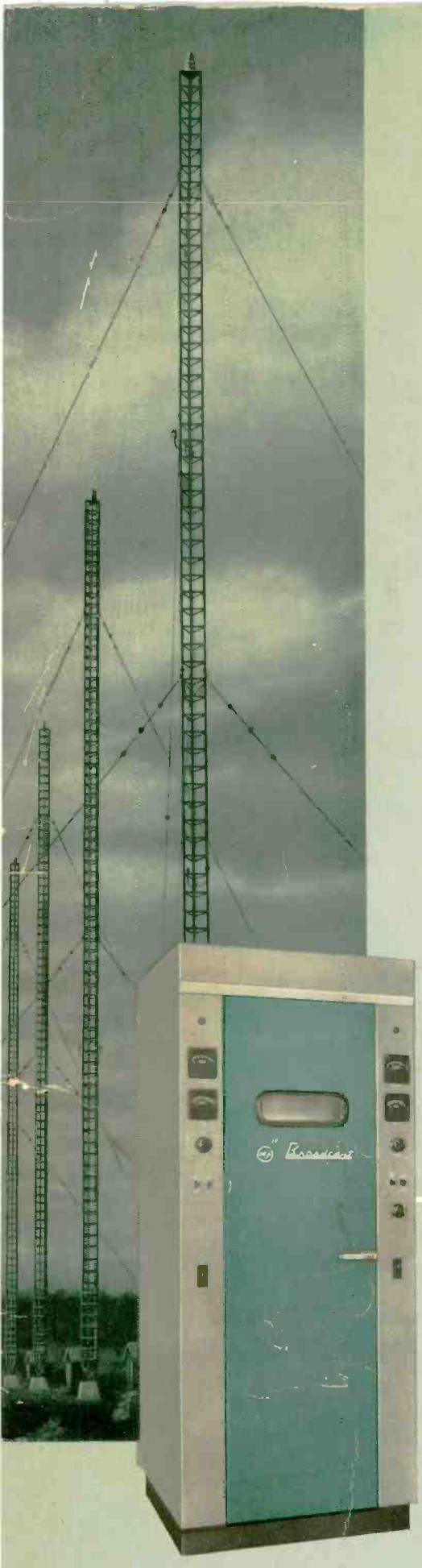
2
EDITION



RCA

BROADCAST
TRANSMITTING
EQUIPMENT

for

AM and FM

AM TRANSMITTERS
REMOTE CONTROL
PHASING
LINE TERMINATING
INPUT & MONITORING
TRANSMISSION LINES
TOWERS
ACCESSORIES

BROADCAST AM-FM TRANSMITTING EQUIPMENT CATALOG

(Second Edition)

PRICE $1.00

RADIO CORPORATION OF AMERICA

Broadcast and Television Equipment Camden, N. J.

ABOUT THIS CATALOG

This Catalog is devoted solely to information on RCA radio broadcast equipment designed especially for AM-FM broadcast station use. Other RCA Broadcast Equipment Catalogs contain similar information on audio equipment, TV transmitters, TV cameras, film and terminal equipment, TV antennas, TV transmission line, and TV test equipment.

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

OTHER RCA TECHNICAL PRODUCTS

The RCA television equipment described in this catalog is specifically designed for broadcast station use. RCA also manufactures many other electronic products including: two-way radio and microwave radio communication equipment; optical and magnetic film recording equipment; sound systems of all types; 16mm projectors and magnetic recorders; industrial inspection and automation equipment; scientific instruments, such as the electron microscope; industrial television systems; intercoms; and many types of custom-built equipment for industry, the military, educational and medical services. Information describing these products may be obtained from RCA Regional Offices.

PRICE LIST

FOR

Broadcast AM-FM Transmitting Equipment

PRICES EFFECTIVE JANUARY 1, 1960

Broadcast and Television Equipment
Radio Corporation of America
Camden, N. J.

ORDERING INFORMATION

RCA broadcast equipment is sold directly to broadcast stations through the Broadcast Field Sales Representatives operating out of the convenient field offices listed below. These Broadcast specialists are available to assist you in discussing the application of broadcast equipment.

In ordering equipment, please indicate the Master Item (MI) number for each equipment. This will help us to speed the shipment to you. You will find the Master Item (MI) numbers are used to identify the equipment on the invoices and packing slips.

The Purchaser shall be responsible for all transportation charges, and shipments will normally be forwarded with shipping charges "collect." However, shipping charges can be prepaid and added to the billing invoice if your purchase order authorizes this method. We suggest that you consider the latter procedure since it eliminates the necessity of having petty cash on hand at the time of delivery. Your purchase order should specify the method of transportation desired, otherwise RCA will use its best judgment. The cheapest method of transportation is not always used as this may not always result in the most rapid delivery. Certain items, such as vacuum tubes, are usually shipped by Express because of the design of carrying container, insurance, etc.

Field Offices

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

Rhodes-Haverty Bldg., Rm. 1121
134 Peachtree Street, N.W.
ATLANTA 3, GEORGIA
Jackson 4-7703

200 Berkeley Street
BOSTON 16, MASSACHUSETTS
Hubbard 2-1700

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

1600 Keith Building
CLEVELAND 15, OHIO
Cherry 1-3450

7901 Empire Freeway
DALLAS 35, TEXAS
Fleetwood 2-3911

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

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

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

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

2250 First Avenue, South
SEATTLE 4, WASHINGTON
Main 2-8350

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

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AM-FM Transmitting Equipment Price List

AM-FM TRANSMITTING EQUIPMENT

AM TRANSMITTERS

Catalog Page	MI Number	Type Number	Description	Price
5-8	ES-28937	BTA-250M	250 Watt AM Broadcast Transmitter	$ 2,945.00
8	28049	—	Complete Set of Spare Tubes for BTA-250M Transmitter	88.90
8	28084	—	FCC Spare Set of Tubes for BTA-250M Transmitter	44.45
9-12	ES-27237	BTA-500R	500 Watt AM Broadcast Transmitter	4,500.00
12	27658	—	Complete Set of Spare Tubes for BTA-500R Transmitter	173.24
12	27659	—	FCC Spare Set of Tubes for BTA-500R Transmitter	115.68
12	ES-34210	—	Conelrad Conversion Kit for BTA-500R (e)	450.00
12	ES-28099-A	—	Power Cutback Kit for BTA-500R	135.00
13-16	ES-27238	BTA-1R	1 KW AM Broadcast Transmitter	4,990.00
16	27695	—	Complete Set of Spare Tubes for BTA-1R Transmitter	227.24
16	27696	—	FCC Spare Set of Tubes for BTA-1R Transmitter	119.18
16	34209	—	Conelrad Conversion Kit for BTA-1R (e)	450.00
16	28099-A	—	Power Cutback Kit for BTA-1R	135.00
17-24	ES-27239	BTA-5R	5 KW AM Broadcast Transmitter	15,900.00
17-24	ES-34206	BTA-5R1	5 KW AM Broadcast Transmitter (silicon high voltage rectifier)	16,900.00
24	ES-27288	—	Complete Set of Spare Tubes for BTA-5R Transmitter	975.83
24	ES-34207	—	Complete Set of Spare Tubes for BTA-5R1 Transmitter	926.00
24	ES-27289	—	FCC Spare Set of Tubes for BTA-5R Transmitter	492.98
24	ES-34208	—	FCC Spare Set of Tubes for BTA-5R1 Transmitter	468.38
24	34312-1	—	Conelrad Conversion Kit (e)	850.00
24	34312-2	—	Power Cutback Kit for BTA-5R/5R1 (5000 watts to 1000 watts) (e)	145.00
24	34312-3	—	Power Cutback Kit for BTA-5R1 (1000 watts to 500 watts) (e)	850.00
25-32	ES-28940-A	BTA-10H	10 KW AM Broadcast Transmitter	20,975.00
32	ES-27073	—	Complete Set of Spare Tubes for BTA-5H Transmitter	1,168.30
32	ES-27074	—	FCC Spare Set of Tubes for BTA-5H Transmitter	617.65
32	ES-27073/27075	—	Complete Set of Spare Tubes for BTA-10H Transmitter	1,409.30
32	ES-27074/MI-27082	—	FCC Spare Set of Tubes for BTA-10H Transmitter	635.65
32	ES-28944	—	5 KW to 10 KW Power Conversion Kit (less tubes)	3,670.00
32	ES-27075	—	5 KW to 10 KW Power Conversion Set of Operating Tubes	254.30
32	28092-A	—	5 KW to 1 KW Power Change Kit for BTA-5H/10	95.00
32	27083	—	Carrier Off Protection Kit for BTA-5H/10H	On Application
32	34308-1	—	Conelrad Conversion Kit for BTA-5H/10H	Estimated at 850.00
32	28324	—	Synchro Differential Generator	48.00
33-40	ES-27221	BTA-50G	50 KW "Ampliphase" AM Transmitter	95,000.00
40	ES-27222-A	—	Complete Set of Spare Tubes for BTA-50G Transmitter	5,365.25
40	ES-27223-A	—	FCC Spare Set of Tubes for BTA-50G Transmitter	2,876.73
40	27688	—	50 KW to 10 KW Power Cutback Kit for BTA-50G	3,450.00
40	—	—	50 Cycle Conversion Kit	On Application

HF BROADCAST TRANSMITTERS

41-42	—	BHF-1A	1 KW High Frequency Broadcast Transmitter	On Application
43-44	—	BHF-10A	10 KW High Frequency Broadcast Transmitter	On Application
45-48	ES-8460	BHF-50B	50 KW High Frequency Broadcast Transmitter	On Application
48	22619	—	Frequency Source	On Application
48	8480	—	Set Small Tubes	On Application
48	8481	—	Set Large Tubes	On Application
48	28950	—	Supervisory Console	On Application
48	8476	—	Installation Material Kit	On Application
48	8471	—	Recommended Spare Parts	On Application
48	22620	—	60 Cycle Conversion Kit	On Application

FM BROADCAST TRANSMITTERS

49-52	ES-27280	BTF-5B	5 KW FM Broadcast Transmitter	13,500.00
52	ES-27282	—	Complete Set of Spare Tubes for BTF-5B	602.56
52	ES-27297	—	FCC Spare Set of Tubes for BTF-5B	563.97
52	34509	—	Spare Crystal Unit with Oven for BTF-5B	90.00
52	ES-34211	—	Auxiliary Equipment Rack (specify door color)	355.75
53-56	ES-27278	BTE-10B	10 Watt FM Exciter	2,400.00
53-56	ES-27295	BTX-1A	Subcarrier Generator	2,150.00
56	34510	—	Complete Set of Operating Tubes for BTE-10B FM Exciter	54.14

FM BROADCAST TRANSMITTERS (Continued)

Catalog Page	MI Number	Type Number	Description	Price
56	34515	—	FCC Spare Set of Tubes for BTE-10B FM Exciter	$ 43.92
56	34514	—	Complete Set of Operating Tubes for BTX-1A Subcarrier Generator	41.09
56	34519	—	FCC Spare Set of Tubes for BTX-1A Subcarrier Generator	35.20
56	34509	—	Spare Crystal for BTE-10B FM Exciter	90.00

INPUT AND MONITORING

57-58	—	—	Essential Input and Monitoring for AM Station	
58	—	—	Typical Input and Monitoring Equipments	

REMOTE CONTROL

59-62	27537/27538-A	BTR-11B	Studio and Transmitter Control Unit	945.00
59-62	27539/27526	BTR-20A	Studio and Transmitter Control Unit	1,080.00
61-62	27220	—	Two-Meter AM Monitoring Panel	125.00
61-62	27516	—	A-C Voltage Pickup	77.00
61-62	27519	—	Tower Lighting Unit	160.00
61-62	27509-A	—	Latching Relay Panel	75.00
61-62	28027-A	—	Remote R-F Pickup	69.50
62	27544	—	Tower Light Monitoring Unit	45.00
62	27543	—	Weatherproof Enclosure for MI-27544	45.00
62	27524-1	—	Combining Latching Relay	22.00
62	27755-4	—	DPDT High Power R-F Contactor	134.00
62	27545-1	—	DPDT Lower Power R-F Contactor	15.80
62	27524-3	—	4PDT Lower Power Latching Relay	28.60
62	27966	—	Remote R-F Pickup Unit (Base Currents up to 10 KW)	45.00
62	27542	—	Motor Operated J Frame Breakers	925.00
62	27687	—	Remote Control Accessory Kit for BTA-50G	975.00
62	27522	—	Remote Control Accessory Kit for BTA-250M	On Application
62	27523	—	Remote Control Accessory Kit for BTA-500MX/1MX	525.00
62	27517	—	Remote Output Control for BTA-5H/10H	250.00
62	27518	—	Remote Filament Control for BTA-5H-10H	250.00
62	27520	—	Remote Power Cutback Kit for BTA-5H/10H	160.00
62	27540	—	Miscellaneous Resistors and Parts for BTA-5H/10H	20.00
63-64	31874-A	CR-17B	Conelrad Receiver	115.00
65-66	—	CSU-15GH	450-470 mc, 15 Watt, 115-volt AC Operated Dual Frequency Transmitter-Receiver Station Unit	935.00
65-66	—	CMU-15BH/6H	450-470 mc, 15 Watt, Dual Frequency Mobile Transmitter-Receiver Unit	760.00
65-66	—	CSU-15CH	450-470 mc, 15 Watt, 115-volt AC One-Way Remote Pickup Station Unit	880.00
66	—	CX-8A1	Frequency and Modulation Monitor for Dual Frequency	282.50
66	31751-B	CX-7B	Portable Test Meter	120.00
66	—	AJIR	1000-watt Onan Power Plant	On Application
66	—	—	Kurland Combinator AC-DC Generator	On Application
66	31399-1	—	Omnidirectional Station Antenna for 450-470 mc Remote Pickup Equipment	311.95
66	3606-1	—	Directional Corner Reflector for 450-470 mc operation	80.00
66	—	116	Directional Yagi Antenna	70.00
66	31654-14	BNC	Male Transmitter Connector	7.20
66	31654-7	N	Male Antenna Connector	On Application
			Transmission Line—⅞" Coaxial	
66	31880-100	G-4	100 feet	156.50
66	31880-125	G-4	125 feet	185.25
66	31880-150	G-4	150 feet	214.00
66	31228	—	Fan Kit for use with CSU-15CH Station Unit	50.00

TUNING AND PHASING

67-74	—	—	Antenna Phasing Equipment	On Application
68	—	—	1-KW, 5-KW and 10-KW Phasing and Branching Equipment	On Application
69	—	—	Alternate 1-KW, 5-KW and 10-KW Antenna Phasing and Branching Equipment	On Application
70	—	—	1-KW, 5-KW and 10-KW Line Terminating Units	On Application
70	—	—	1-KW, 5-KW and 10-KW Open-Type Wall-Mounted Line Terminating Unit Panels	On Application

TUNING AND PHASING (Continued)

Catalog Page	MI Number	Type Number	Description	Price
71	—	—	50-KW Phasing and Branching Equipment	On Application
72	—	—	50-KW Line Terminating Units	On Application
73-74	—	—	Typical Proposal for Antenna Phasing Equipment	On Application
75-76	27767-A	BPA-21A	1-KW Antenna Tuning Unit	$ 460.00
75-75	27767-B	BPA-21B	with Remote Metering	550.00
75-76	27767-C	BPA-21C	with Remote Metering and Two-wire Lighting Choke	595.00
75-76	27767-D	BPA-21D	with Remote Metering and Three-wire Tower Lighting Choke	605.00
75-76	27725	—	250/1000 Watt Antenna Tuning Unit less Remote Meter Kit and Remote Meter	315.00
75-76	27785	—	Antenna Coupler, 1250 Watts for Series Feed	175.00
75-76	27786	—	Antenna Coupler, 1250 Watts for Shunt Feed	175.00
76	27771	—	Horn Gap	18.00
76	27798	—	Insulator Bowl	On Application
77	27789-A	BPA-5A	5 KW Antenna Tuning Unit	635.00
77	27790-A	BPA-10A	10-KW Antenna Tuning Unit	825.00
78	28903-A	BPA-50	50-KW Antenna Tuning Unit (230 ohm line)	On Application
78	28903-B	BPA-50	50-KW Antenna Tuning Unit (70/51.5 ohm line)	On Application
78	27755-1	—	SPDT RF Contactor, for use up to 17 kv at 2 mc at 25 amp	116.00
78	27755-2	—	DPDT RF Contactor, for use up to 17 kv at 2 mc at 25 amp	127.00
78	27755-3	—	SPDT RF Contactor, for use up to 22 kv at 2 mc at 25 amp	165.00
78	27755-4	—	DPDT RF Contactor, for use up to 22 kv at 2 mc at 25 amp	174.00
78	7486-B	—	3" Meter Panel and Switch, for use with LTU Weatherproof Cabinet	42.00
78	27760	—	for use with Open Panel LTU	31.50
78	27761	—	for use with Open Panel LTU with DPDT Switch	36.50
78	27762	—	Dial Counter for Variable Coil Conductor	11.50
78	27763	—	Plug-in Meter Bracket Shorting Bar and Meter Plug	18.00

TRANSMISSION LINE

79-94	—	—	AM-FM Transmission Line Equipment	
91	—	—	Coaxial Line Power Rating Data	
94	—	—	Coaxial Transmission Line Quick Reference Chart	

3/8" SOFT COPPER 72-OHM STEATITE COAXIAL LINE AND FITTINGS (MI-19306 Series)

80	19306-1	—	Transmission Line per ft.	.55
80	19306-2	—	Straight Coupling	2.60
80	19306-3	—	Straight Gas Servicing Coupling	2.00
80	19306-4	—	Reducer Coupling	18.00
80	19306-5	—	End Seal with gauge and valve	11.60
80	19306-6	—	End Seal	7.00
80	19306-7	—	Coupling Adapter	7.50
80	19306-8	—	Line Clamp	.10

7/8" SOFT COPPER 72-OHM STEATITE (MI-19307 Series) and 7/8" SOFT COPPER 51.5-OHM STEATITE (MI-19305 Series) COAXIAL LINE AND FITTINGS

81	19307-1, 19305-1	—	Transmission Line per ft.	1.34
81	19307-2, 19305-2	—	Straight Coupling, unflanged	.75
81	19307-3, 19305-3	—	Straight Coupling	14.00
81	19307-4, 19305-4	—	End Seal with gauge	15.75
81	19307-5, 19305-5	—	End Seal	12.00
81	19307-6	—	Adapter	13.00
81	19305-6	—	Straight Coupling	1.60

7/8" HARD COPPER 51.5-OHM STEATITE COAXIAL LINE AND FITTINGS (MI-19309 Series)

82	19309-1	—	Transmission Line per ft.	49.00
82	19309-1-F	—	same as MI-19309-1 except one flange omitted per ft.	42.00
82	19309-1-NF	—	same as MI-19309-1 except both flanges omitted per ft.	37.50
82	19309-2	—	90° Sweep Elbow	25.00
82	19309-2-F	—	same as MI-19309-2 except fixed flange omitted	19.50
82	19309-2-NF	—	same as MI-19309-2 except both flanges omitted	15.00
82	19309-3	—	45° Sweep Elbow	25.00
82	19309-3-F	—	same as MI-19309-3 except fixed flange omitted	19.50
82	19309-3-NF	—	same as MI-19309-3 except both flanges omitted	15.00
82	19309-4	—	Adapter Coupling	12.00
82	19309-5	—	End Seal	15.50
82	19309-6	—	Reducer Coupling	18.00
83	19309-7	—	Adapter	4.00

7/8" HARD COPPER 51.5-OHM STEATITE COAXIAL LINE AND FITTINGS (MI-19309 Series) (Continued)

Catalog Page	MI Number	Type Number	Description	Price
83	19309-8	—	90° Mitre Elbow	On Application
83	19309-9	—	Adapter	On Application
83	19309-10	—	Fixed Flange, Silver Solder	On Application
83	19309-11	—	Inner Conductor Connector	On Application
83	19309-12	—	Adapter Connector	On Application
83	19309-13	—	Inner Conductor Connector	On Application

1 5/8" HARD COPPER 72-OHM STEATITE COAXIAL LINE AND FITTINGS (MI-19310 Series)

84	19310-1	—	Transmission Line, 20-ft. Lengths	67.00
84	19310-1-F	—	same as MI-19310-1 except one flange omitted	62.00
84	19310-1-NF	—	same as MI-19310-1 except both flanges omitted	58.00
84	19310-2	—	90° Sweep Elbow	35.00
84	19310-2-F	—	same as MI-19310-2 except solid flange omitted	31.00
84	19310-2-NF	—	same as MI-19310-2 except both flanges omitted	27.00
84	19310-3	—	45° Sweep Elbow	35.00
84	19310-3-F	—	same as MI-19310-3 except solid flange omitted	31.00
84	19310-3-NF	—	same as MI-19310-3 except both flanges omitted	27.00
84	19310-4	—	Adapter Coupling	13.00
84	19310-5	—	End Seal	23.00
84	19310-11	—	Inner Conductor Connector	3.00

1 5/8" HARD COPPER 51.5-OHM VHF STEATITE COAXIAL LINE AND FITTINGS (MI-19112 Series)

86	19112-1	—	Transmission Line, 20-ft. Lengths	59.00
86	19112-1-F	—	same as MI-19112-1 except one flange omitted	53.50
86	19112-1-NF	—	same as MI-19112-1 except both flanges omitted	48.00
86	19112-2	—	90° Sweep Elbow	33.00
86	19112-2-F	—	same as MI-19112-2 except fixed flange omitted	29.00
86	19112-2-NF	—	same as MI-19112-2 except both flanges omitted	26.00
86	19112-3	—	45° Sweep Elbow	33.00
86	19112-3-F	—	same as MI-19112-3 except fixed flange omitted	29.00
86	19112-3-NF	—	same as MI-19112-3 except both flanges omitted	26.00
86	19112-4	—	Flange Adapter	13.00
86	19112-5	—	Gas Stop	17.00
86	19112-6	—	Reducer Coupling 3 1/8" to 1 5/8" (Gassed)	36.00
87	19112-7	—	Reducer Coupling 3 1/8" to 1 5/8" (Ungassed)	18.00
87	19112-8	—	Straight Coupling	5.75
87	19112-9	—	Special Inner Conductor	6.00
87	19112-10	—	O-Ring Gasket	.35
87	19112-11	—	Inner Connector	1.60
87	19112-12	—	Line Gassing Accessories	20.00
87	19112-13	—	Emergency Cover Plate	4.00
87	19112-16	—	Flange Adapter (Ungassed)	8.00
87	19112-18	—	90° Mitre Elbow	57.00
87	19112-18-F	—	same as MI-19112-18 except flange omitted on long leg	45.00
87	19112-18-NF	—	same as MI-19112-18 except both flanges omitted	41.00
87	19112-19	—	Hardware Kit	1.10
87	19112-20	—	Flange, Fixed	4.00
87	19112-21	—	Flange, Swivel	8.00
87	19112-22	—	45° Mitre Elbow	56.00
87	19112-22-F	—	same as MI-19112-22 except flange omitted on long leg	45.00
87	19112-22-NF	—	same as MI-19112-22 except both flanges omitted	41.00
87	19112-58	—	Reducer, 1 5/8" (Ungassed)	38.50
87	19112-59	—	Reducer, 1 5/8" (Gassed)	41.00
87	19112-60	—	Adapter for Ungassed Line	10.00

3 1/8" HARD COPPER 51.5-OHM VHF STEATITE COAXIAL LINE AND FITTINGS (MI-19113 Series)

88	19113-B-1	—	Transmission Line, 20-ft. Lengths	117.00
88	19113-B-1-F	—	same as MI-19113-B-1 except one flange omitted	106.00
88	19113-B-1-NF	—	same as MI-19113-B-1 except both flanges omitted	96.00
88	19113-B-1-SF	—	same as MI-19112-B-1 except one of the two flanges is a swivel flange	116.00
88	19113-B-2	—	90° Sweep Elbow	55.00
90	19113B-2-F	—	Coupling 90° Sweep Elbow less solid flange	41.00
90	19113-B-2-NF	—	Coupling 90° Sweep Elbow less both flanges	32.00
90	19113-B-3	—	Coupling 45° Sweep Elbow	55.00
90	19113-B-3-F	—	less solid flange	41.00
90	19113-B-3-NF	—	less both flanges	32.00
90	19113-C-4	—	Flange Adapter for Gassed Line	31.00
90	19113-C-5	—	Gas Stop	50.00
90	19113-C-6	—	Reducer Coupling 3 1/8" to 1 5/8"	36.00
90	19113-C-7	—	Reducer Coupling 3 1/8" to 1 5/8" for Ungassed Line	18.75
90	19113-C-8	—	Straight Coupling	7.75

3⅛" HARD COPPER 51.5-OHM VHF STEATITE COAXIAL LINE AND FITTINGS (MI-19113 Series) (Continued)

Catalog Page	MI Number	Type Number	Description	Price
90	19113-C-9	—	Special Inner Conductor	$ 22.00
90	19113-C-10	—	O-Ring Gasket	.40
90	19113-C-11	—	Inner Connector	1.90
90	19113-C-13	—	Cover Plate	8.50
90	19113-C-17	—	End Seal	41.00
90	19113-C-18	—	90° Mitre Elbow	70.00
90	19113-C-18-F	—	same as MI-19113-C-18 except flange omitted from short leg	60.00
90	19113-C-18-NF	—	same as MI-19113-C-18 except both flanges omitted	51.00
90	19113-C-19	—	Hardware Kit	1.70
90	19113-C-20	—	Fixed Flange	8.50
90	19113-C-21	—	Swivel Flange	12.00
90	19113-C-22	—	45° Mitre Elbow	70.00
90	19113-C-22-F	—	same as MI-19113-C-22 except flange omitted from short leg	68.50
90	19113-C-22-NF	—	same as MI-19113-C-22 except both flanges omitted	53.00
90	19113-C-51	—	Cut-Off Gauge	7.75
90	19113-C-53	—	Transformer, 51.5-Ohm to 50-Ohm	70.00
90	19113-C-54	—	Cut-Off Gauge	7.75
90	19113-C-55	—	Solder Type Adapter	26.75
91	19113-C-58	—	Reducer	105.00
91	19113-C-60	—	Adapter, Flanged	28.00

OPEN WIRE LINES

95	28010	#6	Hard Drawn Copper Wire for Transmission Line Conductors	On Application
95	28013	—	Transmission Line Pole and Cap	On Application
95	L-13853	—	Building Dead End Kit	On Application
95	L-13854	—	Pole Dead End Kit	On Application
95	L-13855	—	Lead-In Kit	On Application
95	L-13852	—	Bayonet Insulator Assembly	On Application

FLEXIBLE COAXIAL LINE

			Styroflex Coaxial Cable,		
96	27742-1	—	⅜" 50-ohm	per ft.	1.00
96	27743-1	—	½" 50-ohm	per ft.	1.13
96	27746-1	—	½" 70-ohm	per ft.	.941
96	27744-1	—	¾" 50-ohm	per ft.	1.464
96	27747-1	—	¾" 70-ohm	per ft.	1.324
96	27745-1	—	⅞" 50-ohm	per ft.	1.94
96	27748-1	—	⅞" 70-ohm	per ft.	1.454
96	27779-1	—	1⅛" 50-ohm	per ft.	2.518
96	27783-1	—	1⅛" 70-ohm	per ft.	1.891
96	27780-1	—	1⅝" 50-ohm	per ft.	4.33
96	27784-1	—	1⅝" 70-ohm	per ft.	3.779
96	27781-1	—	3⅛" 70-ohm	per ft.	10.25
96	—	—	3⅛" 70-ohm	On Application	
96	—	—	6⅛" 50-ohm	On Application	
			Spirafil Coaxial Cable,		
96	27749-1	—	⅜" 50-ohm	per ft.	.506
96	27751-1	—	⅜" 70-ohm	per ft.	.53
96	27750-1	—	½" 50-ohm	per ft.	.60
96	27752-1	—	½" 70-ohm	per ft.	.66

TRANSMISSION LINE ACCESSORIES

97-104	—	—	AM-FM Transmission Line Accessories	
			Fixed Hanger for Single Line	
98	19112-41	—	1⅝" (Clamp on Round Member 1" to 2¼")	15.00
98	19112-42	—	1⅝" (Clamp on Round Member 2½" to 5")	15.75
98	19113-41	—	3⅛" (Clamp on Round Member 1" to 2¼")	18.00
98	19113-42	—	3⅛" (Clamp on Round Member 2½" to 5")	18.00
98	19112-44	—	1⅝" (Mount Through Hole—Short)	10.00
98	19112-47	—	1⅝" (Mount Through Hole—Long)	9.00
98	19113-44	—	3⅛" (Mount Through Hole—Short)	11.75
98	19113-47	—	3⅛" (Mount Through Hole—Long)	11.75
98	19314-44	—	6⅛" (Mount Through Hole—Grounded)	17.00

TRANSMISSION LINE ACCESSORIES (Continued)

Catalog Page	MI Number	Type Number	Description	Price
			Fixed Hanger for Double Line	
98	19112-15	—	1⅝" (Mount Through Hole—Grounded)	$ 10.50
98	19112-49	—	1⅝" (Mount Through Hole—Insulated)	12.00
98	19113-15	—	3⅛" (Mount Through Hole—Grounded)	11.00
98	19113-49	—	3⅛" (Mount Through Hole—Insulated)	29.00
			Expansion Hanger for Single Line	
100	19112-23	—	1⅝" (Clamp on Round Members 1" to 2¼")	16.75
100	19112-26	—	1⅝" (Clamp on Round Members 2½" to 5")	16.75
100	19112-25	—	1⅝" (Clamp on Round Members—Insulated—1" to 2¼")	22.00
100	19112-28	—	Insulated—2½" to 5")	22.00
100	19113-23	—	3⅛" (Clamp on Round Members—Grounded—1" to 2¼")	21.00
100	19113-26	—	Grounded—2½" to 5")	22.75
100	19113-25	—	Insulated—1" to 2¼")	26.75
100	19113-28	—	Insulated—2½" to 5")	28.00
100	19309-23	—	⅞" (Pivot Clamp on Round Members—Grounded—1" to 2¼" Short-Swivel)	20.00
100	19309-24	—	Grounded—1" to 2¼" Long-Swivel)	20.00
100	19309-25	—	Insulated—1" to 2¼")	30.00
100	19309-26	—	Grounded—2¼" to 5" Short-Swivel)	20.00
100	19309-27	—	Grounded—2¼" to 5" Long-Swivel)	20.00
100	19309-28	—	Insulated—2¼" to 5")	30.00
100	19112-32	—	1⅝" (Mount Through Hole)—Grounded, Short	12.00
100	19112-33	—	1⅝" (Mount Through Hole)—Grounded, Long	12.00
100	19112-34	—	1⅝" (Mount Through Hole)—Insulated, Long	18.75
100	19113-32	—	3⅛" (Mount Through Hole)—Grounded, Short	15.50
100	19113-33	—	3⅛" (Mount Through Hole)—Grounded, Long	15.50
100	19113-34	—	3⅛" (Mount Through Hole)—Insulated	21.00
100	19309-32	—	⅞" (Pivot Mount Through Hole)—Grounded, Short	16.00
100	19309-33	—	⅞" (Pivot Mount Through Hole)—Grounded, Long	16.00
100	19309-34	—	⅞" (Pivot Mount Through Hole)—Insulated	25.00
			Expansion Hanger for Double Line	
100	19112-14	—	1⅝" (Mount Through Hole)—Grounded	30.75
100	19112-48	—	1⅝" (Mount Through Hole)—Insulated	35.00
100	19113-14	—	3⅛" (Mount Through Hole)—Grounded	32.75
100	19113-48	—	3⅛" (Mount Through Hole)—Insulated	50.00
100	19309-20	—	⅞" (Pivot Clamp on Flat Members)—Grounded, Short-Swivel	20.00
100	19309-21	—	Grounded, Long-Swivel	20.00
100	19309-22	—	Insulated	30.00
100	19309-29	—	⅞" (Pivot Clamp on Angles)—Grounded, Short-Swivel	21.00
100	19309-30	—	Grounded, Long-Swivel	21.00
100	19309-31	—	Insulated	31.00
100	19113-16	—	Extension Kit	2.60
100	19113-56	—	Clamp Kit for Round Members 1" to 2¼" (e)	10.00
100	19113-57	—	Clamp Kit for Round Members 2½" to 5" (e)	13.00
100	19113-59	—	Clamp Kit for Angular Members 4" to 8" (e)	13.00

DEHYDRATOR EQUIPMENT

103-104	27348-1	—	1 Cu. Ft. Double Desiccant Dehydrator	655.00
103-104	27348-2	—	1.5 Cu. Ft. Double Desiccant Dehydrator	1,235.00
103-104	27348-3	—	2 Cu. Ft. Double Desiccant Dehydrator	1,654.00
103-104	27348-4	—	1 Cu. Ft. Single Desiccant Dehydrator	412.00

FM ANTENNAS

105-108	27925-1	BFA-1A	Single Section FM Antenna	650.00
105-108	27925-2	BFA-2A	Two-Section FM Antenna	1,200.00
105-108	27925-3	BFA-3A	Three-Section FM Antenna	1,750.00
105-108	27925-4	BFA-4A	Four-Section FM Antenna	2,400.00
105-108	27925-5	BFA-5A	Five-Section FM Antenna	3,050.00
105-108	27925-6	BFA-6A	Six-Section FM Antenna	3,600.00
105-108	27925-7	BFA-7A	Seven-Section FM Antenna	4,250.00
105-108	27925-8	BFA-8A	Eight-Section FM Antenna	4,800.00
105-108	27925-10	BFA-10A	Ten-Section FM Antenna	6,600.00
105-108	27925-12	BFA-12A	Twelve-Section FM Antenna	7,900.00
107	27926	—	De-Icers ....Bay	80.00

AM-FM ANTENNA TOWERS

Catalog Page	MI Number	Type Number	Description	Price
109-116	—	—	AM-FM Antenna Towers	On Application
111	—	—	Guyed Towers	On Application
111	—	—	Self-Supporting Towers	On Application
111	—	—	Tower Construction	On Application
112	—	—	Wind Load	On Application
114	—	—	Tower Accessory Equipment	On Application
114	—	—	Ground Systems	On Application
114	—	—	Transmission Line and Hangers	On Application
114	—	—	Sampling Lines	On Application
114	—	—	Antenna Feed Line	On Application
115	—	—	Tower Lighting	On Application

TOWER ACCESSORIES

115	27765	—	Expanded Copper Ground Screen 8 foot x 24 foot Section	$ 54.50
115	28405-8	No. 10	Copper Wire — lb.	.52
115	28405-A2	—	Ground Strap, 3" x .032 — lb.	.73
115	28405-A1	—	Ground Strap, 4" x .032 — lb.	.80
115	—	—	3000 Watt Fisher Pierce Photo-Cell	60.00
115	—	—	4500 Watt Fisher Pierce Photo-Cell	75.00
115	—	—	Hazard Markers (Set of 3) — ea.	925.00
115	—	—	Hot Dip Galvanizing of Angle Frame Work for Individual Markers — ea.	80.00
115	—	A-1	Tower Lighting Kit, Towers up to 150 feet	85.00
115	—	A-2	for 150-foot Towers	450.00
115	—	A-3	for 300-foot Towers	550.00
115	—	A-4	for 450-foot Towers	1,070.00
115	—	A-5	for 600-foot Towers	On Application
115	—	A-6	for 750-foot Towers	On Application
115	—	A-7	for 900-foot Towers	On Application
115	—	A-8	for 1050-foot Towers	On Application
115	—	A-9	for 1200-foot Towers	On Application
115	—	A-10	for 1350-foot Towers	On Application
115	—	A-11	for 1500-foot Towers	On Application
117	28215-1	A-2101	1.5 KW Austin Transformer	313.00
117	28215-2	A-1971	3 KW Austin Transformer	354.00
117	28215-3	A-2815	7 KW Austin Transformer	435.00
118	7112-B	—	Double RF Antenna Lighting Choke	37.50
118	27726	—	Triple RF Antenna Lighting Choke	50.75
118	27728-1	—	Capacitor for Lighting Chokes	3.75
118	27741	—	Weatherproof Housing	40.00

SAMPLING LOOPS

119	27729	173-10	Shielded, Rotatable, Insulated Sampling Loops	108.95
119	27759	173-10-2	Shielded, Rotatable, Insulated Sampling Loop for use with RG-8U/11U Cable	110.00
119	27730	173-11-1	Unshielded, Grounded Sampling Loop	33.70
119	27731	173-11-2	Unshielded, Insulated Sampling Loop	43.75
120	8217-A	—	Sampling Coil	75.00
120	27723	—	Bowl Insulator, solid stud	15.40
120	27724	—	Bowl Insulator, hollow stud	15.80

DUMMY LOADS

121	—	WG	½ KW AM Dummy Load, Ohm-spun	120.00
121	—	WG	1 KW AM Dummy Load, Ohm-spun	134.00
121	—	WG	5 KW AM Dummy Load, Ohm-spun	194.00
121	—	WG	10 KW AM Dummy Load, Ohm-spun	436.00
121	27029-3	—	50 KW AM Water-Cooled Load	764.00

ISOLATION FILTER INDUCTORS

121	27735	172-74	Isolation Filter, ⅜" Coaxial Type, Insulated Mounting	177.85
121	27756-1	172-63	Isolation Inductor, RG-11/U, 75 Ohms	101.25
121	27756-2	172-64	RG-8/U, 52 Ohms	101.25
121	27756-3	172-65	RG-11/U, 75 Ohms, Panel Wall Mount	233.75
121	27756-4	172-66	RG-8/U, 52 Ohms, Panel Wall Mount	233.75
121	27756-5	172-47	RG-11/U, 75 Ohms, in Weatherproof Housing	425.00
121	27756-6	172-48	RG-8/U, 52 Ohms, in Weatherproof Housing	425.00

ISOLATION FILTER INDUCTORS (Continued)

Catalog Page	MI Number	Type Number	Description	Price
			Isolation Inductor,	
121	27756-7	—	⅜" Styroflex, 50 Ohms	$ 235.00
121	27756-8	—	⅜" Styroflex, 70 Ohms	250.00
121	27756-9	—	⅜" Spirafil, 50 Ohms	235.00
121	27756-10	—	⅜" Spirafil, 70 Ohms	250.00

REMOTE ANTENNA AND R-F METERS

122	28027-A	BPM-1	Remote Metering Kit (less meter)	69.50
122	28037-A	—	Remote Ammeter, 3" White Scale	18.00
122	28037-B	—	Remote Ammeter, 3" Black Scale	18.00
122	28037	—	Remote Ammeter, 4" White Scale	22.50
122	27644	—	Remote Ammeter, 4" Black Scale	22.50
			3" RF Meter,	
122	7147-2	—	0-2 amp. white face	34.00
122	7147-3	—	0-3 amp. white face	34.00
122	7147-5	—	0-5 amp. white face	34.00
122	7147-8	—	0-8 amp. white face	34.00
122	7147-10	—	0-10 amp. white face	34.00
122	7147-15	—	0-15 amp. white face	34.00
122	7147-20	—	0-20 amp. white face	34.00
122	28048-2	—	0-2 amp. black face	30.00
122	28048-3	—	0-3 amp. black face	30.00
122	28048-5	—	0-5 amp. black face	30.00
122	28048-8	—	0-8 amp. black face	30.00
122	28048-10	—	0-10 amp. black face	30.00
			4" RF Meter,	
122	7157-F2	—	0-2 amp. black face	45.00
122	7157-F3	—	0-3 amp. black face	45.00
122	7157-F5	—	0-5 amp. black face	45.00
122	7157-F8	—	0-8 amp. black face	45.00
122	7157-F10	—	0-10 amp. black face	45.00
122	7157-F15	—	0-15 amp. black face	45.00
122	7157-F20	—	0-20 amp. black face	45.00
122	7157-F25	—	0-25 amp. black face	45.00

TEST AND MEASURING EQUIPMENT

123-124	—	WO-91-A	5" Cathode-Ray Oscilloscope	239.50
126	—	WG-337A	Tube Socket Adapter Set	Discontinued
126	—	WG-338A	Tube Socket Adapter for Testing 7-Lead In-Line Subminiature Tubes	Discontinued
126	—	WG-339A	Tube Socket Adapter for Testing 8-Lead Circular Subminiature Tubes	Discontinued
127	—	WV-87B	Master Voltohmyst	137.50
128	—	WV-98A	Senior Voltohmyst	79.50
128	—	WV-77E	Voltohmyst, factory wired and tested	49.95
128	—	WV-77E (K)	Voltohmyst, unwired	29.95
129-130	30002-E	WX-2E	Field Intensity Meter	850.00
130	—	121	Recording Amplifier	175.00
131-132	19384	BW-7A	Field Intensity Meter and Test Set	2,250.00
132	—	—	1 ma Esterline-Angus Recorder	(Discontinued)
132	—	110	Mobile Recording Drive Assembly	90.00
133-134	30066-B	BW-66F	AM Modulation Monitor	480.00
134	30450	—	Spare Tube Kit for BW-66F	11.46
134	#59160	—	Remote Meter	87.84
135-136	30011-B	BW-11A	AM Frequency Monitor	795.00
136	93688	—	Remote Meter for BW-11A/11AT	45.30
136	8295	—	Spare Tube Kit for BW-11A	15.42
136	7962-B	TMV-135L	Crystal Unit for BW-11A	49.00
137-138	—	335-BR	Frequency Monitor and Modulation Meter	1,565.00
138	—	HP-112-13	Remote Modulation Meter	
139-140	—	108-E	Phase Monitor	On Application

BROADCAST EQUIPMENT SALES POLICY

FOREWORD

The present statement sets forth basic conditions under which RCA sells broadcast equipment as described in our catalog, and notes certain supplemental information. This statement does not apply to the sale of tubes or sound film recording equipment, for which separate standard sales and lease policies are in effect.

RCA broadcast equipment is sold directly through RCA Regional representatives, who are familiar with broadcast equipment.

CONTRACT PROCEDURE

All sales based on orders for transmitters, antennas and custom built or special apparatus and on orders over $5,000 are made in accordance with the conditions of the RCA Standard Proposal Form for the sale of broadcast equipment and with any agreement stipulated thereon for individual customers.

PRICES

RCA broadcast equipment domestic prices are net f.o.b. factory or warehouse, which is Camden, New Jersey, for most items. These prices do not include any federal, state or local taxes based upon use or measured by sale or use and unless otherwise noted do not include federal excise tax. Any such taxes in effect at the time of shipment will be billed separately or will be included in the prices when required and will be due and payable upon delivery.

RCA's prices do not include installation or installation supervision unless specifically mentioned in a written condition or proposal. Purchaser assumes responsibility for installation and operation of the equipment as well as for obtaining all necessary licenses, permits, etc.

NOTE: The service of factory trained personnel who are specialists in the supervision of the installation of broadcast equipment and its maintenance and repair may be obtained through an order placed with the RCA Service Company, Inc. It is recommended that the advantages of this service be considered at the time of purchase of any major broadcast equipment.

In the case of orders under the Standard Proposal Form the billing prices are based on those prices effective at the date of the order to the extent indicated in the final contract. In the case of orders not under the Standard Proposal Form the billing prices are those prices in effect on the date of shipment.

RCA endeavors to keep its published prices current; however, all published prices are subject to change without notice.

Prices for items marked with a symbol (e) are estimates only and are subject to adjustment to those in effect on the date of shipment.

In the event the estimated prices quoted herein are exceeded by more than 10% and the billing price cannot be established by mutual agreement prior to shipment, such items may be cancelled without liability to RCA or Purchaser by either party giving written notice to the other.

PAYMENT

Terms of payment are subject to approval of RCA's Credit Department at Camden, New Jersey.

DELIVERY

RCA's delivery of broadcast equipment will be f.o.b. factory or warehouse, which is Camden, New Jersey for most items. The Purchaser shall be responsible for all transportation charges, and shipments will normally be forwarded with shipping charges "collect." As an accommodation, when specifically requested to do so by the Purchaser's order, RCA will prepay transportation charges and invoice them to the Purchaser as a separate item.

Delivery will be made to a carrier specified by the Purchaser, unless none is specified, in which event it will be to a common carrier selected by RCA. In the absence of specific routing instructions from the purchaser, RCA's judgment with respect to the selection of a route will be final.

As a special service with respect to shipments overland, by inland waterways or by air we carry All Risk Transportation Insurance for the benefit of our Broadcast Equipment customers, and your interests will be amply protected in all shipments of equipment while in transit by the methods indicated above, at no additional expense to you, provided that you inspect all shipments within 15 days after receipt and report within that time in writing any shortages or damages to the carrier and to RCA.

RCA will endeavor to meet delivery schedules but it assumes no liability for damages of whatever kind for delays in delivery. No delays in delivery shall relieve the purchaser of his obligation of performance.

PATENT LICENSES

RCA broadcast equipment is licensed for radio telephone or television broadcast transmission under United States patents owned by RCA or under United States patents under which RCA is licensed.

PATENT PROTECTION

RCA, at its own expense, will defend any suit which may be brought against purchaser for infringement of United States patents by the equipment furnished when sold or used for radio telephone or television broadcast transmission, and in any such suit will satisfy any final award for such infringement. This is upon the condition that purchaser gives RCA prompt notice of such suit and full right and opportunity to conduct the defense thereof, together with full information and all reasonable cooperation, and upon the further condition that the claimed infringement does not result from the combination of the equipment furnished with other equipment, apparatus, or devices not furnished by RCA. No costs or expenses shall be incurred for the account of RCA without its written consent. If purchaser's sale or use of such equipment for radio telephone or television broadcast transmission shall be prevented by permanent injunction, RCA shall substitute for the infringing equipment or parts other equally suitable equipment or parts, or at RCA's option obtain for purchaser the right to sell or continue the use of such equipment, or at RCA's option take back such equipment and refund any sums purchaser has paid RCA therefor, less a reasonable amount for use, damage and obsolescence.

WARRANTY

Except for electronic tubes, which bear their own warranty which accompanies them at the time of their sale, RCA warrants its broadcast equipment to be free from defects in material and workmanship under normal use and service for a period of one year from the date of delivery. RCA's obligations under this warranty are limited to the repair or replacement of defective parts and the shipment of such repaired or replacement parts to the purchaser f.o.b. factory. Equipment furnished by RCA but listed as manufactured by another bears only the warranty given by such other manufacturer. No warranties other than those set forth herein are given or are to be implied with respect to broadcast equipment. In no event is RCA liable for consequential damages.

REPAIRED AND RETURNED APPARATUS

Before an apparatus is returned to RCA for repairs or adjustments shipping instructions and an identifying number should be obtained from the nearest RCA Regional Office. RCA assumes no responsibility for unauthorized returns.

EQUIPMENT MODIFICATIONS AND WITHDRAWALS

RCA reserves the right to make, without notice, modifications of the equipment described in this catalog without affecting its right to sell such equipment under orders based on the catalog description, provided, however, that the modifications shall not materially affect performance. These modifications of equipment may be made by RCA or its suppliers from time to time for reasons such as improvement in performance, simplification in design, or availability of material. RCA also reserves the right to withdraw from sale, without notice, any equipment described in our catalog.

ACCEPTANCE OF ORDER

No order shall be binding upon RCA until accepted by it in writing at Camden, New Jersey, and the banking, negotiation or other use of the down payment shall not constitute an acceptance by RCA. Orders received by Regional Offices will be forwarded promptly to RCA's Camden Office.

HOW TO ORDER

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

PRICES

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

YOU CAN LOCATE YOUR NEAREST RCA REPRESENTATIVE FROM THIS LIST

REGIONAL OFFICES

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

•

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

•

7901 Empire Freeway
DALLAS 35, TEXAS
Fleetwood 2-3911

•

1600 Keith Building
CLEVELAND 15, OHIO
Cherry 1-3450

200 Berkeley Street
BOSTON 16, MASSACHUSETTS
Hubbard 2-1700

•

1121 Rhodes-Haverty Building
134 Peachtree Street, N.W.
ATLANTA 3, GEORGIA
Jackson 4-7703

•

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

•

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

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

•

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

•

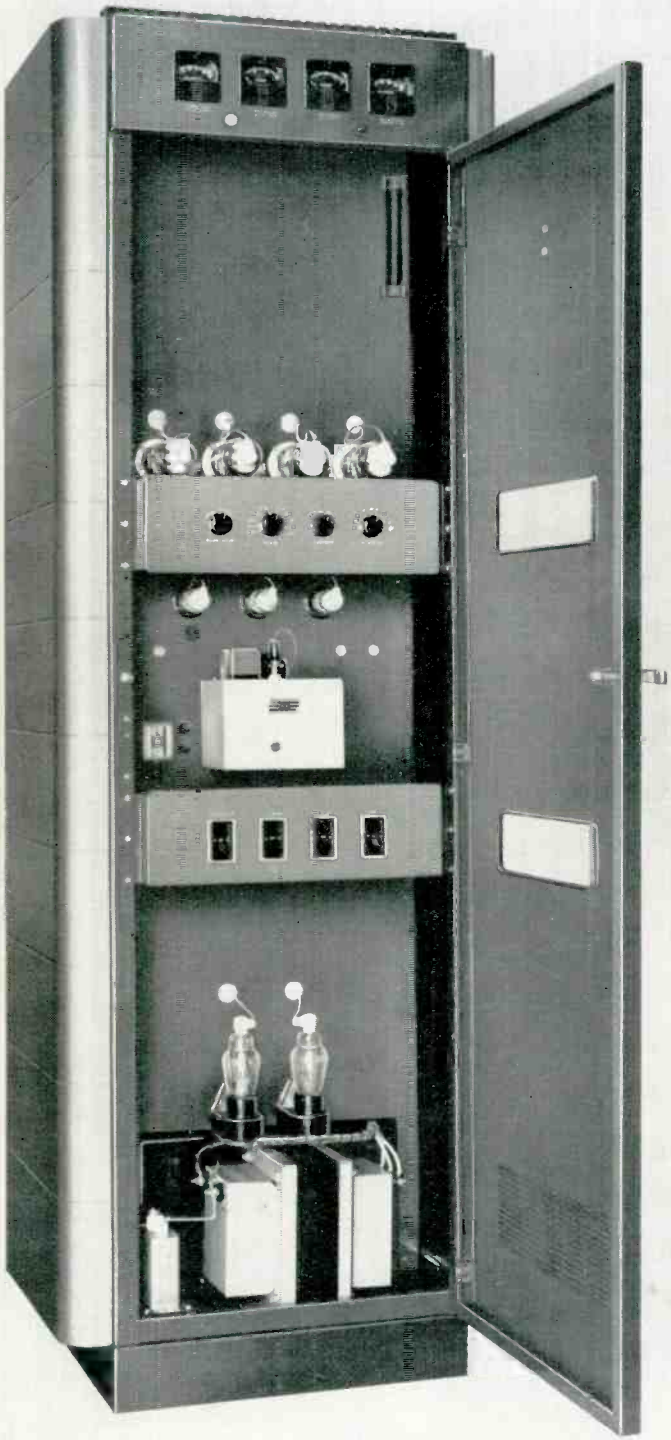
1625 K Street, N.W.
WASHINGTON 6, D. C.
District 7-1260

•

2250 1st Avenue, South
SEATTLE 4, WASHINGTON
Main 2-8350

250 WATT AM BROADCAST TRANSMITTER

TYPE BTA-250M



FEATURES

- Designed for High-Fidelity Operation
- Distortion-free Bi-Level modulation
- Fewer tubes—uses only ten
- Only three tube types
- Quiet operation—suitable for control-room installation
- Only one tuning control
- Excellent frequency stability
- Readily remote-controlled

DESCRIPTION

One of a complete line of High-Fidelity AM Broadcast Transmitters, the BTA-250M is compact, reliable, and fulfills all FCC and RETMA specifications. It is simple to operate and economical to maintain.

Completely housed in a single cabinet exactly the size of a standard audio rack, the BTA-250M requires a minimum of floor space. Overall width including side panels is only 28 inches. Depth is 20 inches and height is 84 inches. Since the cabinet of the BTA-250M is identical in size to BR-84 series audio and monitoring racks, the transmitter can be installed adjacent to these racks after removal of one of the transmitter side panels which can then be placed on the opposite side of the audio rack. Electrical shields (see Accessory List on last page) should be placed between the transmitter and audio rack frames.

In the BTA-250M, no blowers are used—consequently, noise has been reduced to a minimum. Thus, the transmitter can be placed in the same room where announcements are made. These features also make the transmitter useful as emergency equipment, installed side-by-side with audio racks in master control rooms. Noise-free operation may save the expense of a partitioning wall or an additional room for transmitting equipment.

Circuits and Components

The BTA-250M is designed to operate at any frequency from 535 kc to 1620 kc. Nominal power output is 250 watts; however, the transmitter is capable of producing 275 watts to compensate for transmission line and antenna tuning equipment losses. The output network provides excellent harmonic attenuation and accommodates antenna or transmission line load impedances from 20 to 250 ohms.

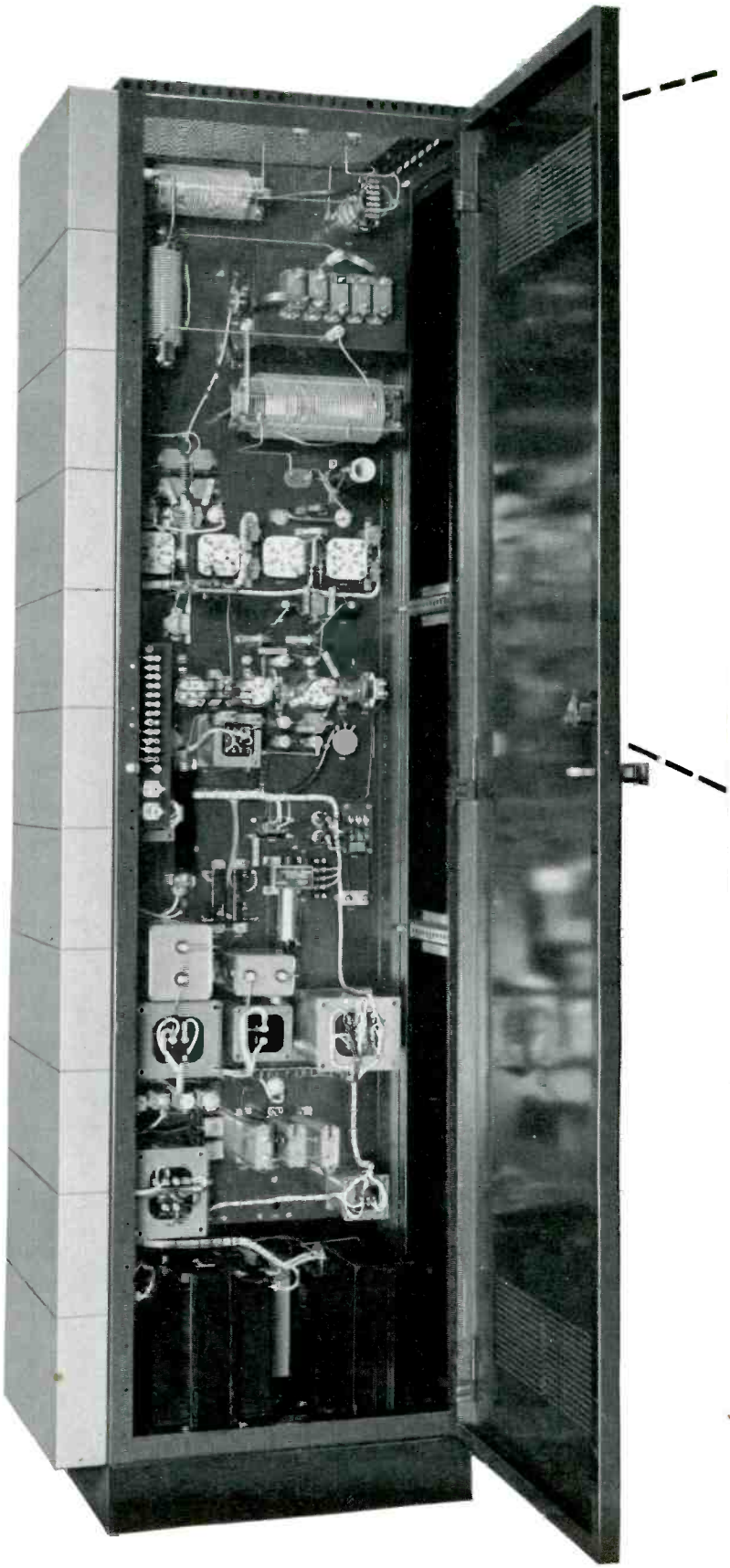
Both front and rear cabinet doors are interlocked for protection of personnel. Most of the tubes and components are mounted on a single vertical chassis accessible from both front and rear. All controls can be operated through openings in the front door.

The BTA-250M Transmitter uses the UL-4392 Crystal Oscillator with the TMV-129B Temperature Controlled Crystal Unit which maintains the frequency constant to within plus or minus five cycles. The oscillator feeds a single type RCA-807 Tube operating as a buffer amplifier with a broadly tuned plate circuit which requires no tuning after initial set-up. The buffer, in turn, drives the power amplifier consisting of two type RCA-813 Tubes in parallel. The power amplifier tank circuit and output matching network have a circuit configuration such that the high-frequency distortion is greatly reduced. Neutralization is not required since all r-f stages use screen grid tubes.

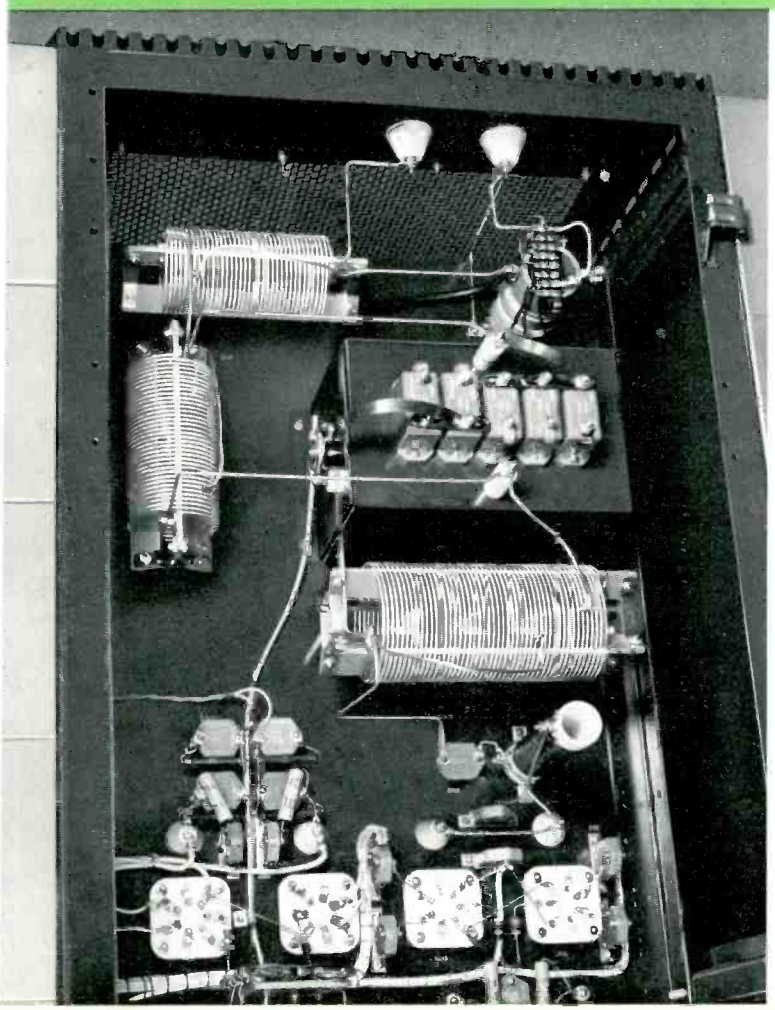
The modulator consists of two type RCA-807 Tubes in push-pull resistance coupled to two type RCA-813 Modulator Tubes. The modulation transformer secondary is tapped to provide modulation of the buffer screen as well as the PA plate and screen, resulting in a very low order of distortion.

The power supply comprises: 1. A selenium rectifier for modulator bias; 2. A selenium rectifier for the 807 tubes (plates and screens) and the screens of the 813 modulator tubes; 3. A high-voltage rectifier using two RCA 866A tubes which supplies the plates of the modulator tubes and the plates and screens of the PA tubes.

Circuit protection is provided entirely by means of high speed magnetic circuit breakers. The circuit breakers also function as control switches and are located in the filament, plate, and PA and modulator cathode circuits. Delay of the plate voltages is provided by a mercury type time delay relay, the only relay in the transmitter.



Rear open door view shows clean wiring, adequate space and accessibility to all the components.



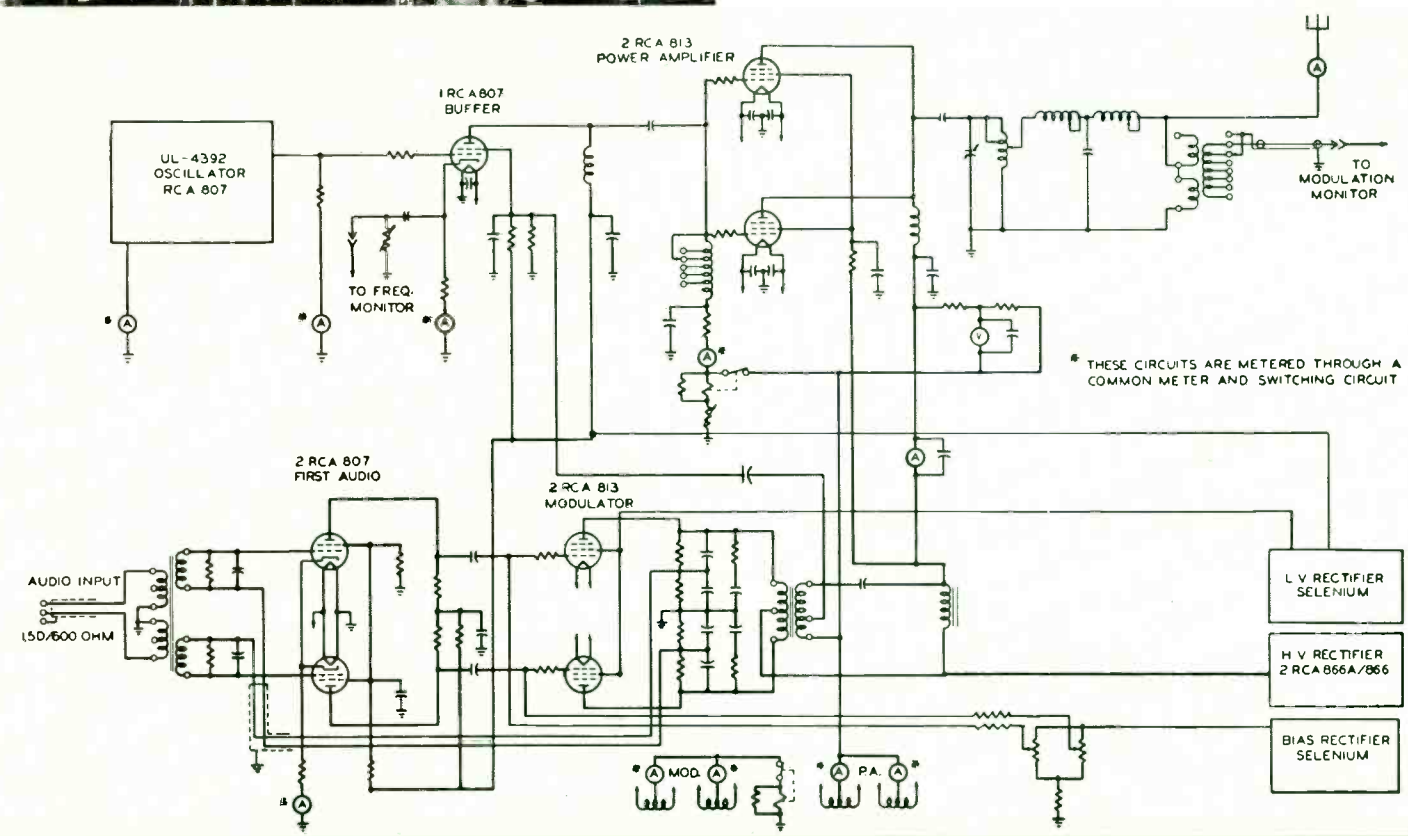
New circuit design in the BTA-250M simplifies transmitter adjustment and operation. There is only one tuning control and one power output control in the entire transmitter. The tuning control is a variable capacitor in the plate circuit of the power amplifier, and the power output control is a variable resistor in the cathode circuit. In the low level r-f stages, the Type RCA 807 Crystal Oscillator plate is fixed-tuned by an inductor with suitable taps to cover the broadcast band. The 807 Buffer Plate is also fixed-tuned.

