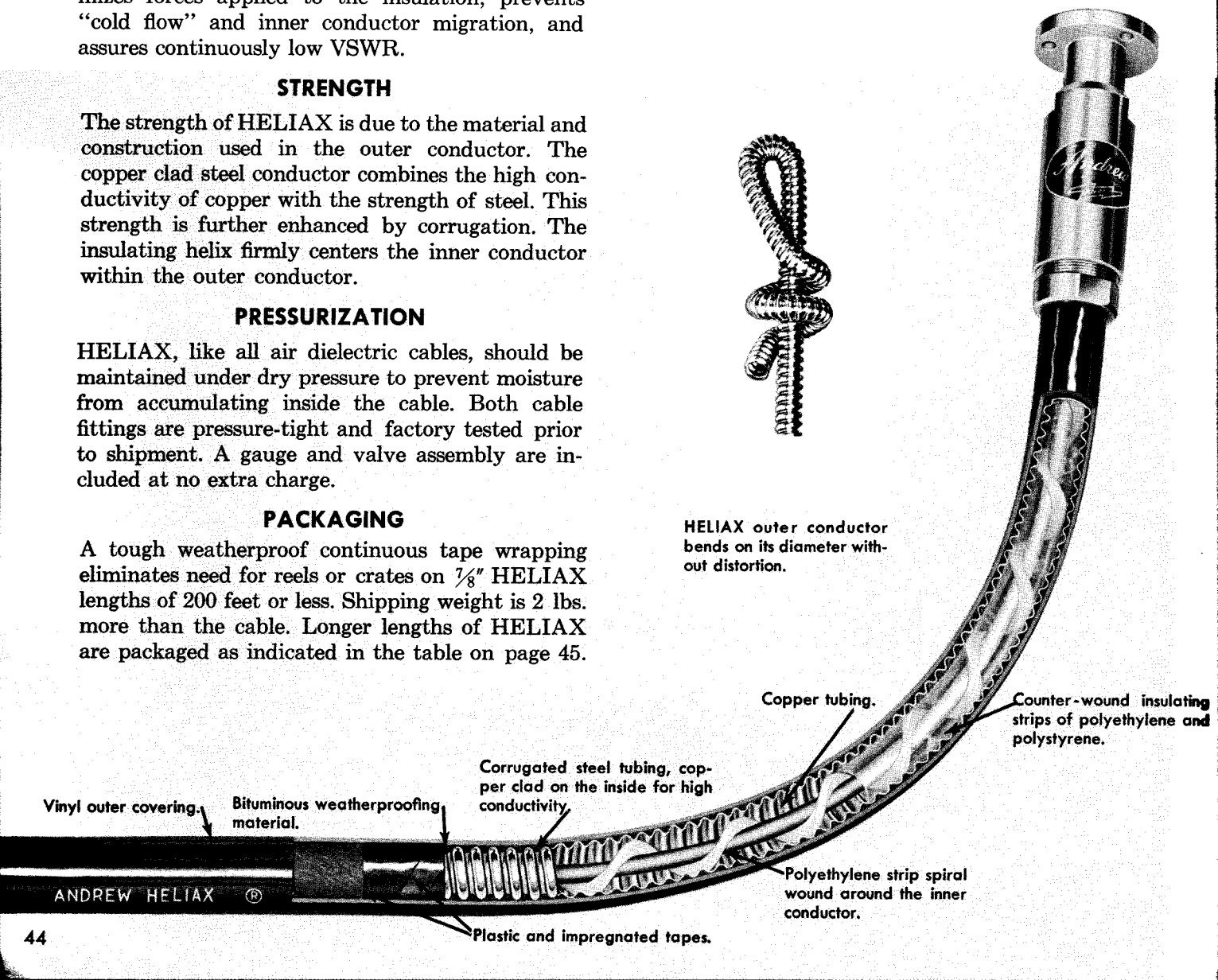
A tough weatherproof continuous tape wrapping eliminates need for reels or crates on 7/8" HELIAX lengths of 200 feet or less. Shipping weight is 2 lbs. more than the cable. Longer lengths of HELIAX are packaged as indicated in the table on page 45.

FITTING ATTACHMENT

HELIAX fittings are designed for easy field attachment without special tools. However, we prefer to attach them and ship the cable under dry air pressure to protect the cable during shipment. This service is provided at no charge. Unless otherwise specified, fittings will be attached at the factory.

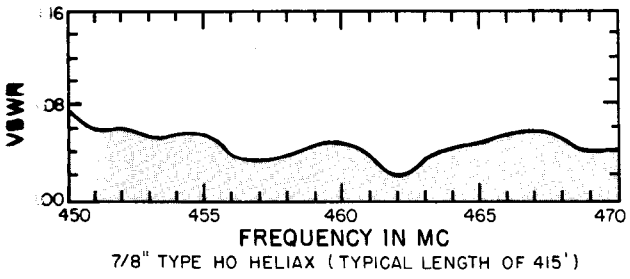
ASSEMBLIES

Order HELIAX assemblies by type number. The numbering system uses the cable type number plus the fitting code letters. The first code letter covers the fitting at the outside of the reel.
For example, HO-RN is a 7/8" HELIAX assembly with a 20R at the outside (antenna end) of the reel and a 20N at the inside. Type HO (7/8") HELIAX is stocked in 10-foot increment lengths up to 200 feet for 24 hour shipment. Longer lengths are cut to order.

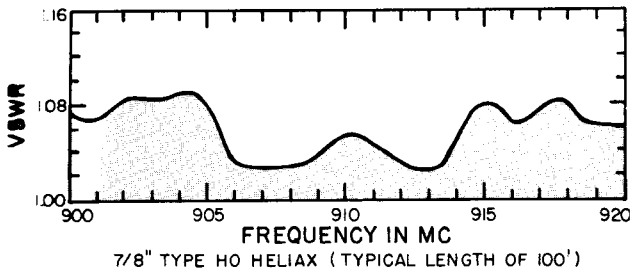


LOW VSWR

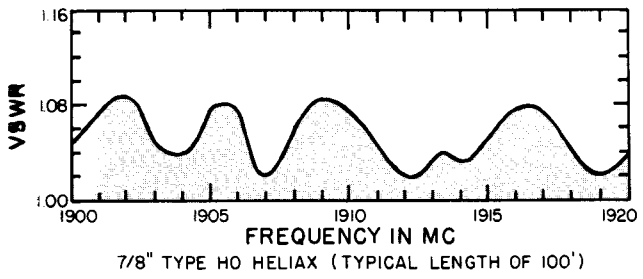
HELIAX is produced by a continuous process. Thus, no joints are required, even for very long lengths (several thousand feet). The uniform cross section together with the continuous inner conductor, outer conductor, and insulation provides minimum VSWR. Extremely close dimensional control is applied in every step of the manufacture of HELIAX. The curves shown below are plotted from measured data.



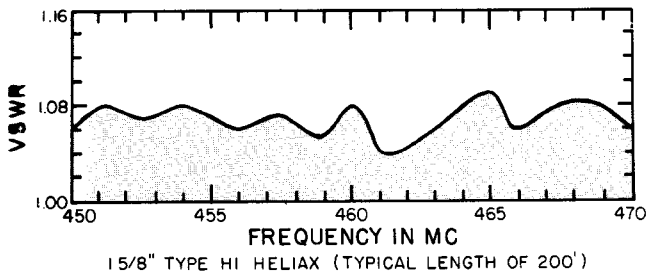
7/8" TYPE HO HELIAX (TYPICAL LENGTH OF 415')



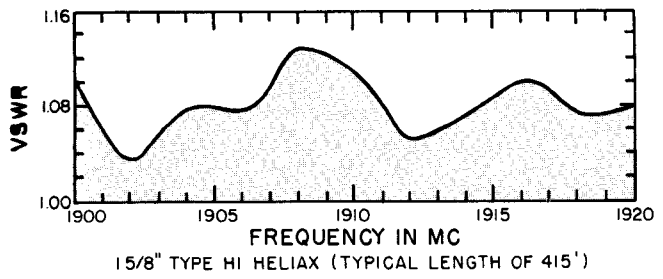
7/8" TYPE HO HELIAX (TYPICAL LENGTH OF 100')



7/8" TYPE HO HELIAX (TYPICAL LENGTH OF 100')



1 5/8" TYPE HI HELIAX (TYPICAL LENGTH OF 200')



1 5/8" TYPE HI HELIAX (TYPICAL LENGTH OF 415')

HELIAX CHARACTERISTICS

	7/8"	1 5/8"	3 1/8"
ELECTRICAL			
Type Number:	HO	H1	H2
Characteristic Impedance, ohms:	50	50	50
VSWR, 300-foot length with 50 ohm Termination, 0-2500 mc except H2 is shown for 0-550 mc:			
Average:	1.10	1.15	1.10
Maximum:	1.06	1.08	1.07
Velocity of Propagation, per cent:	91.6	91.3	93.0
Frequency Range, mc:	0-5200	0-2800	0-1200
MECHANICAL			
Length:	— Cut to order —		
Insulation:	— Polyethylene —		
Outer Conductor:			
Jacket O.D., inches:	1.19	2.04	3.74
Minor I.D., inches:	0.795	1.586	2.972
Mean I.D., inches:	0.870	1.695	3.150
Inner Conductor:			
O.D., inches:	0.355	0.680	1.354
I.D., inches:	0.287	0.596	1.141
Net Weight, lbs. per foot:	0.49	1.36	3.02
Minimum Bending Radius, inches:	10	20	36

See Engineering Data Section for attenuation, power rating, and additional characteristics.

HELIAX SHIPPING WEIGHTS AND DIMENSIONS

TYPE HO—7/8" HELIAX			
Length	Container	Size	Container Weight
1-200 ft.	Tape wrapping	48" dia. coil	2 lbs.
201-800 ft.	Reel*	60" dia. x 24"	130 lbs.
Over 800 ft.	Reel*	72" dia. x 42"	700 lbs.

Cable weight is .5 lbs. per foot, plus 5 lbs. for connectors.

TYPE H1—1 5/8" HELIAX			
Length	Container	Size	Container Weight
1-20 ft.	Box	6"x6"x cable lgth.	70 lbs.
21-85 ft.	Crate	65"x65"x12"	75 lbs.
86-500 ft.	Reel*	72" dia. x 42"	700 lbs.
Over 500 ft.	Reel*	96" dia. x 42"	1500 lbs.

Cable weight is 1.4 lbs. per foot, plus 20 lbs. for connectors.

TYPE H2—3 1/8" HELIAX			
Length	Container	Size	Container Weight
1-20 ft.	Box	6"x6"x cable lgth.	70 lbs.
21-75 ft.	Crate	84"x84"x18"	130 lbs.
76-700 ft.	Reel*	96" dia. x 42"	1500 lbs.

Cable weight is 3.02 lbs. per foot, plus 30 lbs. for connectors.
*Reels are disposable.

HELIAX INSTALLATION

HELIAX is the easiest cable to install

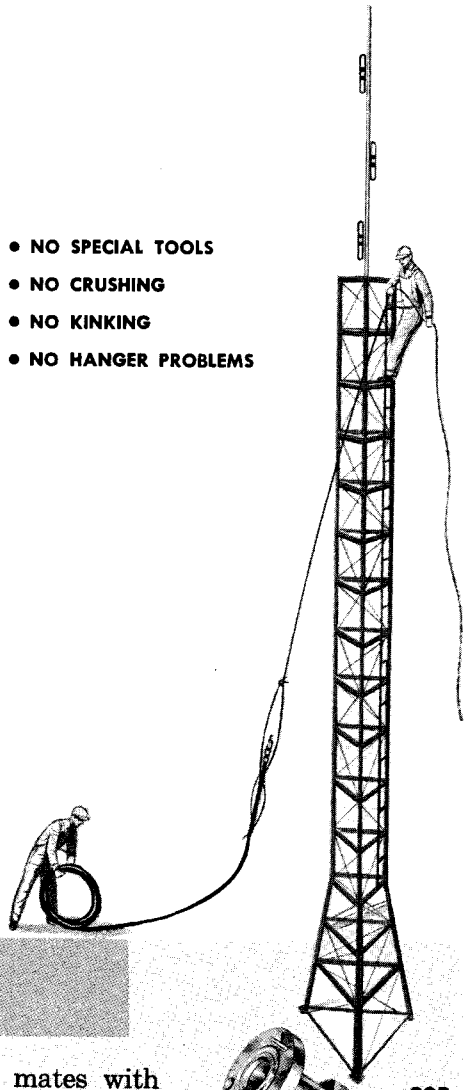
The flexibility of HELIAX permits it to be pulled through conduit, and curved around interfering transmitting equipment, tower members, or other obstructions. It may also be used for temporary installations as it can be taken down, recoiled, and subsequently reinstalled. Since it is flexible, it can be attached directly to the tower, thus eliminating the need for spring or sliding hangers.

HELIAX is easy to handle. The corrugated outer conductor has much greater strength than uniform tubing with respect to kinking and crushing.

No special tools are required. In the event field cutting is desired, end fittings can be quickly attached with standard tools.

HELIAX is particularly suited for difficult environmental conditions such as salt, air, water, or direct ground burial in soil of any degree of acidity. HELIAX may be wraplocked directly to tower members, installed on messenger cables using standard cable spinners, run directly along the surface of the earth, buried underground, or installed under water.

- NO SPECIAL TOOLS
- NO CRUSHING
- NO KINKING
- NO HANGER PROBLEMS



7/8" HELIAX FITTINGS

In addition to the fittings shown below, any of the 7/8" EIA fittings shown on page 56 may be used in conjunction with Type 20R to connect 7/8" HELIAX to equipment. Cable terminations attach directly to the HELIAX, providing connections as indicated by the code letter suffix.

20R, 7/8" EIA flange termination includes inner connector, stainless steel hardware, "O" ring gasket.

20N, Type N jack termination mates to Type N plug. Used for connecting HELIAX to VHF, UHF, and microwave equipment.

20U, UHF jack termination mates to UHF plug. Used for connecting to low power UHF and VHF antennas and transmitters, and for UHF to 470 mc. Not suitable for microwave.

20M, LC plug termination mates with LC receptacle, or equivalent.

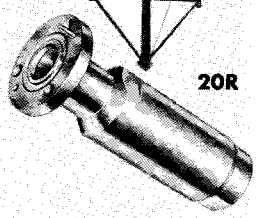
20L, LC jack termination mates to LC plug. Used for connecting to VHF, UHF, and microwave antennas and transmitters.

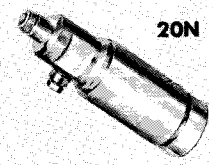
20T, end terminal is used for AM installations and for connection to certain VHF antennas designed for use below 174 mc.

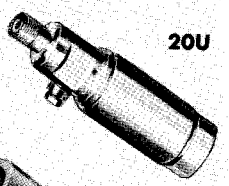
1060M, right angle miter elbow has EIA swivel flanges at both ends. VSWR is less than 1.02 up to 2400 mc. Inner connector, "O" ring gasket, and hardware are included.

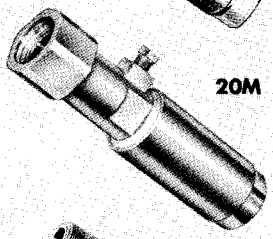
4850, adaptor is used to connect 7/8" EIA flange to Type 740 cable flange.

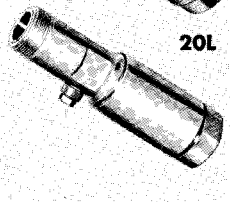
18275, spare inner connector is used in joining 7/8" EIA flanges.

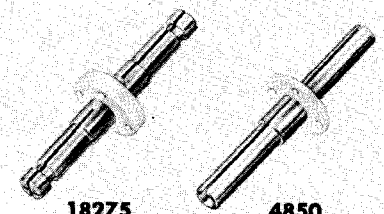

20R

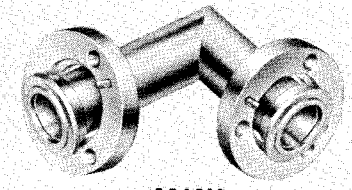

20N

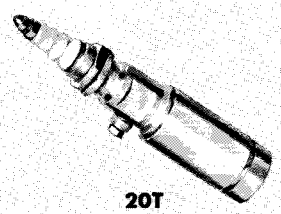

20U


20M

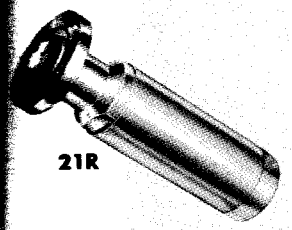

20L

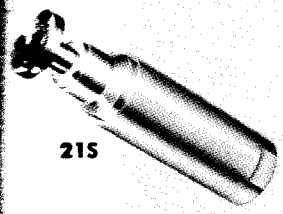

18275 4850

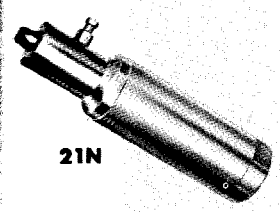

1060M


20T

1⅝" HELIAX FITTINGS


21R


21S


21N

In addition to the fittings shown below, any of the 1⅝" EIA fittings shown on page 57 may be used in connection with Type 21R to connect 1⅝" HELIAX to equipment. Cable terminations attach directly to the cable and provide connections as indicated by the code letter suffix.

21R, 1⅝" EIA flange termination includes inner connector, hardware, and "O" ring gasket.

21S, ⅞" EIA flange termination provides for direct attachment of 1⅝" HELIAX to microwave or other antennas with ⅞" EIA flange input termination. Includes inner connector, stainless steel hardware, "O" ring gasket.

21N, Type N jack termination mates to Type N plug.

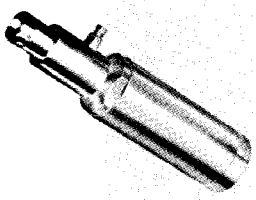
21L, LC jack termination mates to LC plug, or equivalent.

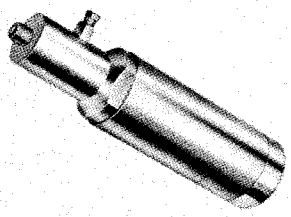
21U, UHF jack termination mates with UHF plug, or equivalent.

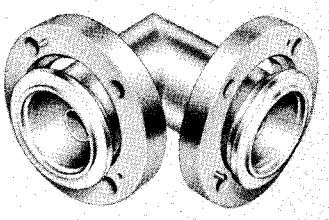
1061M, miter elbow has swivel flanges at each end. VSWR is less than 1.02 up to 3000 mc. Elbow includes "O" ring gasket, inner connector, and hardware.

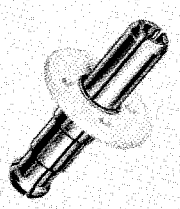
4851, inner adaptor is used to connect 1⅝" EIA flange to 51.5 ohm flat flange.

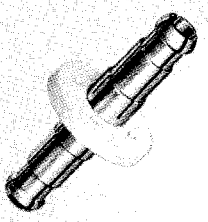
15069, spare inner connector is used to join 1⅝" EIA flanges.


21L


21U


1061M


4851


15069

HELIAX MOUNTING ACCESSORIES

CABLE GRIPS

Type 19256 (⅞") and **Type 19257** (1⅝"), cable grips wrap snugly around the outer jacket of HELIAX and are used to hoist cable to tower top or to pull cable through conduit or around obstructions. On vertical runs, order one for every 200 feet of cable.

GROUNDING KITS

Type 19248 (⅞") and **Type 19249** (1⅝"), grounding kits provide a positive ground connection to the tower or ground system without impairing the weatherproof qualities of the cable jacket. Factory installed at specified intervals at no extra charge or field installed with common tools. Specify if factory installation is desired.

WRAPLOCK

Type 12395-1, wraplock consists of 100 feet of stainless steel tape with buckles and keys for attaching HELIAX to structural member. Order one can for each 100 feet of cable. No other materials or precautions are required. Toughness of cable jacket prevents possibility of cutting or tearing.

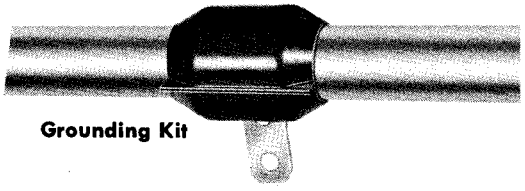
MOUNTING STRAPS

Type 17500-1 (⅞") and **Type 17500-2** (1⅝"), are used to mount HELIAX to wood poles or other wood surfaces.

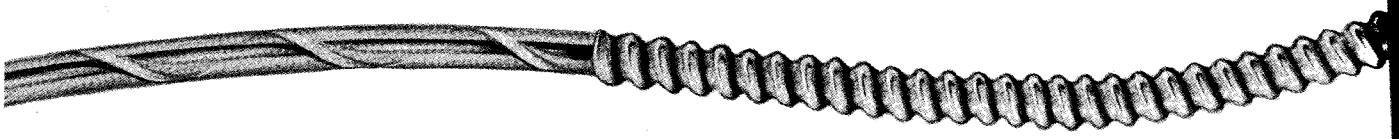
3⅛" HELIAX FITTINGS

Type 22R (not illustrated) is a 3⅛" EIA flange termination for H2 HELIAX. An EIA inner connector, "O" ring gasket, and hardware are included. Any of the 3⅛" EIA fittings shown on page 58 can be used in conjunction with 22R to attach H2 to other cable sizes or for transmitter room interconnections.


Cable Grip


Grounding Kit

COPPER HELIAX 3/8", 7/8", and 1 5/8"



HELIAX is now produced with copper outer conductors. Three sizes: 3/8", 7/8", and 1 5/8" are available. Electrical and mechanical characteristics of the 7/8" and 1 5/8" sizes are the same as Types HO and H1 respectively as shown on page 45 with the exception that low frequency attenuation is improved.

ORDERING INFORMATION

Type Number	Size
H3	3/8"
H5	7/8"
H7	1 5/8"

End fittings for 7/8" and 1 5/8" copper HELIAX are available in two series. The Type 65 (7/8") and 67 (1 5/8") series are for factory attachment. The Type 75 (7/8") and 77 (1 5/8") series are for field attachment. In each case, the suffix letters R, U, and N denote terminations which *mate* with an EIA flange, a UHF plug (10805-1), and a Type N plug (10804-6), respectively.

CHARACTERISTICS TYPE H3

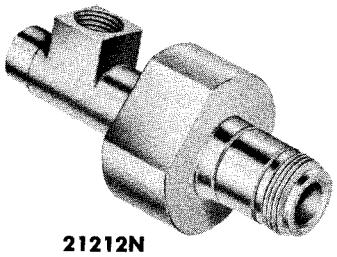
ELECTRICAL

Characteristic Impedance:	50.0 ohms
VSWR, 200-foot length with 50 ohm Termination, 0-2000 mc:	1.10 max.
Frequency Range:	0-11,800 mc

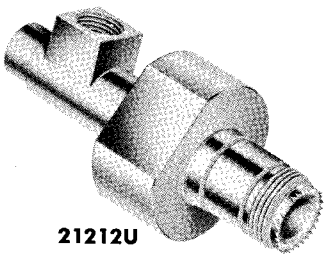
MECHANICAL

Length:	Cut to order
Insulation:	Polyethylene spiral
Outer Conductor:	Major O.D. 0.500" Minor I.D. 0.360"
Inner Conductor:	O.D. 0.162", solid copper
Weight:	.18 lbs. per foot
Minimum Bending Radius:	5 inches

3/8" HELIAX END FITTINGS



21212N



21212U

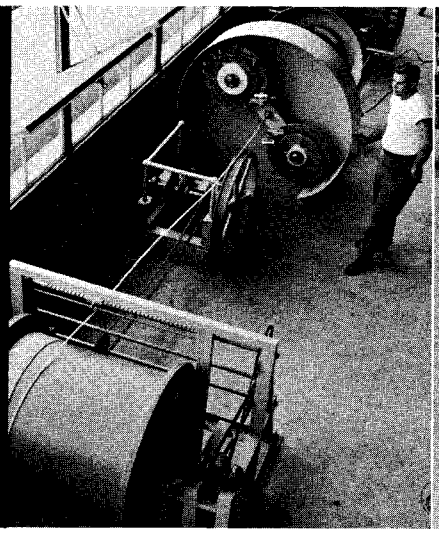
These fittings are brazed to the outer conductor for permanent noise free connections. We prefer to attach the fittings at the factory and ship the cable under pressure. Fittings for field attachment are available on special order.

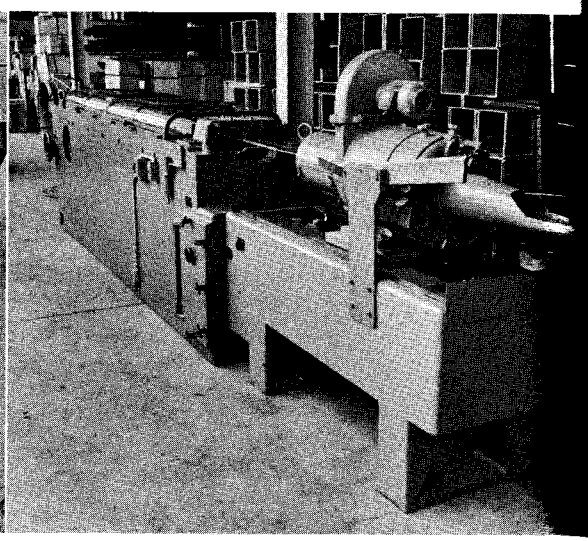
21212N, Type N jack mates with Type N plug (10804-6).

21212U, UHF jack mates with UHF plug (10805-1).

HELIAX PRODUCTION SCENES AT THE ORLAND PARK PLANT

ANDREW





3/8" SEMI-FLEXIBLE CABLE

Type 83A is recommended for VHF communications, aircraft applications, low power signal measurement, and RF distribution systems.
This small size air dielectric cable has an efficiency comparable to the largest solid dielectric cables, and is preferred in many applications for its small diameter, light weight, and ability to withstand high temperatures. This cable is constructed entirely of copper and ceramic. When installed with its gas-tight end terminals and maintained under dry air pressure, it is completely weatherproof and capable of retaining its high efficiency indefinitely.
Type 83A has a characteristic impedance of 50 ohms. All fittings designed for use with Type 83A will also fit the obsolete 70 ohm Type 83. Line connectors and terminals are pressure tight and are made of non-ferrous materials. All fittings which solder to cable are tin plated.

Type 83AL is for uses requiring minimum weight. Type 83AL is identical in all respects to 83A, except that the outer conductor is made of aluminum instead of copper. Type N fittings are available.

HIGH TEMPERATURE CABLES

Modifications of Types 83A and 83AL cables are available. Refrasil,* Teflon,** or other special insulation materials permit operation at elevated temperatures. Advise us of your requirements. End fittings are also available for these special cables.

ACCESSORIES FOR TYPE 83A COAXIAL CABLE

1701AGV, end terminal with gas inlet and pressure gauge includes inner and outer connectors.

1701AP, end terminal with removable exhaust plug includes connectors.

1701AR, end terminal with needle valve for gas release includes connectors.

990, cable cap is used to cap line for pressurizing during shipment.

990GV, cable cap includes pressure gauge and gas inlet valve.

8319A, connector for joining two sections of cable includes inner connectors.

4868, adaptor has Type UHF jack on one end; other end attaches to 1701AGV or equivalent.

8329A, adaptor for connecting to 7/8" cable (Types S450 or 737 cable) includes inner connectors.

6102, mounting strap is used to attach line to wood support.

*Trade-mark for H. I. Thompson Fiber Glass Co. silica insulation.
**Trade-mark for DuPont Tetrafluroethylene resin.

CHARACTERISTICS

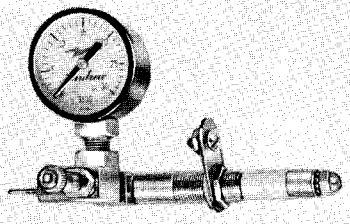
MECHANICAL

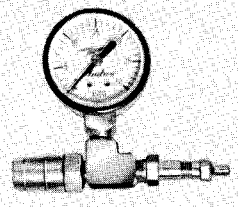
Outer Conductor:	O.D. 0.375", I.D. 0.311", soft copper tubing
Inner Conductor:	O.D. 0.114", #9 hard temper copper wire
Net Weight:	Type 83A 0.18 lbs. per foot Type 83AL 0.08 lbs. per foot
Shipping Weight:	Up to 400 feet, cable weight plus 6 lbs. Over 400 feet, cable weight plus 175 lbs.
Maximum Temperature:	Type 83A—900° F Type 83AL—700° F

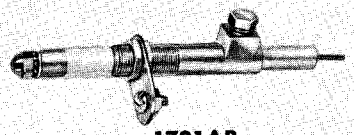
ELECTRICAL

Characteristic Impedance:	50 ohms	
Velocity:	83.3%	
Frequency Range:	0–3110 mc	
Power Rating:	Type 83A	Type 83AL
Average at 175 mc	650 watts	600 watts
Peak	6 kw	6 kw

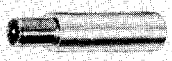
ACCESSORIES

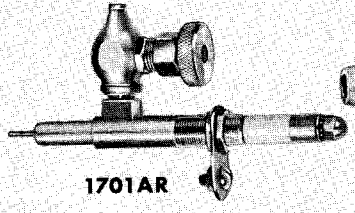

1701AGV

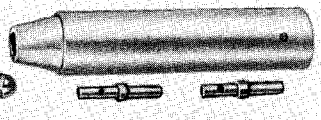

990GV


1701AP


8319A


4868

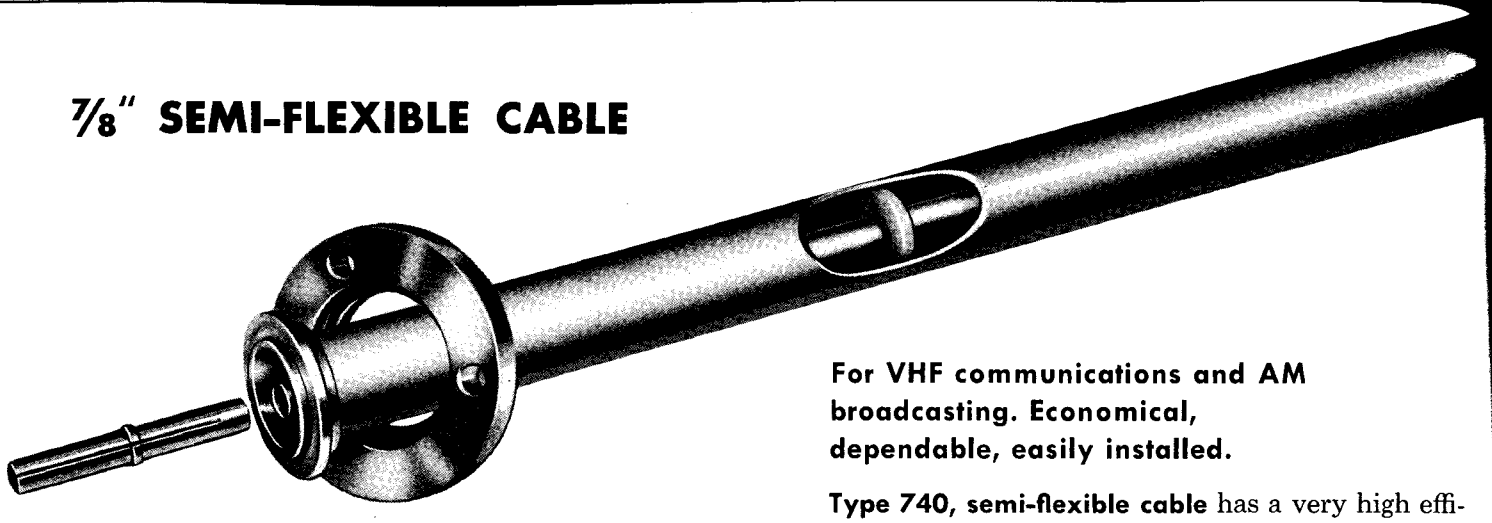

1701AR


8329A


990


6102

7/8" SEMI-FLEXIBLE CABLE



For VHF communications and AM broadcasting. Economical, dependable, easily installed.

Type 740, semi-flexible cable has a very high efficiency as compared to solid dielectric cables of similar size. For example, with a 100 watt transmitter at 450 mc, 200 feet of RG-17/U will deliver only 41 watts to the antenna compared to 63 watts delivered by the same length of Type 740 cable. This line is also an excellent choice for directional AM broadcast arrays.

CONSTRUCTION

Inner and outer conductors are of soft temper copper tubing. This line is manufactured in 100-foot lengths which are factory spliced to form continuous lengths up to 1000 feet. The inner conductor is supported by low loss steatite insulators. Type S450 is designed for use with solder type connectors. Type 740 has 7/8" flat flanges attached. Standard impedance is 50 ohms.

Type 740 is shipped under pressure at no extra charge for pressurizing and each length includes end cover caps, and a gauge and valve assembly.

ORDERING INFORMATION

When ordering S450 cable, specify cable caps or end fittings desired. These will be attached at the factory and the complete assembly shipped under pressure. Cost will be the price of cable plus the price of fittings. No charge for factory attachment.

CHARACTERISTICS

MECHANICAL

Standard Length:	Cut to order
Insulators:	Steatite beads spaced 4"
Outer Conductor:	O.D. 0.875", I.D. 0.795"
Inner Conductor:	O.D. 0.313", I.D. 0.263"
Minimum Bending Radius:	12"
Net Weight:	0.50 lbs. per foot

Shipping Dimensions: Carton:	Tare Weight:	Maximum Cable Length:
41" x 41" x 6"	6 lbs.	100 feet
Crate: 42" x 42" x 13"	50 lbs.	250 feet
Reel:* 60" dia. x 24"	130 lbs.	1000 feet

ELECTRICAL

Characteristic Impedance:	50 ohms
Velocity:	87.2%
Frequency Range:	0–780 mc

Power Rating:

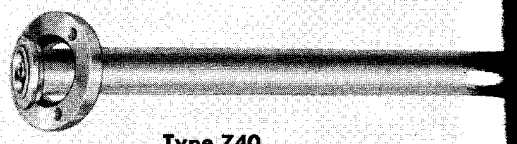
AM Broadcast	3.2 kw with VSWR = 3
FM at 108 mc	2.3 kw with VSWR = 1.75
Communications at 174 mc	2.1 kw with VSWR = 1.5

See Engineering Data Section for attenuation and additional characteristics.

*Reels are disposable.

STOCK PROGRAM FOR IMMEDIATE SHIPMENT

We stock Type 740 in standard lengths from 30 feet to 200 feet in multiples of 10 feet. For immediate shipment, order in exact 10-foot increments, such as 30 feet, 40 feet, 50 feet, 60 feet, and up to 200 feet. For over 200 feet, order two or more approximately equal standard lengths.

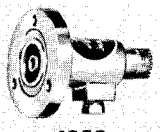


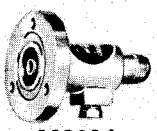
Type 740

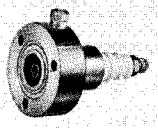
Type S450

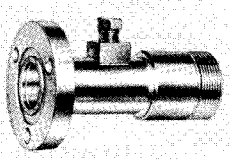
Type 740 is equipped with 7/8" flanges
Type S450 is unflanged and available with end terminals attached

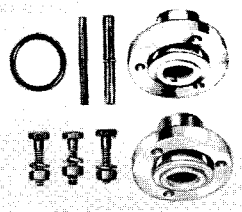
TYPE 740 ACCESSORIES


4855


12291A


2050


12692A


13223A-1

4855, adaptor has UHF jack for RG-8/U cable; other end has 7/8" flange for connection to Type 740. Teflon insulated for use to 470 mc. Includes hardware. Use 10805-13 plug.

12291A, adaptor has Type N jack for RG-8/U; other end has 7/8" flange for connection to Type 740 line. Includes connecting hardware.

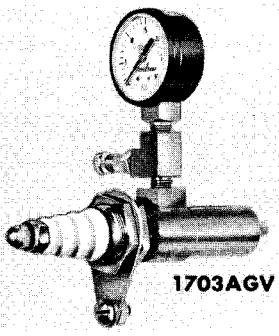
13223A-1, pair of swivel flanges includes inner connector and hardware.

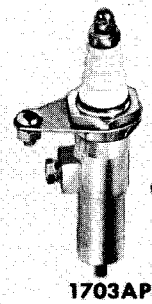
13223A-2, spare swivel flange* includes inner connector and hardware.

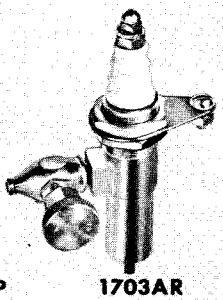
2050, end terminal attaches to flange. Use for AM broadcasting and low frequency applications.

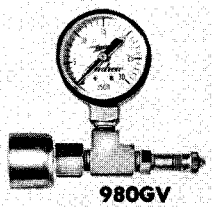
12692A, adaptor to type LC plug.

TYPE S450 ACCESSORIES


1703AGV


1703AP

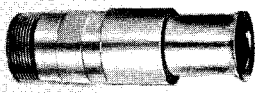

1703AR


980GV


980


12394


14139


12423

1703AGV, end terminal includes gauge, valve, and connectors.

1703AP, end terminal includes gas release plug and connectors.

1703AR, end terminal includes release valve and connectors.

980, cable cap is used to cap line for pressurizing during shipment.

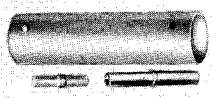
980GV, cable cap includes gauge and valve.

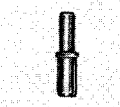
12394, adaptor has UHF jack, attaches to end terminal.

14139, adaptor has Type N jack, attaches to end terminal on S450, includes Type N plug.

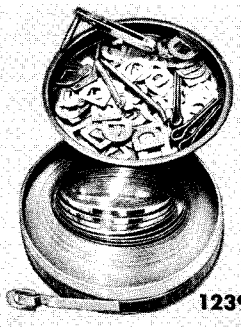
12423, adaptor has LC jack, attaches to end terminal on S450.

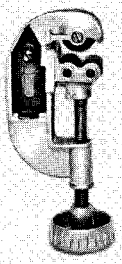
ACCESSORIES FOR TYPES 740 AND S450

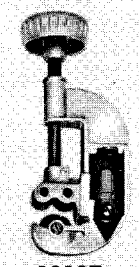

8328E

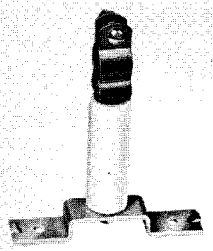

13244-2


6104


12395-1


13046


13137


11662-1

8328E, connector is used to splice line.

13244-2, adaptor is used to join S450 or 740 inner conductor to inner conductor of obsolete 64 ohm Type 737.

16551, adaptor* is the same as 13244-2 except also includes outer conductor connector.

13046, tubing cutter is used to prepare conductors for splicing.

13137, grooving tool is used to strengthen outer conductor splice mechanically and to help control solder flow.

HANGERS FOR TYPES 740 AND S450

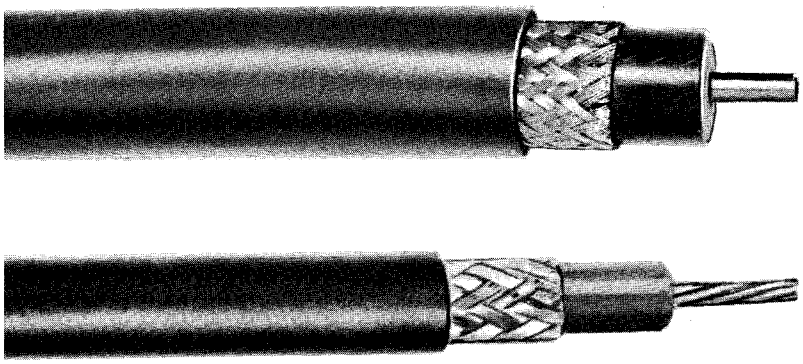
11662-1, insulated mounting clamp is used to attach cable to a base insulated AM radiator. Can be bolted or wraplocked to tower members. See page 82.