Better PA Linearity with Bi-Level modulation

Special design in the output network provides symmetrical loading on both sides of the carrier for modulating sum and difference frequencies—thus reducing distortion. Further reduction in distortion is effected by modulation of the r-f drive to the PA. This is accomplished by modulating the buffer screen as well as the plates and screens of the PA. By applying modulation to the buffer screens, the PA is supplied with additional driving power required during the modulating peaks. Thus the PA receives the proper drive during all portions of the audio cycle, greatly improving its linearity. Distortion rating is 2 percent or less over a range of 50 to 10,000 cycles. See curve on opposite page.

View at left shows power amplifier tank and output network components.

SIMPLIFIED SCHEMATIC DIAGRAM—BTA-250M



SPECIFICATIONS

AF Input Impedance	150/600 ohms
AF Input Level (100% mod.)	+10 ±2 dbm
AF Response:	
50-7,500 cycles	±1 db
30-10,000 cycles	±1.5 db
AF Distortion (95% mod.) 50-10,000 cycles	2%
Noise (below 100% mod.)	—60 db
Frequency Range	535-1620 kc
Frequency Stability	±5 cycles
Type of Output	Single ended
Carrier Shift (0-100% mod.)	2½%
Output Impedance	20-250 ohms
R-F Voltage (for freq. monitoring)	10 v. RMS 75 ohms
R-F Voltage (for mod. monitoring)	10 v. RMS 75 ohms
Power Output Capability	275 watts
Power Requirements	110/125 volts, single phase, 50-60 cycles
Power Consumption:	
No Modulation	1000 w. approx.
Average Program Modulation	1150 w. approx.
100% Modulation	1400 w. approx.
Power Factor	90%
Permissible Combined Line Voltage Variation and Regulation	±5%
Buffer Tuning	Fixed tuned
PA Tuning	Air capacitor (with dust cover)
Number of Oscillators	1
Provisions for Spare Crystals	1
Number of Meters	4
Circuits Metered	13
Overload Circuits	Filaments, plates, PA cathode, mod. cathode
Cabinet Dimensions	Height 84⅞", Width 28", Depth 20½" (Less door handle)
Overall Height	86⅝"
Weight (unpacked)	Approx. 600 lbs.

Tube Complement (ES-28049)

1 RCA 807 oscillator; 1 RCA 807 buffer; 2 RCA 813 power amplifier; 2 RCA 807 a-f amplifier; 2 RCA 813 modulator; selenium low voltage rectifiers; 2 RCA 866A high voltage rectifier.

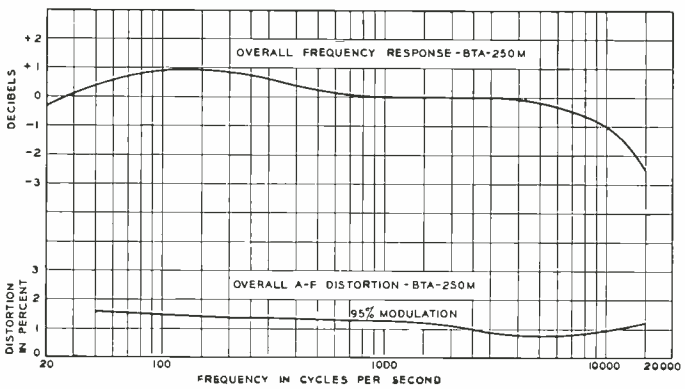
Equipment Supplied (ES-28937)

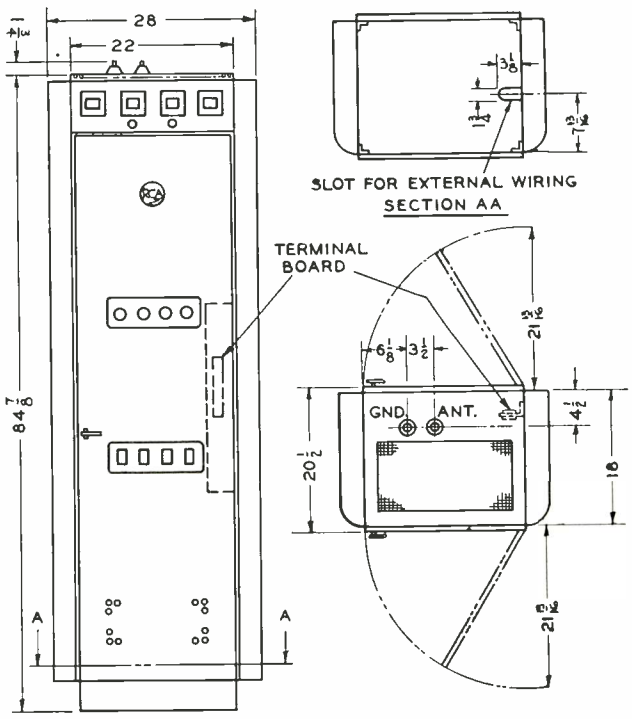
Quan.	Description	Ref.
1	BTA-250M Transmitter Unit, Including	
	1 Type UL-4392 Oscillator	MI-28053
2	Side Panels	MI-30541-G84
1	Set of Tubes	MI-28049
1	Type TMV-129B Crystal Unit	MI-7467
1	Touch-up Finish Kit	MI-7443
2	Instruction Books	IB-30220
1	Nameplate	MI-28180-1
Choice of One:		
	R-F Output Ammeter	MI-28048
	Remote Antenna Ammeter	MI-28037-B

Available Accessories

BTA-11B Remote Control System	MI-27537/27538-A
BTR-20A Remote Control System	MI-27539/27526
Remote Control Accessory Kit	MI-27522
Type BW-66F Modulation Monitor	MI-30066-B
Type BW-11A Frequency Monitor	MI-30011-A
Type BPA-21 Antenna Tuner	ES-27250
BPM-1C Remote Metering Kit, Consisting of:	
Remote Metering Kit, Less Meter	MI-28027-A
Remote Meter for Transmitter Panel	MI-28037-B
Type BR-84C Audio Rack	MI-30951-C84
Double Trim Strip	MI-30568-G84
Single Trim Strip	MI-30566-G84
Electrical Side Shields per side—2 of	MI-30546-G28
1 of	MI-30546-G21
Operating Spare Tube Kit	MI-28049
FCC Spare Tube Kit	MI-28084

TYPICAL FREQUENCY RESPONSE AND DISTORTION CURVES





BTA-250M OUTLINE DIMENSIONS

500 WATT AM BROADCAST TRANSMITTER

TYPE BTA-500R

FEATURES

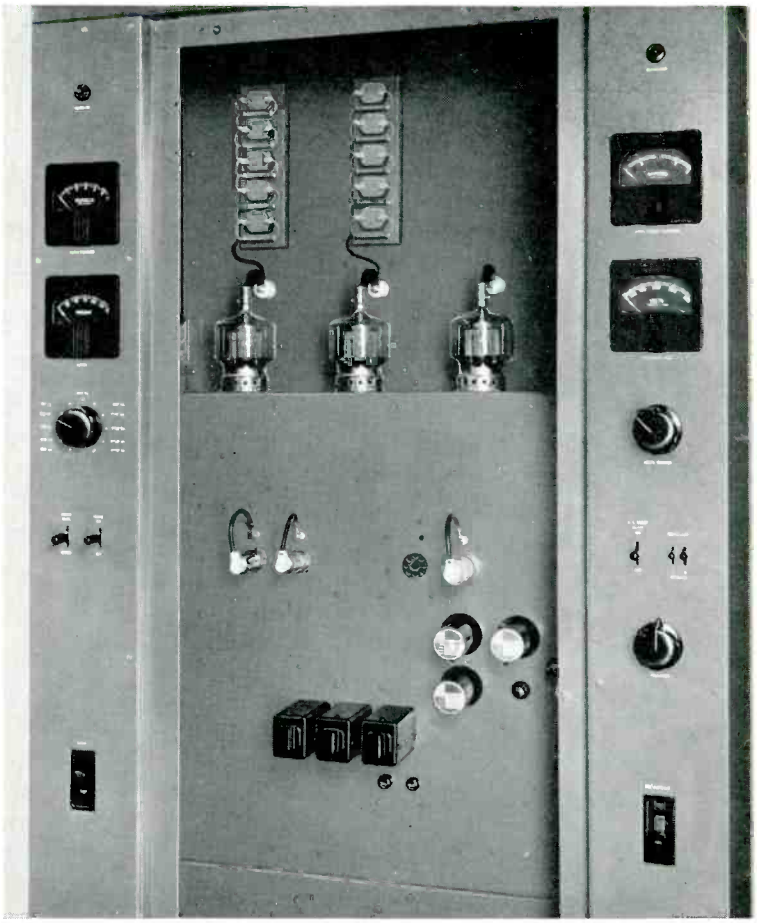
- Excellent performance
- Bi-level modulation—better sound
- Remote control
- Fewer tubes
- Simplified power changeover
- Lowest operating cost for tubes and power
- Rugged construction—small size
- All chassis and components accessible
- Simplified tuning
- Functional styling and decor
- Easy power change to 1 kw

USES

Modern trends in AM radio broadcasting including excellent performance, remote control and Conelrad requirements together with all-around economy, dependability and new styling are featured in RCA's new Type BTA-500R AM Broadcast Transmitter. Simplified power change made possible by standardized circuitry is basic in the BTA-500R. Remote control provisions permit unattended operation of the transmitter. Also included in the design, with the addition of accessories, is remote Conelrad switching.

The BTA-500R AM Broadcast Transmitter is designed to operate on any frequency from 535 kc to 1620 kc with a normal rated output of 500 watts. The maximum transmitter output is 550 watts to compensate for transmission line and antenna tuning equipment losses. The transmitter will meet all requirements of the FCC and EIA pertaining to this class of equipment.

Improved functional design and novel decor which permits choice of color combinations to harmonize with studio color schemes are an important departure in RCA's new 500 watt transmitter. A single vertically-constructed cabinet houses the equipment. Square construction permits locating the transmitter against the wall, or it can be butted against other equipment. The vertical construction makes it accessible from both front and rear for ease of maintenance. Fewer tubes and tube types, reduced tube costs, and bi-level modulation; use of tetrodes with resultant elimination of neutralization; a single front panel tuning control providing easiest operation are other features of the BTA-500R.



The front of the BTA-500R permits easy tube changes. The power amplifier and modulator tubes are located on the top chassis and just below this is the exciter chassis. All normal operating controls are shown on the two side panels.

DESCRIPTION

The Type BTA-500R Transmitter is designed to provide an amplitude modulated signal at any frequency in the standard broadcast band between 535 kc and 1620 kc. The nominal power output rating is 500 watts and maximum output capability 550 watts. The transmitter will operate from a 208-240 volt, 60 cycle, single phase power source for the main power. A 50 cycle kit is available. In addition the crystal heaters require an additional 115 volt, 50/60 cycle, a-c power input.

The entire transmitter is housed in a single aluminized steel cabinet. The cabinet consists of two end panels with the fronts formed to provide control panels mounted on a sturdy welded steel base. Vertical center chassis are fastened between the end panels to form a basic H cross section. A hinged front door is located between the two control panels. Rear access is provided by two interlocked removable panels. Control components are conveniently located on the control panels on both sides of the front door and all meters are at eye level.

Most BTA-500R components are mounted on a vertical center chassis which provides extremely good accessibility. Tubes, feedback ladders and overload relays are mounted on the front and the other components are mounted on the rear of this chassis. Larger power components are mounted on the base.

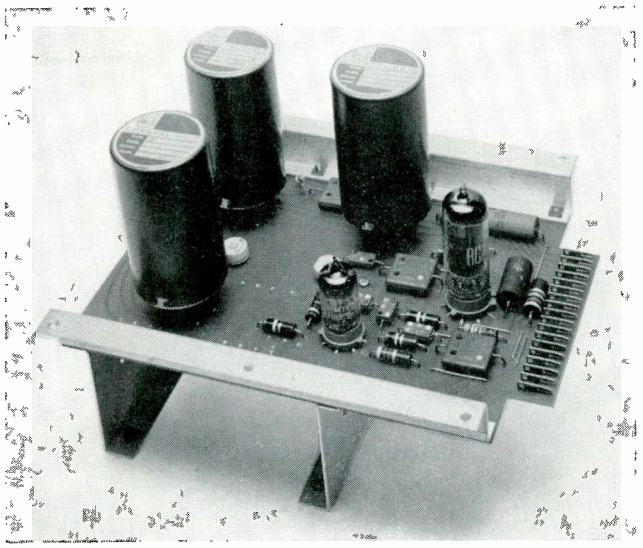
The BTA-500R has been designed around standardized circuits. Included in the basic transmitter is an exciter unit, low voltage supply, bias supply and a portion of the control circuits. By adding to the exciter unit the proper r-f, modulator, high voltage rectifier and power determining components either a 500 watt or 1000 watt transmitter can be provided.

New design techniques utilized in the BTA-500R provide simplified tuning, reduced installation time and expense. Tetrodes are utilized throughout the r-f section to eliminate the requirement for neutralization. Another feature is the very successful RCA bi-level modulation system which contributes to the soundability of the transmitter. A new RCA

feature is the attractively colored doors available in red, blue, green and umber gray. The low voltage power supply utilizes dry disc selenium rectifiers for the plate, screen and bias. Lower power drain and cooler operation result. The high voltage supply is built around two RCA 8008 Tubes. These tubes have a long record of reliability and fine performance.

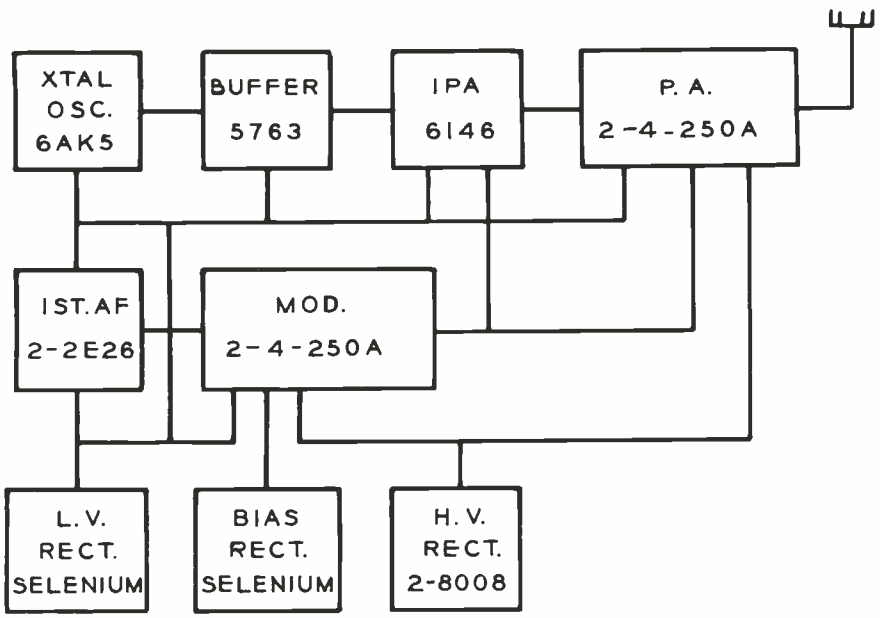
Circuitwise the BTA-500R transmitter uses a MI-27632 Crystal Oscillator which has provisions for three switchable TMV-130B temperature controlled crystal units which maintain the frequency constant to within plus or minus five cycles. The three crystals are intended for main, standby and Conelrad operation. Selection of the desired crystal is by means of front panel switches and latching relays. The oscillator employs a broadband circuit with no adjustments, and uses an RCA 6AK5 oscillator tube and RCA 5763 buffer tube.

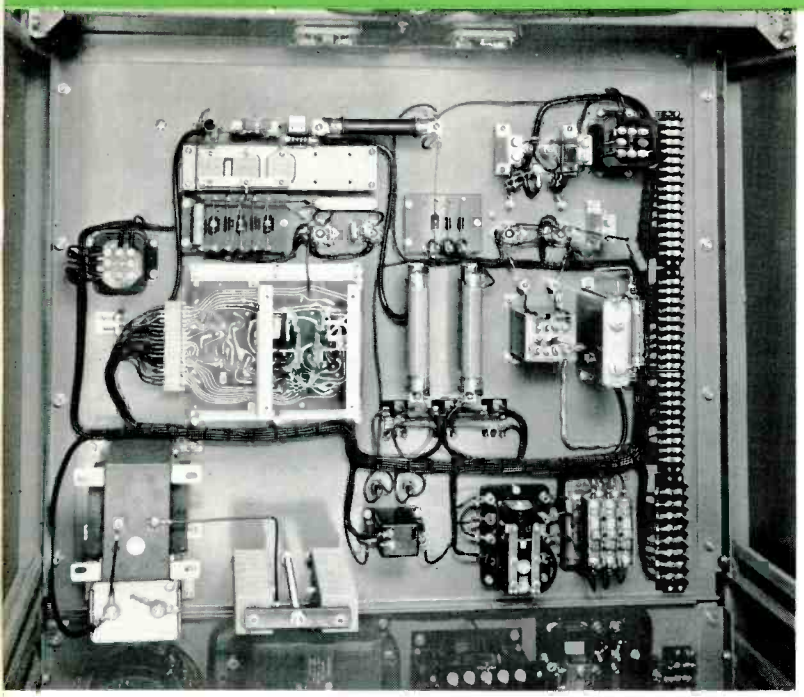
The buffer feeds a single 6146 driver tube which in turn feeds the power amplifier which consists of two 4-250A tubes connected in parallel. Neutralization is not required



View of oscillator chassis. The terminal strip on right contains all of the oscillator connections. The three crystals are switchable from a front panel control.

SIMPLIFIED BLOCK DIAGRAM OF BTA-500R AM TRANSMITTER





Rear view of entire oscillator subassembly showing vertical construction, plug-in terminal strip, etched wiring and simplified circuitry of BTA-500R AM Broadcast Transmitter.

since all tubes are tetrodes. The modulator comprises two 2E26 tubes in push-pull, resistance coupled to two 4-250A modulator tubes. The modulation transformer secondary is tapped to provide bi-level modulation of both driver and power amplifier, resulting in a very low order of distortion.

The power supply consists of a high voltage rectifier for the power amplifier and modulator plate circuits, a low voltage rectifier for all other plate and screen circuits and a bias rectifier. The high voltage rectifier uses two 8008 tubes and the low voltage and bias rectifier use selenium rectifiers.

Dual power operation of the transmitter at 250 or 500 watts can be provided by the installation of an MI-28099-A Power Cutback Kit. The kit comprises a group of resistors to be connected in series with the plate circuit of the power amplifier tubes and switching relays. A latching relay is provided for remote cutback control.

Another accessory, an ES-34210 Conelrad Kit, can be installed in the BTA-500R when the transmitter is to be used in a Conelrad net and it is necessary to switch frequencies. The accessory equipment consists of capacitors for returning the PA tank circuit, r-f contactors for switching the tank circuits, and a control network. The control network includes sequencing relays so that "cold" switching is performed in all r-f circuits. By momentarily closing a pair of contacts, switching can be accomplished either manually or remotely.

$4,500

SPECIFICATIONS

Performance Specifications

AF Input Impedance	150/600 ohms
AF Input Level (100% Modulation)	+10 ±2 dbm
AF Response:	
50-7500 cycles	±1 db
30-10,000 cycles	±1.5 db
30-15,000 cycles	±3 db
AF Distortion (95% Modulation):	
50-10,000 cycles	2%
50-12,000 cycles	3%
Noise (below 100% Modulation)	60 db
Frequency Range	535-1620 kc
Frequency Stability	±5 cycles
Type of Output	Single ended
Carrier Shift (0-100% Modulation)	3%
Output Impedance	40-250 ohms

Electrical Specifications

RF Voltage (for frequency monitoring)	10 V RMS 75 ohms
RF Voltage (for modulation monitoring)	10 V RMS 75 ohms
Power Output (nominal)	500 watts
Power Output Capability	550 watts
Power Supply	208/240 volts
Line Frequency	60 cycles†
Phase	1
Power Consumption (0% modulation)	2000 watts (approx.)
(100% modulation)	2550 watts (approx.)
(average program modulation)	2200 watts (approx.)
Power Factor	90%
Permissible combined line voltage variation and regulation	±5%
Crystal Heater Power Supply	115 volts 50/60 cycles

Tube Complement

1	6AK5	Crystal Oscillator
1	5763	Buffer
1	6146	Intermediate Power Amplifier
2	2E26	Audio Frequency Amplifier
2	250A	Modulator
2	250A	Power Amplifier
2	8008	High Voltage Rectifier

Mechanical Specifications

Height	84"
Width	34"
Depth	32½" (less door handle)
Weight (net)	1300 pounds (approx.)
Altitude Range	0-7500 ft.
Ambient Operating Temperature (min.)	+10°C (50°F)
(max.)	+45°C (113°F)

Equipment Supplied

Type BTA-500R 500-Watt AM Broadcast Transmitter Complete		ES-27237
Including:		
1	AM Transmitter, Type BTA-500R	MI-27648
1	Touch-Up Finish Kit	MI-27660-A
1	Crystal, Type TMV-132B	MI-27493
1	Set of Operating Tubes	MI-27658
1	Set of Frequency Determining Parts	MI-27690
1	Nameplate	MI-28180-1
1	Door (Choose decor as follows)	
	Burgundy	MI-27645-A1
	Dark Umber Gray	MI-27645-A2
	Peacock Blue	MI-27645-A3
	Emerald Green	MI-27645-A4

Optional and Accessory Equipment

Type BTR-11B Remote Control System	MI-27537/27538-A
Type BTR-20A Remote Control System	MI-27539/27526
Type BW-11A Frequency Monitor	MI-30011-B
Type BW-66F Modulation Monitor	MI-30066-B
Operating Spare Tube Kit	MI-27658
FCC Spare Tube Kit	MI-27659
Conelrad Conversion Kit	ES-34210
Power Cutback Kit	ES-28099-A
RF Output Meters	MI-7157-F Series

† 50 cycle operation is possible with a 50 cycle kit.

1 KW AM BROADCAST TRANSMITTER

TYPE BTA-1R

FEATURES

- Lowest operating cost for tubes and power
- Simple to operate—only one tuning control
- Bi-level modulation provides finest sound
- No neutralization
- Remote control provisions for main, stand-by or Conelrad switching
- Fewer tubes—fewer tube types
- Simplified power changeover
- Functional styling and decor

USES

The RCA Type BTA-1R AM Broadcast Transmitter is designed to provide an amplitude modulated signal at any frequency in the standard broadcast band between 535 kc and 1620 kc. The nominal power output rating is 1000 watts, however, it is capable of producing a maximum of 1100 watts to compensate for losses in the antenna tuning equipment. The equipment will meet all requirements of the FCC and EIA pertaining to this class of equipment.

The new transmitter is designed to provide improved performance, ease of tuning, simplified installation, and low cost performance. Modern trends in AM radio broadcasting including increased power, remote control and Conelrad requirements together with all-round economy, dependability and decor are also featured in the BTA-1R. Tetrodes have been utilized throughout the r-f section of the transmitter to eliminate need of neutralization. RCA's very successful bi-level modulation has been retained.

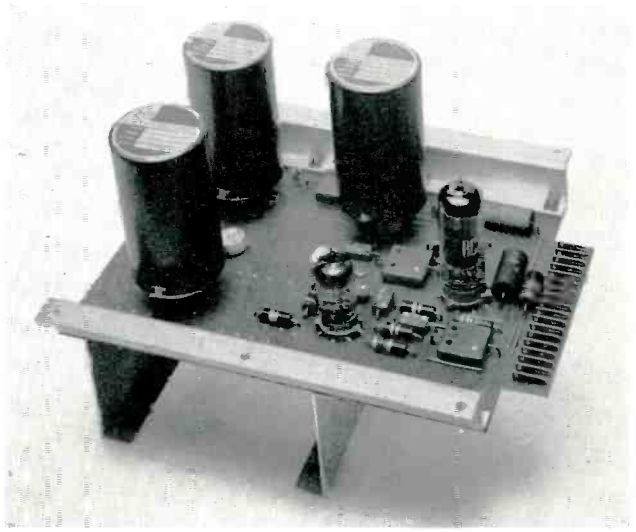
Improved functional design and new decor which permits choice of color combinations to harmonize with studio color schemes are an important departure in RCA's new transmitter line. A single vertically-constructed cabinet houses the equipment. Square construction permits locating the transmitter against the wall, or it can be butted against other equipment. The vertical construction makes it accessible from both front and rear for ease of maintenance. A single front panel tuning control provides easiest operation. Remote control provisions permit unattended operation of the transmitter. Also included in the design, with the addition of accessories, is remote Conelrad switching and power cutback.

BTA-1R Transmitter with front door open showing accessibility of tubes and components. Power Amplifier and Modulator tubes are shown on top chassis; below is exciter chassis. All normal operating contacts are shown on two side panels.

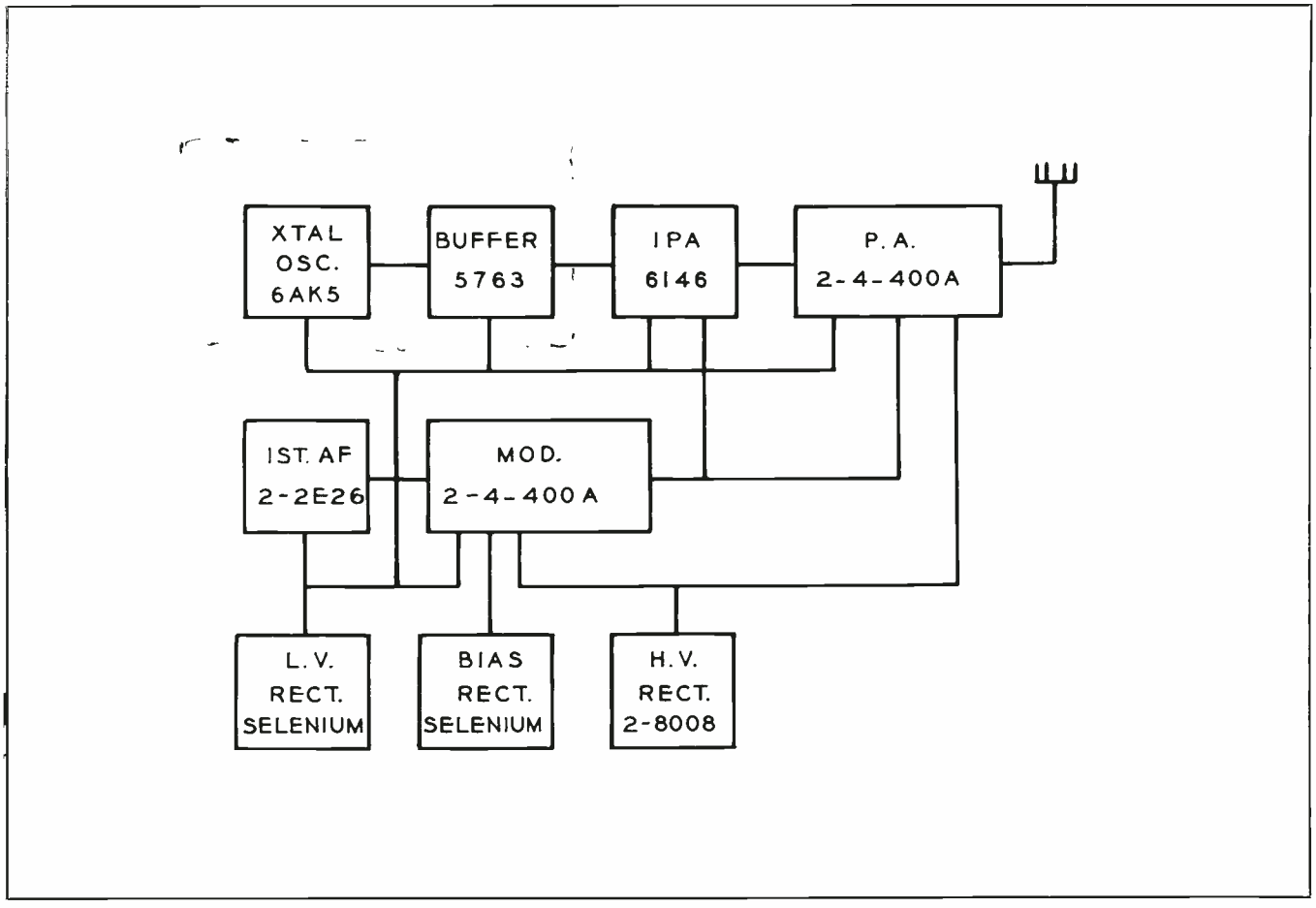
DESCRIPTION

The Type BTA-1R Transmitter is designed to provide an amplitude modulated signal at any frequency in the standard broadcast band between 535 kc and 1620 kc. The nominal power output rating is 1000 watts and maximum output capability 1100 watts. The transmitter will operate from a 208-240 volt, 60 cycle, single phase power source for the main power. In addition the crystal heaters require an additional 115 volt, 50/60 cycle, a-c power input. The Transmitter can be modified for operation on 50 cycle a-c current if desired.

The entire transmitter is housed in a single aluminized steel cabinet. The cabinet consists of two end panels with the fronts formed to provide control panels mounted on a sturdy welded steel base. Vertical center chassis are fastened between the end panels to form a basic H-cross section. A hinged front door is located between the two control panels. Rear access is provided by two interlocked



View of oscillator chassis. The terminal strip on right contains all of the oscillator connections. The three crystals are switchable from a front panel control.



Simplified Block Diagram of BTA-1R AM Transmitter.

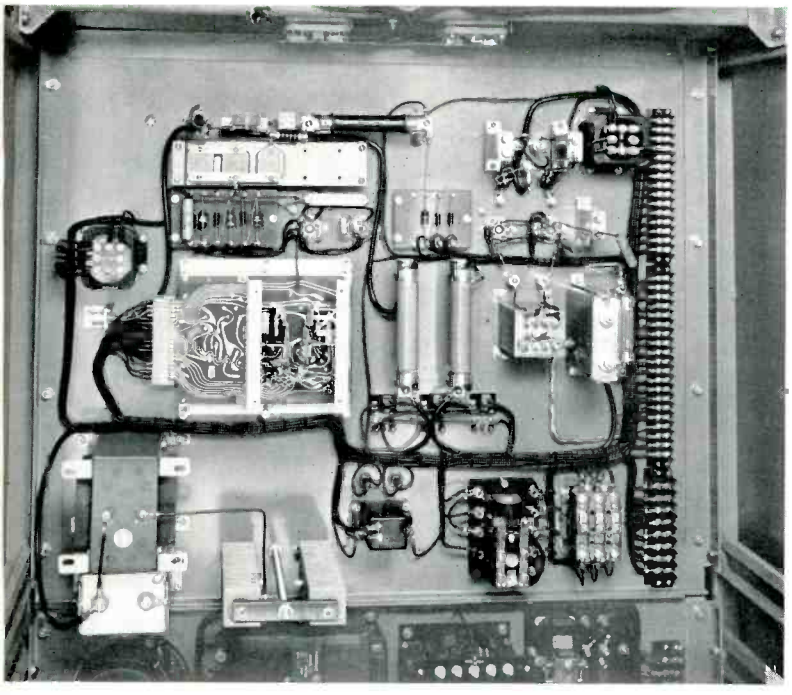
removable panels. Control components are conveniently located on the control panels on both sides of the front door and all meters are at eye level.

Most BTA-1R components are mounted on a vertical center chassis which provides extremely good accessibility. Tubes and overload relays are mounted on the front and the other components are mounted on the rear of these chassis. Larger power components are mounted on the base.

New design techniques utilized in the BTA-1R provide simplified tuning, reduced installation time and expense. Tetrodes are utilized throughout the r-f section to eliminate the requirement for neutralization. Another feature is the very successful RCA bi-level modulation system with attendent low distortion which contributes to the soundability of the AM transmitter. A new RCA feature is the attractively colored doors available in red, blue, green and umber gray. The low voltage power supply utilizes dry disc selenium rectifiers for the plate, screen and bias. Lower power drain and cooler operation result. The high voltage supply is built around two RCA 8008 tubes. These tubes have a long record of reliability and fine performance.

Circuitwise the BTA-1R transmitter uses a MI-27632 Crystal Oscillator which has provisions for three switchable TMV-130B temperature controlled crystal units which maintain the frequency constant to within plus or minus five cycles. The three crystals are intended for main, standby and Conelrad operation. Selection of the desired crystal is by means of front panel switches and latching relays. The oscillator employs a broadband circuit with no adjustments, and uses an RCA 6AK5 oscillator tube and an RCA 5763 buffer tube.

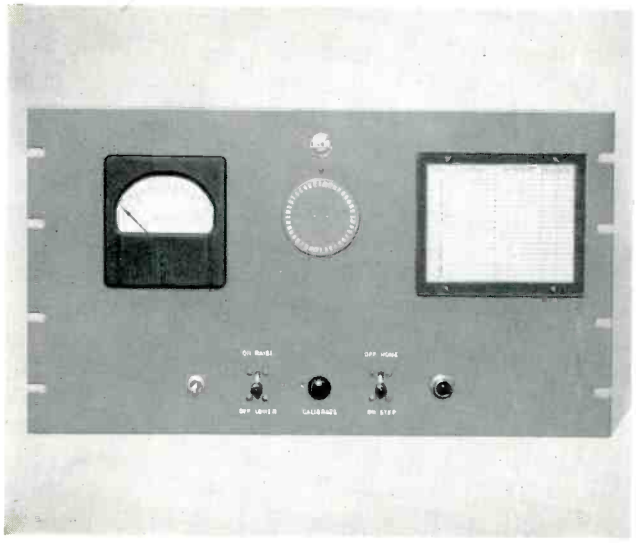
The buffer feeds a single 6146 driver tube which in turn feeds the power amplifier which consists of two 4-400A tubes connected in parallel. Neutralization in not required since all tubes are tetrodes. The modulator comprises two 2E26 tubes in push-pull, resistance coupled to two 4-400A modulator tubes. The modulation transformer secondary



Rear view of entire oscillator subassembly showing vertical construction, plug-in terminal strip, etched wiring and simplified circuitry of BTA-1R AM Broadcast Transmitter.

is tapped to provide bi-level modulation of both driver and power amplifier, resulting in a very low order of distortion.

The power supply consists of a high voltage rectifier for the power amplifier, a low voltage rectifier for all other plate and screen circuits and a bias rectifier. The high voltage rectifier uses two 8008 tubes and the low voltage and bias rectifiers use selenium rectifiers.



Front view of BTR-20A Receiver Control Panel, MI-27539.

SPECIFICATIONS

Performance Specifications

AF Input Impedance	150/600 ohms
AF Input Level (100% modulation)	+10 ±2 dbm
AF Response:	
50-7500 cycles	±1 db
30-10,000 cycles	±1.5 db
30-15,000 cycles	±3 db
AF Distortion (95% modulation):	
50-10,000 cycles	2%
50-12,000 cycles	3%
Noise (below 100% modulation)	60 db
Frequency Range	535-1620 kc
Frequency Stability	±5 cycles
Type of Output	Single ended
Carrier Shift (0-100% modulation)	3%
Output Impedance	40-250 ohms

Electrical Specifications

RF Voltage (for frequency monitoring)	10 V RMS 75 ohms
RF Voltage (for modulation monitoring)	10 V RMS 75 ohms
Power Output (nominal)	1000 watts
Power Output Capability	1100 watts
Power Supply	208/240 volts
Line Frequency	60 cycles†
Phase	1
Power Consumption:	
(0% modulation)	3000 watts (approx.)
(100% modulation)	4000 watts (approx.)
(average program modulation)	3300 watts (approx.)
Power Factor	90%
Permissible combined line voltage variation and regulation	±5%
Crystal Heater Power Supply	115 volts 50/60 cycles

Tube Complement

1	6AK5	Crystal Oscillator
1	5763	Buffer
1	6146	Intermediate Power Amplifier
2	2E26	Audio Frequency Amplifier
2	4-400A	Modulator
2	4-400A	Power Amplifier
2	8008	High Voltage Rectifier

Mechanical Specifications

Height	84"
Width	34"
Depth	32½" (less door handle)
Weight (net)	1700 pounds (approx.)
Altitude Range	0-7500 ft.
Ambient Operating Temperature:	
(min.)	+10°C (50°F)
(max.)	+45°C (113°F)

Equipment Supplied

Type BTA-1R 1000-Watt AM Broadcast Treansmitter complete		ES-27238
Including the following:		
1	AM Transmitter, Type BTA-1R	MI-27649
1	Touch-Up Finish Kit	MI-27660-A
1	Crystal, Type TMV-132B	MI-27493
1	Set of Operating Tubes	MI-27695
1	Set of Frequency Determining Parts	MI-27691
1	Nameplate	MI-28180-1
1	Door (Choose decor as follows)	
	Burgundy	MI-27645-A1
	Dark Umber Gray	MI-27645-A2
	Peacock Blue	MI-27645-A3
	Emerald Green	MI-27645-A4

Optional and Accessory Equipment

Type BTR-11B Remote Control System	MI-27537/27538-A
Type BTR-20A Remote Control System	MI-27539/27526
Type BW-11A Frequency Monitor	MI-30011-B
Type BW-66F Modulation Monitor	MI-30066-B
Operating Spare Tube Kit	MI-27695
FCC Spare Tube Kit	MI-27696
Power Cutback Kit	MI-28099-A
Conelrad Kit	ES-34209
RF Output Meters	MI-7157-F Series

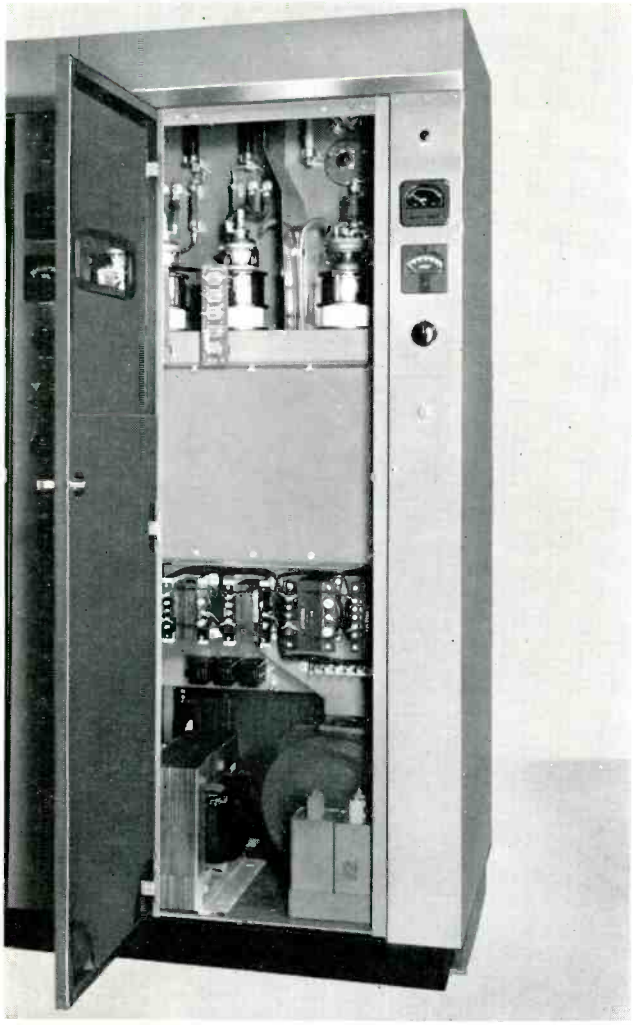
† 50 cycle operation is possible with a 50 cycle kit.

5KW AM BROADCAST TRANSMITTER

Type BTA-5R/5R-I

FEATURES

- Outstanding performance
- Built-in remote control provisions for main, standby or Conelrad switching
- Long life 5762 PA tubes
- Choice of silicon or tube high-voltage rectifiers
- Only two tuning controls
- Broadband neutralization
- Compact size
- Functional styling and decor



PA cubicle opened to provide access to PA and modulator. The easily removed panel in center of cabinet encloses the silicon rectifiers. At bottom of cabinet can be seen the modulation transformer and blower.

USES

The RCA Type BTA-5R/5R1 AM Broadcast Transmitter is designed to provide an amplitude modulated signal at any frequency in the standard broadcast band between 535 kc and 1620 kc. The nominal power output rating is 5,000 watts; however, it is capable of producing 5,500 watts to compensate for losses in the antenna tuning equipment. Built-in relays allow remote control of main, standby and Conelrad operations. The transmitter meets all requirements of the FCC and EIA pertaining to this class of equipment.

The transmitter operates from a 208/240 volt, 60-cycle, three-phase power source for the main power. In addition, the crystal heaters require an additional 115-volt, 50/60-cycle single phase ac power input. The transmitter can be modified for operation on 50-cycle ac current. Simplified power change to 1 kilowatt or 500 watts can be provided, if desired, by Power Cutback Kits MI-34312-1 and MI-34312-2.

DESCRIPTION

The RCA Type BTA-5R Transmitter (and the Type BTA-5R1 with high voltage silicon rectifiers) is an air-cooled, 5-kw amplitude modulated broadcast transmitter featuring a number of RCA's latest developments. The new exciter-driver employs etched circuits, three crystal oscillators, and adjustable broadband circuits for greater operating economies. Long-life 5762 PA tubes, with improved air-cooling system, and a new, small sized, improved plate transformer are provided in these new transmitters.

Other new design techniques of the BTA-5R/5R1 provide simplified tuning, increased safety, longer tube life and improved performance. The transmitter can be tuned from the front panel by only two controls. Provisions for manual or remote control operation are incorporated in the transmitter. All doors and panels are interlocked and grounding switches provide utmost safety for operation personnel. The PA tuning control is located on the front panel. The transmitter is air-cooled, a blower being required in the PA cabinet. A delay relay is employed to retain the blower system in operation for one minute after the transmitter has been shut down. This refinement is used to improve tube life and cooling of components.

The low voltage power supply utilizes dry disc silenium rectifiers for plate, screen and bias. Lower power drain and cooler operation result. Similar advantages are offered, on an optional basis, by substitution of silicon rectifiers for the 8008 tubes in the high-voltage and intermediate voltage circuits of the PA power supply.

Improved Mechanical Design

The entire transmitter, except for the plate transformer, is housed in two attractively styled cabinets made of aluminized steel to provide improved magnetic and electrostatic shielding. Each cabinet consists of end panels with wrap-around front edges formed to provide control panels, mounted on a sturdy, welded steel base. Vertical center chassis are fastened between the end panels to form a basic "H" cross section. Hinged, front doors are located between the control panels. Rear access to each cabinet is provided by two removable, interlocked panels. Control components are conveniently located on the panels on both sides of the front doors. All meters are at eye level to facilitate readings.

The matched cabinets are designed to combine an attractive appearance with the utmost in utility. Doors are offered in burgundy red, peacock blue, emerald green and dark umber gray, to harmonize with station surroundings. Vertical construction permits easier maintenance and service. It also permits installation of the transmitter against a wall, and allows other equipment to be placed on either side of the cabinet.

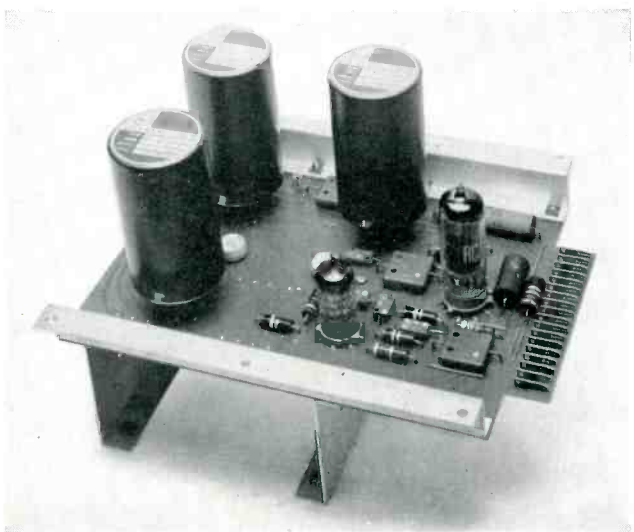
The front doors of the transmitter give immediate access to the front of the vertical panels on which circuit components such as tubes, feedback ladders and overload relays are mounted. Remaining components are mounted on the rear of these chassis, while the larger power components are situated in the base of the cabinet. This type of construction provides excellent accessibility.

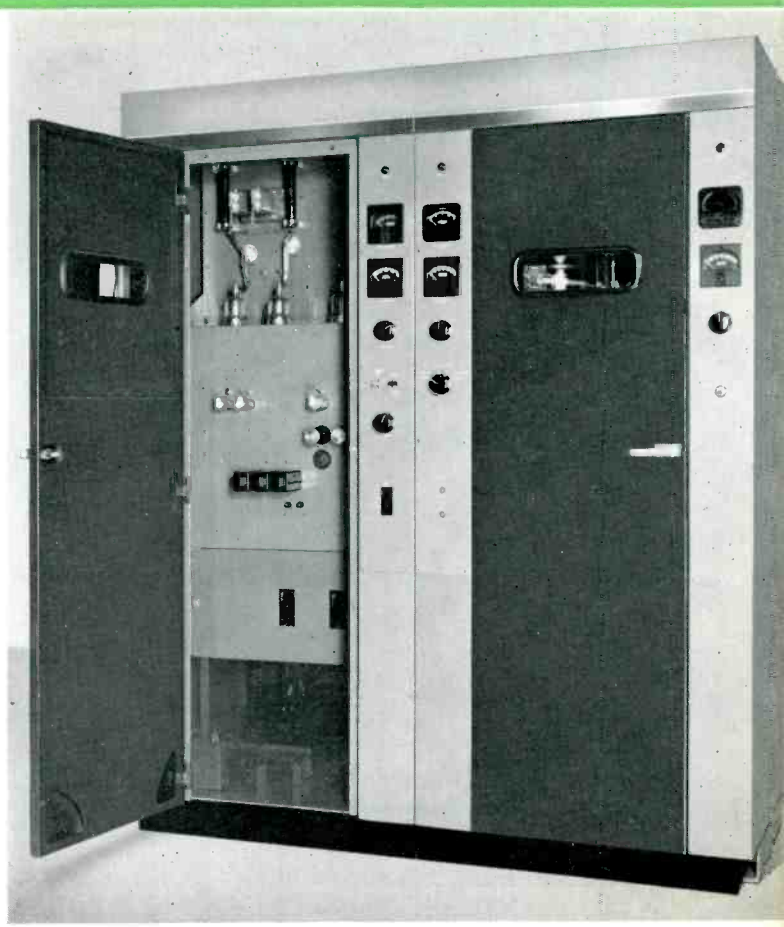
The left hand cabinet contains the BTA-5R exciter-driver, while the right hand cabinet houses the amplifier, modulator and high voltage rectifier portions of the transmitter. The cabinets require less than 16 square feet of floor space. A plate transformer occupies only an additional 3 sq. ft.

Latest Radio and Audio Frequency Circuit Design

The BTA-5R/5R1 Transmitter incorporates RCA's new MI-27632 Crystal Oscillator with three, switchable, temperature-controlled crystal units. Each crystal will remain constant within plus or minus five cycles. The three crystals control main, standby and Conelrad operation. The desired crystal can be selected by means of a front panel switch or by means of a remote-control switch since relays are built into the exciter. The oscillator employs broadband circuits that require no adjustments. A 6AK5 is used as an oscillator tube with a 5763 as the buffer. This unit is built on an etched circuit panel easily accessible for service by removing the cover. The entire oscillator unit can be removed by disconnecting a cable, plug and retaining screws. Also a part of the basic exciter is the 6146 IPA stage which is operated very conservatively and a pair of 2E26 tubes used as the first a-f stage of the modulator circuit.

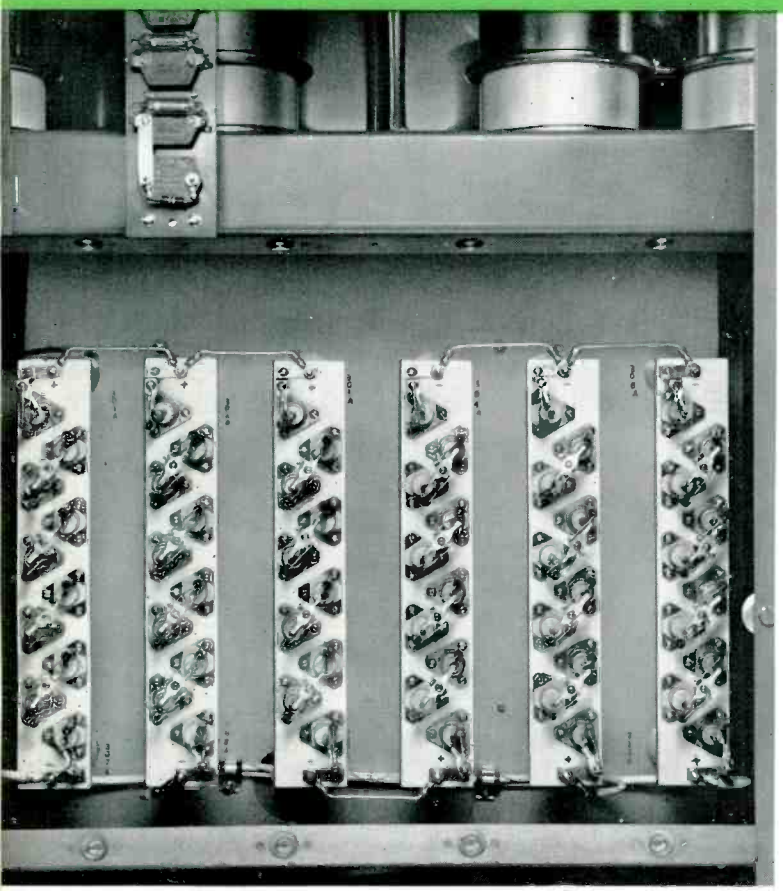
New Crystal Oscillator, MI-27632, showing three, switchable temperature-controlled crystal units for controlling transmitter main, standby and Conelrad operations.





IPA and modulator driver stages of the BTA-5R can be seen at top of open cabinet. The exciter is at the center of the cabinet, and control equipment is placed just below the exciter.

The output of the 6146 IPA stage is broadband and requires no tuning. It drives a pair of 4-125A tubes where tuning is accomplished by using a slug-tuned coil controlled from the front panel. These tubes, in turn, drive two long-life 5762 output triodes. A front panel control of a vacuum variable capacitor tunes the plate circuit.



Silicon rectifier chassis of the BTA-5R1 Transmitter showing two banks of thirty silicon cells which comprise the full-wave rectifier. Silicons offer improved performance since they are particularly resistant to aging, moisture, and wide temperature variations.

A new slug-tuned coil was developed for the power output adjustment and it is driven by a reversible motor. The motor is actuated at the front panel or by a remote power output adjustment switch. The second harmonic trap uses a slug-tuned coil, thus eliminating the possibility of contact pitting from high current in the r-f circuit of the transmitter. Neutralization of the 5762 PA stage is achieved by broadband transformers and a variable vacuum capacitor. The use of a broadband type of transformer holds neutralization over a wide band and prevents spurious oscillation at other frequencies.

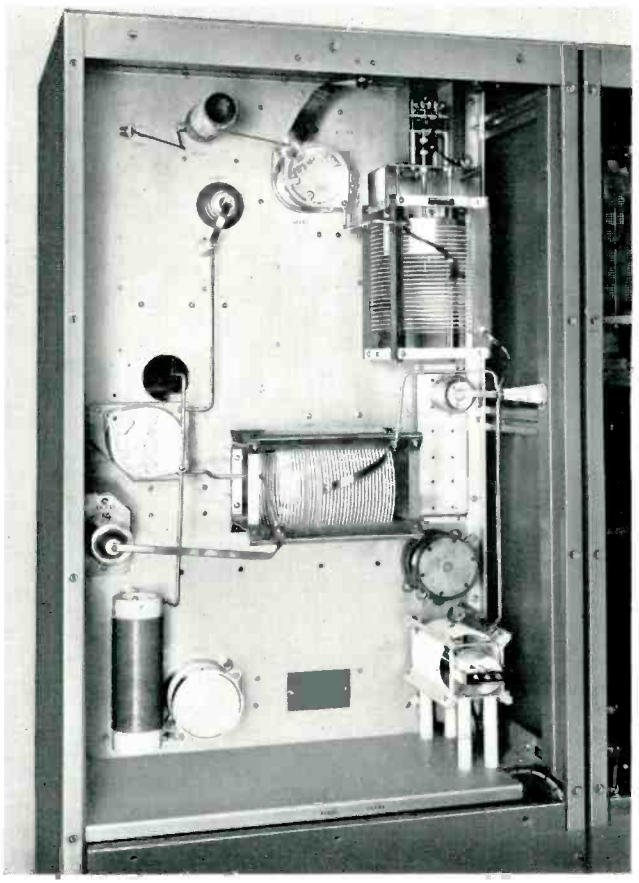
The modulator of the transmitter consists of a pair of 2E26 tubes located in the exciter portion, resistance coupled to drive a pair of 6155/4-125A second audio frequency amplifiers which, in turn, are resistance coupled to drive a pair of 3X3000F1 modulators. These modulator tubes are low mu triodes, drawing no grid current. They are capable of excellent response and fidelity.

Dependable Semiconductor Power Supply

The BTA-5R normally is supplied with Type 8008 RCA Tubes for the high-voltage rectifier. However, in keeping, with the latest trend to improve products, another version of the transmitter has been developed—the Type BTA-5R1, which incorporates silicon-type rectifiers in the high-voltage circuits. This rectifier is ideal not only in a combined operation, but even more so in a remote-control application.

The rectifiers are hermetically sealed so they will not be adversely affected by weather conditions. They can operate at ambient temperatures ranging from −20°C to +45°C and at altitudes up to 7500 feet above sea level. There is no significant aging of the forward drop characteristics. Across each one of the silicon cells a resistor has been shunted so that they will all share equally the peak inverse voltage rating. RCA specifications have been set higher than EIA standards by adding an additional 30 percent peak inverse voltage safety factor.

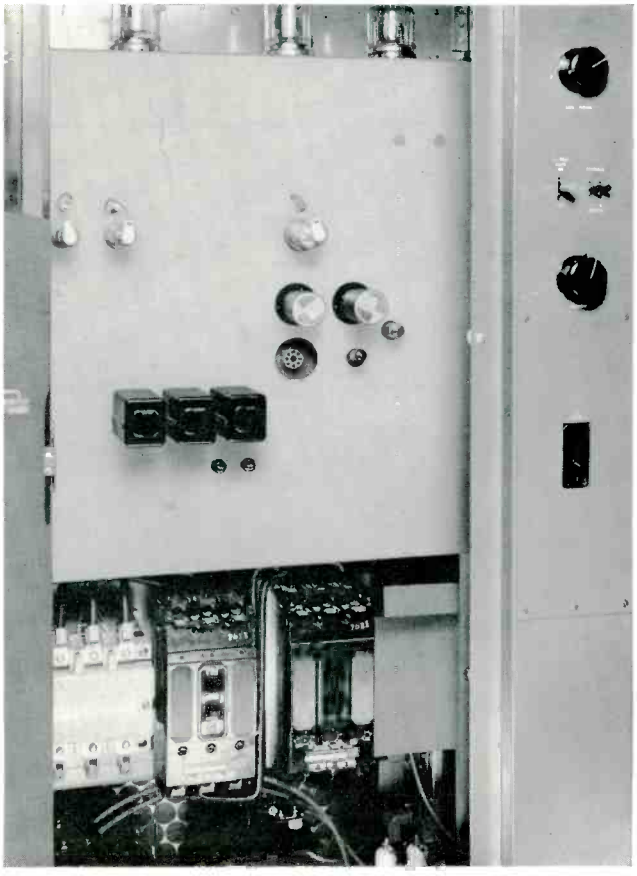
New motor-driven, slug-tuned power-output coil shown at upper right. The tuning control is on the front panel.

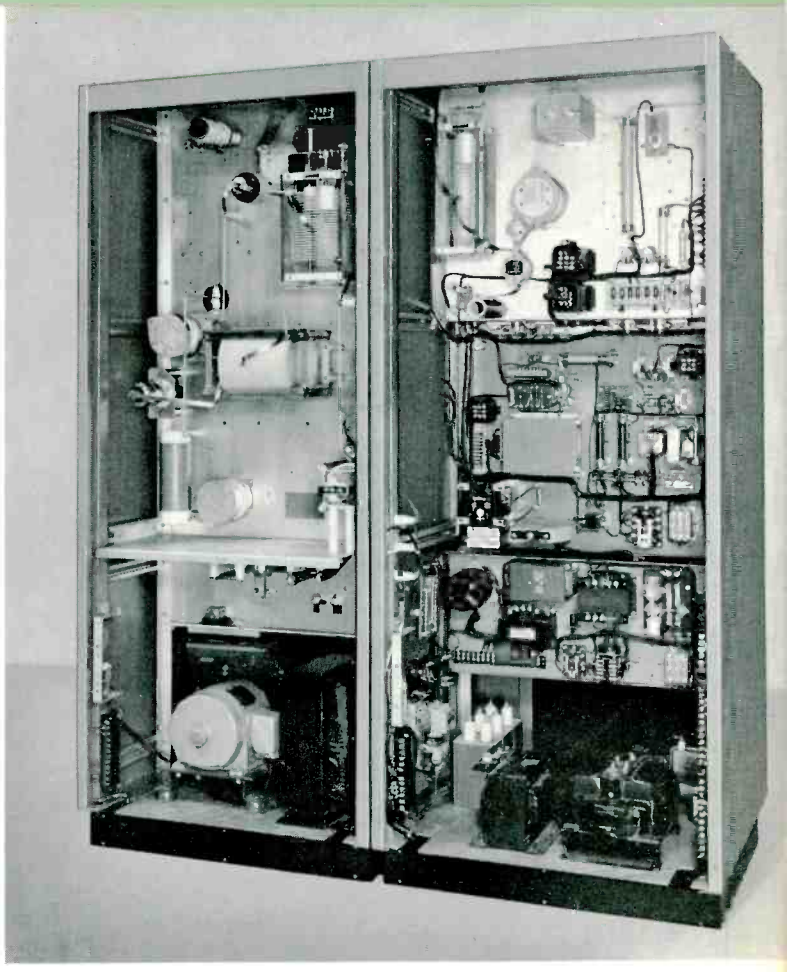


Cooling System

The transmitter is completely air-cooled. Added refinements such as a delay relay have been built-in to keep the blower system in operation for one minute after the transmitter has been shut down. The continued supply of air extends tube life. The exciter cabinet employs air convection cooling. A louvered lower back panel and top grill panel provide good ventilation. In the second cabinet a blower air system distributes air to the modulator and PA tubes. The forced air is also used to cool the PA tank circuit. Rectifier tubes in the BTA-5R are cooled by a small, thermally-controlled blower, that is not required with dry-disc silicon rectifiers in the BTA-5R1. When silicon, high-voltage rectifiers are installed, air from the main blower is utilized, assuring an additional safety factor.

Close up view of the exciter with two crystal units in place. Just above the crystals is the 6146 r-f driver. To the left may be noted the pair of 2E26 tubes for the a-f input. Panel below exciter is removed to show circuit breakers and fuses.

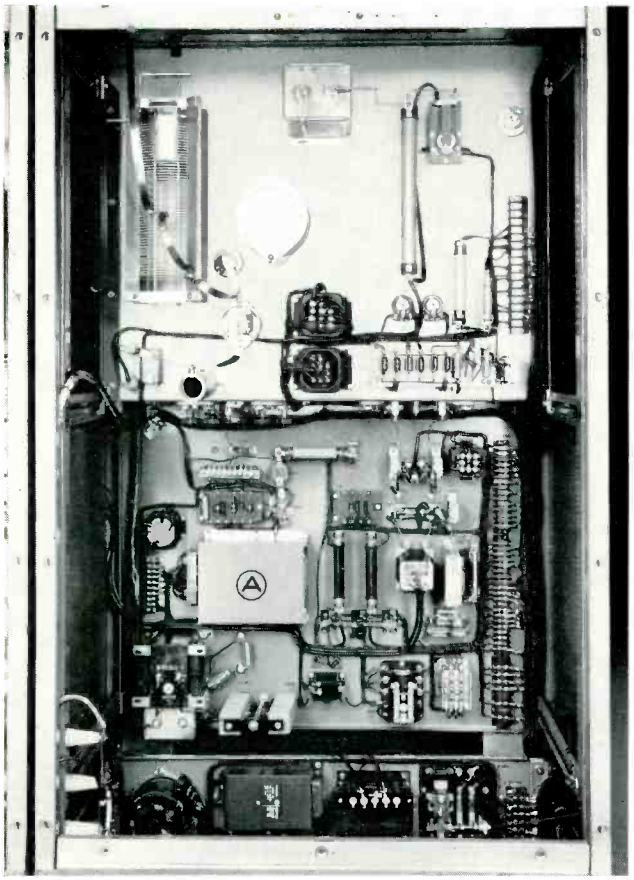




Complete rear access to all components and wiring of the BTA-5R is made through easily removable interlocked panels shown removed here.

Overload Protection

To provide additional reliability, improvements were made in the control and protective circuitry of the BTA-5R/5R1 Transmitter. Primary lines are protected by means of circuit breakers with thermal and instantaneous overload trip protection. The 3-phase blower is protected by a contactor with the thermal cutoff in each phase. Relay switching is sequential so that filaments will not come on unless the blower is operating. Low voltage is delayed for 30 seconds to allow proper filament heating. The high voltage is interlocked with the low-voltage and the bias supply so that it will come on only after the low-voltage and bias potential is present. Overload protection is also provided in the low-voltage supply, the second AF stage, the IPA stages, the modulator, the PA stages and the high-



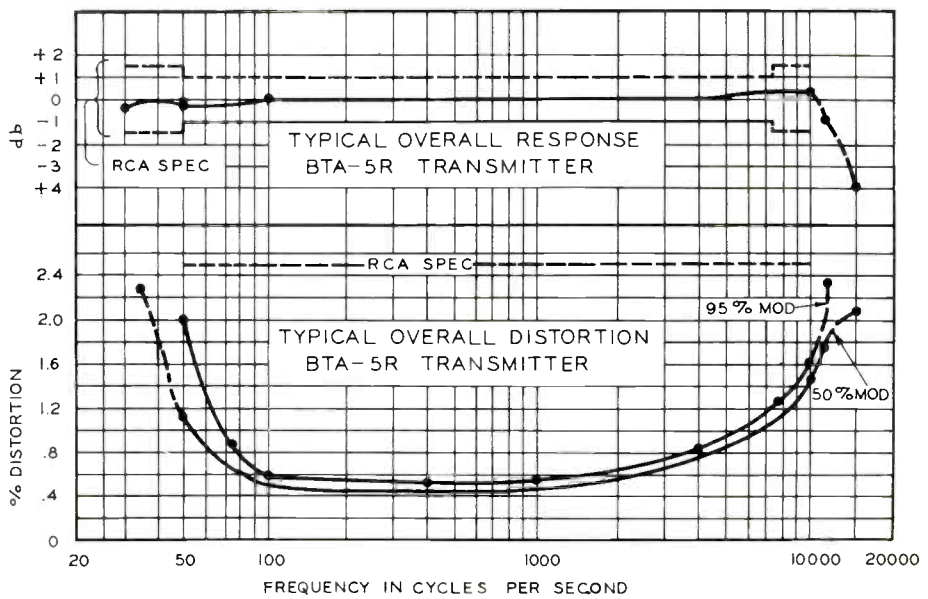
Rear of exciter, IPA and modulator driver stages.

voltage rectifier. They are instantaneous in action and each overload relay carries a spare set of contacts wired to terminals that may be connected to an external indicator unit.

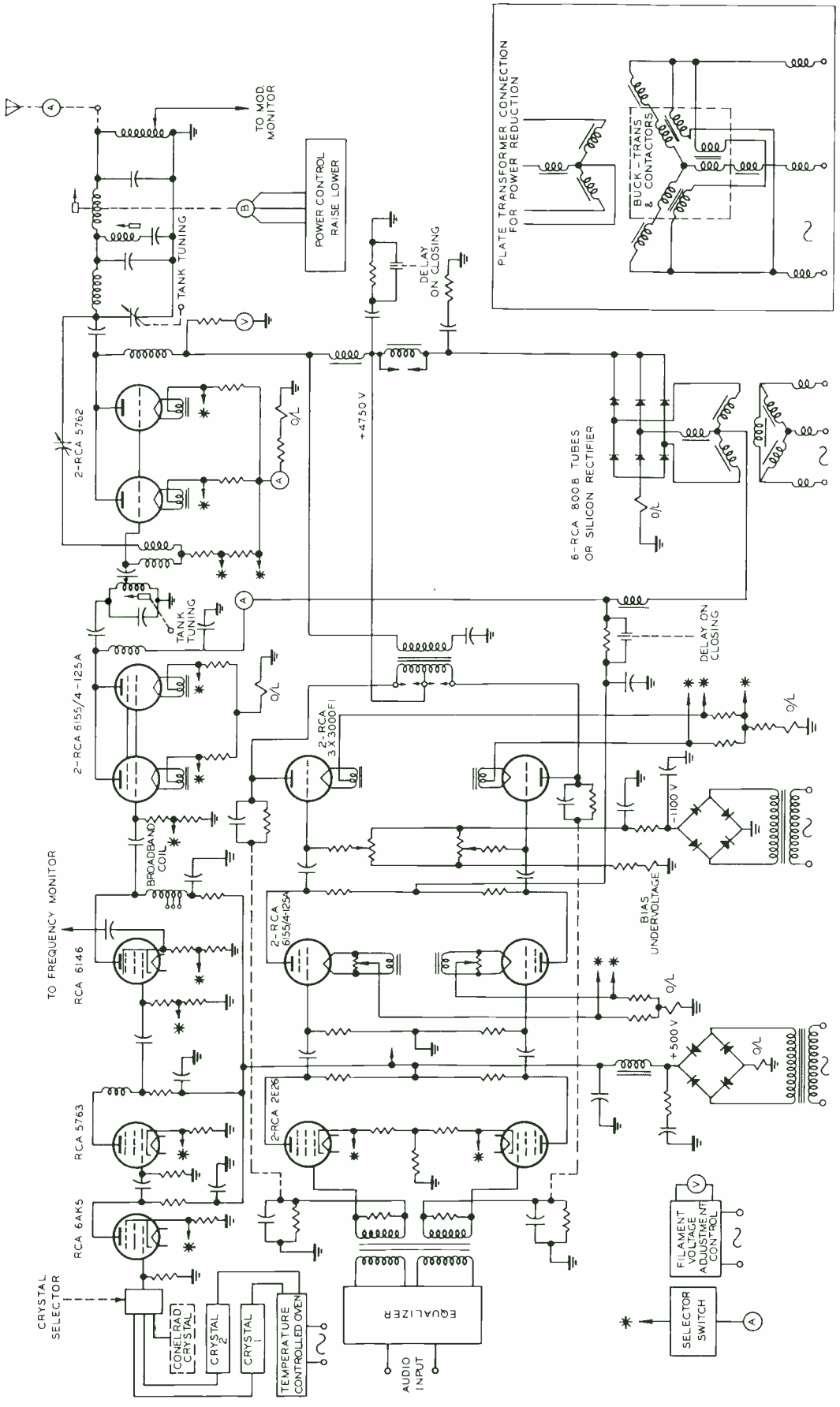
Starting surges in the plate transformer, high voltage rectifier, and the filter capacitor are eliminated by the use of a stop-start and damping circuit. This at one time was only available in the higher-power transmitters, but now longer life and added reliability are provided in the BTA-5R/5R1 with the incorporation of this circuit for the suppression of starting transients.

Smaller Transformers

Continuing research has added still another feature to this RCA transmitter. Grain-oriented steel and epoxy resin are used in the manufacture of plate transformers, this results in realizing half the size that would be normally expected in a transformer of this power. This also reflects in lower floor area requirements while still providing high-quality components.



Typical response measurements for the BTA-5R showing the measured response compared with the specifications.



Simplified schematic diagram of the BTA-5R/5R1 AM Broadcast Transmitter.

SPECIFICATIONS

Performance Specificaitons

AF Input Impedance.....150/600 ohms
AF Input Level (100% modulation).....+10 ±2 dbm
AF Response:
50-7500 Cycles.....±1 db
30-10,000 Cycles.....±1.5 db
AF Distortion (95% modulation):
50-10,000 Cycles.....2.5%
Noise (below 100% modulation).....60 db
Frequency Range.....535-1620 kc
Frequency Stability.....±5 cycles
Type of Output.....Single ended
Carrier Shift (0-100% modulation, 400 cycles).....3% at constant line voltage
5% at normal line voltage regulation
Output Impedance.....40-250 ohms

Electrical Specifications

RF Voltage (for frequency monitoring).....10 V RMS 75 ohms
RF Voltage (for modulation monitoring).....10 V RMS 75 ohms
Power Output (nominal).....5000 watts
Power Output Capability.....5500 watts
Power Supply.....208/240 volts ±11 volts
Line Frequency.....60 cycles (50 cycle kit available)
Phase.....3
Power Consumption:
(0% modulation).....12 kw
(100% modulation).....18 kw
(average program modulation).....14 kw
Power Factor.....90%
Permissible Combined Line Voltage Variation and Regulation.....±5%
Crystal Heater Power Supply.....117 volts 50/60 cycles

Tube Complement

1 6AK5 Crystal Oscillator
1 5763 Buffer
1 6146 Intermediate Power Amplifier
2 6155/4-125A Driver
2 5762 Power Amplifiers
2 2E26 1st Audio Frequency Amplifier
2 6155/4-125A 2nd Frequency Audio Amplifier
2 3X3000F1 Modulator
6 8008 High Voltage Rectifier (not used in BTA-5R1)

Mechanical Specifications

Height.....84" (80" less floor channels)
Width.....69"
Depth.....32" (less door handle)
Net Weight:
Transmitter.....3800 lbs. (approx.)
Plate Transformer.....420 lbs. (approx.)
Altitude Range.....0-7500 ft.
Ambient Operating Temperature:
BTA-5R.....*—10°C (50°F) min.; +45°C (113°F) max.
BTA-5R1.....—20°C (40°F) min.; +45°C (113°F) max.

* For —20°C to 45°C ambient temperature operation specify Type CH-1120 Xenon Rectifier Tubes (MI-34615).

Equipment Supplied

	BTA-5R	BTA-5R1
Type BTA-5R 5000-Watt Broadcast Transmitter (complete)	ES-27239	
Type BTA-5R1 5000-Watt AM Broadcast Transmitter (complete		ES-34206
Including the following:		
1 Transmitter Driver	MI-27650	MI-27650
1 Amplifier, Modulator and High Voltage Rectifier	MI-27635-A	MI-27635-B
1 Plate Transformer	MI-27636-A	MI-27636
1 Installation Material Kit	MI-34610	MI-34610
1 Miscellaneous Hardware Kit	MI-7474	MI-7474
1 Blower	MI-34616	MI-34616
1 Door Right Hand (Choose decor as follows)		
Burgundy	MI-27645-1	MI-27645-1
Light Umber Gray	MI-27645-2	MI-27645-2
Peacock Blue	MI-27645-3	MI-27645-3
Emerald Green	MI-27645-4	MI-27645-4
1 Door Left Hand (Choose decor as follows)		
Burgundy	MI-27645-A1	MI-27645-A1
Light Umber Gray	MI-27645-A2	MI-27645-A2
Peacock Blue	MI-27645-A3	MI-27645-A3
Emerald Green	MI-27645-A4	MI-27645-A4
1 Nameplate	MI-28180-1	MI-28180-1
1 Touch-Up Finish Kit	MI-27660-A	MI-27660-A
1 Dome Type Insulator for PA Output	MI-19406-A	MI-19406-A
1 Adaptor or Plate for Coaxial Line Output	MI-34613	MI-34613
1 Set of Frequency Determining Parts	MI-27692	MI-27692
1 Crystal, Type TMV-130B	MI-27493	MI-27493
1 Set of Operating Tubes	MI-27288	MI-34207

Optional and Accessory Equipment

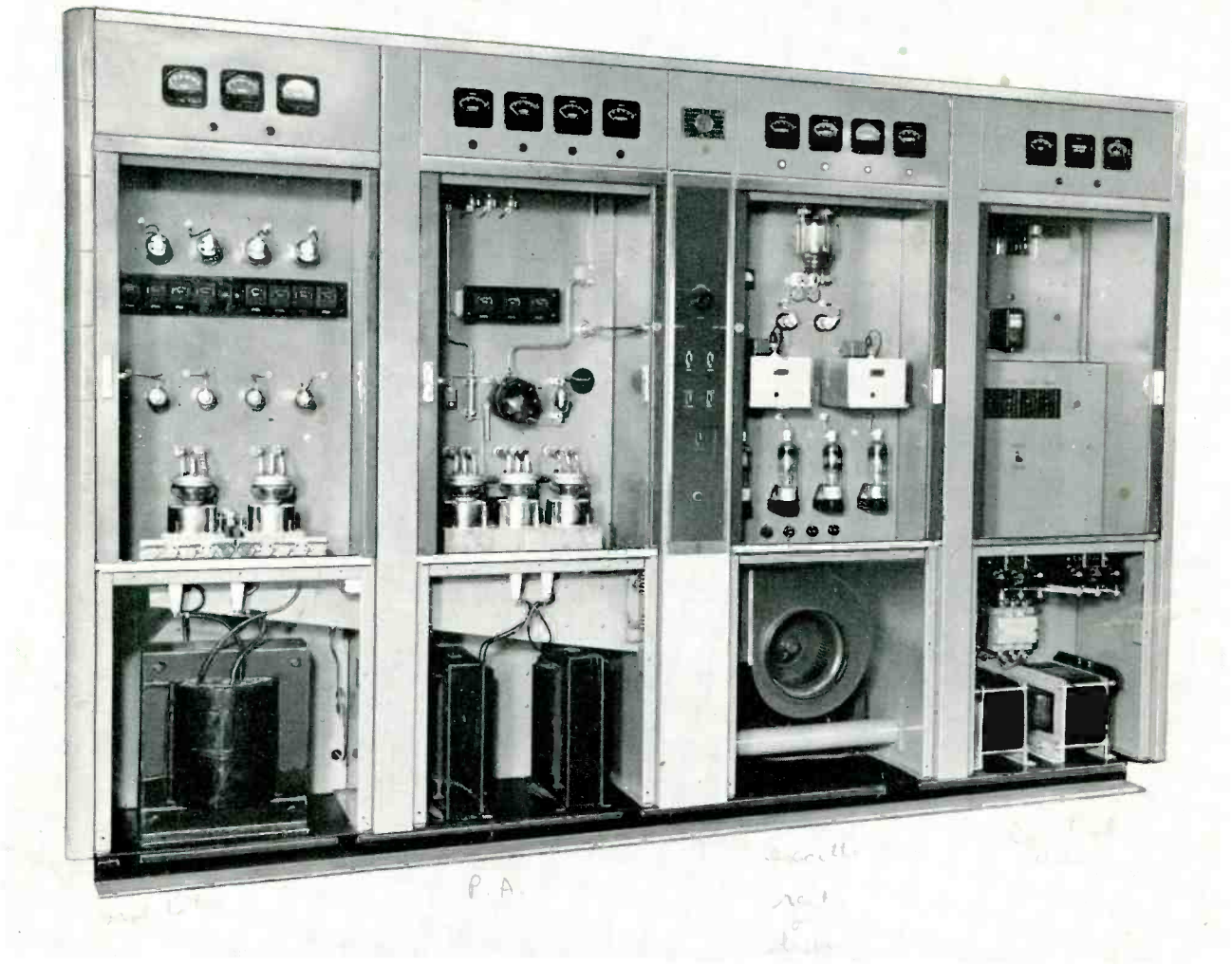
Type BTR-11B Remote Control System	MI-27537/27538	MI-27537/27538
Type BTR-20A Remote Control System	MI-27539/27536	MI-27539/27536
Antenna Tuning Equipment	ES-27256	ES-27256
Filament Hours, Elapsed Time Indicator	MI-34614	MI-34614
Remote Antenna Current Ammeter	MI-27644	MI-27644
Remote Ammeter Pick-up Unit	MI-27966	MI-27966
Complete Set of Spare Tubes	ES-27289	MI-34208
Type BW-11A Frequency Monitor	MI-30011-A	MI-30011-A
Type BW-66F Modulation Monitor	MI-30066-B	MI-30066-B
Power Cutback Kit (5000 watts to 1000 watts)	MI-34312-1	MI-34312-1
Power Cutback Kit (1000 watts to 500 watts)	MI-34312-2	MI-34312-2
Conelrad Kit	MI-34312-3	MI-34312-3
Six Type CH-1120 Xenon Tubes (for BTR-5A operation from —20°C to +45°C)	MI-34615	.....

5 KW/10 KW AM BROADCAST TRANSMITTERS

TYPES BTA-5H AND BTA-10H

FEATURES

- Low operating cost for tubes and power
- Low distortion
- Only two tuning controls
- Grid-controlled thyratron power supply—split-cycle overload protection
- Bi-level modulation
- Fewer tubes, fewer tube types
- True High-Fidelity frequency response
- Lower voltage, higher dependability
- Easily remote-controlled



Front view with sliding doors opened and lower panels removed to show interior arrangement. Note the similarity of mechanical layout. Cabinets from left to right house modulator, power amplifier, exciter, and rectifier and control units respectively.

USES

The RCA Type BTA-5H is a 5-kw amplitude modulated, high fidelity, broadcast transmitter for operation in the band of 535-1620 kilocycles. Every consideration has been given to the simplification of mechanical and circuit design for ease of operation and maintenance and to reduction of installation and operating costs. The Type BTA-10H transmitter is similar to the BTA-5H in design. It provides a power output capability of better than 10-kilowatts.

The BTA-5H and BTA-10H provide "split-cycle" overload or arc back protection through the use of new grid-controlled thyratron rectifiers. "Recycling" circuits work so rapidly that "off-on" breaks are not audible.

Bi-level modulation, accomplished by adding a controlled amount of audio to the r-f driver increases efficiency, reduces power consumption and reduces distortion.

Smaller size, and new flush-mounted, horizontally-sliding or "rollback" doors result in considerably less "operating" floor area than other 5 KW's since no "door-swing" area is needed. Tubes and Components are mounted on vertical chassis within easy reach from front or rear. All tubes are visible through observation windows in the sliding doors. All a-f and r-f tubes are metered by a total of 23 meters to provide continuous indication of electrical operation. Controls are all conveniently grouped on a central panel strip for simplified fingertip operation.

Low power consumption and low tube costs result in substantial savings. Fewer tubes and fewer types plus the use of the same tube in "P. A." and Modulator contribute further to economical and dependable operation. All components are conservatively rated and increase to 10-KW may be done easily and inexpensively without increasing cabinet or floor space.

DESCRIPTION

The Type BTA-5H/10H AM Broadcast Transmitters are outstanding in appearance, performance and reliability. Fidelity, distortion, and noise level are held to standards meeting the highest requirements. The power output capability is conservatively rated at 5500 and 10,600 watts respectively. The frequency range of the equipment is 535 to 1620 kc.

The entire transmitter consists of four rugged steel and aluminum cabinets housing the exciter, power amplifier, modulator, and power rectifier and control units respectively. These cabinets are installed side by side on two 4-inch wire troughs (supplied) which run the full length of the transmitter. These individual cubicles simplify shipping and installation of the transmitter, and when assembled provide an attractive unified appearance.

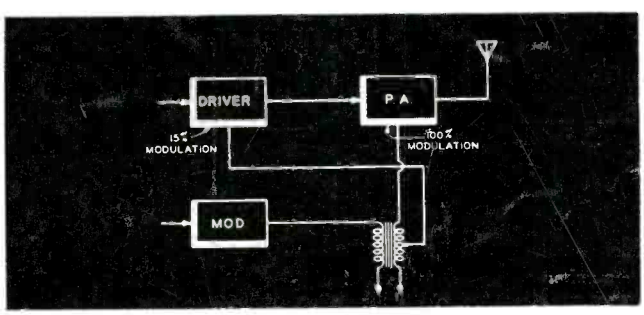
The cabinets feature unique aluminum sliding doors which slide back effortlessly on rubber castor assemblies. These flush-mounted doors save operating floor space and provide more "walk-around" area in compact transmitter rooms. Vertical chassis construction is employed throughout both the BTA-5H and BTA-10H Transmitters. This provides utmost accessibility to all components without disassembly by merely rolling back the front or rear doors.

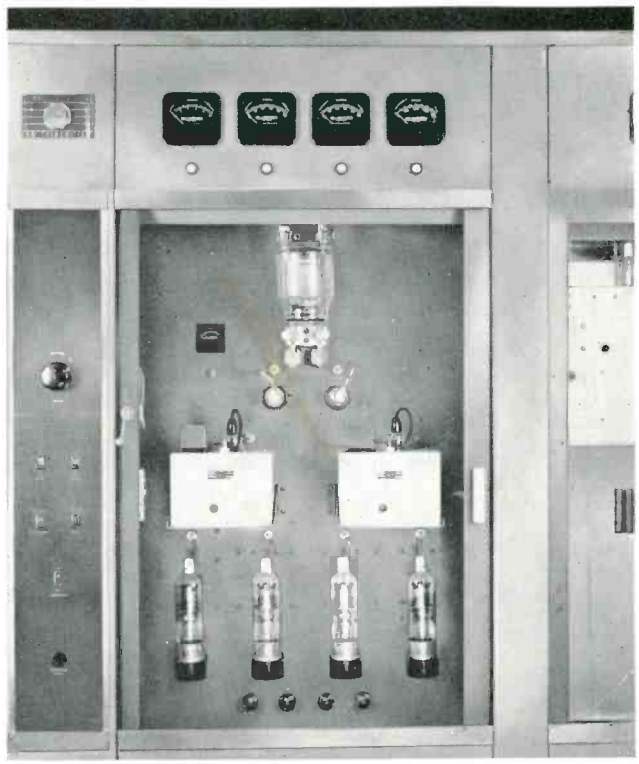
All operating tubes are visible through convenient observation windows in the doors. The centralized grouping of the two tuning controls, with all meters grouped on panels above the doors provide ease of operation. All doors are provided with conventional plate inter-lock and high voltage grounding switches for protection of operating personnel.

Circuit Description

The BTA-5H and BTA-10H Transmitters are supplied with two UL-4392 Oscillator Units equipped with TMV-129B

Schematic of Bi-level modulation circuit.





Close up front view of the R-F Driver or Exciter cabinet. Sliding door is fully opened to show tubes, controls and components. Vertical chassis construction is employed throughout the BTA-5H and BTA-10H Transmitters.

Crystal Units. To provide easy accessibility, the crystal units and tubes of the driver stages are located on the front of a single vertical chassis.

The crystal oscillator vernier frequency adjustments are readily accessible. Front panel oscillator switching is provided to enable selection of the auxiliary oscillator. These oscillators maintain the frequency within plus or minus five cycles. The crystal oscillator feeds two RCA 807 Tubes in parallel operating as a buffer amplifier. A tapped coil is utilized in the plate circuit of this stage. No neutralization is required, and the plate circuit does not require tuning after initial set-up is made. The frequency monitor feed is taken from the cathode circuit of this buffer.

The buffer, in turn, excites the driver amplifier consisting of one RCA 833-A Tube utilizing a slug-tuned inductor in the plate circuit and broadband neutralization transformer.

The slug-tuning is controlled by a vernier dial located on the front panel. The RCA 833-A drives the power amplifier.

Also housed in the lower portion of the exciter cabinet is the low-voltage rectifier utilizing four RCA 8008 Tubes. It supplies plate voltage to oscillators, buffers and audio stages.

The Power Amplifier or r-f output stage consists of two RCA-5762 Tubes, in the BTA-5H for 5-kw operation. A third RCA 5762 is added in the final of the BTA-10H for 10-kw operation.

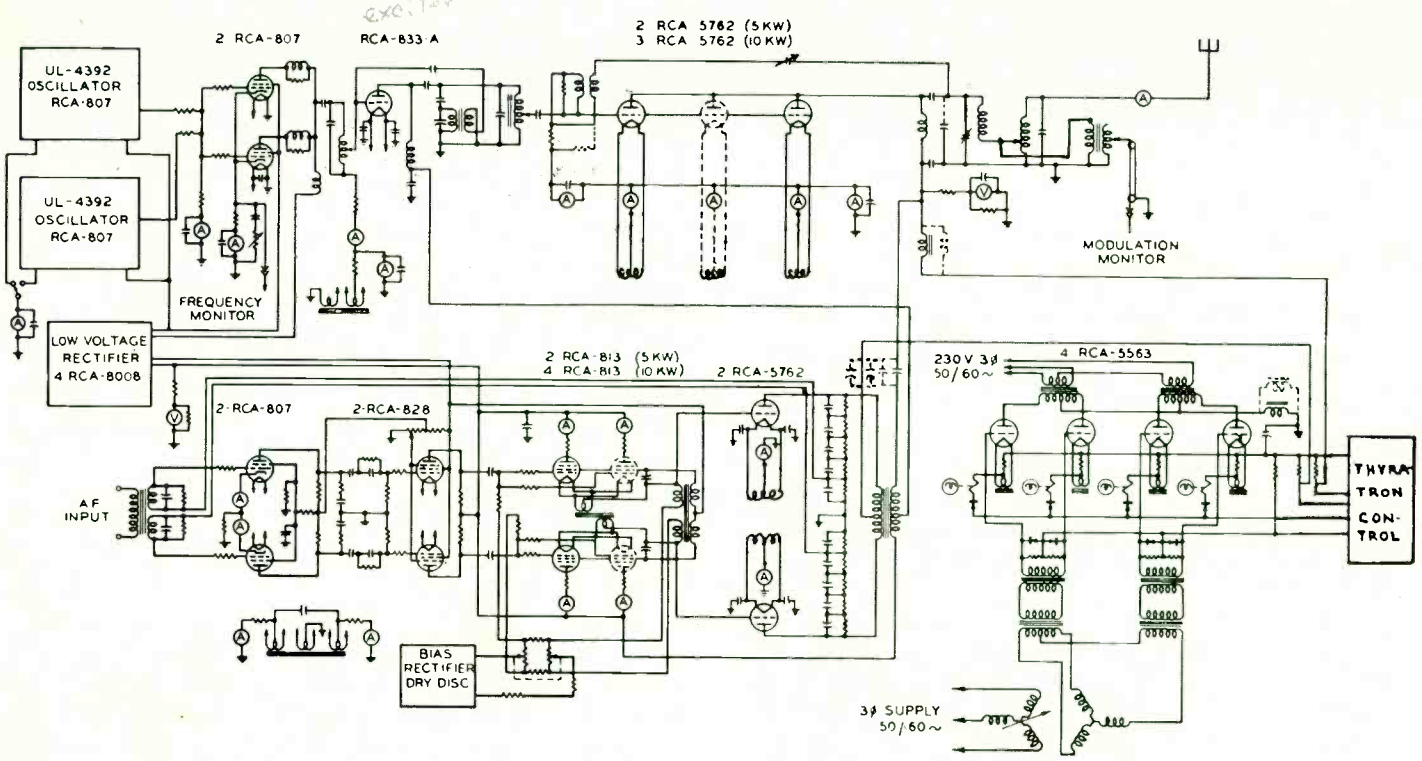
The plate circuit of this modulated power amplifier is tuned by a variable vacuum capacitor which is controlled manually by a vernier dial located on the front panel. Neutralization is accomplished by means of a broadband transformer. The power amplifier tank circuit and output matching network form a symmetrical network so the load impedance is the same to both side bands, thus eliminating a possible source of distortion. The modulation monitor feed is provided by a transformer across the output of the transmitter to provide faithful monitoring of transmitter output. There are no air dielectric condensers in the transmitter, thus reducing arc-over possibilities due to dust collection. There are only two tuning controls and one power output control in the transmitter. All r-f stages operate Class C.

Use of the RCA-5762 tubes in both the power amplifier and modulator stages not only reduces number of tube types, but makes possible interchange of tubes to increase useful life.

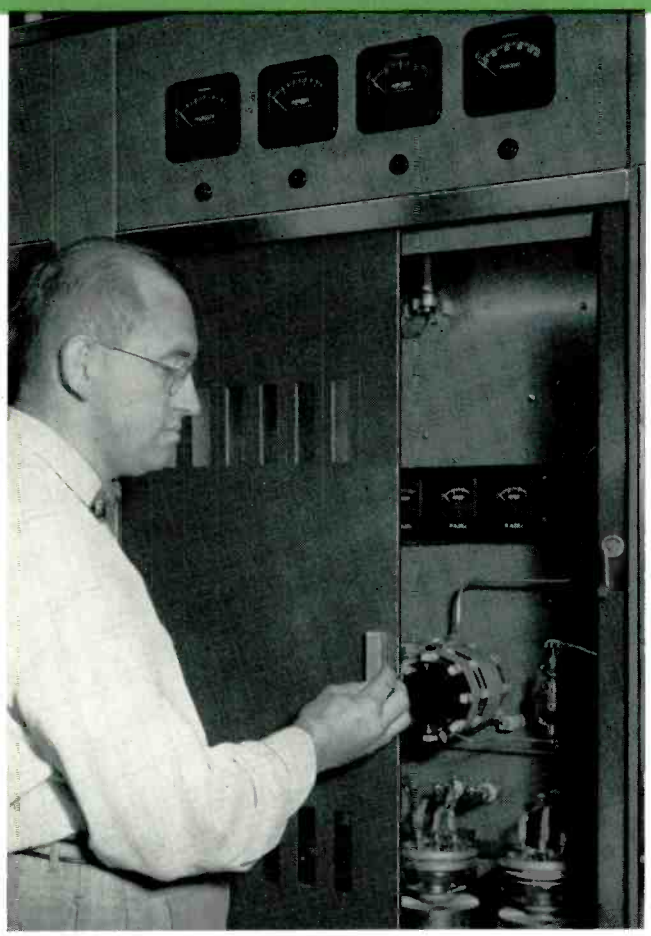
Low audio distortion at frequencies from 30 to 15,000 cycles per second is achieved. This is accomplished by improved audio circuit design, and by modulating the plate of the r-f driver as well as the power amplifier. Bi-level modulation improves the linearity of the power amplifier by varying the drive in proportion to the modulation. Hum and distortion is further reduced by utilizing inverse feedback in the audio section of the transmitter.

The audio amplifier consists of two RCA-807 Tubes operating push-pull Class A, resistance coupled to two RCA-828 Tubes, also operating push-pull Class A. These tubes are.

SIMPLIFIED SCHEMATIC DRAWING



Simple, straightforward, circuit design reduces the number of stages, tubes and components to a minimum. Dotted lines indicate changes required for 10-KW operation.



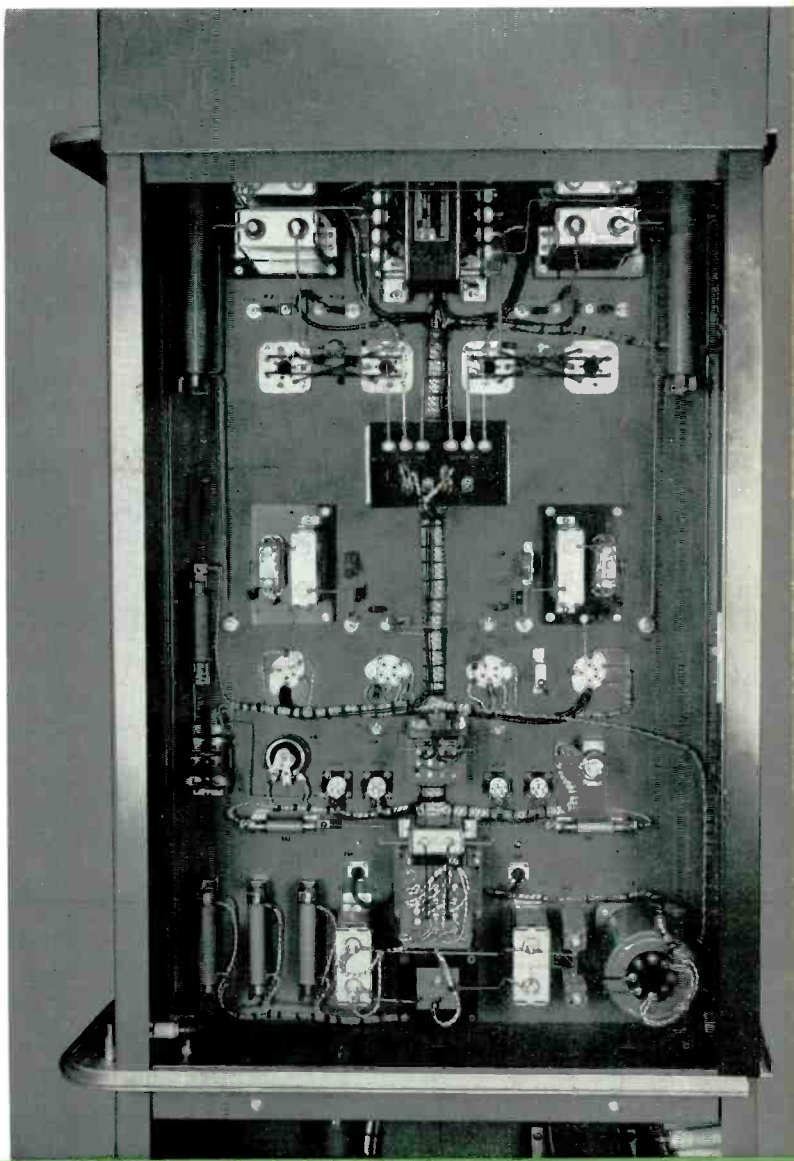
Complete accessibility to all "vertical-chassis" components and tubes is facilitated by the use of horizontally-sliding doors made of extruded aluminum slats. Doors slide back effortlessly on rubber caster assemblies.

in turn, resistance coupled to two RCA-813 Tubes operating push-pull Class AB_1, in the BTA-5H. In the BTA-10H, two additional RCA 813's are added to form a push-pull parallel Class AB_1 circuit. The sockets and circuitry for these tubes are already wired into the BTA-5H. The audio amplifier is direct coupled to the two RCA-5762 Modulator Tubes operating Class B, which provide high level plate modulation power to the r-f power amplifier. The bias for the Class AB_1 driver and amplifier and modulator tubes is obtained from a long life selenium rectifier. Plate and screen voltages for the audio stages are obtained from the Low Voltage Rectifier.

In the high-voltage rectifier and power control cabinet of the BTA-5H and BTA-10H are located the necessary relays, switches, controls, tubes, and power-rectifier components. The front compartment of the power-rectifier is accessible at all times and is not interlocked but fully protected, to permit operation of control switches. The rear compartment of this unit contains a special thyratron control circuit with components arranged on a hinged chassis. The thyratron rectifier tubes are visible through windows located on front of the transmitter door. A set of arc-back and overload indicator lamps are also mounted on the thyratron tube shelf and are visible through jewels mounted in the vertical chassis.

The plate voltages for the power-amplifier and modulator are obtained from the four-phase thyratron rectifier which employs four RCA-5563 Tubes. A manually operated selsyn motor, used as a phase-shifter, provides front panel control of the output plate voltage and a convenient means for power output control. No bulky contactors are required.

Rear view of audio and modulation cabinet showing accessibility of components. Bi-level modulation reduces distortion and increases fidelity to a new high.



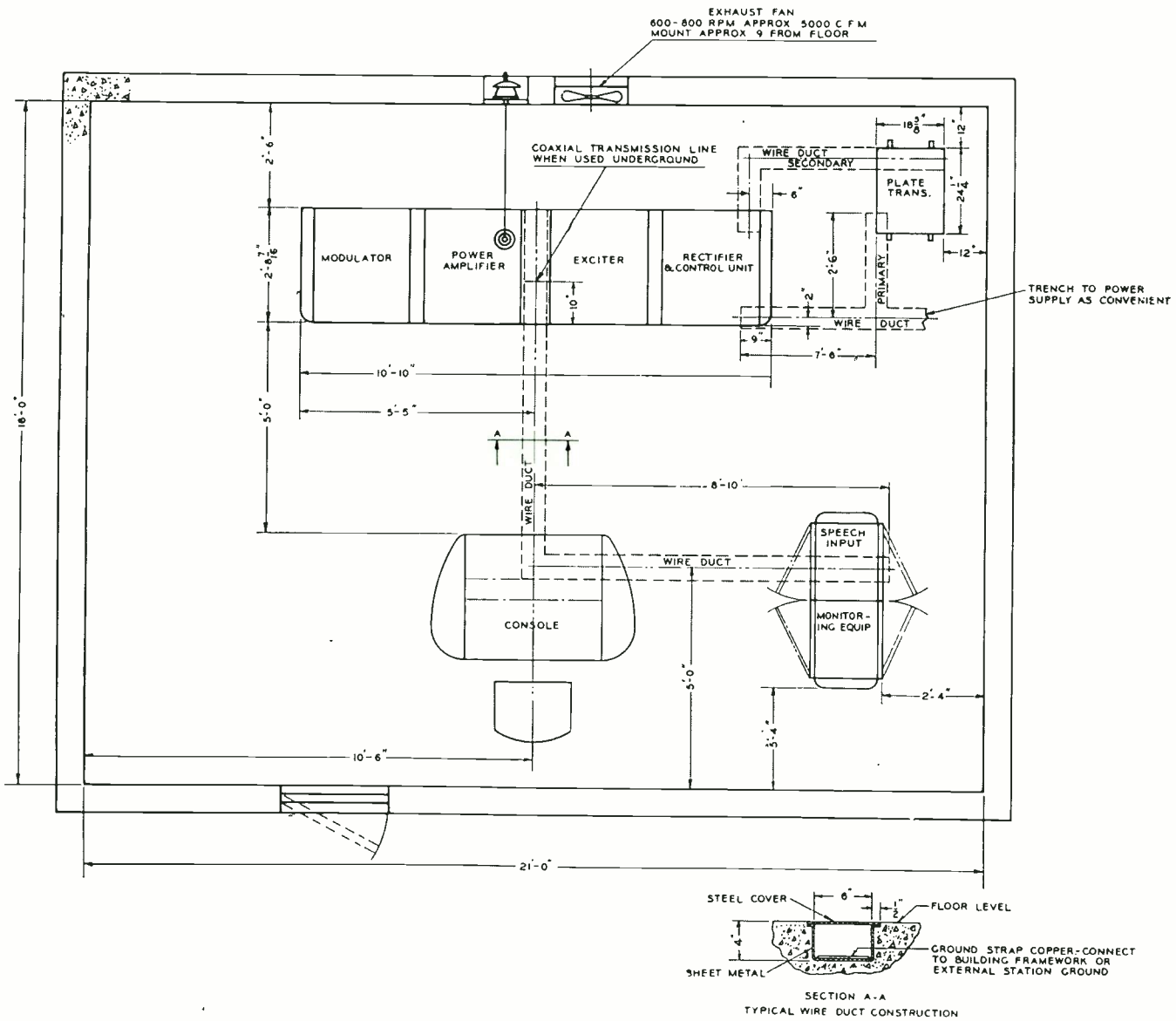
Split-cycle electronic overload or arc-back protection in the HV rectifier is provided, with positive arc-back indication. Automatic recycling of the overload and arc-back protective circuits is another incorporated feature.

The four rugged steel and aluminum cabinets which house the major transmitter components are readily transported through average doorways and may be arranged to suit station needs. The floor plan below shows the usual arrangement with the cabinets installed side by side on two 4-inch wire troughs which run the full length of the transmitter. These individual cubicles simplify shipping and installation of the transmitter and when assembled provide an attractive unified appearance.

Universal cabinets are available to house the phasing and branching equipment if a directional array is employed. The externally located, air-cooled plate transformer is completely enclosed and shielded, and does not usually require a fireproof vault. A preformed wiring cable supplied with the transmitter simplifies the installation and reduces time to a minimum.

The transmitter is designed and wired to operate from a remote transmitter control console where this type of operation is desired; however, the transmitter is usually operated by use of centralized controls on the front panel. Speech input and monitoring equipment may also be used with the BTA-5H/10H and can be accommodated in standard broadcast rack-mounting cabinets.

SUGGESTED STATION FLOOR PLAN



SPECIFICATIONS

Performance Specifications

Description	Reference BTA-5H	BTA-10H
AF Input Impedance	150/600 ohms	150/600 ohms
AF Input Level (100% mod.)	+10 ±2 dbm	+10 ±2 dbm
AF Response		
50-7500 Cycles	±1 db	±1 db
30-10,000 Cycles	±1.5 db	±1.5 db
AF Distortion		
50-10,000 Cycles	2.5%	2.5%
Noise, Unweighted (below 100% mod.)	—60 db	—60 db
Modulation	High level class B**	High level class B**
Frequency Range	535-1620 kc	535-1620 kc
Type of Emission	A3	A3
Frequency Stability	±5 cycles	±5 cycles
Type of Output	Unbalanced	Unbalanced
Carrier Shift (0-100% mod.)	Less than 4%	Less than 5%
Output Impedance	40-250 ohms	40-250 ohms
R.F. Voltage (for frequency monitoring)	10 v. RMS, 75 ohms	10 v. RMS, 75 ohms
R.F. Voltage (for modulation monitoring)	10 v. RMS, 75 ohms	10 v. RMS, 75 ohms
Power Output Capability	5500 watts	10,600 watts
Maximum Ambient Operating Temperature	+45 degrees C	+45 degrees C

Electrical Specifications

Power Supply	208/230 volts	208/230 volts
Line Frequency	*60 cycles	*60 cycles
Phase	3	3
Power Consumption		
(0% mod.)	12 kw (approx.)	20 kw (approx.)
(Average)	13.5 kw (approx.)	23 kw (approx.)
(100% mod.)	18 kw (approx.)	33 kw (approx.)
Power Factor	85%	85%
Permissible Combined Voltage Variation and Regulation	±5%	±5%
Crystal Heater Power Supply	117 volts	117 volts
Crystal Heater Line Frequency	50/60 cycles	50/60 cycles
Crystal Heater Phase	1	1
Crystal Heater Power Consumption	30 watts	30 watts

* Accessory kit available for 50-cycle operation.

** With bi-level technique.

Tube Complement

Description	Reference BTA-5H	BTA-10H
Two Oscillators	2 RCA 807	2 RCA 807
Buffer	2 RCA 807	2 RCA 807
R.F. Driver	1 RCA 833-A	1 RCA 833-A
Power Amplifier	2 RCA 5762	3 RCA 5762
1st Audio	2 RCA 807	2 RCA 807
2nd Audio	2 RCA 828	2 RCA 828
3rd Audio	2 RCA 813	4 RCA 813
Modulator	2 RCA 5762	2 RCA 5762
LV Rectifier	4 RCA 8008	4 RCA 8008
HV Rectifier	4 RCA 5563-A	4 RCA 5563-A
Bias Rectifier	Selenium	Selenium
Buffer Tuning	Tapped coil	Tapped coil
Driver Tuning	Slug tuned inductor	Slug tuned inductor
PA Tuning	Variable vacuum capacitor	Variable vacuum capacitor
Driver and PA Neutralization	Broad band transformer	Broad band transformer
Number of Meters	23	26
Tubes Metered	All RF and AF tubes	All RF and AF tubes
Number of Oscillators	2	2
HV Rectifier Circuit	4-phase thyratron	4-phase thyratron
HV Overload Circuit	Split-cycle electronic	Split-cycle electronic
Arc Back Protection	Split-cycle electronic	Split-cycle electronic
Protection to Personnel	Door interlocks HV grounding switches	Door interlocks HV grounding switches
Total Tubes	23	26
Total Tube Types	7	7

Mechanical Specifications

Transmitter Height	84"	84"
Transmitter Width	130"	130"
Transmitter Depth	32 9/16"	32 9/16"
Transmitter Floor Space	29.4 sq. ft.	29.4 sq. ft.
Transmitter Weight (unpacked)	5300 lbs. (approx.)	5500 lbs. (approx.)
Building Entrance Requirements	30" wide x 33" high	30" wide x 33" high
Plate Transformer Height	34"	45"
Plate Transformer Width	22"	22"
Plate Transformer Depth	31"	31½"
Plate Transformer Floor Space	4.75 sq. ft.	4.8 sq. ft.

In order to make improvements in design and effect economies in manufacture, RCA reserves the right to make changes in design, components and specifications published herein.

SPECIFICATIONS (Continued)

Equipment Supplied

Quan.	Description	Reference BTA-5H (ES-28938-A)	Reference BTA-10H (ES-28940-A)
1	Modulator Unit	MI-27061	MI-27061
1	Power Amplifier Unit	MI-27062	MI-27062
1	Exciter Unit, Including 2 Type UL-4392 Oscillators	MI-27063	MI-27063
1	Rectifier and Control Unit	MI-27064	MI-27064
1	Control Panel, Installation Material Kit and Wiring Harness	MI-27065	MI-27065
1	Set of End Shields (L & R)	MI-28061	MI-28061
1	Plate Transformer	MI-27069	———
1	Set of Freq. Determining Capacitors	MI-27071†	MI-27072†
1	Touch-up Finish Kit	MI-7499-A	MI-7499-A
1	Miscellaneous Hardware Kit	MI-7474	MI-7474
1	5 to 10 KW Conversion Kit (60 cycles) Including Plate Transformer	———	ES-28944
2	Instruction Books	IB-30232	IB-30232
1	Set of Operating Tubes	ES-27073	ES-27073/27075
1	Nameplate	MI-28180-1	MI-28180-1
2	TMV-129B Crystal Units	MI-7467	MI-7467
2	Installation Instruction Book	IB-30233	IB-30233
Choice of One:			
	RF Output Ammeter	MI-7157-F	MI-7157-F
	Remote Antenna Ammeter	MI-28037	MI-28037

———

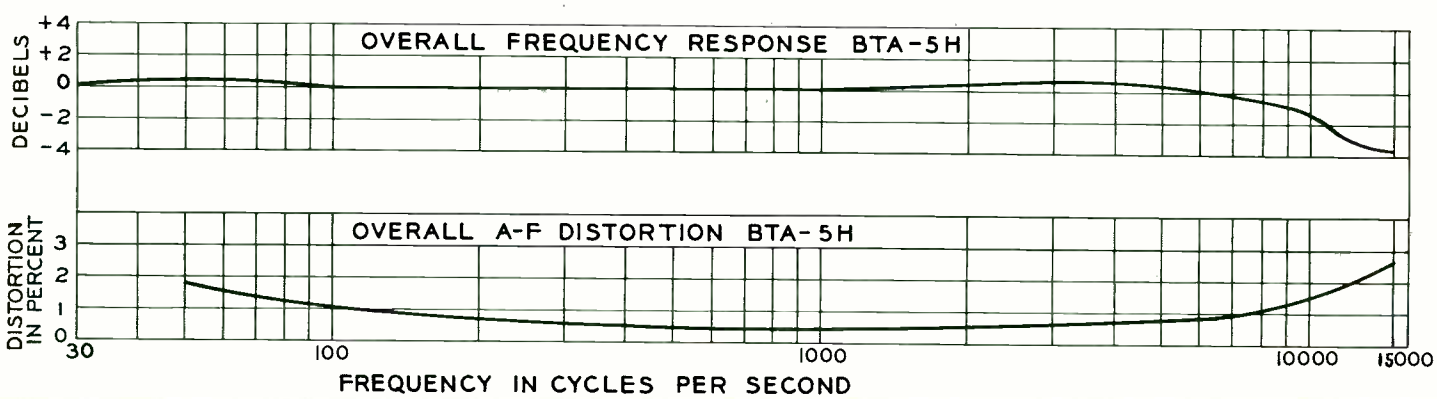
† Select dash to suit customer's frequency and transmission line impedance.

Optional and Accessory Equipment

Description	Reference BTA-5H	Reference BTA-10H
Power Change Kit (10 KW-5 KW)	———	MI-28092
Power Change Kit (5 KW-1 KW)	MI-28092-A	MI-28092-A
50 Cycle Conversion Kit	MI-27066	MI-27066
Matching Left Wing Phasing Cabinet	ES-28927	ES-28927
Type BW-11A Frequency Monitor	MI-30011-B	MI-30011-B
Type BW-66F Modulation Monitor	MI-30066-B	MI-30066-B
Operating Spare Tube Kit	ES-27073	ES-27073/27075
FCC Spare Tubes	ES-27074	ES-27074/ MI-27082
5 to 10 KW Conversion Kit (less tubes	ES-28944	———
5 to 10 KW Conversion Set of Tubes	ES-27075	———
Carrier Off Protection Kit	MI-27083	MI-27083
Remote pick-up (Shielded)	MI-28027-A	MI-28027-A
Type BPA-5A Antenna Tuner	MI-27789	———
Type BPA-10A Antenna Tuner	———	MI-27790-A
BTR-11B Remote Control System	MI-27537/27538-A	MI-27537/27538-A
BTR-20 Remote Control System	MI-27539/27526	MI-27539/27526
Conelrad Conversion Kit	MI-34308-1	MI-34308-1
Synchro Differential Generator	MI-28324	MI-28324

#2,775

TYPICAL PERFORMANCE CURVES

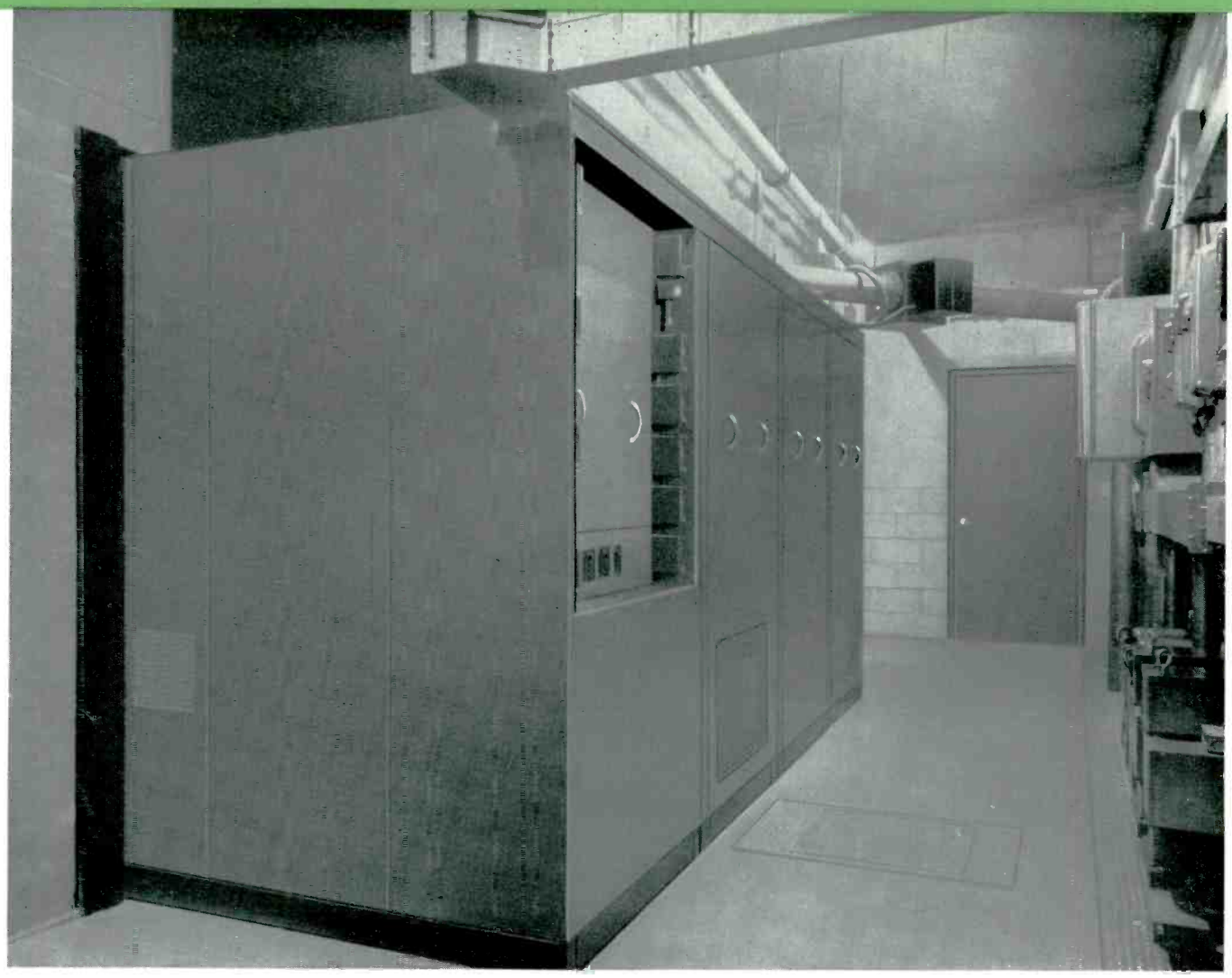


50 KW "AMPLIPHASE" AM TRANSMITTER

TYPE BTA-50G

FEATURES

- Requires less than 80 square feet of floor space—smaller than many 5 kw transmitters
- Internal blowers—no air-ducts necessary
- Cuts tube costs in half
- Lowest operating cost ever offered in a 50 kw transmitter
- Low R-F harmonic distortion
- Excellent frequency response
- Uses long life RCA 5671 tubes
- Designed for remote-control operation
- Uses fewer major components than any other transmitter of similar power for maximum dependability



Rear view of the BTA-50G "Ampliphase" AM Broadcast Transmitter.

USES

The RCA Type BTA-50G "Ampliphase" AM Broadcast Transmitter is designed for high fidelity transmission in the frequency band of 535 and 1620 kc, providing exceptionally low distortion and excellent frequency response. The new transmitter is an all air-cooled 50 kw phase-to-amplitude modulated equipment featuring a number of RCA's latest developments as well as time tested features which have proven their worth.

Of particular interest, is the use of a low level exciter wherein a phase modulated signal is developed with consequent circuit simplicity and stability. Two RCA 5671 triodes functioning as power amplifiers in the BTA-50G assure long-life performance. These tubes have logged up to 60,000 hours of dependable service during a seven year period of operation—and are "still going strong." Broadcasters can capitalize on the extra dividends of lower operating cost, lower capital investment—increased stability of operation.

Outstanding features of the BTA-50G are the small floor space requirements and ease of installation of the transmitter. It is housed in only 4 cubicles—less space than required for other 50 kw equipments. This results in a transmitter which greatly reduces initial building costs when planning a completely new installation. As a replacement transmitter the BTA-50G yields valuable floor space for other uses; or, since it occupies so little space it may be installed in the present transmitter building keeping the former transmitter in operation during installation, or later utilizing it as a stand-by unit. Elimination of the need for under-floor cable trenches and considerable reduction in external air ducts, simplifies installation and reduces installation costs still further.

Completely air-cooled, the BTA-50G requires no external blowers. Also contributing to heat-reduction and economical operation is the minimum number of expensive power tubes required (the BTA-50G uses no costly modulator

tubes). This feature contributes to vast savings in initial tube costs and in the number required by FCC for spares. Other items eliminated are bulky modulation transformers and reactors used in other type transmitters.

Many features provide ease of operation. The transmitter is simple to tune. It has generous, easy-to-read metering facilities for all major circuitry. Tubes are accessible from the front. All power tubes are visible during operation through wide-vision glass windows. The Ampliphase design combines the efficiency of high-level modulation at radio-frequency with the attendant economy of low-level modulation at audio frequency.

Ten kilowatt power cut-back provisions can be provided for day-to-night-time operation. The BTA-50G can be completely remote-controlled from console if desired. If this method is employed it is not necessary to make manual adjustments on the transmitter itself. Complete overload protection and visible overload indication are convenient protective feature of the BTA-50G.

DESCRIPTION

The RCA Type BTA-50G Broadcast Transmitter consists of four equipment cabinets, two of which house the power amplifiers (MI-27601), one the exciter unit (MI-27602), and the fourth cabinet the rectifier and control unit, (MI-27603). The high-voltage reactor (MI-27609) is able to be housed in the lower rear compartment of the exciter cabinet, and the 5 kv plate transformer (MI-27606) in the lower rear compartment of the rectifier and control unit cabinet. Both may be fastened to the floor as desired. A BTC-1C console, an antenna tuner, and monitoring equipment are optional items associated with the transmitter.

The transmitter is designed for "Ampliphase" operation in the 535-1620 kc AM broadcast band. The term "ampliphase" has been coined as a convenient reference to the phase-to-amplitude system of modulation in which the r-f signal is phase modulated by audio intelligence at a low level and then amplified by high gain class "C" amplifiers to the desired power and then converted to an amplitude modulated signal by a suitable output network.

To produce phase-to-amplitude modulation in the BTA-50G a carrier wave is developed by a common exciter. This carrier wave is then split and fed to two separate amplifier chains through phase-shift networks that establish a carrier phase difference. These two signals are controlled so that each maintains a prescribed phase relationship with the other in accordance with the intensity of modulating signal. This controlled phase relationship enables the separate 25 kw amplifiers, when feeding their outputs into a combining circuit, to produce a maximum level 50 kw amplitude modulated signal.

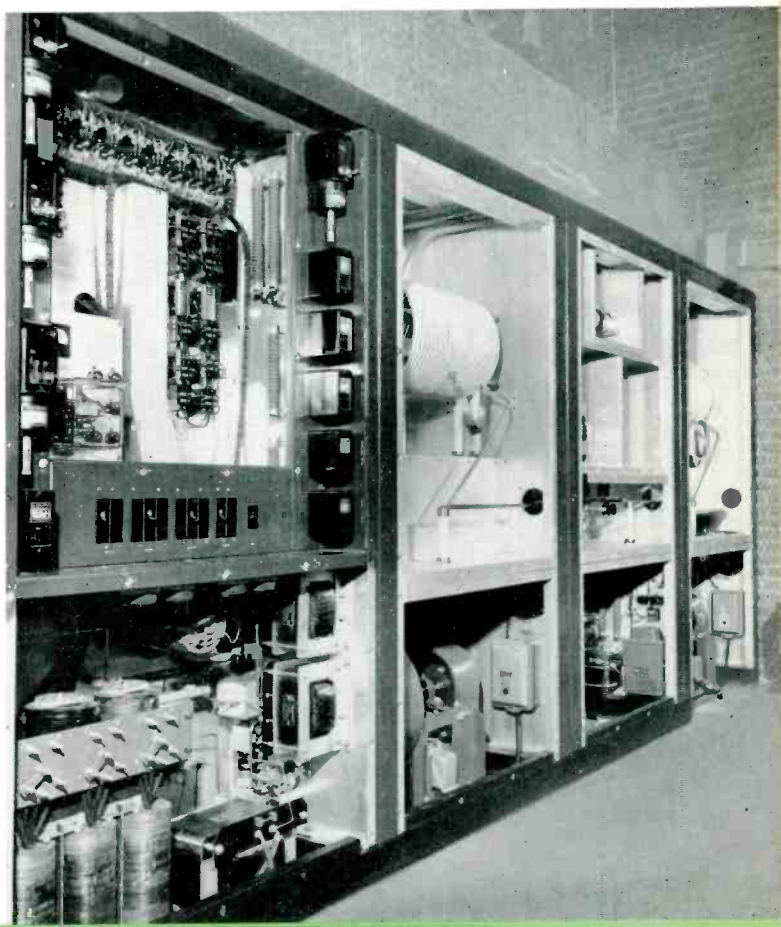
Mechanical Description

In general, the transmitter layout consists of three basic parts: the four in line cabinets which contain the major part of the transmitter; the wall mounted switchgear components; and the main plate transformers. The floor plan, on the next page, illustrates a typical layout of the complete equipment.

It is desirable to leave a passageway at the right end of the front line cabinets since the circuit breakers and overload relays are most accessible from this end of the transmitter. The layout of the front line cabinets is such that a common exhaust duct can be used to carry off heated air from the transmitter.

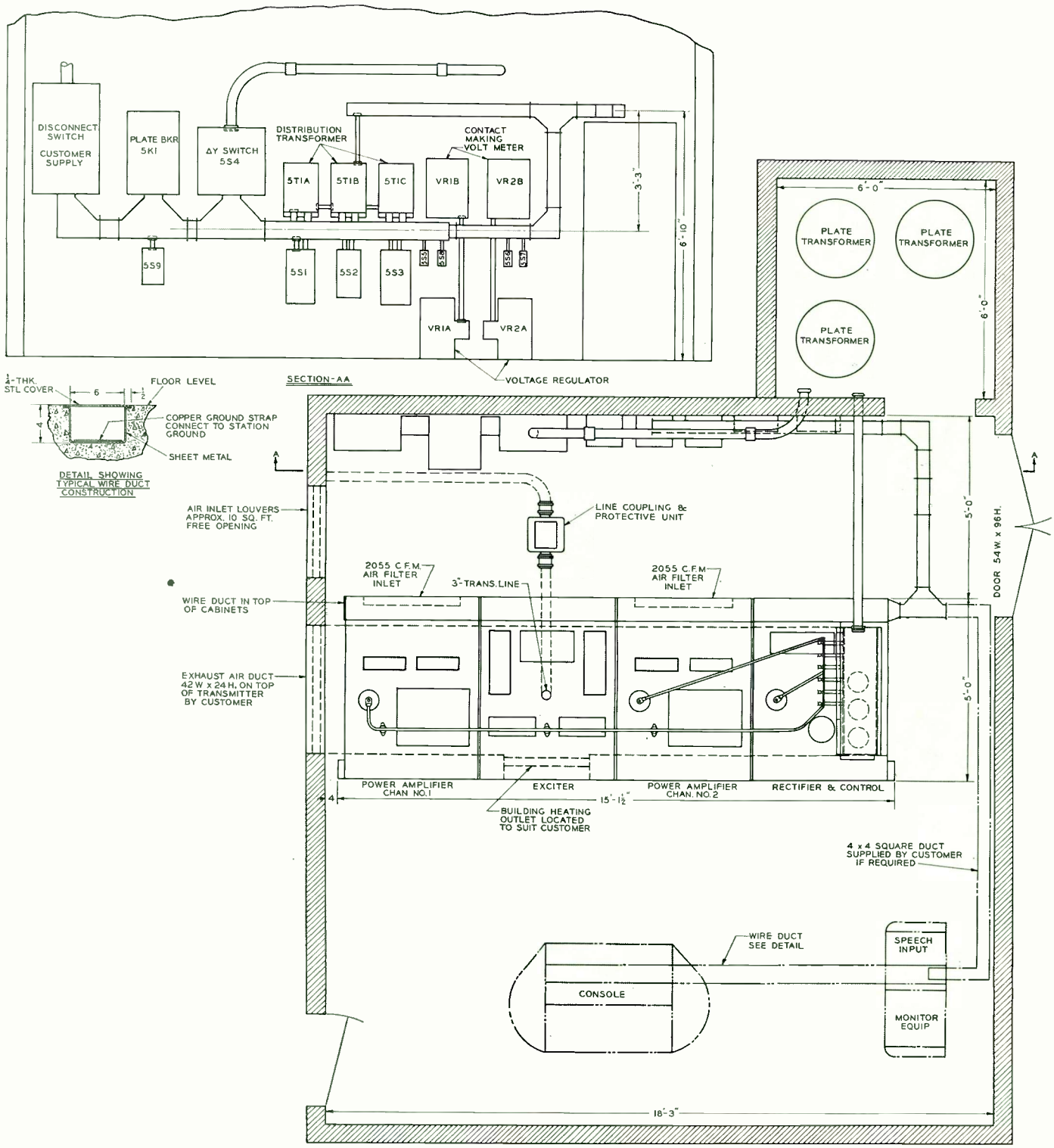
To make this transmitter adaptable to existing transmitter buildings, the main distribution components are wall mounted as shown on the overall floor plan (following page). The mounting of these components is not critical

Rear view of transmitter with cabinets open to show components of rectifier-control, power amplifier, exciter-modulator, second power amplifier cubicles.



as to location. They can be mounted in existing power distribution areas if desired. These components are the Main Plate circuit breaker, a Delta-Wye switch, a Distribution circuit breaker, a 460 to 230 volt bank of Distribution transformers, and two single phase open Delta connected regulators with their control panels. These components are wired through conduit and overhead ductwork to the main plate transformers and the transmitter cabinets.

TYPICAL FLOOR PLAN FOR BTA-50G "AMPLIPHASE" AM TRANSMITTER



Each of the four in line cabinets, 44 inches wide by 60 inches deep by 84 inches high, consists of an all aluminum cubicle erected on a welded steel base. This cubicle consists of a series of panels so fabricated and assembled that they form a rigid structure with good freedom of access. The use of aluminum eliminates unnecessary weight and gives excellent shielding to assure effective confinement of spurious energy. Front access to the cabinet is through a twenty-eight inch wide full length door while rear access is through two covers attached with quick disconnect fasteners for easy removal.

A center vertical panel separates the cabinet into a front compartment and rear compartment which is further divided by a rear horizontal shelf into upper and lower compartments. This gives each cabinet three basic totally shielded compartments in which to mount the electrical components. The eye-level meters, pilot lights and interlocks, mounted on eight inch wide panels each side of the front door, are also shielded.

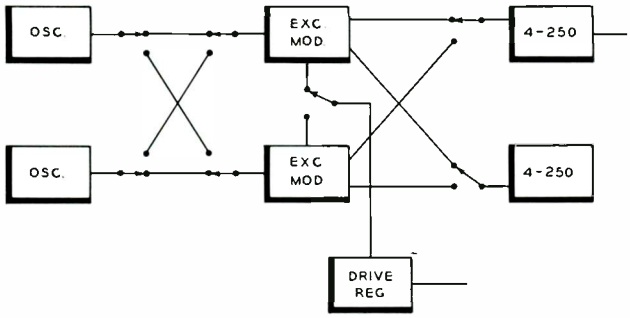
In the rear at the top of each cabinet there is a built-in wire duct which joins similar ducts of the adjacent cabinets, so as to form a continuous duct on the four front cabinets. This duct has a divider down the center on which the interconnection terminal boards are mounted. The rear half of the duct is used for interconnection wiring while the front half is used for internal cabinet wiring from the terminal boards. The internal wiring is carried through conduits to its destination in the cabinet thus shielding all power and control wiring from R.F fields. Provision is also made at the top of the cabinets for the addition of an exhaust air duct.

The left end cabinet and the third cabinet from the left end are identical and contain the final power amplifier stages. The 5671 tube and its grid circuits and part of the plate circuits are contained in the front portion of the cabinet. The upper rear section contains the plate tank coil, shielded filament transformer and grid leak resistors. The lower rear section contains a low noise blower which cools the 5671 tube and its cabinet and the adjacent half of the exciter cabinet. The lower rear panel contains an impingement type air filter for the blower. The PA cabinets are so constructed that the blowers and filters can be mounted externally to the cabinets, if so desired.

Dual Modulator Exciter

Located directly between the two power amplifier units is a cabinet which houses in its front section all the components from the oscillator through the 6076 stages. The separate branches are assembled as mirror images for symmetrical feed to the PA units at left and right. The rear section contains the 50 kw common output circuit and harmonic filter.

Two 807 crystal oscillators are located at the bottom front of the cabinet. Two exciter-modulator units are mounted



Dual Modulator-Exciter and Crystal Oscillator Units are feature of BTA-50G Transmitter. Above drawing shows switching plan.

on sliding rails directly above the drive regulator. The dual exciter-modulators are self-contained units with the r-f and a-f components mounted on a vertical hinged panel which in turn is mounted on a horizontal chassis containing the power components for the exciter-modulator. Above are two vertical sub-compartments behind interlocked doors which contain the 4-250 and 6076 stages. A meter panel for these stages is provided for at the bottom of these sub-compartments.

Each of the above dual modulator-exciter units are complete and arranged so that either may be selected instantly by means of cut-over switches. Thus while modulator #1 is in operation, modulator #2 is in standby condition. Further, two complete oscillators are supplied with provisions for instantaneous switching to either modulator. These provisions with the extreme reliability designed into the high power stages essentially provides a second 50 kw transmitter for standby service.

The common output capacitors of the 2 PA tanks and the harmonic filter are located in the upper rear of the cabinet. Sub-partitions are so arranged in this section that complete isolation and shielding is affected between the various sections of the filter and the output capacitor. The lower rear section of this cabinet contains high voltage filter reactor and bias supply.

The right hand cabinet contains the high power rectifiers, low power distribution components, and the majority of the control components. The front of the cabinet contains the 16.2 kv rectifier tubes and filament transformers, the 5.0/2.5 kv rectifier tubes and filament transformers, high voltage grounding switches, surge suppressor relay and resistors, the 16.2 kv filter capacitors, and heating and cooling equipment to keep this section of the cabinet at the proper temperature level for best operation of the mercury vapor rectifiers. The top rear section of the cabinet contains the control relays, overload relays, distribution contactors, and low power distribution circuit breakers.