12395-1, stainless steel wraplock is used to attach cable to tower members.

6104, mounting strap is used to attach cable to wood surface.

*Not Illustrated

SOLID DIELECTRIC CABLES—FITTINGS RG-8/U and RG-17/U CABLES



These are highly flexible cables frequently used in short lengths for connecting antennas and transmitters to air dielectric cable.
Since the attenuation in this cable is high, refer to the Engineering Data Section to be sure that the length used will not cause excessive loss.

Type 10791-1 (RG-8/U), in lengths of less than 400 feet is shipped in cartons. Longer lengths are shipped on returnable reels (deposit required).

Type 10791-7 (RG-17/U), in lengths of less than 250 feet is shipped in cartons. Longer lengths are shipped on reels (deposit required).

CHARACTERISTICS

ANDREW Type Number	Army-Navy Type Number	O.D. over Vinyl jacket, inches	Weight, lbs./ft.	Impedance, ohms	Velocity, %	Capacitance mmf/ft.	Dielectric constant of insulation	Attenuation db/100 ft. at frequency: 160 mc	460 mc
10791-1	RG-8/U	0.405	0.104	50	66	30.5	2.3	2.63	5.00
10791-7	RG-17/U	0.870	0.463	52	66	29.5	2.3	1.05	1.95

CABLE ASSEMBLIES

Our cable assembly department regularly produces cable assemblies and harnesses of all types. Our wide variety of fittings and large stock of cables enable us to produce high quality assemblies promptly and at minimum cost. The assemblies listed at right are in regular and continuous production.

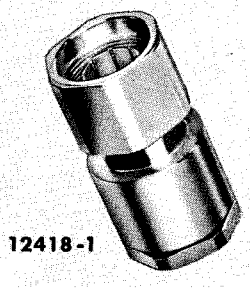
STANDARD LENGTH JUMPER CABLES

Type No.	Description	Fittings
16253-8	RG-8 assembly, 2-foot length	N plugs both ends
16253-2	RG-8 assembly, 8-foot length	UHF plugs both ends
16253-20	RG-8 assembly, 8-foot length	N plugs both ends

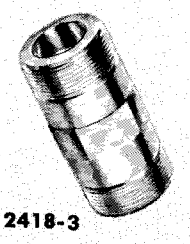
VARIABLE LENGTH ASSEMBLIES

Type No.	Description	Fittings
11033-4	RG-8 assembly, specify length	N plugs both ends
11033-1	RG-8 assembly, specify length	UHF plugs both ends
12992-1	RG-17 assembly, specify length	LC plugs both ends

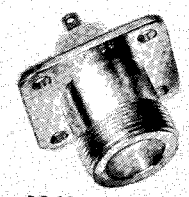
TYPE LC FITTINGS



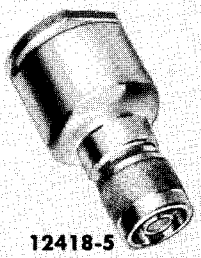
12418-1



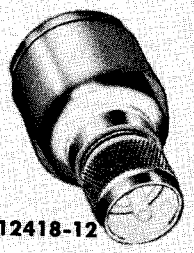
12418-3



12418-7



12418-5



12418-12

Type LC connectors and adaptors are designed for use with Type 10791-7 (RG-17/U) cable. These are general purpose weatherproof fittings. Impedance matches that of cable.

12418-1, plug (UG-154/U) connects to 12418-3 or 12418-7.

12418-3, junction (UG-215/U) provides connection between two 12418-1 plugs.

12418-7, panel receptacle (UG-352/U) mates with 12418-1 plug, above. Has solder connection terminal.

12418-5, adaptor RG-17/U to RG-8/U. One end connects directly to RG-17/U; other end has Type N plug which attaches to Type N jack.

12418-12, adaptor RG-17/U to RG-8/U. One end connects directly to RG-17/U; other end has UHF plug which attaches to UHF jack.

The following adaptors are illustrated and described in greater detail elsewhere as indicated. The description here indicates items which connect to the adaptor.

12692A, LC plug x 7/8" flat flange. . . . . See page 51

12423, LC plug x 7/8" end terminal. . . . . page 51

20L, LC plug x 7/8" HELIAX. . . . . page 46

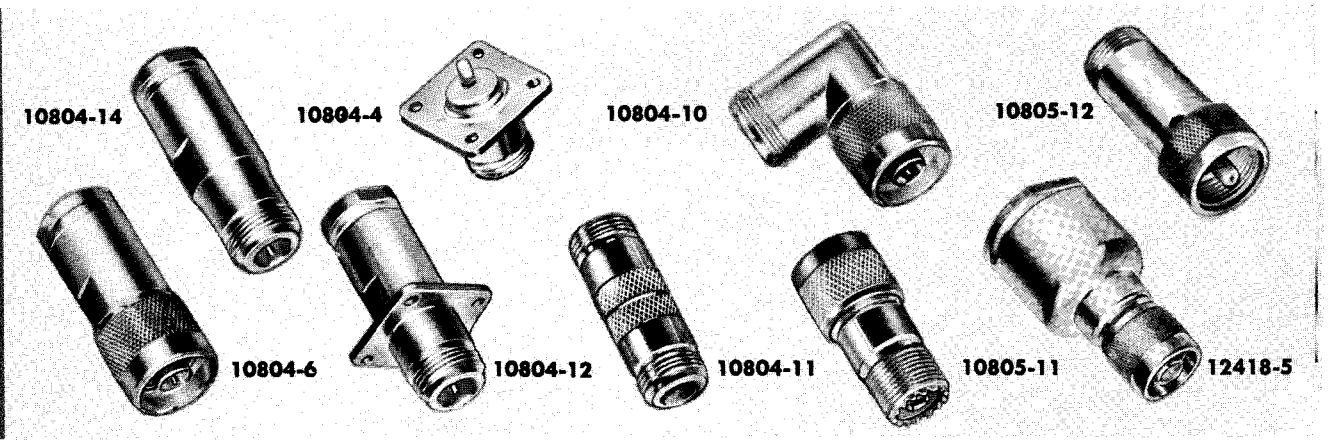
2360, LC plug x 7/8" EIA flange. . . . . page 56

2361, LC plug x 1 5/8" EIA flange. . . . . page 57

20M, LC jack x 7/8" HELIAX. . . . . page 46

21L, LC plug x 1 5/8" HELIAX. . . . . page 47

TYPE N FITTINGS



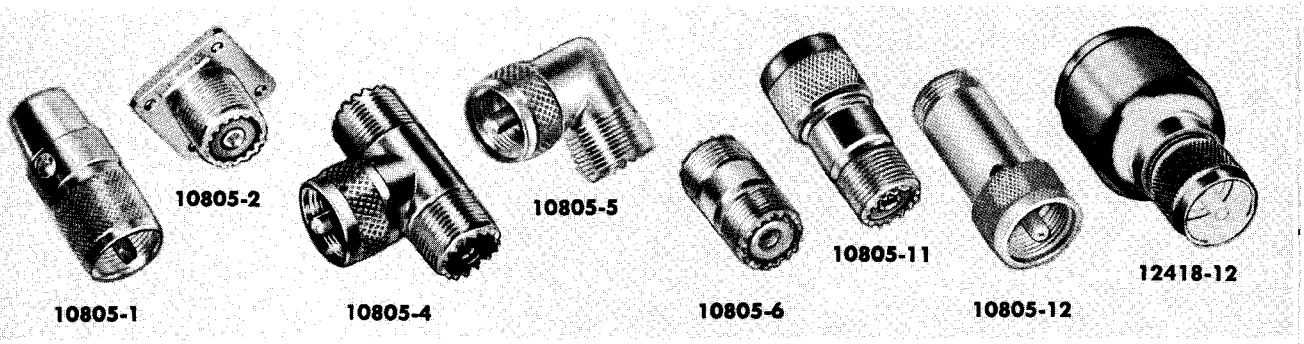
Type N connectors and adaptors are designed for use with Type 10791-1 (RG-8/U) cable. These are general purpose weatherproof fittings. Impedance matches that of cable.

10804-6, plug (UG-21B/U) connects to 10804-14, below.
10804-14, cable jack (UG-23B/U) connects to 10804-6, above.
10804-12, panel jack (UG-22B/U) is similar to 10804-14 above, but has flange for panel mounting.
10804-4, panel receptacle (UG-58A/U) mates with 10804-6 plug, above. Has solder connection terminal.
10804-11, junction (UG-29B/U) provides connection between two 10804-6 plugs.
10804-10, right angle connector (UG-27B/U) has Type N jack on one end; Type N plug on other end.
10805-11, adaptor (UG-146/U) has Type N plug on one end; UHF jack on other end.
10805-12, adaptor (UG83/U) has Type N jack on one end; UHF plug on other end.
12418-5, adaptor (UG-167A/U) has Type N plug on one end; connects directly to RG-17/U cable on other end.

The following adaptors are illustrated and described in greater detail elsewhere as indicated. The description here indicates items which connect to the adaptor.

12291A, Type N plug x 7/8" flat flange.....See page 51
2260, Type N plug x 7/8" EIA flange.....page 56
20N, Type N plug x 7/8" HELIAX.....page 46
21N, Type N plug x 1 5/8" HELIAX.....page 47
2261, Type N plug x 1 5/8" EIA flange.....page 57

TYPE UHF FITTINGS



Type UHF connectors and adaptors are rugged general purpose fittings for use with Type 10791-1 (RG-8/U) cable. They are not weatherproof. Except for the Teflon insulated types, these connectors do not have exact impedance match, and should not be used above 200 mc. The special Teflon models may be used to 470 mc.

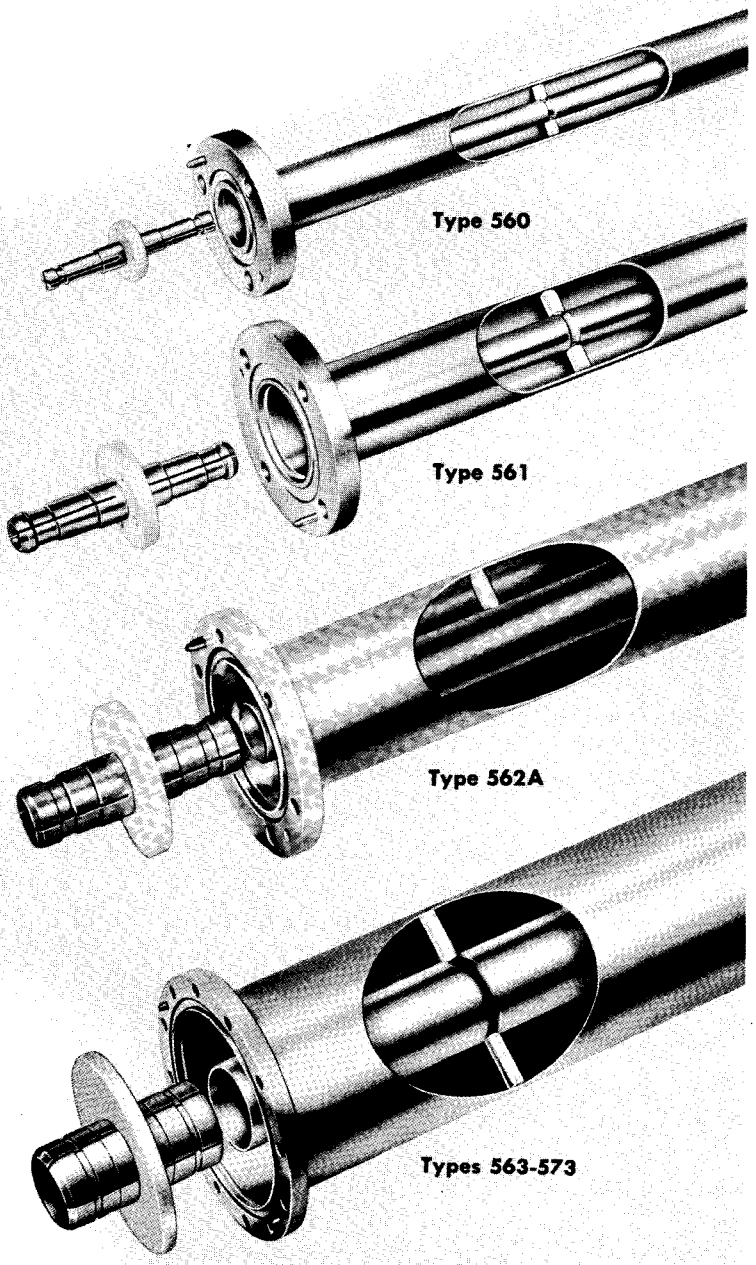
10805-1, plug (PL-259A) connects to 10805-2, below.
10805-13, plug similar to 10805-1 except Teflon insulated is for use to 470 mc.
10805-2, panel receptacle (SO-239) mates with 10805-1 plug, above. Has solder connection terminal.
10805-4, tee connector (M-358) has two UHF jacks and one UHF plug.
10805-5, right angle connector (M359) has Type UHF jack on one end; Type UHF plug on the other end.
10805-6, junction (PL-258) provides connection between two 10805-1 plugs.
10805-11, adaptor (UG-146/U) has UHF jack on one end; Type N plug on other end.
10805-12, adaptor (UG-83/U) has Type N jack on one end; Type UHF plug on other end.
12418-12, adaptor RG-8/U to RG-17/U has Type UHF plug on one end; other end connects directly to RG-17/U.

The following adaptors are illustrated and described in greater detail elsewhere as indicated. The description here indicates items which connect to the adaptor.

4855, UHF plug x Type 740 cable flange.....See page 51
4868, UHF plug x 3/8" end terminal.....page 49
12394, UHF plug x 7/8" end terminal.....page 51
20U, UHF plug x 7/8" HELIAX.....page 46
21U, UHF plug x 1 5/8" HELIAX.....page 47

RIGID TRANSMISSION LINES

- **LOW VSWR**
- **HIGH VELOCITY**
- **HIGH EFFICIENCY, AND VOLTAGE RATING**



ANDREW now offers one series of Teflon insulated rigid coaxial transmission lines. AM, FM, VHF, and UHF-TV tropospheric scatter, RF heating, radar, and other rigid line applications are served by this series of lines.

CONNECTORS

Connectors are fully compatible with current EIA recommendations in all sizes. Inner conductor connectors in 3⅛″ and larger sizes include an ANDREW designed piston ring spring to insure uniform and positive contact. This spring exerts uniform force in all radial directions.

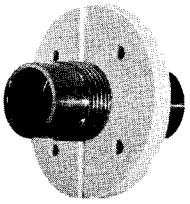
CHARACTERISTIC IMPEDANCE

All ANDREW standard rigid transmission lines have a characteristic impedance of 50 ohms with the exception of Type 563, which has a characteristic impedance of 75 ohms for high channel UHF-TV.

ACCESSORIES

All accessories for the 560 series of rigid lines mate exactly with other fittings of the same series and size and are also in accordance with EIA recommendations. Lines and all fittings include inner connectors, gaskets, and necessary hardware.

SPECIAL APPLICATIONS



For a long scatter system hop, the received signal was so marginal that the minute noise generated by differential expansion when using friction connectors was intolerable. Systems engineers consulted with ANDREW. Result—the Type 21109 bellows connector. This connector is soldered into position in the field, accommodates differential expansion, but generates no noise whatever. Let us help with your transmission problem.

ADAPTORS AND IMPEDANCE TRANSFORMERS

Type 4859 impedance transformer (3⅛) provides an exact impedance match to 51.5 ohm equipment. Inner connector adaptors are available for cases where impedance matching is not critical.

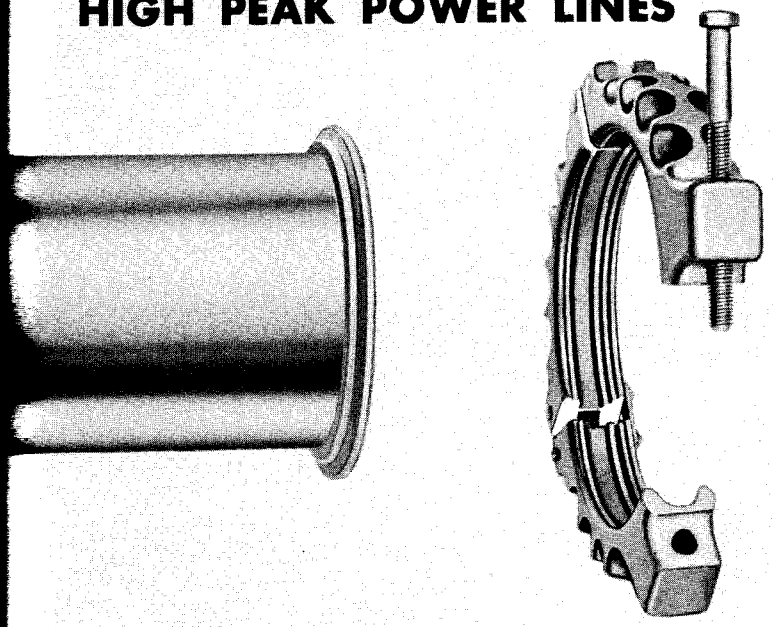
PRESSURIZATION

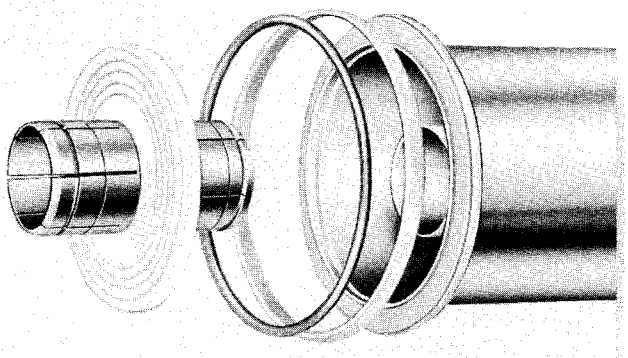
All air dielectric transmission lines should be pressurized. For suitable equipment see page 68.

COPPER OR ALUMINUM OUTER CONDUCTORS

For applications where weight is important, aluminum outer conductors are available in the 1⅝″ and 3⅛″ sizes of lines and elbows. Specify the "AL" suffix for aluminum construction. Other sizes are available with aluminum outer conductors on special order. Inner conductors in all cases are copper. EIA dimensioning is used on both flanges and inner connectors. Standard gas barriers and other fittings may be used with these lines, since the aluminum flanges are chromate conversion coated.

HIGH PEAK POWER LINES





Types 583 and 586

Extremely high peak power ratings are available in the 580 series of lines and fittings. Special ANDREW developed techniques in design, production, and installation make these ratings possible. Three megawatts of peak power can be safely transmitted by both Types 583 (6⅛″) and 586 (9″). The average power rating is the same as for lines of conventional construction. However, lines with higher average power ratings can also be supplied.

SINGLE BOLT FLANGE

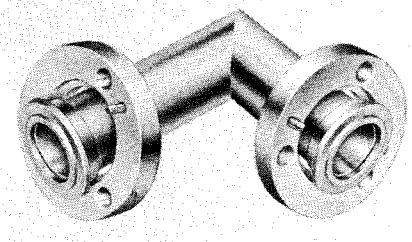
These lines include the ANDREW single bolt clamp type connector. Introduced three years ago, these connectors have cut field installation time to a minimum. This clamp applies uniform pressure to contact surfaces with the tightening of just one bolt. Work required is a small fraction of that needed to tighten the numerous bolts of a conventional flange. An alignment ring centers conductors.

CHARACTERISTICS OF STANDARD AND HIGH PEAK POWER RIGID TRANSMISSION LINES

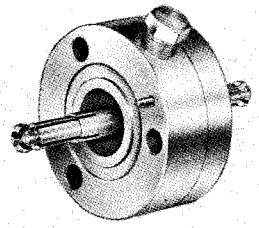
Size	⅞″	1⅝″		3⅛″		6⅛″			9″
Type Number†	560	561	561AL	562A	562AL	563	573	583	586
ELECTRICAL									
Characteristic Impedance, ohms	50	50		50		75	50		50
Frequency Range, mc *	0-3000	0-2700		0-1600		0-890	0-750		0-440
Velocity, per cent	99.8	99.8		99.8		99.8	99.8		99.8
Peak Power Rating, kw**	43	140		400		930	1500	3000	3000
Average Power Rating, kw**	1.2 at 1000 mc	4.4 at 1000 mc	4.2 at 1000 mc	15 at 1000 mc	14.5 at 1000 mc	80 at 500 mc	180 at 100 mc		230 at 200 mc
VSWR, 100 feet with matched load maximum to upper frequency limit	1.25	1.08		1.05		1.05	1.05		1.05
MECHANICAL									
Outer Conductor									
O.D., inches	0.875	1.625		3.125		6.125	6.125		9.000
I.D., inches	0.785	1.527		3.027		5.981	5.981		8.800
Inner Conductor									
O.D., inches	0.341	0.664		1.315		1.711	2.600		3.820
I.D., inches	0.291	0.588		1.231		1.661	2.520		3.740
Net Weight, lbs.	13	25	13	55	23	120	135		310
Shipping Weight, lbs.	400	290	210	425	320	295	305		340
Shipping Dimensions, inches	14x13x245	12x8x245		13x14x245		12x12x245	12x12x245		14 dia. x 245
Number of Sections in Crate	12	6		4		1	1		1
SPECIAL LENGTH, Type Number	2760	2761	2761AL	2762A	2762AL	2763	2773	2783	2786

*Specify frequency.
**See Engineering Data Section for more complete data.
†Type numbers shown are for standard 20-foot lengths and include inner connector, "O" ring gasket, and hardware.

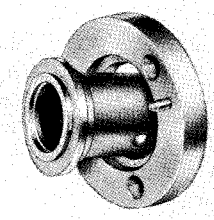
ACCESSORIES FOR 7/8" TYPE 560 LINE



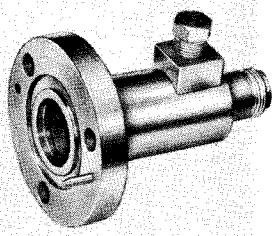
1060M



1260



1560 A



2260

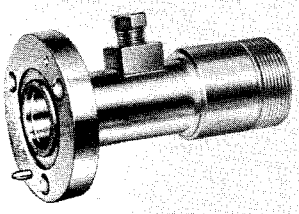
Each of the following fittings includes "O" ring gasket, inner connector, and hardware.

1060M, miter elbow has swivel flanges at each end. VSWR is less than 1.02 up to 2400 mc. Roughing in dimensions are $2\frac{7}{16}$" flange face to centerline on one arm, $3\frac{1}{16}$" flange face to centerline on other arm.

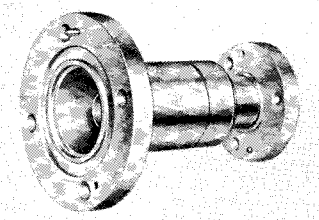
1260, gas barrier. VSWR is less than 1.03 up to 2700 mc. Length between flange faces is $3\frac{17}{32}$.

1560A, soft solder field flange kit consists of sleeve with fixed ring and sliding ring.

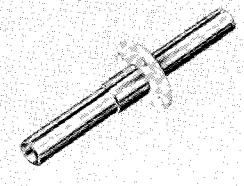
2260, adaptor from flanged line to Type N jack mates with Type N plug (10804-6, not included). Incorporates gas barrier and removable gas vent plug. Overall length is $2\frac{7}{8}$".



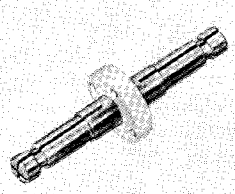
2360



1860



4850



18275

2360, adaptor from flanged line to LC jack mates with Type LC plug (12418-1, not included). Incorporates gas barrier and removable gas vent plug.

1860, reducer for connecting Type 560 line to Type 561 line. VSWR is less than 1.05 up to 2400 mc. Length between flange faces is $4\frac{25}{64}$". Includes connectors and hardware for both ends.

4850, inner conductor adaptor (only) is used for connecting $\frac{7}{8}$" EIA flange to Type 740 cable flange.

18275, inner connector (only). VSWR is less than 1.02 to 2800 mc. See page 63 for dimensions.

NOT ILLUSTRATED

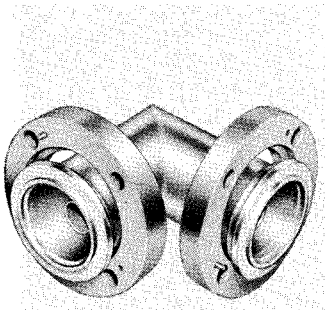
18630, fixed flange kit consists of flange, alignment pin, silver solder ring, and flux. See page 63 for flange dimensions.

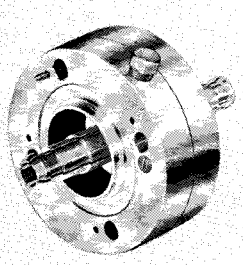
18096, swivel flange kit includes fixed ring, sliding ring, silver solder ring, and flux.

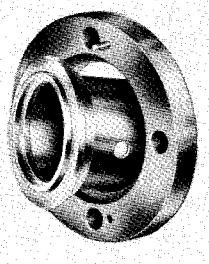
11381-1, spare hardware kit bolts two flanges together. Kit includes three hex head bolts ($\frac{1}{4}$"x 20"x$1\frac{1}{4}$"), nuts, and lockwashers.

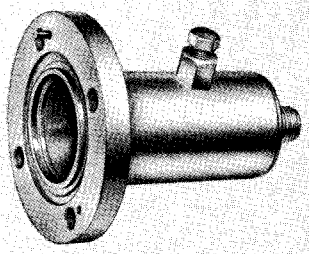
10683-11, "O" ring gasket.

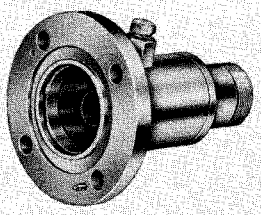
ACCESSORIES FOR 1⅝" TYPE 561 LINE


1061M


1261A


1561A


2261


2361

Each of the following fittings includes "O" ring gasket, inner connector, and hardware.

1061M, miter elbow has swivel flanges at each end. VSWR is less than 1.02 up to 3000 mc. Roughing in dimension is $2\frac{29}{32}$" from flange face to centerline of opposite arm.

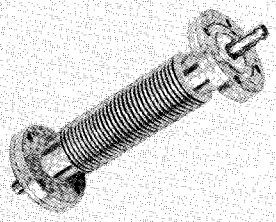
1061MAL, miter elbow is similar to 1061M except outer conductor is aluminum.

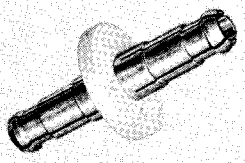
1261A, gas barrier. VSWR is less than 1.03 up to 2800 mc. Length between flange faces is $1\frac{21}{32}$".

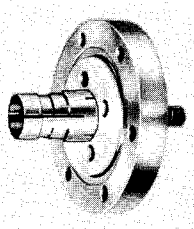
1561A, soft solder field flange kit consists of sleeve with fixed ring and sliding ring.

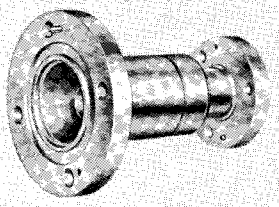
2261, adaptor Type N jack mates with Type N plug (10804-6, not included). Includes gas barrier and gas vent plug. Overall length is $4\frac{1}{4}$".

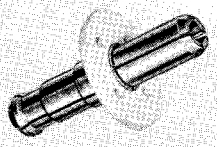
2361, adaptor Type LC jack mates with Type LC plug (12418-1, not included). Includes gas barrier and removable gas vent plug. Overall length is $4\frac{7}{16}$".


20695


15069


1861


1860


4851

20695, flexible section accommodates vibration. Can be used for special angles less than 30 degrees. Includes connectors on both ends. Overall length is 10". This fitting should not be used to accommodate expansion.

15069, inner connector (only). VSWR is less than 1.02 up to 2500 mc. See page 63 for dimensions.

1861, reducer connects Type 561 to Type 562A line. Has EIA flanges on both ends. VSWR is less than 1.01 up to 1600 mc. Length between flange faces is ⅞".

1860, reducer connects Type 561 to ⅞" 50 ohm Type 560 line. VSWR is less than 1.05 up to 2400 mc. Length between flange faces is $4\frac{25}{64}$". Includes connectors and hardware for both ends.

4851, inner adaptor (only) connects $1\frac{5}{8}$" EIA flange to $1\frac{5}{8}$" flat flange.

NOT ILLUSTRATED

The following items include hardware only as indicated.

18631, fixed flange kit consists of flange, alignment pin, silver solder ring, and flux. See page 63 for flange dimensions.

18041, swivel flange kit includes fixed ring, sliding ring, silver solder ring, and flux.

11381-2, spare hardware kit bolts two flanges together. Kit includes four hex head bolts, nuts, and lockwashers.

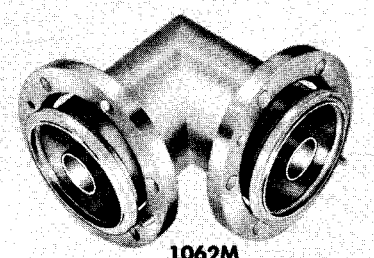
10683-2, "O" ring gasket.

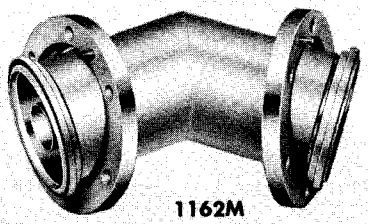
21205, unpressurized straight coupling connects unflanged sections of Type 561. Includes inner connector and clamps.

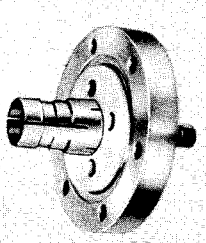
11809-2, stainless steel spare clamp used with straight coupling.

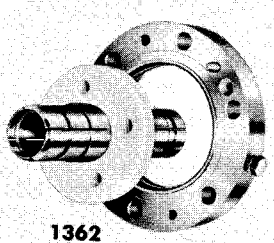
10419-2, silver solder ring for brazing flange to line.

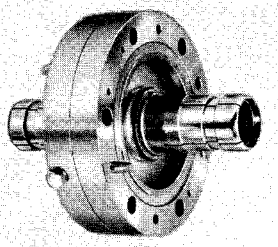
ACCESSORIES FOR 3⅛" TYPE 562A LINE

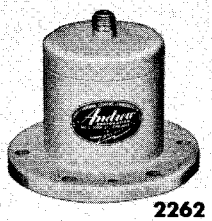

1062M

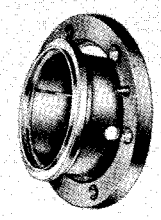

1162M

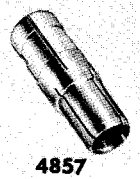

1861

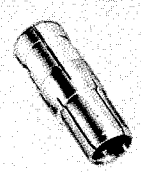

1362

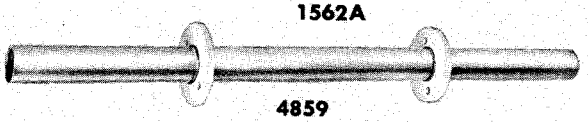

1262A

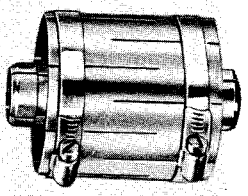

2262


1562A


4857


4852


4859


4862

Each of the following fittings includes "O" ring gasket, inner connector, and hardware. Reducers include these items for both ends.

1062M, miter elbow has EIA swivel flanges at each end. VSWR is less than 1.01 to 1600 mc. Outer conductor is constructed of extra heavy brass. Roughing in dimension is 4 13/16" from flange face to center line of opposite arm. 1062M-2 is similar to 1062M except without flanges for use with 4862 coupling.

1062MAL, miter elbow is similar to Type 1062M except outer conductor is aluminum.

1162M, 45 degree miter elbow has the same construction as Type 1062M. VSWR is less than 1.01 to 1600 mc. Flange face to centerline dimension is 4 29/32".

1861, reducer connects Type 562A to 1⅝" Type 561 line. Mates to EIA standard flanges at both ends. VSWR is less than 1.01 to 1600 mc. Length is ⅞".

1362, gas inlet coupling has ⅛" gas inlets with pipe plugs. Connecting hardware furnished includes special inner connector. Length is ¾".

1262A, gas barrier includes gas inlets on both sides. Used to connect pressurized section to unpressurized section. VSWR is less than 1.01 up to 1600 mc. Length between flange faces is 1⅞".

1562A, soft solder field flange kit is for Type 562A line. Kit includes universal flange with soft solder sleeve.

†Not illustrated

† **1872, reducer** connects Type 562A line to 6⅛" Type 573 line. VSWR is less than 1.02 up to 225 mc. Length is 7⅛".

† **1862, reducer** connects Type 562A to 6⅛" Type 563 75 ohm line. Includes transformer for matching Type 562A to 75 ohms. Mates to EIA standard flanges at both ends. VSWR is less than 1.01 up to 890 mc. Specify channel when ordering. Length is 10".

4859, impedance transformer is used for matching impedance of line to 51.5 ohm line. Includes a length of special inner conductor and inner connectors for both ends. Outer conductor is not included. For channels 2–6, order 4859-1; for channels 7–13, order 4859-2. User cuts per instructions. Length is 53½" for channel 2; 14" for channel 13.

4857, inner adaptor (only) is used to join Type 562A to 3⅛" 51.5 ohm Teflon insulated Type 552.

4852, inner adaptor (only) is used to join Type 562A line to 51.5 ohm steatite insulated Type 452.

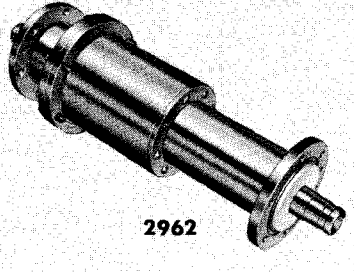
4862, ungassed coupling is used for connecting sections of unflanged Type 562A.

† **15093, spare inner connector** (only). VSWR is less than 1.01 to 1100 mc. See page 63 for dimensions.

† **15840, fixed flange kit** (only) includes flange, solder ring, and flux. See page 63 for dimensions.

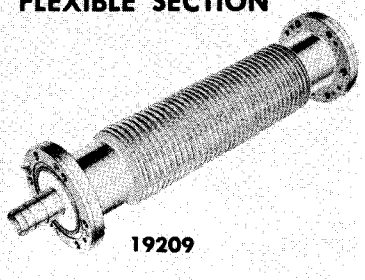
2262, adaptor mates with Type N plug (10804-6).

BREAKAWAY SECTION


2962

2962, breakaway section is used with 3⅛" Type 562A line to permit easy opening of line. Impedance is 50 ohms and VSWR is under 1.02 to 1100 mc. Outer conductor is bolted in place when extended and has full pressure contact. Length between flange faces is 15 3/16" when installed. Net weight, 21 lbs.; gross weight, 34 lbs.

FLEXIBLE SECTION


19209

19209, flexible section accommodates vibration between equipment. This fitting should not be used to accommodate expansion. Can be used for special angles less than 30 degrees. Includes connectors for both ends. Length is 18" between flange faces.

ACCESSORIES FOR 6⅛" TYPES 573 AND 563 LINES

50 and 75 ohms

Each of the following fittings includes "O" ring gasket, inner connector, and hardware.

90 DEGREE MITER ELBOWS

1063M (75 ohms) and 1073M (50 ohms), miter elbows have EIA swivel flanges at each end. VSWR is less than 1.01 up to 450 mc. Specify frequency for use above 450 mc. Outer conductor is constructed of extra heavy brass. 1083M miter elbow is similar to 1073M except that single bolt clamp flanges are used. Roughing in dimension of all 90 degree elbows is 4$\frac{3}{16}$" from flange face to centerline of opposite arm.

45 DEGREE MITER ELBOW

1163M (75 ohms), miter elbow has the same construction as right angle elbow including swivel flanges, extra heavy outer conductor. VSWR is less than 1.01 at specified frequency. Flange face to center line is 4$\frac{29}{32}$".

REDUCERS TO 3⅛"

1862, reducer is used to connect Type 563 to Type 562A 3⅛" diameter 50 ohm line. Includes quarter-wave impedance transformer for matching Type 563 to 50 ohms. Mates to EIA standard flanges at both ends. VSWR is less than 1.01 to 890 mc. Includes connectors for both ends. Specify channel when ordering. Length is 10" between flange faces.

1872, reducer for connecting Type 573 6⅛" line to Type 562A 3⅛" line. VSWR is less than 1.02 up to 850 mc. Includes inner connectors for both ends. Length between flange faces is 7⅛".

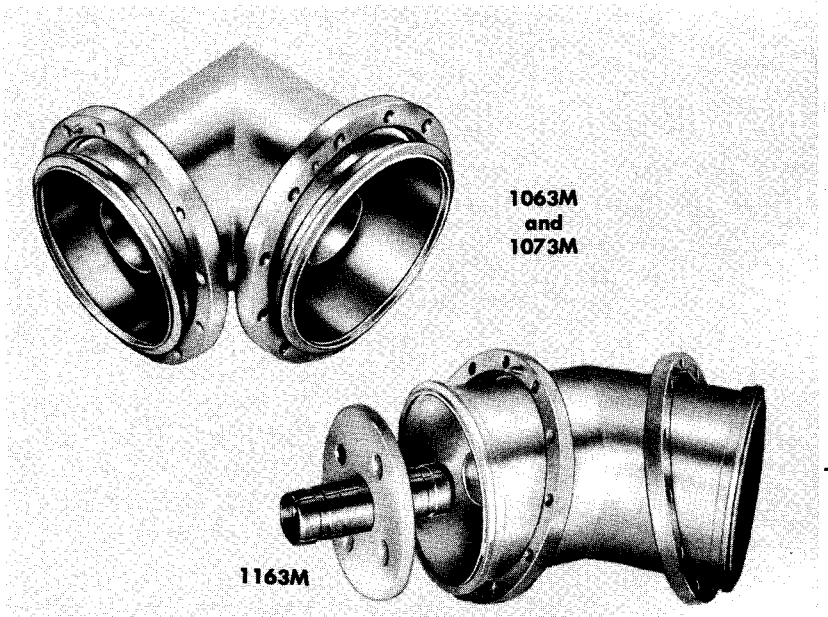
GAS BARRIER

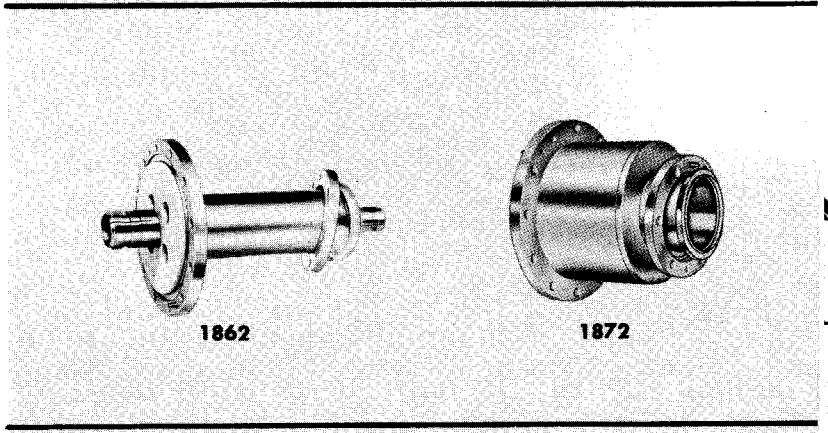
1273, gas barrier is compensated to provide a VSWR of less than 1.01 up to 850 mc. Length between flange faces is 1$\frac{11}{16}$".