The distribution breakers and overload relays are accessible without removing panels and recessed so that they will not be damaged or improperly operated. The bottom

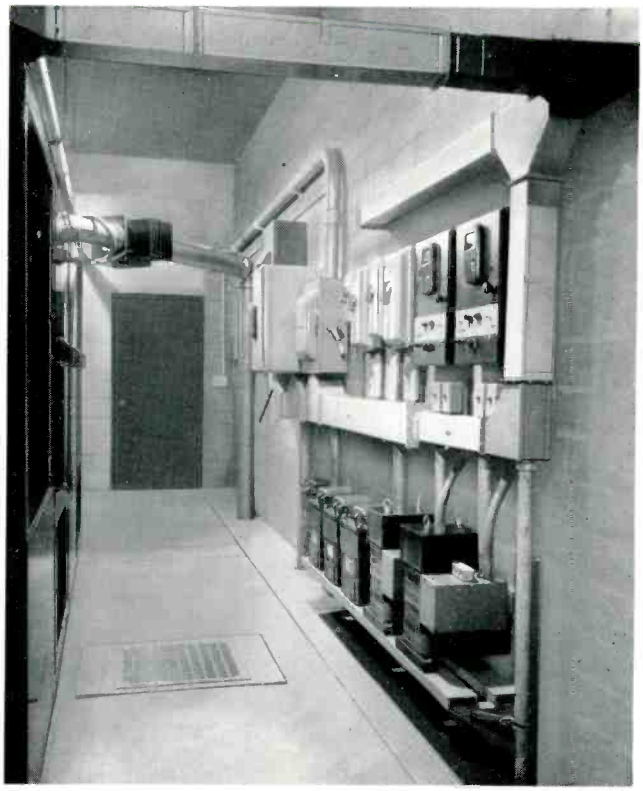
rear of the cabinet contains the 5.0 kv rectifier components including plate transformer. Operational control switches and status lights for the entire transmitter are located on the eight inch panels at each side of the door.

Circuit Description

The BTA-50G r-f is generated by an 807 crystal controlled oscillator, operating at carrier frequency. This signal is amplified and then separated into two channels differing in phase by 180 degrees. (Refer to block diagram on the opposite page.) Each signal is then passed through d-c modulator stages so adjusted that a phase difference of approximately 135 degrees exists between the two signals. Modulation is appiled at this point to each r-f channel by a variable resistance type of phase modulator.

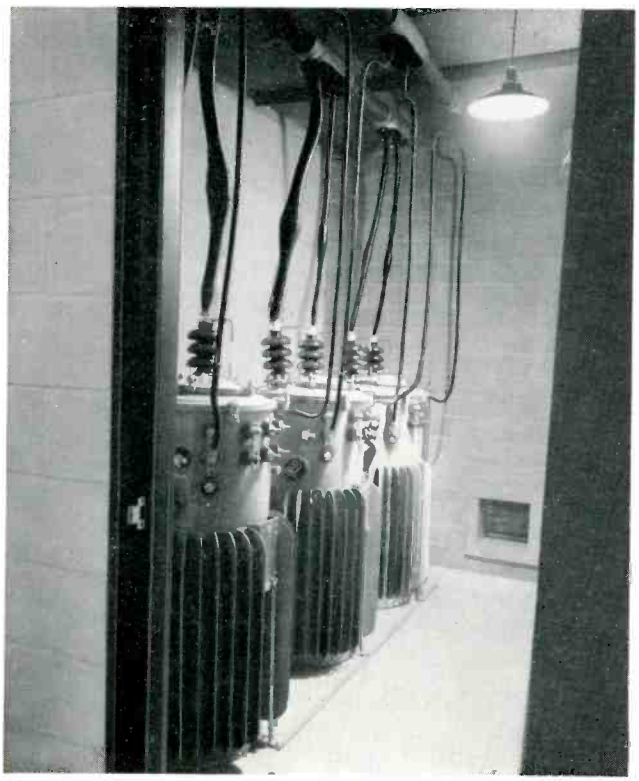
At the output of the phase-modulated stages, each r-f signal has a phase excursion of approximately ±22.5 degrees when modulated 100 percent. The modulation process consists of the injection of a variable resistance into the plate tank circuit of the 5693 modulated stage in accordance with the modulation intelligence. This variable resistance is obtained through the use of grounded grid cathode follower stages utilizing 5692 triodes.

The outputs of the modulated stages are then fed through the 1614 amplifier stages. The power level after the 1614 amplifiers is in the order of 5 watts, sufficient to adequately drive the following class "C" amplifier stages. These stages use 4-250 tetrodes which in turn drive 6076 air cooled tetrode amplifiers.



Typical arrangement of wall-mounted switch gear and distribution transformers. Door at rear gives access to the transformer vault.

High voltage plate transformer vault.



The PA output circuit is a conventional pi-network type of tank circuit. Each tube has its own tank circuit, with a common output shunt element. Each network is set-up as a 90 degree network with the characteristic impedance required to convert the load resistance to the value required for optimum operation of the PA tube. Subsequent operational tuning is accomplished by adjusting the input shunt element, to provide a non-reactive load for the tube.

In line with recent concepts concerning degree of suppression of spurious radiation, a completely shielded low pass filter is incorporated in the BTA-50G output. A two section low pass filter is used. Each section is a tee network, and each inductive series element is completely shielded. Two series-tuned, shunt connected traps are used to provide added attenuation for the second harmonic.

The drive regulator is a cathode-follower type stage that samples the audio signal, amplifies it, and applies a desired value to the grids of the second IPA, providing a variation of drive to the final stage only when needed. This technique contributes considerably to the overall improvement of efficiency during modulation.

The drive regulator consists of three audio amplifiers (two 6AG7's and an 807) driving three 807 cathode followers. The regulator is used to control the grid operating conditions of the final power amplifier tubes so that they will be operating at maximum plate efficiency over the complete audio cycle. During the trough of modulation when zero or very little output is required from the final stage, the drive regulator reduces the drive to the final stages and conversely at the peak of modulation when maximum power is required from the final stage the drive is increased over that at carrier condition.

During periods of 100 percent modulation the 5671 power amplifier tubes require 16.2 kv d-c at 7.5 amperes which is obtained by using 12 6894 half-wave diodes in a three phase double way rectifier circuit. Each pair of 6894 tubes is operated in parallel for two reasons. First, the 6894 is an economical rectifier tube with a good life record in more severe service. Two other plate voltage supplies, 5.0 kv and 2.5 kv, are supplied by a three phase double way center tapped rectifier using 6 8008 tubes. Bias voltages for all tubes are supplied by a single phase full wave metallic rectifier. The High Power distribution equipment for the transmitter consists of an electrically operated air circuit breaker, and a manually operated Delta-Wye switch which feed both the 16.2 kv rectifier and the 5.0/2.5 kv rectifier. The remaining transmitter power is distributed through a manually operated distribution circuit breaker to a 460 to 230 volt distribution transformer to voltage regulators and thence to the various low power distribution circuit breakers.

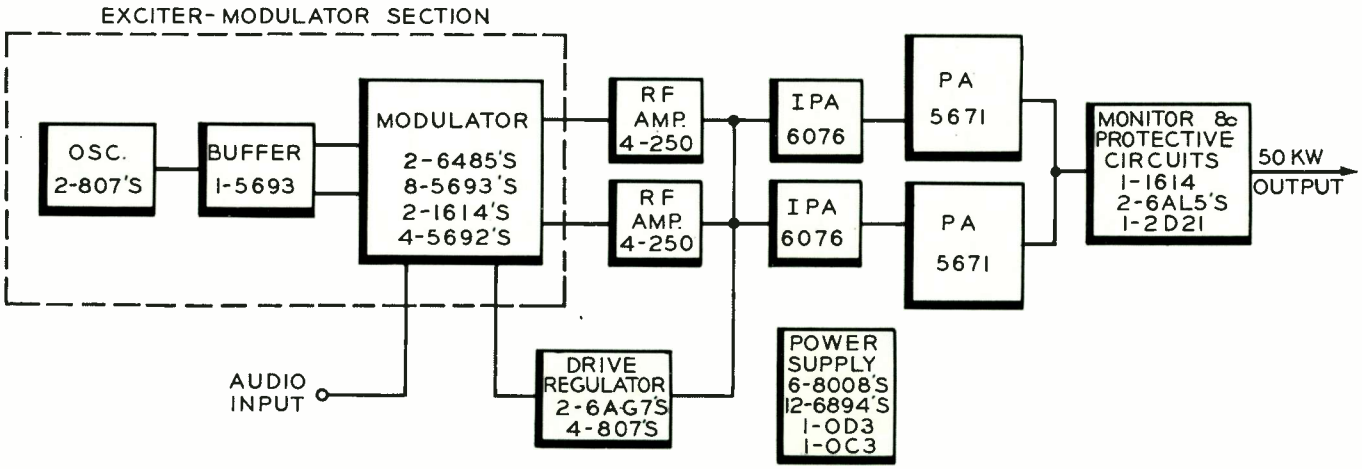
Transmitter Control

A reflectometer is supplied for installation at the output of the transmitter which is sensitive to the standing wave ratio on the output transmission line to the antenna. A mismatch acts to remove the carrier by biasing off a low level stage momentarily to allow the r-f fault to clear itself. If, however, the fault persists after removing carrier several times, the plate power is removed by opening the plate breaker.

Control circuits in the BTA-50G transmitter contain the following features which are designed to provide maximum flexibility in control, protection, and operation: choice of single-button or step-by-step starting, automatic timing and sequencing of starting operations, provisions for emergency bypassing of some of the time-delay functions, protection of the operator by a system of interlocking grounding devices, protection of the equipment by conventional relays and circuit breakers, protection of the equipment against transmission line irregularities or arcbacks, protection of the equipment against air failure, and location of transmitter faults by a system of indicators.

The control of the transmitter is accomplished from the front of the Rectifier and Control cabinet with provisions made to allow control from a remote point. Lamps which show the status of the transmitter control circuits are also mounted on the front of this cabinet. The control ladder is arranged and interlocked so that the transmitter can either be turned on by operating the control switches in sequence or by leaving all control switches in the ON

SIMPLIFIED BLOCK DIAGRAM OF BTA-50G "AMPLIPHASE" TRANSMITTER



position with the exception of the start switch, which when operated to the ON position allows the transmitter to automatically come on.

The two types of overload circuits used in this transmitter are the current type, instantaneous or time delay, which are connected directly in the tube circuit and rectifier ground leads, and the thermal magnetic circuit breakers connected in the a-c power leads used as convenient back up protection and disconnect switches. The transmitter circuitry is such that an overload will either lock out the plate circuit or allow a single reclosure which will reset if there are no further overloads. In either case when a lockout position has been reached, the transmitter can be reset by means of an overload reset control. The principal overload relays have indicating flags so that even after the overload has been cleared there is a record of which overload has operated. Another feature of the control circuit is indicating lamps on each cabinet which indicate the status of the interlock in that particular cabinet.

SPECIFICATIONS

Electrical Specifications

Power Line Requirements:
Line.....460 volts, 60 cycles, 3 phase
Combined Regulation and Variation.....Not more than ±5%
Power Consumption.....94 kilowatts (approx.) at zero modulation
Power Consumption.....100 kilowatts (approx.) at average modulation
Power Factor.....90%
Crystal Heaters.....110 volts
Type of Emission.....A3
Power Output (at transmitter terminals).....53 kilowatts (max.)
Frequency.....Any specified between 535 and 1620 kc
Frequency Stability.....Assigned frequency ±5 cycles
Type Modulation.....Phase to amplitude
Audio Input.....+10 dbm
Audio Response.....±1.5 db 50-10,000 cycles
AF Distortion.....Less than 3% RMS 50-7500 cycles
Noise level.....60 db below 100% modulation
Carrier Shift.....Less than 5% neg. 100% modulation
Type Output.....Unbalanced
Output Impedance.....50 ohms nominal
Spurious Emission (2nd harmonic and above).....83 db down

Mechanical Specifications

Cabinet Size.....44" wide, 84" high, 63" deep
Overall Weight.....12,000 lbs. approx.
Maximum Altitude.....6,000 ft.
Ambient Temperature.....113° F. max.
Maximum Cabinet Weight.....3,093 lbs., approx.
PA Cabinet Weights (each).....953 lbs., approx.
Plate Transformer Weight (total).....820 lbs., approx.
Rectifier Weight.....3,093 lbs., approx.
Exciter Weight.....1,241 lbs., approx.
Filter Reactor.....570 lbs., approx.

Tube Complement

Exciter-Modulator Section

2	807	Oscillator Tubes
1*	5693	Buffer Amplifier
2*	5693	DC Modulator
6*	5693	Modulated Amplifier
2*	1614	RF Amplifier
2*	6485	1st Audio Amplifier
4*	5692	Phase Modulator

RF Amplifier Section

2	4-250A	Intermediate Power Amplifier
2	6076	Driver Amplifier
2	5671	Power Amplifier

Drive Regulator Section

1	6AG7	1st Audio Amplifier
1	807	Intermediate Audio Amplifier
1	6AG7	Intermediate Audio Amplifier with linearity control
3	807	Cathode follower output amplifier

Power Supply Section

12	6894	High Voltage Rectifiers
6	8008	Medium Voltage Rectifier
1*	OD3	Low Voltage Regulator
1*	OC3	Low Voltage Regulator

Monitor Circuits

1	1614	Frequency Monitor Amplifier
2	6AL5	Reflectometer
1	2D21	Thyratron Control

* Transmitter tube complement provides double quantity of all tubes starred. Extra tubes are for use in the spare Exciter Modulator.

Equipment Supplied

BTA-50G (ES-27221)

Qty.	Description	Stock No.
2	Power Amplifiers	MI-27601
1	Exciter Unit	MI-27602
1	Rectifier and Control Unit	MI-27603
1	Installation Material	MI-27604
3	15-KW Plate Transformers	MI-27605/27605-A
1	5-KW Plate Transformer	MI-27606
3	Distribution Transformers	MI-27607
2	Induction Regulators	MI-27608
1	High Voltage Reactor	MI-27609
1	Circuit Breaker	MI-27610
1	Reduced Voltage Switch	MI-27611
2	Modulator Exciters	MI-27612
1	Tube Hoist	MI-27613
2	Blowers	MI-27616
2	Crystal Oscillator Units, Type UL-4392	MI-19458
1	Miscellaneous Hardware Kit	MI-7474
1	Finish Touch-Up Kit	MI-7499-A
1	Set of Operating Tubes	ES-27222
2	Type TMV-129B Crystal Units, including crystal ground to frequency specified by D.T.W.	MI-7467
1	Nameplate	MI-28180-1
1	Line Coupling and Protection Unit	MI-27622
2	Sets of Frequency Determining Parts for Exciter Modulator Unit	MI-27623*
1	Set of Frequency Determining Parts for Exciter	MI-27624*
2	Sets of Frequency Determining Parts for Power Amplifier	MI-27625*
1	R-F Output Meter	MI-27644†
1	Instruction Book	IB-30236
1	Installation Instruction Book	IB-30235

* Specify station's assigned frequency.
† Select current range as determined by customer's transmission line characteristic.

Optional and Accessory Equipment

Set of Spare Tubes.....ES-27222
Set of FCC Spare Tubes.....ES-27223
50/10 Cutback Kit for BTA-50G Transmitter.....MI-27688
Remote Control Accommodating Accessories.....MI-27687
Type BTR-11B Remote Control Equipment.....MI-27537/27538-A
Type BTR-20A Remote Control Equipment.....MI-27539/27526
BPA-50 Antenna Tuning Unit.....MI-28903-A/B
Remote RF Pickup Unit.....MI-28027-A
50 Cycle Conversion Kit.....MI-27066
Type BW-11A Frequency Monitor.....MI-30011-B
Type BW-66F Modulation Monitor.....MI-30066-B

#95,000

1 KW HF BROADCAST TRANSMITTER

Type BHF-1A

FEATURES

- Complete transmitter in single cabinet
- Minimum floor space requirement
- Lightweight aluminum cabinet
- Fewer tubes—fewer types
- Low tube cost
- Low power consumption
- Vertical panel construction provides reach-in accessibility
- High fidelity
- Quick frequency change
- Balanced or single ended output

DESCRIPTION

The RCA BHF-1A transmitter combines all the best features and accumulated knowledge of 25 years experience in the design, manufacture and operation of broadcast and high frequency transmitters.

The transmitter is compact coming in one cabinet which requires 7.5 sq. ft. (.7 sq. meters) floor space. The transmitter is completely tested at the factory. This reduces installation and test time in the field.

The only building requirements are:

Floor Area—Load requirements 200# sq. ft. or 2140# sq. meters

Incoming power and audio lines

Outgoing R.F. transmission lines

The entire transmitter is housed in a lightweight aluminum cabinet with a steel base. This cabinet is 84" high, 33" wide and 32⅝" deep. It is equipped with sliding doors that never extend beyond the cabinet, thus minimizing floor space requirements. The sliding doors are interlocked. Automatic high voltage grounding is also provided for the protection of operating personnel.

Shielding

All circuits are enclosed for personnel protection. Shielding is complete and no additional screening is required to suppress unwanted radiation.

Power Circuits

The lower half of the cabinet contains three power supplies. The main rectifier tubes, 8008's, supply the high voltage for the PA and modulator tubes. The low voltage

rectifier utilizes two RCA 866A/866 tubes, and bias is supplied from a selenium bias rectifier. These rectifiers and the tube filaments require a 230-volt single phase supply.

Overload Protection

Circuit protection is provided by high speed circuit breakers and a plate contactor. The filament and plate circuit breakers serve as control switches. Circuit breakers in the cathode circuit of the power amplifier, modulator, and ground return of the low voltage and bias rectifier, operate the plate contactor. All plate and bias voltages are removed when an overload occurs. Provision is made for automatic and instant return of the transmitter to the air after a power line interruption of up to two seconds duration. If the power interruption is over two seconds duration, the transmitter will return to the air automatically, thirty seconds after the power line interruption is over.

Radio Frequency Circuits

The frequency source contains a type 6AK5 oscillator, type 6AG7 buffer, 6AG7 multiplier. Five crystal frequencies may be pre-tuned and are then available for instant selection with a five-position switch.

The signal is amplified by a 6146 amplifier which provides ample drive for the two type 4-400A tubes in the power amplifier. Using tetrode tubes in all radio frequency amplifiers provides high power gain and eliminates the need for neutralization adjustments.

Output Circuits

A tank circuit of the pi-filter type provides sufficient harmonic suppression and impedance matching. If a balanced transmission line is used a balancing bridge is inserted between the pi-filter and the line.

Modulator

In the three modulator stages the program input signal is raised to the level needed to modulate the power amplifier. A push-pull voltage amplifier and a push-pull cathode follower use two 6146 tubes each. In the Class B modulator two type 833A triodes are employed. Output from the modulator is coupled to the power amplifier through the usual transformer-reactor combination. Inverse feedback is applied from the modulator plates through an R-C network to the grids of the input amplifier.

Cooling

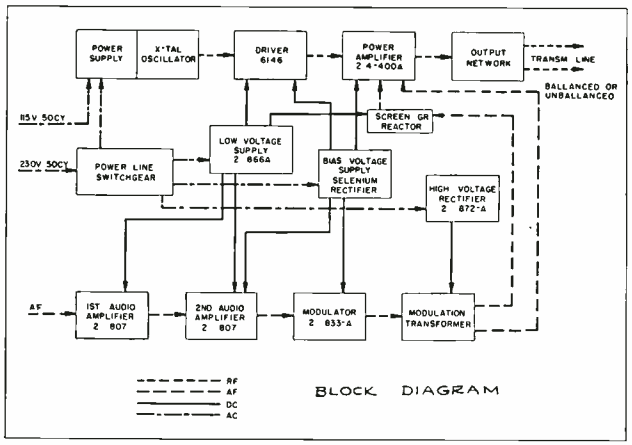
A single blower provides the pressure for the forced-air cooling of the power amplifier tubes and also ventilates the entire cabinet. An air-operated relay cuts all high voltages if the blower is not operating properly.

SPECIFICATIONS

Type of Emission	A 3
Output Frequency Range	3.9 to 26.1 mc/s
Rated Power Output at Transmitter Terminals	1 kw, carrier
Output Load Impedance	50 to 230 ohms unbalanced 300 to 600 ohms balanced Resistive ±10.1R
Spurious Frequency Radiation	—40 db
Frequency Stability	0.003%
Type of Modulation	High-level Class B
Program Input Impedance	150/600 ohms
Program Input Level	+10 dbm ±2 dbm
Audio Frequency Response	±2 db, 30 to 10,000 cps (1000 cps, 60% reference)
Modulation Capability:	
400 cps	100%
50 to 7500 cps	90% minimum
Envelope Distortion (1000 cps, 90% mod.)	4%
Noise Level, Unweighted (below 100% mod.)	52 db
Carrier Shift Up to 100% Modulation	Less than 5%
Power Consumption:	
Unmodulated	2900 watts, approx.
40% Modulation	3100 watts, approx.
100% Modulation	3900 watts, approx.
Power Factor	.9
Power Line Requirements:	
Transmitter	230 volts, single-phase, 60 cy., available also for 50 cy.
Cabinet Lights	115 volts, single-phase, 50/60 cy.
Permissible Power Line Variation	5%
Ambient Temperature Range	+10° C to +45° C
Elevation	8000 feet maximum
Transmitter Height	84"
Transmitter Width	33"
Transmitter Depth	32 9/16"
Transmitter Floor Space	7.5 sq. ft.
Transmitter Weight (Unpacked)	1500 lbs. (approx.)

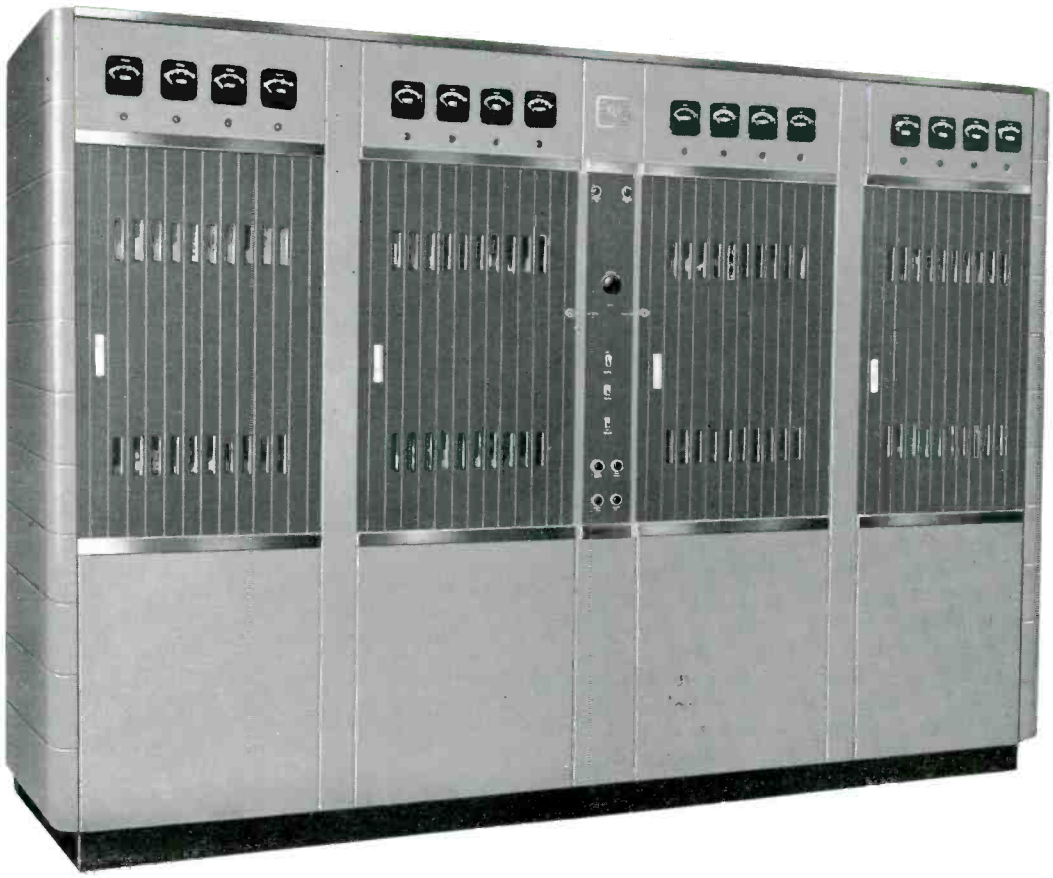
Tube Complement—1 Set

FREQUENCY SOURCE	
Crystal Oscillator	1—6AK5
Buffer	1—6AG7
Multiplier	1—6AG7
Voltage Regulator	1—VR150
RADIO FREQUENCY AMPLIFIERS	
Intermediate Amplifier	1—6146
Power Amplifier	2—4-400A
AUDIO FREQUENCY AMPLIFIERS	
Voltage Amplifier	2—6146
Cathode Follower	2—6146
Modulator	2—833A
RECTIFIERS	
Low Voltage Rectifier	2—866A
Main Rectifier	2—8008



10 KW HF BROADCAST TRANSMITTER

Type BHF-10B



FEATURES

- Rapid frequency change
- Few tuning elements
- No neutralizing adjustments
- Minimum of tube types
- Electronically controlled power supply with rapid fault cut-off and automatic re-application
- Sliding panel access doors
- All air cooled . . . high efficiency
- High level modulated for simplicity of adjustment
- Simplified radio frequency circuits
- Harmonic suppression circuits included
- Light weight, aluminum cabinets

DESCRIPTION

The BHF-10B transmitter combines all the best features and accumulated knowledge of 25 years experience in the design, manufacture and operation of broadcast and high frequency transmitters. The four main cabinets, and external plate transformer contain all the elements functionally disposed to deliver a fine quality broadcast signal to a high frequency radiating system within a short time after unpacking and placement. The only building arrangements required prior to installation are (1) a floor area suitable for the load, (2) incoming power and program service and (3) outgoing radio frequency transmission lines.

Power Circuits

The right hand cabinet houses power circuits and the electronically controlled main rectifier utilizing 4 high power, mercury vapor thyratrons, type 5563. Electronic control coordinates several functions (heretofore handled with cumbersome magnetic devices) into a smoothly operating system with the selective safety and back up protection using a sturdy contactor and a high speed breaker.

Low Power Circuits

The right center cabinet houses intermediate voltage, direct current power supplies; the primary radio frequency

source* and intermediate radio frequency amplifiers. Five crystal positions are available for instant selection with a 5 position switch. Buffer stages are integral with the frequency source unit which also contains its own direct current power supply. The two intermediate amplifiers, one 6146 and three 813's, provide stable, high gain amplification with ample output for driving the power amplifier.

Power Amplifier

Next in line to the left is the radio frequency power amplifier cabinet with two screen grid, type 6166, air cooled tubes. Use of this tetrode type tube provides a great advantage in highest power gain with stable operation. Elimination of neutralizing circuits is a further advantage resulting in fewer components subject to failure and reduction of power wasting and excessive radio frequency currents at the higher operating frequencies.

Output Circuits

Impedance matching of power amplifier output to transmission line along with harmonic attenuation is provided by a variable network. This circuit allows adjustment during operation to maintain constant output for variations of 10% from normal load impedance.

Modulator

The left hand cabinet contains all tubes and circuits associated with the Class B modulator. Program input is raised from a 10 milliwatt level to 6500 watts needed to modulate the power amplifier. Low power push pull stages include two voltage amplifiers and a cathode follower. Output from the two air cooled modulator tubes is coupled to the power amplifier through the familiar transformer—reactor combination. Approximately 20 db of feedback is applied from the modulator plates through a simple network to the grids of the input amplifier.

Integral Auxiliaries

All heavier components (plate transformer excepted) such as filament and intermediate power transformers, filters, modulation transformer and reactor, blower and filters are housed in the lower sections of the four cabinets. Front and rear, light weight, aluminum panels are quickly removable by hand for full accessibility to any of these components. Two finger operated locking lugs secure each panel. These lugs are accessible only after opening the corresponding upper section sliding door so that it is impossible for personnel to expose any high voltage circuits without first opening a door which operates interlock and grounding switches.

Floor Space

The four cabinets occupy a floor space of 11 feet 1 inch (340 cms.) front and rear by 2 feet 8½ inches (82.5 cms.) deep. The plate transformer which can be located where most convenient requires a floor space of 19 x 24 inches (49 x 64 cms.). Wire ducts are provided to run the interconnections between this transformer and the power supply cabinet.

Optional Supervisory Console

BTC-1A Universal Transmitter Console, MI-28950. This unit can be supplied where it is desired to combine program control functions and essential transmitter controls from a single location in front of the transmitter.

* An external frequency source may be used.

Other Accessories

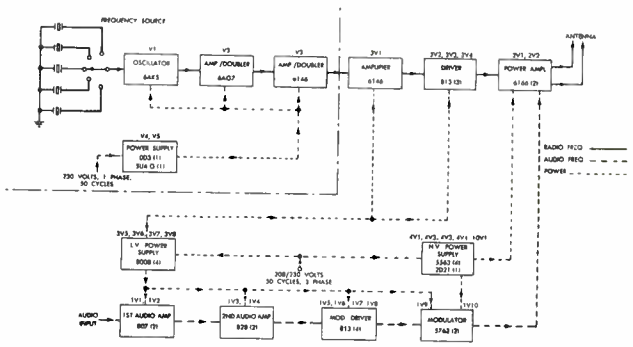
The RCA International Division can supply spare parts, program speech input cabinets, local studio equipment, measuring equipment, transmission lines, antennas, emergency power supplies and other items to equip a transmitter plant as a completely integrated installation.

SPECIFICATIONS

Type of Emission	A 3
Output Frequency Range	3.2 to 26.1 mcs
Power Output at Transmitter terminals	10 kw unmodulated
Output Load Impedance	350 to 650 ohms resistive ±JO.1R
Radio Frequency Harmonic Output	Less than 200 milliwatts
Frequency Stability	0.003%
Type of Modulation	High level, Class B
Program Input Impedance	150 or 600 ohms
Program Input Level (100% Modulation)	+10 dbm ±2 db
Audio Frequency Response	±1.0 db 50 to 7,500 cycles ±2.0 db 30 to 10,000 cycles
Audio Frequency Distortion at 95% Modulation, 50 to 5,000 cycles	4.0% RMS maximum
Noise Level, Unweighted (below 100% Modulation)	54 db
Carrier Regulation	Less than 5% up to 100% modulation
Power Consumption:	
Without Modulation	22 kw approx.
40% Modulation	28 kw approx.
100% Modulation	35 kw approx.
Power Factor	0.85
Power Line Requirements	230 volts, 3 phase, 3 wire, 50 cycles
Permissible Power Line Regulation	5% zero to full load
Permissible Power Line Combined Regulation and Variation Limits	±5%
Ambient Temperature	+45 degrees C max.
Elevation	8000 feet max.
Frequency Change Time:	
(a) 4 to 22 Megacycle Range	120 seconds max.
(b) Range (a) to 26.1 or 3.2 Megacycle Ranges	300 seconds max.

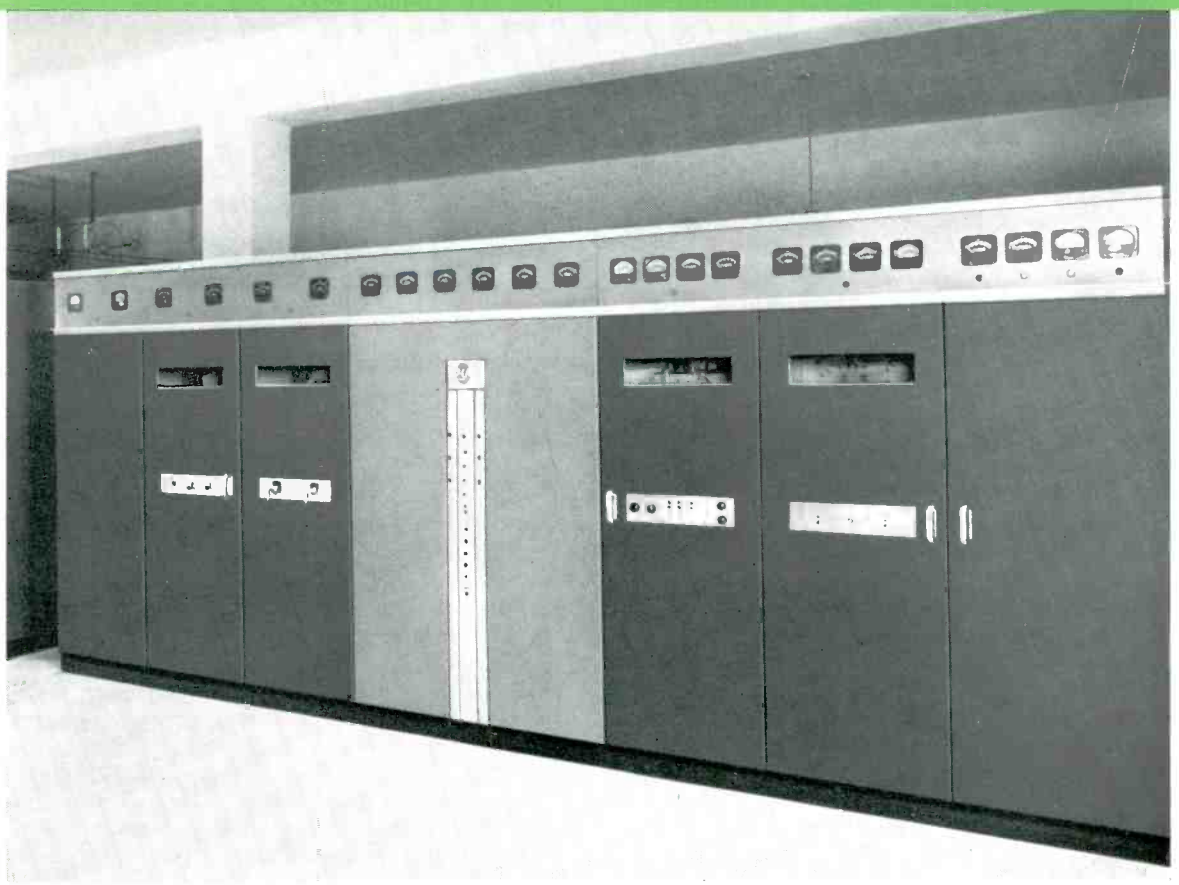
Tube Complement

FREQUENCY SOURCE	
Crystal Oscillator	1—6AK5
Buffer	1—6AG7
Doubler	1—6146
Voltage Regulator	1—VR150
RADIO FREQUENCY AMPLIFIER	
1st Intermediate Amplifier	1—RCA 6146
2nd Intermediate Amplifier	2—RCA 813
Power Amplifier	2—RCA 6166
AUDIO FREQUENCY AMPLIFIERS	
Input Amplifier	2—RCA 807
1st Intermediate Amplifier	2—RCA 828
Cathode Follower	4—RCA 813
Modulator	2—RCA 5762
POWER SUPPLY	
4700 Volt Thyratron Rectifier	4—RCA 5563
Intermediate Voltage Rectifier	4—RCA 8008
Control	1—RCA 2D21



50 KW HF BROADCAST TRANSMITTER

Type BHF-50B



FEATURES

- Entirely air cooled
- High stability grounded grid amplifiers
- Quick frequency change
- High level modulation by Class B modulator
- Low operating cost—low power consumption
- Conservative operation of all parts and tubes
- Small floor space requirements—reduces installation and building construction costs
- Built in wiring ducts—minimizes conduit and wire trenches—low installation cost
- Simplified effective control with high speed air circuit-breakers
- Simplified power supply—only one main mid-voltage tap rectifier, one auxiliary and one metallic bias rectifier
- Single phase filament heating of all vacuum tubes
- Motor driven tuning—essential circuit metering
- Breaks down into small units for ease of transportation and installation
- Sectional fault indication on front panel enclosure
- Non-critical, low distortion performance obtained by audio feedback in connection with a cathode follower driver for the modulator
- Attractive appearance achieved by functional styling
- Vertical chassis construction for accessibility and maximum ventilation
- Supervisory control console constructed of build-up sections

DESCRIPTION

General

The new RCA type BHF-50B transmitter is an all air cooled 50-kw amplitude modulated shortwave broadcast transmitter featuring a number of RCA's latest developments, as well as time tested features which have proven their worth. Of particular interest is the use of a grounded grid power amplifier with consequent circuit simplicity and stability. Two of the outstanding features are the small floor space requirements and ease of installation of the transmitter. The transmitter is designed for high fidelity transmission in the frequency band of 3.9 to 22 megacycles and the frequency band of 25.6 to 26.1 megacycles. Radio stations of this class usually have long operating schedules which permit minimum time off for servicing and maintenance. This point has been given careful consideration in the layout and design of the BHF-50B.

Mechanical Design

The general arrangement of the transmitter consists of a series of self-supporting chassis in line with a front enclosure to form a unified front panel. A typical floor plan (refer to plan view) permits installation of the radio frequency portion of the transmitter in a space sixteen and one-half feet long by nine feet deep. With such an arrangement, the blower and power equipment can be installed as indicated on the referenced drawing. Other disposition of the power equipment and blower may be made to make the optimum use of existing building space. All equipment is dead-front constructed, with doors in the front enclosure allowing free access to the driver and P.A., R.F. cabinets, modulator and to the transmitter area. With the transmitter "on the air", station personnel can walk behind the enclosure and around the individual units for close inspection without fear of coming in contact with dangerous voltages.

Single Unit

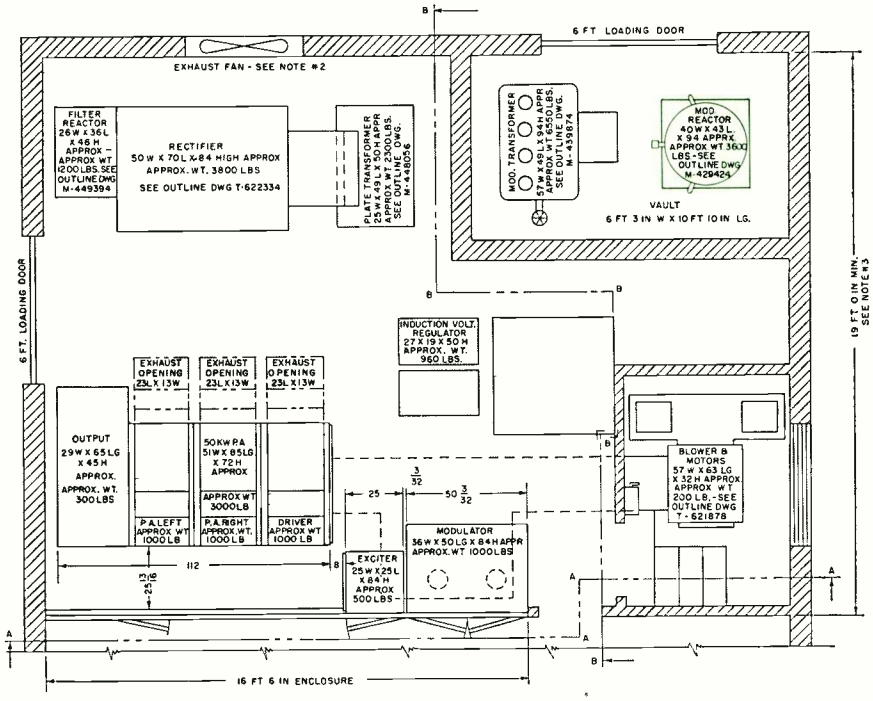
All incoming power supply and high power rectifier switchgear along with lower power distribution circuits, contactors, and control relays are centralized in a single unit. This unit also contains the filament voltage regulator and distribution transformers.

For installation, the transmitter can be broken down into units no larger than 50 x 52½ x 84 inches, with the exception, in height, of the modulation transformer and reactor, which will be approximately 92 inches high.

Operational controls, indicating instruments, indicator lights and tuning controls are located on the front panel at appropriate intervals. Tuning operations required for normal daily adjustments are remotely controlled by front panel key switches controlling motor drives on the tuning elements. Power amplifier tuning controls are conveniently located with respect to the corresponding meters for easy viewing of d-c power input and R.F. output during tuning operations.

Control Console

The supervisory control console is designed to be set up in a convenient position in front of the transmitter. Essential operational controls and indicator lamps are duplicated on the R.F. turret of the console. The audio turret of the console has all controls for program handling. Space and mounting convenience has been provided in the R.F. turret for mounting three 4-inch meters in a recessed position behind the front panel, the choice of the meters being left to the discretion of the station personnel. The control console is of the sectionalized type which provides for adding further sections for associated usage, such as antenna switching controls, another HF, MF or FM transmitter control, paralleling controls, etc.



Plan View.

Frequency Source

Most customers prefer to supply their own frequency source. In some cases transmitters are driven from a central control room. A Frequency Source, therefore, has not been included in the equipment supplied with the transmitter. RCA can supply an external Frequency Source to drive the transmitter and lists one under the accessories.

Mechanically Operated Tube Hoist

Tube changing in the driver and power amplifier and modulator is facilitated by the use of a mechanically operated tube hoist, solidly mounted in a swivel supporting structure and suitably located for easy access to the high power tubes. Swivel supports are provided. The hoist can be easily lifted from one support to the other, depending upon which tube is to be removed. Minimum tube change time is assured by use of quick opening clamp type filament connectors.

Radio and Audio Frequency Circuit Design

Simplified single ended circuits are used throughout. An output circuit consisting of a capacity tuned, single turn primary and a capacity tuned, double turn secondary is used to control the power amplifier loading and to convert the unbalanced output of these amplifiers to balanced output. Radiation cooled, shielded grid type tubes are used in the low power r-f and a-f stages while forced air cooled triodes are used in all subsequent stages above the 250 watt r-f level and the modulator. High stability grounded grid amplifiers are used for all r-f stages above the 250 watt level. Only three tube types are used in the r-f amplifiers. Completely shielded construction in the higher power stages and use of grounded grid circuits leads to complete stability and freedom from operation discrepancies. The complete shielding of the r-f stages and the design of the power amplifier tank circuit and output coupling network reduces harmonic radiation to a minimum.

The audio section of the transmitter employs push pull circuits throughout with fixed overall audio feedback. This design results in a very stable system having excellent fidelity characteristics with very low distortion and noise level. A total of three stages of audio amplification are employed, the third of which is a highly efficient cathode follower circuit. High level, Class B modulation is employed resulting in further economy of equipment and operation.

All filaments are heated with power frequency a-c voltage and filament voltages are maintained within specified limits by means of an automatic induction regulator. Single phase filaments are used in all tubes resulting in greater tube life. All high power tubes have thoriated tungsten filaments, with subsequent saving in filament power.

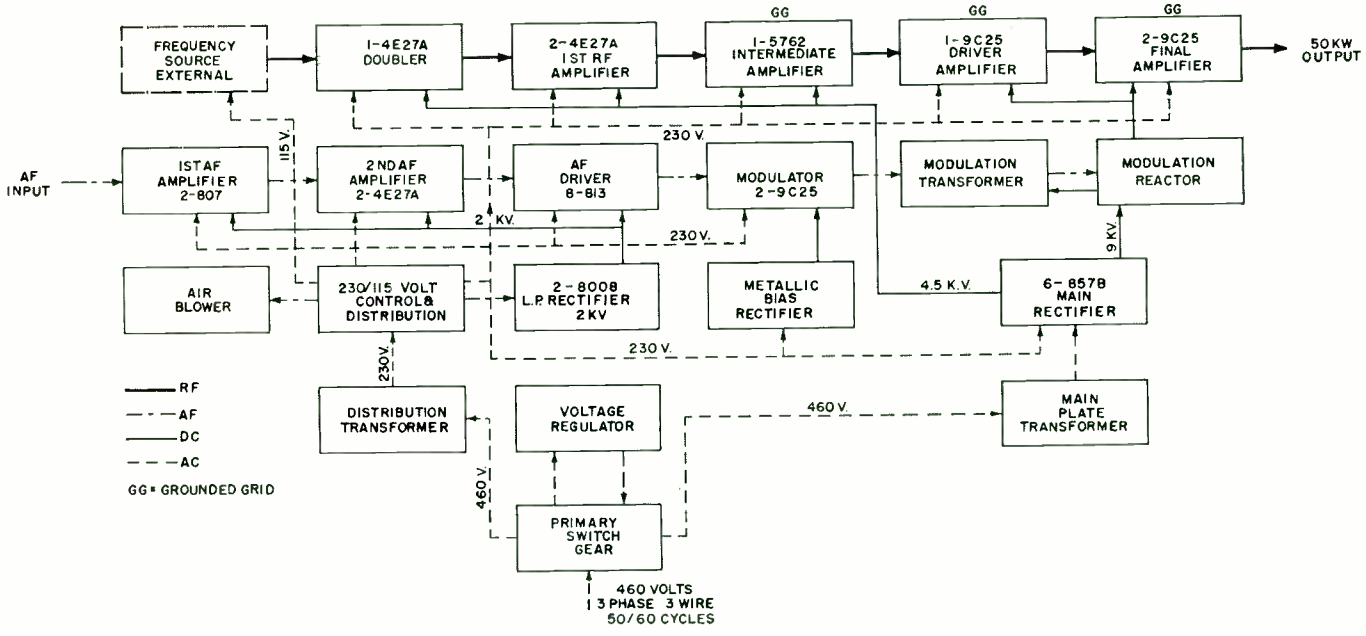
Rectifiers

A total of three rectifiers are employed in the BHF-50B.

(1) A single phase full wave unit, using two mercury vapor rectifier tubes to supply plate and screen voltage for the low power a-f tubes.

(2) A single phase bridge connected unit, using two metallic rectifier sections to supply bias voltage for the cathode follower and modulator tubes.

(3) A three phase full wave, high voltage rectifier, with a mid-voltage tap, which supplies plate and screen voltage for all r-f screen type tubes and plate voltage for all triode r-f power tubes and the modulator tubes. This rectifier has a preheated spare tube which may be switched into the circuit manually. The plate transformer is an air cooled three-phase unit with extended windings on the primary to provide reduced voltage for test and tune-up purposes.



Simplified Block Diagram.

Metering

All essential indicating instruments are located along the top front of the enclosure and are the 4-inch square faced type meters with black background. Less important meters are located behind the enclosure and may be viewed through windows while the transmitter is in operation.

High-speed air circuit breakers of the hum free mechanical latch type are employed in all high power switchgear. Overload protection consists of a selective relay system combining high speed tripping on d-c overloads and short circuit faults, with time delay tripping on nominal a-c system overcurrent and under-voltage faults.

The control system is carefully engineered to provide proper starting sequence and automatic protection against most operating faults. Circuit indicator lamps provide a quick means for analyzing and localizing transmitter, tube or line faults, etc. A reclosing system will return full power automatically if the plate voltage is removed due to operation of overload devices on rectifier backfires, vacuum tube gas arcs, antenna flash-overs or other causes. This operation is repeated three times. If the fault persists on the third re-application of plate voltage, the recloser will lock out until reset manually.

All power circuits are doubly protected by high speed overload relays and air circuit breakers. In addition, a special hold-in circuit is provided which permits the transmitter to return instantly to the air in case of a momentary power line failure, thus avoiding the delay required for the plate time-delay relay to operate.

Installation

Ease of installation and good utilization of building space is a feature of the BHF-50B. Being air cooled, no plumbing is required, and its design is such that virtually no wiring trenches or conduit need be used. All interconnections are made in either built in or overhead ducts or conduits, so that the only conduits or trenches required are those for the supervisory console and incoming power. While the plan view shows an under floor air duct and depressed level blower room, both the air duct and blower may be above floor level with only slight inconveniences on accessibility to units located to the rear. Units are designed as sub-groups for economy of floor space and wiring materials, leading to economy of installation labor as well.

Safety

All possible precautions have been taken to provide maximum safety to operating personnel. All doors permitting access to high voltage circuits or equipment are interlocked to remove high voltage and to operate a grounding switch on the high voltage bus. In addition, grounding sticks are provided in each enclosure where high voltage is present.

SPECIFICATIONS

Electrical Characteristics

Type of Emission ..... A 3 (telephone)
Output Frequency Range ..... Any frequency within the ranges 3.9 to 22.0 mc; and 25.6 to 26.1 mc
Stability ..... Determined by frequency source
RF Power Required from External Frequency Source ..... 2 watts minimum
Power Output ..... Not less than 50 kw for frequency range of 3.9 to 22.0 mc
Not less than 40 kw for frequency range of 25.6 to 26.1 mc
Modulation ..... High level Class B
Capability:
400 Cycles ..... Not less than 100 per cent
50 to 7500 Cycles ..... Not less than 90 per cent
Audio Frequency Response ..... ±2 db 30 to 10,000 cycles (Input reference level corresponding to 60 per cent modulation at 1000 cycles)
Residual Modulation ..... 56 db below 100 per cent modulation
Envelope Distortion ..... Less than 4.0 per cent rms (with 90 per cent modulation at 1000 cycles)
Input Impedance ..... 600 ohms
Input Level Required for Full Modulation (400 cycles) ..... +10 ±2 dbm
R-F Output Load Impedance ..... 300 to 600 ohms resistive
Power Sources:
For Main Supply ..... 460 volts, 50 cycles, 3 phase, 3 wire. Allowable regulation 5.0 per cent. Allowable total voltage variation including regulation, 46 volts.
For Auxiliary Supply ..... 115 volt, 50 cycle, single phase, approximately 500 watts
Power Consumption (less Auxiliaries):
0% Modulation ..... 110 kw
30% Modulation ..... 125 kw
100% Modulation ..... 165 kw
Power Factor (at 100% Modulation) ..... At least 90 per cent

Tube Complement (less Frequency Source)

5—RCA 4E27A
1—RCA 5762
5—RCA 9C25
2—RCA 807
8—RCA 813
2—RCA 8008
6—RCA 857B

Equipment Supplied

Following is a condensed list of equipment included as a complete BHF-50B Transmitter ES-8460:

	RCA Reference	Description	Approx. Weight (Pounds)	Approx. Dimensions (Inches) Height	Width	Depth
1	MI-8461	Exciter	500	84	25	25
1	MI-8462	Power Amplifier	3300	72	112	65
1	MI-8463	Modulator	1000	84	50	36
1	MI-8467-B	Control, Distribution, and Switchgear Unit	3800	84	82	48
1	MI-8464	Rectifier	3800	84	70	50
1	MI-8465-A	Plate Transformer	2300	50	25	49
1	MI-28236	Filter Reactor	1200	46	26	36
1	MI-7344-1	Modulation Transformer	6550	94	49	57
1	MI-7344-2	Modulation Reactor	3600	94	43	40
2	MI-8466-A	Voltage Regulator	800	46	16	22
1	MI-8468	Enclosure	800	84	198	6
1	MI-28237	Blower and Accessories	200	32	57	63
1	MI-8479	Set Doors	560	85	30	30
2	MI-7382-3	Modulation Capacitor	125	24	18	12
1	MI-8473	Modulation Capacitor Unit	110	24	24	24
2	MI-28204	Tube Dolly	100	24	24	24
2		Instruction Books	—	—	—	—
1	MI-7474	Miscellaneous Hardware Kit	—	—	—	—

Available Accessories

Frequency Source MI-22619
Set Small Tubes MI-8480
Set Large Tubes MI-8481
Supervisory Console MI-28950
Installation Materials Kit MI-8476
Recommended Spare Parts MI-8471
60 Cycle Conversion Kit MI-22620

5 KW FM BROADCAST TRANSMITTER

TYPE BTF-5B

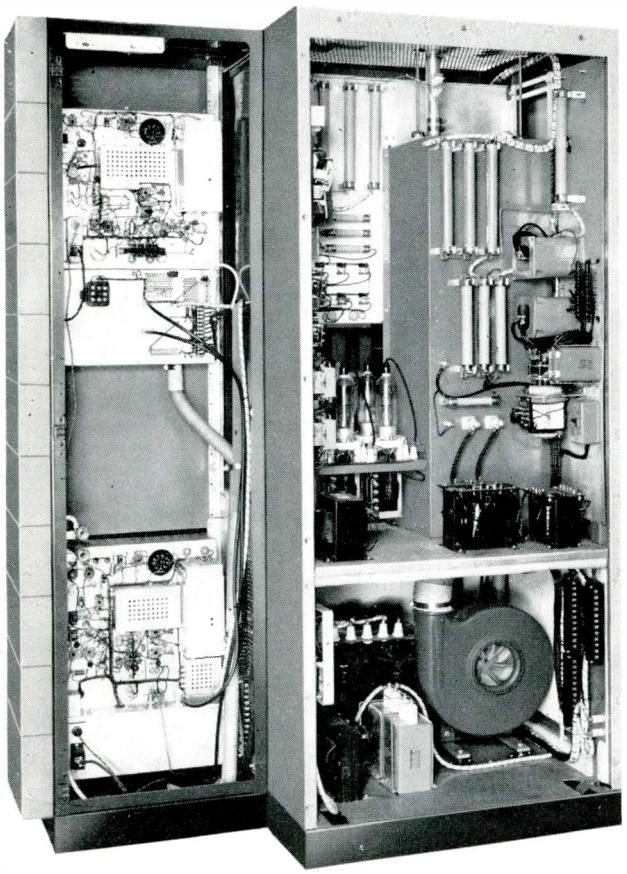
FEATURES

- Incorporates "Direct FM" system which requires fewer tubes and parts—easier to tune
- No spurious frequencies generated by modulation process
- Low pass filter for adequate harmonic suppression
- Simplified controls with complete circuit protection
- Minimum of different tube types
- Vertical chassis construction—front and rear accessibility
- Extremely stable
- Designed for remote control

USES

The RCA Type BTF-5B FM Broadcast Transmitter provides a maximum 5000-watt output for stations operating in the 88 to 108 megacycle band. It is designed specifically to meet the more stringent requirements of multiplex service transmission. Incorporating the latest developments in FM Transmitter design, the BTF-5B is outstanding in performance and reliability. Compact and simplified mechanical construction plus attractive cabinet styling produce an economical installation with dignified appearance. The entire transmitter is housed in two steel cabinets, and an additional BR-84 Type Cabinet may be added to house optional monitoring, test and metering equipment. Accessibility is assured by vertical chassis construction, surface mounting of components and exposed wiring for speedy circuit tracing.

The exciter unit of the BTF-5B is the newly designed RCA BTE-10B Type employing "Direct FM" modulator circuits which requires no special tuning when setting up for Multiplex and is virtually foolproof. Only seventeen adjustments are required and all the circuits are single tuned. There is a built-in scope for ease of tuning. With "Direct FM" noise remains constant no matter what the deviation of the transmitter. A minimum of tubes and components is required in the new transmitter. All tubes operate at conservative ratings for long life. The transmitter is designed to operate from a three-phase 240/208-volt, 50/60 cycle, power line.



Rear view of the BTF-5B showing ease of accessibility. At the top of the left cabinet note the BTX-1A Subcarrier Generator; just below it the IPA stage, and at the bottom the BTE-10B FM Exciter.

USES (continued)

By the addition of one or two Type BTX-1A Subcarrier Generators, ES-27295, the BTF-5B provides means of transmitting two or more services simultaneously over a stations' regularly assigned FM program channel. Space is provided in the exciter for the mounting of one BTX-1A multiplex unit. A second subcarrier generator can be housed together with other auxiliary equipment in Auxiliary Equipment Rack, ES-34211. With this accessory equipment stations can offer background music services or stereophonic programs while retaining presently scheduled FM broadcast programming. The use of the equipment for subsidiary communications and stereo is subject to FCC approval.

DESCRIPTION

The Type BTF-5B FM Transmitter is comprised of a 250-watt Driver, MI-24502, housed in a type BR-84 cabinet and a 5-KW Amplifier, MI-34503 which is housed with the power supply, plate transformer and forced-air blower in a matching cubicle. The heart of the transmitter is RCA's Type BTE-10B FM Exciter designed for use with one or two subcarrier generators. The exciter is housed in the same cabinet with the 250-watt driver or Intermediate Amplifier.

Accessibility is achieved by vertical chassis construction plus surface mounting of components and exposed wiring for easy and speedy circuit tracing and servicing. Six meters and all controls are grouped on two panels, located at either side of the amplifier cubicle. Interlock circuits protect operating personnel from high voltages when doors or panels are opened. The cabinets have been styled functionally to present a pleasing appearance. The doors of the amplifier cabinet have been styled in several pleasing colors to better harmonize with station decorative plans. They may be ordered in such hues as burgundy red, peacock blue, emerald green or dark umber gray.

Multiplex Exciter

A new Type BTE-10B Multiplex Exciter is employed in the BTF-5B Transmitter. It contains a modernized version of RCA's well-known "Direct FM" modulator and frequency control circuits that require fewer tubes and components. The exciter, including self-contained dry-disc, d-c power supply and line and plate breaker-switches, is mounted on a single vertical chassis. The chassis hinges forward to provide instant accessibility to all components and wiring.

Frequency modulation is accomplished directly by push-pull reactance tubes connected across the frequency-determining circuits of the modulated oscillator. This "direct modulation" process eliminates numerous multiplier and converter stages with resulting low noise and distortion levels. A subcarrier reactance tube is coupled to a small portion of the oscillator coil for modulating one or two subcarriers in multiplex operation. Effective decoupling minimizes the possibility of cross-talk between main and subcarrier channels. Only 7 tubes of the exciter are used in the audio and r-f generating circuits. The remaining tubes are not a part of the basic transmitter and do not effect the quality of transmission in any way. Failure of any one of them will not require shut down of the transmitter.

The output frequency is controlled automatically by means of an AFC circuit in association with an off-frequency detector. This circuit has a long record of reliable operation. Off-frequency operation beyond normal tolerance results in the unit taking the transmitter off the air. In this case all of the AFC circuits may be by-passed by means of an AFC switch and the transmitter frequency maintained manually by means of the frequency-control knob. Adjustment of the AFC circuits is simplified by means of a built-in cathode ray oscilloscope. A switch permits instantaneous checking and adjustment of the stable dividers. Lock in is easily observed at any time without disturbing the operation of the transmitter. Single-tuned circuits are used in the r-f multiplier and output stages of the BTE-10B Exciter.

Power Amplifier

Two simplified single-ended amplifiers operating class "C" follow the exciter. The 250-watt IPA stage is a 7034 tube, and the final amplifier a type 4CX5000A. The 250-watt stage is tuned by means of Pi network input and output circuits. No taps or sliding contacts are used. The inductors are varied by means of silver-plated, movable slugs. The final amplifier also uses familiar Pi network circuitry, but in this case, tuning is accomplished by means of variable inductors operating at ground potential. Large area contacts having low current distribution are used. Neutralization is required only in the final amplifier. This adjustment is not critical and can be made by means of pre-set slides.

The BTF-5B Transmitter is very easy to tune and maintain. Power output is controlled by means of a variable, motor-driven autoformer connected in the primary of the screen voltage supply. The screen voltage is varied simultaneously on both the driver and final amplifier tubes. The harmonic filter is factory adjusted for the required operating frequency and requires no field adjustment.

Protective Circuits

Power circuits are protected by magnetically tripped circuit breakers as well as overload relays. An interlock relay prevents application of plate power until all filaments have heated and the exciter has reached a stable operating condition. Overload relays are used in each phase of the high voltage rectifier. In addtiion, a latching relay automatically re-applies power to the transmitter three times before locking-out in case of brief overloads or power interruptions. The overload relays are re-set by means of an instantaneous key-switch on the front panel. An overload indicator lamp signals when an overload has taken place. The relays are accessible inside the front door of the amplifier cabinet.

Cooling air for the BTF-5B is supplied by means of one blower that is mounted in the amplifier section of the transmitter. Heavy sound insulation is used to reduce noise to a minimum. The blower cools both the IPA and PA stages, which are each protected by air-flow failure switches. Access to high voltage areas is protected by built-in high-voltage shorting devices.

Control Features

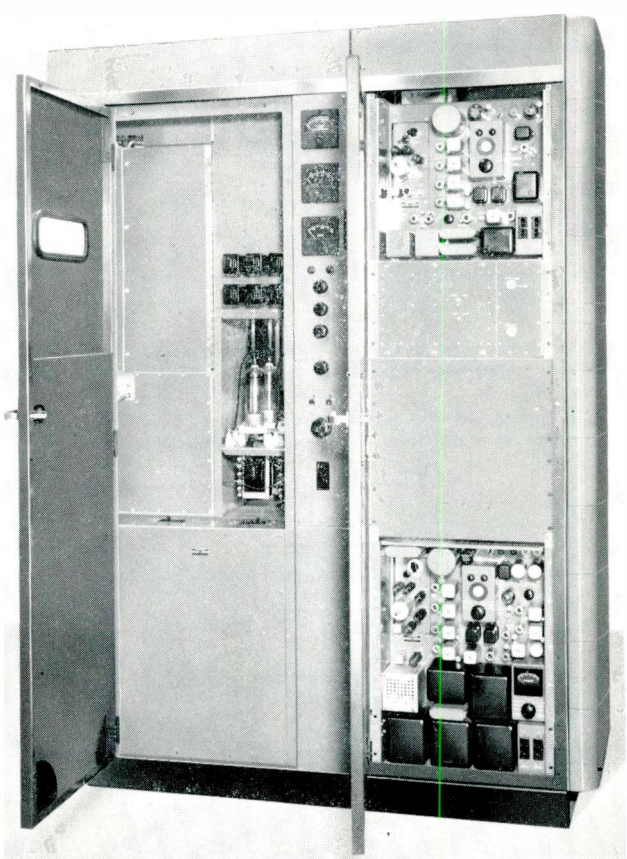
Meters, controls and indicators are used in adjusting and operating the BTF-5B at peak efficiency. The BTE-10B exciter has a self-contained multimeter. It is used to read modulator cathode current, second and third multiplier grid current, PA cathode and plate current, AFC control voltage and plate voltage.

The 5-KW amplifier cabinet provides metering of the PA plate current, plate voltage, hours elapsed-time, VSWR-power output, AC line volts and a multimeter. All tuning adjustments can be made by means of front panel controls. They include key switches for filament-on, plate on and off, screen raise and lower, and overload-reset. Front panel lights indicate all main functions such as transmitter-on, transmitter ready, plate on, and overload.

Remote Control

Remote control facilities are provided in the transmitter and terminals are provided for this type of use with remote control units such as the Type BTR-11B. Terminals are provided for remote control of transmitter on-off, plate on-off, raise-lower, overload reset, and power output. Remote indication of final amplifier, Cathode current, IPA cathode current, plate voltage, and power output are also provided.

Front view of the BTF-5B showing the convenient location of all components. On the right the Exciter is mounted at the bottom of the cabinet; above it is the IPA stage, and at the top the BTX-1A Multiplex Subcarrier Generator. The power supplies, cooling, and PA stage are in the cabinet on the left.



SPECIFICATIONS

Performance Specifications

Type of Emission.....F3
Frequency Range.....88 to 108 mc
Power Output.....5 kw
Output Impedance (1⅝" O.D. Line).....50/51.5 ohms
Frequency Deviation 100% modulation.....±75 kc
Modulation Capability.....±100 kc
Carrier Frequency Stability.....±1000 cycles Max.
Audio Input Impedance.....600/150 ohms
Audio Input Level—*(100% Mod.).....±10 ±2dbm
Audio Frequency Response—**(30-15,000 cycles).....±1 db Max.
Harmonic Distortion—***(30-15,000 cycles).....0.5% or less
FM Noise Level (referred to 100% FM mod.).....—65db Max.
AM Noise Level (referred to 100% AM mod.).....—50db Max.
Subcarrier Input Level (30% mod. of Carrier).....2 volt Max.
Subcarrier Input Impedance.....10,000 ohms
Subcarrier Frequency.....30-67 kc.

Electrical Specifications

Main-to-Subchannel Crosstalk.....—53 db referred to ±7.5 kc/s deviation of the subcarrier by a 400 cps tone. Main channel modulation 85% by 30-15,000 cps tones

Sub-to-Main-Channel Crosstalk.....—65 db referred to ±7.5 kc deviation of the main carrier by a 400 cps tone. Subchannel modulated 100% (±7.5 kc/s) by 30-6000 cps tones. Subcarrier modulated 30% on main carrier

Power Line Requirements:
Line.....240/208 volt, 3ϕ, 50/60 cycles
Slow Voltage Variation.....±5%
Power Consumption.....10,000 watts (approx).
Power Factor (approx.).....90%
Crystal Heaters:
Line.....117 volt, 1ϕ, 50/60 cycles
Power Consumption.....28 watts

Tube Complement

Exciter:

5—6AH6	3—6AQ5	2—5763
1—6146	1—6CL6	1—12AT7
1—6AS6	1—6AU6	1—OD3
1—2D21	1—1EP1	

Driver:
1—7034/4X150A
Power Amplifier:
1—4CX5000A
High Voltage Rectifier:
6—8008

———

* Level measured at input to pre-emphasis network
** Audio Frequency response referred to 75 micro-second pre-emphasis curve
*** Distortion includes all harmonics up to 30 kc and is measured following a standard 75 micro-second de-emphasis network.