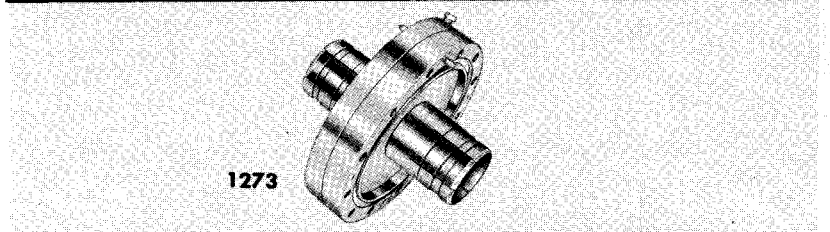
INNER CONNECTORS

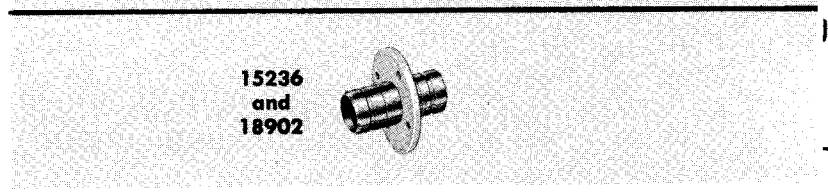
15236, spare inner connector for Type 563. See page 63 for dimensions.

18092, spare inner connector for Type 573. See page 63 for dimensions.









OTHER ACCESSORIES

1563A and 1573A, soft solder field flange kit is used for Type 563 and Type 573 line. Fixed ring with soft solder sleeve and sliding ring.

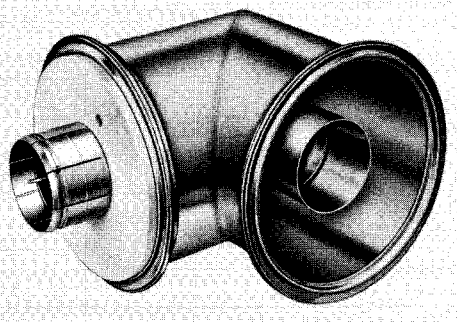
18110, swivel flange kit is used for Type 563 and Type 573 lines. Includes fixed ring, sliding ring, silver solder, and flux. See page 63 for dimensions.

10683-10, "O" ring gasket.

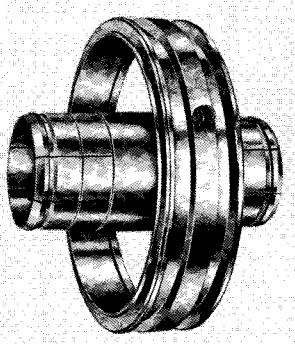
21206, hardware for one pair of flanges. Includes 12 lockwashers, 12 bolts, and 12 nuts.

21207, adaptor from Type 583 to Type 573 line.

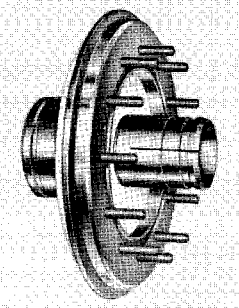
ACCESSORIES FOR 9" TYPE 586 TRANSMISSION LINE



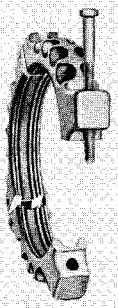
1086M



1286



18362



17008

Each of the following fittings includes "O" ring gasket, alignment ring, inner connector, and flange clamp.

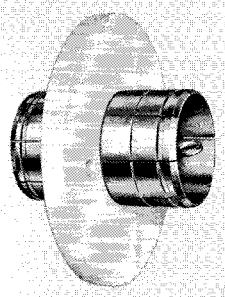
1086M, miter elbow has VSWR less than 1.01 up to 220 mc. Each elbow is pressure tested. Flange face to centerline of opposite arm is 7 5/16".

1286, gas barrier has VSWR less than 1.01 up to 220 mc. Length between flange faces is 2 3/4".

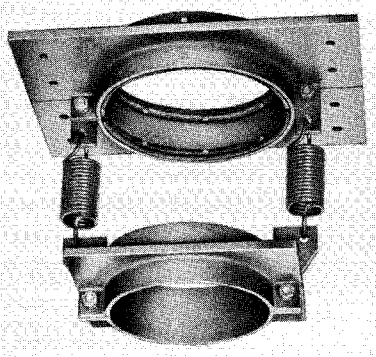
18362, reducer connects Type 586 line to Type 573 6 1/8" 50 ohm EIA flange-type line. VSWR is less than 1.01 up to 220 mc. 6 1/8" hardware included.

17008, flange clamp design provides swivel action on all connections. One bolt feature reduces field assembly time. Alignment ring is included with clamp. Outer diameter of assembled clamp is 13 1/4".

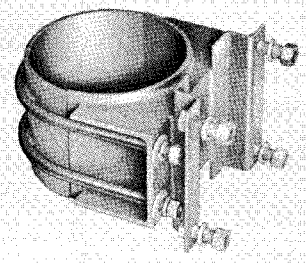
†**1873, reducer** is similar to 18362 except with female inner connection on both ends. Length is 8".



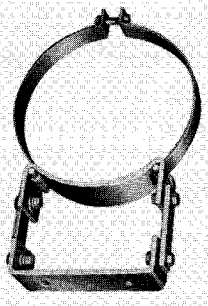
16972A



18409



18365



20985

† **18894, flange ring kit** includes silver solder preform and flux.

16972A, inner connector has VSWR less than 1.01 up to 220 mc.

† **10683-51, "O" ring gasket.**

18409, spring hanger for 9" line accommodates line expansion and contraction; should be used every 10 feet on a vertical run.

18365, rigid hanger mounts at top of vertical run. Use two at top for vertical runs over 500 feet. Can be also used as anchor on horizontal runs.

20985, horizontal hanger for 9" line has double swinging link construction which accommodates axial movement caused by expansion and contraction while preventing lateral motion.

†Not illustrated

ACCESSORIES

Other accessories for the 9" line, such as patch panels, power dividers, expansion joints, special hangers, and field assembly tools are available. Write or call for information.

COAXIAL SWITCH

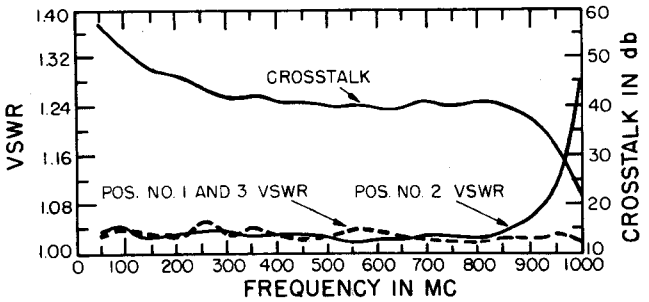
Type 6710—remotely controlled coaxial single pole triple throw switch provides 4-second switching of 3⅛″ coaxial transmission line at frequencies up to 1000 mc.

This automatic switch allows high power communication systems, as well as VHF and UHF television stations, the convenience of rapid switching to standby equipment.

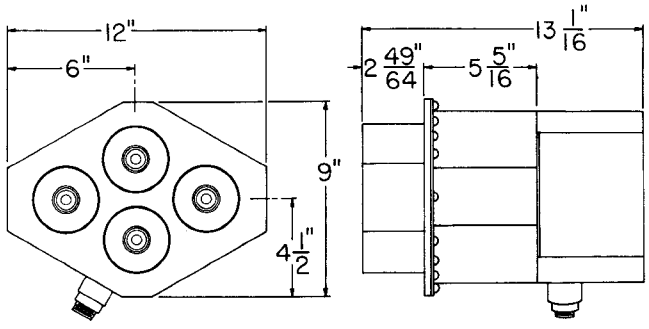
Use of these switches eliminates time consuming manual changes of coaxial line connections. Standby equipment may be quickly and easily checked under actual operating conditions. In the event of main equipment failure, the spare equipment is switched in with negligible "off-the-air" time.

Type 6710 coaxial switch is used with 3⅛″ UHF, 50 ohm transmission line (Type 562A). It is a single pole triple throw switch that shifts to an adjacent position in four seconds or through two positions in six seconds.

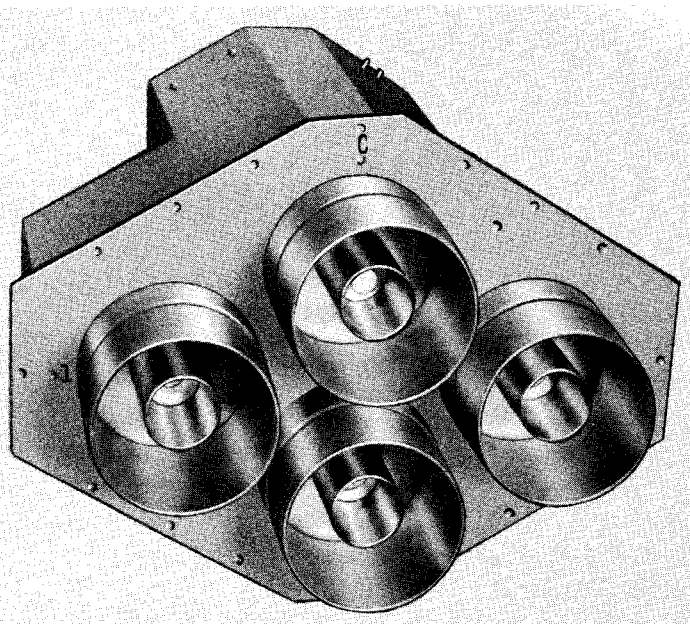
Remotely controlled—the switch is operated by a dependable long-life motor. The motor operates on 115 volt, 60 cycle alternating current. Control circuitry includes a wafer switch for use in remote position indication, and a microswitch for use in high voltage interlock circuits. The microswitch is linked to the switching mechanism so that transmitter power is removed before switching and is reapplied only after new contact is made.



VSWR AND CROSSTALK OF TYPE 6710 SWITCH



INSTALLATION DIMENSIONS FOR TYPE 6710



CHARACTERISTICS

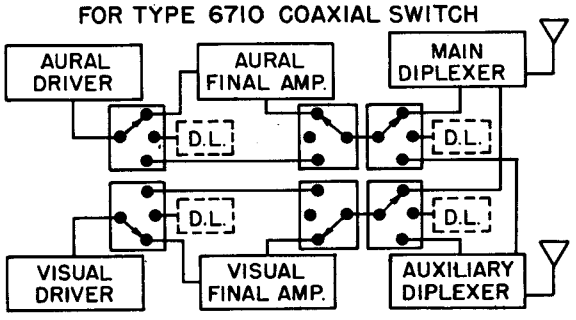
MECHANICAL

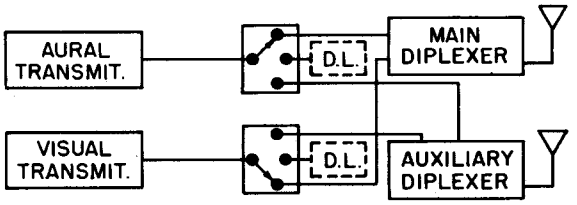
Dimensions:	12″ x 9″ x 12 15/16″
Insulation:	Teflon
Life:	10,000 actuations
Outer Conductor:	O.D. 3.125″, I.D. 3.027″
Inner Conductor:	O.D. 1.315″, I.D. 1.231″
Switching Time:	4 seconds between positions
Net Weight:	20 lbs.
Shipping Weight:	40 lbs.

ELECTRICAL

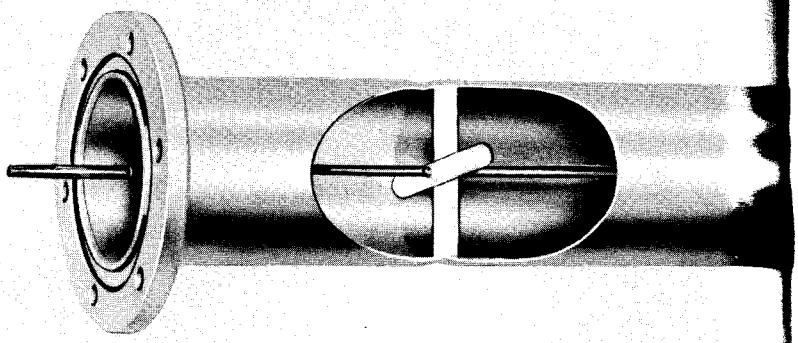
Actuator Operating Current:	1.5 amperes at 115 volts, 60 cycles
Characteristic Impedance:	50 ohms
VSWR with 50 ohm Termination:	See curve
Insertion Loss:	0.15 db at 900 mc
Cross Talk:	See curve
Frequency Range:	0-1000 mc
Power Rating:	10 kw at 1000 mc

2 TYPICAL SWITCHING SCHEMATICS FOR TYPE 6710 COAXIAL SWITCH





3⅛" 180 OHM TRANSMISSION LINE



TYPE 14208—A SPECIAL LINE FOR HF SHIPBOARD USE

This special ANDREW transmission line meets the exacting requirements of U.S. Naval shipboard radio, where unusual antenna impedance frequently produces a very high VSWR on the line. The 180 ohm impedance is ideal for this application and the 3⅛" size of this line makes it much easier to install than the 12" "trunk" line formerly used.

Nonmagnetic construction. All materials are nonferrous and nonmagnetic. The line is built to withstand high stresses and vibration. Teflon insulation permits operation at high temperatures.
180 ohm line is supplied in 20-foot lengths. Each section includes standard inner connector, "O" ring gasket, and hardware. Packed 4 sections per crate, 13x14x248 inches outside dimensions.

Order by type number below:
14208, 20-foot length with flanges.
14208-2, 20-foot length unflanged.
15736, special length with flanges.

CHARACTERISTICS

MECHANICAL

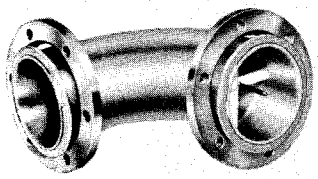
Standard Length:	20 feet
Insulation:	Anchored Teflon pegs
Outer Conductor:	O.D. 3.125", I.D. 3.027" (copper)
Inner Conductor:	O.D. 0.162" (solid copper)
Weights:	(see chart below)

ELECTRICAL

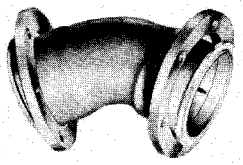
Characteristic Impedance:	180 ohms
Voltage Breakdown:	18,000 volts peak at 60 C.P.S.

See Engineering Data Section for attenuation, power rating, and additional characteristics.

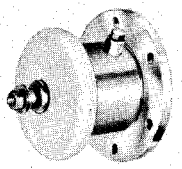
ACCESSORIES



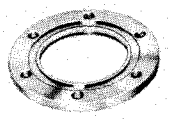
14547



15254



14544



10881

14548-1

ACCESSORIES FOR 180 OHM TRANSMISSION LINE

These accessories match Type 14208 line in impedance and voltage rating. Nonmagnetic, made of nonferrous materials. Bends are Teflon insulated. Flanged accessories include connecting hardware, standard inner connector, "O" ring rubber gasket, bolts (N43-B-15194-5330), nuts (N43-N-4875-5405), and lockwashers (N16-W-182501-110).

DESCRIPTION	ANDREW TYPE NO.	NAVY STOCK NO.*	WEIGHT, LBS.	
			Net	Packed
20-foot flanged section	14208	N16-T-25301-1528	54	425 (4 sections)
20-foot unflanged section	14208-2	.....	50	415 (4 sections)
90° elbow, has swivel flanges, 3⅜" radius, 2" tangents	14547	N16-T-25301-1474	7	10
45° elbow, has swivel flanges, 4" radius, 2" tangents	15254	N16-S-25301-1540	6	9
End terminal, 4¾" long	14544	N16-T-150225-137	5	8
Fixed flange, 5¼" O.D.	10881	N16-F-650431-164	1	2
Inner connector	14548-1	N16-T-25301-1524	0.1	0.2
"O" ring gasket	10683-3	N33-P-99500-23	0.1	0.2
Solder ring, for brazing flange	10419-11	N17-R-650651-207	0.05	0.2
Bulkhead flange, for anchoring line at bulkhead	15249	.....	2	3
Hardware, for one set of flanges	11381-3	.....	0.3	0.5
Swivel flange	14486	.....	1	2

*Navy Stock Numbers shown above are for reference purposes only.

FOR INFORMATION ON HF SKIRT ANTENNAS WRITE FOR ANDREW BULLETIN 9730.

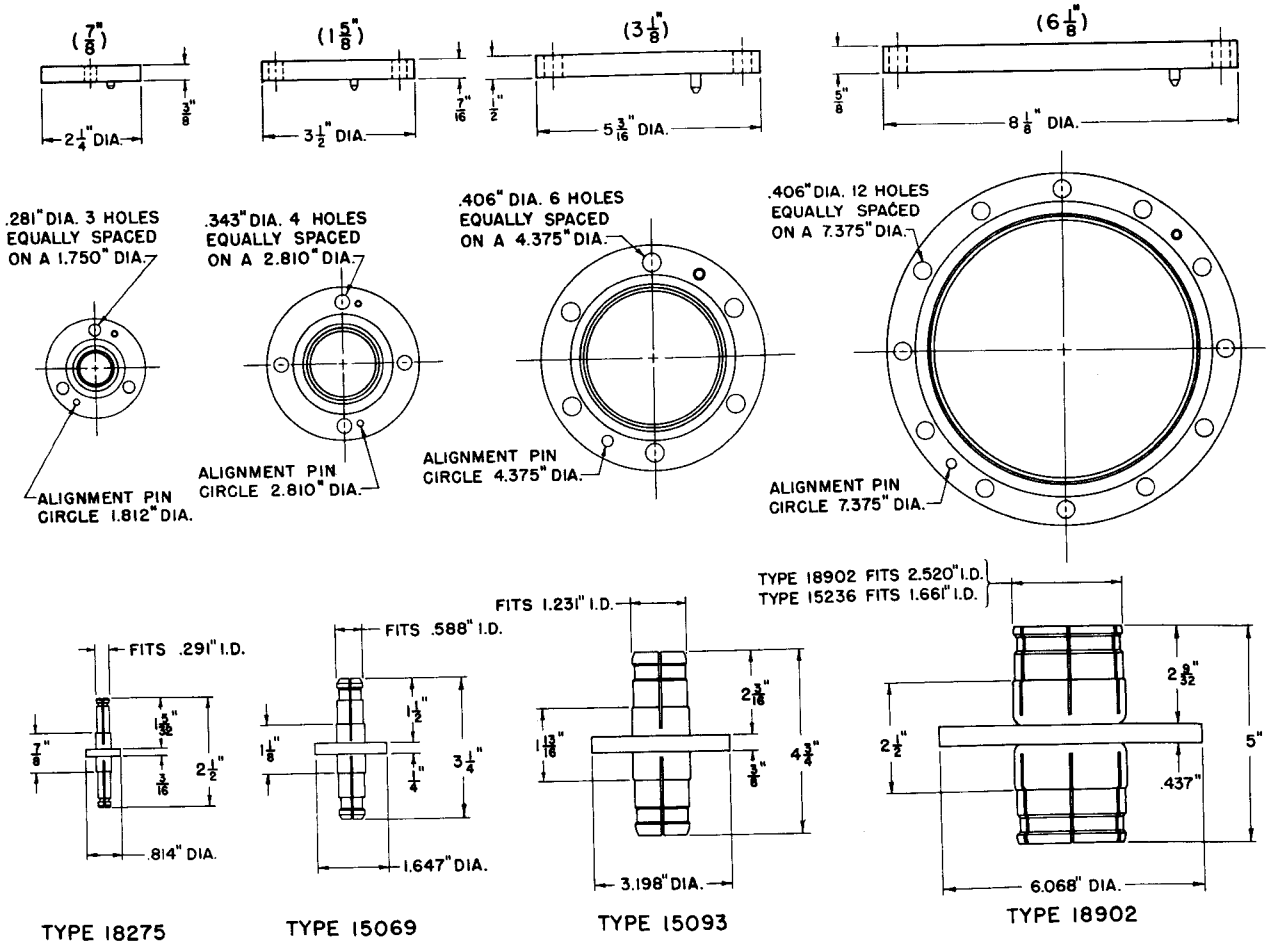
RIGID COPPER TUBING

The copper tubes shown in this table are 95% conductivity (IACS) copper, identical to those used in the rigid transmission lines shown on page 55. For convenience in shipping, we have chosen 80 inches as the standard length. Prices shown in the price list are based on this length. Longer lengths up to 20 feet are available. Prices on request. Flanges and connectors are not included. The part numbers shown below for these items are for your convenience in ordering.

Line size	Conductor Type No.	Dimensions, inches	Net Weight, Lbs./Ft.	Fixed Flange Type Number	Inner Connector Type Number
7/8"	10570A-6	0.875 O.D. x 0.785 I.D. x 80 long	.45	18630	.....
7/8"	10570A-52	0.341 O.D. x 0.291 I.D. x 80 long	.1	.....	18275
1 5/8"	10570A-9	1.625 O.D. x 1.527 I.D. x 80 long	.94	18631	.....
1 5/8"	10570A-49	0.664 O.D. x 0.588 I.D. x 80 long	.35	.....	15069
3 1/8"	10570A-12	3.125 O.D. x 3.027 I.D. x 80 long	1.83	15840	.....
3 1/8"	10570A-48	1.315 O.D. x 1.231 I.D. x 80 long	.64	.....	15093
6 1/8"	10570A-16	6.125 O.D. x 5.981 I.D. x 80 long	5.31	18111	.....
6 1/8"	10570A-51	1.711 O.D. x 1.661 I.D. x 80 long	.525	.....	15236
6 1/8"	10570A-45	2.600 O.D. x 2.520 I.D. x 80 long	1.24	.....	18902
9"	10570A-58	9.000 O.D. x 8.800 I.D. x 80 long	10.7	18894*	.....
9"	10570A-59	3.820 O.D. x 3.740 I.D. x 80 long	1.85	.....	16972

*Fixed ring only. See page 60 for clamp. Tubes of 6 1/8" O.D. or less are normally shipped in an 8x8x96" carton. Tare weight is 6 lbs. 9" tubes are normally shipped in a 12" O.D. x 84" long impregnated fiberboard shipping tube. Tare weight is 20 lbs.

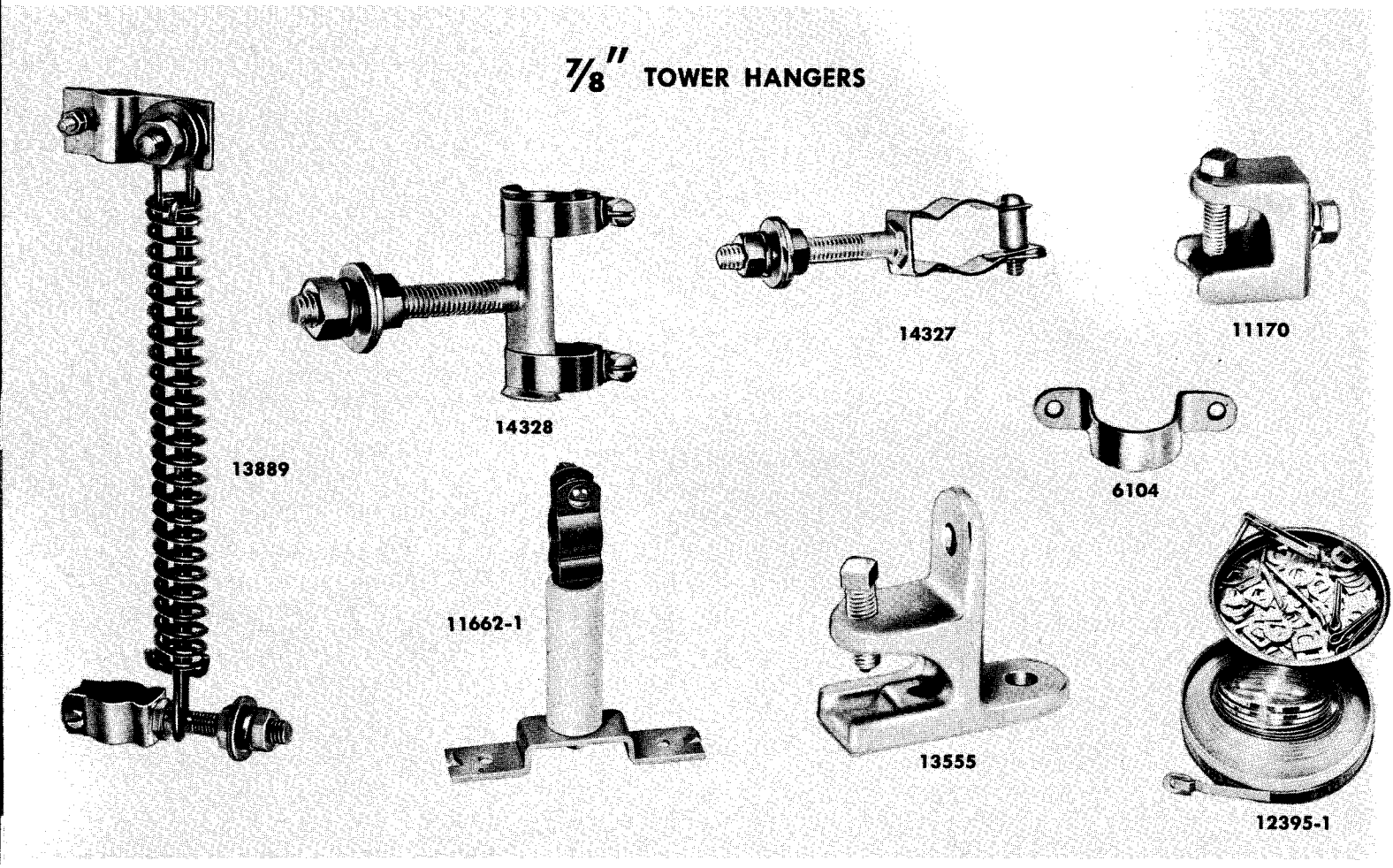
STANDARD CONNECTOR DIMENSIONS



RIGID TRANSMISSION LINE HANGERS

ANDREW has a complete line of tower and horizontal hangers for attaching transmission line to any support. Three styles of tower hangers are available: rigid, sliding (to prevent lateral motion of line), and spring (supports weight of line and accommodates expansion). These are available insulated or noninsulated. The insulated hangers are used when the line feeds an auxiliary antenna mounted on an AM broadcast tower.

Adaptors are also available to attach hangers to any type of tower member without drilling.



14328, rigid hanger is brass with a stainless steel clamp and is used at the top of the tower in spring suspended system.

14327, sliding hanger is a brass guide and is used at 6-foot intervals to prevent lateral motion of line on both horizontal and vertical runs.

13889, spring hanger is a brass housing with a stainless steel spring and clamp and is used at 100-foot intervals to support the weight and accommodate the expansion of the line.

11662-1, insulated hanger has a galvanized iron base and is adjustable for rigid or sliding clamps. Bolts or wraplocks to tower.

11170, angle adaptor is a galvanized iron clamp which attaches Type 14327 sliding hanger to tower with angle members up to ½" thick, no drilling required.

13555, angle adaptor is a galvanized iron clamp which attaches Type 14328 rigid hanger or Type 13889 spring hanger to tower having angle members up to ⅞" thick, no drilling required.

12395-1, stainless steel wraplock, 100-foot length, ½" wide. Rigidly attaches cable to any type tower.

6104, copper mounting strap for ⅞" cable.

See page 67 for horizontal hangers.

13924, rigid hanger is used at the top of the tower in single line systems. Use two if tower is over 300 feet high.

14378, sliding hanger is used at 10-foot intervals to prevent lateral motion of line on vertical and horizontal runs.

14379, spring hanger has brass housing with a stainless steel spring and clamp. It is used at 50-foot intervals to support weight and accommodate expansion of the line.

14442, insulated sliding hanger is similar to 14378 and is used at 10-foot intervals to isolate line from tower.

14441, insulated spring hanger is similar to 14379 and is used at 50-foot intervals to isolate line from tower.

†**12430, grounding clamp** for grounding insulated line to tower includes flexible ground connection.

†**13552, extension spacer** is used with noninsulated single spring and sliding hangers to space them the same distance from tower as insulated hangers.

T4835, dual rigid hanger is used at the top of the tower in spring suspended, dual-line system. Use two if the tower is over 300 feet high.

T4834, dual spring hanger is used at 10-foot intervals to support weight and accommodate expansion of dual lines.

13220, insulated dual spring hanger is similar to T4834 and is used at 10-foot intervals to isolate lines from tower.

†**13553, extension spacer** is used with noninsulated dual spring hangers to space them the same distance from the tower as insulated hangers.

†**14063, spare insulator** is used with insulated hangers.

These clamps will attach any of the above hangers to any standard tower without drilling. Order one per hanger.

13555, angle adaptor is a galvanized iron clamp which attaches hanger to tower having angle members up to $\frac{7}{8}$" thick.

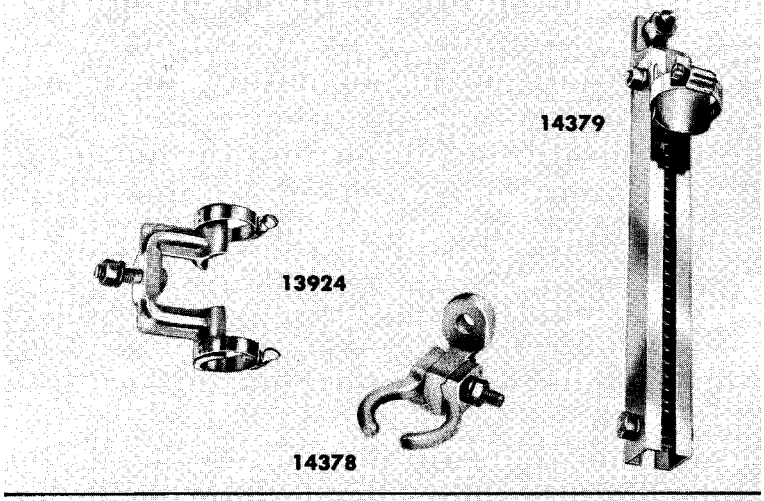
13550, round member clamp is galvanized iron and attaches hanger to tower having round members $\frac{3}{4}$" to 3" diameter.

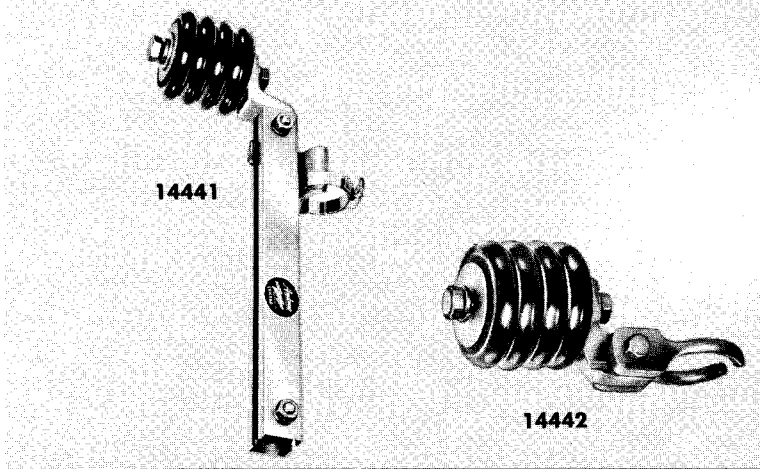
†**12395-1, stainless steel wraplock,** 100-foot length, $\frac{1}{2}$" wide. Rigidly attaches HELIAX to any type tower.

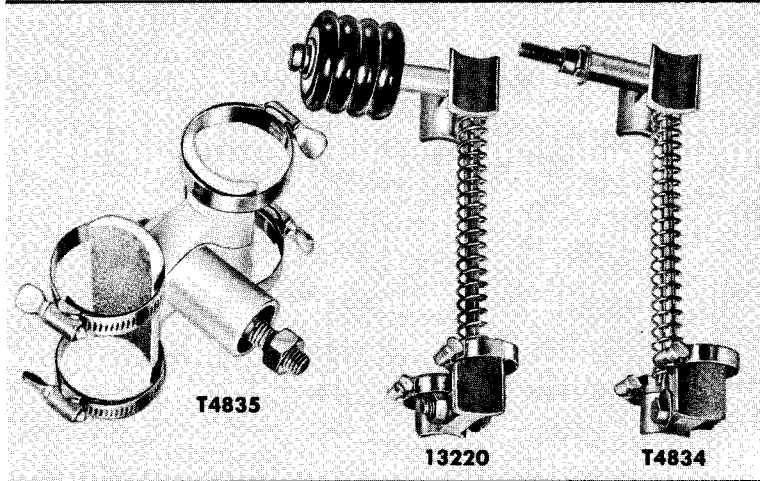
See page 67 for horizontal hangers.

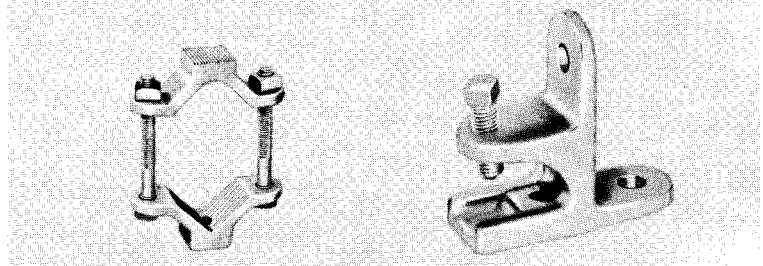
†Not illustrated.

1 5/8" TOWER HANGERS









3⅛" TRANSMISSION LINE HANGERS

ANDREW transmission line hangers for single and dual runs of 3⅛" line include both tower and horizontal types. Two styles of tower hangers are available: rigid and spring (supports weight of line and accommodates expansion). They are available either insulated or noninsulated. Insulated hangers are used when the line feeds an antenna mounted on an AM tower.

SINGLE LINE TOWER HANGERS

13927, rigid hanger is used at the top of the tower. Use two if tower is more than 300 feet high.

13925, spring hanger is used at 10-foot intervals to support weight and accommodate differential expansion of the line.

13926, insulated spring hanger is similar to 13925 and is used at 10-foot intervals to isolate line from tower.

12431, grounding clamp for grounding insulated line to tower includes flexible ground connection.

DUAL-LINE TOWER HANGERS

T4836, dual rigid hanger is used at top of tower in dual-line system. Use two if tower is more than 300 feet high.

T4830, dual spring hanger is used at 10-foot intervals to support weight and accommodate differential expansion of dual line.

13221, insulated dual spring hanger is similar to T4830 and is used at 10-foot intervals to isolate the line from tower.

13552, extension spacer is used with noninsulated spring hangers to space them the same distance from the tower as insulated hangers.

13553, extension spacer is used with noninsulated dual spring hangers to space them the same distance from the tower as insulated hangers.

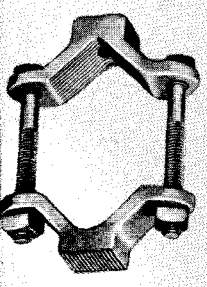
14063, spare insulator is used with insulated hangers.

CLAMPS FOR ATTACHING HANGERS TO TOWER WITHOUT DRILLING

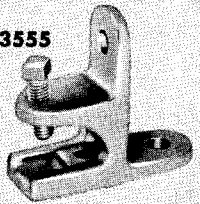
13555, angle adaptor clamp is a galvanized iron clamp which attaches hanger to tower having angle members up to ⅞" thick.

13550, round member clamp is galvanized iron which attaches hanger to tower having round members ¾" to 3" diameter.

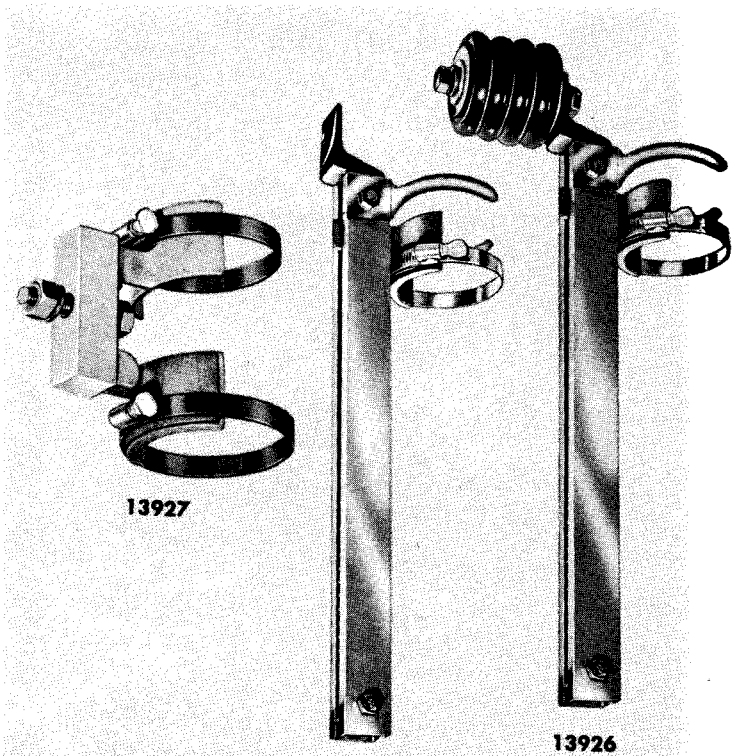
See page 67 for horizontal hangers.