Mechanical Specifications

Dimensions (overall):
Width.....59½"
Width (with additional optional monitor rack).....84½"
Height.....84"
Depth.....32"
Weight.....1200 lbs. (approx.)
Finish:
Cabinets.....Dark umber gray, polished stainless steel trim
Doors.....Burgundy red, peacock blue, emerald green, or dark umber gray
Altitude.....7500 Ft. Max.
Ambient Temp. Range.....0-45°C

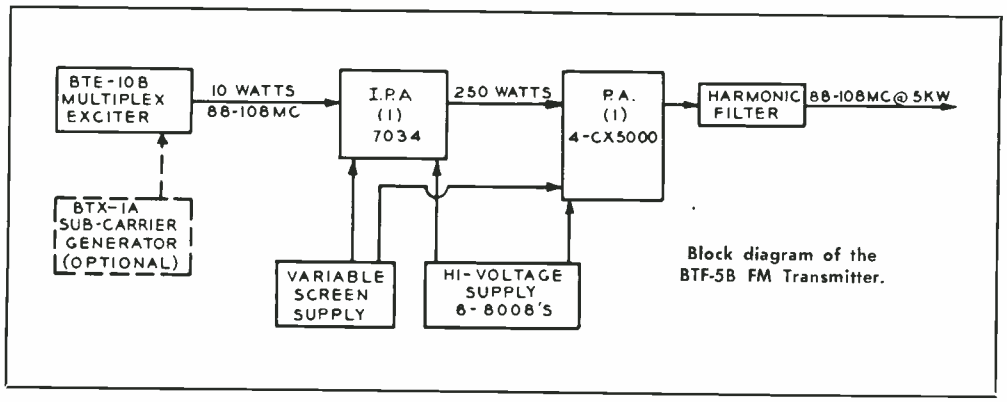
Equipment Supplied

BTF-5B FM Broadcast Transmitter (ES-27280)

Qty.	Description	Stock No.
1	250-Watt Driver	MI-34502
1	5-KW Amplifier	MI-34503
1	Plate Transformer	MI-34507
1	Blower	MI-34508
1	Side Panel (End Shield)	MI-30541-G84
1	Harmonic Filter	MI-27967-1 or -2
1	Reducer 3⅛" to 1⅝"	MI-19112-7
1	Mitre Elbow 90°	MI-19112-18NF
1	Inner Connector	MI-19313-10
1	Coupling	MI-19112-8
1	Tool Kit	MI-27088
1	Installation Material Kit	MI-34505
1	Finish Touch Up Kit	MI-27660
1	Crystal (to suit customers' assigned frequency)	MI-34509*
1	Set of Operating Tubes	ES-27282
1	Door, Right Hand, choose decor as follows:	
	Burgundy	MI-27645-1
	Light Umber Gray	MI-27645-2
	Peacock Blue	MI-27645-3
	Emerald Green	MI-27645-4
1	Door, Left Hand, Choose decor as follows:	
	Burgundy	MI-27645-A1
	Light Umber Gray	MI-27645-A2
	Peacock Blue	MI-27645-A3
	Emerald Green	MI-27645-A4
1	Nameplate	MI-28180-1

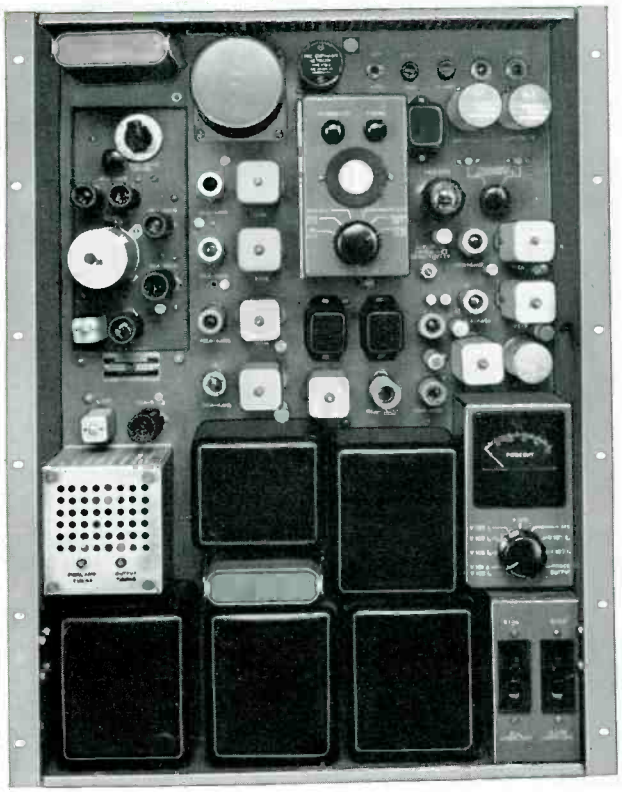
Optional and Accessory Equipment

Auxiliary Equipment Rack for BTF-5B Transmitter (Specify Door Color).....ES-34211
Complete Set of Spare Tubes for BTF-5B.....ES-27282
FCC Set of Spare Tubes.....ES-27297
Spare Crystal Unit for BTF-5B with Oven (Specify operating carrier frequency).....MI-34509
Type BTR-11B Remote Control System.....MI-27537/27538-A
Type BTX-1A Subcarrier Generator.....ES-27295
Complete Set of Spare Tubes for BTX-1A Subcarrier Generator.....MI-34514
FCC Set of Spare Tubes for BTX-1A Subcarrier Generator.....MI-34519
Model 335-BR Frequency and Modulation Monitor.....



Block diagram of the BTF-5B FM Transmitter.

FM MULTIPLEX EQUIPMENT



Type BTE-10B Multiplex Exciter.

USES

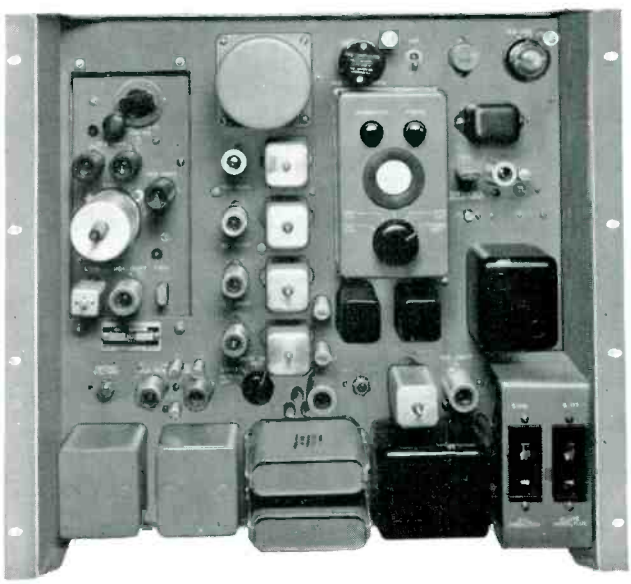
RCA FM Multiplex Equipment provides on-air FM stations with an inexpensive means of broadcasting two or more services simultaneously over their regularly assigned broadcast channel. With this equipment stations can offer background music services or stereophonic programs while retaining presently scheduled FM broadcast programming. The use of the equipment for subsidiary communications and stero is subject to FCC approval.

Multiplexing is the simultaneous transmission of two or more separate program channels on the same r-f carrier. By employing the RCA BTE-10B Multiplex Exciter and one or two Type BTX-1A Subcarrier Generators, one or two additional program channels can be transmitted along with the regular FM program channel. This is accomplished by transferring the sub-channel programs into the supersonic frequency range and frequency modulating the subchannel programs on 30-67 kc subcarriers. The FM supersonic carriers are then used to modulate the r-f carrier. Special receivers with multiplex adaptors and automatic or selective muting circuits are available for receiving the multiplexed FM transmissions.

FEATURES

- "Direct FM" modulation
- Fewer stages—easier to tune
- Built-in scope
- No spurious frequencies generated by modulation process
- Exciter requires no special tuning when setting up for Multiplex
- All circuits single tuned
- Muting and cut-off protective circuits provide built-in protection

Type BTX-1A Subcarrier Generator.



DESCRIPTION

The RCA Type BTE-10B Multiplex Exciter is a compact, self-contained unit with built-in power supplies and an oscilloscope to facilitate alignment. Miniature tubes are used throughout, and semiconductor rectifiers are used in the power supplies. The BTE-10B incorporates features which make it very easy to adjust and maintain, and extremely reliable in operation.

The r-f multiplier and power amplifier stages of the exciter use relatively broadband, single-tuned circuits, thus simplifying adjustment. A built-in meter can be switched to read the following voltage and currents: modulator cathode current, second and third multiplier grid currents, PA cathode and plate current, AFC control voltage, and plate voltage. A monitor oscilloscope incorporated in the exciter simplifies adjustment and maintenance of the AFC frequency dividers. A switch permits instantaneous checking and adjustment of all five dividers and a check of the control action of the phase detector. Displays are in the form of Lissajous' figures, with the advantage that lock-in of the dividers can be easily observed. Checks can be made during operation without disturbing the AFC action in any way.

Self-contained power supplies for the BTE-10B employ semiconductor rectifiers throughout. The high voltage regulated supply which furnishes d-c plate and screen voltages utilizes a bridge-type germanium rectifier. Modulator and oscillator filaments are energized by a d-c supply employing a full-wave silicon rectifier.

All components of the BTE-10B are mounted on a vertical chassis designed for standard rack mounting. Special hinge-type mounting pins at the bottom corners permit the top of the chassis to be swung out for access to the wiring and circuit components on the underneath side.

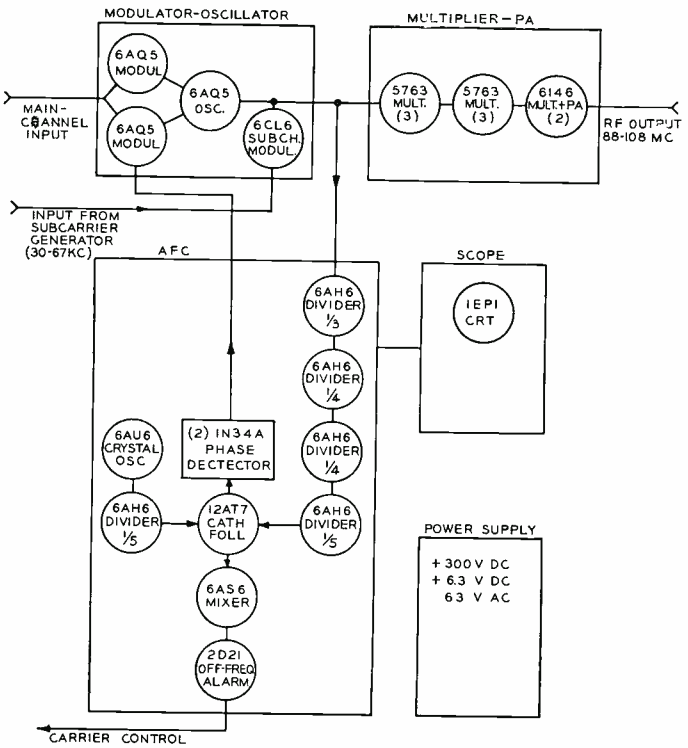
Circuits of the BTE-10B, as shown in the block diagram, consist of a master oscillator which operates at 1/18 of the carrier frequency; two reactance modulators to provide modulation for the main channel; a third reactance modulator for the subcarrier; three frequency multipliers including the output stage to bring the output frequency up to the 88 to 108 mc range; automatic frequency control circuitry; and the power supplies necessary to furnish a-c and d-c voltages for these stages. The final amplifier of the exciter acts as a doubler.

Circuit features include the use of a pushpull modulator and inductive coupling circuit that results in highly linear operation with very low harmonic distortion. Each tube becomes almost a pure reactance. Loading of the oscillator is greatly reduced thus providing better AFC action. Moreover, the pushpull modulator automatically balances out temperature and supply-voltage changes. The modulating circuits are very effectively decoupled, minimizing the possibility of cross-talk between the main channel and subchannel.

The automatic frequency control circuitry of the BTE-10B Exciter is characterized by a long record of dependable operation. A phase detector is used to develop a control voltage which establishes and maintains a phase lock between a reference crystal oscillator and the derived signal. Thus the system is actually an automatic phase control system which achieves a stability precisely matching that of the crystal reference source. The master oscillator frequency and swing are reduced to confine phase deviations. Limited pull-in range normally associated with precise frequency control is overcome by the use of an off frequency circuit which simultaneously provides a safeguard against uncontrolled and possible off-frequency operation. The a-c overload switch can be used as a power "ON-OFF" switch, if desired, and the d-c overload switch for "Standby Plate" switching. Manual control of the oscillator is provided so that failure of any tubes or components in the AFC section will not require shutdown of the transmitter.

The BTE-10B Exciter is used in the RCA BTF-5B 5-KW FM transmitter. In many instances it may be used to replace the exciters in previously designed transmitters that will not meet the stringent requirements of multiplex operation.

Simplified block diagram of a BTE-10B Exciter. The modulator-oscillator is shown with provisions for inserting one subcarrier.



BTX-1A Subcarrier Generator

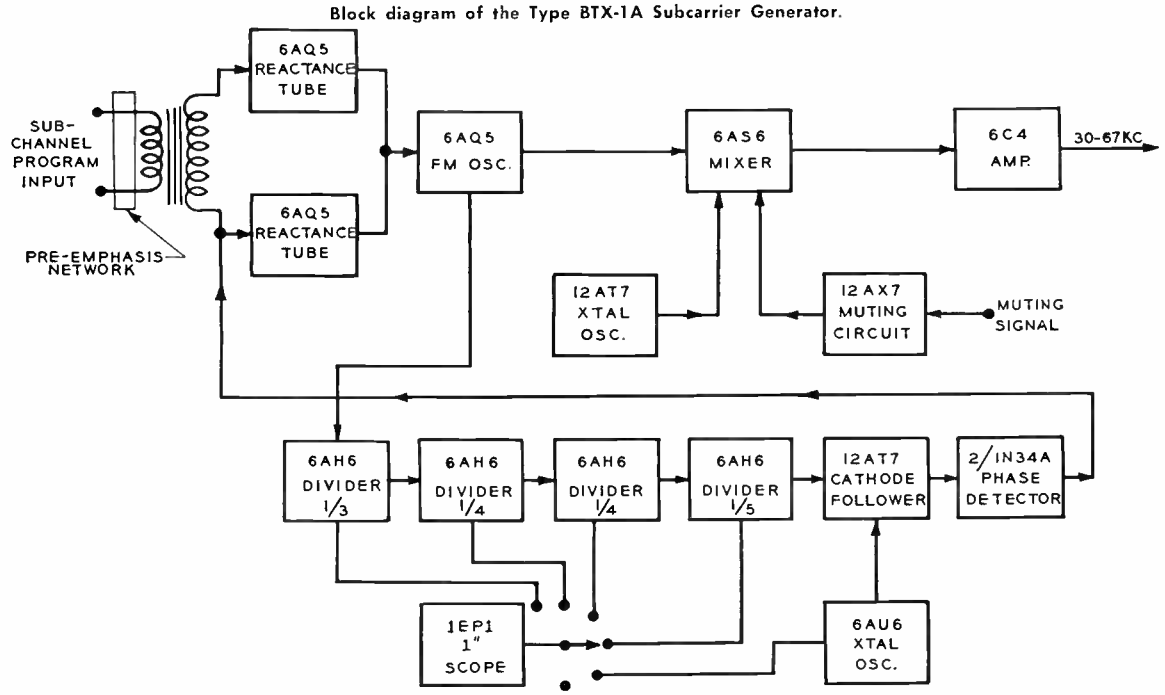
The BTX-1A Subcarrier Generator is designed to provide a frequency modulated r-f signal having a center frequency in the range of 30 to 67 kc. When used in conjunction with the RCA BTE-10B FM Exciter, an FM station can multiplex up to two channels in addition to the regular program channel on a single r-f carrier. Crystal units providing a center frequency of 32.5, 42, 59, and 67 kc are currently available for use in the generator.

All components of the BTX-1A are mounted on a vertical chassis designed for standard rack mounting. The equipment employs miniature tubes in all stages except in the power supply which utilizes an OD3 voltage regulator and germanium rectifiers in a bridge circuit. Other features include a built-in monitor oscilloscope which permits instantaneous check and adjustment of all five AFC frequency dividers, and the control action of the phase detector.

The BTX-1A circuitry consists of a master oscillator, pushpull reactance modulators, crystal oscillator, automatic frequency control, subcarrier muting stage, mixer, cathode follower output stage, alignment oscilloscope and a power supply. Two reactance modulators are connected to the oscillator plate, and the pushpull grids are inductively coupled to the plate tank. R-f voltages on the two modulator grids are 180 degrees out of phase with respect to each other, and each is 90 degrees out of phase with the oscillator plate. Thus one tube appears as a capacitive reactance and the other appears as an inductive reactance across the oscillator tank. The magnitude of the reactive component presented to the tank coil varies with the audio voltage applied to the modulator grids. The frequency of the oscillator is varied accordingly. The mean frequency is controlled by the bias voltage applied to one grid by the automatic frequency control circuit.

The modulated output from the master oscillator and the r-f output from a 12AT7 crystal oscillator are then fed into a mixer. This stage supplies the modulated beat frequency in the range of 30 to 67 kc, which is connected to the cathode follower. A subcarrier muting stage is used to disable the mixer and thus suppress subcarrier output when no audio voltage is present at the audio input terminals of the generator. Operation of this stage is such that with no audio voltage present at the input, the plate of the second half of the 12AX7 tube clamps the grid voltage of the mixer to a very low value, reducing output of the mixer to zero. Audio applied to the input of the muting stage, however, is amplified in the first half of the 12AX7, rectified by a 1N38A crystal diode and applied as bias to disable the clamping section of the tube. A five-position switch is provided for switching the muting stage in and out of the circuit, and also selection of three different values of time delay before muting takes place. The pushpull modulation of the BTX-1A is similar to that in the BTE-10B and has the same features as previously outlined. The automatic frequency control circuitry used in the BTX-1A is also very similar to that in the BTE-10B Exciter, and it performs the same function.

Block diagram of the Type BTX-1A Subcarrier Generator.



SPECIFICATIONS

Type BTE-10B Exciter

Performance Specifications

Type of Emission	F3
Frequency Range	88-108 mc/s[8]
Power Output	10 watts
Output Impedance	50 ohms
Frequency Deviation for 100% modulation	±75 kc/s
Modulation Capability	±100 kc/s min.
Carrier Frequency Stability	±1000 cps max.
Audio Input Impedance	600/150 ohms
Audio Input Level (100% mod.)	+10 ±2 dbm[1]
Audio Frequency Response (50-15,000 cps)	±1 db max.[2]
Harmonic Distortion (50-15,000 cps)	50-100: 1.5% max.[3] 100-7,500: 1% max. 7,500-15,000: 1.5% max.
FM Noise Level (referred to 100% FM mod.)	—65 db max.
AM Noise Level (referred to carrier voltage)	—50 db max.
Subcarrier Input Level (30% mod. of carrier max.)	5 volts max.[4]
Subcarrier Input Impedance	10,000 ohms
Subcarrier Center Frequency Range	30-67 kc/s
Main-to-Sub-channel Crosstalk	—53 db[5]
Sub-to-Main Channel Crosstalk	—65 db[6]

Electrical Specifications

Power Line Requirements:

Transmitter:	
Line	240/208 or 117 V, a-c, 50/60 cps, single phase
Slow Voltage Variations	±5%
Power Consumption	300 watts
Crystal Heaters:	
Line	117 V, a-c, 50/60 cps, single phase
Power Consumption	28 watts

Tube Complement

1 Cathode Ray Tube	1EP1
2 Reactance Modulator	6AQ5
1 Master Oscillator	6AQ5
1 Subcarrier Modulator	6CL6
2 Frequency Tripler	5763
1 Frequency Doubler and Power Amplifier	6146
1 Frequency Divider (1/3)	6AH6
2 Frequency Divider (1/4)	6AH6
1 Frequency Divider (1/5)	6AH6
1 Crystal Oscillator	6AU6
1 Crystal Frequency Divider (1/5)	6AH6
1 Cathode Follower	12AT7
1 Off-Frequency Detector	6AS6
1 Off-Frequency Control	2D21
1 Voltage Regulator	OD3

Mechanical Specifications

Overall Dimensions	24½" high, 19" wide, 11" deep
Weight	80 lbs.
Maximum Altitude	7500 feet
Ambient Temperature Range	0-45°C

Equipment Supplied

Type BTE-10B FM Exciter	ES-27278
Comprising the following:	
1 FM Exciter Unit	MI 34501
1 Crystal Unit (*Sales Order must specify crystal frequency)	MI-34509*
1 Set of Operating Tubes	MI-34510
2 Instruction Book	IB-30262

[1] Level measured at input to pre-emphasis network using 400 cps tone.

[2] Audio frequency response referred to 75 μs pre-emphasis curve.

[3] Distortion includes all harmonics up to 30 kc/s and is measured following a standard 75 μs de-emphasis network.

[4] Subcarrier modulation percentage can be brought to 50% if required.

[5] Reference shall be ±7.5 kc/s deviation of the subcarrier by a 400 cps tone. Main-channel modulated 85% by 50-15,000 cps tones.

Type BTX-1A Sub-Carrier Generator

Performance Specifications

Type of Modulation	FM
Center Frequency Range of Sub-carrier	30-67 kc/s
Output Voltage	5 volts min.
Source Resistance	Approx. 400 ohms, cathode follower
Frequency Deviation (100% subcarrier mod.)	±7.5 kc/s
Modulation Capability	±25 kc/s
Carrier Frequency Stability	±500 cps
Audio Input Impedance	600/150 ohms
Audio Input Level (100% mod.)	+10 ±2 dbm[1]
Audio Frequency Response (50-6,000 cps)[7]	±1 db max.[2]
Harmonic Distortion (50-6,000 cps)	1.5% max.[3]
FM Noise Level (referred to 100% mod.)	—60 db max.
AM Noise Level (referred to carrier)	—50 db max.

Electrical Specifications

Power Line Requirements:

Line	240/208 V, a-c, 50/60 cps, single phase
Slow Voltage Variation	±5%
Power Consumption	100 watts

Tube Complement

2 Reactance Modulator	6AQ5
1 Master Oscillator	6AQ5
1 Crystal Oscillator #1	12AT7
1 Mixer	6AS6
1 Cathode Follower	6C4
1 Frequency Divider (1/3)	6AH6
2 Frequency Divider (1/4)	6AH6
1 Frequency Divider (1/5)	6AH6
1 Crystal Oscillator #2	6AU6
1 Cathode Follower	12AT7
1 Subcarrier Muting	12AX7
1 Voltage Regulator	OD3
1 Cathode Ray Tube	1EP1

Mechanical Specifications

Overall Dimensions	17½" high, 19" wide, 10" deep
Weight	40 lbs.
Maximum Altitude	7500 feet
Ambient Temperature Range	0-45°C

Equipment Supplied

Type BTX-1A Subcarrier Generator	ES-27295
Comprising the following:	
1 Subcarrier Generator Unit	MI-34500
1 Set of Operating Tubes	MI-34514
1 Crystal Unit, Type CR-18/U (*Order must specify frequency of 67, 58, 42, or 32.5 kc)	MI-34520*
1 Instruction Book	IB-30262

Accessory Equipment

Spare Set of Operating Tubes for BTE-10B Exciter	MI-34510
Set of Spare FCC Tubes for BTE-10B Exciter	MI-34515
Spare Set of Operating Tubes for BTX-1A Subcarrier Generator	MI-34514
Set of Spare FCC Tubes for BTX-1A Subcarrier Generator	MI-34519
Spare Crystal for BTE-10B Exciter (*Sales order must specify channel frequency.)	MI-34509*

[6] Reference shall be ±75 kc deviation of the main-carrier by a 400 cps tone. Sub-channel modulated 100% (±7.5 kc/s) by 50-6,000 cps tones.

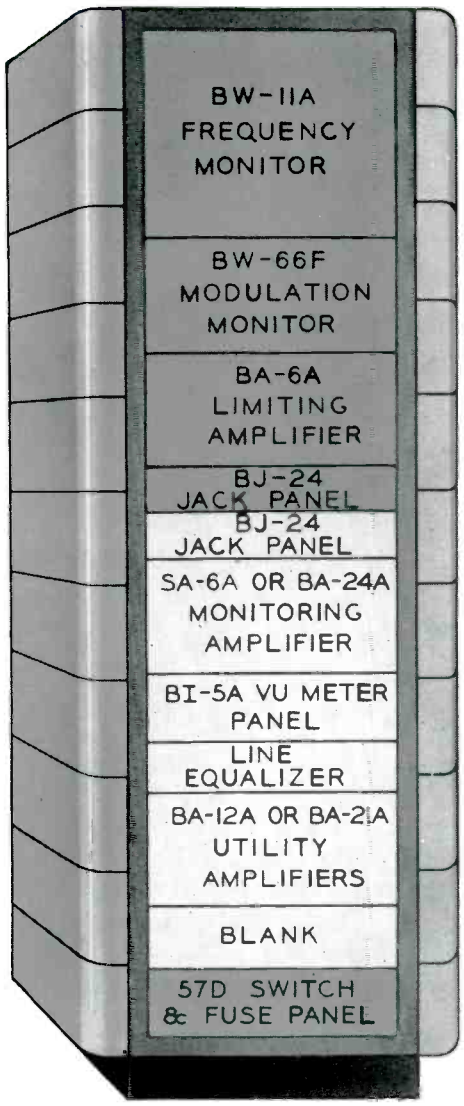
[7] For use in a stereophonic system the sub-channel frequency response is 50-15,000 cps. No changes will have to be made in the BTE-10B Exciter.

[8] Coil furnished for 44 to 54 mc for use where a doubler follows the exciter.

#2/4C - Exciter #2/5C - Sub-carrier generator

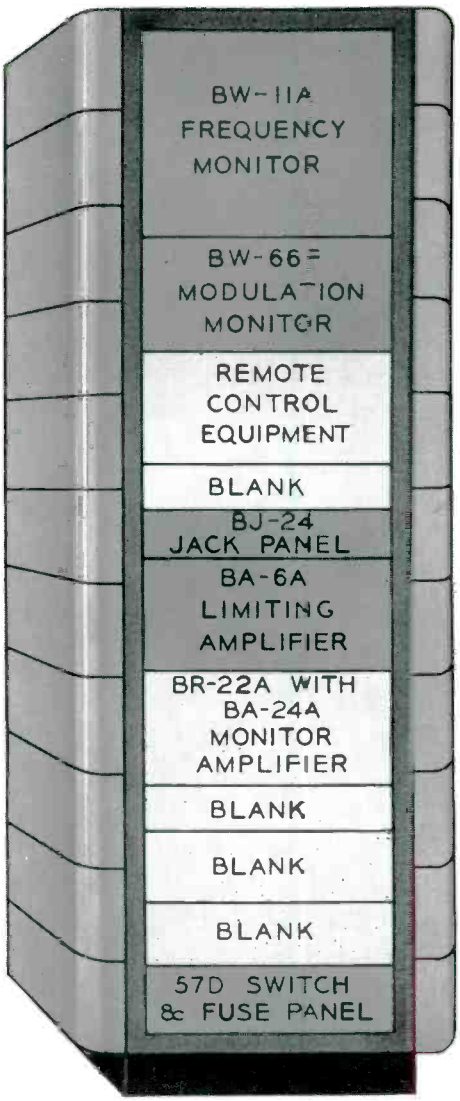
INPUT AND MONITORING EQUIPMENT

(AM BROADCAST)



◀ **FOR USE WITH TRANSMITTER AND STUDIO AT SAME LOCATION** the rack at left contains suggested equipment. The dark shaded items represent essential equipment . . . the white open areas show optional equipment.

FOR USE WITH TRANSMITTER REMOTE FROM STUDIO the rack at right contains suggested equipment. The dark shaded items represent essential equipment . . . the white open areas show optional equipment. ▶



FEATURES

- Cabinets are same height as RCA transmitters
- All essential units may be contained in one rack
- Reserve space in rack for optional equipment
- Attractively styled to blend with all control room installations
- Suitable for fitting in a flush position to a side or rear wall
- Drilled and tapped for standard 19" panels

USES

The RCA Standard BR-19A or BR-84 Rack as shown contains all the essential equipment needed to fulfill FCC monitoring requirements and necessary input functions.

DESCRIPTION

A typical RCA Input and Monitoring Rack may contain, depending on station's requirements:

1. The RCA AM Frequency Deviation Monitor, Type BW-11A, which indicates continuously and directly in cycles-per-second any departure from the assigned frequency. It bears FCC approval Number 1471, for use in Standard Broadcast stations. It has an accuracy of better than ±10 parts per million.
2. The RCA AM Modulation Monitor Type BW-66F gives continuous direct reading indication in percentage of carrier modulation. It will indicate program level, carrier shift, and provide demodulation for distortion and frequency response measurements.
3. The RCA Limiting Amplifier Type BA-6A serving as an automatic means of increasing program level while limiting peaks to prevent over-modulation, and adjacent channel interference. This amplifier provides for a more effective use of transmitter power by allowing the system to be operated as near maximum modulation as possible, thus permitting greater coverage at a fixed power input.
4. The RCA Standard Jack Panel Type BJ-24, provided to improve the overall operating flexibility of a Broadcast Station. With the use of patch cords, many combinations of input and output circuits can be realized. It can be used freely in emergencies and for test purposes. Spacing of jack pairs prevents cross circuit patching.
5. The RCA Switch and Fuse Panel, Type 57-D, provides master switch and fuses for the rack mounted equipment with a 'power-on' indicator light and removable door for fuse access.

* If studio and transmitter are to be at the same location, some of the following equipments may be desired to increase the efficiency of your operation and can be installed in the Input and Monitoring Equipment Rack:

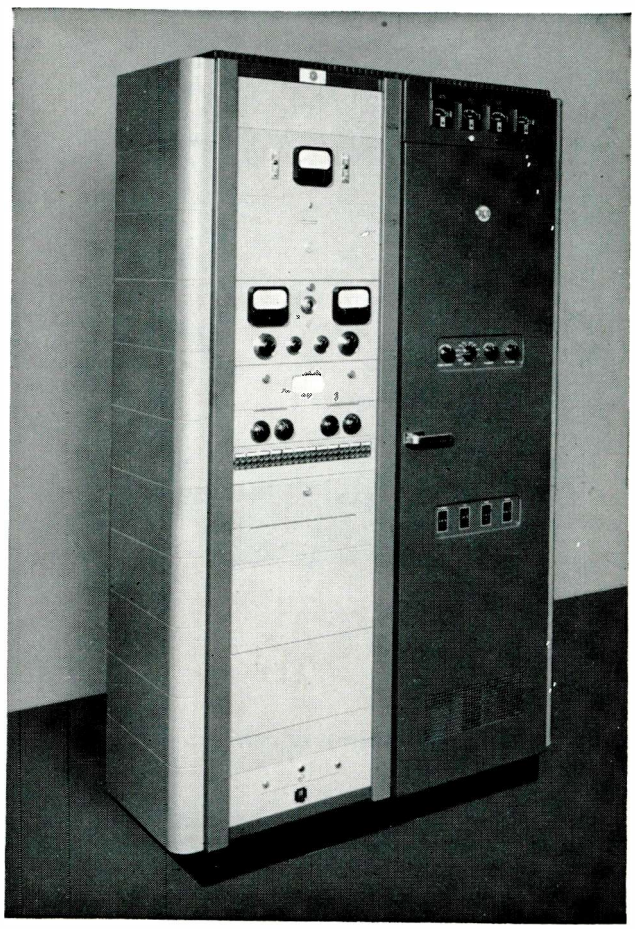
6. An additional RCA Standard Jack Panel Type BJ-12 or BJ-24.
7. An RCA Monitoring Amplifier Type SA-6A or BA-24A.
8. An RCA VU Meter Panel Type BI-5A.
9. An RCA Line Equalizer.
10. An RCA Utility Amplifier Type BA-12A or BA-21A.

** If Transmitter will be located remotely from your studio, some of the following equipment may be desired and can be installed in the Input and Monitoring Equipment Rack:

6. The RCA Remote Control System Receiver Type BTR-11B/20A for unattended transmitter operation.
7. An RCA type Monitor Amplifier Type SA-6A or BA-24A.

SPECIFICATIONS

Complete detailed specifications on each of these approved Input and Monitoring Equipments may be found in this catalog or in the RCA Audio Equipment Catalog.



A typical Input and Monitoring Rack adjacent to an RCA 250 Watt Transmitter (BTA-250M). Rack can be located separately in any transmitter set-up.

REMOTE CONTROL SYSTEMS

TYPES BTR-11B/20A

FEATURES

- Flexible systems at minimum cost
- Provisions for checking metering circuit calibration at control point
- Operates without vacuum tubes, amplifiers, oscillators or tuned circuits
- Lowest telephone line rental and lowest power consumption
- Easy accessibility to all terminal connections and components
- Home-step provision—rapid homing
- Provides fail-safe circuit
- D-C system operates on proven dial telephone principles

USES

The RCA Type BTR-11B and BTR-20A Remote Control Systems are designed for use with AM, FM or TV broadcast transmitter equipment to remotely control the operation of the station transmitter. With this equipment a station can be operated entirely from the broadcast studio or other remote point without the presence of an attendant at the transmitter site.

The Type BTR-11B Remote Control System provides control or measurement facilities of all essential transmitter functions. Up to ten functions such as transmitter on-off, plate on-off, overload reset, power output, tower lights, Conelrad provisions may be controlled. Metering of filament voltage, plate voltage, plate current, antenna current from a common point or from up to three base points, tower light current, modulation monitor, and frequency monitor may be read by means of the system. The Type BTR-20A Remote Control System is an extended deluxe equipment providing up to 19 control and metering facilities. All essential functions performed by the BTR-11B are provided, plus spare control and metering accommodations. This unit may be used to control a second or standby transmitter if desired.

Front View of BTR-20A Transmitter Control Unit.

DESCRIPTION

The radio broadcast transmitter remote control equipment consists essentially of a Station Control Unit, a Transmitter Control Unit, and a number of auxiliary units, the exact number depending on the functions to be controlled. With this equipment it is possible to control and/or measure the operation of up to 10 transmitter functions with the Type BTR-11B Remote Control System, or 19 functions with the BTR-20A equipment.

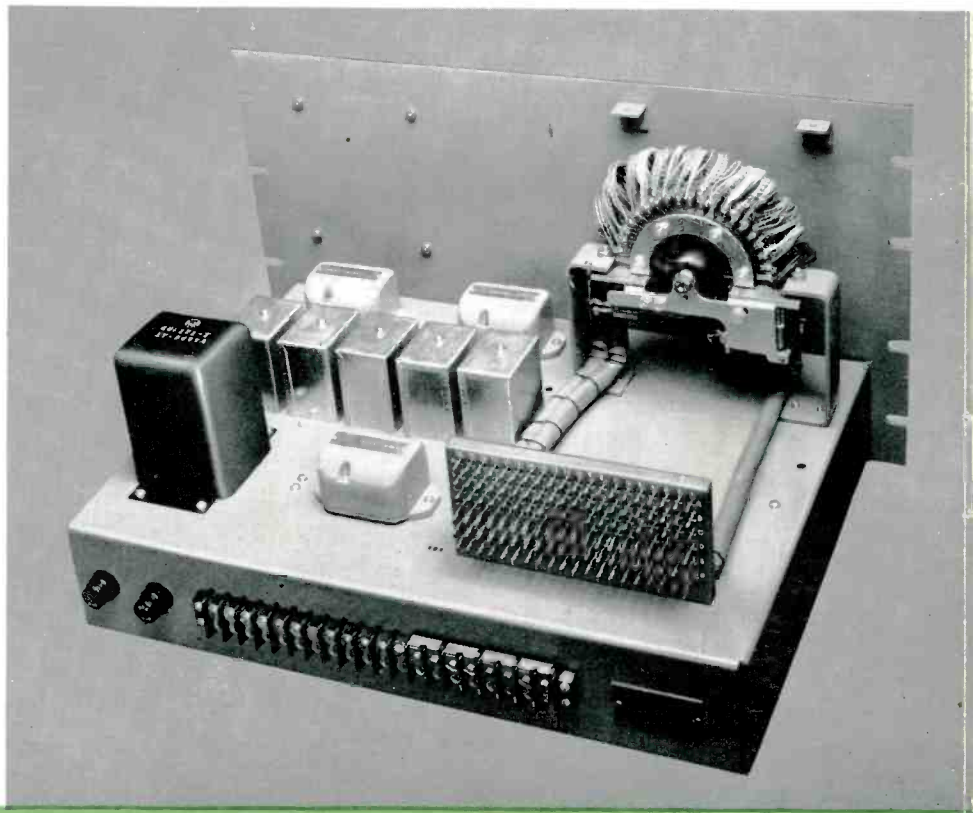
The Typical Metering and Control Functions Tables contain a sample list of the transmitter circuits that can be measured and the operations that can be controlled by the Station Control Unit at the remote location via two telephone lines and ground return with a loop resistance up to 5000 ohms. The station Control Unit is designed for rack mounting at the studio location; while the Transmitter Control Unit and most of the auxiliary equipment is housed at the transmitter site.

The Studio Control Unit has the following front panel controls: "home-step" switch, "on-raise—off-lower" switch, power switch, indciator lamp, meter, and function indicator dial. The Transmitter Control Unit of the BTR-11B system has a power switch and indicator lamp; while the BTR-20A unit has additional function indicator dial, step switch, and "on-raise—off-lower" switch to facilitate local set-up or test operations.

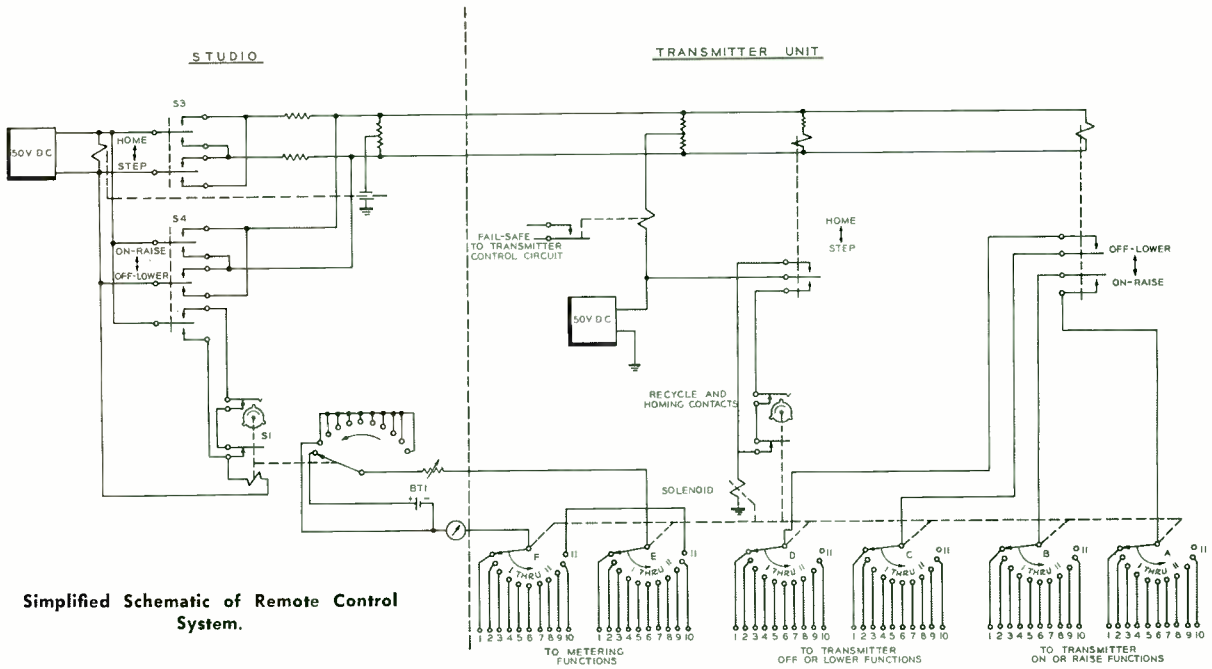
Stepping switches are located in both studio and transmitter units which are rotated to the desired position by operating the "home-step" switch to the step position. Each operation of the "home-step" switch rotates the stepping switch one position. Attached to the shaft of the stepping switches are indicator dials for indicating the position of the stepping switches (studio unit only in the BTR-11B system). Provision is made for rapid homing of the system by operating the "home-step" switch to the home position. After the desired function has been selected, the required operation can be performed by means of the "on-raise—off-lower" switch.

It is possible to read on the studio meter any desired transmitter meter reading in any position of the stepping switches. Means are provided for calibrating the line resistance by means of a standard cell. A fail-safe circuit is provided in the equipment systems to meet all FCC requirements. In the event of a failure of the remote control system or the control telephone lines, the transmitter is automatically shut down. Both studio and transmitter units have self-contained power supplies. The remote control systems require the use of two "signal service" telephone pairs plus a ground return. In-as-much as these lines carry only d-c they can be rented at a minimum rate.

The following auxiliary equipment units are intended for use with the RCA Remote Control Systems Type BTR-11B or BTR-20A. The units are necessary in order to make possible certain specific control and metering functions .Where



Rear view of BTR-20A Transmitter Control Unit showing power transformer, three polarized and five auxiliary relays, rear of stepping switch with cover removed and switch terminal board on chassis. Two fuses and strip terminal board for power and telephone line connections are at rear of chassis.



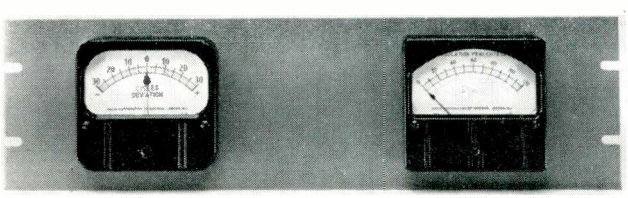
Simplified Schematic of Remote Control System.

such units are provided as part of the transmitter they are not required and may be omitted in ordering.

Remote R-F Pickup, MI-28027-A, provides the means of observing the antenna current at the studio control unit. The pickup coil is coupled to the antenna lead where it absorbs a sample of the transmitter r-f output. A diode rectifier provides d-c to operate the meter in the Studio Control Unit. A pickup can be installed at a common point to register the combined current of all the antennas. It can also be installed at the individual antennas to register the current of each antenna.

Meter Panel (AM Monitoring), MI-27527, provides the means of monitoring the output frequency and modulation of an AM transmitter from the remote location. The studio control unit has provisions for connecting the meter panel to the meter circuit of the stepping switch. The unit contains a separate frequency meter and modulation meter mounted on a standard 19-inch panel. It includes a step-down transformer to supply voltage for illuminating the meter lamps.

A-C Voltage Pickup, MI-27516, is installed at the transmitter and is connected to the transmitter control unit



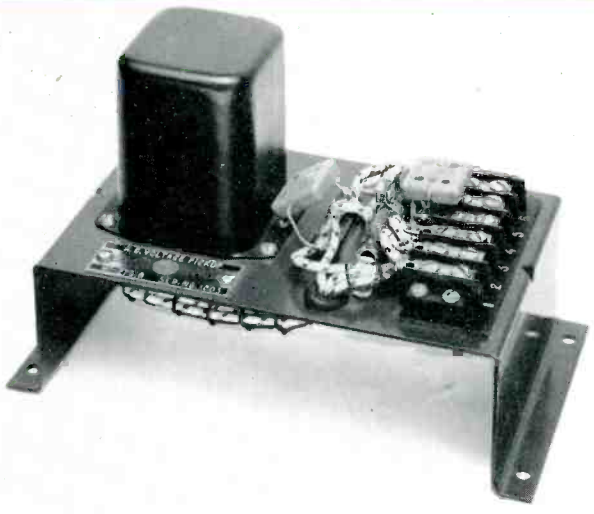
Meter Panel, MI-27527 for AM Monitoring.

Typical Control and Metering Functions for AM BTA-500R Transmitter Controlled by BTR-11B Remote Control Unit (1 tower)

Dial	*Control*	*Metering*
1	Transmitter On-Off	Filament Line
2	Plate On-Off	Plate Volts
3	Output Raise-Lower	Antenna Current
4	Overload Reset	Plate Current
5	Tower Lights On-Off	Tower Current
6		Frequency Deviation
7		% Modulation
8	Spare	
9	Spare	
10	Spare	
11	Home	Calibrate

Typical Control and Metering Function for AM BTA-1R AM Transmitter (3 towers) and BTF-5B FM Transmitter Controlled by BTR-20A Remote Control

Dial	*Control*	*Metering*
1	AM Transmitter On-Off	Filament Line
2	AM plate On-Off	Plate Volts
3	AM Output Raise-Lower	Common Point Current
4	Overload Reset	Plate Current
5	AM Day-Night	Common Point Current
6		Base Current 1
7		Base Current 2
8		Base Current 3
9		AM Frequency Deviation
10		AM % Modulation
11	Spare	
12	Spare	
13	FM Transmitter On-Off	Filament Line
14	FM Plate On-Off	Plate Volts
15	FM Output Raise-Lower	Reflectometer
16	FM Overload Reset	Plate Current
17		FM Frequency Deviation
18		
19	Tower Lights On-Off	Lighting Current
20	Home	Calibrate



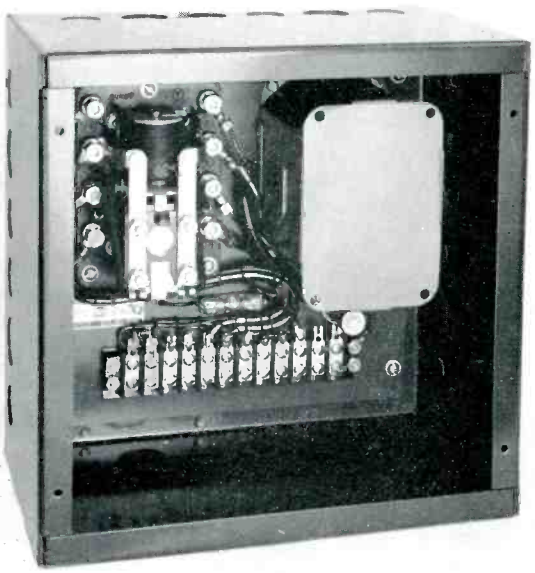
A-C Voltage Pickup, MI-27516.

$77

metering section. It provides an indication of the transmitter filament bus or line voltage on the studio control meter.

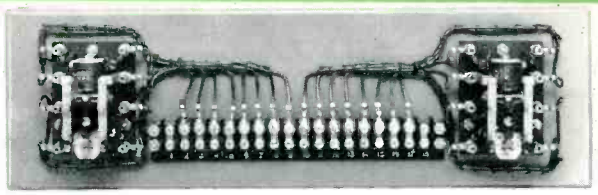
Tower Lighting Unit, MI-27519, may be connected to the transmitter antenna tower lighting circuit to provide both the metering and control connections to the transmitter control unit. It provides d-c voltage to the studio control meter for indicating tower light current and has a relay control circuit which enables the antenna tower lights to be turned on and off from the studio control unit.

Latching Relay Panel, MI-27509-A, is installed in the transmitting equipment where its function is to turn the transmitter on and off, or other similar function. It contains two



Tower Lighting Unit, MI-27519.

$160



Latching Relay Panel, MI-27509-A.

$75

relays which perform this control function when activated by the studio control unit. One relay turns the filament supply on or off and the other relay turns the plate voltage on or off.

SPECIFICATIONS

Control Functions:	
BTR-11B	10
BTR-20A	19
Power Requirements	117 volts, a-c, 50/60 cycles
Power Consumption and/or metering	25 watts maximum
Calibration	Standard cell
Meter	0 to 150 per cent (200 microamps)
Telephone Line	Special d-c; 5000 ohms loop resistance max.
Fail Safe	Meets FCC requirements
Finish	Light umber gray
Dimensions (overall):	
BTR-11B Transmitter Control Unit	19" wide, 8¾" high, 11" deep
BTR-11B Studio Control Unit	19" wide, 8¾" high, 6" deep
BTR-20A Transmitter Control Unit	19" wide, 8¾" high, 12⅞" deep
BTR-20A Studio Control Unit	19" wide, 8¾" high, 8⅞" deep
Weight (approx.):	
BTR-11B Transmitter Control Unit	18 lbs.
BTR-11B Studio Control Unit	18 lbs.
BTR-20A Transmitter Control Unit	20 lbs.
BTR-20A Studio Control Unit	20 lbs.

Equipment Supplied

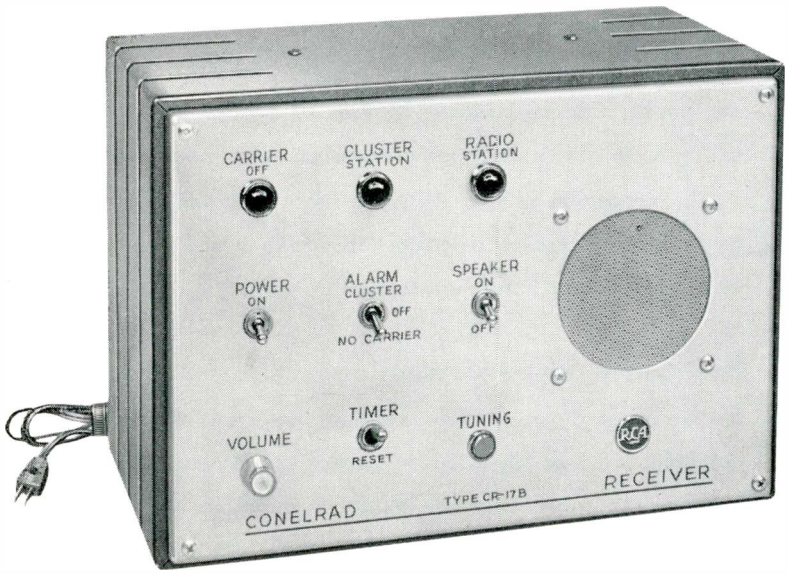
BTR-11B Remote Control System (10 functions) consisting of:	
1 Studio Control Unit	MI-27537
1 Transmitter Control Unit	MI-27538-A
BTR-20A Remote Control System (19 functions) consisting of:	
1 Studio Control Unit	MI-27539
1 Transmitter Control Unit	MI-27526

Accessory and Optional Equipment

2-Meter Panels (AM Monitoring)	MI-27527
A-C Voltage Pickup	MI-27516
Tower Lighting Unit	MI-27519
Latching Relay Panel (including two relays)	MI-27509-A
Remote R-F Pickup	MI-28027-A
Meter Communicator	MI-27541
Tower Light Monitoring Unit	MI-27544
Weatherproof Enclosure for MI-27544	MI-27543
Combining Latching Relay	MI-27524-1
DPDT High Power RF Contactor	MI-27755-4
DPDT Lower Power RF Contactor	MI-27545
4PDT Low Power Latching Relay	MI-27524-3
Remote RF Pickup Unit (Base Currents up to 10 KW)	MI-27966
Motor Operated J Frame Breakers	MI-27542
Remote Control Accessory Kit for BTA-50G	MI-27687
Remote Control Accessory Kit for BTA-250M	MI-27522
Remote Control Accessory Kit for BTA-500MX/1MX	MI-27523
Remote Output Control for BTA-5/10H	MI-27517
Remote Filament Control for BTA-5/10H	MI-27518
Remote Power Cutback Kit for BTA-5/10H	MI-27520
Miscellaneous Resistors and Parts for BTA-5/10H	MI-27540

*CONELRAD RECEIVER

Desk Mount, Type CR-17B



FEATURES

- Meets FCC requirements
- Designed for continuous operation
- Two tuning sections—tunable to broadcast band and preset to Conelrad frequency
- Silent or audible monitoring
- Automatic visual indication on loss of carrier or presence of Conelrad carrier—provisions for external alarm
- Automatic switching between broadcast station and Conelrad channel
- Fail safe indication
- Built-in ferrite rod antenna
- Provision for connecting external antenna and ground in weak signal areas

* CONtrol of ELectromagnetic RADiation.

APPLICATIONS

The Federal Communications Commission requires every station in the Amateur, Standard Broadcasting, Public Safety, Special Industrial, and Land Transportation Radio Services to observe all Conelrad radio alerts. Notification of a Conelrad radio alert may be assured by continuously monitoring a broadcast station which will proceed as follows in the event of an alert:

1. Cut the carrier for approximately 5 seconds.
2. Return carrier to the air for approximately 5 seconds.
3. Cut the carrier for approximately 5 seconds.
4. Return carrier to the air.
5. Broadcast approximately 1000 cycle tone for 15 seconds.
6. Make announcement of Conelrad radio alert.
7. Repeat announcement of alert.
8. Remove carrier from air.

Broadcasting of essential information and instructions during the alert will then be made on either 640 or 1240 kc depending upon the facilities available in your area. At the conclusion of the alert, normal operation will be resumed by the station to which the receiver was tuned before the alert.

For emergency weather and flood warnings, the broadcast station will proceed with steps 1 thru 5 and then transmit the emergency weather report.

DESCRIPTION

The RCA Conelrad Receiver is designed to provide continuous monitoring of a selected AM broadcast station for reception of Conelrad radio alerts or emergency weather warnings. A tuning knob is provided at the rear of the cabinet for presetting the receiver to Conelrad frequency 640 or 1240 kc, whichever is available in your area. A green pilot light indicates that the receiver is on, and

DESCRIPTION (Continued)

that the carrier of the selected broadcast station is being received. A toggle switch provides either audible monitoring, or silent monitoring to eliminate nuisance noise in your radio room. Absence of a carrier or receiver failure is indicated by a red pilot light.

In the absence of a carrier, the RCA Conelrad Receiver automatically switches between the broadcast channel and the Conelrad channel until a carrier is received. During this process the red light (indicating the absence of a carrier) will remain on. When a signal is received, the receiver locks on that channel, the red light is extinguished, and an orange or green pilot light will indicate which carrier is being received (broadcast channel or Conelrad channel).

Conelrad Radio Alert

In the event of an alert, the receiver automatically (1) lights red indicator on front panel, (2) turns on the speaker to receive the Conelrad alert message, and (3) switches automatically to the pre-set conelrad frequency and lights orange indicator. A three-position switch on the front panel permits the pre-setting of an external alarm circuit (to which a buzzer, bell, light or other means of indication may be connected) so that (1) the absence of a carrier will actuate the alarm, or (2) the presence of the pre-set Conelrad Cluster Carrier of 640 or 1240 kc will actuate the alarm, or (3) the alarm will remain off. At the conclusion of the alert, the receiver automatically returns to the regular broadcast station to which the receiver was tuned before the alert.

Emergency Weather Warning

In the event of a weather warning, the receiver automatically turns on the speaker to receive the emergency weather report. A switch on the front panel permits the pre-setting of an external alarm circuit (to which buzzer, bell, light or other means of indication may be connected) so that the absence of a carrier or the alerting procedure followed by the broadcast station prior to the transmission of the emergency weather warning will actuate the alarm. At the conclusion of the weather report, the broadcast station will return to its normal programming and the receiver may be re-set for silent monitoring.

SPECIFICATIONS

Frequency Range	550-1600 kc
Supply Voltage	115 volts, 50/60 cycles
Power Consumption	35 watts
Temperature Rating	—22° to +122° F. (—30° to +50° C.)
Dimensions	Height 9½", Width 13½", Depth 6"
Weight:	
Net	15 lbs.
Shipping	24 lbs.
Finish	Umber gray Hammeroid enamel over zinc chromate primer with brushed aluminum front panel
Type of Circuit	Superheterodyne
Sensitivity	25 microvolts at 640 kc 15 microvolts at 1240 kc
Selectivity	40 db down at ±16 kc
Spurious Response	Image more than —44 db at 1600 kc
Audio Output	1.0 watt
Duty Cycle	Continuous
Tube Complement:	(1) 12BE6, (1) 12BA6, (1) 12AV6, (1) 35C5, (1) 12AT7, (1) 35W4

Ordering Information

Equipment includes receiver, a-c power supply, loudspeaker, built-in ferrite rod antenna, and one set of tubes housed in an attractive desk cabinet containing a control panel and 6-foot a-c cord with plug. Receiver shipped complete and ready for operation. Simply plug into any 115 volt, 50/60 cycle power outlet.

Type CR-17B Conelrad Receiver MI-31874-A

· 115

450 MC REMOTE PICKUP EQUIPMENT

Type CSU-15CH Station Transmitter-Receiver.

FEATURES

- **Choice of one-way or two-way remote pick-up equipment for broadcast applications**
- **Permits continuous operation at low maintenance costs**
- **Improved frequency response**
- **Remote control functions available**
- **Available with AC or DC Power Supplies**
- **Line of sight range up to 30 miles**

USES

RCA's Remote Pickup Equipment provides an economical means of transmitting program material from a distant location to the broadcast studio. Serving as a radio link, the system permits reporting special events, sports contests, on-the-spot accidents and other newsworthy happenings; relays entertainment from remote locations, and can transmit other events of local interest.

The remote transmission equipment allows utmost programming flexibility since it requires no special installation or time consuming and costly telephone line charges. Wherever the Mobile Transmitter is located, it can be broadcasting in a matter of seconds standing still or moving. It may, therefore, be considered as a temporary remote studio when housed in a sports arena, auditorium, or other semi-permanent site, a mobile studio when set up in auto or truck, or merely as a one-shot remote broadcast transmitter for reporting special events.

Remote Pickup Equipment can be used for such other services as dual frequency operation, cuing, and to provide order service to exsiting microwave or remote pickup systems. Equipment is available for use in any of the remote pickup channels now authorized by the FCC. The 405-470 mc band has become the most popular for this application since there is less interference from man-made noise, the equipment, especially the antenna, is smaller physically, so higher gain antennas can be conveniently used.

DESCRIPTION

RCA VHF and UHF Equipment for Remote Pickup Applications in the 450-470 mc band consist primarily of a Type CSU-15CH, 15-watt, 115 volt a-c operated station transmitter receiver combination housed in a desk type cabinet; and the Type CMU-15B 15-watt Mobile Unit for 6 or 12 volt d-c operation mounted in a drawer type case. Other items include suitable power supplies, antennas, transmission lines, and test equipment. A number of

Type CMU-15B Mobile Transmitter-Receiver.

custom equipment packages can be made up by combining these various items. The most popular arrangements are:

1. A two-way remote pickup equipment package containing two Type CSU-15CH station units, modified for continuous operation.
2. A two-way remote pickup equipment package containing one Type CMU-15B Mobile Unit and one modified Station Unit, Type CSU-15CH. The station unit can be operated continuously, while the Mobile Unit has the normal 20 percent duty cycle.
3. A one-way remote pickup equipment package containing one modified CSU-15CH Station Unit located at the remote point.

The CSU-15CH Station Unit includes separate rf transmitter, receiver and power supply housed in an attractive dynamically styled cabinet which requires comparatively little space on a desk or table. Maintenance is facilitated by "all top tuning." Built-in metering sockets and tuning adjustments are available by merely lifting the cabinet lid. The transceiver is supplied with a transistorized microphone, built-in speaker, tubes and one set of crystals.

The CMU-15B Mobile FM Radio includes a transmitter, receiver and power supply with one set of tubes and crystals mounted in a sturdy, compact, drawer type case which provides easy access for maintenance. It is supplied with microphone, speaker, antenna, control head and connecting cables.

Other available systems items include the MI-31228 Fan Kit for use with the Station Unit if continuous duty operation is desired. The MI-31399-1 Omnidirectional Station Antenna for 450-470 mc operatoin provides a gain of 7 db. It is provided with mounting clamps, flange type transmission line fittings for ⅞-inch copper and an MI-31654-13 Adapter required for use with RG-80/17U line. A 1000-watt Onan Power Plant, Type AJIR or a Turland Combinator a-c d-c generator is available as a 115 volt a-c supply for use with the CSU-15CH when used in mobile applications.

A useful directional antenna is the MI-3606-1 Andrew Corner Reflector providing a gain of 8 db. It includes mounting clamps and flange type transmission line fitting for ⅞-inch copper. The Type 116 Andrew Yagi Directional Antenna with a gain of 10 db is suggested for portable use where a directional antenna is required. It has threaded socket for ¾-inch IPS Pipe and Type "N" Receptacle for use with RG-8U Cable. Type G-4 Transmission Line packages consisting of ⅞-inch soft drawn UHF Coax with fittings are available in line lengths of 100 feet, 125 feet or 150 feet, or other specified lengths, for use with Mark Products or Andrew Type 3603-1 Antenna and Type CSU-15 Series Transmitters. RG-8U Cable and Male Connector MI-31654-14 for use at the Transmitter end and Male Connector MI-31654-7 for use at the Antenna end comprise other installation accessories.

The Type CX-8A1 Frequency and Modulation Monitor provides facilities for checking the radiated carrier frequency and modulation devitaion of the mobile and station radio transmitter for compliance with FCC rules. The CX-8A1 can also be used as a field strength meter and as a precise signal source for the accurate aligning of radio receivers. The equipment employs internal batteries making it especially adaptable for field use.

The RCA Type CX-7B Portable Test Meter is recommended for adjustment of both mobile and station equipment having either built-in metering sockets or point-to-point checking facilities. In addition to measuring d-c voltages and currents, the meter may be used for measuring audio output or noise quieting of a receiver, as well as the relative radiated power of a transmitter. The Meter is supplied complete with "sniffer" antenna and voltage, current and audio cables.

SPECIFICATIONS

Available Equipment

450-470 mc, 15-watt, a-c operated Transmitter-Receiver in desk type cabinet. (Supplied with transistorized microphone, built-in speaker, tubes and crystals) ..... Type CSU-15C(H)

Same as above with dual frequency transmitter and receiver ..... Type CSU-15C(H)-DTR

Same as above with Remote Control. (Includes a line terminating panel, test handset with hang-up cup and remote control unit) ..... Type CSU-15CR(H)

450-470 mc, 15-watt Mobile Transmitter-Receiver for 6 or 12 volt operation. (Supplied with Power Supply, tubes and crystals in drawer-type case. Supplied with microphone, speaker, antenna, control head and connecting cables) ..... Type CMU-15B

Same as above with dual frequency transmitter and receiver ..... Type CMU-15B-DTR

D 135

ANTENNA PHASING EQUIPMENT

FEATURES

- **Individual "custom" design provides optimum operation for day and night patterns**
- **Circuits designed for maximum stability and operating flexibility**
- **Front-panel-controlled variable components provide adjustment under power**
- **Coordination of both phasing and transmitter design assures matched performance**

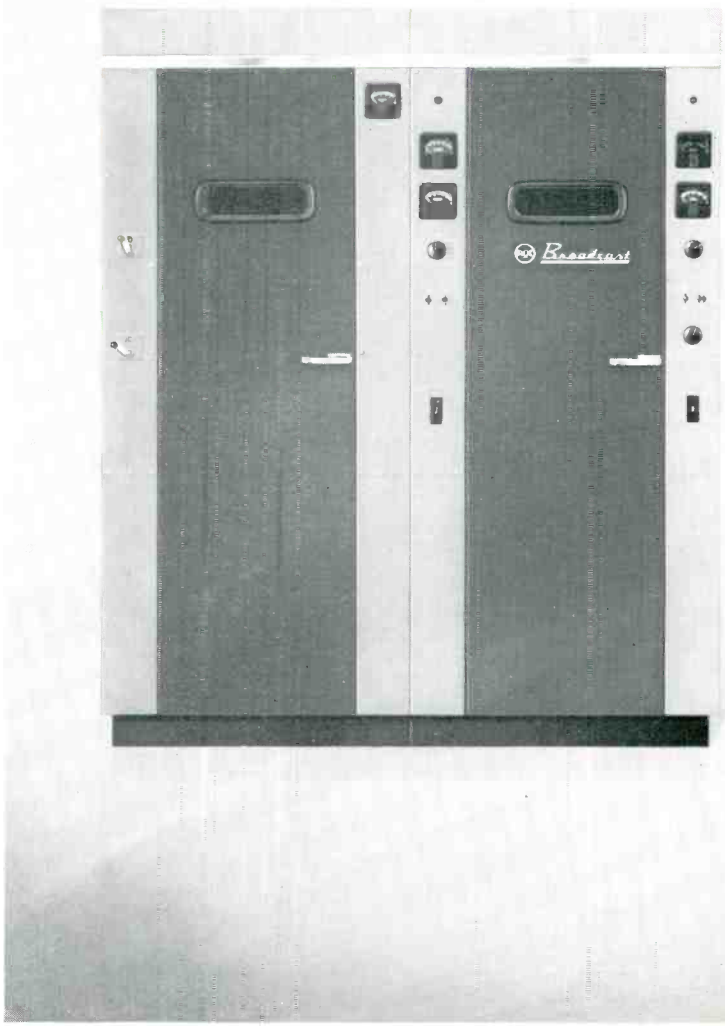
DESCRIPTION

RCA Phasing and Branching Equipment is custom-built to provide precise coverage patterns to fully meet the requirements of both the Broadcaster and the FCC. This "custom" equipment is designed for use with its companion antenna array to assure "tailored" patterns for optimum day and night coverage, and is available in a wide selection of cabinets. From the initial plan to the finished product, RCA bases its design on requirements of the station engineer and his consultant. RCA has had over twenty years of experience with Phasing Equipment and has completed hundreds of custom installations.