13550


13552

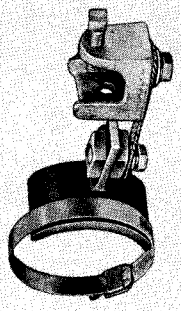

13555


14063

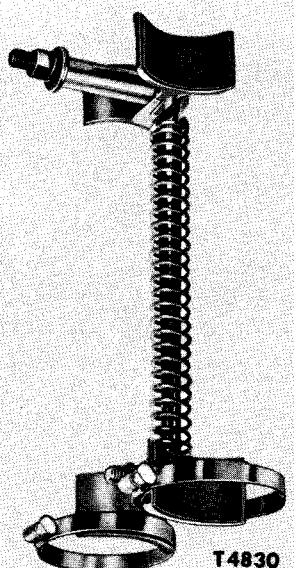

13927

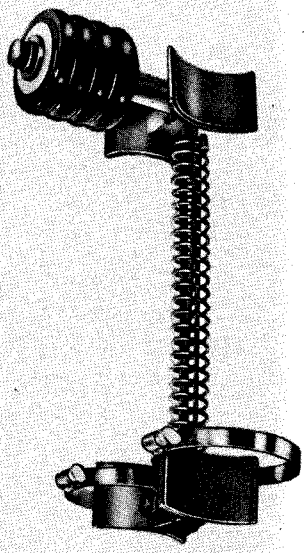
13925

13926

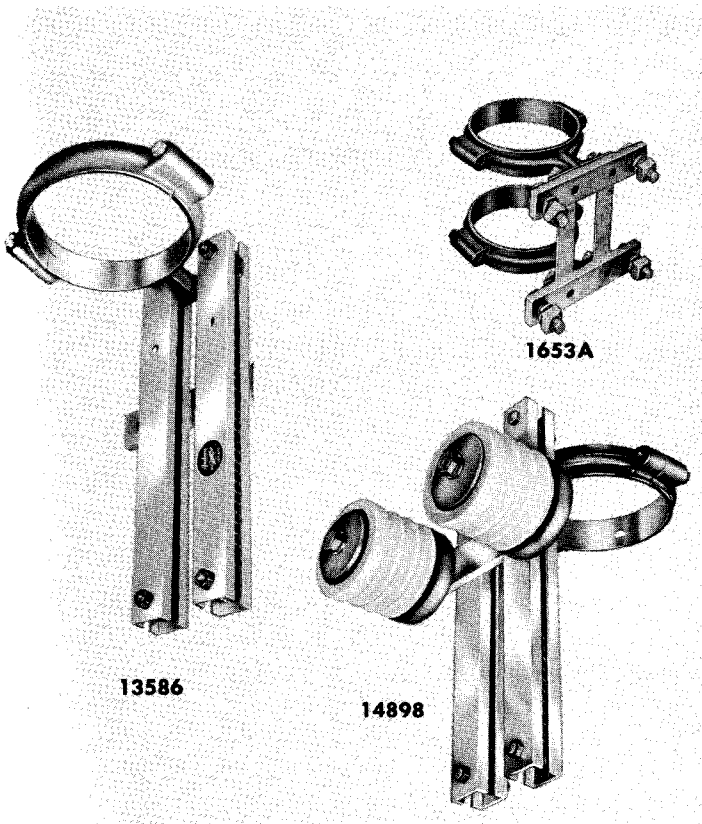

12431

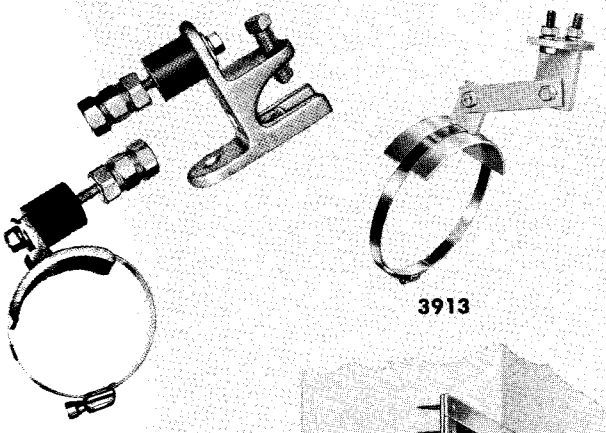

T4836

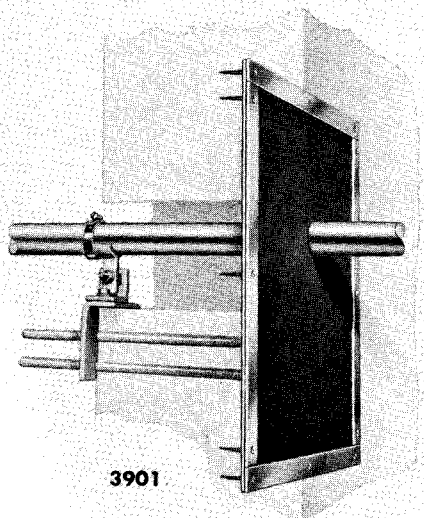

T4830


13221

6⅛" TRANSMISSION LINE HANGERS







Since most installations involving 6⅛" line are on heavy custom built towers, you are urged to contact the ANDREW sales department for recommendations on hangers to be used on your tower. Adaptors for mounting hangers to tower without drilling are available on special order.

These hangers are made of bronze. The rigid hanger mounting plate is of heavily galvanized steel.

In dual runs of this heavy line, each line is mounted individually to simplify maintenance. Hangers shown require holes in tower members for mounting.

1653A, rigid hanger is used at the top of the tower. Use two for tower heights over 1,000 feet.

13586, spring hanger is used at 10-foot intervals on the vertical run to support the weight and to accommodate the expansion of the line.

14898, insulated spring hanger is similar to 13586. Use at 10-foot intervals. Isolates line from tower.

HORIZONTAL MOUNTINGS— ALL LINE SIZES

LATERAL BRACE KITS

Lateral braces are used at the bottom of vertical runs of transmission line to prevent lateral motion while accommodating expansion and contraction. Rubber cushion connectors absorb the line vibrations and also act as universal joints. Kit includes end fittings to be used with ½" thinwall conduit (not included).

3921, lateral brace for 1⅝" lines.
3922, lateral brace for 3⅛" lines.
3923, lateral brace for 6⅛" lines.

HORIZONTAL HANGERS

These swinging hangers provide horizontal support but permit axial movement caused by expansion and contraction.

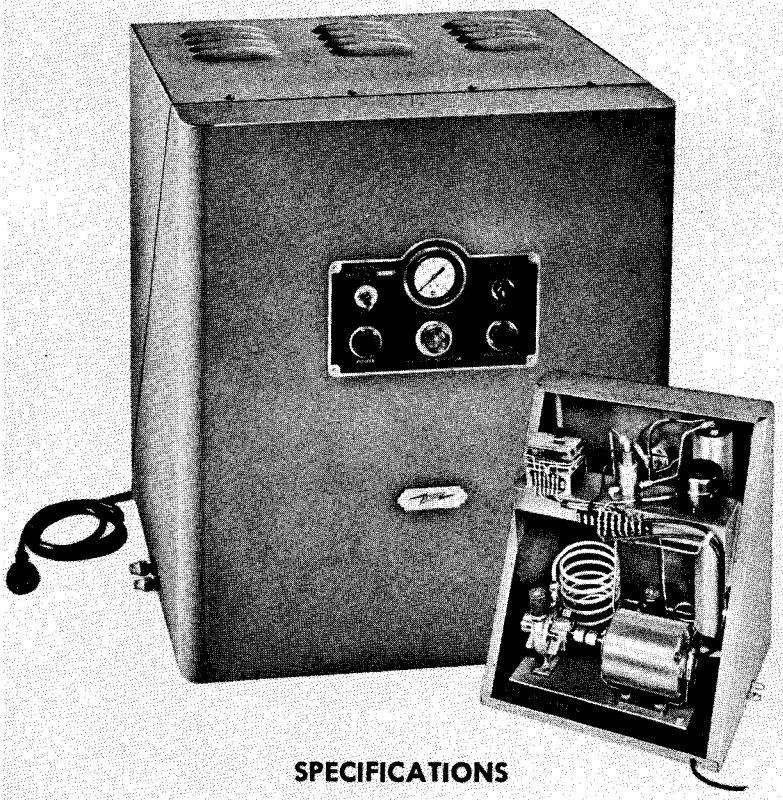
3911, horizontal hanger for 1⅝" lines.
3912, horizontal hanger for 3⅛" lines.
3913, horizontal hanger for 6⅛" lines.

HORIZONTAL ANCHORS

Designed to anchor horizontal runs to wall of building. Double swivel action accommodates lines passing through the wall at any angle up to 45 degrees. A weatherproof cover is included.

3900, horizontal anchor for ⅞" lines.
3901, horizontal anchor for 1⅝" lines.
3902, horizontal anchor for 3⅛" lines.
3903, horizontal anchor for 6⅛" lines.

PRESSURIZING EQUIPMENT



1910, ANDREW automatic dehydrator *supplies dry air for the pressurization of coaxial transmission lines. Operation is completely automatic.*

Dry gas pressurization is an absolute requirement for the satisfactory operation of an outdoor installation of air dielectric coaxial transmission line. If such a line is not pressurized, outside air may be drawn into the line as temperature drops. A further drop in temperature will cause the moisture content of this outside air to condense. Arcing between inner and outer conductors may result. As dry air is readily available, it is the most economical way to pressurize line.

Output air having 50 degrees to 60 degrees F dewpoint differential will be delivered, depending upon intake conditions.

The ANDREW automatic dehydrator will maintain a constant dry air pressure in the line. It includes a compressor which pumps air through a desiccant tank into the line. A pressure switch starts the compressor when line pressure drops below 5 p.s.i., and stops it when the line pressure reaches 10 p.s.i. The switch is adjustable for pressures up to a maximum of 20 p.s.i. For normal applications, 5–10 p.s.i. is quite adequate.

A solenoid operated valve prevents line pressure from leaking back. Line pressure and condition of desiccant are indicated on the front panel. The desiccant is reactivated by a heater every four hours of compressor operating time. Complete reactivation is accomplished in two hours, during which time the solenoid operated valve holds the pressure in the line. In an average system, this reactivation period will occur only once every several weeks.

The compressor is of the rotary type, which gives years of maintenance-free service. It is connected by direct drive to a heavy duty ¼ H.P. motor.

SPECIFICATIONS

Compressor Output:	1 cu. ft. per minute
Output Connection:	Flare fitting for ¼" tubing; 20 ft. of tubing included
Power Consumption:	380 watts by compressor 1250 watts during first hour of reactivation
Power Source Required:	115 volts, 60 cycles (standard) 115 volts, 50 cycles (on special order)
Net Weight:	125 lbs.
Shipping Weight:	135 lbs.
Dimensions:	21" wide, 16" deep, 24" high

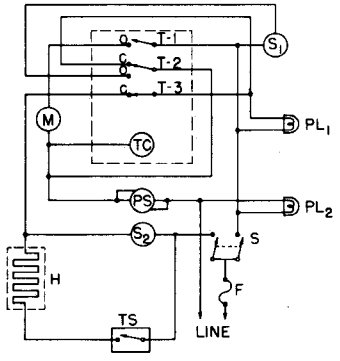
Dehydrator Capacity:

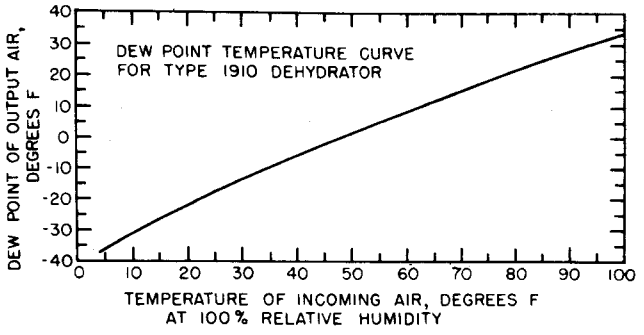
Line diameter, inches	Max. length, feet
⅞	40,000
1⅝	10,000
3⅛	2,500
6⅛	700

CIRCUIT DIAGRAM
AUTOMATIC DEHYDRATOR

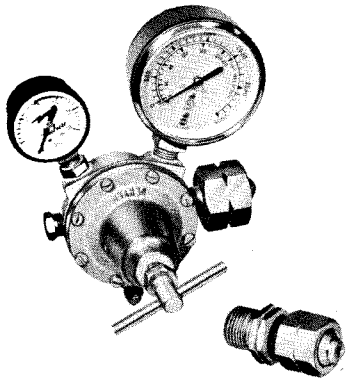
LEGEND

F	FUSE
H	CALROD HEATER
M	MOTOR
PL_1	RED LIGHT
PL_2	GREEN LIGHT
PS	PRESSURE SWITCH
S	TOGGLE SWITCH
S_1	UPPER SOLENOID
S_2	LOWER SOLENOID
TC	TIMER CLOCK
TS	THERMO SWITCH
c	CLOSED
o	OPEN
T-1 T-2 T-3	TIMER CLOCK SWITCHES





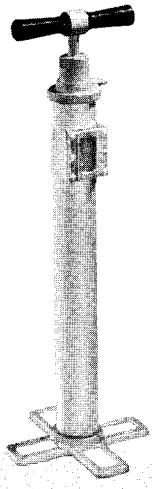
ACCESSORIES FOR PRESSURIZING EQUIPMENT

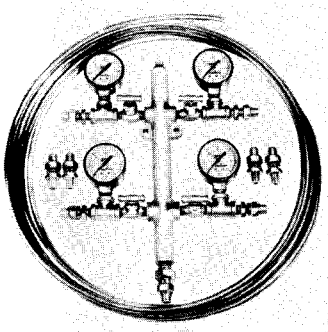


Type 878,* dry air hand pump will deliver output air having 50 degrees to 60 degrees F dewpoint differential, depending upon intake conditions.

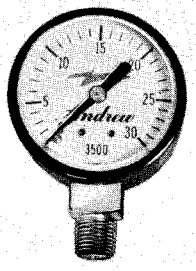
Type 878 will pressurize up to 1,000 feet of 7/8" cable, and up to 250 feet of 1 5/8" line. Supplied with 1 lb. of silica gel and 8 feet of hose.

Type 858, nitrogen fittings include a pressure regulator, high and low pressure gauges, and 10 feet of 1/4" O.D. soft temper copper tubing complete with flare fittings to fit 1/8" pipe threads. Air Reduction or Ohio Chemical nitrogen bottles are to be procured locally.



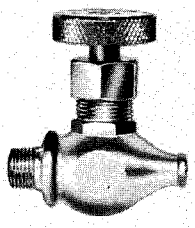


6600-4

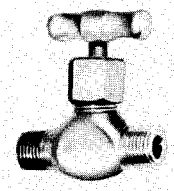


3500

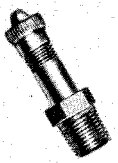
3022



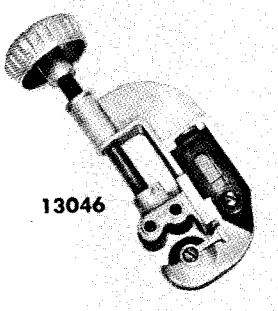
3027



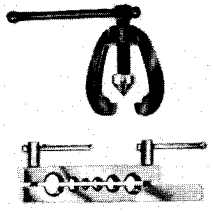
4944



3017



13046

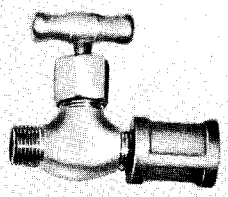


12993

4947

10994-2

10994-4



4949

6600, gas distribution manifold includes pressure gauges, needle valves, 15 feet of 1/4" copper tubing for each outlet. Specify number of outlets required. Manifold illustrated has 4 outlets.

3017, gas inlet valve has 1/8" male pipe thread.

3500, pressure gauge reads 0–30 p.s.i. and has 1/8" male pipe thread.

3022, service tee has 1 male and 2 female outlets, and has 1/8" pipe threads.

3027, needle stem release valve has 1/8" male pipe thread one end.

4944, needle stem release valve has 1/8" male pipe threads both ends.

13046, tubing cutter includes deburring tool, cuts up to 7/8" diameter tubing.

12993, flaring tool flares standard tubing 3/16" to 5/8" diameter.

4947, coupling solders to 1/4" tubing, has 1/8" male pipe thread.

10994-2, flared coupling for 1/4" tubing.

10994-4, coupling for 1/4" tubing has flare fitting one end and 1/8" male pipe thread other end.

4949, needle stem release valve has 1/8" pipe threads; male one end, female other end.

NOT ILLUSTRATED

6101, mounting strap attaches 1/4" tubing to support.

12225, silicone grease lubricant, 1/4 ounce tube.

9905-18, vinyl tape is 20 feet in length, 3/4" wide.

1911, spare parts kit for Type 1910 automatic dehydrator includes set of rotor vanes, flexible compressor coupling, flaring tool, pilot bulbs, and fuses.

10195, spare house assembly 7 feet long for 878 dry air pump. One end connects to pump; other end has no deflator pin, thus providing check valve action.

210, silica gel refill one lb. for 878 dry air pump.

3026, pipe nipple has 1/8" male pipe thread entire length.

3016, pipe tee has 1/8" female pipe threads each inlet.

3018, pipe plug has 1/8" male pipe thread.

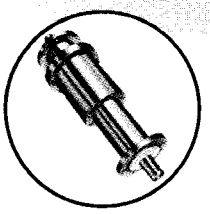
3012, thread lubricant has 4 cc tube.

10741-2, copper tubing 1/4" diameter, soft temper.

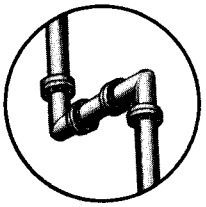
12129, splicing sleeve solders to 1/4" tubings.

*U.S. PATENT 2,469,328

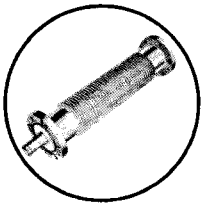
PLANNING YOUR RIGID TRANSMISSIO



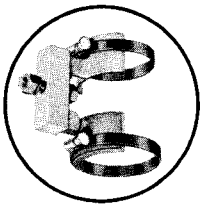
Breakaway section is used for antenna connection.



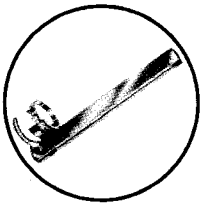
Alternately, two miter elbows with a short special length can be used for this connection.



Flexible section can be used to correct misalignment.



Rigid hanger anchors line at the top of the run.



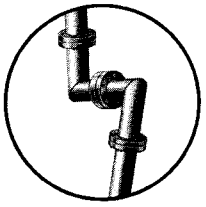
Spring hanger accommodates vertical expansion and contraction.

The information on these pages will help you to select the proper components for a satisfactory transmission line system.

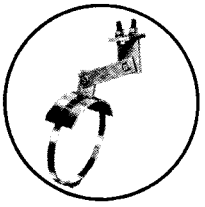
Selection of the proper line for your installation is based on frequency of operation, transmitter power output, and efficiency required. For long transmission line runs, it is frequently more economical to use line of larger diameter than would be specified from power requirements alone. This is because the larger diameter lines have higher efficiency and waste less of the transmitter power. Complete specifications of all ANDREW transmission lines are found on the preceding pages and in the Engineering Data Section, which starts on page 79.

The transmission line system consists of a vertical run which connects to the antenna by means of a breakaway section and a horizontal run which connects to the power amplifier or diplexer. A variety of hangers is required for supporting and anchoring the line. Connections between various units of transmitter equipment are made by unpressurized line which may incorporate a switching system for switching between units. Pressurizing equipment is required for the outdoor line. A gas barrier is used between pressurized and unpressurized lines.

Expansion and contraction due to changes in temperature of the line are accommodated by the use of spring hangers on the tower and swinging hangers for the horizontal run. The line is anchored at the antenna by a rigid hanger and at the transmitter building by a horizontal anchor so that movement of the line is away from the equipment. Over a temperature range of minus 25°F to plus 125°F, expansion of the line is about 1½″ per 100 feet. This amount of movement must be allowed for in the horizontal run. On the tower the steel also expands or contracts with temperature change, but at a different rate, and the line will change length relative to the tower about ½″ per 100 feet over the above temperature range. The spring and swinging hangers support the weight of the line but permit free axial movement during changes in temperature. This expansion or contraction of the system accumulates at the base of the tower; therefore, 15 or 20 feet of line on each side of the elbow at the base of the tower must be free to flex and accommodate the change in length. A lateral brace (which is used at the base of the tower) prevents lateral line motion which would be caused by wind forces, but does not interfere with movement caused by change in length of the line. *Hangers are illustrated on pages 64–67.*



Special angles are formed by means of two miter elbows.



Swinging hanger accommodates horizontal expansion and contraction.

Tapered towers involve changes in line direction different from the 90 degrees permitted by standard elbows. In such cases, use two 90 degree miter elbows in series to form the desired angle.

Connection to the antenna should be made by a breakaway section. This makes it easy to disconnect the antenna from the transmission line for separate testing. If the line is of different diameter than the antenna input, an adaptor is required. A flexible section can be used to correct for slight misalignment. If the antenna output stub is horizontal as in the case of a center fed parabola, a miter elbow should be used with the breakaway section.

When the antenna has a harness of air dielectric cable, gas from the transmission line should be permitted to enter the antenna. A gas inlet fitting should be inserted at the point of connection for possible use in flushing the line. This may be omitted if the antenna harness has a gas port.

If, for any reason, an antenna with air dielectric cable harness is not to be pressurized, a gas barrier must be provided at the point of connection. In this case, the unpressurized line above the gas barrier may collect moisture, so drain holes should be drilled immediately above the gas barrier insulator.

Special lengths of line may be ordered cut to specified lengths, or the lines may be fabricated at the site by use of spare flanges.

For new installations using towers having angle-type members, the tower manufacturer in most cases will punch the members with holes to mate to the hangers. For existing towers and for new towers with cylindrical members, use mounting adaptors that attach hangers without drilling. Tower members should not be drilled without consent of the manufacturer because of possible weakening of the structure.

The horizontal swinging hangers bolt directly to arms which are attached to a tower leg with stainless steel clamps. The horizontal anchor is bolted to the transmitter building wall.

Tower hangers should be spaced 10 feet apart greater spacing requires special hangers). Most convenient location is by the tower ladder. Alternatively. the line may be attached to a tower leg inside the tower.

AM broadcast radiator—If the supporting tower is also used as an AM broadcast radiator, some method must be used to prevent the AM energy from being grounded by the transmission line. A recommended procedure is to connect the line to the tower by a grounding strap about .22 wavelength (at the AM frequency) from the tower base and support the line from the grounding strap to the base by insulated spring hangers. A variable capacitor is used between the tower base and line to tune the stub thus formed to quarter-wave resonance. This produces a very high impedance across the tower base insulator at the AM frequency. *Caution:* Since a high RF potential exists between line and tower, the line should be mounted where it will not be accidentally touched by a man on the tower ladder.

Protection of horizontal run—In areas where icing conditions may be encountered, a shield should be provided to protect the line from ice falling from the tower. An inclined shield is recommended for greatest protection.

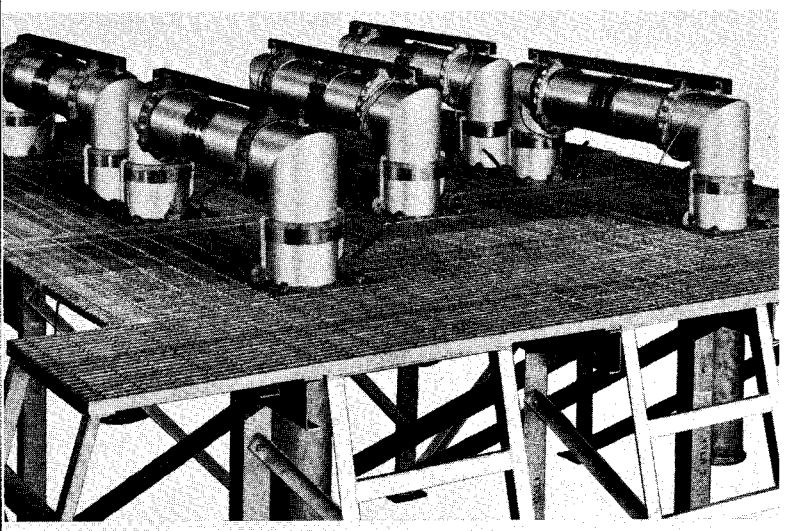
Pressurization—All outdoor lines should be pressurized with dry air to prevent moisture from accumulating inside the lines. An automatic dehydrator is recommended for this purpose. A gas barrier is inserted in the line after it enters the building, and the dehydrator is connected to the gas inlet of the barrier. If it is necessary to pressurize more than one line, a gas distribution manifold is also required. *Pressurizing equipment is illustrated on pages 68–69.*

Inside the building, the line is usually unpressurized. Several special lengths of line and miter elbows are required to make connection between the various units of transmitter equipment. It is recommended that these special lengths of line be cut at the site to the exact length required. Sleeve-type straight couplings should be used for connecting lines and elbows to equipment, as they are easy to install and disconnect, whenever necessary for purposes of testing and maintenance.

Coaxial switching systems are recommended for all installations. Such a system greatly reduces transmitter tune-up and testing time, and off-the-air time caused by equipment failure. Motor-driven coaxial switches are ideal for this application. Manual coaxial transfer panels are also frequently used. *Coaxial switches are illustrated on page 61.*

Complete installation instructions are included with each ANDREW transmission line system. However, it is recommended that installation be supervised by personnel experienced in this type of work.

RF TRANSFER SWITCHES



Three megawatts peak are handled by this 9" transfer switch for use in high power radar applications.

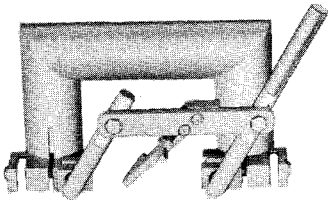
The critical nature of many scatter and radar systems and the increasing cost of air time in broadcast stations make it extremely desirable to have a means for switching spare transmitters, antennas, or transmission lines into the system when failures occur or during scheduled maintenance periods.

RF transfer switches provide the means to change coaxial connections quickly and efficiently with a minimum of down-time. Pictured on this page are a few of the many transfer switches designed and built at ANDREW.

The standard ANDREW patch link, using positive toggle action to make and break the outer conductor connection and standard EIA connecters for the inner conductor connections, is the basis for most of the designs shown.

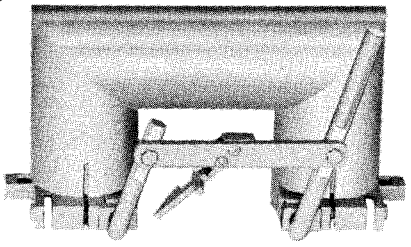
Interlock circuitry, indication of incident and reflected power, and VSWR are some of the optional features regularly supplied. Let us solve your RF switching problem. Contact your ANDREW sales engineer.

STANDARD PATCH LINKS



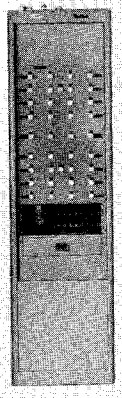
1⅝" PATCH LINK

Note positive toggle action outer connecters. No tools are required for switching.

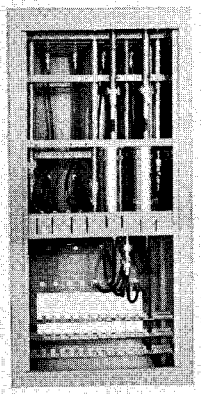


3⅛" PATCH LINK

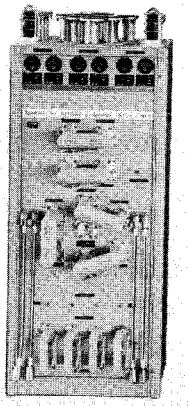
TYPICAL ANDREW RF TRANSFER SWITCHES



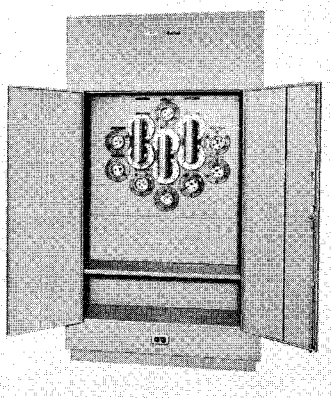
Low level RF power from exciter stage is switched between amplifiers by this unit.



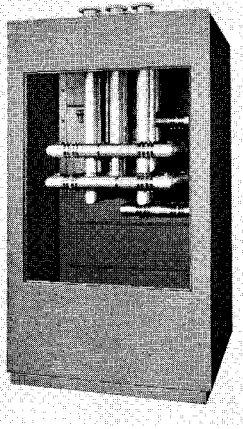
Preselectors are built into this receiver transfer switch.



RF transfer switch for scatter service, 3⅛" outputs handle transmitter power, 1⅝" outlets provide for patching received signals, meters show incident and reflected power, and VSWR.



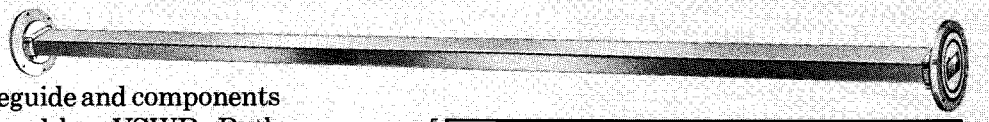
RF transfer switch for UHF tropospheric scatter service. This unit provides instant interconnections between 3 transmitters, 4 antennas, 2 diplexers, and 2 dummy loads.



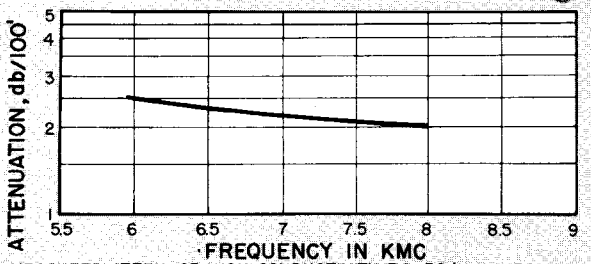
Rear view of typical 3⅛" RF transfer switch, showing interior connections.

5925-8200 WAVEGUIDE

Type 137HC (RG-50/U) Waveguide Provides Highly Efficient Transmission Between Equipment and Antenna

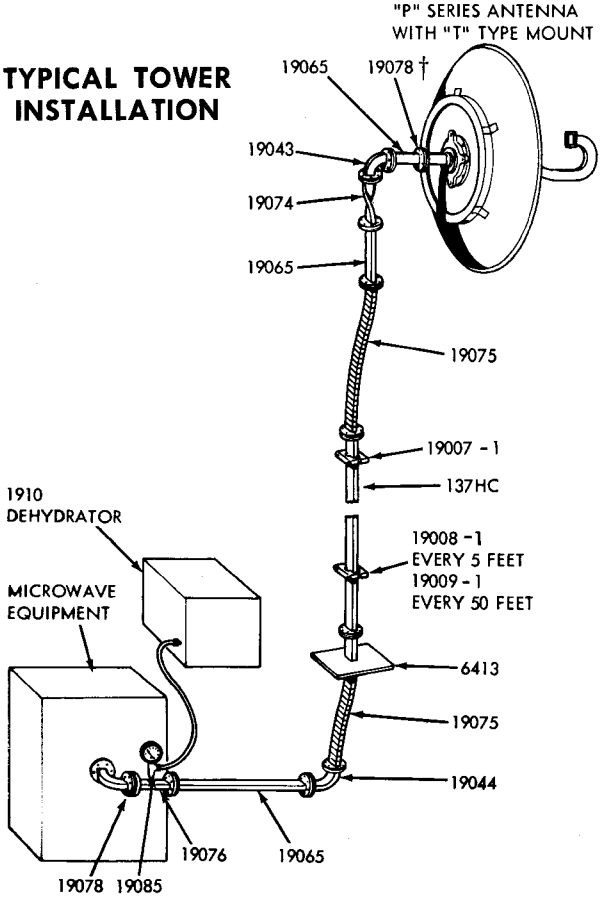


ANDREW Type 137HC waveguide and components provide maximum efficiency and low VSWR. Both waveguide and fittings are available with choke or contact flanges. A complete stock of fittings, including elbows, twists, flexible sections, pressure windows, transitions, flanges, and hangers, is available from one integrated source. All items listed are suited for use with the 5925–8200 mc parabolic antennas shown on pages *11–20*. Write for Bulletin 9727 for complete installation dimensions and system planning information.



MEASURED ATTEN. OF HIGH CONDUCTIVITY RG-50/U WAVEGUIDE

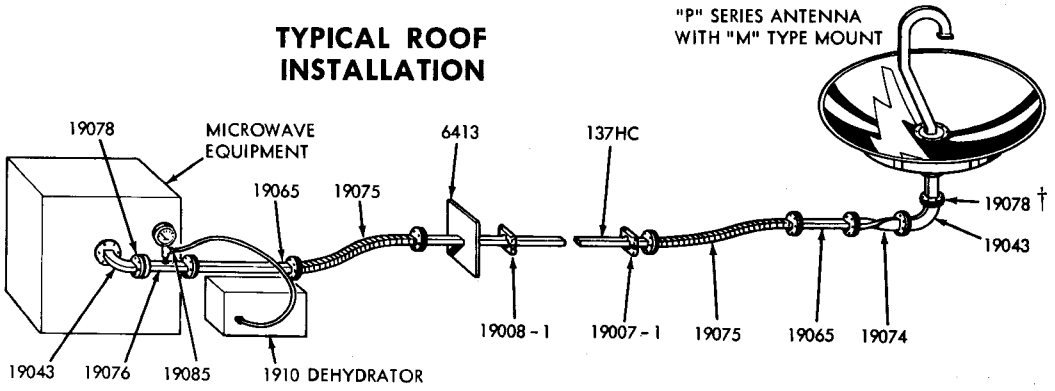
TYPICAL TOWER INSTALLATION



TYPICAL 6 KMC SYSTEM INSTALLATION

Type Number	Description	Flanges
137HC	10-foot section, RG-50/U (WR-137)	choke-contact
137HC-2	10-foot section, RG-50/U (WR-137)	none
19065	Variable length, RG-50/U, available in 12″ increments. Length in inches is detail number	choke-contact
19043	90° H-plane elbow	choke-contact
19044	90° E-plane elbow	choke-contact
19074	90° twist	choke-contact
19075	Flexible section, 12, 18, 36, and 48″ lengths available. Specify length.	choke-contact
19076	Pressure adaptor, (gas inlet)	choke-contact
19078	Pressure window	choke-choke
19085	Pressure gauge assembly	
19690	Choke flange UG-343A/U	
19048	Contact flange UG-344/U	
19007-1	Rigid hanger	
19008-1	Sliding hanger	
19009-1	Spring hanger	
6413	Roof feed-thru	
19084	Hardware kit, for joining one pair of flanges	

TYPICAL ROOF INSTALLATION

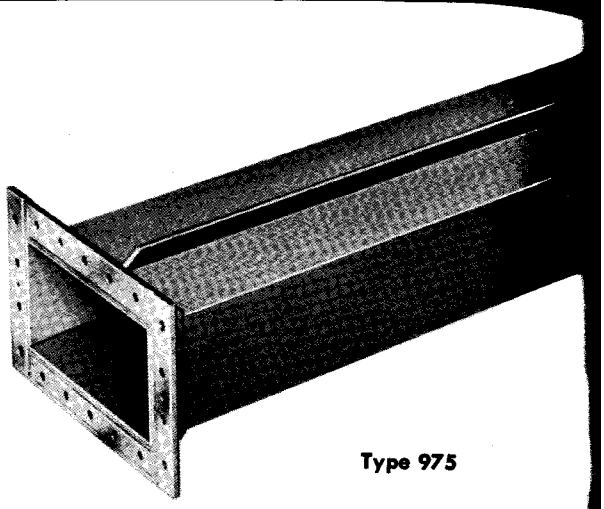


† required with ANDREW parabolic antennas.

LARGE WAVEGUIDE

Waveguide is a must for very high peak and average power applications. It is also ideal for long runs because of its very high transmission efficiency.

ANDREW designs and fabricates complete waveguide systems to meet specific requirements. Both waveguide and fittings are engineered to keep VSWR to an absolute minimum. Depending upon the application, either aluminum or copper clad steel construction may be used. Aluminum is preferred for its light weight and ease of handling. Copper clad steel is desirable for long runs, where low attenuation is required and for vertical runs on steel towers, since its expansion rate is that of steel.



Type 975

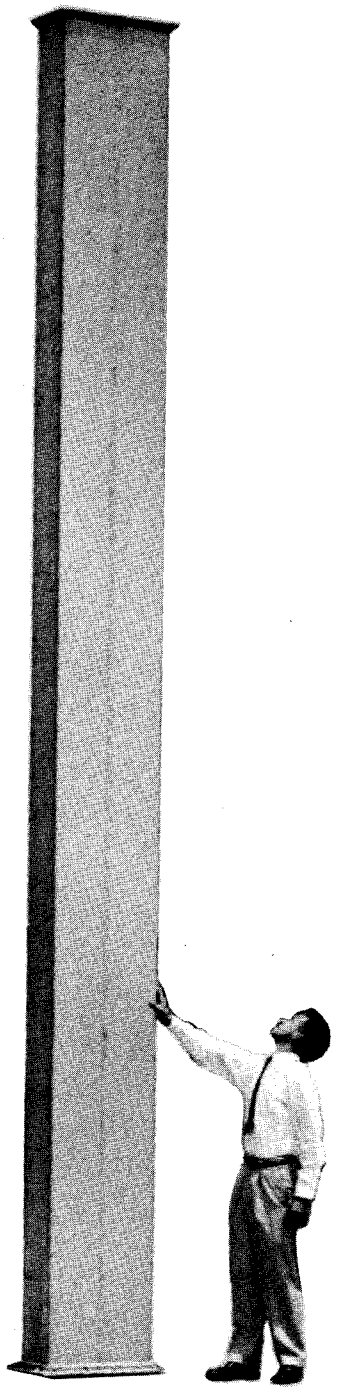
Four sizes, 975, 1150, 1500, and 2100, cover the range from 350 to 1120 mc. A complete line of bends, transitions, and hardware is available for each of these sizes. In addition, custom components such as switches, slotted sections, special angle bends, and many others are designed and fabricated to order.

Flanges in each of the sizes are fully compatible with current EIA standards, thus, permitting connection to equipment supplied by others. Locating pins provide ease and permanence of alignment.

Pressure tight construction is employed in both aluminum and copper clad steel waveguides. Continuous longitudinal seam welding and pressure seals at the gaskets insure minimum leakage rates.

Aluminum waveguide (2100) is fabricated from light weight, matched, extruded aluminum half-sections. Precision fixtures and process control are instrumental in the achievement of extremely close tolerances for minimum VSWR. Cast aluminum flanges are welded to the waveguide. Bends, transitions, and other components are made from plate stock. Waveguide and components are treated by a chromate conversion coating process for added corrosion resistance.

Copper clad steel waveguides (975, 1150, and 1500) are fabricated from sheet stock. Sheets are preformed into half-sections and joined by welding. Both surfaces of the waveguide are copper; inside for conductivity, outside for corrosion protection. Components are made by a similar process. Flanges used on copper clad steel waveguides are made from special brass extrusions, machined after fabrication, and welded to the waveguide.



Type 2100

SPECIFICATIONS

Type Number	975	1150	1500	2100
MECHANICAL				
Dimensions:				
Waveguide I.D., inches:	4⅞ x 9¾	5¾ x 11½	7½ x 15	10½ x 21
Flange O.D., inches:	8⅜ x 13¼	8¾ x 14½	10½ x 18	14⅛ x 24⅝
Standard Length, feet:	10	10	10	20
Net Weight, lbs.:	90	104	124	300
Shipping Weight, lbs.:	140	161	195	450
ELECTRICAL				
Frequency Range, mc:	750-1120	640-960	470-750	350-530
Peak Power Rating*, megawatts:	2.8	4.0	6.7	13.2
Average Power Rating*, kilowatts:	150	215	425	780
VSWR, per section, maximum**:	1.03	1.03	1.03	1.03

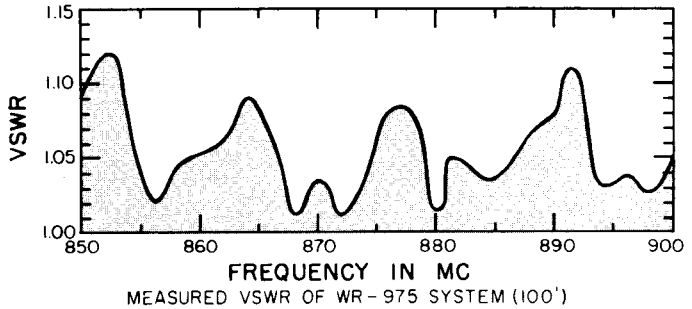
*At center of band. See page 77 for attenuation and complete power rating information.
**See page 75 for typical system VSWR.

LARGE WAVEGUIDE VSWR

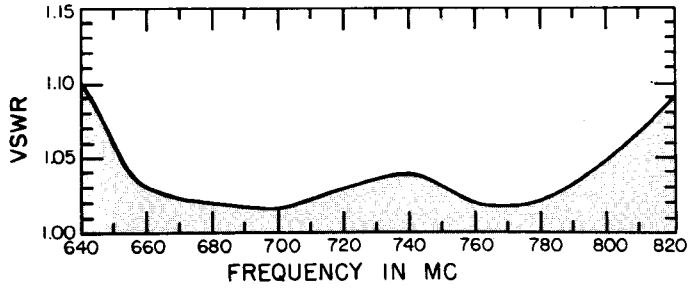
Low component VSWR is accomplished by careful attention to design details and precise control of the manufacturing process. VSWR curves shown below are all measured curves. System curves were measured with sweep equipment. Component curves were measured on a point-by-point basis.

Low system VSWR is the result of a system approach to component design. An integrated ANDREW waveguide system represents the most advanced state of the art. The system VSWR curves shown below are based on measurements of typical waveguide runs including straight sections, elbows, and transitions as indicated.

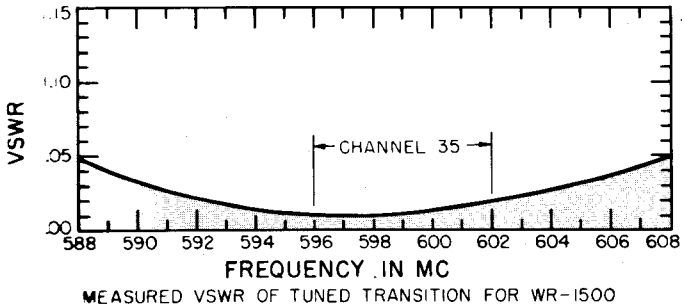
MEASURED VSWR DATA



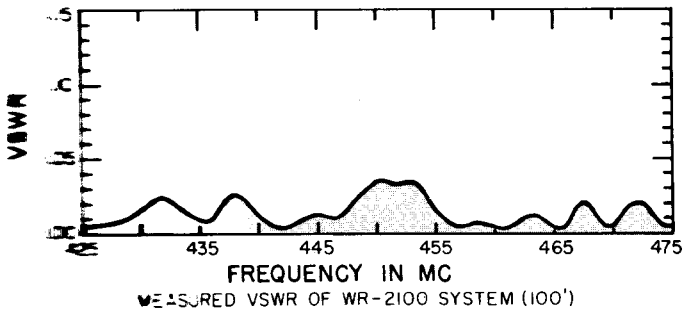
MEASURED VSWR OF WR-975 SYSTEM (100')



MEASURED VSWR OF BROADBAND TRANSITION FOR WR-1150



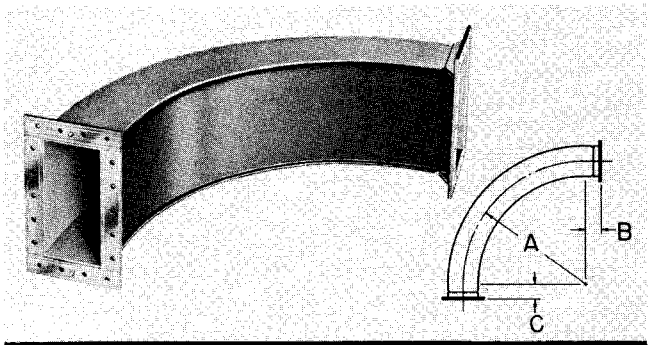
MEASURED VSWR OF TUNED TRANSITION FOR WR-1500



MEASURED VSWR OF WR-2100 SYSTEM (100')

E AND H-PLANE ELBOWS

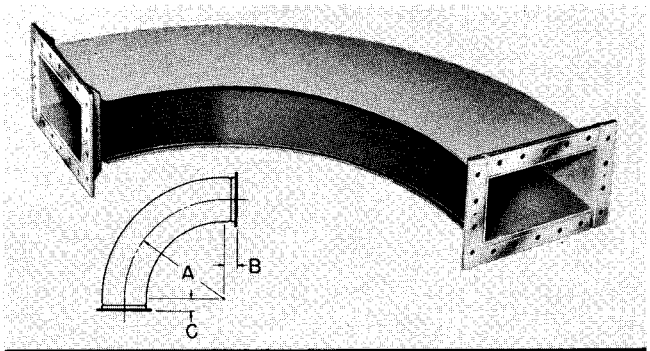
All E and H-plane elbows include alignment pins and hardware. Each elbow has less than 1.05 VSWR over the design range with the exception of the WR-1500 elbows, which are spot tuned to a specific operating frequency. Special angle elbows or elbows with special tangent sections are available upon order.



E-PLANE ELBOWS

Waveguide Type No.	Elbow Type No.	Dimensions, inches		
		A	B	C
975	16726	24	3	3
1150	E1064	24	3	3
1500	E1065	*	*	*
2100	21005	21	2	2

*These are miter elbows. Dimensions vary with frequency.

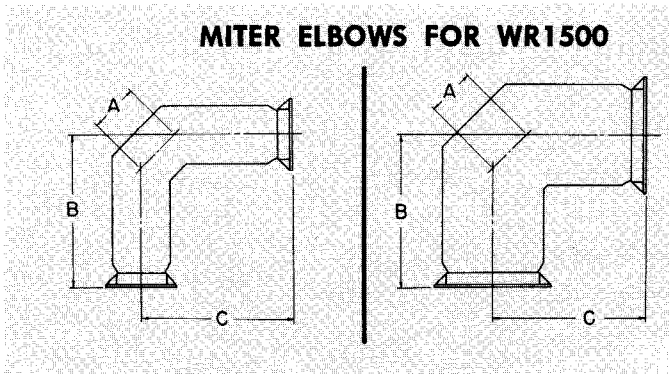


H-PLANE ELBOWS

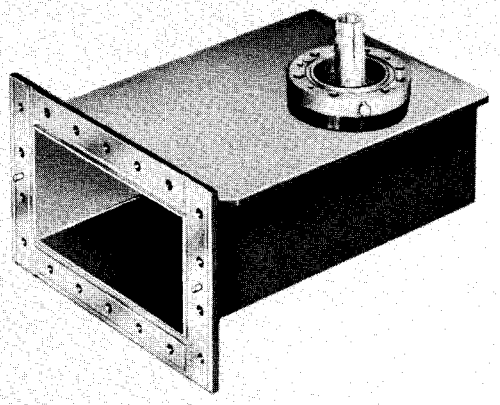
Waveguide Type No.	Elbow Type No.	Dimensions, inches		
		A	B	C
975	16727	24	3	3
1150	H1064	24	3	3
1500	H1065	*	*	*
2100	21090	18	6	6

*These are miter elbows. Dimensions vary with frequency.

MITER ELBOWS FOR WR1500



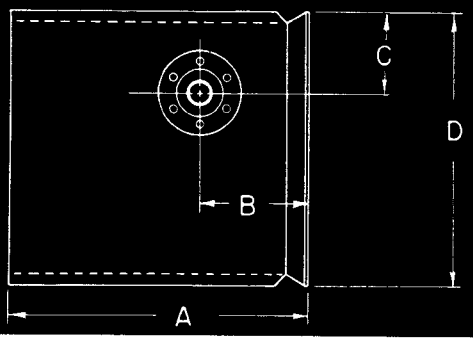
WAVEGUIDE COMPONENTS



TRANSITIONS

Any waveguide system which employs transitions to coaxial line is dependent on the electrical quality of the transitions. At ANDREW, special attention has been paid to transition design. Heavy plate construction is used to provide the extra rigidity required in a transition, and is used to prevent changes in VSWR due to mechanical loading problems. ANDREW coaxial inner connectors with their unique spring loading and positive contact contribute to transition effectiveness by eliminating hot spots at the probe.

Each of the transitions shown is broadband, covering the design range without adjustment, except Type 1865A which is spot tuned to extra low VSWR at a specific frequency. For narrowband operation, any of the standard transitions can be spot tuned for lower VSWR. All input connections are 3⅛" 50 ohm coaxial except Type 21192 which is 6⅛" 50 ohm. Gas barriers are provided at the probe input on the coaxial side of the transition. These barriers will withstand 30 p.s.i. on the coaxial side. Pressure within the waveguide itself should not exceed 0.3 p.s.i. A gas inlet to the waveguide side of the transition can be provided upon request.



TRANSITION CHARACTERISTICS

Waveguide Size	Transition Type No.	Nominal Dimensions, inches				VSWR	Weight, lbs.	
		A	B	C	D		Net	Shipping
975	16733	16⅝	3¾	4½	13¼	1.08	38	78
1150	1864A	19⁷⁄₁₆	3¼	3½	15	1.03	45	87
1500	1865A	20	*	*	18½	1.05*	54	99
2100	21295 (3⅛)	24	7¾	5⁵⁄₁₆	24⅝	1.07**	68	118
2100	21192 (6⅛)	24	7¾	5⁵⁄₁₆	24⅝	1.07**	76	126

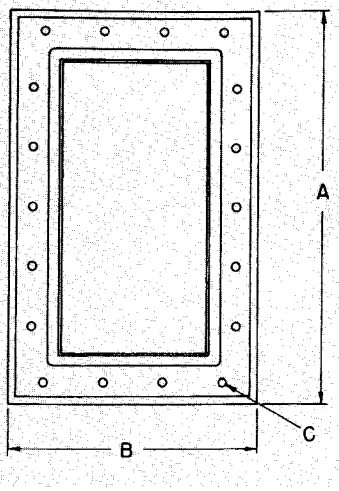
*This unit is spot tuned, dimensions vary with frequency.
**Lower VSWR is available over a narrower band. For example, 1.05 over 50 mc.

SPECIAL WR-2100 COMPONENTS (Not illustrated)

21398, slotted section has 4-foot slot length for precision measurements. Residual VSWR is less than 1.02.

21214, directional coupler for signal generator power level only. Coupling as specified. Directivity is 20 to 30 db over specified band. Coupling can be calibrated to within 0.1 db up to 40 db coupling.

20928, gas barrier is used to isolate pressurized inside waveguide from pressurized outside waveguide. VSWR is less than 1.03.



21213, transition to WR-2300 has over-all length of 24".

21006, H-plane wye switch has noncontacting resonant vane design. Isolation between outputs is 30 db. VSWR is less than 1.05. Over-all length is 54" and angle between outputs is 30°.

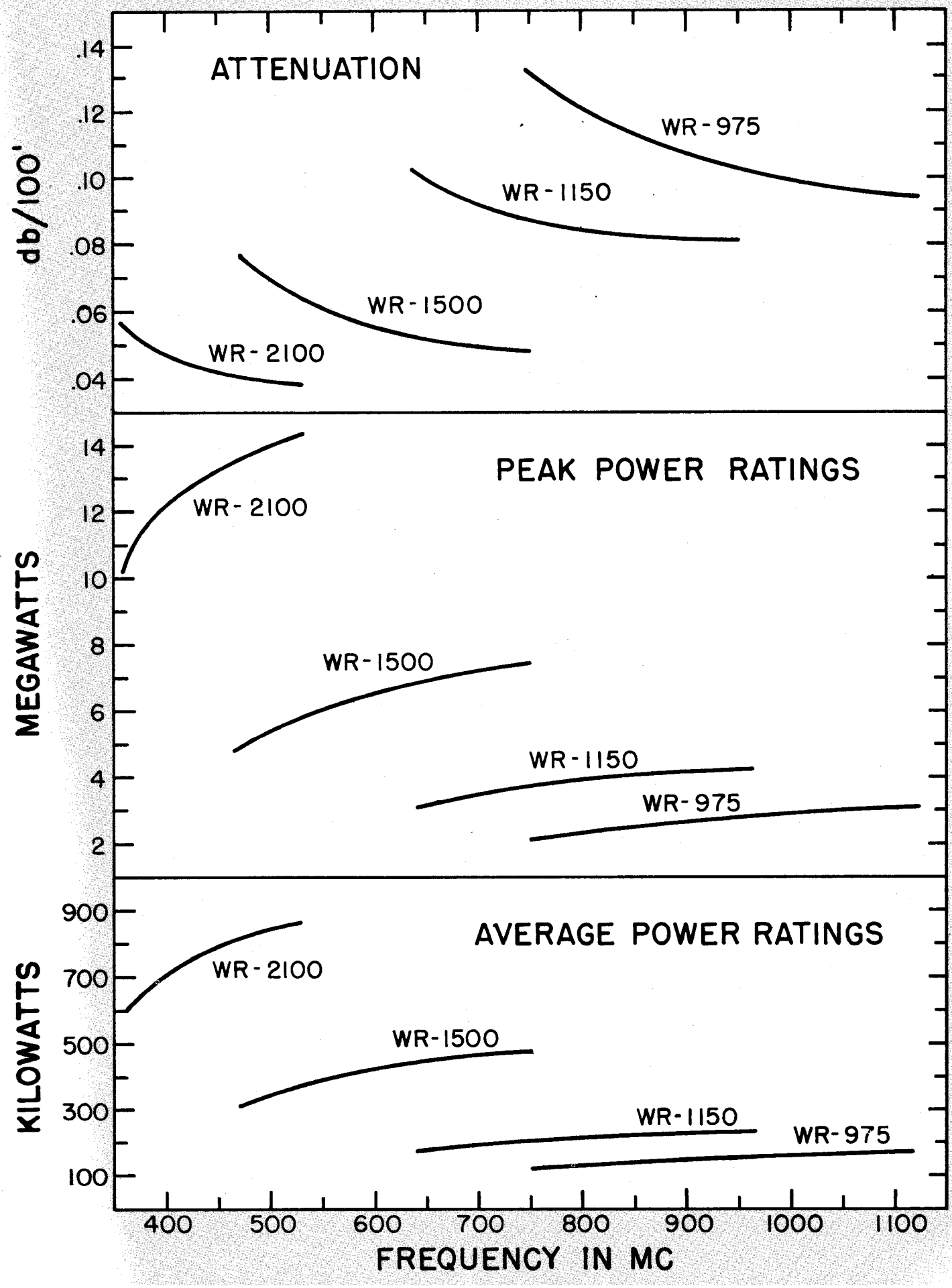
FLANGES

ANDREW waveguide flanges are compatible with EIA standards. These standards cover number, location, and size of bolt holes and alignment pins and holes. Flanges are pressure tight when sealed with gaskets. Type 19934-3 is an aluminum casting for welding or brazing to Type 2100 waveguide. The others are field flanges which are attached to the waveguide in the field by bolting and soft soldering.

WAVEGUIDE FLANGES

Waveguide Size	Flange Type No.	Dimensions, inches			Number of bolt holes
		A	B	C	
975	18962	13¼	8⅜	¹³⁄₃₂	18
1150	1564A	14½	8¾	¹³⁄₃₂	22
1500	1565A	18	10½	¹³⁄₃₂	28
2100	19934-3	24⅝	14⅛	¹⁷⁄₃₂	28

WAVEGUIDE ATTENUATION & POWER RATINGS



TELESCOPING MASTS

For missile instrumentation, emergency communciations, path or coverage surveys, temporary microwave, point-to-point, HF radiator, other similar uses.

These masts can be mounted in many types of vehicles or they may be ground mounted.

Sequential raising and locking of mast sections permits one-man operation. In lowering, the sequence is reversed. All guy lines remain tight until the section to which they are attached is lowered. This provides stability, even under high wind loads.
Installation instructions are provided with each mast. We will be pleased to quote on factory installation of vehicular masts in your vehicle.
All models include a hydraulic or pneumatic 115 volt AC pump unless otherwise specified. Guyed models include guys, anchors, and hardware. Hydraulic models include tank and oil. Aluminum models are anodized or Iridited.

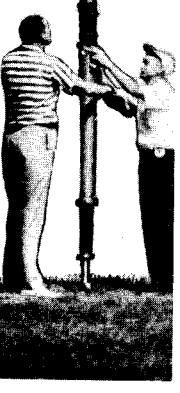
150-FOOT MAST

Type 3306, (stainless steel, hydraulic operation) has eight sections. Nested height is 23 feet. Raising time is thirty minutes. Has three sets of 4-way guys. Maximum top weight is 150 pounds with maximum horizontal thrust of 30 psf on 7 square feet. Includes base level indicator. Net weight, 1600 lbs; shipping weight, 2000 lbs.; volume, 23 cubic feet.

100-FOOT MASTS

Type 3300, (stainless steel, hydraulic operation) has six sections and includes track and dolly for stowing nested mast on top of truck or van. Has top crossarm for antenna mount, crossarm is guyed for maximum stability. Nested height is 18½ feet. Raising time is fifteen minutes. Has six sets of 4-way guys. Maximum top weight is 200 lbs. with maximum horizontal thrust of 30 psf on 7 square feet. Includes base level indicator. Net weight, 500 lbs.; shipping weight, 1500 lbs.

Type 3301 is the same as Type 3300 except mounted on two-wheel trailer and folds down for transport (see photo).



50-FOOT MASTS

Type A3303, (aluminum, hand pump operated) has seven sections. Nested height is 9½ feet. Has two sets of 3-way guys. Base includes folding support legs with leveling pads and level indicators. Mast is rotatable from base and includes azimuth position indicator. Maximum top weight is 50 lbs. with maximum horizontal thrust of 30 psf on 2 square feet. Net weight, 185 lbs.; shipping weight, 235 lbs.; volume, 10 cubic feet. Erection time is 1½ to 5 minutes.

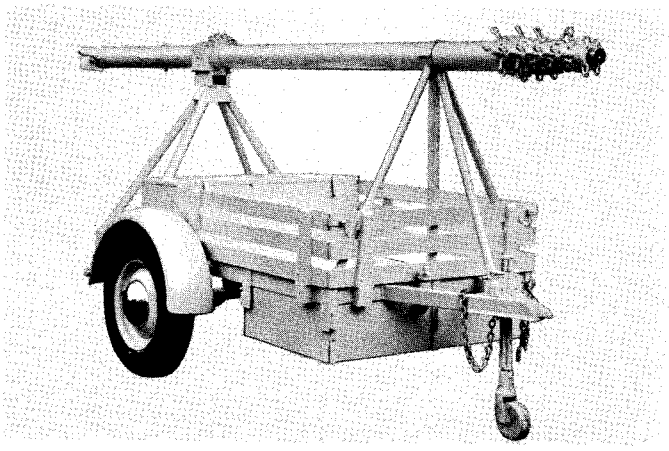
Type A3303A is the same as A3303 except includes motor-driven pump. Erection time is 5 minutes.

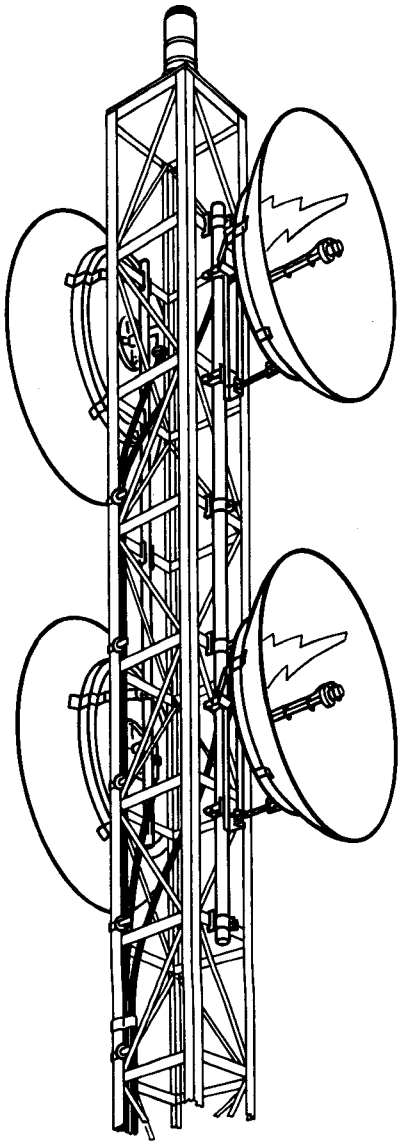
30-FOOT MASTS

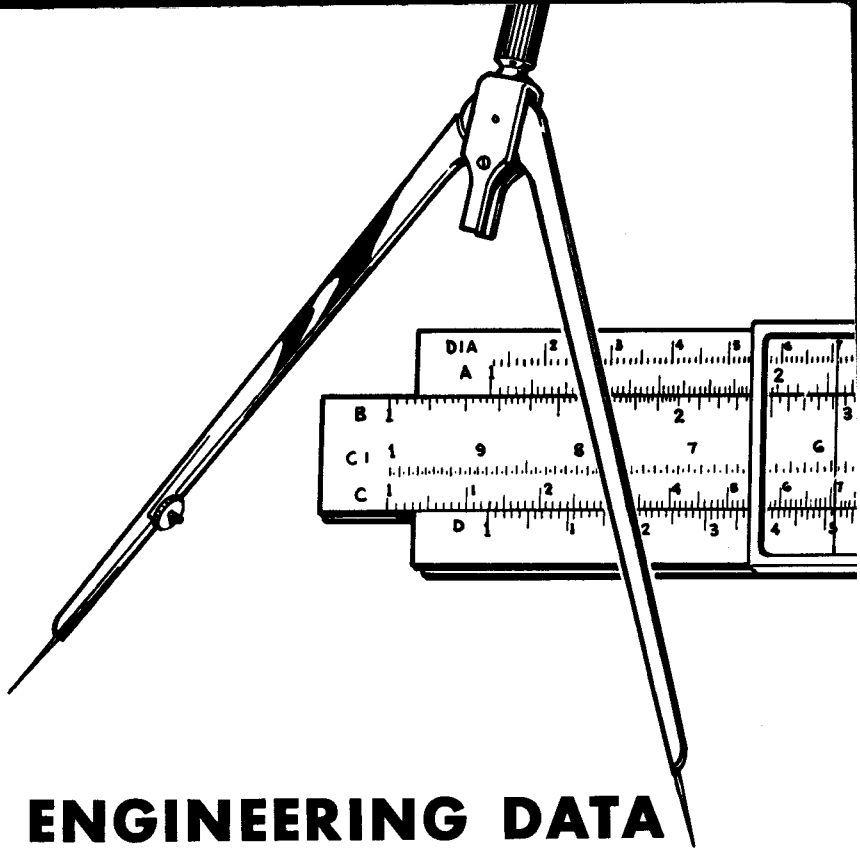
Type S3302, (stainless steel, hydraulic operation) and **Type A3302,** (aluminum, hydraulic operation) have six sections. Nested height is 5 feet. Are self-supporting when braced at 4-foot height. Most commonly used mounted in station wagon, panel truck, or similar vehicle. Mast is rotatable from base and includes azimuth position indicator. Maximum top weight is 50 lbs. with maximum horizontal thrust of 30 psf on 2 square feet. Erection time is 2 minutes. Includes pump with 12 volts DC, 28 volts DC, or 115 volts AC motor (or 6 volts DC for hydraulic model only). Aluminum model—net weight, 80 lbs.; shipping weight, 110 lbs. Stainless steel model—net weight, 170 lbs.; shipping weight, 250 lbs.

SPECIAL MODELS

ANDREW also supplies special models to customer specifications. These may include special heights, sliding contacts for use as radiator, heavy top, wind, or ice load capabilities, other mast materials, mast rotatability, faster raising time, etc. Send us a summary of your requirements.

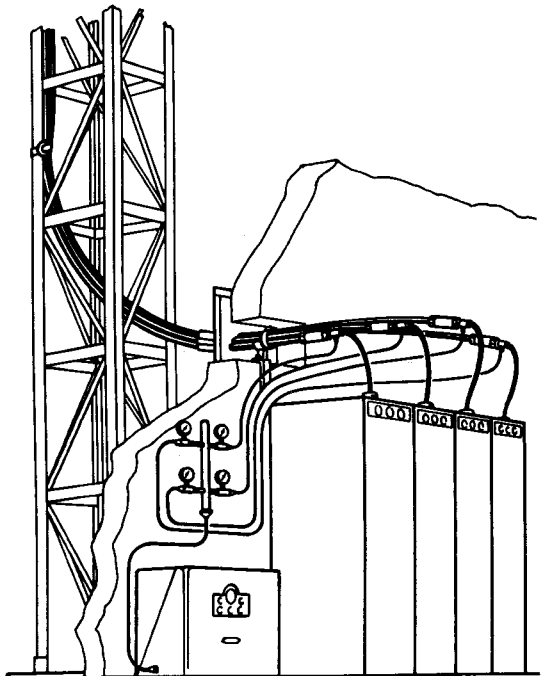






ENGINEERING DATA

The following pages have been prepared for your assistance in the solution of antenna and transmission line problems. Please contact your ANDREW sales engineer on any problem where further assistance is required.



CONTENTS

PARABOLIC ANTENNA DESIGN CONSIDERATIONS

GAIN OF PARABOLIC ANTENNAS

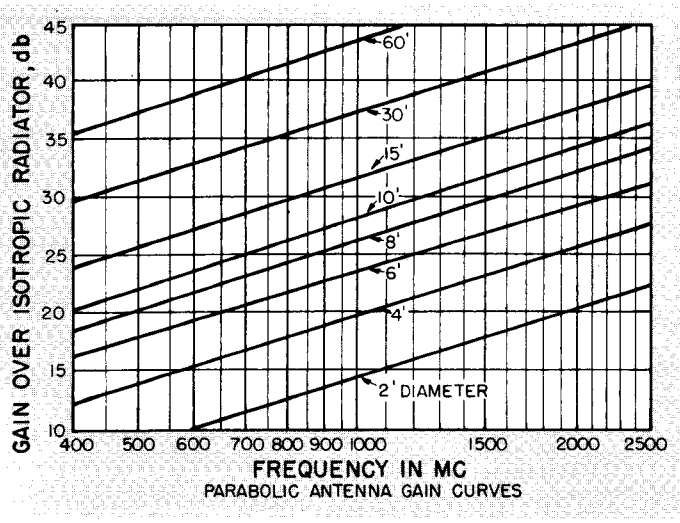
The gain of a parabolic antenna may be expressed as

$$G = 10 \log_{10} \frac{4 \pi A g}{\lambda^2}$$

in db over an isotropic radiator, where A is the projected area of the reflector, g is the gain factor or efficiency of the antenna, and λ is the wavelength corresponding to the operating frequency.

Gain factor depends on such parameters as aperture illumination taper, spill-over energy, reflector tolerance, and particularly the separation of the phase centers of the feed in the E and H-planes. The gain factor of most antennas is about 55%.

The curves below represent the theoretical gain of popular sizes of parabolic antennas, based on an efficiency of 55%. To convert to gain over a dipole, subtract 2.15 db. For actual gain of ANDREW antennas, refer to their specifications.



PARABOLIC ANTENNA GAIN CURVES

For best aperture efficiency, aperture illumination should be uniform. For maximum antenna efficiency, spill-over energy should be minimized. However, these factors are not compatible in practice and must be compromised. The usual choice is when edge illumination is 9 to 11 db down from center.

Ideally, a parabolic antenna requires a point source at its focal point as a feed. A practical feed will give certain phase error across the aperture with resultant gain reduction. This error may be measured in terms of separation of feed phase centers in E and H-planes. An electromagnetic horn has phase centers with least known separation. Thus, it gives the least aperture phase error and is most suitable for a parabolic antenna feed. In addition, illumination intensity at the edge of the parabolic antenna may be controlled by properly proportioning the horn.

BEAMWIDTH AND SPURIOUS RADIATION LOBES

On the assumption that the aperture illumination taper of a parabolic antenna with a circular projected aperture is a parabolic function and that the intensity at the aperture edge is 10 db down from center, the width between the half-power points of its main radiation beam is approximately $\theta = 70\lambda/D$ (degrees) where D is the antenna diameter.

The spurious radiation lobes of a parabolic antenna occur in three regions. Side lobes are centered around the main beam and are caused by imperfect aperture illumination, aperture phase error introduced by the feed, and irregularity of reflector surface. Wide angle lobes occur from 80 to 120 degrees away from the main beam and are due to spill-over energy. Back lobes occur opposite the main beam and are due to edge diffraction of the reflector.

Spurious lobes may be reduced by narrowing the primary feed pattern at the expense of antenna gain.

CROSS POLARIZED RADIATION COMPONENTS

Because of reflector curvature, RF current flow in the reflector creates a cross polarized radiation component. This radiation is an even function of angular position and has large characteristic peaks on each side of the axial direction of the reflector. These peaks are at the highest level in the plane 45 degrees to E or H-planes. The cross polarized component is theoretically zero everywhere in the E and H-planes of a center-fed reflector. Actually, the symmetry is destroyed by surface variation. The level of the cross polarized peaks is usually 25 to 35 db down from the main beam in either principal plane.

In an offset parabolic antenna, the reflector is a nonsymmetrical portion of a large paraboloid. The feed is pointed at the center of the reflector. Its cross polarized radiation component may be as much as 10 db down from the main beam in the principal plane in which the reflector lacks symmetry, when looking at an angle slightly off the axial direction.

REFLECTOR EFFECT ON VSWR

Reflected energy will be partly absorbed by the feed, causing feed VSWR variation across the frequency band. The magnitude depends on wavelength, reflector focal length, and the feed gain. The dish reflection coefficient is approximately

$$|K| = \tfrac{1}{2}\lambda/f$$

where f is the focal length of reflector.

The most widely used technique for compensating reflector effect is vertex plate matching. This plate is located at the center of the reflector from $\lambda/24$ to $\lambda/12$ away from the dish vertex and has a radius approximately

$$R = (f\lambda/3)^{\frac{1}{2}}$$

The disadvantage of the vertex plate is that it raises the first side lobe level.

Another technique for compensating reflector effect on VSWR is the use of an offset paraboloidal reflector. The disadvantage of this method is its mechanical awkwardness and its high cross polarized radiation.

PARABOLIC ANTENNA SYSTEM NOMOGRAPH

These nomographs will enable you to find the gain, beamwidth, free space attenuation, thermal noise, and equivalent receiver noise input of a parabolic antenna system. This information allows a simplified calculation of complete system performance of a radio relay link.

Antenna gain (G) and beamwidth (θ) between half-power points have been defined as:

$$G = g(\pi D/\lambda)^2, \quad \theta = 70°\lambda/D$$

where g is aperture efficiency, assumed to be 55%; D, dish diameter; λ, wavelength; and the constant 70 degrees based on a 10 db illumination taper.

The free space attenuation (a_s) between two isotropic radiators separated by a distance R is:

$$a_s = 20\log(4\pi R/\lambda).$$

For convenience, wavelength is converted to frequency in the nomographs.

The equivalent noise input (ENI) of a receiver is FKTB, where F is receiver noise figure; K, Boltzmann's constant; T, temperature (assumed to be 300 degrees K); and B, receiver bandwidth, KTB is the Johnson or maximum available thermal noise. It can be found from the nomograph at left by using zero db noise figure, or F = 1.

If F is not available, use

$$F = 10f^{\frac{2}{3}}$$

This figure is based on the performance of commercially available crystal mixers. It is shown as carrier frequency (f) on the other side of the F scale (in the nomograph at left).

Example—To find the characteristics of a 6-foot dish at 6 kmc, use the nomograph at right. Draw a straight line between six feet on the D scale and 6 kmc on the frequency scale. The intersection of this line with the θ and G scales shows a gain of 38.7 db and a beamwidth of 3.6 degrees.

To find the free space attenuation between two stations 40 miles apart at 6 kmc, draw a straight line between 6 kmc on the frequency scale and 40 miles on the R scale. The intersection of this line with the a_s scale shows a value of −144.8 db.

To find the equivalent noise input of a receiver with 20 mc bandwidth at 6 kmc or a 15 db noise figure, use the nomograph at left. A straight line drawn from 20 mc on the B scale through the proper point on the F or the f scale shows a value of −115.7 dbw on the ENI scale.

You can now calculate the performance of a system with two 6-foot dishes 40 miles apart and a transmitting power of one watt:

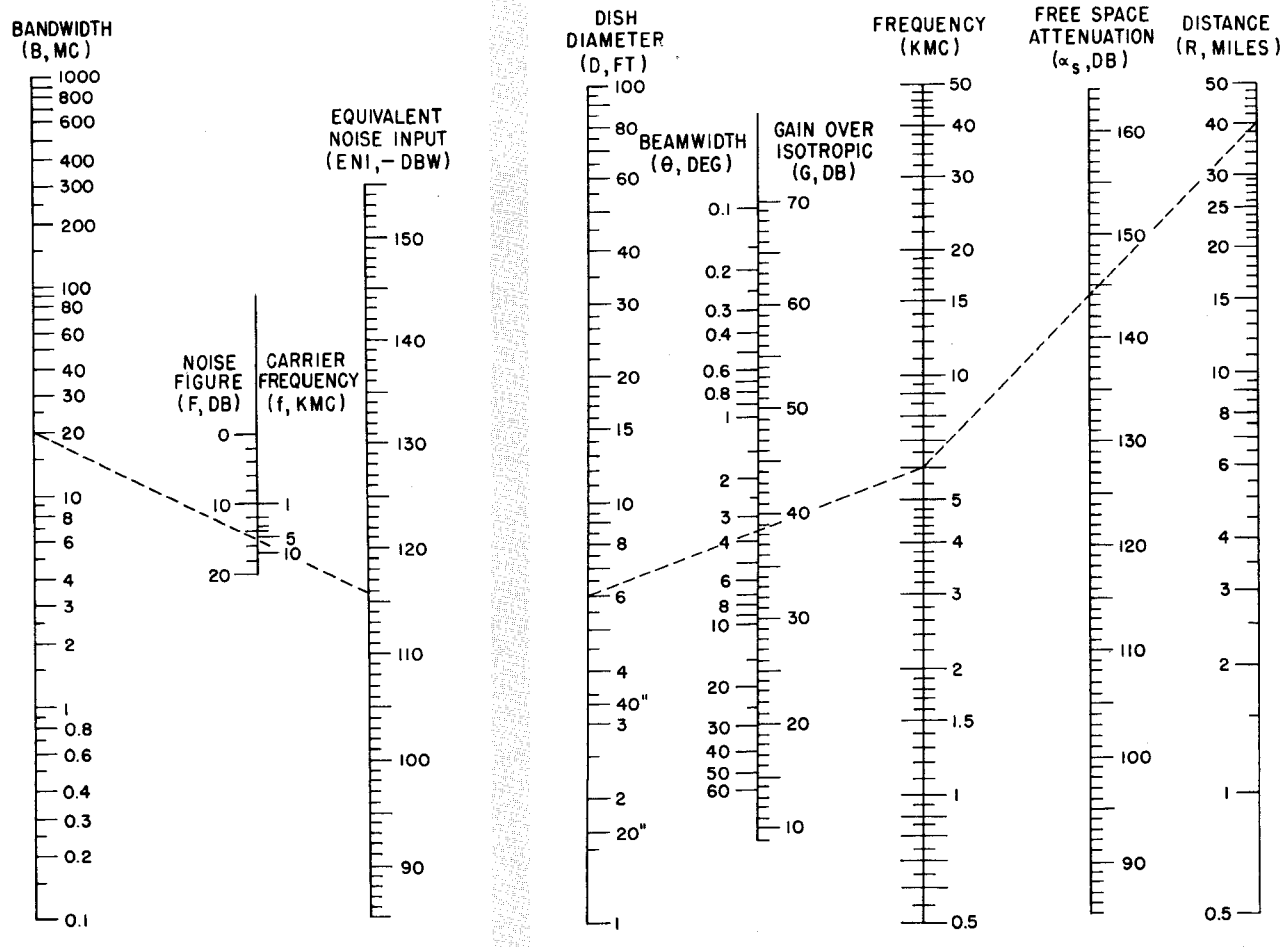
1) Find the received signal by adding gain (twice 38.7 db) to free space attenuation:

$$-144.8 \text{ db} + 77.4 \text{ db} = -67.4 \text{ dbw}.$$

2) Find the carrier-to-noise ratio (C/N) by subtracting ENI from the received signal:

$$67.4 \text{ dbw} - (-115.7 \text{ dbw}) = +48.5 \text{ db}.$$

If the transmission line losses are significant, they should be subtracted from the C/N value.

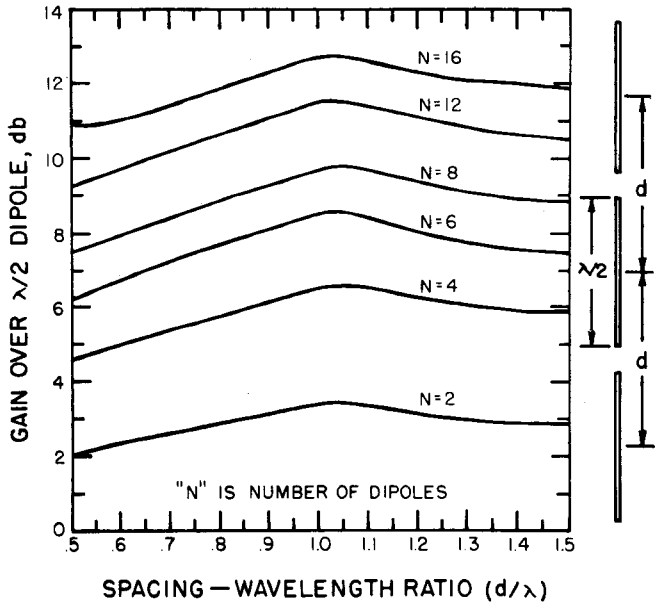


COMMUNICATION ANTENNAS

Gain of Collinear Arrays

A simple vertical half-wavelength dipole has a radiation pattern that is circular in the horizontal plane, but similar to a "figure 8" in the vertical plane with nulls along the axis of the dipole. By stacking a number of dipoles in a collinear array, and by feeding the dipoles in phase and with equal power to each dipole, the vertical radiation pattern is compressed. This increases the effective radiated power along the horizon. Therefore, the collinear array can produce a power gain over the simple dipole.

The curves below show the maximum theoretical gain of several arrays that are commonly used. In practice, these curves must be derated to account for manufacturing tolerances and design compromises.



System Measurements

A directional wattmeter is a useful aid in system installation and maintenance. Although limited in accuracy, it can be used to considerable advantage at frequencies up to 450 mc where system VSWR is about 1.5 or 2.0 to 1. In such a system, significant changes in antenna, transmission line, or filter performance can be readily isolated.

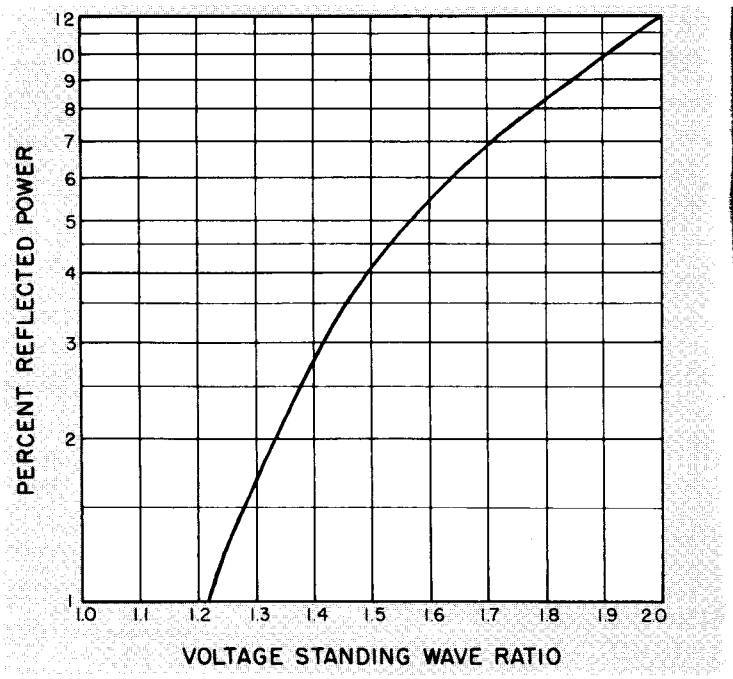
Directional wattmeters are connected directly into the line. They read in terms of forward and reflected power. The relationship between VSWR and reflected/forward power ratio is expressed:

$$\text{VSWR} = \frac{1+(W_r/W_f)^{\frac{1}{2}}}{1-(W_r/W_f)^{\frac{1}{2}}}$$

W_r = watts reflected

W_f = watts forward

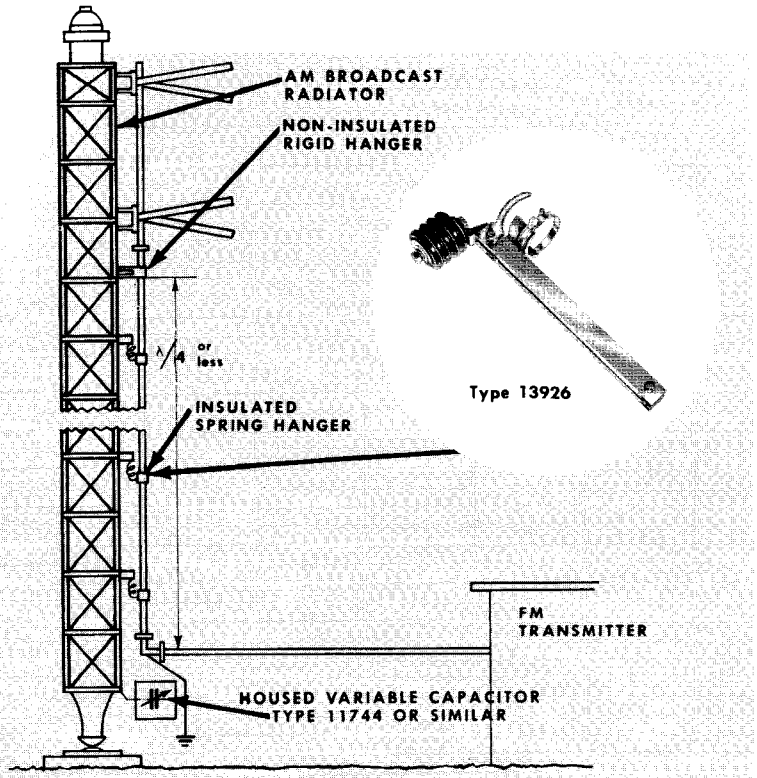
A plot of this relationship is shown below.