Front panel controlled rotary coils, one for each tower, provide independent current amplitude control for each antenna, affording maximum flexibility. Lagging "T" networks are provided to properly phase the currents to the various antenna transmission lines. The two series legs of each phasing network consist of two ganged rotary coils with a single front-panel control. Networks provide independent phase adjustment for each antenna current over a wide range with precise impedance matching. When antenna currents do not require phase delay, RCA employs economical series resonant circuits with rotary coils to provide the proper phase adjustment.

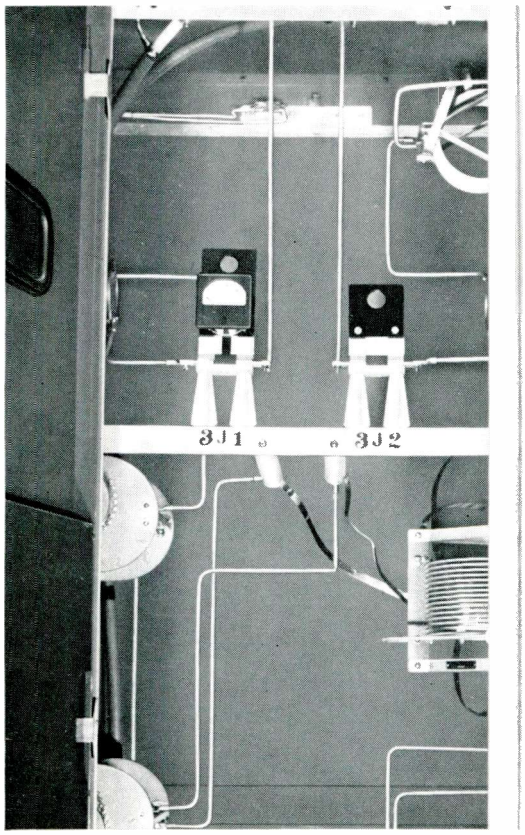
Line Terminating Units are necessary to obtain exact impedance matching between transmission lines and antennas. RCA installations incorporate circuit components with generous values, resulting in exceptional flexibility which permits "on-the-spot" adjustments over a 2-to-1 impedance range.

Reliable switching facilities are indispensable for changing from day to night patterns, or from nondirectional to directional patterns. Pattern switching is accomplished by use of remotely controlled, positive-latching relays. This arrangement provides the switching of completely separate "day-and-night" power dividing and phasing networks, and changes the values of the network arms of the Line Terminating Units. Pattern-switching relays have pilot contacts which can be used to monitor the relay operation by means of indicator lights. The pilot contacts can also be connected in the transmitter interlock and control circuits to provide a single control of pattern change.



BTA-1R Transmitter with matching left-wing phasing cabinet

1-KW, 5-KW AND 10-KW PHASING AND BRANCHING EQUIPMENT



1-KW Phasing Cabinet showing simplicity of design and layout. Custom equipment provides maximum stability for dependable AM operation.

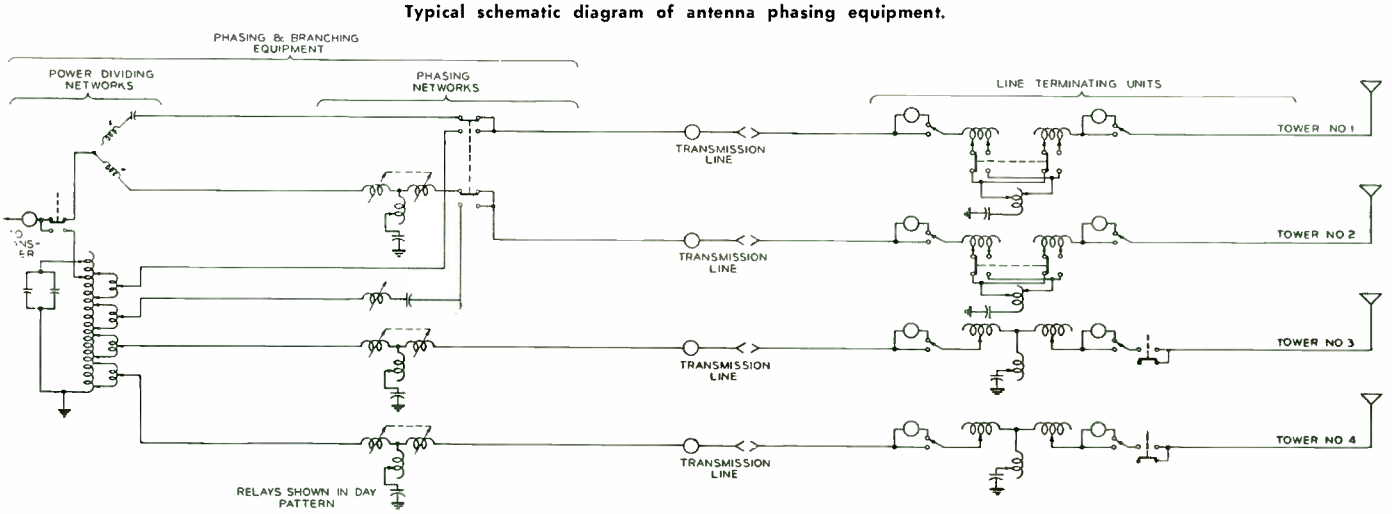
Equipment is available in a wide variety of arrangements. These custom equipments may be housed in one or more of the new RCA stylized cabinets made of aluminized steel which provide improved magnetic and electrostatic shielding. The cabinets consist of end panels with front edges formed to provide control panels, mounted on a sturdy welded steel base. Rear access to each cabinet is provided by two interlocked removable panels.

The doors of the cabinets are pleasingly styled and finished in tones of burgundy red, peacock blue, emerald green, or dark umber gray to match the color scheme of any broadcast station. The cabinet provides a matched wing for housing the phasing equipment when used with the RCA BTA-250M, 500R, 1R or 5R Transmitters. For complex antenna arrays, "side-by-side" matching cabinets are used to provide the additional mounting space required for properly housing the additional phasing and branching components.

In order to estimate floor space required for installation, the following cabinet requirement chart will prove helpful. Each cabinet measures 84-inches high, 34-inches wide, and 33-inches deep.

	Power	*Two Tower*	*Three Tower*	*Four Tower*
Directional Night	1-KW	(1)	(1)	(1 or 2)
and Non-Directional	5-KW	(1)	(1)	(2)
Day	10-KW	(1)	(1 or 2)	(2)
One Pattern	1-KW	(1)	(1)	(2)
Directional Day	5-KW	(1)	(1 or 2)	(2)
and Night	10-KW	(1)	(1 or 2)	(2)
Two Pattern	1-KW	(1 or 2)	(2)	(2 or 3)
Directional	5-KW	(1 or 2)	(2)	(3)
Day and Night	10-KW	(2)	(2)	(3)

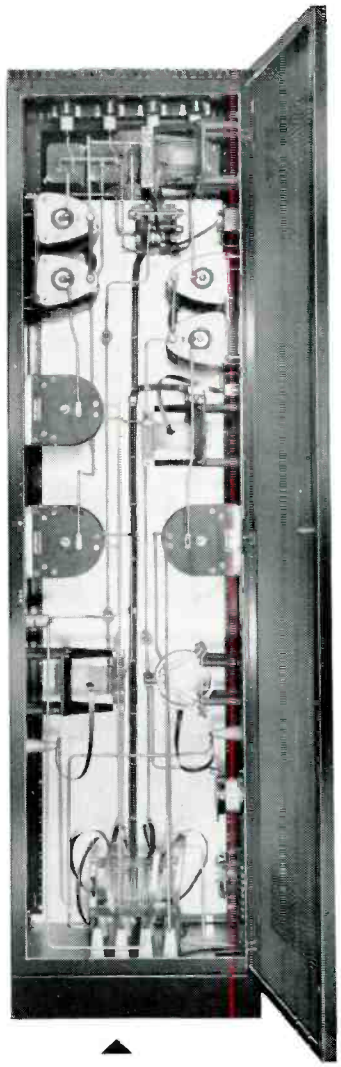
Typical schematic diagram of antenna phasing equipment.



ALTERNATE 1-KW, 5-KW AND 10-KW ANTENNA PHASING AND BRANCHING EQUIPMENT

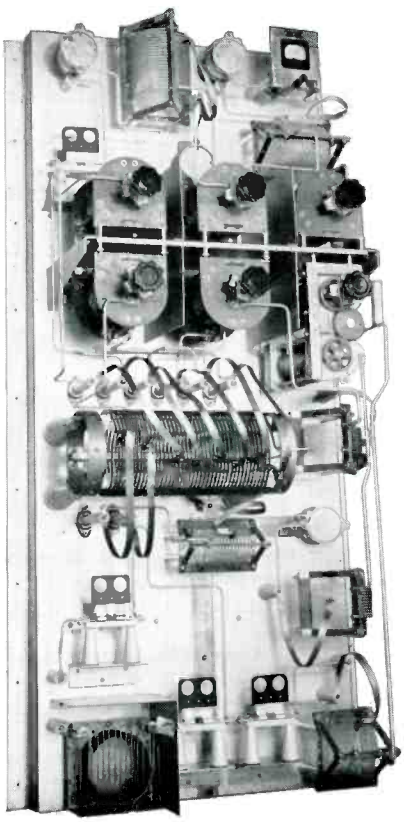
Attractively styled BR-84 Rack Cabinet for housing 1-KW, 5-KW and 10-KW Phasing Equipment.

RCA Phasing and Branching Equipment for 1-KW, 5-KW and 10-KW installations may be economically housed in the standard BR-84 Rack Cabinet (at left and at right). This type of cabinet is suitable for simple antenna phasing systems where cabinet matching may not be a requisite and where cabinets are located separately from the transmitter. Finished in two-tone umber gray with stainless steel door handles and trim, styling blends with companion equipment. Welded and bolted steel construction provides a sturdy cabinet of one standard height and width. Height is 84", width is 28" (with side panels). Depth including doors and handles is 24¼". A glass window is provided at the top of the cabinet for maximum visibility of the common point and transmission line meters. Ample cabinet space permits a "roomy" mechanical layout for all components. For more complex phasing equipment, individual cabinets can be bolted together on a common base, thus providing additional component-mounting space.



The BR-84 Rack provides easy access to components and is completely ventilated at top.

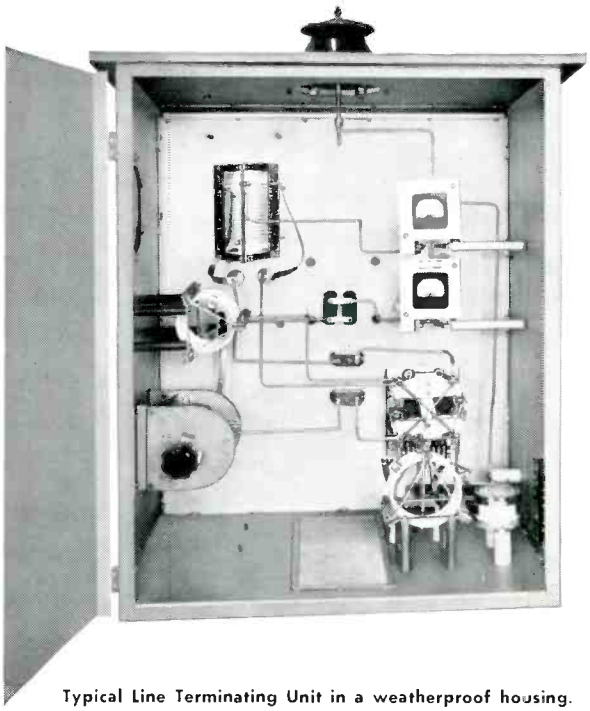
Wall-mounted, Open-type Phasing Panels are also available for use in certain transmitter room installations where it is not possible or convenient to employ the "cabinet-type" equipment. In these cases, the wall-mounted design provides an economical arrangement which has the inherent advantages of flexibility and maximum accessibility.



Wall-mounted, open-type phasing panel.

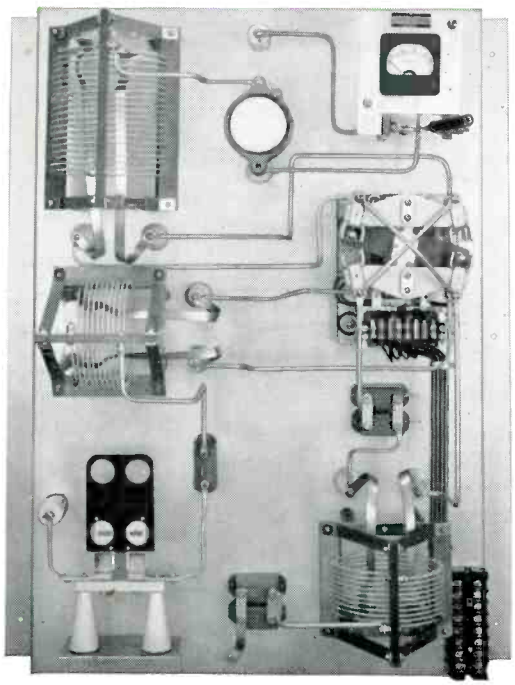
1-KW, 5-KW AND 10-KW LINE TERMINATING UNITS

1 to 10-KW Line Terminating Units are provided to properly terminate transmission lines leading to the various towers of the antenna array. They are available in either metal weather-proof cabinets, or on open-type, wall-mounted panels. The weather-proof housing mounts upon a wooden platform or a steel angle support. Components of generous values are incorporated in a flexible design, permitting proper impedance transformation over a wide range of antenna impedances. R-F pattern switching relays are provided with pilot contacts to permit remote indication of their operation or to be connected in special, fail-safe, interlock circuits. Pattern switching is completely coordinated with the transmitter control circuit for a centralized switching operation. Transmission line meters and antenna-current meters are provided with individual "make-before-break" switches that provide isolation of meters not being observed. Plug-in meter units, which permit complete removal of the meters, can also be provided. Equipment is shipped assembled for simple installation.



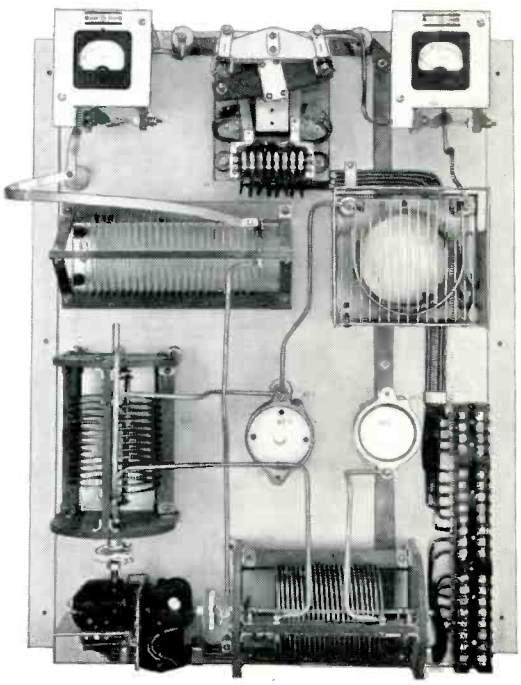
Typical Line Terminating Unit in a weatherproof housing.

1-KW, 5-KW AND 10-KW OPEN-TYPE WALL-MOUNTED LINE TERMINATING UNIT PANELS



Typical open panel, wall-mounted Line Terminating Unit.

RCA Open-type, Wall-mounted Panels are ideal for mounting upon the wall of a tuning house at the antenna tower base and provide maximum accessibility for easy maintenance of Line Terminating Equipment. For complex arrays, either hand-driven or remotely-controlled, motor-driven rotary coils can be provided in Line Terminating Units for further convenience in equipment tune-up. Remote metering kits can also be included for convenient remote indication of the antenna current.

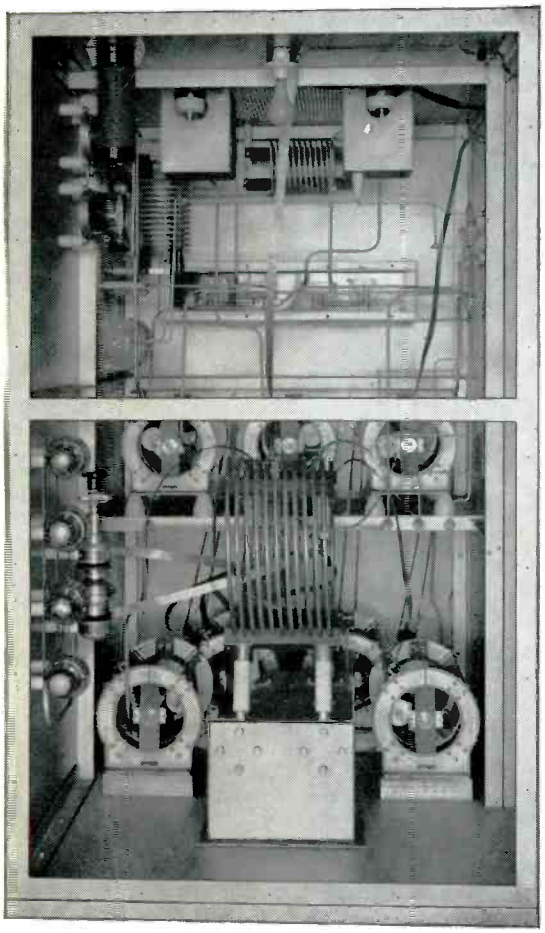


Open panel Line Terminating Unit utilizing remotely-controlled, motor-driven tuning.

50-KW PHASING AND BRANCHING EQUIPMENT

50-KW Phasing and Branching Equipment mounted in an MI-7485-J Cabinet which matches RCA Transmitters.

Rear View of a typical 50-KW Phasing and Branching installation showing a section of the above cabinet. Note that all components are completely accessible and provided with rugged mountings.

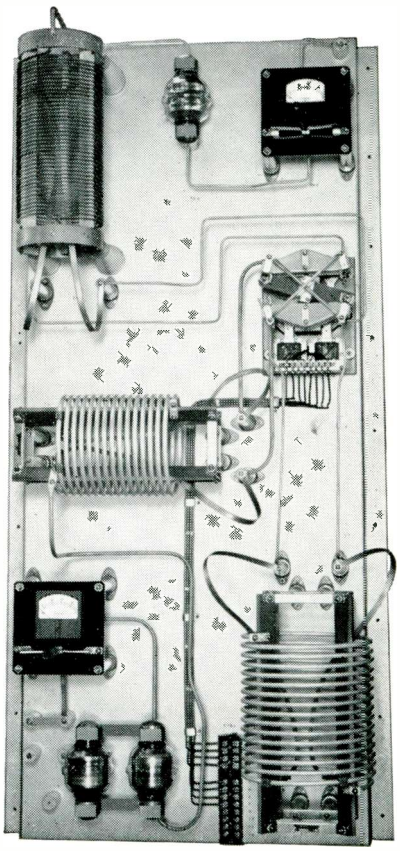


The cabinet shown above is the type used to house 50-KW phasing and branching equipment. This cabinet may be used to form a "styled-to-match" left-wing extension for RCA 50-KW series Transmitters. An interlocked door on the "left-end" side of the cabinet provides protection for operating personnel. Expanded scale, four-inch R-F ammeters are mounted on a sub-panel for easy reading through a glass observation window.

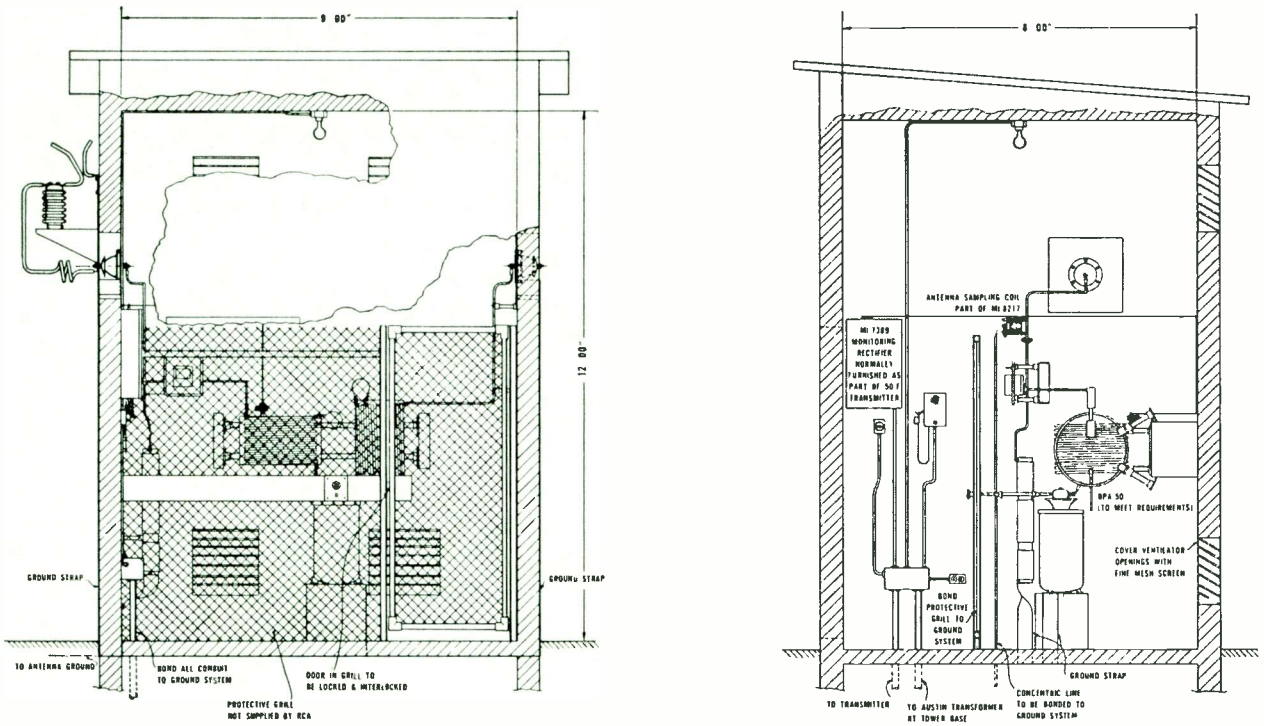
Phasing adjustments are made from the front panel by use of crank handles. Cranks are removable to prevent accidental de-tuning. A counter, calibrated to 1/10 turn, indicates the correct setting of each control. Motor tuning may be controlled from a push button on the front panel or at the supervisory control console. Rotary coils, used in the phase shift networks, are so arranged that one control operates both coils in each network. Coils are provided which permit a wide range of phase shift without impedance variation. Rotary coils are also provided in the power dividing network for independent control of the current amplitude in each tower. Vacuum, gas-filled, and Faradon Mica capacitors are used throughout. Where desired, variable capacitors, either gas or vacuum are used for maximum life and efficiency.

50-KW LINE TERMINATING UNITS

50-KW Line Terminating Units are supplied completely assembled on open wall-mounted panels, or as a complete kit of components for assembly by the radio station. The open-panel, Line Terminating Units are particularly suitable for any towers which have operating power of 25 KW or less. Components include feed-through, bowl insulators, 6" R-F ammeters, meter panels, coils, capacitors and day-night pattern switching relays. Transmission line meters and antenna current meters are provided with individual "make-before-break" switches that provide isolation of meters not being observed. Pattern switching relays are provided with pilot contacts to permit coordination with the transmitter control circuits. Gas filled, vacuum, or Faradon mica capacitors are utilized. For greater ease in adjustment of critical circuits, variable components can be provided. The remote-control of motor driven variable components is another RCA custom feature that is available.



50-KW Open Panel Wall-mounted Line Terminating Unit.



Typical arrangement of components in a 50-KW Line Terminating Unit.

HOW TO ORDER

The accurate preparation of a quotation for antenna phasing equipment and the custom design of such equipment requires that either the station or its engineering consultant supply the following data:

(a) Operating power, frequency and number of elements in proposed array.

(b) Description, spacing and self-impedance of proposed tower.

(c) Amplitude and phase of current required in each tower.

(d) Length and characteristic impedance of transmission lines from branching unit to each tower.

(e) Information on pattern switching requirements (non-directional day-time operation or different pattern night and day).

(f) Type of cabinet desired (5/10 KW equipment).

(g) Type antenna current sampling system desired.

TYPICAL SPECIFICATIONS

1. CARRIER FREQUENCY

(a) Present 1000 KC

(b) Proposed 1000 KC

2. TRANSMITTER EQUIPMENT

(a) Type Transmitter BTA-10H Mfr. RCA

(b) Operating Power: Day 10,000 watts Night 5,000 watts

3. TRANSMISSION LINES IMPEDANCE: 230 ohms

4. GROUND SYSTEM:

(Include full description for each radiator)

(a) Number of radials 120

(b) Average length 0.4

5. ANTENNA DATA:

	(South West) No. 1 Tower	(South Center) No. 2 Tower	(North Center) No. 3 Tower	(North East) No. 4 Tower	No. 5 Tower	No. 6 Tower
(a) Resistance	34	37	35	32	—	—
(b) Reactance (Indicate + or —)	+20	+17	+21	+17	—	—

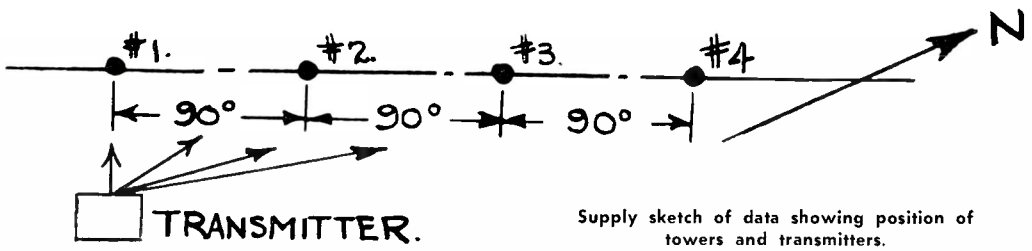
(Above are self impedances; if operating impedances are available, append them as a part of this specification.)

(c) Type radiator Blaw Knox—Uniform Cross-Section—Single Guy Level (Guyed or self-supporting).

(d) Height	250′	250′	250′	250′	—	—
(e) Base spread (if self-supporting)	—	—	—	—	—	—
(f) Relative Field Day	1	—	—	—	—	—
Night	1.0	1.7	1.7	1.0	—	—
(g) Phase angle Day	0°	—	—	—	—	—
Night	0°	+76°	+142°	−163°	—	—
(h) Power division	386W	1890W	2460W	264W	—	—
(i) Lengths of transmission lines from phasing cabinet to	95°	130°	197°	255°	—	—

(j) Plot plan of array showing distances and angles between towers: (Use last page if additional space is required)

TYPICAL SPECIFICATIONS (Continued)



Supply sketch of data showing position of towers and transmitters.

6. PHASING EQUIPMENT:

(a) Location with respect to transmitter—
Indoor X Outdoor ——

(b) Distance from transmitter Adjacent

(c) Type Mounting desired:
1. Standard Rack ——
2. Transmitter Wing (5/10 KW Transmitter only) X
3. Unstyled outdoor or wall-mounted housing ——

(d) Are rotary inductors required:
1. In line terminating units? Yes —— No X
Remotely-controlled motor-driven? Yes —— No ——
2. In power distribution equipment? Yes X No ——
Remotely-controlled motor-driven? Yes —— No X

7. METERING DESIRED:

(a) Current (RF) phase indicator, Clarke Model 108 Yes X No ——

(b) Phase monitor pick-up units. Base Coils X Tower Loops ——
If tower loops, are base insulator isolating coils required? Yes —— No ——

(c) Remote indicating antenna ammeters. Yes X No ——

(d) Line current ammeters at terminating equipment. Yes X No ——

(e) Line current ammeters at distribution point. Yes X No ——

8. TOWER LIGHTING SYSTEM:

(a) Will RCA furnish the tower lighting feed system? Yes X No ——

(b) Type of feed. RF Choke Coils —— Toroidal Transformers X

9. TOWER TUNING HOUSES:

(a) Are tuning houses to be constructed at each tower? Yes X No ——

10. SUPPLY ANY PATTERN DATA AVAILABLE: Engineering report attached.

11. SPECIAL REQUIREMENTS, PREFERENCES (capacitors, relays, etc.) AND REMARKS:

NOTE: RCA's quotation and custom equipment design will be based upon the data contained herein. Accuracy and completeness are essential for a properly executed proposal and satisfactory equipment design.

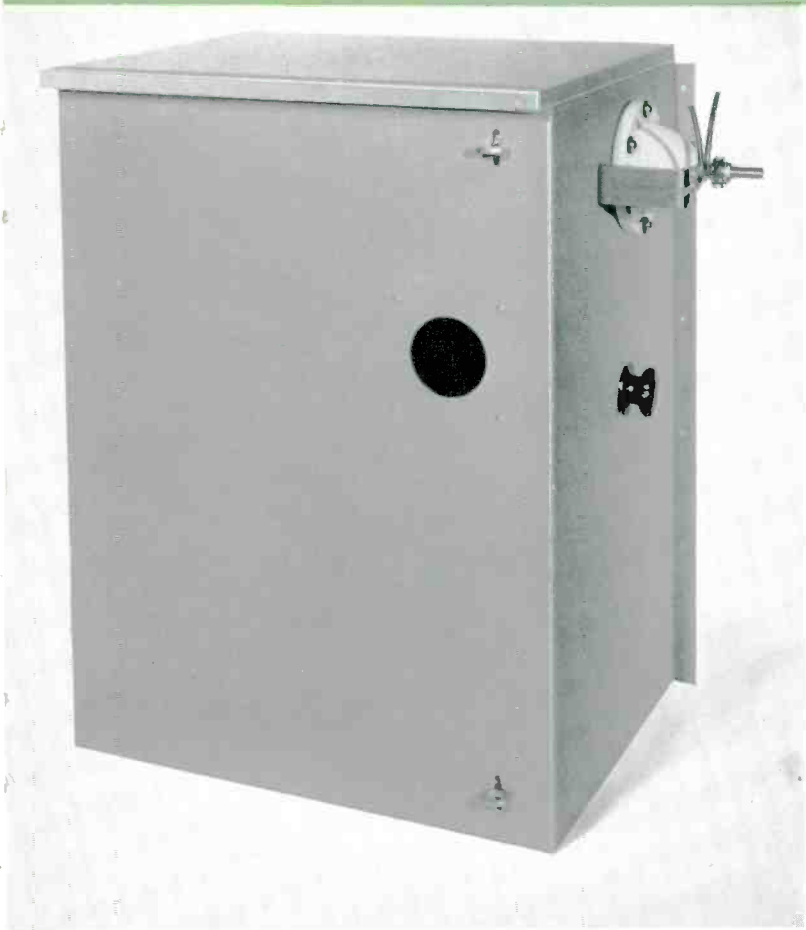
Date: Dec. 1, 195-

John Doe
(Signed)

Chief Engineer
(Title)

ANTENNA TUNING UNITS

TYPES BPA-21A/B/C/D (1 kw)
BPA-5 & 10A/B (5-10 kw)
BPA-50 (50 kw)



FEATURES

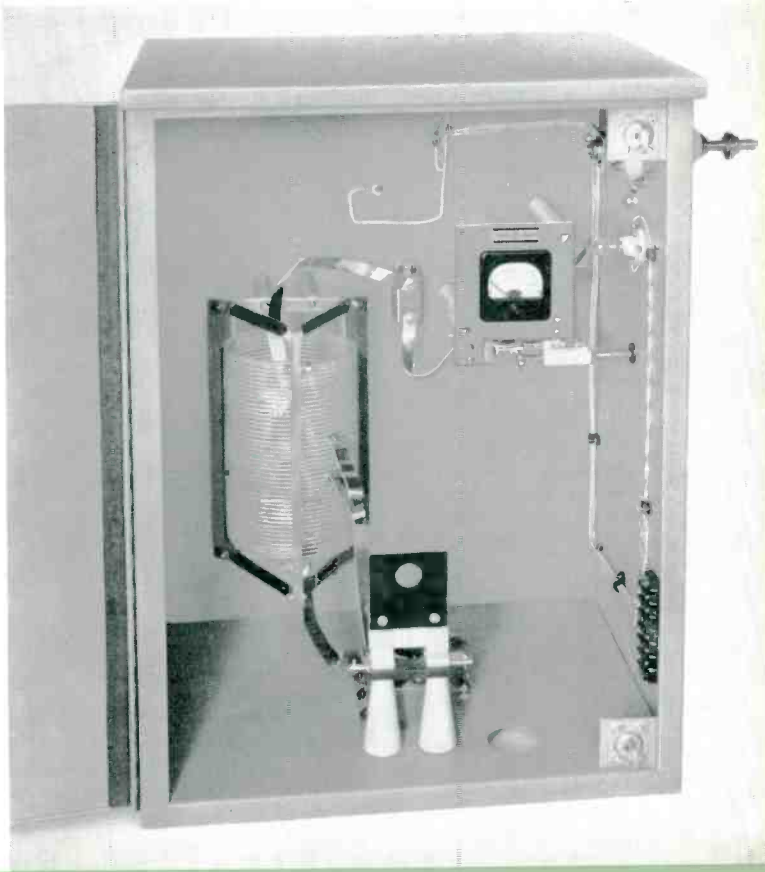
- Conservatively rated design for all carrier powers through fifty kilowatt
- Make-before-break switches avoid damage to antenna ammeter from static discharges
- Reliable operation
- Custombuilt arrangements available for any requirement
- Optional remote metering provisions

USES

The RCA Type BPA Series of Antenna Tuning Units serve to match broadcast antennas to either concentric or open wire transmission lines and also aids in suppressing carrier harmonics. The units are custom built to meet customer requirements and are regularly supplied with power handling capacities of 1-kw, 5-10 kw, and 50 kw as the Types BPA-21, BPA-5/10A, and BPA-50.

When ordering specify: (1) Transmitter carrier power. (2) Transmitter frequency. (3) Antenna resistance and reactance or type and height. (4) Transmission line impedance.

In addition, Antenna Couplers for 1250-watt series fed or shunt fed tower antenna installations are available. Tower height and frequency should be specified when ordering the RCA couplers.



Basic 1 KW Antenna Tunning Unit, MI-27767-A.

1 KW ANTENNA TUNING UNIT, TYPE BPA-21

DESCRIPTION

Four models of the 1 KW Antenna Tuning Unit are available: The MI-27767-A Basic Antenna Tuning Unit with no remote metering or lighting choke included; the MI-27767-B unit which adds to the "A" equipment, an MI-28027-A Remote Metering Pickup and Meter for remote metering of antenna current; an MI-27767-C unit which adds to the "B" equipment a two wire lighting choke with two filter capacitors; and the MI-27767-D unit adds to the "B" equipment, a three-wire lighting choke with four filter capacitors. All four models include an r-f antenna ammeter.

The RCA 1 KW Antenna Tuning Unit consists essentially of line terminating and antenna-tuning elements housed in a weatherproof metal cabinet. Access to the interior and component parts of the tuning unit may be gained through the front door which is provided with two hasp locks. An opening is provided in the bottom of the housing for entrance of a coaxial transmission line, but the unit may also be used with an open wire type of line by addition of a bowl insulator. Electrically, the unit consists of a low-pass impedance-matching filter using a "T" type network.

The basic tuning unit does not include a remote pick-up unit or lighting chokes and capacitors, but the housing is designed to accommodate a remote metering unit and one lighting choke and two associated capacitors for a two wire tower lighting circuit or an additional lighting choke and capacitors for three wire tower lighting circuit.

The antenna ammeter may be read through a circular window in the door. The meter switch is operated by means of a knob extending through the side of the housing. Rear mounting strips are provided to permit mounting the unit on two uprights. It may also be mounted on a platform or a steel angle cradle by means of side flanges at the bottom of the housing.

A 250/1000-watt Antenna Tuning Unit having an antenna meter but lacking a remote meter kit and remote meter is available for stations not utilizing open wire transmission line. The unit is contained in a lightweight housing measuring 20-inches high, 22⅛ inches wide and 19-inches deep. The unit weighs 55 pounds. The cabinet provides room for housing a remote meter kit, but not for lighting chokes. The electrical specifications are the same as for the BPA-21 series of Tuning Unit.

SPECIFICATIONS

Electrical Specifications

Frequency Range	*800 kc to 1600 kc
Transmitter Power (maximum)	1 kw
Antenna Resistance	20 to 250 ohms
Transmission Line Impedance	50 to 230 ohms
Antenna Reactance	+j200 to −j200 ohms

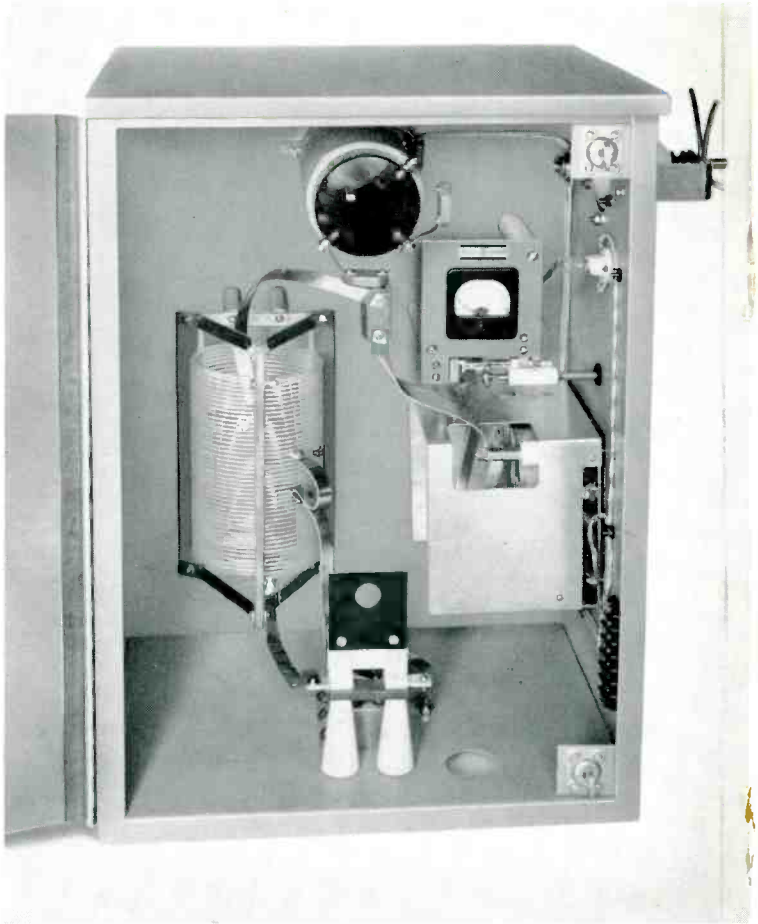
(Can be extended in the positive direction by the addition of series capacitance and in a negative direction if operated from a transmission line of lower impedance than the antenna resistance)

Mechanical Specifications

Height	28 1/16"
Width	22 1/8"
Depth	16 3/4"
Weight (net)	65 lbs.

* Low frequency limit may be extended to 540 kc on special order.

** Note: Select dash number to correspond with customer's antenna current requirements.



1 KW Antenna Tuning Unit MI-27767-D including remote metering unit and three-wire tower lighting circuit.

Equipment Supplied

1 KW Antenna Tuning Unit, Including	ES-27250
1 Type BPA-21A Antenna Tuning Unit	MI-27767-A
or	
1 Type BPA-21B Antenna Tuning Unit with remote metering	MI-27767-B
or	
1 Type BPA-21C Antenna Tuning Unit with remote metering and two-wire lighting choke	MI-27767-C
or	
1 Type BPA-21D Antenna Tuning Unit with remote metering and three-wire tower lighting choke	MI-27767-D
1 Ammeter	**MI-7147-B

Optional and Accessory Equipment

250/1000 watt Antenna Tuning Unit less Remote Meter Kit and Remote Meter	MI-27725
Antenna Coupler, 1250 watts, for series feed, non-weatherproof	MI-27785
Antenna Coupler, 1250 watts, for shunt feed, non-weatherproof	MI-27786
Horn Gap	MI-27771
Insulator Bowl	MI-27798
Remote Meter Pick-up Unit	MI-28027-A
Double Winding R-F Antenna Lighting Choke Coil with 2 Capacitors	MI-27241
Triple Winding R-F Antenna Lighting Choke Coil with 4 Capacitors	MI-27242
Ammeter	**MI-7147-B
Remote Indicating Ammeter for 3-inch Case	**MI-28037-B
Remote Indicating Ammeter for 4-inch Case	**MI-28037-B

(5-10 KW) Antenna Tuning Units, Types BPA-5A/10A

DESCRIPTION

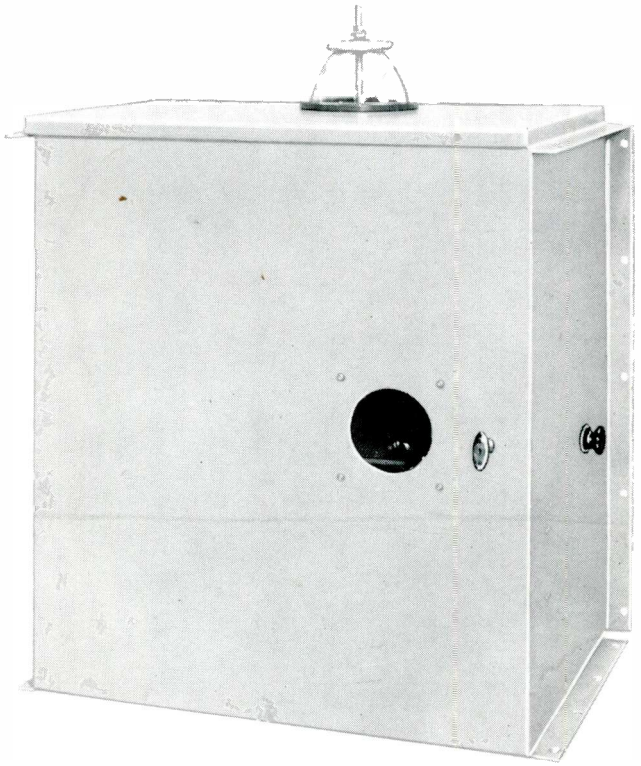
The BPA-5A (5 kilowatt) and BPA-10A (10 kilowatt) Antenna Tuning Units serve the double purpose of matching antennas of widely divergent characteristics to either concentric or open-wire transmission lines and of suppressing metal carrier harmonics.

All parts of this equipment are enclosed in a weatherproof metal housing equipped at the front with a door affording ready access to the interior. This door is provided with a lock. The unit is designed for mounting on a wooden platform or a steel angle cradle by means of side flanges at the bottom of the housing. Rear flanges are also provided to permit mounting the unit on two upright posts or on a wall. The antenna ammeter, which may be read through a circular window in the door, is protected from lightning surges by a SPDT switch operated by means of a knob extending through the side of the housing.

The circuit of the antenna tuning unit consists essentially of a single T-section low-pass filter which reduces the number of elements to a minimum. Two series inductors permit separate adjustments of the transmission line and antenna terminating impedances. The shunt capacitors are fixed at values determined by the station frequency. The tuning units are provided with a light which is useful for reading the antenna current meter at night and also serves as a heater to prevent accumulation of moisture in the unit.

An optional Remote Antenna Pickup Unit, MI-28027-A and a Remote indicating Ammeter with a range corresponding to the tower base ammeter can be added to the tuning units to provide a means of observing the antenna current at a remote location (transmitter house).

The antenna lead-in insulator is located on the top of the unit and provision is made for mounting an insulator, MI-27723, or MI-27722-1 on the side of the housing in case an open-wire line is used. A hole is provided in the bottom of the cabinet for bringing in a concentric line. Ample space is provided in the weatherproof cabinet for mounting R-F Antenna Lighting Choke Coils, if desired.



Type BPA-5/10A Antenna Tuning Unit.

SPECIFICATIONS

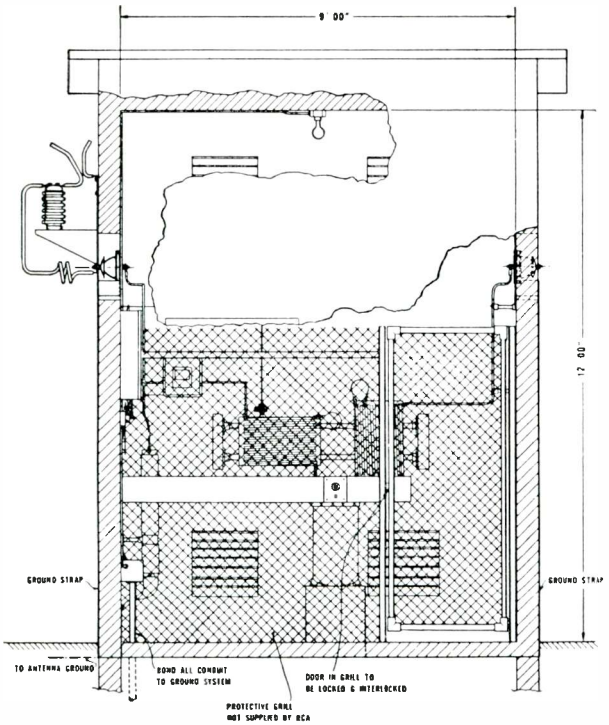
Frequency Range	540 kc to 1700 kc
Transmitting Power (Maximum):	
BPA-5A	5 kw
BPA-10A	10 kw
Antenna Resistance:	
BPA-5	10 to 1100 ohms
BPA-10A	20 to 1100 ohms
Transmission Line Impedance	50 to 350 ohms
Antenna Reactance	+j500 to −j500 ohms
(Can be extended in the positive direction by the addition of a series capacitor, and in a negative direction if operated from a line of lower impedance than the antenna resistance.)	
Finish	Durable gray
Overall Dimensions	41" high, 34" wide, 23" deep
Weight (net)	330 lbs.
Stock Identification:	
BPA-5A	MI-27789-A
BPA-10A	MI-27790-A

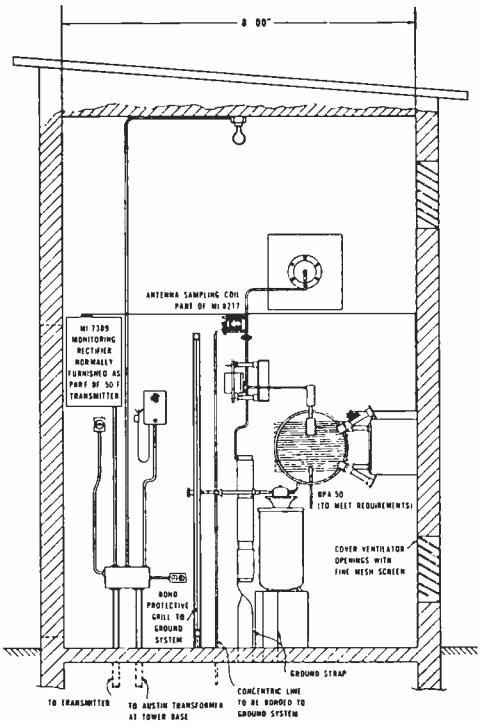
Accessory Equipment

Insulator Bowl, complete with fittings, 10¼" solid stud and shield	MI-27723
Insulator Bowl, complete with fittings, hollow stud and shield	MI-27724
Remote Meter Pick-up Unit	MI-28027-A
Remote Indicating Ammeter, 4-inch case, black scale	MI-28037
Remote Indicating Ammeter, 3-inch case, black scale	MI-28037-B
Double Winding R-F Antenna Lighting Choke Coil with 2 capacitors	MI-27241
Triple Winding R-F Antenna Lighting Choke Coil with 4 capacitors	MI-27242

#635—1525

50-KW Antenna Tuning Unit, Type BPA-50





DESCRIPTION

The Type BPA-50 Antenna Tuning Equipment is designed to be mounted in a tuner house at the base of the antenna tower. The tuning equipment does not include the tuner house, but all the necessary electrical components, brackets, wiring material and hardware are supplied. Complete blueprints, diagrams and instructions for assembly of the tuner are also included.

Electrically, the BPA-50 consists of a low-pass impedance-matching filter using a "T" type network. The large series arm coils are made of heavy silver-plated copper tubing, and are conservatively rated. The shunt leg capacitors are normally of the vacuum variety an antenna ammeter is protected from lightning surges by a double-throw switch which removes the meter from the circuit. The equipment may be specified for use with either 230 ohm line or for 70/51.5 ohm line.

SPECIFICATIONS

TUNER

Operating Limits:

Carrier Frequency	550-1700 kc
Transmitter Power (maximum)	50 kw
Input Impedance (unbalanced open wire or concentric line)	40 to 350 ohms
Antenna Resistance (approximately)	20 to 1100 ohms
Antenna Reactance	+j500 to −j500

(Can be extended in a positive direction by the addition of a series capacitor; and in a negative direction if operating from a line of lower impedance than the antenna resistance.)

Space Requirements	Approximately 70 sq. ft. floor area with 10 ft. ceilnig
Net Weight (approx.)	500 lbs.

Stock Identification:

Type BPA-50 Antenna Tuning Unit for 230 Ohm Line	MI-28903-A
Type BPA-50 Antenna Tuning Unit for 70/51.5 Ohm Line	MI-28903-B

Optional and Accessory Equipment

Extra Bowl Insulator, solid stud	MI-27723
Extra Bowl Insulator, hollow stud	MI-27724
SPDT RF Contactors (for use up to 17 kv at 2 mc at 25 amp.)	MI-27755-1
DPDT RF Contactors (for use up to 17 kv at 2 mc at 25 amp.)	MI-27755-2
SPDT RF Contactors (for use up to 22 kv at 2 mc at 25 amp.)	MI-27755-3
DPDT RF Contactors (for use up to 22 kv at 2 mc at 25 amp.)	MI-27755-4
3" Meter Panel and Switch for use with LTU Weatherproof Cabinet	MI-7486-B
3" Meter Panel and Switch for use with Open Panel LTU	MI-27760
3" Meter Panel and Switch for use with Open Panel LTU with DPDT Switch	MI-27761
Dial Counters for Variable Coil Inductors	MI-27762
Plug-in Meter Bracket Shorting Bar and Meter Plug	MI-27763

AM-FM TRANSMISSION LINE

COAXIAL TYPES

FEATURES

- Provides efficient transfer of power for every broadcast application
- Maximum stability provided by low loss dielectrics
- Minimum attenuation—maximum efficiency —low standing wave ratio
- Excellent power handling capability
- Designed for precise, accurate assembly
- Complete line of fittings and accessories for installation versatility

USES

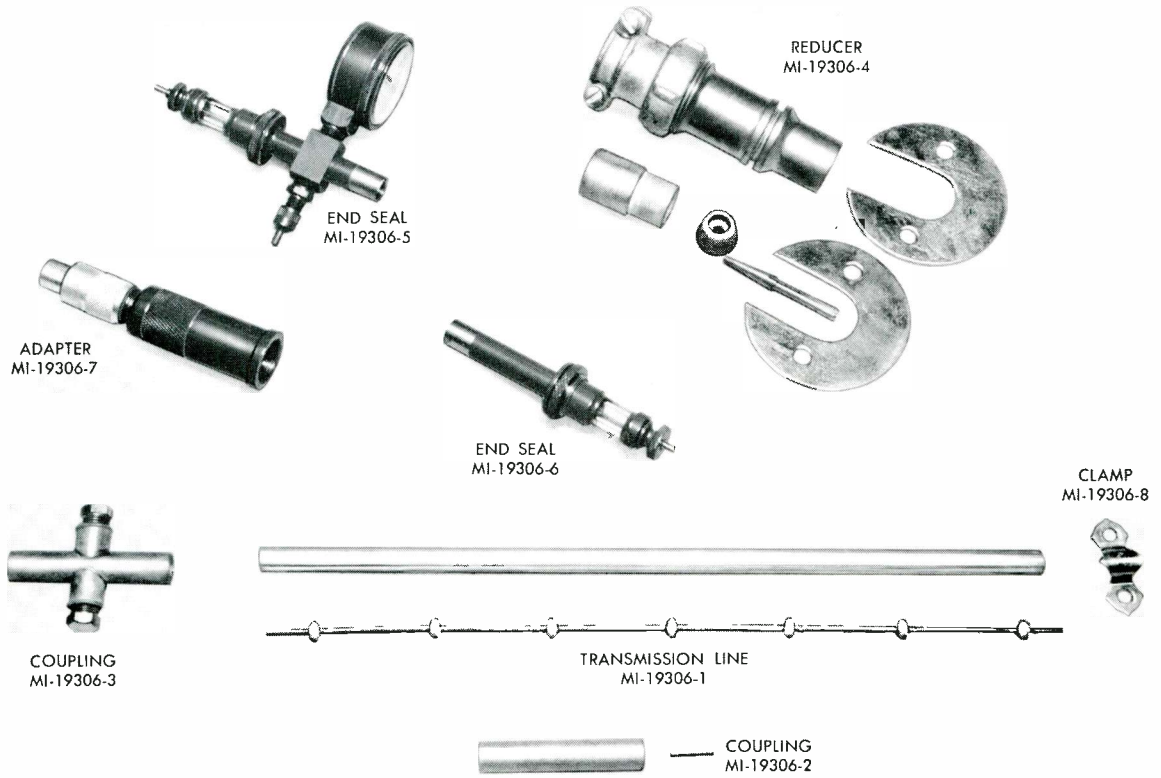
RCA coaxial transmission line provides an efficient means for transferring RF power to AM, and FM antennas. It is manufactured in various sizes and types to accommodate many different power and installation requirements.

RCA transmission line equipment features high efficiency plus time saving installation. Ease of installation is due to the RCA-developed flanged line which is now used in all types of radio installations. This line is supplied in convenient lengths with flanges already silver soldered to the ends. Thus, line sections can be quickly and easily bolted together. A specially designed connector which compensates for differential expansion and contraction is used for joining the inner conductors. No special tools, no torches or soldering are necessary. Mating flanges are automatically sealed for pressure by insertion of a neoprene O-ring gasket before assembly.

Each of the various types of RCA transmission line is designed for a particular application. The choice of line for an installation will depend principally upon the frequency in use and the power to be handled. Selection of the proper line will provide the most economical and efficient installation.

There is a comprehensive data table included on the rear page which sets forth the general overall characteristics and specifications of RCA's complement of AM and FM transmission lines. This should prove to be helpful to broadcast engineers and planners.

3/8" 72-OHM SOFT COPPER LINE AND FITTINGS, MI-19306



DESCRIPTION

RCA 3/8" Beaded Steatite Transmission Line, Type MI-19306, is a soft copper 72-ohm coaxial line designed for uses where the power and frequency to be handled are relatively low, and where line efficiency is not too important a factor. This type line is widely used to carry phase sampling voltages for directional AM arrays, to feed frequency measuring equipment, etc. It is also used in mobile and aircraft communication installations.

This solder-type, soft line is available with a complete complement of couplings, adapters, end seals, clamps, and reducers. The line lends itself readily to bending around obstructions and therefore requires no elbows.

MI-19306-1 TRANSMISSION LINE
This line is furnished to specified length on 36"-diameter reels which contain up to 250 feet, or on larger returnable reels which contain up to 5000 feet. The coils are hermetically sealed. Orders should specify which is desired. Insulators are spaced 1¾" apart allowing a bending radius of 8" without shorting or loss of concentricity. Capable of handling 250 w. nominal and 1 kw maximum power.

MI-19306-2 STRAIGHT COUPLING
This item includes solder type inner and outer conductors.

MI-19306-3 COUPLING (Straight Gas Servicing)
Outer conductor has two 1/8" IPS ports for gas admission with pipe plugs. Item includes solder type inner conductor.

MI-19306-4 REDUCER COUPLING
Used for reducing 7/8" diameter MI-19309 hard drawn transmission line to 3/8" diameter soft line for soldering. Includes 2 steel locking plates for mounting to flat surface.

MI-19306-5 END SEAL WITH GAUGE AND VALVE
Solder type including two valves for gas admission with pipe plugs, furnished with nut for clamping to mounting surface.

MI-19306-6 END SEAL
Solder type including two 1/8" IPS ports for gas admission with pipe plugs. Furnished with nut for clamping to mounting surface.

MI-19306-7 ADAPTER
Used for coupling RG 11/U Cable when used with End Seals MI-19306-5 or MI-19306-6 to Type UG-21U Plug.

MI-19306-8 CLAMP
Used for clamping 3/8" diameter line. Has 2 holes for number 10 screws. Mount one clamp approximately every 4 feet.

7/8" SOFT COPPER LINE AND FITTINGS, MI-19307, MI-19305

(72-OHM) (51.5-OHM)

DESCRIPTIONS

RCA 7/8" Steatite Transmission Line, MI-19307, is used for AM Broadcast lines and phase sampling. It is a soft-tempered copper coaxial line with a nominal impedance of 72 ohms. This line is also supplied with an impedance of 51.5 ohms for FM or AM Broadcast applications. The 51.5-ohm soft line is identified by MI-19305. List of accessory items and dimensions for MI-19305 are identical to MI-19307 except O.D. of the inner conductor.

MI-19307-1 (MI-19305-1) TRANSMISSION LINE
Furnished in 48" diameter coils hermetically sealed. Insulators are spaced 4" apart allowing a bending radius of 30" without shorting or loss of concentricity. The 51.5 ohm line is rated at 4.5 kw input at 50 mc with a 92% efficiency for 100 feet. Weight is 60 pounds per 100 feet.

MI-19307-2 (MI-19305-3) STRAIGHT COUPLING UNFLANGED
Includes solder type inner and outer conductors.

MI-19307-3 (MI-19305-3) STRAIGHT COUPLING
Used for connecting 7/8" diameter (MI-19309) hard drawn transmission line to 7/8" diameter soft solder-type line. Includes two steel locking plates for mounting to flat surface. Inner connector is solderless type.

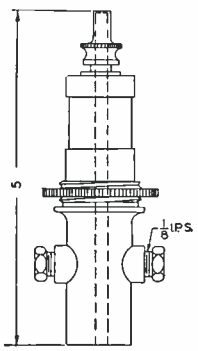
MI-19307-4 (MI-19305-4) END SEAL WITH GAUGE
Solder-type fitting with two ports. Includes 30-pound pressure gauge and gas admission valve. End Seal is furnished with nut for clamping to mounting surface.

MI-19307-5 (MI-19305-5) END SEAL
Solder-type fitting with two 1/8" IPS gas admission ports and pipe plugs. Furnished with nut for clamping to mounting surface.

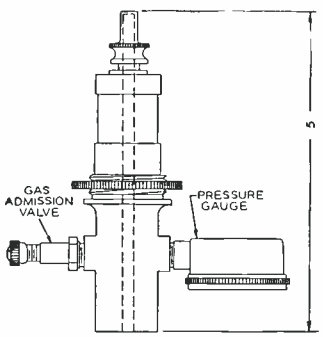
MI-19307-6 ADAPTER
End seal to Type "N" connector.

MI-19305-6 STRAIGHT COUPLING
With 1/8 IPS outlet.

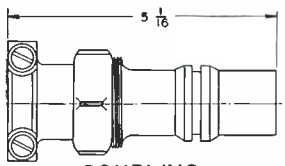
Dimensions for 7/8" Soft Line and Fittings



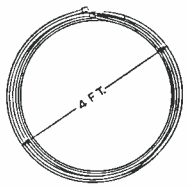
END SEAL
MI-19307-5



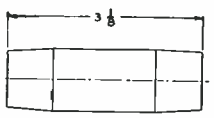
END SEAL
MI-19307-4



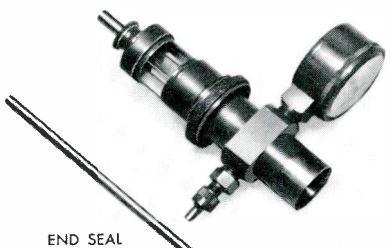
COUPLING
MI-19307-3

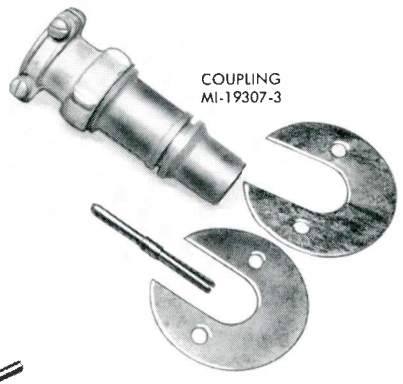


TRANSMISSION LINE
MI-19307-1

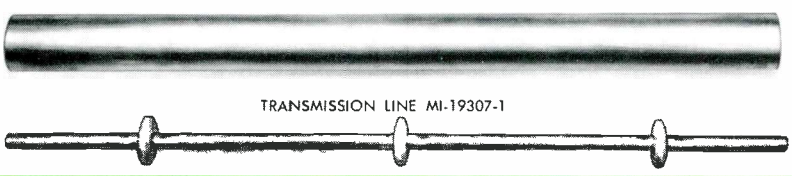


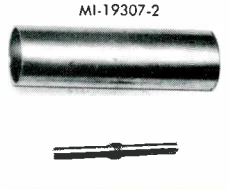
COUPLING
MI-19307-2


END SEAL
MI-19307-4

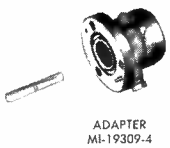

COUPLING
MI-19307-3

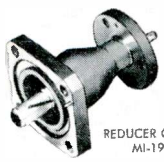

END SEAL
MI-19307-5


TRANSMISSION LINE MI-19307-1


COUPLING
MI-19307-2

7/8" 51.5-OHM HARD COPPER LINE AND FITTINGS, MI-19309





DESCRIPTIONS

RCA 7/8" Steatite Transmission Line, Type MI-19309, is a hard-tempered coaxial line with a nominal impedance of 51.5 ohms. This line operates with good efficiency on low, medium and high frequencies. It is for AM and FM uses.

MI-19309-1 TRANSMISSION LINE
This line is supplied in 20-foot lengths with a flange silver soldered to each end. The inner conductor is 5/16" diameter with steatite insulators spaced 6" apart. The outer conductor is designed to allow for removing inner conductor for inspection. Power rating is 3 kw at 100 mc with 90% efficiency for 100 feet. Line includes solderless inner connector, O-ring gasket and silicon copper hardware.

MI-19309-1-F TRANSMISSION LINE
Same as MI-19309-1 except one flange is omitted.

MI-19309-1-NF TRANSMISSION LINE
Same as MI-19309-1 except both flanges are omitted.

MI-19309-2 COUPLING (90° Elbow)
This elbow has one flange silver soldered to outer conductor. Opposite flange swivels to take care of any angle. Inner conductor is supported by 3 steatite insulators held in place. The elbow is furnished with solderless inner conductor, O-ring gasket and hardware.

MI-19309-2-F COUPLING (90° Elbow)
Same as MI-19309-2 except the fixed flange is omitted.

MI-19309-2-NF COUPLING (90° Elbow)
Same as MI-19309-2 except both flanges are omitted.

MI-19309-3 COUPLING (45° Elbow)
Same as MI-19309-2, except 45°.