Isolation of Transmission Line from AM Broadcast Tower

AM broadcast towers are frequently used as supports for TV, FM, or communications antennas. When this is done, means must be provided for bringing the transmission line feeding these antennas off the tower without shorting the AM energy to ground.

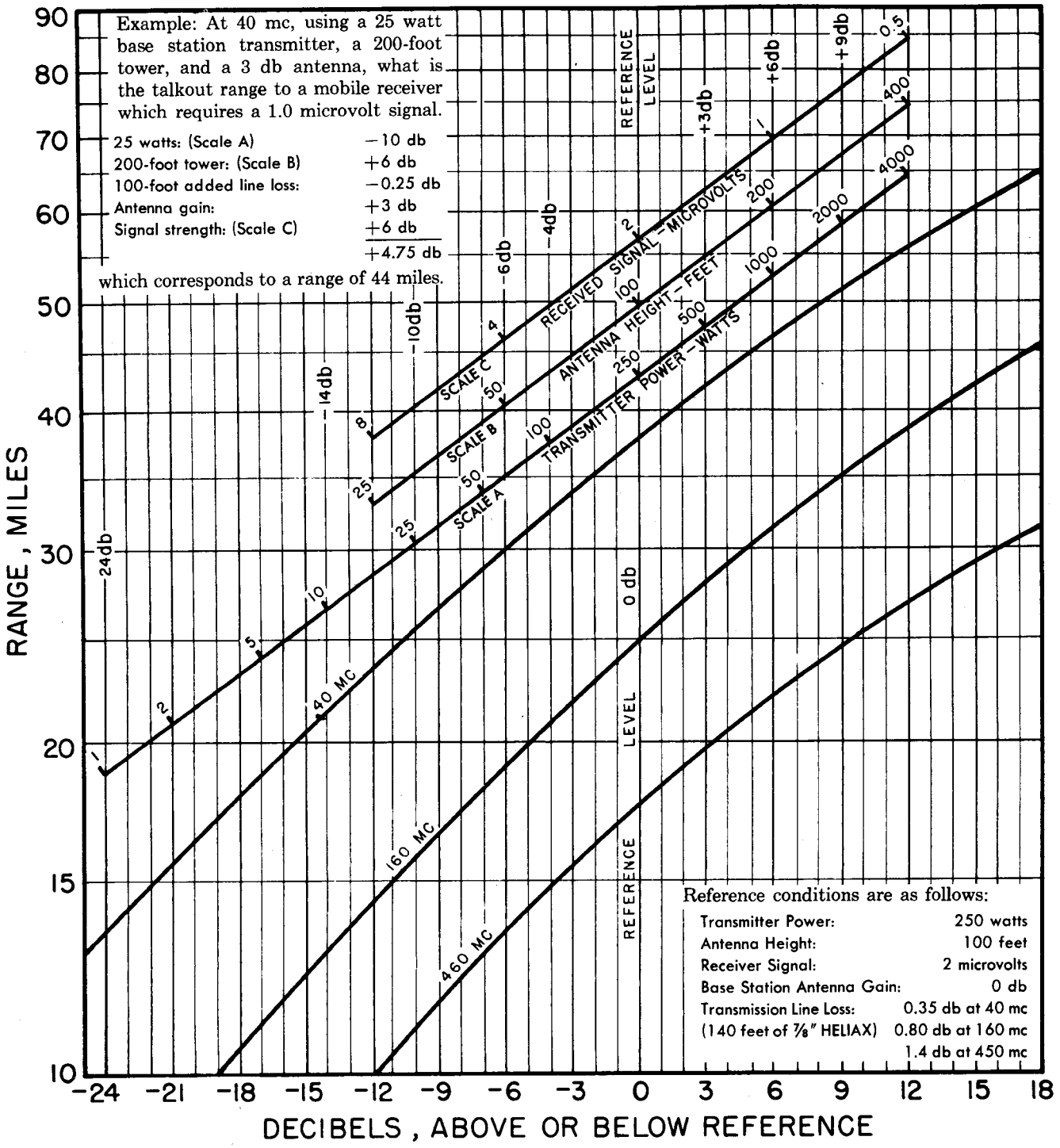
A popular method is to isolate the line up the tower for a distance of a quarter-wavelength (at the AM broadcast frequency) from the base, using insulated line hangers. Thus, at the base of the tower, a very high impedance between tower and line is presented to the AM energy. Common practice is to make the isolated section approximately .22 wavelengths long and to use a variable capacitor at the base of the tower to tune to quarter wave resonance. A typical quarter-wavelength isolation system is shown at left.



COMMUNICATION SYSTEMS NOMOGRAPH

This nomograph is useful in predicting approximate range in two-way radio systems. The curves are based on average terrain and ground conductivity and use of a quarter-wave whip antenna on the mobile unit.

Reference level conditions are represented at zero db. Transmission line loss is shown on pages 92–95. Signal, antenna height, and transmitter power adjustments can be found by means of the inclined scales. Approximate signal levels for satisfactory operation are 1.5, 2.0, and 4.0 microvolts in the 30–50, 150–170, and 450–470 mc bands, respectively. To determine range for your operating conditions, adjust each parameter in db and read the range corresponding to the total reference level adjustment on the appropriate frequency curve.

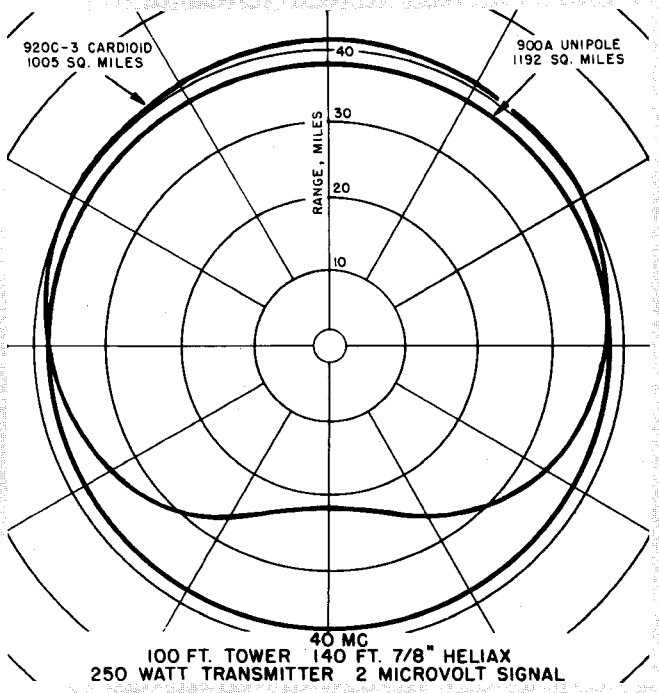


RELATIVE COVERAGE
WITH VARIOUS TYPES OF ANTENNAS

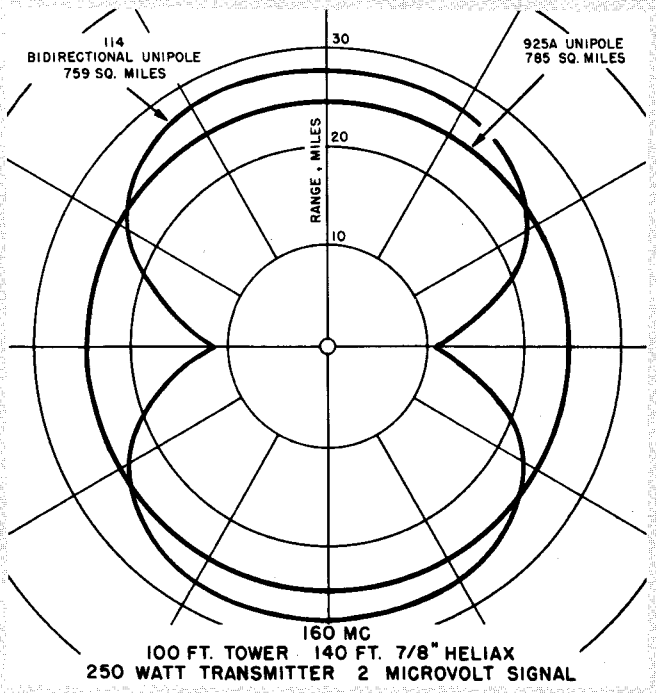
The coverage plots shown on this page illustrate the coverage areas provided by various antennas.

The areas shown are based on average terrain and a quarter wave whip antenna on the mobile units.

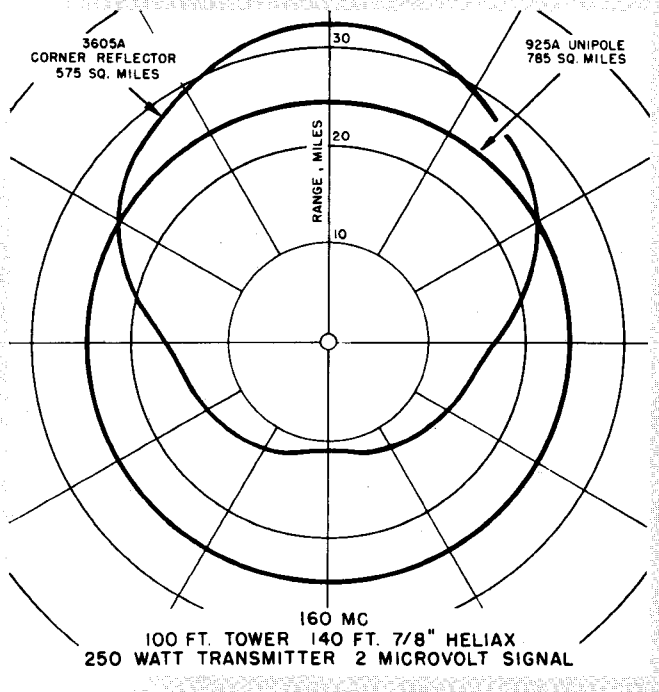
Additional antennas can be compared to those shown by computing their coverage areas from their gain patterns and the nomograph on page 83.



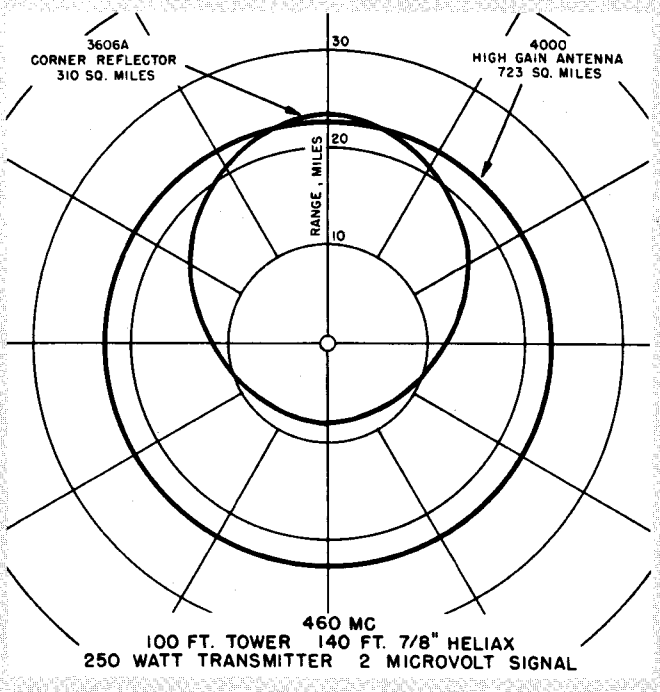
40 MC
100 FT. TOWER 140 FT. 7/8" HELIAX
250 WATT TRANSMITTER 2 MICROVOLT SIGNAL



160 MC
100 FT. TOWER 140 FT. 7/8" HELIAX
250 WATT TRANSMITTER 2 MICROVOLT SIGNAL



160 MC
100 FT. TOWER 140 FT. 7/8" HELIAX
250 WATT TRANSMITTER 2 MICROVOLT SIGNAL

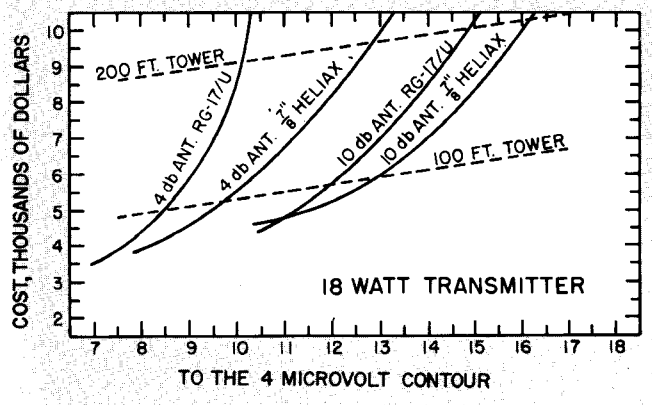


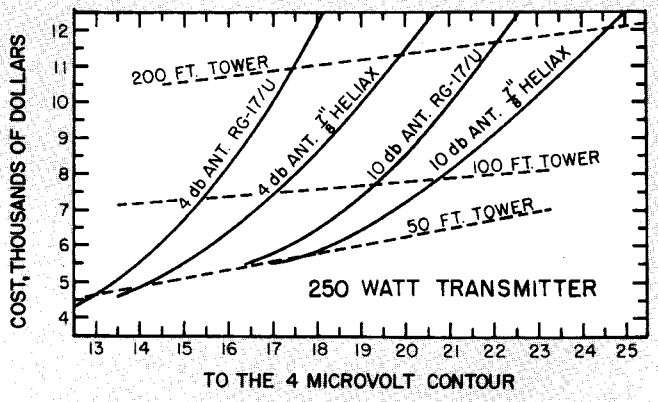
460 MC
100 FT. TOWER 140 FT. 7/8" HELIAX
250 WATT TRANSMITTER 2 MICROVOLT SIGNAL

PLANNING YOUR 450 MC SYSTEM FOR MINIMUM COST

How to Plan Your Communications System for the Desired Coverage at the Least Total Cost.

In planning coverage over a certain area with a new installation, or for increasing the coverage area of an existing installation, there are four basic equipment items which must be considered. These are the transmitter, antenna, transmission line, and supporting tower. Since a variety of each of these items is available, numerous combinations providing the desired coverage are possible. This study outlines the method for determining the most economical combination.





The curves on this page illustrate how total cost depends on the manner in which coverage is achieved. The curves are presented for 18 watt transmitters, and for 250 watt transmitters. Range is the distance in miles to the 4 microvolt contour.

The curves were prepared from calculated data. Antennas considered were those having 4 and 10 db gain. Transmission lines considered were RG-17/U and 7/8" HELIAX. Tower heights are 50, 100, and 200 feet.

Total cost in each case includes the transmitter, tower (with lights), antenna, transmission line (with accessories), initial installation costs, and power and maintenance costs for five years. Not included are mobile, audio or remote equipment, wages, or building costs.

Since towers are available for any desired intermediate height, each individual curve is plotted to show how cost and coverage increase with tower height for a certain combination of antenna and transmission line. Points were plotted for 50, 100, and 200-foot heights. Intermediate tower heights can be interpolated.

For a given coverage radius, the lowest cost system is represented by the corresponding point on the lowest curve at that distance.

If it is desired, to cover a radius of 20 miles, a 250 watt transmitter is required. Choices on other items are as follows; a 200-foot tower with a 4 db antenna fed with 7/8" HELIAX for about $10,500, a 100-foot tower with a 10 db antenna fed with RG-17/U for about $7,500, or a 75-foot tower (interpolating between points) with a 10 db antenna fed with 7/8" HELIAX for about $6,800.

The curves indicate that the high gain antenna is always the most economical choice with 7/8" HELIAX generally also the best choice. RG-17/U is economical only in short runs, the break-even point being at line lengths of less than 50 feet.

Frequently, new installations are planned around existing towers or to take advantage of roof top locations. In these cases, the curves can be used to determine the most economical combination of antenna and transmission line to achieve the desired coverage.

It is possible to increase talkout range only by increasing base station transmitter power. To achieve an increase in talkback range requires an increase in the power of *each* mobile unit. However, when talkout range is increased by means of higher base station antenna gain or lower transmission line loss, there is a corresponding increase in talkback range.

MECHANICAL CONSIDERATIONS

BURIED CABLES AND UNDERGROUND CORROSION

Normally, cables should not be buried because of the difficulty of maintenance and the possibility of electrolytic action. When underground installations are necessary, careful planning is required.
Polyethylene or PVC jacketed cables, such as HELIAX or solid dielectric cables, can be buried without regard of electrolytic action. A layer of sand surrounding the cable is usually adequate to protect the jacket from stones or other sharp objects.

Metal cables should be buried only after analysis determines the soil is alkaline. A minimum number of soil samples would include the areas where the cable enters and leaves the ground. Competent local advice is usually available on soil conditions.
A buried cable acts as an electrode. Any metal object to which the cable is connected, even indirectly, acts as the other electrode and usually suffers the greatest damage. The earth between the metals acts as the connection and electrolyte.

Relative Activity of Common Metals
(In order of decreasing activity.)

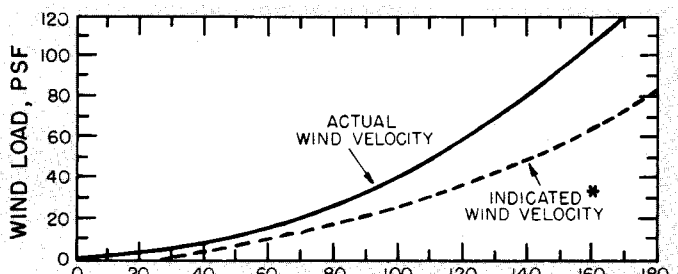
1. Magnesium	5. Nickel
2. Aluminum	6. Tin
3. Zinc	7. Lead
4. Iron	8. Copper (least active)

The attack on the more active metal is inversely proportional to the electrolytic resistance between the two metals. Adjacent metals in the series have the least activity between them. Magnesium, for example, would suffer greater damage if copper were the other electrode, than if zinc or aluminum were the other electrode.
When a cable must be buried under unfavorable soil conditions, protective measures are as follows:

1. Install the cable in a conduit.
2. Use an inactive metal cable sheath. Copper is the least active of the common metals.
3. Use a sacrificial metal. The life of an underground cable can be greatly extended by placing a magnesium strip or rod close to the cable.
4. Use a protective covering. One or more coats of paint together with a PVC or polyethylene wrapping will retard corrosion.
5. Cable fittings are usually made from alloys of active metals. When fittings are buried, they should be wrapped in PVC or polyethylene.

WIND LOAD RATINGS

Ratings based on wind velocities are frequently confusing. "Pounds per square foot," on the other hand, is readily understood. The ratings throughout this catalog are expressed in terms of psf, in accordance with EIA standards and with established industry practice.



WIND LOAD CONVERSION CURVES
*Obsolete 4 cup anemometer method.

WIND LOAD SHAPE FACTORS

Shape factors are used to account for the difference in effective loading on various surfaces of the same projected area due to friction and turbulence.

SHAPE	SHAPE FACTOR
Flat	1.0
Tubes or rods	0.667
Angles	1.16 (flat)
Cones	0.75 (90° cone)
	0.51 (60° cone)
Parabolas	1.2 (front)
	0.7 (back)

Example 1: Determine the thrust transmitted to the support structure by a 4-foot parabolic antenna under 40 psf wind load.

$$\text{Projected area (front)} = \frac{\pi D^2 \text{ (form factor)}}{4}$$
$$= \frac{(3.14)(4)^2(1.2)}{4}$$
$$= 15.08 \text{ ft.}^2$$
$$\text{Maximum thrust} = 15.08\ (40)$$
$$= 604 \text{ lbs.}$$

Example 2: The P4 series antennas mount to a 4″ pipe. Determine the maximum free standing pipe length and deflection for the thrust loads shown.

Properties of 4″ standard pipe

Modulus of Elasticity $E = 30 \times 10^6$
Moment of Inertia $I = 7.233 \text{ in.}^4$
Distance from Neutral Axis to Extreme Fiber $C = \frac{D}{2} = 2.25 \text{ in.}$
Section Modulus $Z = \frac{I}{C} = 3.21 \text{ in.}^3$
Stress Allowable in Bending $S = 20{,}000$ psi (AISC)
Maximum Moment $SZ = 64{,}200$ in lbs.
Maximum length

$$H = M/\text{thrust}$$
$$= 64{,}200/(604)(12) = 8.86 \text{ feet}$$
(to ℄ of antenna)

$$\text{Deflection} = y = \frac{\text{Thrust } L^3}{3EI} = \frac{604(8.86 \times 12)^3}{3(30 \times 10^6)7.233}$$
$$= 1.1 \text{ inches or } 0.5° \text{ tilt.}$$

If less tilt is required, use extra strong or double extra strong pipe or a shorter length of pipe.

TRANSMISSION LINE EQUATIONS

Characteristic impedance of coaxial transmission line:

$$Z_o = \frac{138.1}{(k)^{\frac{1}{2}}} \log_{10} \frac{b}{a} \text{ ohms}$$

where k is average dielectric constant, b is I.D. of outer conductor, a is O.D. of inner conductor.

Average dielectric constant of a line partially filled with dielectric (insulating discs supporting the inner conductor):

$$k = 1 + \frac{W}{12}(K - 1)$$

where W is $12\frac{t}{d}$ inches per foot of line (t is effective thickness of one disc, d is spacing between discs), K is dielectric constant of insulator.

Wavelength (in free space):

$$\lambda = \frac{985}{F} \text{ feet} = \frac{1180}{F} \text{ inches}$$

where F is frequency in mc.

Capacitance:

$$C = \frac{7.35}{v^2 \log_{10} \frac{b}{a}} \times 10^{-12} \text{ farads per foot}$$

Inductance:

$$L = .1404 \times 10^{-6} \log_{10} \frac{b}{a} \text{ henries per foot}$$

Cutoff frequency of coaxial transmission line:

$$F_c = \frac{7520}{a + b} \text{ mc}$$

where b is I.D. of outer conductor, a is O.D. of inner conductor (inches). (This expression is an approximation, accurate to within 3%.)

Velocity of propagation in coaxial transmission line:

$$V = \frac{100}{(k)^{\frac{1}{2}}}\%, \text{ relative to free space}$$

Wavelength (in coaxial line):

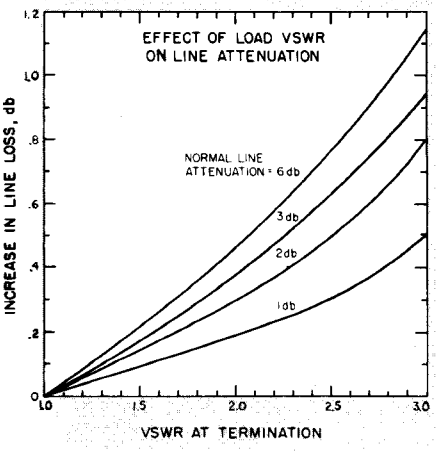
$$\lambda_1 = \frac{V\lambda}{100}$$

where V is velocity in coaxial line, λ is wavelength in free space.

Quarter-wavelength transformers are frequently used for transforming antenna impedance to line impedance and for other impedance transformations. The transformers normally consist of coaxial line which is one-quarter wavelength long at the operating frequency. Velocity of propagation in the line must be considered in determining length. The impedance relationship is,

$$Z_o = (Z_{in} Z_{out})^{\frac{1}{2}}$$

where Z_{in} is the impedance at the input to the transformer, Z_o is the characteristic impedance of the coaxial line used for making the transformer, and Z_{out} is the impedance at the termination of the transformer.

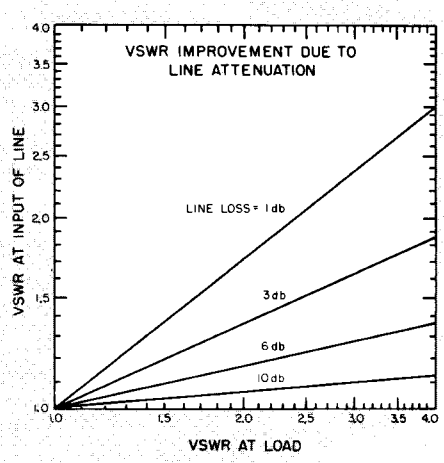


EFFECT OF VSWR ON ATTENUATION

When transmission line is attached to an antenna, the VSWR of the antenna increases the attenuation of the line. This effect is quite small for normal conditions. The curve at left shows increase in power loss versus VSWR.

EFFECT OF ATTENUATION ON VSWR

Antenna VSWR, as measured at the input to the connecting transmission line, is reduced by the attenuation of the line. The curves show this relationship.



TRANSMISSION LINE POWER RATINGS

"Peak" and "Average" power ratings are both required to fully describe the power handling capabilities of a transmission line. Frequently, one rating will be met, while the other is exceeded.

PEAK POWER RATINGS

Peak power rating is constant with frequency and is given by the following equation:

$$P_{pk} = \frac{(E_{rf})^2}{Z_o(1-M)^2 VSWR}\left(\frac{P_2}{P_1}\right)^2\left(S_d\right)^2 \text{watts}$$

where M is amplitude of modulation relative to unmodulated carrier amplitude, VSWR is Voltage Standing Wave Ratio on the line, P_2/P_1 is line absolute pressure divided by atmospheric pressure, and S_d is dielectric strength of the pressurizing medium relative to air. E_{rf} is determined as follows:

$E_{rf} = 0.247\,E_p$

E_p is the 60 cycle peak production test voltage (the values in the table below are typical), and the constant 0.247 includes factors to relate 60 cycle voltage to RF voltage, to adjust to rms value, and includes a safety factor of 2. All of these factors are empirical and have been extensively verified.

Outer Conductor O.D., in.	3/8	7/8	1 5/8	3 1/8	6 1/8	9
E_p volts	2200	6000	11000	19000	35000	50000

CONDITIONS

Peak power ratings shown on page 89 are based on lines pressurized with dry air at one atmosphere absolute at sea level.

Higher peak power ratings can be obtained through pressurization or the use of high dielectric strength gases or both. Peak power rating is proportional to the square of absolute pressure. Doubling the line pressure will multiply the peak power rating by 4. Sulphur hexafluoride gas as compared to dry air at equivalent pressures will yield a 2:1 voltage or 4:1 peak power rating improvement. Combining the effects of high strength dielectrics and pressurizing to several atmospheres will compound the improvement.

AVERAGE POWER RATINGS

Average power rating is based on safe temperature rise in the inner conductor. The standard method limits outer conductor temperature rise to 23° C over 40° C ambient. This corresponds to an actual inner conductor temperature of 102° C or 216° F. Inner versus outer conductor temperature rise is shown in the curve below. Average power rating may be calculated from the following:

$$P_{av} = \frac{16{,}380\sigma D}{db_1} \text{watts}$$

where P_{av} = average power rating for 23° C rise of outer conductor temperature over 40° C ambient; D is O.D. of line in inches; db_1 is measured attenuation derated for increase in loss at elevated temperature; and σ is heat emissitivity coefficient of outer conductor in watts/in.^{2} Standard values are:

Outer Conductor O.D., in.	3/8	3/8	1 5/8	3 1/8	6 1/8	9
watts/in.^{2}	0.166	0.134	0.120	0.111	0.10	0.095

CONDITIONS

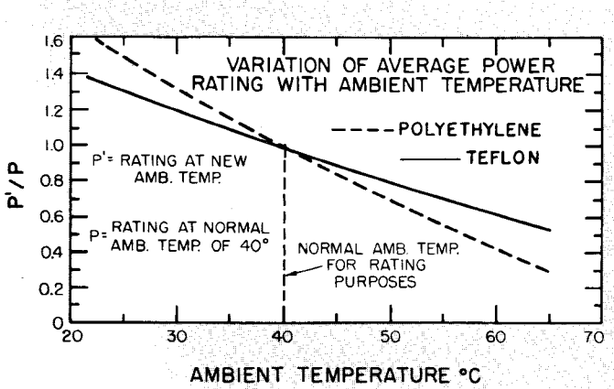
The ratings resulting from the above equation are based on heat emissivity for conductors between slightly and normally oxidized. There is no allowance for VSWR. The rating should be divided by the expected VSWR to account for hot spots. The resultant rating is conservative, since the heat tends to distribute. Outer conductor temperature rise is 23° C over 40° C ambient. See the curve below for inner conductor temperature rise. For conversion to other ambient temperatures, see the curve below. However, the values used in the equations are recommended for most cases.

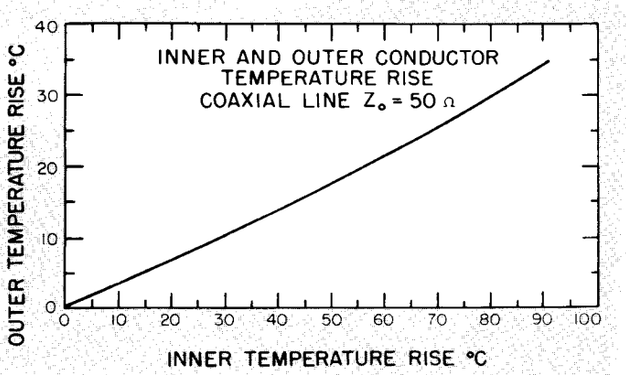
HELIAX CABLES

Average power ratings shown for HELIAX are computed in a manner similar to that shown above except that maximum inner conductor temperature is limited to 80° C at 40° C. ambient.

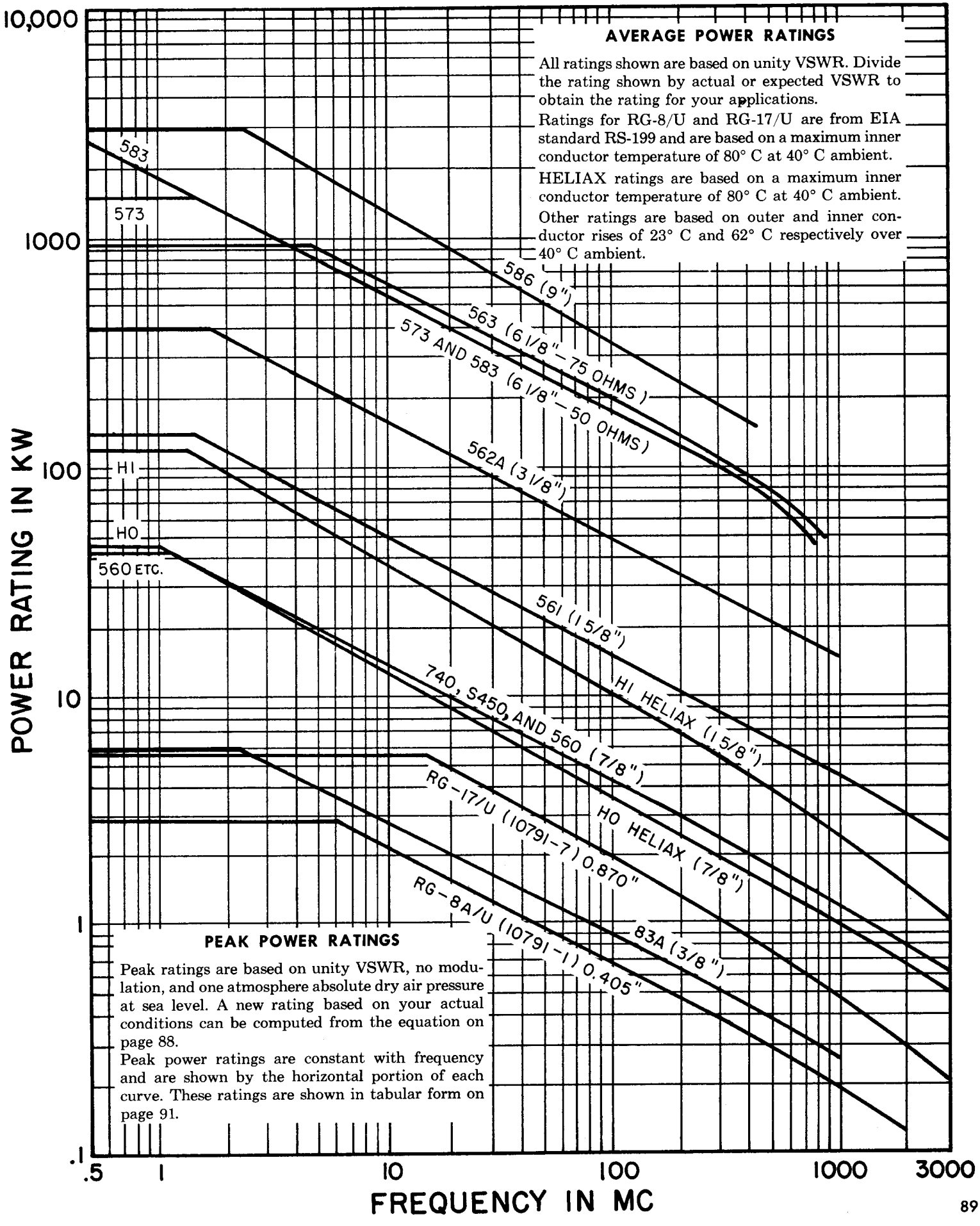
SOLID DIELECTRIC CABLES

Ratings shown for these cables are taken from EIA specification RS-199.





TRANSMISSION LINE POWER RATINGS



POWER RATINGS AND ATTENUATION

of Television Transmission Lines

VHF SINGLE LINE SYSTEMS

Channel No.	1⅝" Type 561		3⅛" Type 562A		6⅛" Type 573		Channel No.	1⅝" Type 561		3⅛" Type 562A		6⅛" Type 573	
	α	P	α	P	α	P		α	P	α	P	α	P
2	.140	17.5	.077	56.0	.038	200	8	.267	9.1	.147	29.0	.070	109
3	.148	16.4	.082	52.0	.039	193	9	.270	8.9	.149	28.7	.071	107
4	.155	15.5	.086	50.0	.042	184	10	.275	8.8	.151	28.4	.072	105
5	.167	14.6	.093	46.0	.049	171	11	.280	8.7	.154	28.0	.074	103
6	.176	13.8	.097	44.0	.047	167	12	.285	8.6	.157	27.6	.075	102
7	.262	9.3	.143	30.0	.065	113	13	.290	8.4	.159	27.0	.076	100

UHF SINGLE LINE SYSTEMS

Channel No.	3⅛" Type 562A		6⅛" Type 573		Waveguide Type 1500		Channel No.	3⅛" Type 562A		6⅛" Type 573		Waveguide Type 1150	
	α	P	α	P	α	P		α	P	α	P	α	P
14	.243	17.8	.125	62	.076	250	49	.289	15.0	.165	45.8	.094	155
15	.244	17.7	.127	61	.075	255	50	.290	14.9	.166	45.4	.093	155
16	.246	17.6	.128	61	.073	260	51	.291	14.9	.168	45.1	.092	160
17	.247	17.5	.129	60	.072	265	52	.292	14.8	.169	44.8	.092	160
18	.249	17.4	.130	60	.070	275	53	.293	14.8	.170	44.2	.091	160
19	.250	17.3	.130	59	.069	280	54	.295	14.7	.172	43.7	.091	160
20	.252	17.2	.131	59	.068	285	55	.296	14.7	.173	43.2	.090	160
21	.253	17.2	.132	58	.066	290	56	.297	14.6	.174	42.8	.090	160
22	.254	17.1	.133	58	.065	295	57	.298	14.6	.175	42.5	.089	165
23	.255	17.0	.134	57	.064	300	58	.299	14.5	.177	42.1	.089	165
24	.257	16.9	.135	57	.063	300	59	.300	14.5	.180	41.8	.088	165
25	.258	16.8	.136	56	.062	305	60	.301	14.4	.183	41.4	.088	165
26	.260	16.7	.138	56	.061	310				6⅛" Type 563			
27	.261	16.6	.139	55	.061	315							
28	.262	16.5	.140	55	.060	320	61	.302	14.4	.154	49.5	.087	170
29	.263	16.5	.141	54	.059	325	62	.303	14.3	.156	49.0	.087	170
30	.265	16.4	.142	54	.059	330	63	.304	14.3	.157	48.7	.087	170
31	.266	16.3	.143	54	.058	335	64	.306	14.2	.158	48.4	.086	170
32	.268	16.2	.144	53	.057	335	65	.307	14.1	.159	48.0	.086	170
33	.269	16.1	.145	52.6	.057	340	66	.309	14.0	.161	47.5	.085	170
34	.270	16.0	.146	52.1	.056	345	67	.310	14.0	.162	47.2	.085	170
35	.271	16.0	.147	51.7	.056	345	68	.311	13.9	.163	46.9	.084	170
36	.273	15.9	.148	51.0	.055	350	69	.312	13.9	.164	46.5	.084	175
37	.274	15.9	.149	50.2	.055	355	70	.313	13.8	.166	46.0	.084	175
38	.275	15.8	.150	49.8	.055	355	71	.314	13.8	.167	45.6	.084	175
39	.276	15.7	.151	49.5	.054	360	72	.315	13.7	.169	45.2	.084	175
40	.278	15.6	.152	49.0	.054	360	73	.316	13.7	.170	44.9	.084	175
41	.279	15.6	.153	48.6	.053	365	74	.318	13.6	.172	44.5	.084	175
42	.280	15.5	.154	48.3	.053	365	75	.319	13.6	.173	44.1	.084	175
43	.281	15.4	.156	47.9	.053	370	76	.320	13.5	.175	43.7	.083	175
44	.283	15.3	.157	47.5	.052	370	77	.320	13.5	.176	43.4	.083	175
45	.284	15.3	.159	47.1	.052	370	78	.321	13.5	.178	43.0	.083	180
46	.285	15.2	.161	46.8	.052	375	79	.322	13.4	.179	42.6	.083	180
47	.286	15.1	.163	46.5	.051	375	80	.323	13.4	.181	42.2	.083	180
48	.288	15.0	.164	46.1	.051	380	81	.324	13.4	.183	41.8	.083	180
							82	.326	13.3	.185	41.3	.083	180
							83	.328	13.2	.187	40.9	.083	180

POWER RATINGS (P) are listed in terms of peak video transmitter power in kilowatts.
For power ratings and attenuation of lines not listed, here, refer to curves on pages 92-95 inclusive.