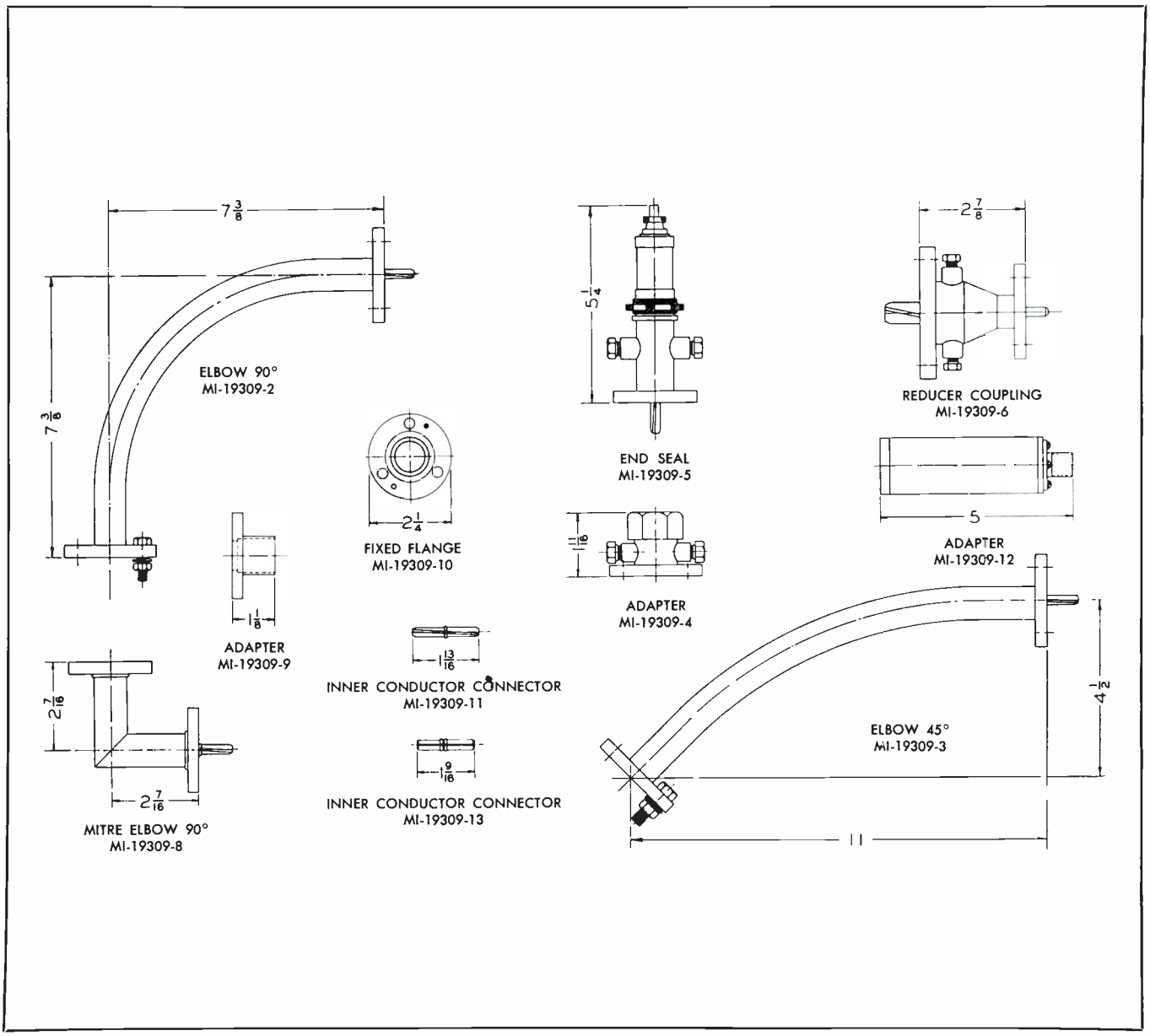
MI-19309-3-F COUPLING (45° Elbow)
Same as MI-19309-3 except the fixed flange is omitted.

MI-19309-3-NF COUPLING (45° Elbow)
Same as MI-19309-3 except both flanges are omitted.

MI-19309-4 ADAPTER COUPLING
Used for coupling a 7/8" 51.5-ohm flanged line to a 7/8" 51.5-ohm unflanged line. A 1½" wrench is required for clamping the special gland nut on the unflanged line. Furnished with solderless inner connector, O-ring gasket and hardware.

MI-19309-5 END SEAL
This sturdy end seal uses Steatite as an insulator. It is fitted with two 1/8" IPS ports and brass plugs for gas admission or bleeding the line. A clamp nut is supplied for mounting. A screw terminal with locking nut is used for the termination of inner conductor. No soldering is necessary for installing. Furnished with O-ring gasket and solderless inner connector.

MI-19309-6 REDUCER COUPLING
Used for reducing from 1 5/8" 51.5-ohm to 7/8" 51.5-ohm gassed line. Complete with outer and inner conductor, inner connectors, O-ring gaskets and hardware.



MI-19309-7 ADAPTER
Adapts a flange using two bolts on 1¾" bolt circle to a flange using three bolts on same bolt circle. Furnished complete with O-ring gaskets.

MI-19309-8 90° MITRE ELBOW
Includes two swivel flanges, inner conductor connector, hardware and O-ring.

MI-19309-9 ADAPTER
Field flange of soft solder type for connecting plain to flanged line.

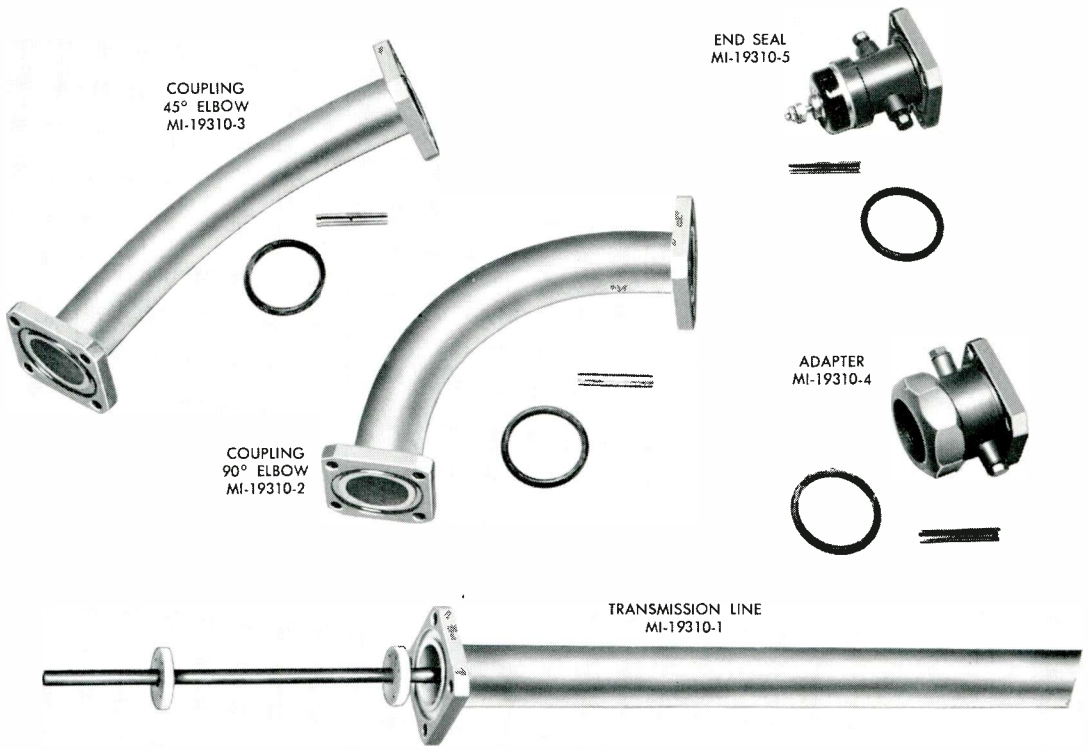
MI-19309-10 FIXED FLANGE, SILVER SOLDER
Flange 2¼" dia. with three bolting holes for use on ⅞" hard copper line.

MI-19309-11 INNER CONDUCTOR CONNECTOR
For use with ⅞" 51.5-ohm transmission line.

MI-19309-12 ADAPTER
Used to connect RG-8/U Cable used with MI-19309-5 End Seal to PL-259 Plug.

MI-19309-13 INNER CONDUCTOR CONNECTOR
For connecting .250" I.D. Tube to 0.263" I.D. tube.

1-5/8" 72-OHM HARD COPPER LINE AND FITTINGS, MI-19310



DESCRIPTIONS

RCA 1⅝" Steatite Transmission Line, Type MI-19310, is a hard-tempered coaxial line designed for installation where medium power is to be handled, and where the frequency to be used dictates use of a line with good efficiency.

MI-19310-1 TRANSMISSION LINE
This line is supplied in 20-foot lengths with flanges silver soldered to ends. The outer conductor is 1⅝" diameter with an inner conductor of ⅜" diameter using steatite insulators spaced 12" apart. The outer conductor is designed to allow for removing inner conductor for inspection. Line includes solderless inner connector, O-ring gasket and silicon copper hardware.

MI-19310-1-F TRANSMISSION LINE
Same as MI-19310-1 except one flange is omitted.

MI-19310-1-NF TRANSMISSION LINE
Same as MI-19310-1 except both flanges are omitted.

MI-19310-2 COUPLING (90° Elbow)
This elbow has one flange silver soldered. Opposite flange swivels to take care of any angle. Inner conductor is supported by 3 steatite insulators held in place. The elbow is furnished with solderless inner conductor, O-ring gasket and hardware.

MI-19310-2-F COUPLING (90° Elbow)
Same as MI-19310-2 except the solid flange is omitted.

MI-19310-2-NF COUPLING (90° Elbow)
Same as MI-19310-2 except both flanges are omitted.

MI-19310-3 COUPLING (45° Elbow)
Same as MI-19310-2 except 45°.

MI-19310-3-F COUPLING (45° Elbow)
Same as MI-19310-3 except the solid flange is omitted.

MI-19310-3-NF COUPLING (45° Elbow)
Same as MI-19310-3 except both flanges are omitted.

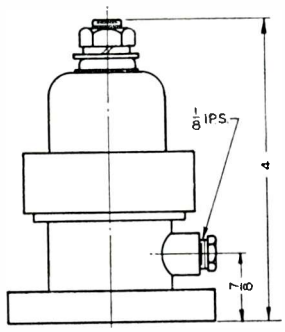
MI-19310-4 ADAPTER COUPLING
Used for coupling a 1⅝" 72-ohm flanged line to a 1⅝" 72-ohm unflanged line. A 2" wrench is required for clamping the special gland nut for the unflanged line. Furnished with solderless inner connector, O-ring gasket and hardware.

MI-19310-5 END SEAL
This end seal uses a steatite insulator that may be replaced by loosening the clamp nut which seals the insulator by means of an O-ring gasket. Has ⅛" I.P.S. port for gas admission or bleeding the line. A screw terminal with lockwashers and nut is used for termination of center conductor. Furnished with solderless inner conductor, O-ring gasket and hardware.

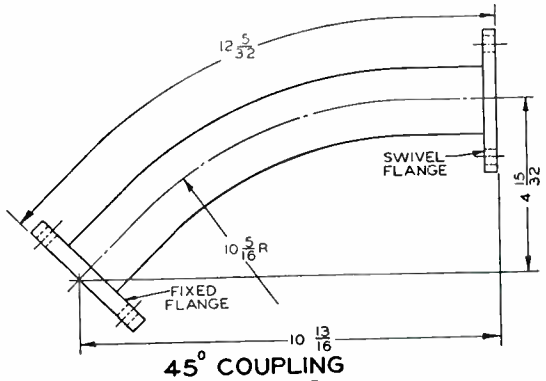
MI-19310-11 INNER CONDUCTOR CONNECTOR
Phosphor bronze bullet (0.250" Dia.) for 1⅝" hard copper line.

OUTLINE DIMENSIONS . . . 1-5/8" 72-OHM LINE AND FITTINGS

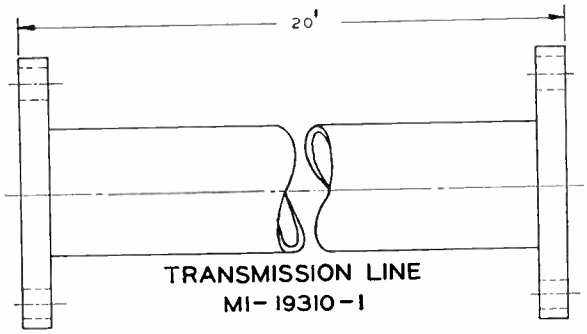
(MI-19310)



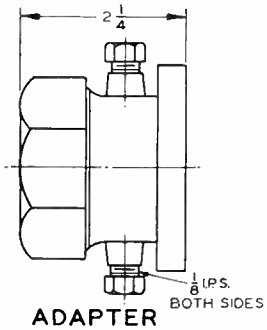
END SEAL
MI-19310-5



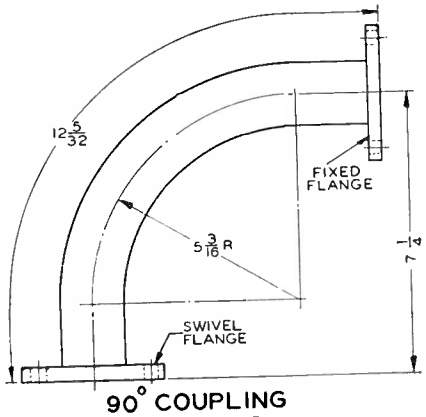
45° COUPLING
MI-19310-3



TRANSMISSION LINE
MI-19310-1

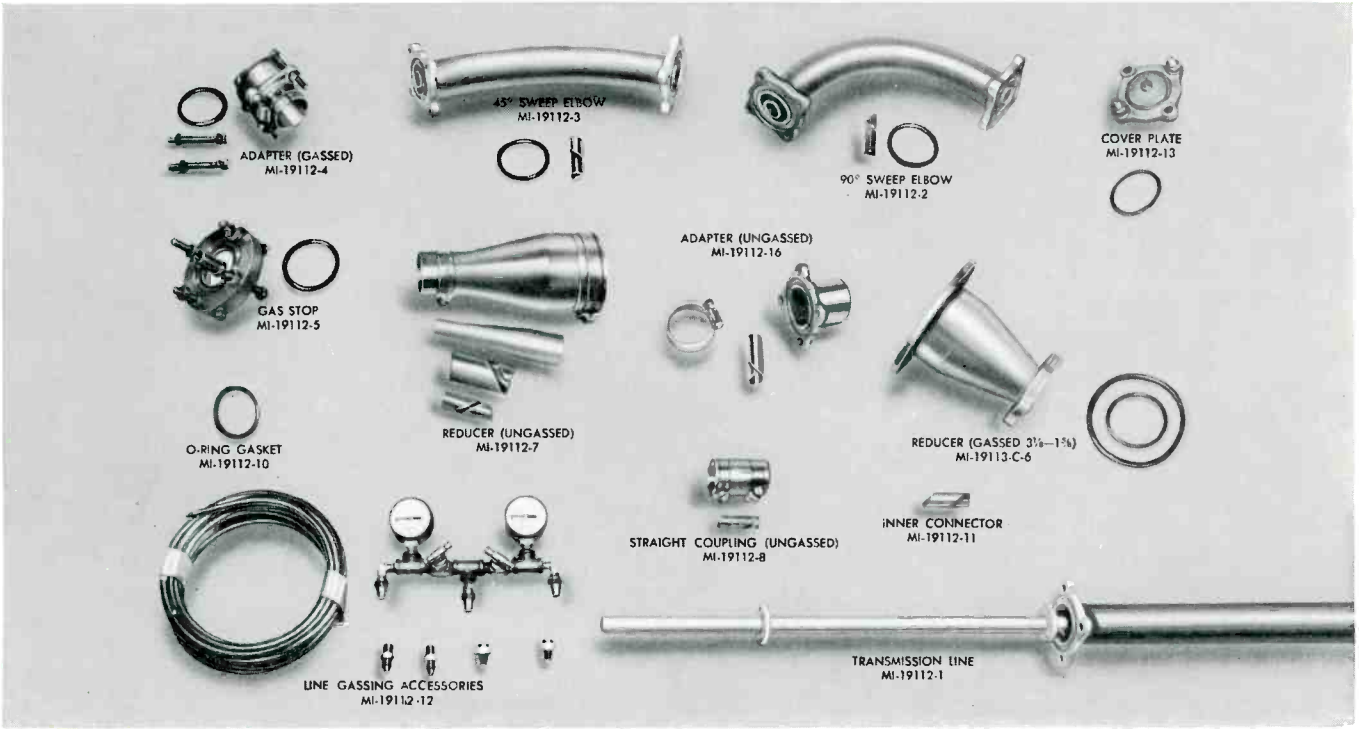


ADAPTER
MI-19310-4



90° COUPLING
MI-19310-2

1-5/8" 51.5-OHM HARD COPPER LINE AND FITTINGS, MI-19112



DESCRIPTION

RCA 1⅝" Steatite Transmission Line, Type MI-19112, is a hard-tempered copper line with a nominal impedance of 51.5 ohms. Because of its low impedance and good efficiency at VHF frequencies, this type line is widely used in TV as well as AM and FM installations.

MI-19112-1 TRANSMISSION LINE
This line is supplied in 20-foot lengths† with flanges silver-soldered to ends. The outer conductor is 1⅝" diameter with an inner conductor of ⅝" diameter using special low loss insulators spaced 12" apart. The outer conductor is designed to allow for removing inner conductor for inspection. Maximum power rating is 10 kw at 100 mc. Line includes solderless inner connector, O-ring gasket, and silicon copper hardware.

MI-19112-1-F TRANSMISSION LINE
Same as MI-19112-1 except one flange is omitted.

MI-19112-1-NF TRANSMISSION LINE
Same as MI-19112-1 except both flanges are omitted.

***MI-19112-2 COUPLING, 90° ELBOW**
Elbow with one fixed flange and opposite flange that swivels to take care of any angle. Inner conductor is supported by insulators spaced 12" apart. There is also a support for the inner conductor in the center of the elbow. Furnished with inner connector, O-ring gasket and silicon copper hardware.

***MI-19112-2-F COUPLING, 90° ELBOW**
Same as MI-19112-2 except the fixed flange is omitted.

***MI-19112-2-NF COUPLING, 90° ELBOW**
Same as MI-19112-2 except both flanges are omitted.

***MI-19112-3 COUPLING, 45° ELBOW**
Same as MI-19112-2 except 45°.

***MI-19112-3-F COUPLING, 45° ELBOW**
Same as MI-19112-3 except the fixed flange is omitted.

***MI-19112-3-NF COUPLING, 45° ELBOW**
Same as MI-19112-3 except both flanges are omitted.

MI-19112-4 ADAPTER, FOR GASSED LINE
Used for adapting a flange type line to an unflanged line. Tools needed are wrenches for the flange hardware and screwdriver for tightening clamp. Furnished with inner connector, O-ring gasket and hardware.

MI-19112-5 GAS STOP
To be inserted between two flanged sections of line to seal a gassed section from an ungassed section of line.

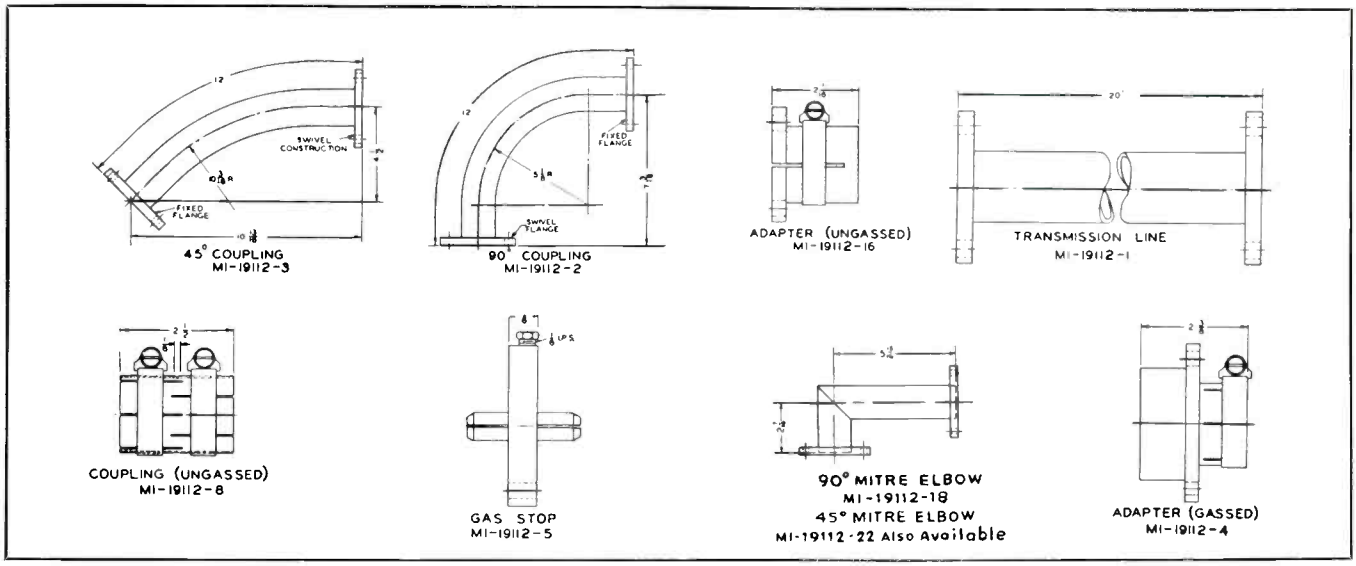
***MI-19112-6 REDUCER COUPLING**
Flanged coupling used for reducing from 3⅛" 51.5-ohm to 1⅝" 51.5-ohm gassed line. Complete with inner conductor and connectors, O-ring gaskets and hardware.

† May be ordered in lengths less than 20 feet. When line is to be used for television, it should be in multiples of feet. If length is not in multiples of feet, it is necessary to make up the difference by using .647 diameter conductor MI-19112-9. When ordering specify the MI-number and length required.

* Supplied as replacement part only. Do not order for new installations.

OUTLINE DIMENSIONS . . . 1⅝" 51.5-OHM LINE AND FITTINGS

(MI-19112)



***MI-19112-7 REDUCER COUPLING**
Used for reducing from 3⅛" 51.5-ohm to 1⅝" 51.5-ohm ungassed line. Complete with outer and inner conductor and connectors and stainless steel clamps.

MI-19112-8 STRAIGHT COUPLING
Used for coupling two sections of 1⅝" 51.5-ohm unflanged lines. (Not to be used for gassed line.) Consists of outer and inner connectors, stainless steel clamps.

MI-19112-9 SPECIAL INNER CONDUCTOR
Used for splicing lengths of line which are cut at points between the supporting insulators (these are spaced 12"). Inner conductor as supplied is .645 O.D. x .569 I.D. x 12 feet long. The special inner conductor will fit inner connector MI-19112-11.

MI-19112-10 O-RING GASKET
A long-life synthetic rubber gasket for use between the flanges to make flange joints pressure tight.

MI-19112-11 INNER CONNECTOR
A specially designed solderless inner connector for joining inner conductors of 1⅝" 51.5-ohm line.

MI-19112-12 LINE GASSING ACCESSORIES
Consists of indicators, couplings, 25 ft. of ¼" O.D. copper tubing and fittings. For indicating line pressure.

MI-19112-13 EMERGENCY COVER PLATE
Used to cap 1⅝" line to keep moisture out during installation, or for other temporary capping of the line.

MI-19112-16 ADAPTER
An adapter (ungassed) to couple a flanged to an unflanged line. Furnished complete with inner connector, hardware and clamp.

MI-19112-18 COUPLING, 90° MITRE ELBOW
For use where tower structure configuration or space limitations prevent use of the MI-19112-2 sweep elbow —or wherever desirable. Constructed with Teflon dielectric insulators. Excellent VSWR characteristics.

* Supplied as replacement part only. Do not order for new installations.

MI-19112-18-F COUPLING, 90° MITRE ELBOW
Same as MI-19112-18 except one flange is omitted (on the long leg).

MI-19112-18-NF COUPLING, 90° MITRE ELBOW
Same as MI-19112-18 except both flanges are omitted.

MI-19112-19 HARDWARE KIT
Consists of four bolts, four nuts and four lockwashers for 1⅝" line.

MI-19112-20 FLANGE, FIXED
The same flange which is used as an integral part of MI-19112 Transmission Line. Used for adapting the end of a field-cut-length of line where the original silver-soldered flange has been removed in shortening the line. Installation is made by silver soldering.

MI-19112-21 FLANGE, SWIVEL
Similar to the flange MI-19112-20 except flange is free to rotate.

MI-19112-22, 22-F, 22-NF 45° MITRE ELBOW
Similar to MI-19112-18, 18-F, 18-NF except 45°.

MI-19112-58 REDUCER, 1⅝" UNGASSED
A cone reducer with a special built-in connector at one and a type "N" 51.5-ohm jack at the other. Supplied with special integral outer connector and special clamp.

MI-19112-59 REDUCER, 1⅝" GASSED
Similar to MI-19112-58 with flange and O-ring for use on gassed coaxial line.

MI-19112-60 ADAPTER, FOR UNGASSED LINE
Serves similar purpose to MI-19112-4 except installed by soft soldering. Made in one piece—bolts not included. Used on ungassed coaxial line.

***MI19113-B-2-F COUPLING (90° Sweep Elbow)**
Same as MI-19113-B-2 except the solid flange is omitted.

***MI-19113-B-2-NF COUPLING (90° Sweep Elbow)**
Same as MI-19113-B-2 except both flanges are omitted.

***MI-19113-B-3 COUPLING (45° Sweep Elbow)**
Same as MI-19113-B-2 except 45°.

***MI-19113-B-3-F COUPLING (45° Sweep Elbow)**
Same as MI-19113-B-3 except the solid flange is omitted.

***MI-19113-B-3-NF COUPLING (45° Sweep Elbow)**
Same as MI-19113-B-3 except both flanges are omitted.

MI-19113-C-4 ADAPTER, FOR GASSED LINE
Used for adapting a flange type line to an unflanged line. The only tools necessary for installation are wrenches for the flange hardware and screwdriver for tightening clamp. Furnished with inner connector, O-ring gasket and hardware.

MI-19113-C-5 GAS STOP
To be inserted between two flanged sections of line to seal a gassed section from an ungassed section of line.

MI-19113-C-6 REDUCER COUPLING
Flanged coupling used for reducing from 3⅛" 51.5-ohm line. Complete with inner conductor and connectors. O-ring gaskets and hardware.

MI-19113-C-7 REDUCER COUPLING
Used for reducing from 3⅛" 51.5-ohm to 1⅝" 51.5-ohm ungassed line. Complete with outer and inner conductor and connectors and stainless steel clamps.

MI-19113-C-8 STRAIGHT COUPLING
Used for coupling two sections of 3⅛" 51.5-ohm unflanged lines. (Not to be used for gassed line.) Consists of outer and inner connectors with stainless steel clamps.

MI-19113-C-9 SPECIAL INNER CONDUCTOR
Used for splicing lengths of line which are cut at points between the supporting insulators (these are spaced 12"). Inner conductor as supplied is 1.282 O.D. x 1.136 I.D. x 12 feet long. The special inner conductor will fit inner connector MI-19113-C-11.

MI-19113-C-10 O-RING GASKET
A long-life synthetic rubber gasket for use between the flanges to make flanged joints pressure tight.

MI-19113-C-11 INNER CONNECTOR
A specially designed solderless inner connector for joining inner conductors of 3⅛" 51.5-ohm Steatite (MI-19113) line.

MI-19113-C-13 COVER PLATE
Used to cap the end of 3⅛" line to keep moisture out during installation, or for other temporary capping of the line.

* Supplied as replacement part only. Do not order for new installations.

MI-19113-C-17 END SEAL
Except for size and impedance this end seal is similar to MI-19112-17. The overall length is 4½".

MI-19113-C-18 COUPLING, 90° MITRE ELBOW
A 90° Mitre Elbow having unequal-length legs with swivel flanges which provide any rotational angle. Inner conductor is supported by Teflon insulators. Furnished with two connectors, O-ring gasket and silicon copper hardware.

MI-19113-C-18-F COUPLING, 90° MITRE ELBOW
Same as MI-19113-C-18 except the flange is omitted from the short leg.

MI-19113-C-18-NF COUPLING, 90° MITRE ELBOW
Same as MI-19113-C-18 except both flanges are omitted.

MI-19113-C-19 HARDWARE KIT
Consists of six bolts, six nuts and six lockwashers for 3⅛ inch line.

MI-19113-C-20 FLANGE, FIXED
The same flange which is used as an integral part of MI-19113 Transmission Line. Used for adapting the end of a field-cut-length of line where the original silver-soldered flange has been removed in shortening the line. Installation is made by silver soldering.

MI-19113-C-21 FLANGE, SWIVEL
Similar to the flange MI-19113-C-20 except flange is free to rotate.

MI-19113-C-22 COUPLING, 45° MITRE ELBOW
Same as MI-19113-C-18 except 45°.

***MI-19113-C-22-F COUPLING, 45° MITRE ELBOW**
Same as MI-19113-C-22 except the flange is omitted from the short leg.

***MI-19113-C-22-NF COUPLING, 45° MITRE ELBOW**
Same as MI-19113-C-22 except both flanges are omitted.

MI-19113-C-51 CUT-OFF GAUGE
A specially-designed tool for cutting and dressing the end of the 1.282 O.D. inner conductor to insure a precision cut.

MI-19313-B-53 TRANSFORMER, 51.5 OHM TO 50.5 OHM, CHANNEL 7-13
Used for correct impedance match for Steatite line when used on Channels 7 to 13. Supplied with same hardware as MI-19113-B-1.

MI-19113-C-54 CUT-OFF GAUGE
Similar to MI-19113-C-51 except for use on 1.200 O.D. inner conductor.

MI-19113-C-55 ADAPTER, SOLDER-TYPE
Serves similar purpose to MI-19113-C-4 except installed by soft soldering. Made in one piece—bolts not included.

MI-19113-C-58 REDUCER
A cone reducer with a special built-in connector at one end and a type "N" 51.5-ohm jack at the other. Supplied with special integral outer connector and special clamp.

MI-19113-C-60 ADAPTER, FLANGED
Adapts unflanged piece of line to flanged section. Not pressure tight so use only with ungassed line. Adapter is 2 inches long.

AM POWER RATING DATA

The following power and attenuation ratings have been assigned to RCA Coaxial Transmission Lines. All power ratings are based on frequencies up to 20 megacycles and the attenuation ratings are calculated at 1 megacycle.

Size	Stock No.	Impedance—Ohms	Voltage RMS 60 Cycles	KW Power Rating Based on 100% AM Modulation and Unity VSWR	Attenuation db./100 ft.	Velocity %
3/8"	MI-19306	72	2,500	0.6	.0868	87.0
7/8"	MI-19307	72	7,000	4.5	.0343	90.0
7/8"	MI-19309	51.5	5,000	6.5	.0402	93.2
7/8"	MI-19305	51.5	5,000	6.5	.0360	90.0
1 5/8"	MI-19310	72	12,000	16	.0190	96.3
1 5/8"	MI-19112	51.5	11,000	25	.0204	96.3
3 1/8"	MI-19113	51.5	18,000	94	.0104	93.0

The above power ratings are based on a 100% amplitude modulated signal and a VSWR ratio of 1 to 1. The power ratings for any other VSWR may be obtained by dividing the power listed in the above chart by this ratio. For example, the average AM station will have a typical VSWR of 2 to 1. The above maximum ratings would then be divided by 2. The transmission line power ratings below 20 mc are limited by the flash-over voltage, rather than the temperature rise caused by heating. Voltage breakdown is relatively independent of frequency in this region. The 60-cycle flash-over voltage ratings listed in the above chart are based on an approximate safety factor of three.

The calculated attenuation values are based on 95% conductivity of the copper conductors. Losses in soft drawn semi-flexible cable are stated as calculated. However, all rigid transmission line losses as stated include a 10% derating factor which allows for contact resistance at the joints between the 20-foot sections.

INSTALLATION AND LAYOUT OF TRANSMISSION LINES

GENERAL

Before ordering transmission line or fittings, it is recommended that a dimensioned layout be made of the tower or supporting structure (with antenna mounted), the routing of the transmission line between the tower and transmitter room, and routing of the lines within the transmitter room. This layout will give an idea as to what elbows and fittings will be needed and the length of line required. Refer to next page as an aid in making a check list of items to be ordered. The standard length of transmission line is 20 feet. Shorter lengths may be obtained by ordering the desired lengths with flanges soldered on at the factory, or a 20-foot section may be cut and a flanged to un-flanged line adapter used. The RCA lines have a rolled groove in one end of each of the outer conductors to prevent the inner conductor from moving in one direction. The opposite end is free to permit removal of the inner conductor and insulators, for inspection. The rolled groove supports the end insulator and also the inner conductor when the line is in a vertical position, and this end should always be placed in the lower position to prevent the inner conductor from dropping out. For horizontal runs, rolled groove is placed at alternate joints so that for each two adjacent sections the line is locked in position by the opposing rolled grooves.

All RCA lines and fittings that are to be used outdoors should use the flange type line. The unflanged lines may be used inside buildings where gassing may not be necessary or where changes in transmission line connections are frequently made for tests. An O-ring gasket is supplied which fits into a groove of each mating flange of the flanged line. Also included are bolts, lock washers, and nuts made of silicon copper for each coupling. Care must be exercised when placing the gasket in the groove to avoid pinching the gasket. If the gasket is not assembled properly, a pressure leak may result. It is suggested that additional gaskets, bolts, and O-rings should be ordered to replace damage and loss during installation.

The gassed lines should be brought inside the buildings and connected to a gas stop. Assemble the gas stop with the pipe plug toward the gassed line. From the gas stop to the transmitter, flanged or unflanged line may be used.

There is a wide choice of hangers for supporting the transmission line. See tables, photos and drawings in the Transmission Line and Accessories catalog . . . B.5050. For longer runs, the roller assembly, MI-19312-35, MI-19313-35 or MI-19314-35, is recommended. If it is necessary to run a line through a wall or building, make a hole large enough to clear the diameter of a transmission line flange and mount MI-19312-17 or -18, MI-19313-17 or -18, MI-19314-48 or MI-19314-52 horizontal anchors on both sides of the wall securing same with bolts. A detailed description for each type hanger is given in the hanger section catalog B.5050.

Do not make up an installation in rainy or stormy weather unless the ends of the transmission line and fittings are protected from moisture. If it is necessary to stop work on an installation, cover both ends of the line to keep water out. If water gets into the line in cold weather, it may freeze and crack the line. This is very important since water can be trapped in low sections of line or antenna harnesses and it is difficult to purge from the line with the result that high standing wave ratios may be set up that will permanently damage the line or antenna. Even at normal temperature, if water gets in the line it is difficult to dry out the line by gas or air pressure. A cover plate, MI-19112-13 or MI-19113-13, may be used for closing off the line temporarily. After the complete installation, open up a bleeder valve at the antenna end and apply dry gas or dry air under pressure until all moisture has been blown out after which the bleeder valve must be closed. It is advisable to measure the insulation resistance with a volt-ohmyst and bleed the line until 80 megohms or more resistance is obtained. Care should be exercised not to drop the transmission line as the insulators may break. Do not bend the line more than that listed in the upper portion of the drawing on opposite page.

AM INSTALLATIONS

In AM installations the lines are usually anchored at the transmitter end. The expansion of the line occurs at the tower end. Make certain that sufficient flange to unflanged line adaptors are ordered for use at cut portions of the 20-foot length of line. Roller or swivel hangers are two methods used for supporting the line. These types of hangers leave the line free to expand or contract with temperature changes.

FM INSTALLATIONS

The method of installing an FM Transmission Line system is comparable to the method used in the TV installation shown on opposite page. Note that expansion hangers are required for supporting the vertical length except the top hanger which is a fixed hanger. The fixed hanger forces the expansion at the end of the line which is opposite the FM antenna to avoid damage to the antenna with temperature changes. The line is normally assembled starting from the fixed hanger.

If the FM tower is also used for AM broadcasting and the tower is base-insulated, it is necessary to prevent the transmission line from shorting the base insulator at the AM frequency. The FM line can be quarter-wave insulated utilizing insulated hangers such as MI-19309-22, 19312-22 or 19313-22. On short towers a resonating capacitance is required to compensate for lines of less than one-quarter wavelength.

TYPICAL INSTALLATION OF FM TRANSMISSION LINE ON TOWER SINGLE LINE IS USED FOR FM

REFER TO TABLE BELOW FOR SYMBOL DESIGNATIONS

SYMBOL DESIGNATIONS

Symbol	Description	1⅝ Dia. MI No.	3⅛ Dia. MI No.
A	Transmission Line	19112-1	19113-1
B	90° Elbow	19112-18	19113-18
C	Reducer 3⅛ to 1⅝	19112-6	19113-6
C	Reducer 6⅛ to 3⅛		
D	Gas Stop	19112-5	19113-5
E	Adapter	19112-4	19113-4
F	45° Elbow	19112-3	19113-22
G	Copper Tubing	19315-1	19315-1
H	Elbow Fitting	19315-2	19315-2
J	Nipple	19315-9	19315-9
K	Tee Fitting	19315-13	19315-13
M	Pressure Gauge	19315-14	19315-14
N	Fixed Hanger	See Note 2	See Note 2
P	Spring Hanger	See Note 1	See Note 1
R	Lateral Brace	19312-36	19313-36
S	Horizontal Anchor	19312-17	19313-17
T	Roller Assembly	19312-35	19313-35
U	Swivel Hanger	19312-37	19313-37
V	Dehydrator	On Application	

NOTE 1—For 1⅝ Line use MI-19312-20 through MI-19312-44.
For 3⅛ Line use MI-19313-20 through MI-19313-44.

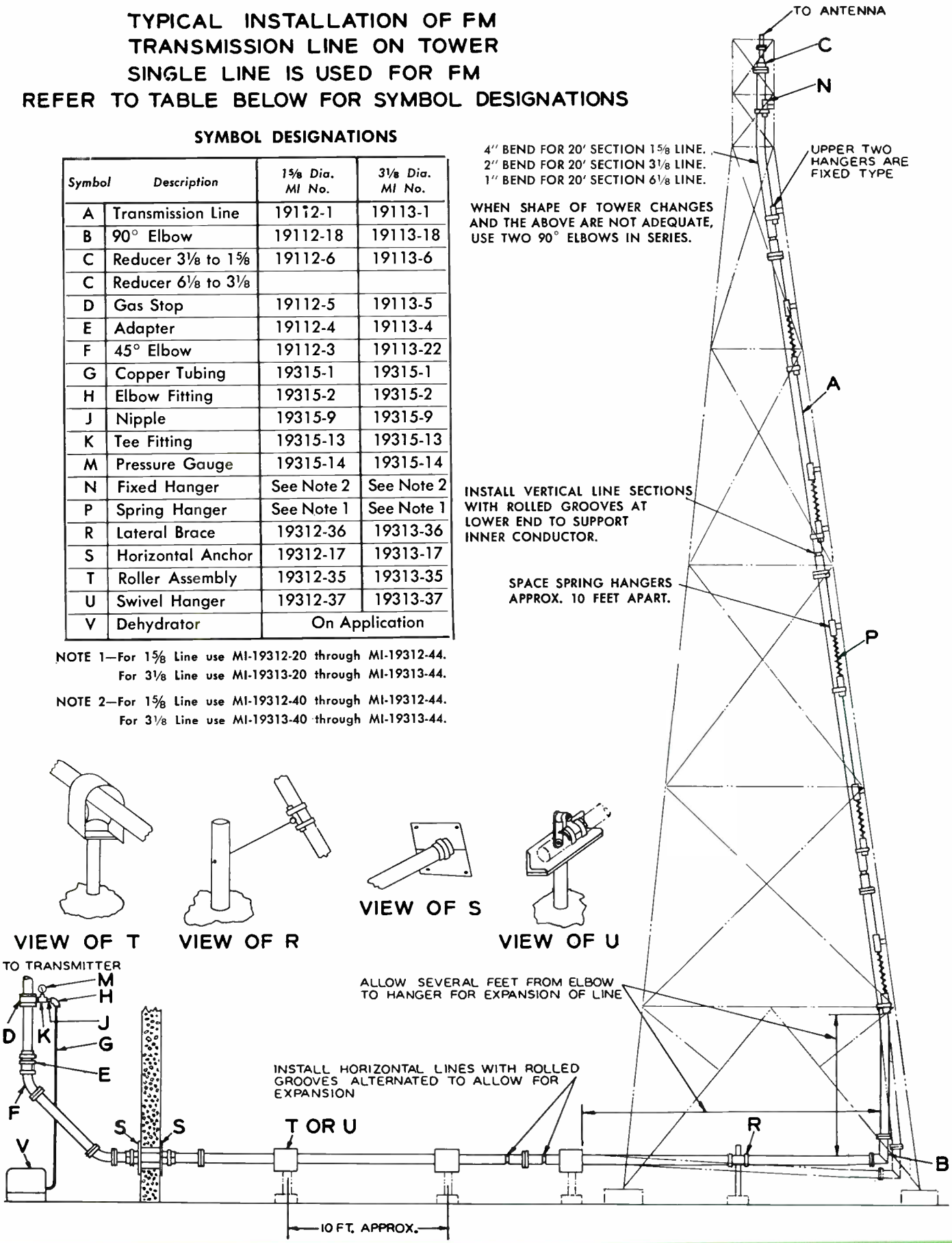
NOTE 2—For 1⅝ Line use MI-19312-40 through MI-19312-44.
For 3⅛ Line use MI-19313-40 through MI-19313-44.

VIEW OF T

VIEW OF R

VIEW OF S

VIEW OF U



QUICK REFERENCE DATA

MECHANICAL AND ELECTRICAL SPECIFICATIONS OF RCA COAXIAL TRANSMISSION LINES

For broadcast installations, the line selected should have a power rating which equals or exceeds the power output of the transmitter. If power increases are contemplated, it will be economical to install larger line than initially required, thus saving the cost of a new installation at a later time. Choice between the use of soft line and hard line will be determined by the installation. Hard, flanged-type line is the preferred type for most cases because of its ease of installation and immunity to damage. It is also easier to replace in sections than soft line. On the other hand, soft, solder-type line readily lends itself to bending around obstructions, thus eliminating the need for elbows.

Size	Stock Identification	Description	Impedance	O.D. of Inner Conductor (in.)	I.D. of Inner Conductor (in.)	Insulators Type—Spacing (in.)	Wt. lbs. per 100 ft.	Class of Service	FM Power Rating (Average—100 mc)
3/8"	MI-19306	Solder fittings, pressurized or unpressurized	72 ohm	.081	Solid	Steatite (Beaded) 1¾	16	Sampling and frequency checking in AM broadcast systems, mobile, aircraft	——
7/8"	MI-19307	Solder fittings, pressurized	72 ohm	.250	.187	Steatite (Wafer) 4	60	AM broadcast lines, phase sampling	——
7/8"	MI-19305	Solder fittings, pressurized	51.5 ohm	.312	.250	Steatite (Wafer) 6	60	AM and FM broadcast lines, phase sampling	3 kw
7/8"	MI-19309	Flanged fittings, no solder—pressurized	51.5 ohm	.312	.250	Steatite (Wafer) 6	62	AM and FM broadcast line, phase sampling	3 kw
1 5/8"	MI-19310	Flanged fittings, pressurized, no solder	72 ohm	.375	.312	Steatite (Wafer) 12	120	AM broadcast lines	——
1 5/8"	MI-19112	Flanged fittings, pressurized, no solder	51.5 ohm	.625	.569	Steatite (Wafer) 12	125	VHF Television and FM installations (up to 220 mc), AM lines	10 kw
3 1/8"	MI-19113	Flanged fittings, no solder—pressurized	51.5 ohm	1.200	1.136	Steatite (Wafer) 12	250	VHF Television and FM installations (up to 108 mc), AM lines	42 kw
3 1/8"	*MI-27912	Unflanged fittings, no solder—unpressurized	50 ohm	1.315	1.231	Teflon (Wafer) 12	230	VHF Television indoor applications	44 kw
3 1/8"	*MI-27791	Quick disconnect flanged fittings, no solder—pressurized	50 ohm	1.315	1.231	Teflon (Wafer) —	280	VHF/UHF Television and FM installations	44 kw
6 1/8"	*MI-19314-C	Flanged fittings, no solder—pressurized	51.5 ohm	2.500	2.435	Steatite (Pin Type) 12	730	VHF Television (up to 220 mc) and FM installations. For high power, high efficiency and exceptionally long runs	166 kw
6 1/8"	*MI-27792	Quick disconnect flanged fittings, no solder—pressurized	75 ohm	1.711	1.661	Teflon (Wafer) —	650	VHF/UHF Television and FM installations	162 kw
9 3/16"	*MI-27793	Quick disconnect flanged fittings, no solder—pressurized	75 ohm	2.580	2.516	Teflon (Wafer) —	1100	VHF/UHF Television and FM installations	320 kw

* TV Transmission Lines are listed here for convenient reference only. Refer to RCA's TV Catalog for full description and other particulars.

OPEN WIRE LINES

FEATURES

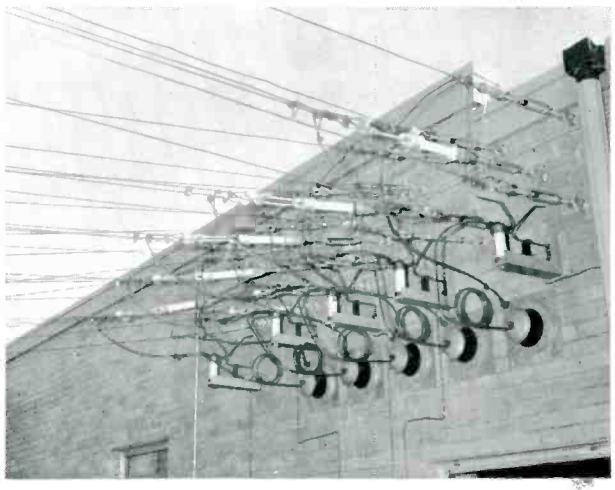
- Simplicity
- Low maintenance cost
- Open for constant inspection
- Requires no auxiliary apparatus (dehydrators, gas, etc.)
- High power handling capacity at low cost

USES

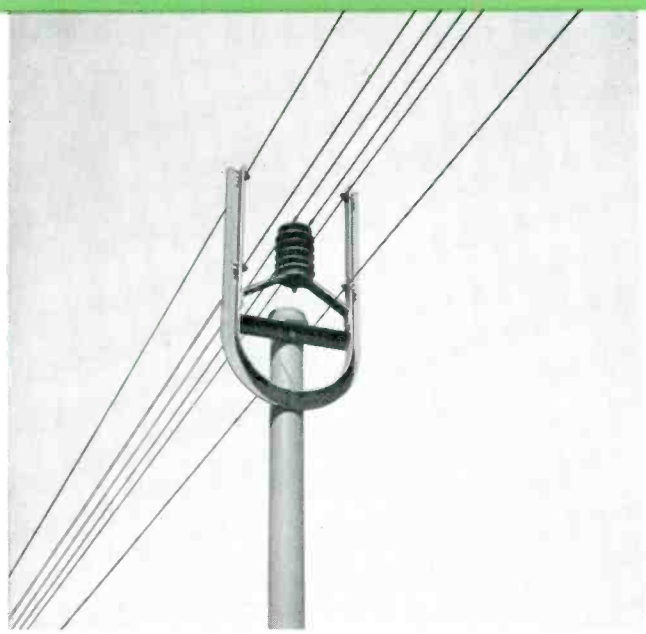
The six wire open line is intended for transmission of RF power from the transmitter to the antenna. The six wire line may be used for either phased arrays or non-directional antennas. It is suitable for use at any standard broadcast frequency and is designed for use in all weather conditions.

DESCRIPTION

Open wire transmission lines when properly designed and constructed, provide high power handling capabilities at low cost. The open wire line is reliable and may be serviced easily. The various open-wire line kits simplify the installation of an efficient line suitable for RF powers up to 150 KW. Radiation is made negligible by using a six wire line consisting of two central power conductors surrounded by four grounded conductors. By use of this line configuration, with appropriate spacing between conductors, a characteristic impedance of 230 ohms is obtained which results in an economy of phasing and terminating equipment.



Building dead-end termination of open wire line leading to five towers. Lightning protector horn-gaps are visible above each ground plate.



SPECIFICATIONS

Number 6 Hard Drawn Copper Wire, for transmission line conductors. Weight 79.4 lbs./1000 ft.

Stock Identification MI-28010

MI-28013 Transmission Line pole and cap. 4" diameter steel pole, 20' long with cap to close the upper end. May be drilled at installation for use with either L-13852 Bayonet Insulator, or L-13854 Building Dead End Kit.

Stock Identification MI-28013

Transmission Line Wire

Building Dead End Kit for terminating line at building, strain insulators, turnbuckles, grounding strap, line connectors.

Stock Identification L-13853

Pole Dead End Kit, fittings needed to terminate line, strain insulators, turnbuckles, line connectors, grounding strap, guy material, guy anchor brackets.

Stock Identification L-13854

Lead In Kit, fittings needed to run line through building wall at transmitter or tuning house. Lead in bowl and mounting plate, lightning horn gap, lightning reactor, grounding materials.

Stock Identification L-13855

Transmission Line Bayonet Insulator

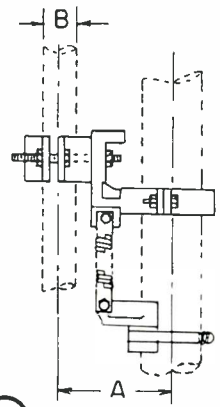
Bayonet Insulator Assembly for supporting line, to be spaced at 50 feet, with supporting bracket and post insulator "U" bolts.

Stock Identification L-13852

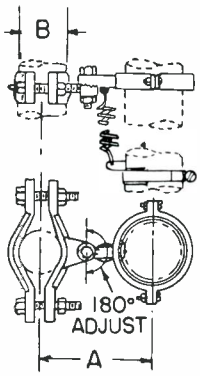
DESCRIPTION AND SPECIFICATION FOR EXPANSION HANGERS

ITEM	DIMENSIONS (inches) A	B	C	GROUNDED OR INSULATED	LINE SIZE AND CAPACITY	RCA REFERENCE NO.
EXPANSION HANGERS, CLAMP ON ROUND MEMBERS Spring-suspended hanger for clamping single line to round member. Complete with hose clamp. Spring must be preloaded at installation. SEE OUTLINE DIMENSION "A"	4 1/8 - 4 7/8 4 7/8 - 6 1/4 5 3/4 - 6 1/2 6 1/2 - 7 15/16 4 7/8 - 5 5/8 5 5/8 - 7 6 1/2 - 7 1/4 7 1/4 - 8 11/16	1 - 2 1/4 2 1/2 - 5 1 - 2 1/4 2 1/2 - 5 1 - 2 1/4 2 1/2 - 5 1 - 2 1/4 2 1/2 - 5		grounded grounded insulated insulated grounded grounded insulated insulated	1 5/8 (1) 1 5/8 (1) 1 5/8 (1) 1 5/8 (1) 3 1/8 (1) 3 1/8 (1) 3 1/8 (1) 3 1/8 (1)	MI-19112-23 MI-19112-26 MI-19112-25 MI-19112-28 MI-19113-23 MI-19113-26 MI-19113-25 MI-19113-28
EXPANSION HANGERS, CLAMP ON ROUND MEMBERS Same uses as above hanger "A" but also have pivot bolt to compensate for line misalignment. Complete with hose clamp. Spring must be preloaded at installation. SEE OUTLINE DIMENSION "B"	3 5/16 6 15/16 6 15/16 3 3/8 7 7	1 - 2 1/4 1 - 2 1/4 1 - 2 1/4 2 1/4 - 5 2 1/4 - 5 2 1/4 - 5		grounded grounded insulated grounded grounded insulated	7/8 (1) 7/8 (1) 7/8 (1) 7/8 (1) 7/8 (1) 7/8 (1)	MI-19309-23 MI-19309-24 MI-19309-25 MI-19309-26 MI-19309-27 MI-19309-28
EXPANSION HANGERS, MOUNT THROUGH HOLE Spring-suspended hanger for mounting through single hole. Complete with hose clamp. Spring must be preloaded at installation. SEE OUTLINE DIMENSION "C"	2 7/8 5 7/8 5 1/4 3 5/8 6 5/8 6	1" max. 1" max. 1" max. 1" max. 4" max. 1" max.	3/8 3/8 3/8 1/2 1/2 1/2	grounded grounded insulated grounded grounded insulated	1 5/8 (1) 1 5/8 (1) 1 5/8 (1) 3 1/8 (1) 3 1/8 (1) 3 1/8 (1)	MI-19112-32 MI-19112-33 MI-19112-34 MI-19113-32 MI-19113-33 MI-19113-34
EXPANSION HANGERS, MOUNT THROUGH HOLE Spring-suspended for mounting through single hole. Similar to preceding type "C" but has pivot bolt to compensate for line misalignment. Spring must be preloaded at installation. SEE OUTLINE DIMENSION "D"	3 11/16 7 5/16 7 5/16			grounded grounded insulated	7/8 (1) 7/8 (1) 7/8 (1)	MI-19309-32 MI-19309-33 MI 19309-34
EXPANSION HANGERS, MOUNT THROUGH HOLE For spring-suspension of two lines. Requires mounting hole. Complete with hose clamps. Spring preloaded at installation. SEE OUTLINE DIMENSION "E"	3 3/4 3 3/4 5 1/2 5 1/2	2-5/32 5 3 1/8 5	1/2 1/2 1/2 1/2	grounded insulated grounded insulated	1 5/8 (2) 1 5/8 (2) 3 1/8 (2) 3 1/8 (2)	MI-19112-14 MI-19112-48 MI-19113-14 MI-19113-48
EXPANSION HANGERS, CLAMP ON FLAT MEMBERS Spring-suspended hanger for fastening 1 line to flat members. Uses adjustable vise-like clamp. Pivot bolt compensates for line misalignment. Complete with hose clamp. Spring must be preloaded at installation. SEE OUTLINE DIMENSION "F"	4 7 5/8 7 5/8			grounded grounded insulated	7/8 (1) 7/8 (1) 7/8 (1)	MI-19309-20 MI-19309-21 MI-19309-22
EXPANSION HANGERS, CLAMP ON ANGLES Spring-suspended hanger for clamping 1 line to structural angles. Pivot bolt compensates for line misalignment. Complete with hose clamp. Spring must be preloaded at installation. SEE OUTLINE DIMENSION "G"	4 3/16 7 13/16 7 13/16	7" max. 7" max. 7" max.		grounded grounded insulated	7/8 (1) 7/8 (1) 7/8 (1)	MI-19309-29 MI-19309-30 MI-19309-31
EXTENSION KIT Extends the mounting of grounded dual hangers to align with insulated dual hangers. SEE OUTLINE DIMENSION "H"	4 1/2	7 1/2	1/2			MI-19113-16
CLAMP KITS (FOR ROUND MEMBERS) Adapts any direct-mounting (mount through hole) type of MI-19113 hanger to round members. SEE OUTLINE DIMENSION "J"	3 1/4 5 3/4	1 - 2 1/4 2 1/2 - 5				MI-19113-56 MI-19113-57
CLAMP KITS (FOR ANGULAR MEMBERS) Adapts any direct-mounting (mount through hole) type of MI-19113 hanger to angular members. SEE OUTLINE DIMENSION "K"	4 - 8					MI 19113-59

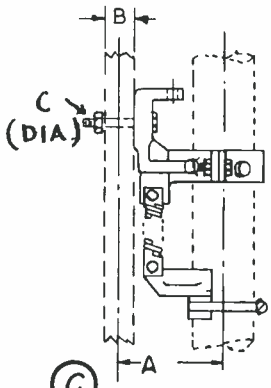
EXPANSION HANGER OUTLINE DIMENSIONS



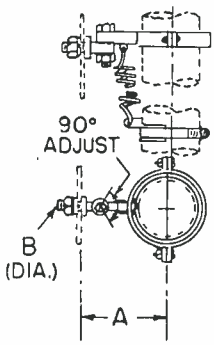
(A) (CLAMP ON ROUND MEMBERS)



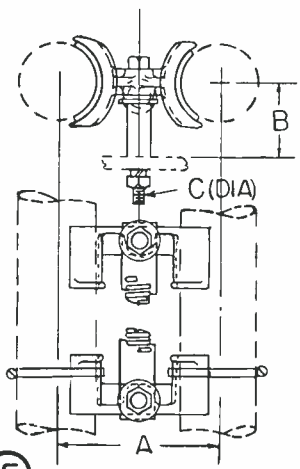
(B) (WITH PIVOT. CLAMP ON ROUND MEMBERS)



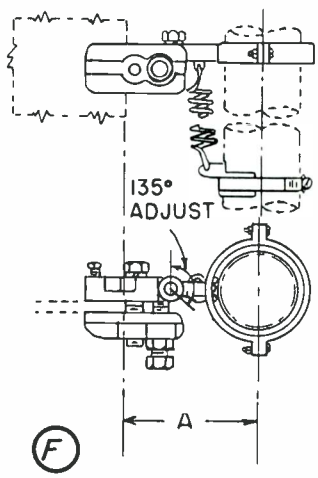
(C) (MOUNT THROUGH HOLE)



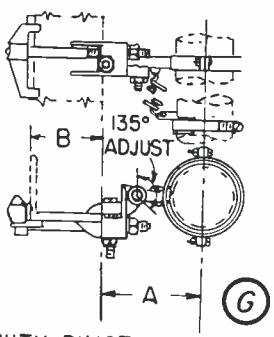
(D) (WITH PIVOT. MOUNT THROUGH HOLE)



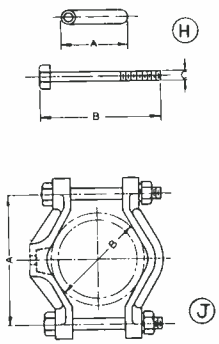
(E) (MOUNT THROUGH HOLE)



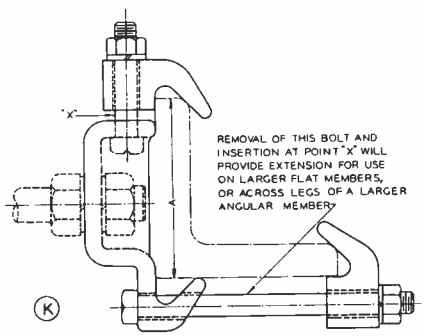
(F) (WITH PIVOT. CLAMP ON FLAT MEMBERS)



(G) (WITH PIVOT. CLAMP ON ANGLES)



(H) (J)



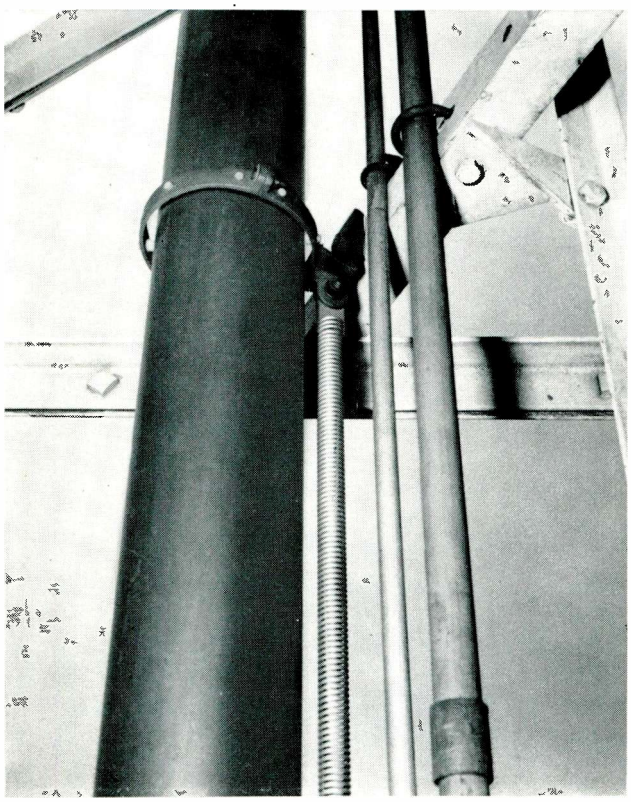
(K)

HANGER INSTALLATION DATA

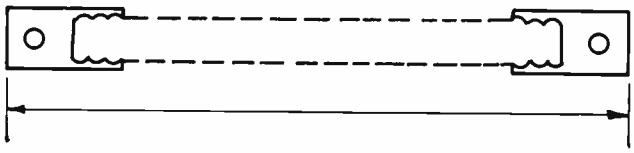
Due to the many precautions that surround transmission line installations, its assembly should be entrusted to only the most competent engineers. In using RCA fixed and expansion type hangers for single and dual runs. RCA engineers are prepared to recommend proper types for all horizontal or tower installations. The following tables on differential expansion should be taken into consideration when installing transmission line.

Differential expansion between line and tower is accommodated by suspending the line from spring hangers within the tower. Two hangers at the top of the tower are fixed so that the line can not move vertically through them. The rest of the hangers are of the spring type which permit the line to move vertically. Each hanger exerts an upward force equal to the weight of ten feet of line. The hangers are spaced at approximately ten foot intervals and hence there is no tension on the line under the average temperature condition.

Sliding type hangers are available to prevent lateral motion of line, and insulated hangers are used when the transmission line feeds an antenna mounted on an AM tower. Isolation of the transmission line in a tower used for medium frequency broadcasting is accomplished by using insulated hangers in the tower for a distance from the base equal to a quarter wavelength at the medium frequency.



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



Drawing showing points of measurement used in spring pre-loading tables for RCA expansion hangers. Charts give length in inches.

SPRING PRE-LOADING DIMENSIONS FOR EXPANSION HANGERS TYPE E

Hanger Installation Settings for MI-19112, 1⅝" Dual Transmission Line in Inches, 10' Average Spacing.*

DISTANCE DOWN FROM LOWEST FIXED HANGER—FT.	AMBIENT TEPERATURE DEGREES F AT TIME OF INSTALLATION				
	0-20	20-40	40-60	60-80	80-100
0-200	18 5/8	18 5/8	18 5/8	18 5/8	18 5/8
200-400	18 1/8	18 3/8	18 5/8	18 7/8	19 1/8
400-600	17 3/4	18 1/4	18 5/8	19 1/16	19 7/16
600-800	17 7/16	18 1/16	18 5/8	19 3/16	19 3/4
800-1000	17 1/8	17 7/8	18 5/8	19 5/16	20 1/16
1000-1200	16 13/16	17 3/4	18 5/8	19 1/2	20 3/8

Dimension Taken Over Spring as shown in diagram.

*For every 1 ft. difference of average hanger spacing, change the setting by 1 1/16 inch, adding if the spacing is greater than 10 ft., subtracting if less.

Hanger Installation Settings for MI-19113, 3⅜" Dual Transmission Line in Inches, 10' Average Spacing.*

DISTANCE DOWN FROM LOWEST FIXED HANGER—FT.	AMBIENT TEPERATURE DEGREES F AT TIME OF INSTALLATION				
	0-20	20-40	40-60	60-80	80-100
0-200	24 3/8	24 3/8	24 3/8	24 3/8	24 3/8
200-400	23 7/8	24 1/8	24 3/8	24 5/8	24 7/8
400-600	23 9/16	23 15/16	24 3/8	24 3/4	25 3/16
600-800	23 1/4	23 13/16	24 3/8	24 15/16	25 1/2
800-1000	22 15/16	23 5/8	24 3/8	25 1/8	25 13/16
1000-1200	22 5/8	23 1/2	24 3/8	25 1/4	26 1/8

Dimension Taken Over Spring as shown in diagram.

*For every 1 ft. difference of average hanger spacing, change the setting by 5/8 inch, adding if the spacing is greater than 10 ft., subtracting if less.