ATTENUATION (α) is listed as decibels per 100 feet of line. Attenuation is the same for a line whether used in single or dual system.
All figures are based on measured data.

ATTENUATION EFFICIENCY NOMOGRAPHS

FOR TRANSMISSION LINE

These curves permit rapid determination of attenuation and efficiency of any standard ANDREW transmission line.

The curves on the following pages may be used to determine attenuation and efficiency of standard ANDREW lines in the frequency range of 300 kc (0.3 mc) to 3000 mc. The curves are plotted from measured data and are based on unity VSWR.

A high degree of correlation exists between measured and calculated attenuation. Attenuation at frequencies outside the range shown can be calculated from the following:

Attenuation = Conductor loss plus dielectric loss

$$\text{Conductor loss} = \frac{0.433\ (F)^{1/2}}{Z_o}\left[\frac{1}{a(g_a)^{1/2}} + \frac{1}{b(g_b)^{1/2}}\right]$$

where a is inner conductor, O.D. in inches.
b is outer conductor I.D. in inches.
g_a is inner conductor relative IACS conductivity.
g_b is outer conductor relative IACS conductivity.
F is frequency in mc.
Z_o is characteristic impedance.
g_a and g_b are expressed as decimals.

Dielectric loss = 2.76 vLfWF db/100.

where V is velocity, expressed as a decimal.
Lf is loss factor of dielectric
W is percent of space between conductors occupied by dielectric other than air, expressed as a decimal.
F is frequency in mc.

The use of the ANDREW nomographs is illustrated by the following example:

Problem: To determine the attenuation and efficiency of 400 feet of ANDREW Type 562A transmission line at TV Channel 10 (mid-channel, 195 mc).

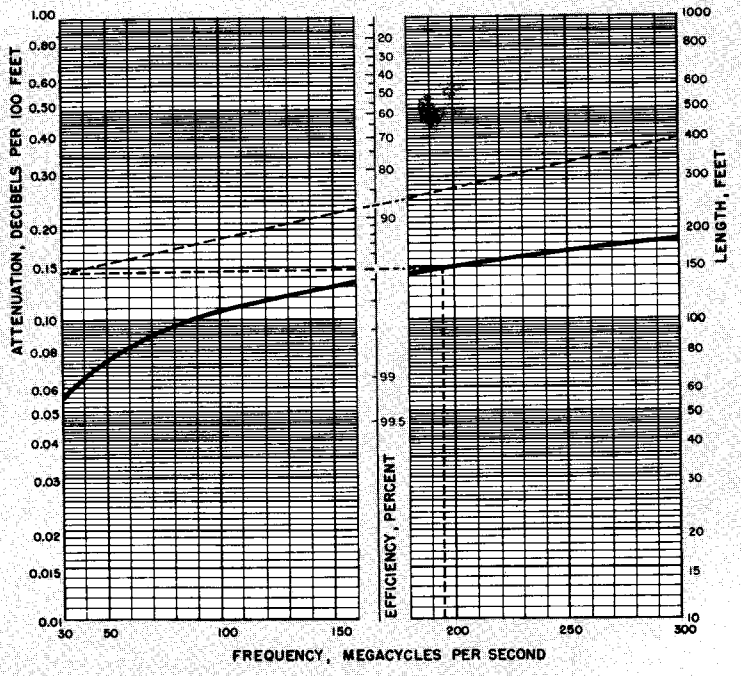
Steps: (refer to curve)

(1) From the frequency scale (195 mc), project a vertical line to its intersection with the 562A curve.

(2) From this intersection, project a horizontal line to the attenuation scale at the left. This determines the attenuation, 0.310 decibels per 100 feet.

(3) Using a straight edge, connect the point of indicated attenuation (0.310 db/100 feet) with the transmission line length (400 feet) on the length scale at the right of the nomograph.

(4) The intersection of this line with the efficiency scale in the center of the nomograph indicates the efficiency of the transmission line (efficiency of 400 feet of 562A at 195 mc is 75%).

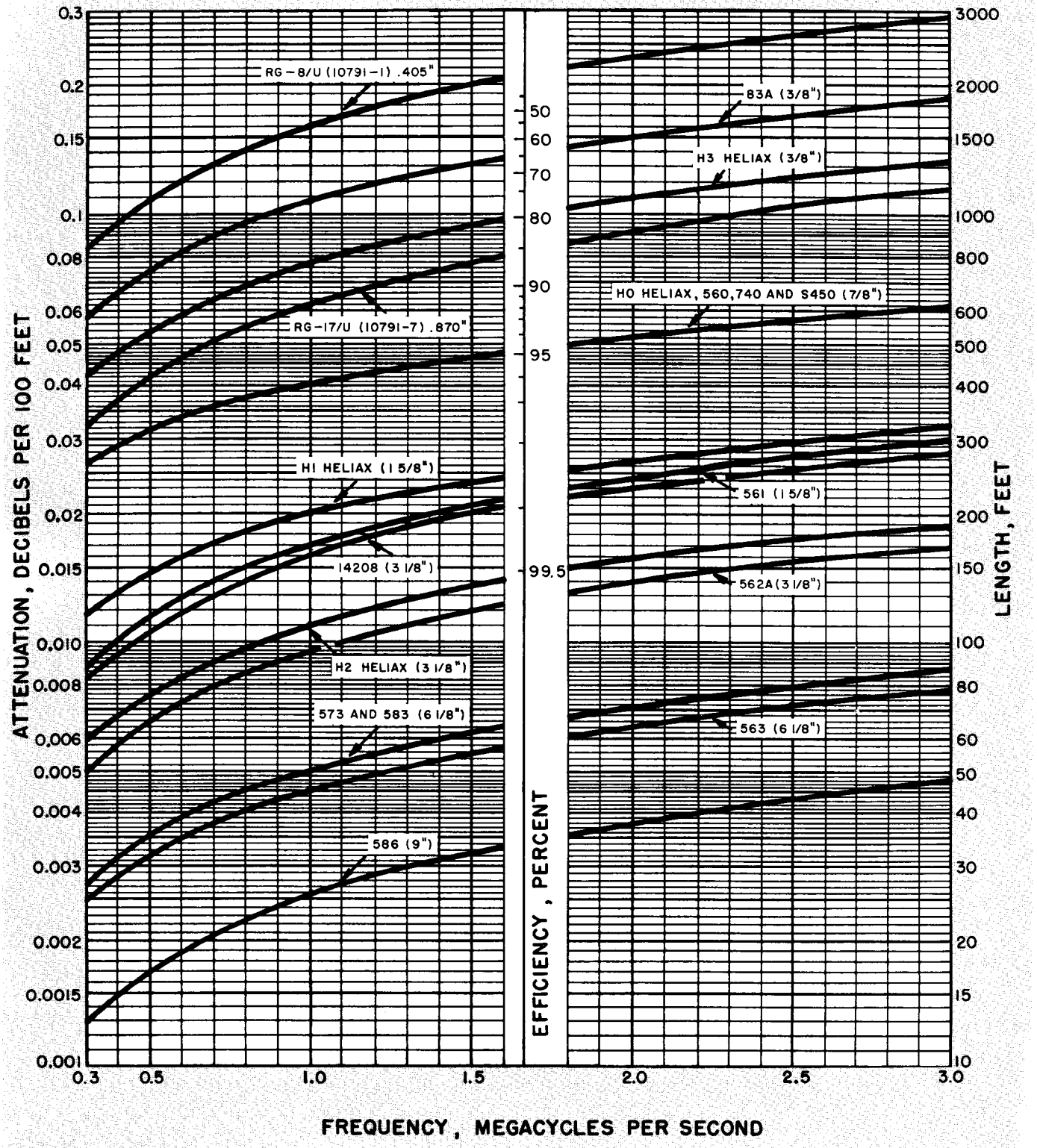


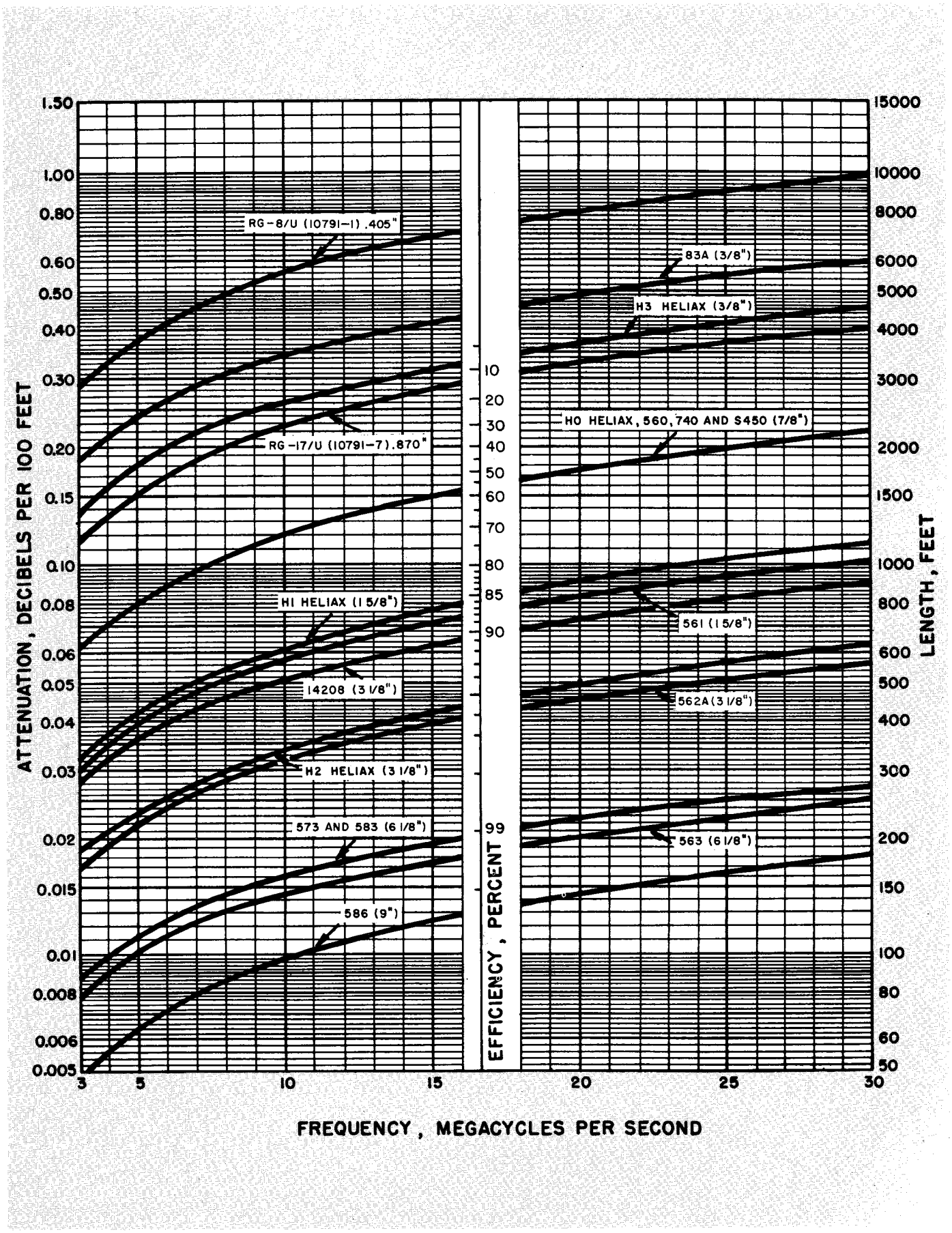
PEAK POWER RATINGS

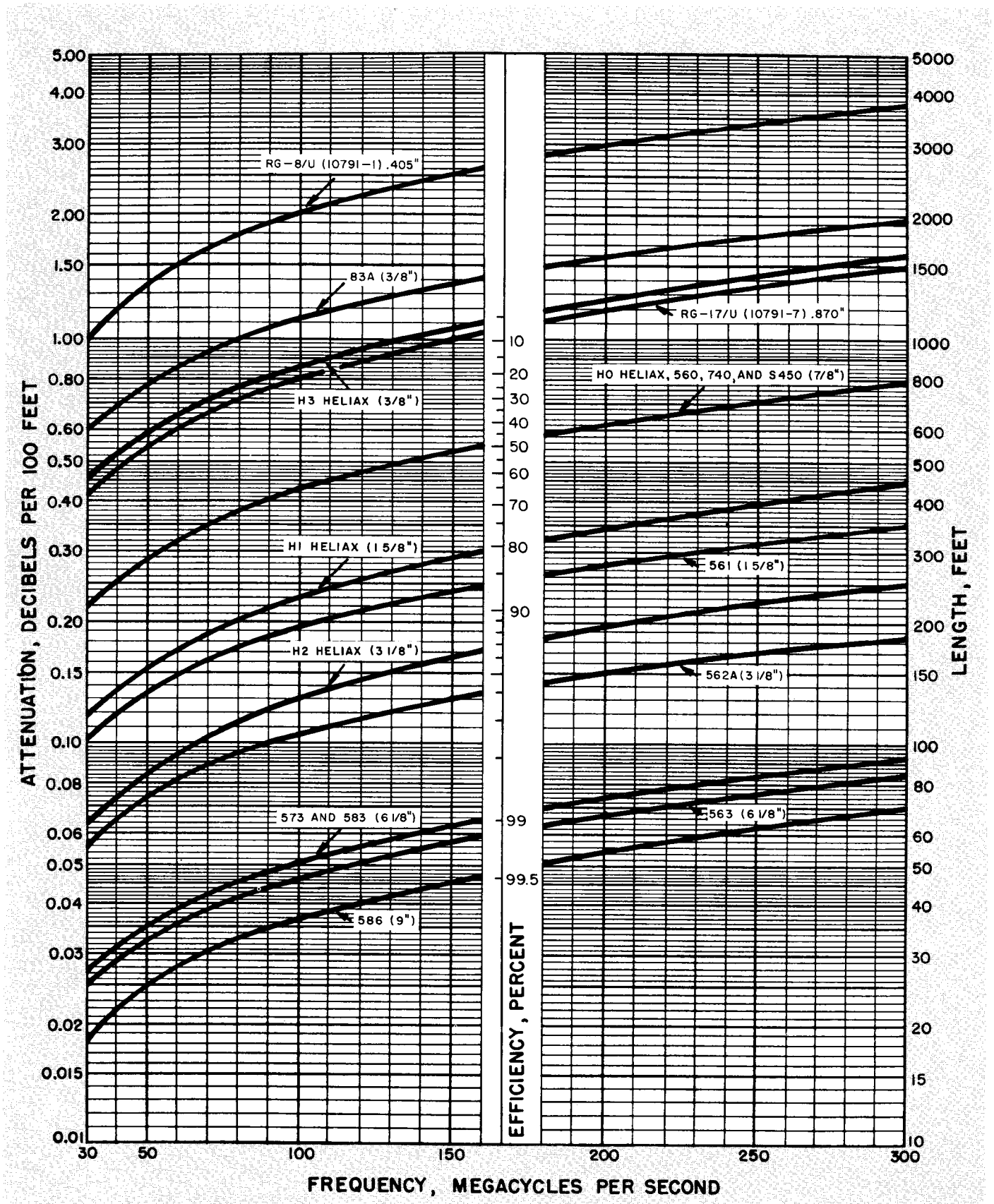
for Coaxial Transmission Lines

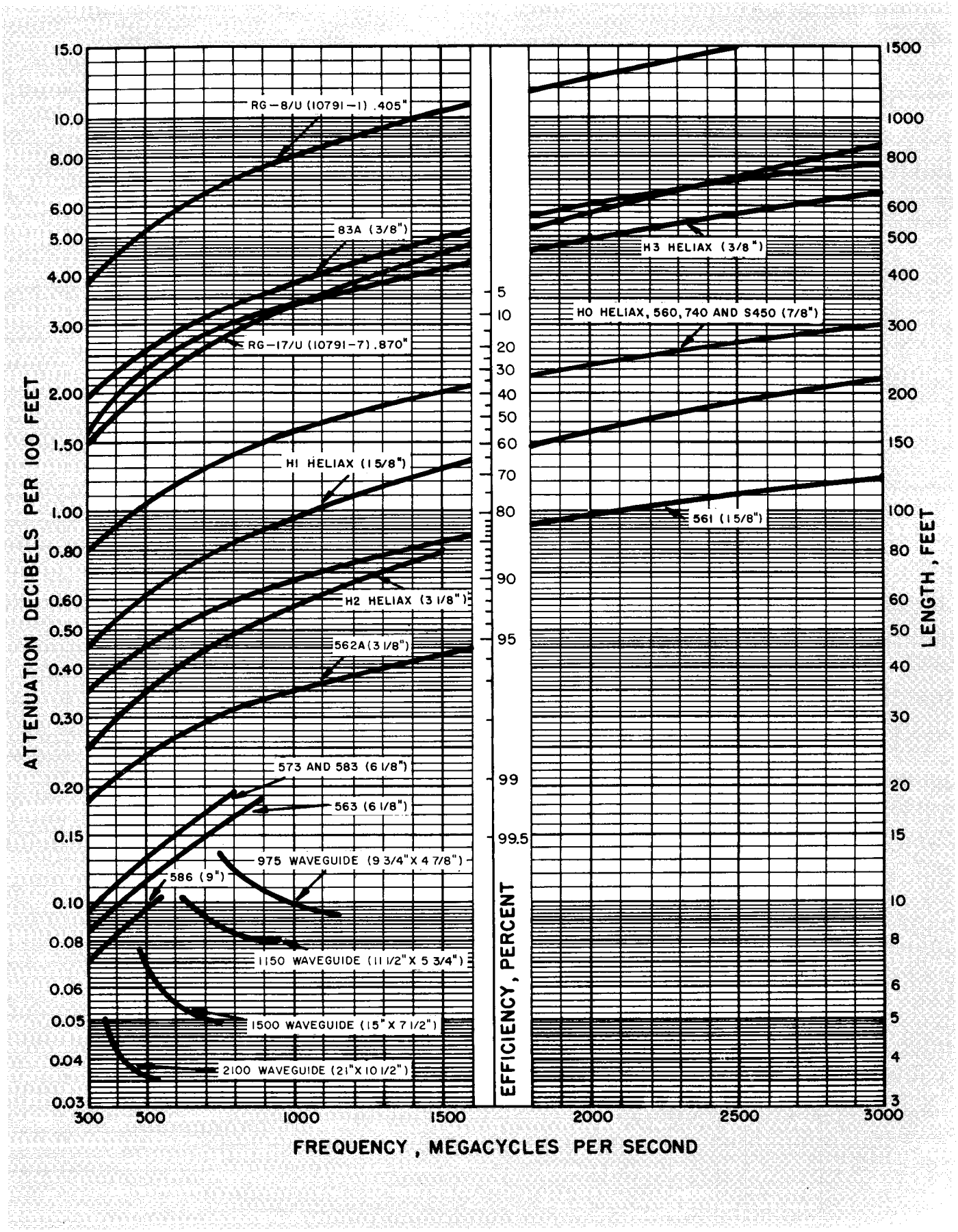
Line Size, inches	Type Number	Peak Power Rating
9	586	3 megawatts
6⅛	583	3 megawatts
6⅛	563	930 kilowatts
6⅛	573	1.5 megawatts
3⅛	562A	400 kilowatts
1⅝	561	140 kilowatts
1⅝	H1	120 kilowatts
⅞	HO	44 kilowatts
⅞	740 and S450	44 kilowatts
⅞	560	43 kilowatts
0.870	10791-7 (RG-17/U)	5.6 kilowatts
⅜	83A	6 kilowatts
0.405	10791-1 (RG-8/U)	2.9 kilowatts

These ratings are constant with frequency and are based on unity VSWR and one atmosphere absolute dry air pressure at sea level. Ratings for other conditions can be computed from the equation on page 88.


ATTENUATION, DECIBELS PER 100 FEET
0.3
0.2
0.15
0.1
0.08
0.06
0.05
0.04
0.03
0.02
0.015
0.010
0.008
0.006
0.005
0.004
0.003
0.002
0.0015
0.001
RG-8/U (10791-1) .405"
RG-17/U (10791-7) .870"
H1 HELIAX (1 5/8")
14208 (3 1/8")
H2 HELIAX (3 1/8")
573 AND 583 (6 1/8")
586 (9")
EFFICIENCY, PERCENT
50
60
70
80
90
95
99.5
83A (3/8")
H3 HELIAX (3/8")
HO HELIAX, 560,740 AND S450 (7/8")
561 (1 5/8")
562A (3 1/8")
563 (6 1/8")
LENGTH, FEET
3000
2000
1500
1000
800
600
500
400
300
200
150
100
80
60
50
40
30
20
15
10
0.3
0.5
1.0
1.5
2.0
2.5
3.0
FREQUENCY, MEGACYCLES PER SECOND


ATTENUATION, DECIBELS PER 100 FEET
1.50
1.00
0.80
0.60
0.50
0.40
0.30
0.20
0.15
0.10
0.08
0.06
0.05
0.04
0.03
0.02
0.015
0.01
0.008
0.006
0.005
RG-8/U (10791-1) .405"
RG-17/U (10791-7) .870"
H1 HELIAX (1 5/8")
14208 (3 1/8")
H2 HELIAX (3 1/8")
573 AND 583 (6 1/8")
586 (9")
EFFICIENCY, PERCENT
10
20
30
40
50
60
70
80
85
90
99
83A (3/8")
H3 HELIAX (3/8")
HO HELIAX, 560, 740 AND S450 (7/8")
561 (1 5/8")
562A (3 1/8")
563 (6 1/8")
LENGTH, FEET
15000
10000
8000
6000
5000
4000
3000
2000
1500
1000
800
600
500
400
300
200
150
100
80
60
50
3
5
10
15
20
25
30
FREQUENCY, MEGACYCLES PER SECOND


ATTENUATION, DECIBELS PER 100 FEET
5.00
4.00
3.00
2.00
1.50
1.00
0.80
0.60
0.50
0.40
0.30
0.20
0.15
0.10
0.08
0.06
0.05
0.04
0.03
0.02
0.015
0.01
RG-8/U (10791-1) .405"
83A (3/8")
H3 HELIAX (3/8")
H1 HELIAX (1 5/8")
H2 HELIAX (3 1/8")
573 AND 583 (6 1/8")
586 (9")
EFFICIENCY, PERCENT
10
20
30
40
50
60
70
80
90
99
99.5
RG-17/U (10791-7) .870"
HO HELIAX, 560, 740, AND S450 (7/8")
561 (1 5/8")
562A (3 1/8")
563 (6 1/8")
LENGTH, FEET
5000
4000
3000
2000
1500
1000
800
600
500
400
300
200
150
100
80
60
50
40
30
20
15
10
30
50
100
150
200
250
300
FREQUENCY, MEGACYCLES PER SECOND


ATTENUATION DECIBELS PER 100 FEET
15.0
10.0
8.00
6.00
5.00
4.00
3.00
2.00
1.50
1.00
0.80
0.60
0.50
0.40
0.30
0.20
0.15
0.10
0.08
0.06
0.05
0.04
0.03
RG-8/U (10791-1) .405"
83A (3/8")
RG-17/U (10791-7) .870"
HI HELIAX (1 5/8")
H2 HELIAX (3 1/8")
562A (3 1/8")
573 AND 583 (6 1/8")
563 (6 1/8")
975 WAVEGUIDE (9 3/4" X 4 7/8")
586 (9")
1150 WAVEGUIDE (11 1/2" X 5 3/4")
1500 WAVEGUIDE (15" X 7 1/2")
2100 WAVEGUIDE (21" X 10 1/2")
EFFICIENCY, PERCENT
5
10
20
30
40
50
60
70
80
90
95
99
99.5
LENGTH, FEET
1500
1000
800
600
500
400
300
200
150
100
80
60
50
40
30
20
15
10
8
6
5
4
3
H3 HELIAX (3/8")
HO HELIAX, 560, 740 AND S450 (7/8")
561 (1 5/8")
300
500
1000
1500
2000
2500
3000
FREQUENCY, MEGACYCLES PER SECOND

INDEX

INTRODUCTION

ANTENNAS

TRANSMISSION LINES

ENGINEERING DATA

Andrew

PRICE LIST FOR CATALOG 22

Prices herein become effective November 15, 1958, and supersede all previous price lists which should now be discarded.

ANDREW

AM ANTENNA TUNING AND PHASING EQUIPMENT MANUFACTURE HAS BEEN COLSOLIDATED AT ANDREW ANTENNA CORPORATION, LTD., WHITBY, ONTARIO, CANADA.

DESCRIPTION	TYPE NO.	PRICE
4-foot diameter		
890-960 mc	P4-9	$ 250.00
1700-1850 and 2100-2300 mc	P4-17	275.00
1850-2110 mc	P4-18	275.00
2450-2700 mc	P4-24	275.00
5925-6525 mc	P4-59	275.00
6525-7125 mc	P4-65	275.00
7125-7425 mc	P4-71	275.00
10700-11700 mc	P4-107	275.00
12700-13200 mc	P4-127	275.00
6-foot diameter		
UHF-TV	21202*	500.00
890-960 mc	P6-9	350.00
1700-2400 mc	PX6-17	675.00
1700-1850 and 2100-2300 mc	P6-17	375.00
1850-2110 mc	P6-18	375.00
2450-2700 mc	P6-24	375.00
5925-6525 mc	P6-59	375.00
6525-7125 mc	P6-65	375.00
7125-7425 mc	P6-71	375.00
*For channels 70-83, specify channel.		
8-foot diameter		
3700-4200 mc	P8-37	750.00
5925-6525 mc	P8-59	750.00
6525-7125 mc	P8-65	750.00
7125-7425 mc	P8-71	750.00
10-foot diameter		
890-960 mc	P10-9	1,125.00
890-960 mc	PX10-9	1,400.00
1700-1850 and 2100-2300 mc	P10-17	1,150.00
1850-2110 mc	P10-18	1,150.00
2450-2700 mc	P10-24	1,150.00
3700-4200 mc	P10-37	1,200.00
5925-6525 mc	P10-59	1,200.00
6525-7125 mc	P10-65	1,200.00
7125-7425 mc	P10-71	1,200.00
Page 17 PARABOLIC ANTENNA MOUNTS		
Tower mount for 4 and 6-foot antennas	T4	75.00
Roof mount for 4 and 6-foot antennas	M4	50.00
Tower mount for 8 and 10-foot antennas	T8A	150.00
Roof mount for 8 and 10-foot antennas	M8	100.00
Page 18 PARABOLIC ANTENNA HEATERS		
4-foot antenna heater	PH4	200.00
6-foot antenna heater	PH6	300.00
8-foot antenna heater	PH8	400.00
10-foot antenna heater	PH10	600.00
Page 19 RADOMES		
4-foot radome	R4	100.00
6-foot radome	R6	200.00
8-foot radome	R8	450.00
4-foot heated radome	HR4	200.00
6-foot heated radome	HR6	350.00
8-foot heated radome	HR8	650.00
Coaxial horn deicer	20712	120.00
Page 20 400-1000 MC PARABOLIC ANTENNAS		
4-foot antenna	21201	400.00
6-foot antenna	21202	500.00
10-foot antenna	21203	1,200.00

DESCRIPTION	TYPE NO.	PRICE
PARABOLIC REFLECTORS		
20" dia., 4" focal length	19875	$ 25.00
20" dia., 5" focal length	19876	25.00
24" dia., 7.2" focal length	12982	30.00
40" dia., 18" focal length	16907	60.00
48" dia., 12" focal length	14865	70.00
48" dia., 18" focal length	17673	70.00
72" dia., 18" focal length	14558	160.00
72" dia., 27.5" focal length	18238	160.00
96" dia., 35.8" focal length	18242	250.00
120" dia., 35.8" focal length	18420-1	580.00
Pages 22-24 FOLDED UNIPOLE ANTENNAS*		
25-30 mc	900A-0	140.00
30-44 mc	900A-1	70.00
44-54 mc	900A-2	65.00
72-76 mc	900A-3	85.00
108-148 mc	900A-4	70.00
148-174 mc	925A	35.00
HURRICANE FOLDED UNIPOLE ANTENNAS*		
25-30 mc	H900A-0	500.00
30-44 mc	H900A-1	240.00
44-54 mc	H900A-2	220.00
72-76 mc	H900A-3	180.00
108-148 mc	H900A-4	140.00
148-174 mc	H925A	80.00
*If cable other than RG-8/U is used, substitute "B" suffix on antenna type number for "A" suffix, deduct $4.00 from antenna price, and order appropriate adaptor.		
Adaptor for 7/8" HELIAX	H901	5.00
Adaptor for 7/8" copper	G901	5.00
Adaptor for RG-8/U, Type N plug	SN901	5.00
Adaptor for RG-17/U	SC901	18.00
Mounting clamps for 2" pipe	10674	6.00
Mounting clamps (stainless steel) for 2" pipe★	15714	20.00
Mounting clamps for 3/4"-3" tube	20898	8.00
Mounting clamps for flat surfaces	20896	4.00
Mounting clamps for angles	20897	8.00
Jumper cable	16253-2	6.00
UHF junction	10805-6	1.50
Mounting clamps	21208	3.00
Page 25 CARDIOID UNIPOLE ANTENNAS*		
30-37 mc	920C-1	175.00
37-44 mc	920C-2	150.00
44-50 mc	920C-3	100.00
50-54 mc	920C-4	100.00
144-148 mc	920C-5	80.00
148-152 mc	926C-0	60.00
152-162 mc	926C-1	60.00
162-174 mc	926C-2	60.00
HURRICANE CARDIOID UNIPOLE ANTENNAS*		
30-37 mc	H920C-1	500.00
37-44 mc	H920C-2	360.00
44-50 mc	H920C-3	360.00
50-54 mc	H920C-4	300.00
144-148 mc	H920C-5	150.00
148-152 mc	H926C-0	100.00
152-162 mc	H926C-1	100.00
162-174 mc	H926C-2	100.00
*If cable other than RG-8/U is used, substitute "D" suffix on antenna type number for the "C" suffix, deduct $4.00 from antenna price, and order appropriate adaptor.		
Conversion kit, 37-44 mc	14142-2	80.00
Conversion kit, 44-50 mc	14142-3	50.00

★ Not listed in catalog

DESCRIPTION	TYPE NO.	PRICE
Page 26 BIDIRECTIONAL UNIPOLE ANTENNAS		
30-50 mc	113	$ 260.00
148-174 mc	114	160.00
Mounting kit, angle towers, 113	14672	35.00
Mounting kit, round towers, 113	14671	35.00
Page 27 SIDE MOUNTED GAIN 25-50 MC ANTENNAS		
2-element array	262	240.00
4-element array	262-4	525.00
Pages 28-31 CORNER REFLECTOR ANTENNAS		
25-40 mc	3600A	700.00
40-50 mc	3601A	450.00
72-76 mc	3602A	390.00
144-174 mc	3605A	100.00
148-174 mc	3625	230.00
148-174 mc	3645	480.00
400-420 mc	3608A-2	145.00
400-420 mc	3628	240.00
400-420 mc	3648	440.00
450-470 mc	3606A-2	80.00
450-470 mc	3626	180.00
450-470 mc	3646	375.00
HURRICANE CORNER REFLECTOR ANTENNAS		
72-76 mc	S3602A	1,000.00
144-174 mc	S3605A	250.00
148-174 mc	S3625	580.00
148-174 mc	S3645	1,080.00
Note: When cable other than RG-8/U with UHF plug is to be used at the antenna connection for 3600A, 3601A, 3602A, and 3605A, use "B" suffix, deduct $3.00 from the antenna price, and order one of the adaptors listed below.		
Adaptor for RG-17/U	13074A	13.00
Adaptor for RG-8/U	13074A-1	10.00
Wood pole mount	13575	30.00
Horizontal mount	16018	12.00
Tower mount	12613	20.00
Jumper cable	16253-2	6.00
Cable harnesses for conversion to stacked arrays—		
Harness for two 3605A's in parallel	17526	40.00
Harness for use with 3606A-2	19452	40.00
Harness for use with 3608A-2	21209	30.00
Page 32 YAGI ANTENNAS		
450-470 mc, 6-element array	116	70.00
450-470 mc, 12-element array	117	180.00
Jumper cable	16253-8	8.00
Page 33 1.5 DB GAIN ANTENNA		
450-470 mc	225A	35.00
Type N right angle plug	10804-10	3.00
Jumper cable	16253-8	8.00
Mounting clamps	13967	6.00
DRILLING RIG ANTENNA		
25-50 mc	15010	150.00
UHF plug	10805-1	.80
Pages 34-37 HIGH GAIN ANTENNAS		
148-174 mc		
6.3 db gain omnidirectional	3000A	800.00
9.0 db gain omnidirectional	3006	4,000.00
3.0 db gain omnidirectional	3008	800.00
8.0 db gain offset pattern	3004	800.00
400-410 mc		
7.5 db gain omnidirectional	4010-1	500.00
410-420 mc		
7.5 db gain omnidirectional	4010-2	500.00

DESCRIPTION	TYPE NO.	PRICE
Pages 34-37 HIGH GAIN ANTENNAS-Cont.		
450-470 mc		
10 db gain omnidirectional	212	$ 500.00
10 db gain omnidirectional	213	500.00
7.6 db gain omnidirectional	4000	275.00
5 db gain omnidirectional	4002	120.00
10.8 db gain offset pattern	201	275.00
Mounting clamps, 212 and 213	21131	35.00
Mounting clamps, 4000, 4010, 201	14671-2	16.50
Mounting clamps, 4002	15681	11.00
Page 37 MOBILE 1.3 DB GAIN ANTENNA		
450-470 mc, RG-8/U cable	233A	17.50
450-470 mc, RG-58/U cable	234A	17.50
Replacement whip, 233A or 234A	16684	4.50
Pages 38-39 GROUND-TO-AIR ANTENNAS †		
HELICAL ANTENNAS		
108-132 mc	19110N-1	1,500.00
215-265 mc	19110N-2	325.00
215-265 mc	50140	300.00
260-320 mc	19110N-3	350.00
320-400 mc	19110N-4	200.00
400-500 mc	19110N-5	110.00
HURRICANE HELICAL ANTENNAS		
108-132 mc	H19110N-1	2,400.00
215-265 mc	H19110N-2	550.00
215-265 mc	H50140	575.00
260-320 mc	H19110N-3	575.00
320-400 mc	H19110N-4	325.00
400-500 mc	H19110N-5	200.00
Antenna mount	M8	100.00
Antenna mount	T4	75.00
Mounting clamps	13550	4.00
CORNER REFLECTOR ANTENNA		
215-265 mc	19140	145.00
HURRICANE CORNER REFLECTOR ANTENNA		
215-265 mc	H19140	270.00
DISCONE ANTENNA		
108-215 mc	19050-1	110.00
HURRICANE DISCONE ANTENNAS		
108-215 mc	H19050-1	235.00
215-420 mc	H19050-2	150.00
TRI-HELIX ARRAY		
215-265 mc, antenna array only	80420	3,000.00
Counterbalance	80422	500.00
Rotator	80427	8,000.00
Rotator	19122	on app.
Pages 40-41 MULTI-V FM ANTENNAS		
88-98 mc		
2-bay array	1302-1	550.00
4-bay array	1304-1	1,150.00
6-bay array	1306-1	2,400.00
8-bay array	1308-1	3,200.00
98-108 mc		
2-bay array	1302-2	550.00
4-bay array	1304-2	1,150.00
6-bay array	1306-2	2,400.00
8-bay array	1308-2	3,200.00
88-108 mc		
Dual polarized 4-bay array	X1304	4,800.00
VSWR tuner	19893	800.00
Connector	4851	10.00
Adaptor	1861	75.00
Harmonic filter	15200	600.00
Deicing kit, 2-bay	21210-2	160.00
Deicing kit, 4-bay	21210-4	320.00
Deicing kit, 6-bay	21210-6	480.00
Deicing kit, 8-bay	21210-8	640.00

† Normally shipped from California

DESCRIPTION	TYPE NO.	PRICE

Page 42 TELEVISION ANTENNAS

LOW POWER		
Channel 2	19890-2	$ 4,200.00
Channel 3	19890-3	4,200.00
Channel 4	19890-4	4,200.00
Channel 5	19890-5	4,200.00
Channel 6	19890-6	4,200.00
Channel 7	19890-7	1,600.00
Channel 8	19890-8	1,600.00
Channel 9	19890-9	1,600.00
Channel 10	19890-10	1,600.00
Channel 11	19890-11	1,600.00
Channel 12	19890-12	1,600.00
Channel 13	19890-13	1,600.00
MEDIUM POWER		
Channel 2	21156-2	5,200.00
Channel 3	21156-3	5,200.00
Channel 4	21156-4	5,200.00
Channel 5	21156-5	5,200.00
Channel 6	21156-6	5,200.00
Channel 7	21156-7	2,600.00
Channel 8	21156-8	2,600.00
Channel 9	21156-9	2,600.00
Channel 10	21156-10	2,600.00
Channel 11	21156-11	2,600.00
Channel 12	21156-12	2,600.00
Channel 13	21156-13	2,600.00
UHF translator antenna	21202*	500.00

*For channels 70-83, specify channel.

Pages 44-47 HELIAX FLEXIBLE AIR DIELECTRIC CABLE

7/8" HELIAX and accessories*		
HELIAX cable	HO	1.50/ft.
EIA flange termination	20R	23.00
Type N jack termination	20N	23.00
UHF jack termination	20U	23.00
LC plug termination	20M	40.00
LC jack termination	20L	40.00
End termination	20T	30.00
Right angle miter elbow	1060M	26.00
Spare inner connector	18275	4.00
Adaptor	4850	5.00
Cable grip	19256	5.00
Grounding kit (one connection)	19248	5.00
Mounting strap	17500-1	0.30
Wraplock	12395-1	12.50
1-5/8" HELIAX and accessories *		
HELIAX cable	H1	3.40/ft.
EIA flange termination	21R	50.00
7/8" EIA flange termination	21S	65.00
Type N jack termination	21N	50.00
UHF jack termination	21U	50.00
LC jack termination	21L	50.00
Miter elbow	1061M	48.00
Spare inner connector	15069	8.00
Inner adaptor	4851	10.00
Cable grip	19257	12.00
Grounding kit	19249	6.00
Mounting strap	17500-2	0.35
Wraplock	12395-1	12.50
3-1/8" HELIAX and accessories*		
HELIAX cable	H2	10.00/ft.
EIA flange termination (Any of the EIA fittings shown on page 58 can be used with 22R)	22R	100.00

Page 48 COPPER HELIAX CABLE

3/8" copper HELIAX*	H3	0.75/ft.
Type N jack termination	21212N	8.00
UHF jack termination	21212U	8.00
7/8" copper HELIAX*	H5	1.75/ft.
Factory attached fittings		
EIA flange termination	65R	12.00
Type N jack termination	65N	12.00
UHF jack termination	65U	12.00
Field attached fittings		
EIA flange termination	75R	16.00

Page 48 COPPER HELIAX CABLE-Cont.

Type N jack termination	75N	$ 16.00
UHF jack termination	75U	16.00
1-5/8" copper HELIAX*	H7	3.75/ft.
Factory attached fittings		
EIA flange termination	67R	40.00
Type N jack termination	67N	40.00
UHF jack termination	67U	40.00
7/8" EIA flange*	67S	45.00
Field attached fittings		
EIA flange termination	77R	50.00
Type N jack termination	77N	50.00
UHF jack termination	77U	50.00
7/8" EIA flange*	77S	55.00

***HELIAX ASSEMBLIES**—HELIAX can be supplied with fittings attached at the factory to form a cable assembly suitable for immediate installation. Price is cable price plus fitting price. No charge for fitting attachment. Assembly numbering system uses code letters of fitting type numbers. The first code letter represents the fitting at the outside of the reel (normally the antenna connection).

Examples:

3/8" copper HELIAX, N jack outside, UHF jack inside	H3-NU
7/8" HELIAX, EIA flange outside, N jack inside	HO-RN
1-5/8" copper HELIAX, 7/8" EIA flange outside, N jack inside	H5-SN
3-1/8" HELIAX, EIA flanges both ends	H2-RR

Page 49 3/8" SEMI-FLEXIBLE CABLE

Cable with copper conductors	83A	0.80/ft.
Cable with aluminum conductors	83AL	0.75/ft.
End terminal, gauge and valve	1701AGV	12.00
End terminal, gas plug	1701AP	8.00
End terminal, release valve	1701AR	10.00
Cable cap	990	0.80
Cable cap, gauge and valve	990GV	4.00
Connector	8319A	1.00
Adaptor, 3/8" term. x UHF jack	4868	8.75
Adaptor, to S450 and 737	8329A	10.00
Mounting strap	6102	0.10

Pages 50-51 7/8" 50 OHM SEMI-FLEXIBLE CABLE

7/8" cable	740	15.00 +1.35/ft.
7/8" cable, no flanges	S450	1.35/ft.
Adaptor, 7/8" flange x UHF jack	4855	11.00
Adaptor, 7/8" flange x N jack	12291A	11.00
Adaptor, 7/8" flange x LC jack	12692A	28.00
Single swivel flange	13223A-2	6.00
Swivel flanges, pair	13223A-1	9.75
End terminal	2050	12.50
End terminal, gauge and valve	1703AGV	16.00
End terminal, gas plug	1703AP	11.00
End terminal, release valve	1703AR	14.00
Cable cap	980	1.10
Cable cap, gauge and valve	980GV	6.00
Adaptor, end term. x S450	14139	8.00
Adaptor, 7/8" term. x UHF jack	12394	7.00
Adaptor, 7/8" x LC jack	12423	17.50
Connector	8328E	2.50
Inner connector adaptor	13244-2	2.50
Adaptor, includes outer connector	16551	4.00
Tubing cutter	13046	3.00
Grooving tool	13137	8.00
Insulated mounting clamp	11662-1	4.00
Wraplock, stainless steel	12395-1	12.50
Mounting strap	6104	0.15

Pages 52-53 SOLID DIELECTRIC CABLE AND FITTINGS

RG-8/U	10791-1	0.17/ft.
RG-17/U	10791-7	0.70/ft.
Type LC fittings		
Plug (UG-154/U)	12418-1	8.00
Junction (UG-215/U)	12418-3	8.00

★ Not listed in catalog

DESCRIPTION	TYPE NO.	PRICE
Pages 52-53 SOLID DIELECTRIC CABLE AND FITTINGS-Cont.		
Panel receptacle (UG-352/U)	12418-7	$ 7.50
Adaptor, RG-17/U to RG-8/U, Type N plug	12418-5	6.00
Adaptor, RG-17/U to RG-8/U, UHF plug	12418-12	9.00
LC plug x 7/8" flat flange	12692A	28.00
LC plug x 7/8" end terminal	12423	17.50
LC plug x 7/8" HELIAX	20L	40.00
LC plug x 7/8" EIA flange	2360	32.00
LC plug x 1-5/8" EIA flange	2361	58.00
LC jack x 7/8" HELIAX	20M	40.00
LC jack x 1-5/8" HELIAX	21L	50.00
Type N fittings		
Plug (UG-21B/U)	10804-6	1.75
Cable jack (UG-23B/U)	10804-14	1.90
Panel jack (UG-22B/U)	10804-12	2.00
Panel receptacle (UG-58A/U)	10804-4	1.25
Junction (UG-29B/U)	10804-11	2.10
Right angle connector (UG-27B/U)	10804-10	3.00
Adaptor (UG-146/U)	10805-11	3.50
Adaptor (UG-83/U)	10805-12	3.10
Adaptor (UG-167A/U)	12418-5	6.00
N plug x 7/8" flat flange	12291A	11.00
N plug x 7/8" EIA flange	2260	20.00
N plug x 7/8" HELIAX	20N	23.00
N plug x 1-5/8" HELIAX	21N	50.00
N plug x 1-5/8" EIA flange	2261	42.00
Type UHF fittings		
Plug (PL-259/A)	10805-1	0.80
Plug	10805-13	3.00
Panel receptacle (SO-239)	10805-2	0.95
Tee connector (M-358)	10805-4	3.00
Right angle connector (M-359)	10805-5	2.25
Junction (PL-258)	10805-6	1.50
Adaptor (UG-146/U)	10805-11	3.50
Adaptor (UG-83/U)	10805-12	3.10
Adaptor RG-8/U to RG-17/U	12418-12	9.00
UHF plug x 7/8" flat flange	4855	11.00
UHF plug x 3/8" end terminal	4868	8.75
UHF plug x 7/8" end terminal	12394	7.00
UHF plug x 7/8" HELIAX	20U	23.00
UHF plug x 1-5/8" HELIAX	21U	50.00
Cable assemblies		
RG-8, 2-foot length, N plugs	16253-8	8.00
RG-8, 8-foot length, UHF plugs	16253-2	6.00
RG-8, 8-foot length, N plugs	16253-20	9.00
RG-8, specify length, N plugs	11033-4	8.50 +0.17/ft.
RG-8, specify length, UHF plugs	11033-1	7.25 +0.17/ft.
RG-17, specify length, LC plugs	12992-1	30.00 +0.70/ft.
Pages 54-60 RIGID TRANSMISSION LINES		
7/8" 50 OHM RIGID LINE		
20-foot section	560	54.00
Special length	2760	18.00 +0.25/in.
Miter elbow	1060M	26.00
Gas barrier	1260	32.00
Soft solder field flange kit	1560A	9.00
Adaptor to Type N jack	2260	20.00
Adaptor to LC jack	2360	32.00
Reducer	1860	40.00
Adaptor, 7/8" EIA x 740	4850	5.00
Inner connector	18275	4.00
Fixed flange kit	18630	4.00
Swivel flange kit	18096	8.50
Spare hardware kit	11381-1	1.00
"O" ring gasket	10683-11	0.20
1-5/8" 50 OHM RIGID LINE		
20-foot section	561	78.00
Special length	2761	30.00 +0.35/in.
20-foot section (aluminum outer)	561AL	78.00
Special length (aluminum outer)	2761AL	30.00 +0.35/in.
Miter elbow	1061M	48.00
Miter elbow (aluminum outer)	1061MAL	48.00
Gas barrier	1261A	60.00
Soft solder field flange kit	1561A	18.00
Adaptor to Type N jack	2261	42.00

DESCRIPTION	TYPE NO.	PRICE
Pages 54-60 RIGID TRANSMISSION LINES-Cont.		
Adaptor to Type LC jack	2361	$ 58.00
Flexible section	20695	140.00
Inner connector	15069	8.00
Reducer, Type 561 to 562A	1861	75.00
Reducer, Type 561 to 560	1860	40.00
Inner adaptor, 1-5/8" EIA flange to 1-5/8" flat flange	4851	10.00
Fixed flange kit	18631	6.00
Swivel flange kit	18041	10.00
Spare hardware kit	11381-2	1.50
"O" ring gasket	10683-2	0.25
Unpressurized straight coupling	21205	8.00
Stainless steel spare clamp	11809-2	0.75
Silver solder ring	10419-2	0.15
3-1/8" 50 OHM RIGID LINE		
20-foot section	562A	140.00
Special length	2762A	40.00 +0.70/in.
20-foot section (aluminum outer)	562AL	140.00
Special length (aluminum outer)	2762AL	40.00 +0.70/in.
Miter elbow, extra heavy brass	1062M	80.00
Miter elbow, extra heavy brass, no flanges	1062M-2	40.00
Miter elbow, aluminum	1062MAL	80.00
Miter elbow, 45 degree	1162M	90.00
Miter elbow, 45 degree, no flanges★	1162M-2	50.00
Reducer connects 562A to 561	1861	75.00
Gas inlet coupling	1362	45.00
Gas barrier	1262A	75.00
Soft solder field flange kit	1562A	36.00
Reducer connects 562A to 573	1872	240.00
Adaptor to Type N	2262	80.00
Reducer connects 562A to 563	1862	240.00
Impedance transformer		
Channels 2 through 6	4859-1	40.00
Channels 7 through 13	4859-2	20.00
Inner adaptor, 562A to 552	4857	10.00
Inner adaptor, 562A to 452	4852	10.00
Ungassed coupling	4862	24.00
Spare inner connector	15093	20.00
Fixed flange kit	15840	10.00
Breakaway section	2962	200.00
Flexible section	19209	300.00
6-1/8" 50 OHM RIGID LINE		
20-foot section	573	420.00
Special length	2773	150.00 +1.40/in.
Miter elbow	1073M	230.00
Reducer connects 573 to 562A	1872	240.00
Gas barrier	1273	240.00
Spare inner connector	18092	60.00
Soft solder field flange kit	1573A	70.00
Swivel flange kit	18110	34.00
"O" ring gasket	10683-10	1.20
Hardware for pair of flanges	21206	8.00
Adaptor, 583 to 573	21207	240.00
6-1/8" 50 OHM HIGH PEAK POWER LINE		
20-foot section	583	480.00
Special length	2783	180.00 +1.50/in.
Miter elbow	1083M	250.00
Inner connector★	19885	80.00
Exterior accessories, such as hardware and gaskets are the same as those shown for Type 573.		
6-1/8" 75 OHM RIGID LINE		
20-foot section	563	420.00
Special length	2763	150.00 +1.40/in.
Miter elbow, 90 degree	1063M	230.00
Miter elbow, 45 degree	1163M	230.00
Spare inner connector	15236	60.00
Soft solder field flange kit	1563A	70.00
Swivel flange kit	18110	34.00
"O" ring gasket	10683-10	1.20
Hardware for pair of flanges	21206	8.00
Reducer to 50 ohm, 3-1/8"	1862	240.00
9" 50 OHM RIGID LINE		
20-foot section	586	875.00
Special length	2786	320.00 +3.00/in.

★ Not listed in catalog

DESCRIPTION	TYPE NO.	PRICE
Pages 54-60 RIGID TRANSMISSION LINES-Cont.		
Miter elbow, 90 degree	1086M	$ 320.00
Miter elbow, 45 degree★	1186M	320.00
Gas barrier	1286	375.00
Reducer, 586 to 573	1873	600.00
Reducer, 586 to 573	18362	600.00
Flange clamp	17008	46.00
Flange ring kit	18894	21.00
Inner connector	16972A	150.00
"O" ring gasket	10683-51	4.00
Spring hanger	18409	180.00
Rigid hanger	18365	110.00
Horizontal hanger	20985	40.00
Page 61 COAXIAL SWITCH		
Coaxial switch	6710	1,100.00
Page 62 3-1/8" 180 OHM TRANSMISSION LINE		
20-foot length with flanges	14208	146.00
20-foot length, unflanged	14208-2	128.00
Special length with flanges	15736	82.00 +0.48/in.
90 degree elbow	14547	60.00
45 degree elbow	15254	60.00
End terminal	14544	40.00
Fixed flange	10881	5.75
Inner connector	14548-1	3.00
"O" ring gasket	10683-3	0.45
Silver solder ring	10419-11	0.25
Bulkhead flange	15249	20.00
Hardware for set of flanges	11381-3	1.60
Swivel flange	14486	14.00
Page 63 RIGID COPPER TUBING		
0.875 O.D. x 0.785 I.D. x 80	10570A-6	5.00
0.341 O.D. x 0.291 I.D. x 80	10570A-52	2.00
1.625 O.D. x 1.527 I.D. x 80	10570A-9	10.50
0.664 O.D. x 0.588 I.D. x 80	10570A-49	4.50
3.125 O.D. x 3.027 I.D. x 80	10570A-12	20.00
1.315 O.D. x 1.231 I.D. x 80	10570A-48	7.50
6.125 O.D. x 5.981 I.D. x 80	10570A-16	65.00
1.711 O.D. x 1.661 I.D. x 80	10570A-51	7.50
2.600 O.D. x 2.520 I.D. x 80	10570A-45	12.00
9.000 O.D. x 8.800 I.D. x 80	10570A-58	120.00
3.820 O.D. x 3.740 I.D. x 80	10570A-59	24.00
Pages 64-67 TRANSMISSION LINE HANGERS		
Page 64 7/8" TRANSMISSION LINE HANGERS		
Rigid hanger	14328	6.00
Sliding hanger	14327	3.00
Spring hanger	13889	9.00
Insulated hanger	11662-1	4.00
Angle adaptor	11170	0.80
Angle adaptor	13555	2.00
Stainless steel wraplock	12395-1	12.50
Copper mounting strap	6104	0.15
Page 65 1-5/8" TRANSMISSION LINE HANGERS		
Rigid hanger	13924	8.00
Sliding hanger	14378	4.00
Spring hanger	14379	9.00
Insulated sliding hanger	14442	12.50
Insulated spring hanger	14441	18.50
Grounding clamp	12430	8.00
Extension spacer	13552	2.00
Dual rigid hanger	T4835	16.00
Dual spring hanger	T4834	20.00
Insulated dual spring hanger	13220	25.00
Extension spacer	13553	2.10
Spare insulator	14063	6.50
Angle adaptor	13555	2.00
Round member clamp	13550	4.00
Stainless steel wraplock	12395-1	12.50
Page 66 3-1/8" TRANSMISSION LINE HANGERS		
Rigid hanger	13927	14.00
Spring hanger	13925	12.00
Insulated spring hanger	13926	24.00

DESCRIPTION	TYPE NO.	PRICE
Pages 64-67 TRANSMISSION LINE HANGERS-Cont.		
Grounding clamp	12431	$ 12.00
Dual rigid hanger	T4836	12.00
Dual spring hanger	T4830	16.00
Insulated dual spring hanger	13221	22.00
Extension spacer	13552	2.00
Extension spacer	13553	2.10
Spare insulator	14063	6.50
Angle adaptor clamp	13555	2.00
Round member clamp	13550	4.00
Page 67 6-1/8" TRANSMISSION LINE HANGERS		
Rigid hanger	1653A	40.00
Spring hanger	13586	30.00
Insulated spring hanger	14898	55.00
HORIZONTAL MOUNTINGS		
Horizontal anchor for 7/8"	3900	18.00
Lateral brace for 1-5/8"	3921	16.00
Horizontal hanger for 1-5/8"	3911	10.00
Horizontal anchor for 1-5/8"	3901	25.00
Lateral brace for 3-1/8"	3922	18.00
Horizontal hanger for 3-1/8"	3912	15.00
Horizontal anchor for 3-1/8"	3902	40.00
Lateral brace for 6-1/8"	3923	30.00
Horizontal hanger for 6-1/8"	3913	20.00
Horizontal anchor for 6-1/8"	3903	75.00
Pages 68-69 PRESSURIZING EQUIPMENT		
Automatic dehydrator	1910	450.00
Dry air hand pump	878	48.00
Nitrogen fittings kit	858	48.00
Gas distribution manifold	6600	14.00 +12.00/ outlet
Gas inlet valve	3017	0.90
Pressure gauge	3500	3.15
Service tee	3022	0.75
Needle stem release valve	3027	3.00
Needle stem release valve	4944	4.00
Tubing cutter	13046	3.00
Flaring tool	12993	5.25
Coupling	4947	0.45
Silicone grease lubricant	12225	0.40
Vinyl tape	9905-18	0.75
Spare parts kit for 1910	1911	16.50
Flared coupling	10994-2	1.75
Coupling	10994-4	0.95
Needle stem release valve	4949	4.00
Spare hose assembly	10195	3.75
Silica gel refill	210	2.50
Pipe nipple	3026	0.40
Pipe tee	3016	0.95
Pipe plug	3018	0.50
Thread lubricant	3012	0.25
Copper tubing	10741-2	0.20/ft.
Splicing sleeve	12129	0.50
Mounting strap	6101	0.08
Pages 73-77 WAVEGUIDE		
5925-8200 WAVEGUIDE†		
10-foot flanged section	137HC	43.00
10-foot unflanged section	137HC-2	19.00
Special length	19065	20.00 +1.90/ft.
1-foot section with choke flanges★	19068-12	24.00
1-foot section with contact flanges★	19069-12	20.00
90 degree H-plane elbow	19043	36.00
90 degree E-plane elbow	19044	36.00
90 degree twist	19074	60.00
Flexible section, 12" length	19075-12	52.00
Flexible section, 18" length	19075-18	56.00
Flexible section, 24" length	19075-24	62.00
Flexible section, 36" length	19075-36	72.00
Flexible section, 48" length	19075-48	82.00
Pressure adaptor, gas inlet, 6"	19076	24.00
Pressure adaptor choke flanges, both ends 6"★	19077	26.00

† Normally shipped from California
★ Not listed in catalog

DESCRIPTION	TYPE NO.	PRICE

Pages 73-77 WAVEGUIDE - Cont.

5925-8200 WAVEGUIDE† - Cont.

Pressure window	19078	$ 40.00
Pressure gauge assembly	19085	6.00
Transition to Type N★	19079	110.00
Choke flange (UG-343A/U)	19690	9.00
Contact flange (UG-344/U)	19048	7.00
Rigid hanger	19007-1	11.00
Sliding hanger	19008-1	10.00
Spring hanger	19009-1	21.00
Feed-thru	6413	35.00
Hardware kit	19084	2.00
WR-975 WAVEGUIDE		
10-foot section	975	240.00
Special length★	16804	150.00 +14.00/ft.
90 degree E-plane elbow	16726	260.00
90 degree H-plane elbow	16727	320.00
Transition to 3-1/8" Type 562A	16733	380.00
Field flange kit	18962	48.00
WR-1150 WAVEGUIDE		
10-foot section	1150	260.00
Special length★	2764	150.00 +14.00/ft.
90 degree E-plane elbow	E1064	280.00
90 degree H-plane elbow	H1064	340.00
Transition to 3-1/8" Type 562A	1864A	310.00
Field flange kit	1564A	40.00
WR-1500 WAVEGUIDE		
10-foot section	1500	290.00
Special length★	2765	160.00 +16.50/ft.
90 degree E-plane elbow	E1065	330.00
90 degree H-plane elbow	H1065	330.00
Transition to 3-1/8" Type 562A	1865A	350.00
Field flange kit	1565A	50.00
WR-2100 WAVEGUIDE		
20-foot section	2100	925.00
Special length, flanged★	21215	235.00 +3.00/in.

DESCRIPTION	TYPE NO.	PRICE

Pages 73-77 WAVEGUIDE - Cont.

Special length, unflanged★	21216	$ 110.00 +3.00/in.
90 degree E-plane elbow	21005	350.00
90 degree H-plane elbow	21090	350.00
Transition to 3-1/8" Type 562A	21295	420.00
Transition to 6-1/8" Type 573	21192	444.00
Slotted section	21398	3,000.00
Directional coupler	21214	660.00
Gas barrier	20928	145.00
Transition to WR-2300	21213	650.00
H-plane wye switch	21006	2,700.00
Flange	19934-3	38.50
Special angle elbow, E-plane★	21217	300.00*
Special angle elbow, H-plane★	21218	300.00*

*Plus $5.50 per degree over 30 degrees, plus $3.00 per inch for tangent sections longer than six inches. Maximum tangent section is eighteen inches under this pricing.

Page 78 TELESCOPING MASTS ▲

150-foot stainless steel mast	3306	on app.
100-foot stainless steel mast	3300	4,600.00
100-foot stainless steel mast with trailer	3301	7,000.00
50-foot aluminum mast, hand pump	A3303	4,250.00
50-foot aluminum mast, motor operated	A3303A	4,400.00
30-foot stainless steel mast	S3302	1,900.00
30-foot aluminum mast	A3302	1,500.00

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Housed variable capacitor	11744	75.00

† Normally shipped from California
★ Not listed in catalog

▲ F.O.B. Wooster, Ohio.

NUMERICAL LISTING OF TYPE NUMBER WITH PRICE and PAGE REFERENCE

Type No.	Price	Page
HO	$ 1.50/ft.	45
H1	3.40/ft.	45
H2	10.00/ft.	45
H3	0.75/ft.	48
HR4	200.00	19
M4	50.00	17
P4-9	250.00	12
P4-17	275.00	12
P4-18	275.00	12
P4-24	275.00	12
P4-59	275.00	12
P4-65	275.00	12
P4-71	275.00	12
P4-107	275.00	12
P4-127	275.00	12
PH4	200.00	18
R4	100.00	19
T4	75.00	17,38
H5	1.75/ft.	48
HR6	350.00	19
P6-9	350.00	12
P6-17	675.00	12
PX6-17	375.00	12
P6-18	375.00	12
P6-24	375.00	12
P6-59	375.00	12
P6-65	375.00	12
P6-71	375.00	12
PH6	300.00	18
R6	200.00	19
H7	3.75/ft.	48
HR8	650.00	18
M8	100.00	17,38
P8-37	750.00	12
P8-59	750.00	12
P8-65	750.00	12
P8-71	750.00	12
PH8	400.00	18
R8	450.00	19
T8A	150.00	17
P10-9	1,125.00	12
PX10-9	1,400.00	12
P10-17	1,150.00	12
P10-18	1,150.00	12
P10-24	1,150.00	12
P10-37	1,200.00	12
P10-59	1,200.00	12
P10-65	1,200.00	12
P10-71	1,200.00	12
PH10	600.00	18
20L	40.00	46,52
20M	40.00	46,52
20N	23.00	46,53
20R	23.00	46
20T	30.00	46
20U	23.00	46,53
21L	50.00	47,52
21N	50.00	47,53
21R	50.00	47
21S	65.00	47
21U	50.00	47,53
22R	100.00	47
65N	12.00	48
65R	12.00	48
65U	12.00	48
67N or 67R	40.00	48
67S	45.00	*
67U	40.00	48
75N	16.00	48
75R	16.00	48
75U	16.00	48
77N or 77R	50.00	48
77S	55.00	*
77U	50.00	48
83A	0.80/ft.	49
83AL	0.75/ft.	49
113	260.00	26
114	160.00	26
116	70.00	32
117	180.00	32
137HC	43.00	73
137HC-2	19.00	73
201	275.00	36
210	2.50	69
212	500.00	36
213	500.00	36
225A	35.00	33
233A	17.50	37
234A	17.50	37
262	240.00	27
262-4	525.00	27
S450	$ 1.35/ft.	50
560	54.00	55
561	78.00	55
561AL	78.00	55
562A	140.00	55
562AL	140.00	55
563	420.00	55
573	420.00	55
583	480.00	55
586	875.00	55
740	15.00+1.35/ft.	50
858	48.00	69
878	48.00	69
900A-0	140.00	23
900A-1	70.00	23
900A-2	65.00	23
900A-3	85.00	23
900A-4	70.00	23
H900A-0	500.00	23
H900A-1	240.00	23
H900A-2	220.00	23
H900A-3	180.00	23
H900A-4	140.00	23
G901	5.00	23
H901	5.00	23
SC901	18.00	23
SN901	5.00	23
920C-1	175.00	25
920C-2	150.00	25
920C-3	100.00	25
920C-4	100.00	25
920C-5	80.00	25
H920C-1	500.00	25
H920C-2	360.00	25
H920C-3	360.00	25
H920C-4	300.00	25
H920C-5	150.00	25
925A	35.00	23
H925A	80.00	23
926C-0	60.00	25
926C-1	60.00	25
926C-2	60.00	25
H926C-0	100.00	25
H926C-1	100.00	25
H926C-2	100.00	25
975	240.00	74
980	1.10	51
980GV	6.00	51
990	0.80	49
990GV	4.00	49
1060M	26.00	46,56
1061M	48.00	47,57
1061MAL	48.00	57
1062M	80.00	58
1062MAL	80.00	58
1062M-2	40.00	58
1063M	230.00	59
E1064	280.00	75
H1064	340.00	75
E1065	330.00	75
H1065	330.00	75
1073M	230.00	59
1083M	250.00	59
1086M	320.00	60
1150	260.00	74
1162M	90.00	58
1162M-2	50.00	*
1163M	230.00	59
1186M	320.00	*
1260	32.00	56
1261A	60.00	57
1262A	75.00	58
1273	240.00	59
1286	375.00	60
1302-1	550.00	41
1302-2	550.00	41
1304-1	1,150.00	41
1304-2	1,150.00	41
X1304	4,800.00	41
1306-1	2,400.00	41
1306-2	2,400.00	41
1308-1	3,200.00	41
1308-2	3,200.00	41
1362	45.00	58
1500	290.00	74
1560A	9.00	56
1561A	18.00	57
1562A	36.00	58
1563A	70.00	59
1564A	40.00	76
1565A	50.00	76
1573A	$ 70.00	59
1653A	40.00	67
1701AGV	12.00	49
1701AP	8.00	49
1701AR	10.00	49
1703AGV	16.00	51
1703AP	11.00	51
1703AR	14.00	51
1860	40.00	56,57
1861	75.00	41,57,58
1862	240.00	58,59
1864A	310.00	76
1865A	350.00	76
1872	240.00	58,59
1873	600.00	60
1910	450.00	68
1911	16.50	69
2050	12.50	51
2100	925.00	74
2260	20.00	53,56
2261	42.00	53,57
2262	80.00	58
2360	32.00	52,56
2361	58.00	52,57
2760	18.00+0.25/in.	55
2761	30.00+0.35/in.	55
2761AL	30.00+0.35/in.	55
2762A	40.00+0.70/in.	55
2762AL	40.00+0.70/in.	55
2763	150.00+1.40/in.	55
2764	150.00+14.00/ft.	*
2765	160.00+16.50/ft.	*
2773	150.00+1.40/in.	55
2783	180.00+1.50/in.	55
2786	320.00+3.00/in.	55
2962	200.00	58
3000A	800.00	36
3004	800.00	36
3006	4,000.00	36
3008	800.00	36
3012	0.25	69
3016	0.95	69
3017	0.90	69
3018	0.50	69
3022	0.75	69
3026	0.40	69
3027	3.00	69
3300	4,600.00	78
3301	7,000.00	78
A3302	1,500.00	78
S3302	1,900.00	78
A3303	4,250.00	78
A3303A	4,400.00	78
3306	on app.	78
3500	3.15	69
3600A	700.00	31
3601A	450.00	31
3602A	390.00	31
S3602A	1,000.00	31
3605A	100.00	31
S3605A	250.00	31
3606A-2	80.00	31
3608A-2	145.00	31
3625	230.00	31
S3625	580.00	31
3626	180.00	31
3628	240.00	30
3645	480.00	31
S3645	1,080.00	31
3646	375.00	31
3648	440.00	30
3900	18.00	67
3901	25.00	67
3902	40.00	67
3903	75.00	67
3911	10.00	67
3912	15.00	67
3913	20.00	67
3921	16.00	67
3922	18.00	67
3923	30.00	67
4000	275.00	36
4002	120.00	36
4010-1	500.00	36
4010-2	500.00	36
T4830	16.00	66
T4834	20.00	65
T4835	16.00	65
T4836	12.00	66
4850	5.00	46,56
4851	10.00	41,47,57
4852	$ 10.00	58
4855	11.00	51,53
4857	10.00	58
4859-1	40.00	58
4859-2	20.00	58
4862	24.00	58
4868	8.75	49,53
4944	4.00	69
4947	0.45	69
4949	4.00	69
6101	0.08	69
6102	0.10	49
6104	0.15	51,64
6413	35.00	73
6600	14.00+12.00/outlet	69
6710	1,100.00	61
8319A	1.00	49
8328E	2.50	51
8329A	10.00	49
9905-18	0.75	69
10195	3.75	69
10419-2	0.15	57
10419-11	0.25	62
10570A-6	5.00	63
10570A-9	10.50	63
10570A-12	20.00	63
10570A-16	65.00	63
10570A-45	12.00	63
10570A-48	7.50	63
10570A-49	4.50	63
10570A-51	7.50	63
10570A-52	2.00	63
10570A-58	120.00	63
10570A-59	24.00	63
10674	6.00	24
10683-2	0.25	57
10683-3	0.45	62
10683-10	1.20	59
10683-11	0.20	56
10683-51	4.00	60
10741-2	0.20/ft.	69
10791-1	0.17/ft.	52
10791-7	0.70/ft.	52
10804-4	1.25	53
10804-6	1.75	53
10804-10	3.00	33,53
10804-11	2.10	53
10804-12	2.00	53
10804-14	1.90	53
10805-1	0.80	33,53
10805-2	0.95	53
10805-4	3.00	53
10805-5	2.25	53
10805-6	1.50	23,53
10805-11	3.50	53
10805-12	3.10	53
10805-13	3.00	53
10881	5.75	62
10994-2	1.75	69
10994-4	0.95	69
11033-1	7.25+0.17/ft.	52
11033-4	8.50+0.17/ft.	52
11170	0.80	64
11381-1	1.00	56
11381-2	1.50	57
11381-3	1.60	62
11662-1	4.00	51,64
11744	75.00	82
11809-2	0.75	57
12129	0.50	69
12225	0.40	69
12291A	11.00	51,53
12394	7.00	51,53
12395-1	12.50	47,51, 64,65
12418-1	8.00	52
12418-3	8.00	52
12418-5	6.00	52,53
12418-7	7.50	52
12418-12	9.00	52,53
12423	17.50	51,52
12430	8.00	65
12431	12.00	66
12613	20.00	29
12692A	28.00	51,52
12982	30.00	20
12992-1	30.00+0.70/ft.	52
12993	5.25	69
13046	3.00	51,69
13074A	13.00	29

* Not listed in the catalog

Type No.	Price	Page
13074A-1	$ 10.00	29
13137	8.00	51
13220	25.00	65
13221	22.00	66
13223A-1	9.75	51
13223A-2	6.00	51
13244-2	2.50	51
13550	4.00	38,65,66
13552	2.00	65,66
13553	2.10	65,66
13555	2.00	64,65,66
13575	30.00	29
13586	30.00	67
13889	9.00	64
13924	8.00	65
13925	12.00	66
13926	24.00	66
13927	14.00	66
13967	6.00	33
14063	6.50	65,66
14139	8.00	51
14142-2	80.00	25
14142-3	50.00	25
14208	146.00	62
14208-2	128.00	62
14327	3.00	64
14328	6.00	64
14378	4.00	65
14379	9.00	65
14441	18.50	65
14442	12.50	65
14486	14.00	62
14544	40.00	62
14547	60.00	62
14548-1	3.00	62
14558	160.00	20
14671	35.00	26
14671-2	16.50	37
14672	35.00	26
14865	70.00	20
14898	55.00	67
15010	150.00	33
15069	8.00	47,57
15093	20.00	58
15200	600.00	41
15236	60.00	59
15249	20.00	62
15254	60.00	62
15681	11.00	37
15714	$ 20.00	*
15736	82.00+0.48/in.	62
15840	10.00	58
16018	12.00	29
16253-2	6.00	23,29,52
16253-8	8.00	33,52
16253-20	9.00	52
16551	4.00	51
16684	4.50	37
16726	260.00	75
16727	320.00	75
16733	380.00	76
16804	150.00+14.00/ft.	*
16907	60.00	20
16972A	150.00	60
17008	46.00	60
17500-1	0.30	47
17500-2	0.35	47
17526	40.00	28
17673	70.00	20
18041	10.00	57
18092	60.00	59
18096	8.50	56
18110	34.00	59
18238	160.00	20
18242	250.00	20
18275	4.00	46,56
18362	600.00	60
18365	110.00	60
18409	180.00	60
18420-1	580.00	20
18630	4.00	56
18631	6.00	57
18894	21.00	60
18962	48.00	76
19007-1	11.00	73
19008-1	10.00	73
19009-1	21.00	73
19043	36.00	73
19044	36.00	73
19048	7.00	73
19050-1	110.00	38
H19050-1	235.00	38
H19050-2	150.00	38
19065	20.00+1.90/ft.	73
19068-12	24.00	*
19069-12	20.00	*
19074	60.00	73
19075-12	52.00	73
19075-18	$ 56.00	73
19075-24	62.00	73
19075-36	72.00	73
19075-48	82.00	73
19076	24.00	73
19077	26.00	*
19078	40.00	73
19079	110.00	*
19084	2.00	73
19085	6.00	73
19110N-1	1,500.00	38
19110N-2	325.00	38
19110N-3	350.00	38
19110N-4	200.00	38
19110N-5	110.00	38
H19110N-1	2,400.00	38
H19110N-2	550.00	38
H19110N-3	575.00	38
H19110N-4	325.00	38
H19110N-5	200.00	38
19122	on app.	39
19140	145.00	38
H19140	270.00	38
19209	300.00	58
19248	5.00	47
19249	6.00	47
19256	5.00	47
19257	12.00	47
19452	40.00	30
19690	9.00	73
19875	25.00	20
19876	25.00	20
19885	80.00	*
19890-2	4,200.00	42
19890-3	4,200.00	42
19890-4	4,200.00	42
19890-5	4,200.00	42
19890-6	4,200.00	42
19890-7	1,600.00	42
19890-8	1,600.00	42
19890-9	1,600.00	42
19890-10	1,600.00	42
19890-11	1,600.00	42
19890-12	1,600.00	42
19890-13	1,600.00	42
19893	800.00	41
19934-3	38.50	76
20695	140.00	57
20712	120.00	19
20896	$ 4.00	24
20897	8.00	24
20898	8.00	24
20928	145.00	76
20985	40.00	60
21005	350.00	75
21006	2,700.00	76
21090	350.00	75
21131	35.00	36
21156-2	5,200.00	42
21156-3	5,200.00	42
21156-4	5,200.00	42
21156-5	5,200.00	42
21156-6	5,200.00	42
21156-7	2,600.00	42
21156-8	2,600.00	42
21156-9	2,600.00	42
21156-10	2,600.00	42
21156-11	2,600.00	42
21156-12	2,600.00	42
21156-13	2,600.00	42
21192	444.00	76
21201	400.00	20
21202	500.00	12,20,42
21203	1,200.00	20
21205	8.00	57
21206	8.00	59
21207	240.00	59
21208	3.00	24,25
21209	30.00	30
21210-2	160.00	41
21210-4	320.00	41
21210-6	480.00	41
21210-8	640.00	41
21212N	8.00	48
21212U	8.00	48
21213	650.00	76
21214	660.00	76
21215	235.00+3.00/in.	*
21216	110.00+3.00/in.	*
21217	300.00**	*
21218	300.00**	*
21295	420.00	76
21398	3,000.00	76
50140	300.00	38
H50140	575.00	38
80420	3,000.00	39
80422	500.00	39
80427	8,000.00	39

* Not listed in the catalog

**Plus $5.50 per degree over 30 degrees, plus $3.00 per inch for tangent sections longer than six inches. Maximum tangent section is eighteen inches under this pricing.

GENERAL INFORMATION ON OUR SALES POLICIES

PRICES

All prices listed herein are net, f. o. b. point of shipment, which is Chicago, Illinois or Claremont, California for warehouse stock items and Orland Park, Illinois for items shipped from factory. This price list supersedes all previous lists, but is itself subject to change without notice. Current quotations which are held firm for 30 days may be obtained by writing the ANDREW Sales Department. Our prices do not include federal, state, or local sales or excise taxes. Where applicable, these will be added to the amounts billed.

TERMS

Shipments on open account are made only after approval of our Credit Department. Otherwise, we ship C.O.D., or upon receipt of advance payment.

Invoices on "open account" shipments are payable within 30 days of invoice date, which coincides with date of shipment. When a cash discount is offered, the discount period of 10 days is computed from the date of invoice, not from the date of arrival of goods at your premises.

We do not offer cash discounts on C.O.D. shipments.

SHIPMENTS

Shipments are normally made with transportation charges collect, by the carrier you specify. However, if you prefer to have shipping charges prepaid and billed to you (on open account shipments), we shall be glad to do this. In the event your order does not indicate a carrier, we shall select one, but we cannot be held responsible for selecting the cheapest or fastest one.

Except for obligations stated under "Warranty" our responsibility for merchandise ceases upon delivery to the carrier. In the event of loss or damage during shipment, your claim should be made against the carrier. Claims for shortages must be made within 30 days after shipment.

Unless we agree otherwise at the time your order is placed, we reserve the liberty to make partial shipments, and to submit invoices for partial shipments, payable in accordance with our standard terms.

Shipping schedules are approximate. We adhere to schedule as nearly as possible, but assume no responsibility for delays.

As production schedules are geared to delivery dates indicated on your original order, you will be asked to absorb reasonable additional costs due to any deferment of delivery which you may subsequently make.

RETURNED MERCHANDISE

Please do not return excess or unused merchandise for credit without our written authorization. We reserve the right to decline all returns, or to accept them subject to a handling charge of not less than 15%. Even after we have authorized the return of goods for credit, we reserve the right to adjust our offer in accordance with condition of the goods on arrival in our plant. In no case will we offer credit for goods returned six months or more after shipment.

Credit for returned merchandise is issued only to the original purchaser, and not to subsequent owners of the goods.

FOREIGN ORDERS

On orders originating outside continental United States and Canada, we require either payment in advance of shipment, or an irrevocable and confirmed Letter of Credit, placed on a Chicago Bank.

Orders originating in Western Hemisphere countries, other than Canada and the United States and its territories, are handled exclusively by ANDREW International Corporation, 361 East 75th Street, Chicago 19, Illinois, U.S.A.

In Canada, orders should be referred to ANDREW Antenna Corporation, Ltd., 606 Beech Street, Whitby, Ontario.

ORDERS FROM WESTERN STATES

Orders originating in the States of Arizona, California, Idaho, Nevada, New Mexico, Oregon, Utah and Washington should be referred to ANDREW CALIFORNIA CORPORATION, 941 East Marylind Avenue, Claremont, California. Shipments are f. o. b. Claremont for items manufactured or warehoused at Claremont and f. o. b. Orland Park, Illinois for items shipped from ANDREW CORPORATION. Orders placed on ANDREW CALIFORNIA CORPORATION are subject to acceptance at Claremont and will be construed in accordance with California law.

WARRANTY

Equipment manufactured or sold by us is subject to a warranty against defects in material and workmanship under normal use and service for a period of one year from the date of delivery. Our obligation under this warranty is limited to the repair or replacement of defective parts, f.o.b. our factory. This warranty is valid only if our inspection upon the return of defective parts to us, properly packed and with transportation charges prepaid by the buyer, shall reveal the defects to our satisfaction. We make no warranty other than the one set forth above. In no event do we assume liability for installation labor or consequential damages.

PATENTS

In the event that suit is brought against the purchaser, alleging infringement of patents, we reserve the right to substitute for apparatus which is alleged to infringe, other equally suitable apparatus, without altering conditions of this sale. We shall also have the right to take back infringing equipment, refunding only purchase price less reasonable allowance for use.

TOOLS

Unless otherwise expressly provided, we shall retain title to and possession of all models, patterns, dies or tools.

RETURNABLE SHIPPING REELS

Invoices for shipping reel deposits are payable on the same basis as invoices for other ANDREW equipment. Where a reel deposit has been charged, we shall issue credit for return of the reel, in good condition, f.o.b. our factory, provided the return is made within one year from the date of original shipment. If you return a reel, transportation charges collect, we shall deduct transportation charges from the credit issued.

MODIFICATIONS

We reserve the right to modify specifications of equipment, provided the modification does not materially affect performance.

PLACE OF ACCEPTANCE

Orders are valid only when accepted at our offices in Chicago, Illinois. The contract shall be construed in accordance with Illinois law.

ANDREW

Andrew®
CORPORATION