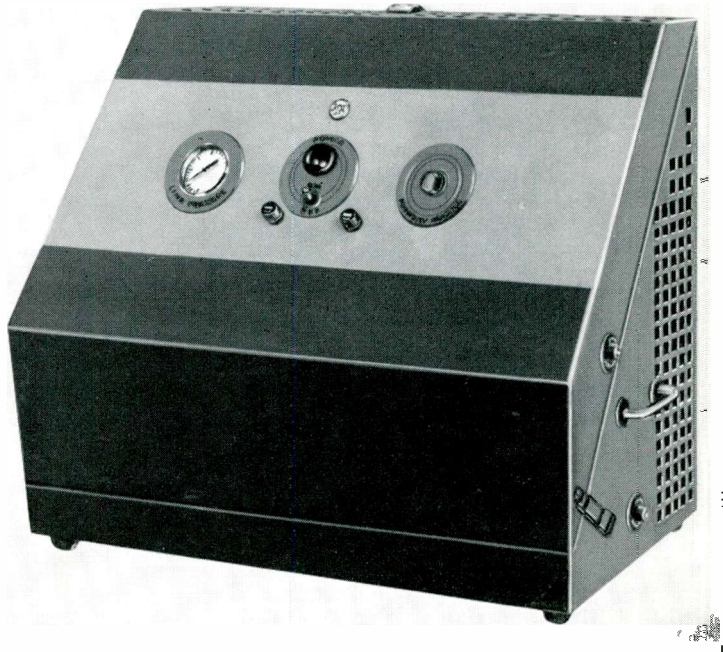
SPRING PRE-LOADING DIMENSIONS FOR HANGERS (Outline Types "B," "D," "F," and "G")

ELEVATION AND TEMPERATURE	LINE SIZE	SPRING LENGTH, EXPANDED
All	1⅝"	8½ inches
All	3⅛"	24 inches

DEHYDRATORS FOR COAXIAL LINE
MI-27348 SERIES

FEATURES

- Compressor inoperative during most of re-activation period . . . providing economical operation and long life
- Attractive space-saving design
- Completely accessible for quick, easy maintenance
- Operates from 115 volt, 60 cycle source
- Convenient arrangement of operation indicating devices
- Choice of single or double desiccants.



USES

It is extremely important that coaxial transmission lines feeding present day antennas be kept free of moisture. Because of their sectionalized construction, exposure to the effects of weather and temperature, and their comparative inaccessibility for maintenance, they are particularly susceptible to the entry of water, either directly or suspended in vapor drawn in by "breathing" of the line due to temperature change. Moisture in antenna systems can change the loading characteristics of the antenna and set up high standing wave ratios. The danger of arc-over is increased, with possible permanent damage to the antennas which can be corrected only by expensive rigger work and possibly a new antenna system. During sub-zero weather, the freezing water can fracture the lines.

To guard against such danger, all coaxial sections of the system should be pressurized with a moisture-free gas. Because the gas is vapor-free, condensation within the line is avoided, and the pressure acts to prevent the entry of water if small leaks develop. The pressurizing should be done only after the lines have been bled thoroughly and over a number of hours to insure that any trapped moisture has had an opportunity to be assimilated by the gas and discharged from the system.

Either nitrogen or dehydrated air is generally used to keep lines dry. The former may be procured locally in tanks. Special adapters and fittings may be secured from RCA. Except for short runs of line and very pressure tight systems, the use of nitrogen is awkward and uneconomical. Bleeding a system of re-pressurizing requires a considerable volume of gas and the constant drop in pressure due to even small leaks common to most systems is a constant drain on the source of the gas. As a consequence, the trend is toward the use of dehydrated air. Dehydrated air is obtained through the use of mechanical dehydrators. RCA makes available a wide range of such units.

DESCRIPTION

The RCA MI-27348 Series of Automatic Dehydrator Equipment for coaxial transmission lines provide a choice of single desiccant or double desiccant automatic equipments that operate from a 115 volt, 60 cycle power source. The equipments are attractively housed in space-saving cabinets with sloping panel for control and indicating devices. They are completely accessible for quick, easy maintenance.

The single-desiccant automatic dehydrator automatically reactivates the desiccant according to a set time cycle of operation. Pressure is maintained constant except during reactivation, when no pressure is applied to the line.

The disadvantage of lack of pressure during reactivation time in the above type is overcome in the fully automatic type by the use of two desiccant chambers in conjunction with an electric program timer and solenoid valve arrangement. With this type equipment, pressure is maintained constant at all times and the reactivation is automatic.

1 CFM Single Desiccant Dehydrator

This unit contains a compressor and a single desiccant chamber. A program timer is located on the compressor to stop the compressor after 10 hours of operation. The compressor will operate only when the line pressure falls below a set amount. At the completion of 10 hours of compressor running time, the compressor is turned off by the program timer and a heating unit is turned on and reactivation begins. The heating unit remains on for 5 hours. During the last ½ hour of this 5 hour period, the compressor blows air through the desiccant chamber and out to the atmosphere. The compressor is then turned off and the desiccant chamber cools for 5 hours. At the end of this 10 hour period, the compressor is ready to start another 10 hour running cycle. This running period need not be continuous. For example: if the compressor runs ½ hour per day, the reactivation cycle will not start for 20 days. A solenoid valve switches the output of the compressor from the line to the atmosphere at the start of the reactivation cycle. This allows the compressor to pass the air through the desiccant chamber during the last ½ hour of the 5 hour heating cycle to the atmosphere rather than the line.

Double Desiccant Dehydrators

These units contains two desiccant chambers. After 10 hours of compressor running time, the output of the compressor is switched from the desiccant chamber being used to the opposite chamber. Reactivation then starts for the chamber previously used. The reactivation cycle is 5 hours heating and 5 hours cooling. During the last ½ hour of the heating cycle a solenoid valve opens and allows a portion of the compressor output to pass through the reactivating chamber to the atmosphere. Dry air is available to the line through the desiccant chamber being used at the same time that air is being passed through the reactivating chamber. Solenoid valves control the output of each chamber. These switch the outputs either to the line or to the atmosphere for reactivation or line pressurization.

SPECIFICATIONS

1 cu. ft. Double Desiccant

Power Consumption	900 watts
Compressor Output to Atmosphere	1 CFM
Weight	120 lbs.
Drain Connection	⅛" female pipe thread
Dew Points	—40° F.
Air Connection	Standard Schrader bicycle valve also 15' connecting hose with fittings
Maximum Operating Pressure	10 PSI
Serves up to	40,000 ft. ⅞" transmission line
	10,000 ft. 1⅝" transmission line
	2,500 ft. 3⅛" transmission line
	700 ft. 6⅛" transmission line
Stock Identification	MI-27348-1

1.5 cu. ft. Double Desiccant

Power Consumption	1700 watts
Compressor Output to Atmosphere	1½ CFM
Weight	200 lbs.
Drain Connection	⅛" female pipe thread
Dew Points	—40° F.
Air Connection	Standard Schrader bicycle valve also 15' connecting hose with fittings
Maximum Operating Pressure	10 PSI
Serves up to	20,000 ft. 1⅝" transmission line
	5,000 ft. 3⅛" transmission line
	1,500 ft. 6⅛" transmission line
Stock Identification	MI-27348-2

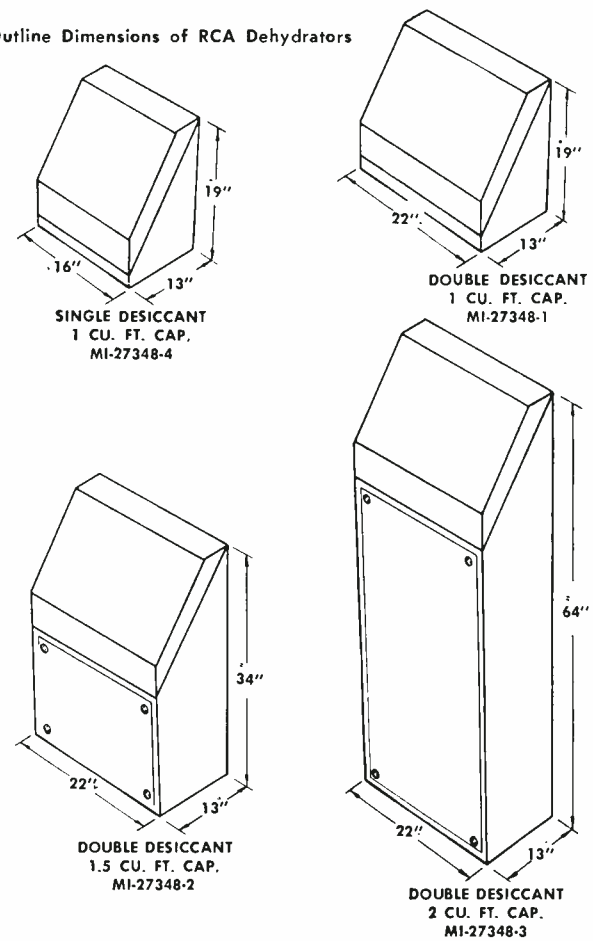
2 cu. ft. Double Desiccant

Power Consumption	2100 watts
Compressor Output to Atmosphere	2 CFM
Weight	375 lbs.
Drain Connection	⅛" female pipe thread
Dew Points	—40° F.
Air Connection	Standard Schrader bicycle valve also 15' connecting hose with fittings
Serves up to	40,000 ft. 1⅝" transmission line
	10,000 ft. 3⅛" transmission line
	3,000 ft. 6⅛" transmission line
Stock Identification	MI-27348-3

1 cu. ft. Single Desiccant

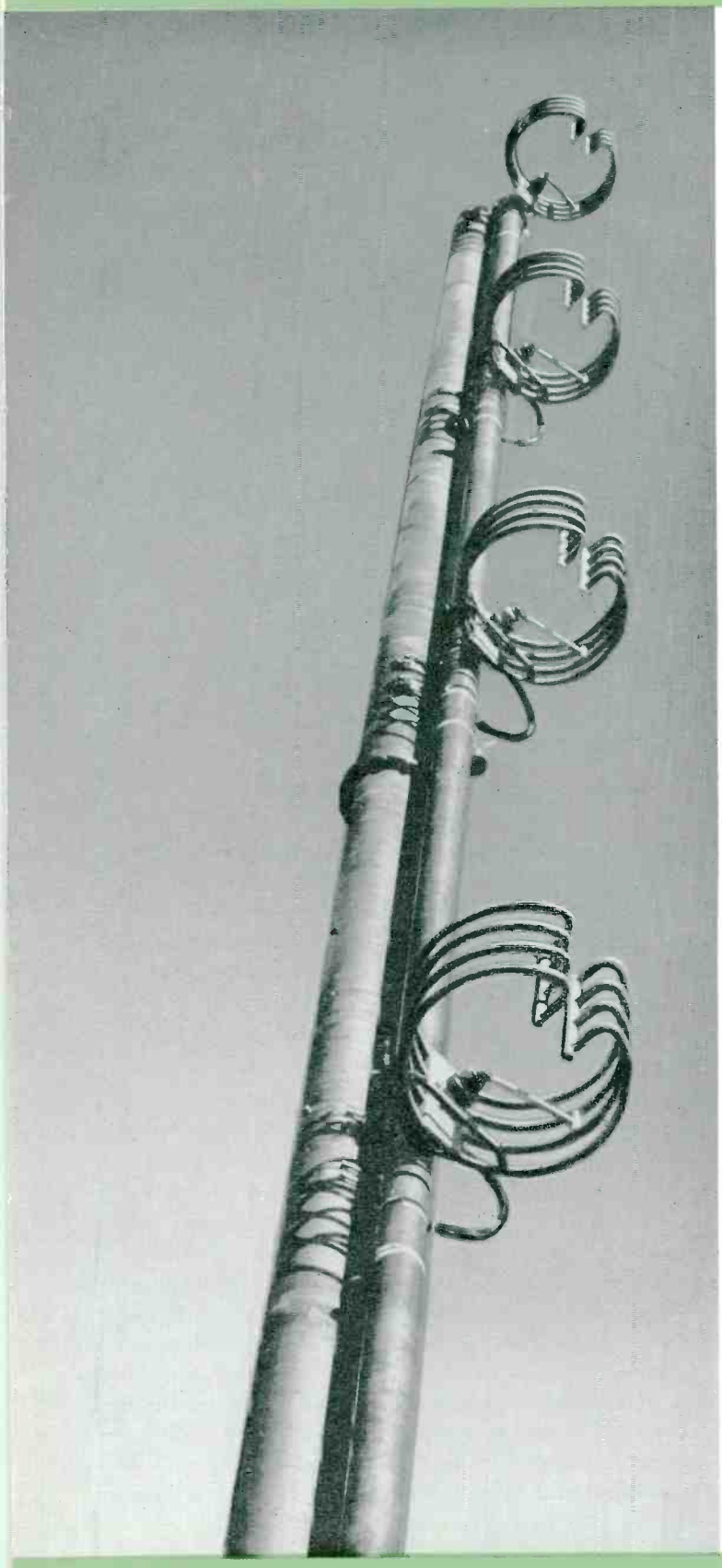
Power Consumption	900 watts
Compressor Output to Atmosphere	1 CFM
Weight	100 lbs.
Drain Connection	⅛" female pipe thread
Dew Points	—40° F.
Air Connection	Standard Schrader bicycle valve also 15' connecting hose with fittings
Maximum Operating Pressure	10 PSI
Reactivation Time	10 hours
Serves up to	40,000 ft. ⅞" transmission line
	10,000 ft. 1⅝" transmission line
	2,500 ft. 3⅛" transmission line
	700 ft. 6⅛" transmission line
Stock Identification	MI-27348-4

Outline Dimensions of RCA Dehydrators



BROADBAND FM ANTENNA

BFA SERIES



FEATURES

- Designed for both standard and multiplex FM broadcast service
- Low VSWR over entire 200 kc band (1.1/1 ratio achieved with field trimming)
- Highest gain at low weight and wind-loading
- Can be side mounted on existing towers
- Provisions for de-icing if desired
- Easy to install—minimum maintenance

USES

The RCA BFA Series of Broadband FM Antennas is designed for use in both standard and multiplex FM broadcast service. These antennas provide a low-standing wave ratio over a 200 kilocycle channel, assuring the perfect match essential for eliminating cross-coupling between standard and multiplex channels.

This new antenna features sectionalized construction and can be erected with as many sections as are required for a given application. Power gain is approximately equal to the number of sections. The spacing of sections is approximately one wavelength. The antennas are designated BFA-1, BFA-2, BFA-3, etc., depending upon the number of stacked sections provided.

The mechanical simplicity and low weight of the BFA Antenna permits quick and easy erection for side mounting on any type of existing tower. Top (pole) mounting on towers is also readily accomplished. Standard support brackets are supplied for side mounting on conventional towers. De-icing units are accessory equipment, and are strongly recommended where a possibility of any icing exists.

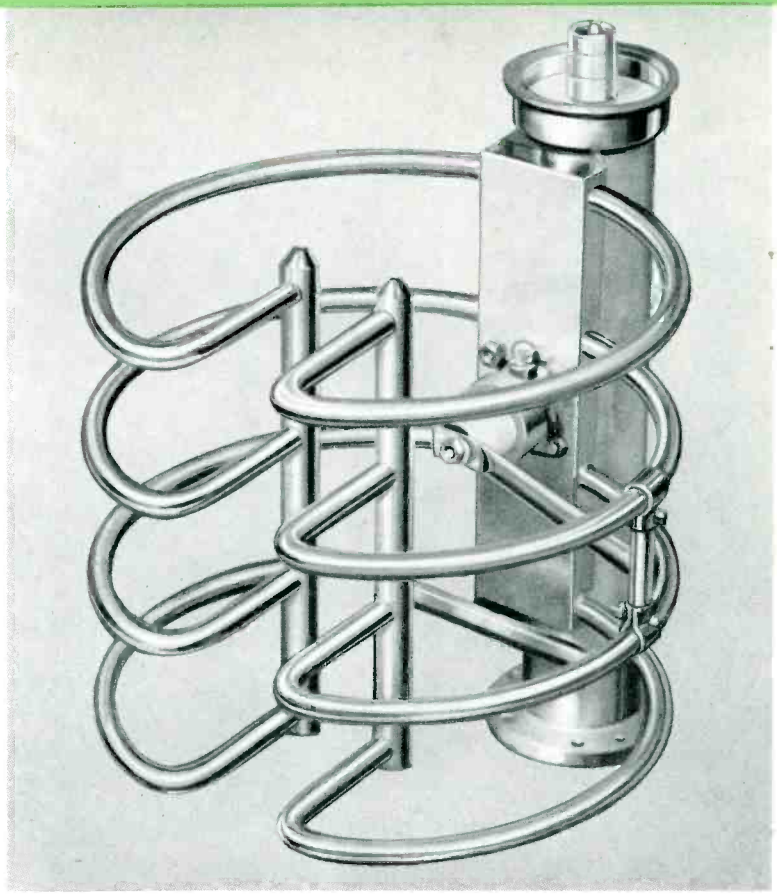
DESCRIPTION

The RCA Type BFA Broadband FM Antenna is of sectionalized construction; each section consisting basically of four radiating rings attached to a supporting frame. An insulated feed assembly and a section of Universal 3⅛-inch, 50 ohm transmission line is provided with flange to fit 3⅛-inch coaxial feedlines. Adapters are available for other size lines. Standard antennas have power gains up to 12.5. Special designs are available on application. All BFA Antennas are factory tuned to any channel in the frequency range of 88 to 108 megacycles. In standard and multiplexing operations, a voltage standing wave ratio of 1.1 to 1 can be achieved with a minimum of field trimming. A transformer section is located near the input fitting.

The horizontol radiation pattern of the BFA is essentially omnidirectional for both top mounting and side mounting arrays. The horizontal pattern in free space is within 1 db of circular. The extent of deviation from a circular pattern for a side mounted array is dependent on type and size of the tower face. If the array is to be side mounted, it is recommended that it be mounted directly off the corner leg. This will minimize the effect of the tower on the circularity of the VSWR. It is also recommended that the array be mounted, if possible, above the top set of guys on a guyed tower. Where this is not possible the guys in the immediate area of the antenna should be broken by insulators every 3½ feet for a distance of at lease 14 feet. In addition, each guy in the vicinity of the antenna should be insulated at the point where it connects to the tower.

The low VSWR over a full 200-kc channel assures optimum linearity. Power handling of the BFA Antenna is 3 kw or 4.8 dbk for a single-section antenna, and up to 36 kw or 15.6 dbk for a 12 section antenna.

Mechanically, each section consists of four stainless steel rings stacked and equally spaced to form a height dimension of 12 inches. Each ring is made of ⅝-inch O. D. (3/32-inch wall) tubing of 13½-inch diameter, with a tuning gap measuring from 1½ to 5 inches depending on channel. The sections are mounted on 3⅛-inch coaxial line with an insulated feed stud energizing each radiating section. Only one inter-element transmission line is used to feed all sections of the antenna, and the individual radiating sections are identical mechanically and electrically. The radiators are both shunt fed and mechanically supported by this interconnecting feed-line which consists of modified lengths of RCA 3⅛-inch rigid coaxial transmission line. The BFA-1A through BFA-8A Antennas terminate mechanically in a pressurized top cap with bleed valve and a bottom 3⅛-inch input flange of either EIA or Marman type as specified for coupling the antenna to the desired type of transmission line. The Types BFA-10A and BFA-12A antennas are center fed through a matching tee. On these two latter antennas the lower and top radiators terminate mechanically in pressurized caps.

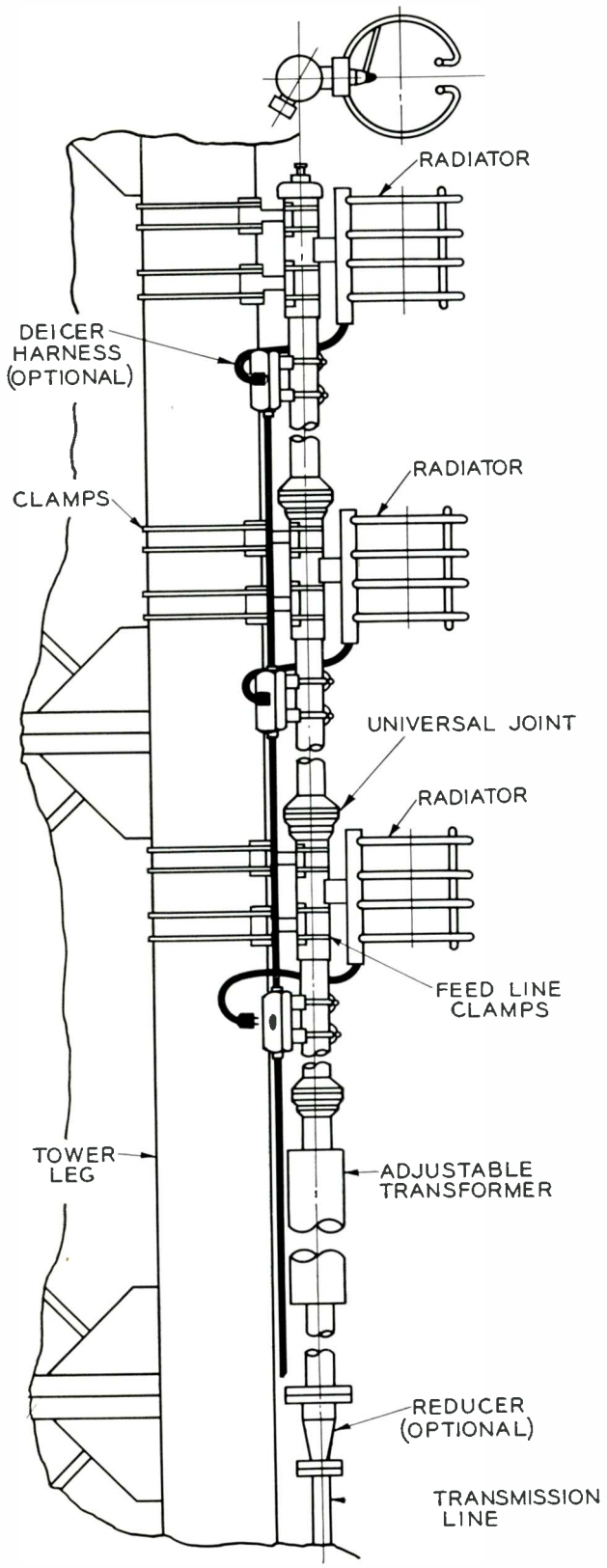


Single Section of BFA Broadband FM Antenna.

Each section may be equipped with internally mounted heating units which consist of insulated resistance wire. A mounting channel for installation of the heaters is 3 inches wide and is provided with a weather-tight cover.

In areas where icing conditions can occurr, even though very occasionally, it is strongly recommended that de-icing equipment be ordered. Since de-icers are installed at the factory, they must be ordered with the antenna.

An additional feature of the new RCA BFA Series FM antennas is the pressure-sealed swivel type mounting that joins the radiator sections at the feed point on the Universal Transmission Line. This permits initial orientation of radiators either in the conventional horizontal plane for maximum horizontal polarization of the radiated wave, or optional rotation of the radiator about it's horizontal axis to provide an increase in the vertically polarized component of radiators where desirable. The radiators may be re-oriented in the field at any time to achieve the required ratio of horizontal versus vertical component.



Type BFA FM Antenna shown side mounted on a typical uniform cross-section tower.

SPECIFICATIONS

Electrical Specifications

Frequency Range.....Factory tuned to any channel in 88-108 mc band

Power Gain.....Approximately equal to number of sections stacked (see table)

Polarization.....Horizontal (Vertical Component approximately 15%)

Horizontal Pattern.....Circularity ±1 db in free space

VSWR at Input (without field trimming):
Top Mounting.....1.2/1 or better
Side Mounting .....1.5/1 or better

VSWR at Input (with field trimming):
Top or Side Mounting.....1.1/1 can be achieved over entire 200 kc channel

Input Impedance.....50 ohms

Power Input Rating.....3 kw per section

Mechanical Specifications

Windload.....50 psf for flat surfaces; 30 psf for cylindrical surfaces (based on true "extreme" velocity of 110 miles per hour. (See table 1 of specific antenna windloads)

Section Dimensions:
Height ..... 12"
Ring Diameter .....13½"
Gap.....1½ to 5 inches (depending on channel)

Overall heights and radiation centers.—See Table 1

Weight
Each Four-Ring Radiating Section.....13 lbs.
Supporting 3⅛-inch Feedline.....2.8 pounds per foot (average)

Approximate deadweight of antennas:

BFA-1A	38 lbs.
BFA-2A	143 lbs.
BFA-3A	191 lbs.
BFA-4A	241 lbs.
BFA-5A	292 lbs.
BFA-6A	348 lbs.
BFA-7A	400 lbs.
BFA-8A	451 lbs.
BFA-10A	686 lbs.
BFA-12A	818 lbs.

Add approximately 15% to above weight if deicing equipment is to be supplied with antenna.

Equipment Supplied

BFA Type Broadband FM Antenna complete with standard support brackets for side mounting on conventional towers. Order by stock number as follows:

BFA-1A, single section FM antenna	MI-27925-1
BFA-2A, two-section FM antenna	MI-27925-2
BFA-3A, three-section FM antenna	MI-27925-3
BFA-4A, four-section FM antenna	MI-27925-4
BFA-5A, five-section FM antenna	MI-27925-5
BFA-6A, six-section FM antenna	MI-27925-6
BFA-7A, seven-section FM antenna	MI-27925-7
BFA-8A, eight-section FM antenna	MI-27925-8
BFA-10A, ten-section center-fed, FM antenna	MI-27925-10
BFA-12A, twelve-section center-fed, FM antenna	MI-27925-12

Accessory Equipment

De-Icers	MI-27926-*
Adaptor, Flanged 3⅛" to 1⅝"—51.5 ohms	MI-19113-C6

* De-Icers must be factory installed.

TABLE 1

RCA Type	Electrical Data					Dimensions in Feet†				Horizontal Windload*	
	Gain		Power Rating		Freq.						
	Power	Db	KW	Dbk	Mc	HC Top	HC Side	H Top	H Side	Less De-Icers	With De-Icers
						Interpolate for In-Between Frequencies					
BFA-1A	0.9	0.5	3	4.8	88	5.0	0.50	8.0	1.0	55	67
					98	5.0	0.50	8.0	1.0	55	67
					108	5.0	0.50	8.0	1.0	55	67
BFA-2A	1.9	2.8	6	7.8	88	10.0	5.55	18.1	11.1	215	261
					98	9.5	5.00	17.0	10.0	206	250
					108	9.1	4.60	16.2	9.2	200	242
BFA-3A	3.0	4.8	9	9.5	88	15.1	10.55	28.1	21.1	310	376
					98	14.0	9.55	26.1	19.1	294	356
					108	13.2	8.70	24.4	17.4	280	339
BFA-4A	4.0	6.0	12	10.8	88	20.1	15.60	38.2	31.2	406	492
					98	18.6	14.05	35.1	28.1	381	461
					108	17.3	12.80	32.6	25.6	361	436
BFA-5A	5.1	7.1	15	11.8	88	25.2	20.65	48.3	41.3	502	608
					98	23.1	18.60	44.2	37.2	469	567
					108	21.4	16.90	40.8	33.8	442	533
BFA-6A	6.3	8.0	18	12.6	88	31.6	27.10	61.2	54.2	620	752
					98	28.9	24.40	55.8	48.8	576	698
					108	26.7	22.20	51.4	44.4	541	654
BFA-7A	7.3	8.6	21	13.2	88	36.8	32.35	71.7	64.7	719	872
					98	33.6	29.15	65.3	58.3	667	808
					108	31.0	26.50	60.0	53.0	625	755
BFA-8A	8.4	9.2	24	13.8	88	42.2	37.70	82.4	75.4	819	994
					98	38.4	33.90	74.8	67.8	758	918
					108	35.3	30.80	68.6	61.6	709	856
BFA-10A	10.5	10.2	30	14.8	88	52.7	48.25	103.5	96.5	1407	1625
					98	47.9	43.45	93.9	86.9	1294	1492
					108	44.0	39.50	86.0	79.0	1201	1383
BFA-12A	12.5	11.0	36	15.6	88	63.4	58.90	124.8	117.8	1683	1943
					98	57.5	53.00	113.0	106.0	1552	1788
					108	52.6	48.10	103.2	96.2	1435	1652

† "Hc" (Top Mounting) Height of radiation center above top of tower.
"Hc" (Side Mounting) Height of radiation center above lowest part of bottom radiator.
"H" (Top Mounting) overall height of antenna above top of tower, not including obstruction lighting.
"H" (Side Mounting) Overall height of antenna measured from top of top radiator section to lowest part of bottom radiator section.

* Pounds based on 30 lb./ft.^{2} on projected areas of round surfaces.

AM-FM ANTENNA TOWERS

AND ACCESSORIES

FEATURES

- Wide selection of AM or FM Antenna Towers
- Self-supporting or guyed types of standard or custom-made designs
- RCA also furnishes tower lighting and other accessories
- RCA will help you plan your entire installation

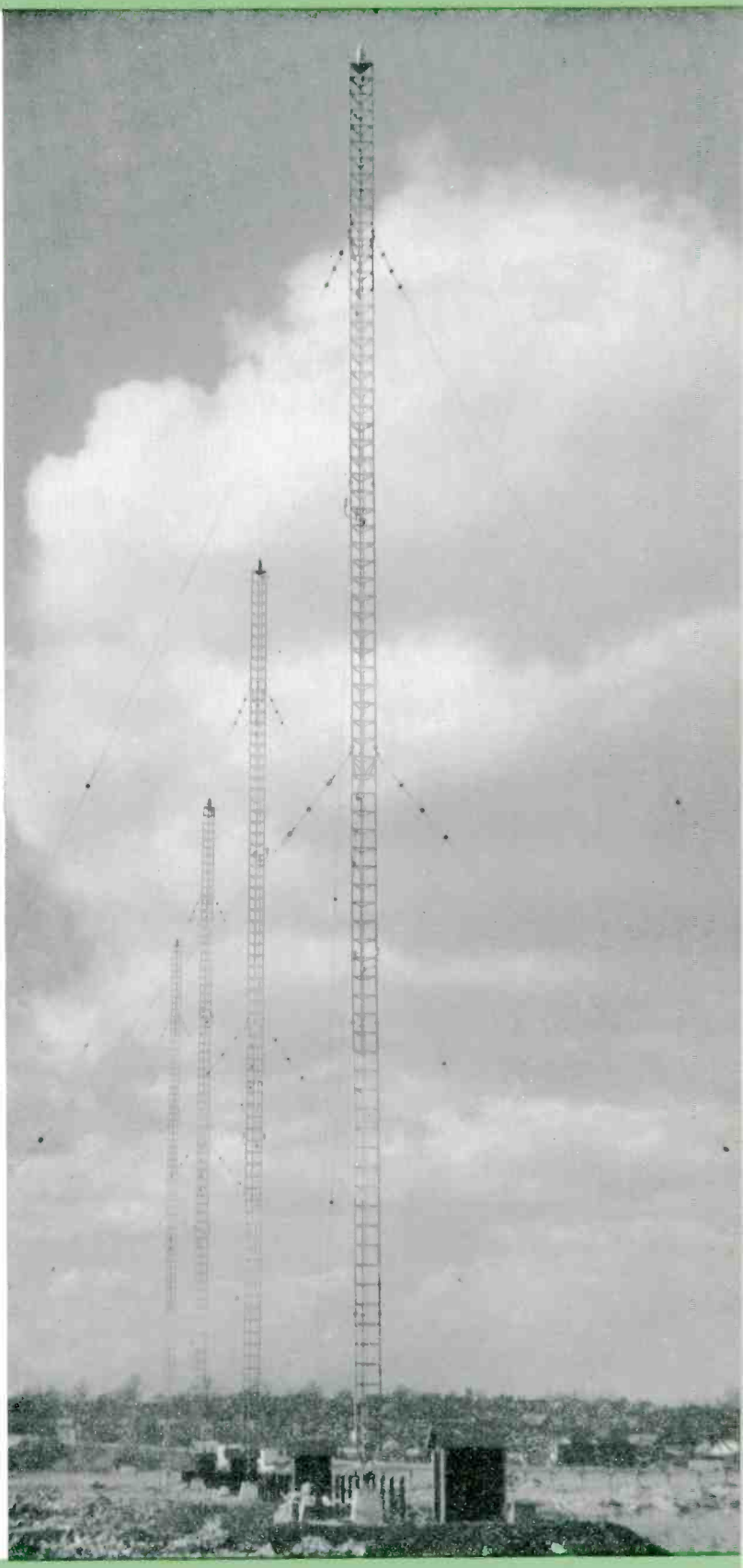
DESCRIPTION

RCA is well-qualified to assist you in the planning and selection of proper AM towers and a qualified erector to complete your installation. Improper or insufficient tower designs and poor erection and installation techniques should be avoided since they can be very costly to the Broadcaster.

Tower Considerations

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

1. Determine station location with respect to service area. This study which will involve among other things joint proximity to other stations, CAA approval, cost of land, zoning restrictions, local regulations, etc., will result in a decision to use:
   a. A self-supporting tower when land is unavailable as in city limits or on top of a building where total height of a tower is 500 feet or less.
   b. Or a guyed tower where land is available.
2. Determine design parameters:
   a. Wind load for area in which tower is located.
   b. Type of antenna which is to be supported (when FM).
   c. Ground system details.
3. Determine tower accessories such as:
   a. Ladders.
   b. Platforms.
   c. Railings.
   d. Lighting.
   e. Microwave dishes.



4. Determine method of routing transmission line if tower is used for FM taking into account:
   a. Accessibility.
   b. Location of structural members.
   c. Location of special networks below tower top.

Wide Variety of Types

A wide selection of towers is available for all applications . . . these include standard self-supporting and guyed designs as well as custom designs. In order to facilitate selection of the tower most suitable, and as an aid to the station in determining specific requirements, a sample questionnaire is included here.

ANTENNA TOWER QUESTIONNAIRE

LOCATION

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

QUOTATIONS TO BE FURNISHED

(Check those required)

Number of Towers.....( )

Ground System .....( )

Tower Guyed.....( )

Self-supporting.....( )

Tower Lighting Equipment.....( )

Tower Erection:

Tower Installation .....( )

Transmission Line Installation (FM).....( )

SPECIFICATIONS

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

Ground to top of base insulator.....

Tower Use: AM Radiator .....

Antenna support (when used for FM or TV).....

Channel or Frequency.....

FM or TV Antenna: Type.....

Description.....

Transmission Lines:

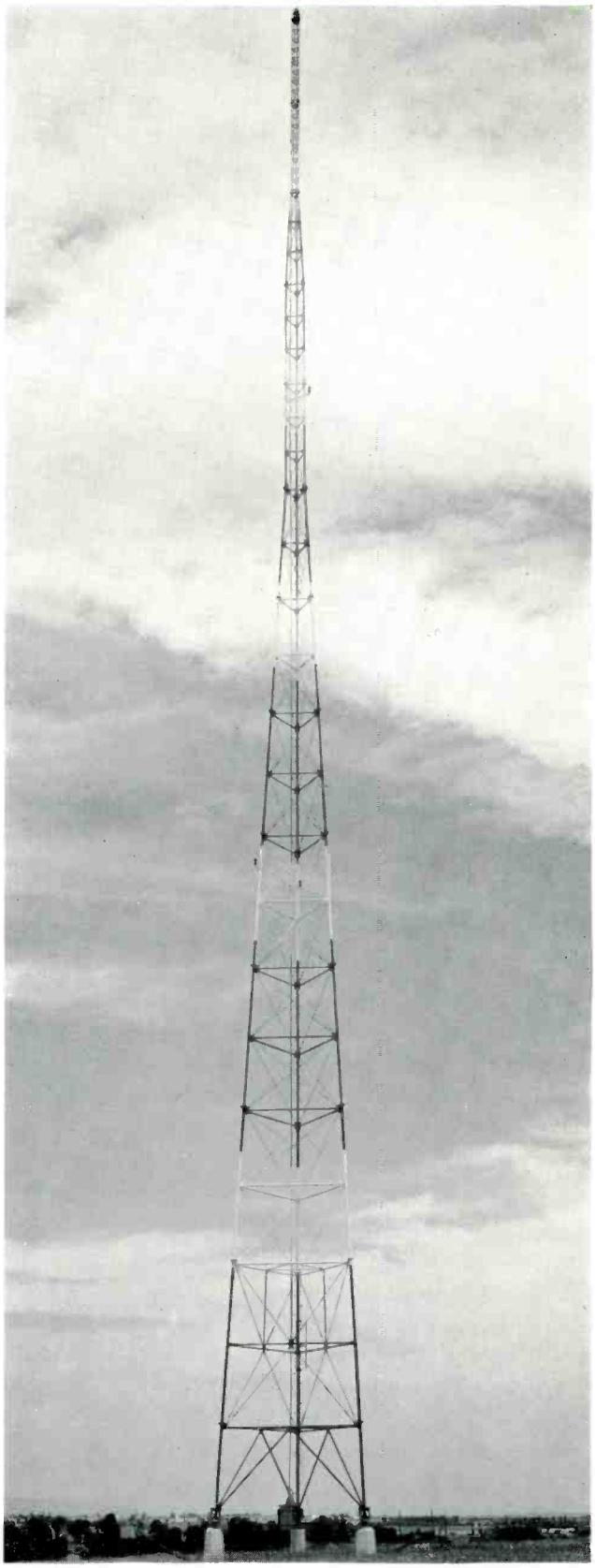
Size *No.*

Design Load: B-1 Open Country.....

B-2 Congested Area.....

Remarks:

(Special requirements, site accessibility, etc.)



Guyed Towers

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

Self-Supporting Towers

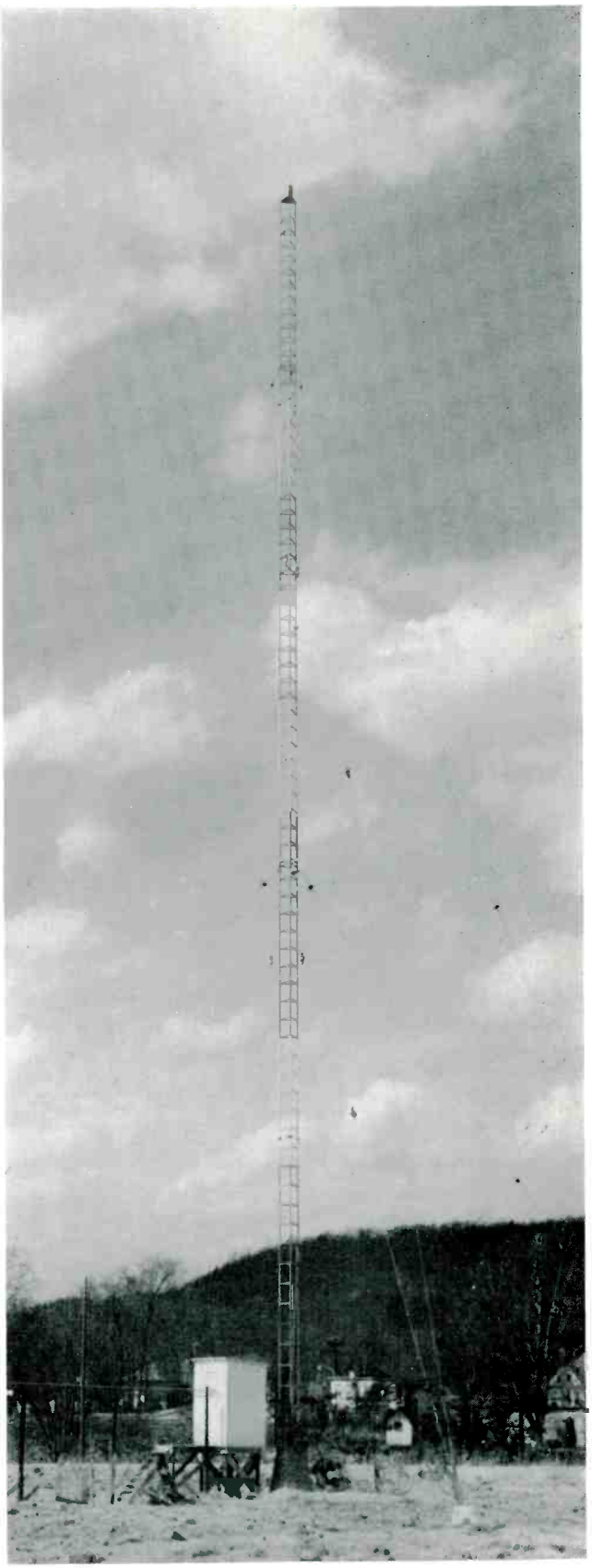
Self-supporting towers are especially advantageous in city and congested districts where land is expensive. For estimating required space for a self-supporting tower, the distance between tower legs can normally be considered as 1/8 the height of the structure.

Tower Construction

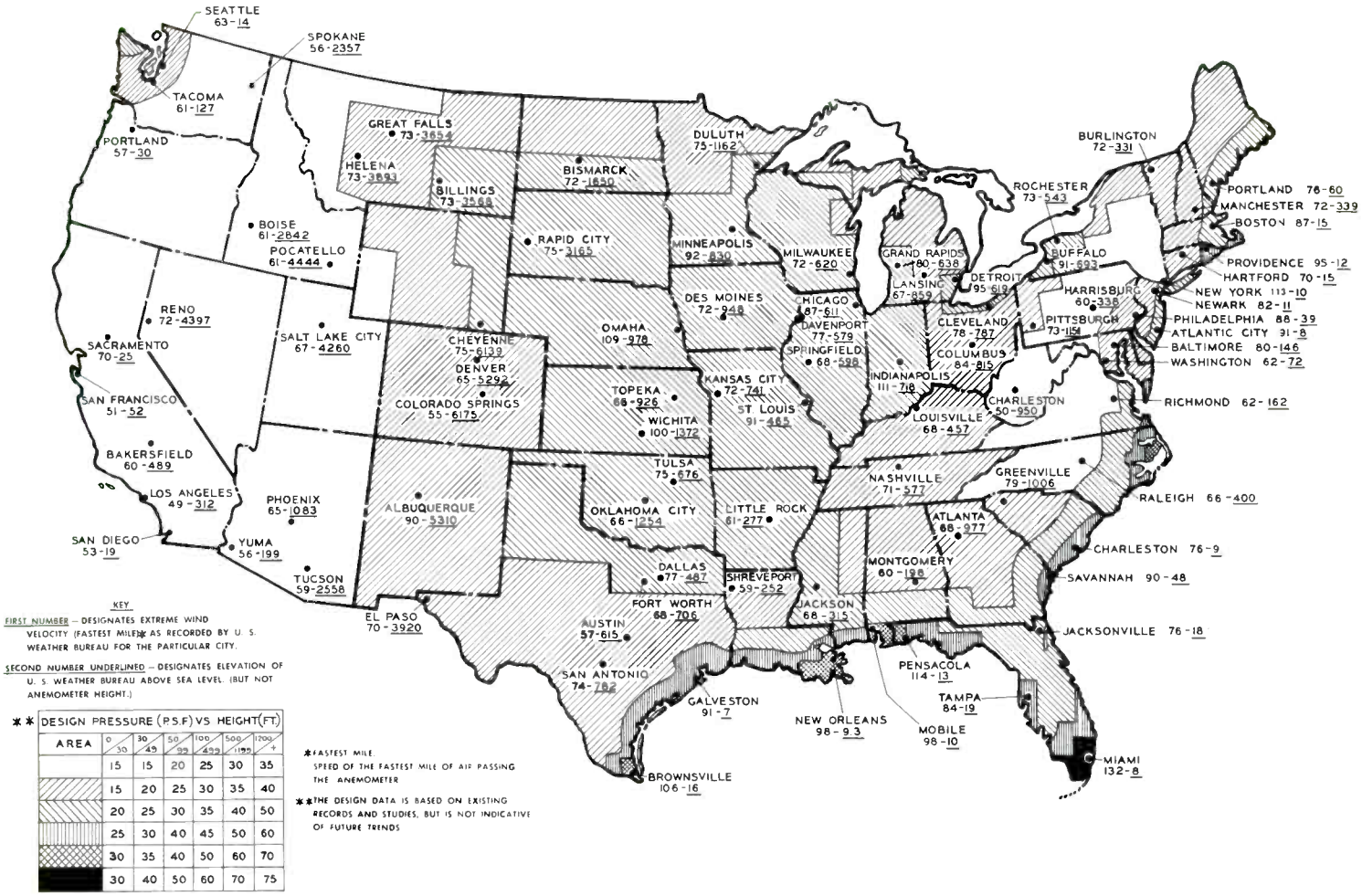
In both types of antenna systems a check for plumb and for proper guy tension should be made in order to obtain the required radiation patterns. Insofar as directional systems are concerned, the towers should be as nearly identical as possible with respect to guy wire, height, azimuth location, positioning of guy insulators, etc. No section of guy wire should be greater than a ⅛ wavelength of the operating frequency in order not to affect the radiation pattern. After the towers have been erected, all joints should be weld-bonded to assure a continuous steel radiator.

Steel towers may be hot dip galvanized, where corrosive action due to fumes, salt air, etc., are likely to occur. All towers should be painted to conform with FCC and CAA regulations.

Climbing ladders, when used, should be located inside the tower if at all possible and preferably near the tower legs. By placing the ladder within the tower, lattice braces form a safety cage for the serviceman. For FM the ladder is also an excellent support for transmission line runs as it is accessible at all times. The type of hangers (usually direct mounting) should be specified so that proper supporting members can be provided in the tower.



WIND VELOCITY AND PRESSURE MAP



KEY

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

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

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

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

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

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

Published records of the U. S. Weather Bureau are given as "maximum" (5 minute average velocity) or "extreme" (the speed of the fastest mile of air passing the anemometer). The selection of design loads should be based on "extreme" velocity. If no data is available on "extreme", the published "maximum" figures should be increased by approximately 20%.

The plotted areas shown on the map are derived from careful studies made by authorities in this field and the information is based on monthly and yearly average velocities, frequency of occurrence, probability of extremes, topographical conditions, etc.

Installations on mountain tops and areas subject to heavy icing conditions should be given special consideration. Building codes and zoning ordinances should also be carefully investigated.

Wind Load

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

Specifications

Towers are designed in accordance with RETMA specifications. Consultation with RCA Broadcast Representatives will help to determine your requirements. Call or write your nearest representative.

WIND VELOCITIES & CORRESPONDING PRESSURES

TRUE "EXTREME" VELOCITY MILES PER HOUR (NOTE No. 1)	FLAT SURFACES PRESSURE IN LBS./SQ. FT. OF PROJECTED AREA		CYLINDRICAL SURFACES PRESSURE IN LBS./SQ. FT. OF PROJECTED AREA		INDICATED VELOCITY MILES PER HOUR (NOTE No. 2)	
V_a	ASA $P = .0042\ V_a^2$	RETMA $P = .004\ V_a^2$	ASA $P = .0025\ V_a^2$	RETMA $P = .0026\ V_a^2$	V_1	
10	.42	.4	.25	.26	11	
15	.95	.9	.56	.58	17	
20	1.7	1.6	1.00	1.0	23	
25	2.6	2.5	1.6	1.6	30	
30	3.8	3.6	2.3	2.3	37	
35	5.2	4.9	3.1	3.2	44	
40	6.7	6.4	4.0	4.2	50	
45	8.5	8.1	5.1	5.3	57	
50	10.5	10.0	6.3	6.6	64	
55	12.7	12.1	7.6	7.3	71	
60	15.1	14.4	9.0	9.5	78	
65	17.8	16.9	10.6	11.2	85	
70	20.6	19.6	12.3	12.9	91	
75	23.6	22.5	14.1	14.9	98	
80	26.9	25.6	16.0	17.0	105	
85	30.4	28.9	18.1	19.0	112	
90	34.0	32.4	20.3	21.4	118	
95	37.9	36.1	22.6	23.8	125	
100	42.0	40.0	25.0	26.4	132	
105	46.3	44.1	27.6	29.1	138	
110	50.8	48.4	30.3	31.9	145	
115	55.5	52.9	33.1	34.9	152	
120	60.5	57.6	36.0	38.0	159	
125	65.6	62.5	39.1	41.3	166	
130	70.9	67.6	42.3	44.6	173	
135	76.5	72.9	45.6	48.1	180	
140	82.3	78.4	49.0	51.7	187	
145	88.3	84.1	52.6	55.5	194	
150	94.5	90.0	56.3	59.4	201	
155	100.9	96.1	60.1	63.4	208	
160	107.5	102.4	64.0	67.6	215	
165	114.3	108.9	68.1	71.7	222	
170	121.4	115.6	72.3	76.3	229	
175	128.6	122.5	76.6	80.9	236	
180	136.1	129.6	81.0	85.5	243	
185	143.7	136.9	85.6	90.4	250	
190	151.6	144.4	90.3	95.3	257	
195	159.7	152.1	95.1	100.4	264	
200	168.0	160.0	100.0	105.6	271	

THESE FIGURES ARE NOT SUBSTANTIATED BY ACTUAL TESTS BUT ARE EXTRAPOLATED

NOTE No. 1—Since 1932 published weather data based on 5 minute average known as "Maximum" and frequently on fastest mile known as "Extreme." Selection of antenna loads should be based on Extreme (increase "Maximum" by 20% if no data on Extreme).

NOTE No. 2—RCA bases strength of antennas on True Velocities, not Indicated. Indicated Velocities are those given by the Robinson 4 Cup Anemometer (now obsolete).

Tower Accessory Equipment

A number of tower accessories to complete the various type RCA AM and FM Broadcast Towers are available for all applications—these include tower grounding accessories, transmission lines and hangers, dehydrators, sampling lines, antenna feed lines, tower lighting equipment, hazard markers, weatherproof housings, and many miscellaneous items such as photo-cells, lighting transformers, and choke coils.

Ground Systems

Since the radiation pattern is computed on the basis of a perfectly conducting plane earth, and since earth's conditions depart radically from this assumption, a ground system of buried copper wires or ribbons must be installed in order to approach this ideal as closely as possible. The FCC minimum requirements consist of buried radial wires at least ¼ wavelength long. They should be as evenly spaced as practicable and in no event should less than 90 radials be used. This is a minimum FCC requirement and where possible a better ground system should be installed. A properly installed and adequate ground system can contribute much to the efficiency and stability of a radiation pattern and actual specifications for installation should be determined by the consultant.

It is suggested that a ground screen be used if high base currents are encountered. It should be placed in position at the base of the tower. This ground screen should be 23 gauge, expanded copper mesh, or equal. Each radial wire must be electrically bonded to the ground screen. There will be some installations in which the consultant will suggest the use of additional radials in lieu of the copper ground screen. They should be placed around the base of each tower and all radials used should be bonded to a heavy bus consisting of a copper ribbon three inches or more wide, or to a bundle of seven copper wires next to the concrete base of the tower. The insulator base and the lightning gap are bonded to the screens or to the bus around the concrete tower base. It is recommended that a No. 10 soft drawn copper wire be utilized for the radials and for the bundle of wires making up the bus.

Transmission Lines and Hangers

Careful consideration should be given to the layout and support of transmission line. Outline drawings with dimensions are available for all types of transmission lines and should be used in making a layout. There are two types of transmission line hangers. One type can be wrap-locked to the tower member, another type is bolted to the tower members. (See RCA Transmission Line and Hanger Catalogs.)

Sampling Lines

Coaxial lines of either semirigid or flexible type may be employed for a sampling system. All lines should be the same electrical length, whichever type is employed, in order to obtain correct phase indication; i.e., all lines must be of the same length as the longest line from antenna to phase monitor. The excess line on the shorter runs may be coiled and stored at either the antenna or the phase monitor end. Alternatively, it may be folded back upon itself.

The characteristic impedance of the transmission line must be chosen to match the input impedance of the particular type of phase monitor employed. These transmission lines, either semirigid or flexible, can be buried in the ground or carried back in the same trough that supports the transmission line. If the semirigid type is used, suitable provision should be made for variations in length due to temperature changes. The semirigid type of concentric line utilizes dry air as the dielectric. The air in these lines must be kept dry and provision should be made so that dry air can be flushed through the line and held at a pressure recommended for the transmission line used. Sampling accessories and methods of sampling are described in the RCA Phasing Equipment Catalog.

If isolation coils are requested or required, sampling cable or air-dielectric coax can be wrap-locked to the tower members and then connected to the isolation coils maintained in the tuning house at the base of the tower. From the isloation coil, the cable is connected to the phase monitor in the transmitter building. The cold end of the isolation coil should be bonded to the ground system. Actual specification for method and type of sampling system and type of transmission line should be determined by the consultant.

Antenna Feed Line

Line-termintaing units can be connected to the tower by means of copper tubing. The line should be flattened at one end and drilled for connections to the antenna-tuning unit terminal. This line is then run through a feed-through insulator in the tuning-house wall and the line is attached to the tower by a bolt or by brazing. At a point between the tower and feed-through insulator, the line should be formed into a one or two-turn coil, 12 to 18 inches in diameter. This coil can be self-supporting and is intended to retard lightning and aid in the breakdown at the ball or horn gap provided at the tower base to keep lightning discharges from damaging the equipment. (See Antenna Feed Line Catalog.)

Main beacon and side obstruction lights shown powered by use of either lighting transformer or lighting choke coil.

Tower Lighting

Lighting equipment must conform to FCC/CAA requirements as specified on the construction permit. All a-c lines can be buried or mounted on the poles carrying the transmission lines. It is recommended that isolation of lighting and r-f lines be obtained. In addition, further isolation of r-f and a-c power must be made when feeding the a-c to the tower lights. This can be provided by utilizing either an antenna lighting choke or an Austin lighting transformer. Either device provides a means of supplying energy to the tower-lighting circuits and at the same time prevents any appreciable loss of r-f energy supplied to the tower by the radio transmitter.

The Lighting Kits are engineered to meet CAA socket voltage requirements with a system voltage of 115/230 volts, 50/60 cycles. For ungrounded towers, provision must be made for isolation of lighting circuits over the base insulator. The beacons have approved red color filters as a marker light for obstructions to air navigation or can be provided with green or yellow color filters as an auxiliary identification aid at airports or other special applications. They are constructed of heavy aluminum castings with ventilated dome and concave base with drain port at lowest point to prevent accumulation of moisture from condensation. A hinged center frame provides easy access for inspection and lamp replacement. The optical system has four clear, heat-resistant lenses designed to provide correct beam distribution in accordance with CAA specifications.

Obstruction lights feature flanged Fresnel lenses seated against an especially compounded long life gasket cemented to the fixture base. Drain holes in the base prevent accumulation of condensation moisture within the unit. The housing is designed for use with 100 or 110-watt, 115-volt, medium screw base lamps and has a positive latch for easier maintenance on all models. Models with a choice of bottom or side entrance conduit fitting are available.

All lighting kits are provided with a beacon flasher designed to provide an intermittent source of electrical power for the flashing of Code and/or Hazard Beacons. This electro-mechanical device is housed within a watertight hinged aluminum enclosure and features heavy duty components. A photo-electric control is available on order for automatic regulation of the beacon flasher. It can be housed in the same waterproof housing. The unit is factory adjusted to turn On at 35 foot-candles and Off at 58 foot-candles in accordance with FCC regulations. Adjustable controls are provided to permit changing the On and Off illumination level points. Use of Photo-Electric Control eliminates need for daily recording the time tower lights are turned on and off manually.

SPECIFICATIONS

Tower Accessories

8′ x 24′ Section Expanded Copper Ground Screen	MI-27765
No. 10 Copper Wire	MI-28405-8
3″ x .032 Ground Strap	MI-28405-A2
4″ x .032 Ground Strap	MI-28405-A1
Double RF Antenna Lighting Choke	MI-7112-C
Triple RF Antenna Lighting Choke	MI-27726
Capacitor for Lighting Chokes	MI-27728-1
Weatherproof Housing	MI-27741
1.5-KW Austin Transformer	MI-28215-1
3-KW Austin Transformer	MI-28215-2
7-KW Austin Transformer	MI-28215-3
3000-Watt Fisher Pierce Photo-Cell	
4500-Watt Fisher Pierce Photo-Cell	
Hazard Markers (Set of 3 including installation material)	
"Hot Dip" Galvanizing of Angle Frame Work for Individual Markers	

Tower Lighting Kits

Tower Height	*No. Beacons*	*No. Obstruction Lights*	*Order No.*
21′ - 150′	0	1 double	A-1
151′ - 300′	1	2	A-2
301′ - 450′	1	4	A-3
451′ - 600′	2	6 (8 on sq. towers)	A-4
601′ - 750′	2	9 (12 on sq. towers)	A-5
751′ - 900′	3	9 (12 on sq. towers)	A-6
901′ - 1050′	3	12 (16 on sq. towers)	A-7
1051′ - 1200′	4	12 (16 on sq. towers)	A-8
1201′ - 1350′	4	15 (20 on sq. towers)	A-9
1351′ - 1500′	5	15 (20 on sq. towers)	A-10

(Lighting Kits include all materials required to light and wire a tower of heights specified, such as original and 100 percent spare lamps, beacon flasher, photo-electric control, color coded wire, stainless steel wraplock tape condulets, locknuts, supporting arms, unions, pipe compound, installation print, and bill of materials in accordance with FCC, CAA and National Electric Code Requirements.)

Antenna Coupler, 1250-watt for Series Feed, non weatherproof	MI-27785
Antenna Coupler, 1250-watt for Shunt Feed, non weatherproof	MI-27786

For other Antenna Accessories See RCA Catalogs on Antenna Tuning Units, AM-FM Phasing Equipment, Transmission Line, Hangers and Dehydrators.

FOOTAGE TABLE FOR BROADCAST TOWER HEIGHTS

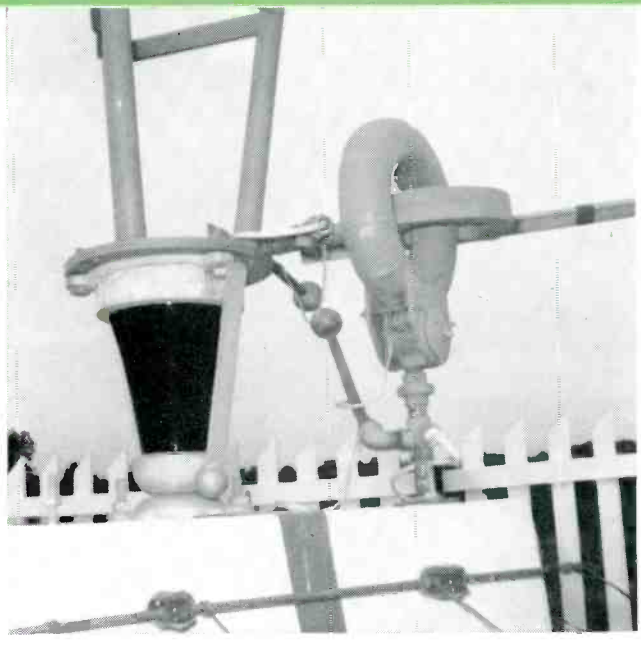
550 KC TO 1070 KC

KC	METERS	1 WAVE	½ WAVE	¼ WAVE
550	545	1787.6	893.8	446.8
560	536	1758.0	879.0	439.5
570	526	1725.3	862.6	431.3
580	517	1695.7	847.8	423.9
590	509	1669.5	834.7	417.3
600	500	1640.0	820.0	410.0
610	492	1612.7	806.3	403.1
620	484	1587.5	799.7	396.8
630	476	1561.2	780.6	390.3
640	469	1546.3	773.1	386.5
650	462	1515.3	757.6	378.8
660	455	1492.4	746.2	373.1
670	448	1469.4	734.7	367.3
680	441	1446.4	723.2	361.1
690	435	1426.8	713.4	356.2
700	429	1407.1	703.5	351.2
710	423	1387.4	693.7	346.8
720	417	1367.7	683.8	341.9
730	411	1348.0	674.0	337.0
740	405	1328.4	664.2	332.1
750	400	1312.0	656.0	328.0
760	395	1295.6	647.8	323.4
770	390	1279.2	639.6	319.8
780	385	1262.8	631.4	315.7
790	380	1246.4	623.2	311.6
800	375	1230.0	615.0	307.5
810	370	1213.6	606.8	303.4
820	366	1200.4	600.2	300.1
830	361	1184.0	592.0	296.0
840	357	1170.9	585.4	292.7
850	353	1157.8	578.9	289.4
860	349	1144.7	572.3	286.1
870	345	1131.6	565.8	282.9
880	341	1118.4	559.2	279.6
890	337	1105.3	552.6	276.3
900	333	1092.2	546.1	273.0
910	330	1082.4	541.2	270.6
920	326	1069.2	534.6	267.3
930	323	1059.4	529.7	264.8
940	319	1046.3	523.1	261.5
950	316	1036.4	518.2	259.1
960	313	1026.6	513.3	256.6
970	309	1013.5	506.7	253.3
980	306	1003.6	501.8	250.9
990	303	993.8	496.9	248.4
1000	300	984.0	492.0	246.0
1010	297	974.1	487.5	243.7
1020	294.1	964.6	482.3	241.1
1030	291.3	955.3	477.6	238.8
1040	288.5	946.2	473.1	236.5
1050	285.7	937.1	468.5	234.2
1060	283.0	928.2	464.1	232.0
1070	280.4	919.7	459.8	229.9

1080 KC TO 1600 KC

KC	METERS	1 WAVE	½ WAVE	¼ WAVE
1080	277.8	911.1	455.5	227.7
1090	275.2	902.6	451.3	225.6
1100	272.7	894.4	447.2	223.6
1110	270.3	886.5	443.2	221.6
1120	267.9	879.0	439.5	219.7
1130	265.5	870.8	435.4	217.7
1140	263.2	862.6	431.3	215.6
1150	260.9	855.7	427.8	213.9
1160	258.6	847.8	423.9	211.9
1170	256.4	840.9	420.4	210.2
1180	254.2	834.7	417.3	208.6
1190	252.1	826.8	413.4	206.7
1200	250.0	820.0	410.0	205.0
1210	247.9	813.1	406.5	203.2
1220	245.9	806.3	403.1	201.5
1230	243.9	799.1	399.5	199.7
1240	241.9	793.7	396.8	198.4
1250	240.0	787.2	393.6	196.8
1260	238.1	780.9	390.4	195.2
1270	236.2	774.7	387.3	193.6
1280	234.4	768.8	384.4	192.2
1290	232.6	762.9	381.4	190.7
1300	230.8	757.0	378.5	189.2
1310	229.0	751.1	375.5	187.7
1320	227.3	746.2	373.1	186.5
1330	225.6	739.9	369.9	184.9
1340	223.9	734.7	367.3	183.6
1350	222.2	728.8	364.4	182.2
1360	220.6	723.2	361.1	180.5
1370	219.0	718.3	359.1	179.5
1380	217.4	713.4	356.2	178.1
1390	215.8	707.8	353.1	176.5
1400	214.3	703.5	351.2	175.6
1410	212.8	696.9	348.4	174.2
1420	211.3	693.7	346.8	173.4
1430	209.8	688.1	344.0	172.0
1440	208.3	683.8	341.9	170.9
1450	206.9	678.6	339.3	169.6
1460	205.5	674.0	337.0	168.5
1470	204.1	669.4	334.7	167.3
1480	202.7	664.2	332.1	166.5
1490	201.3	660.2	330.1	165.0
1500	200.0	656.0	328.0	164.0
1510	198.7	651.7	325.8	162.9
1520	197.4	647.8	323.4	161.7
1530	196.1	643.2	321.6	160.8
1540	194.8	639.6	319.8	159.9
1550	193.5	634.6	317.3	158.6
1560	192.3	631.4	315.7	157.8
1570	191.1	626.8	313.4	156.7
1580	189.9	623.2	311.6	155.8
1590	188.7	618.9	309.4	154.7
1600	187.5	615.0	307.5	153.7

TOWER-LIGHTING TRANSFORMERS



Typical installation of lighting transformer to isolate ac lighting circuit from rf.

FEATURES

- **Independent of frequency—no tuning adjustments**
- **No housing required**
- **Eliminates leakage losses**
- **Dependable operation under all conditions**
- **Excellent regulation and efficiency**

USES

The Austin Insulating Transformer is a device for supplying a-c power to the lighting circuits of an insulated or sectionalized radio tower. Being independent of frequency, the same transformer may be used for any radio frequency and for a wide range of transmitting power.

DESCRIPTION

Austin Insulating Transformers provide an efficient, reliable method of supplying current to tower lighting circuits. The transformer consists of ring type windings with a clear air gap between primary and secondary rings. This type of construction makes the Austin transformer independent of radio frequency, thus requiring no tuning or adjustment. Since the windings are fully enclosed, no transformer housing is required, and the air gap between primary and secondary rings eliminates the possibility of surface leakage which may be appreciable in the housing covering other types. The total capacity added at the tower insulating zone is of the order of a very few micro-microfarads which produces only a slight effect upon the radio frequency circuit, and is constant under all weather conditions.

Installation is simplified since the Austin transformer requires no housing, chokes or filters. The primary of the transformer is usually attached to the base of the tower insulator or pier supporting the insulator. The secondary is supported by a conduit attached to the top of the insulator or to the tower above the insulator.

Austin tower-lighting transformers are available in sizes ranging from 700 watts to 7 kw. The larger sizes may be used to furnish extra energy for lighting neon or other signs on the tower, or for de-icing.

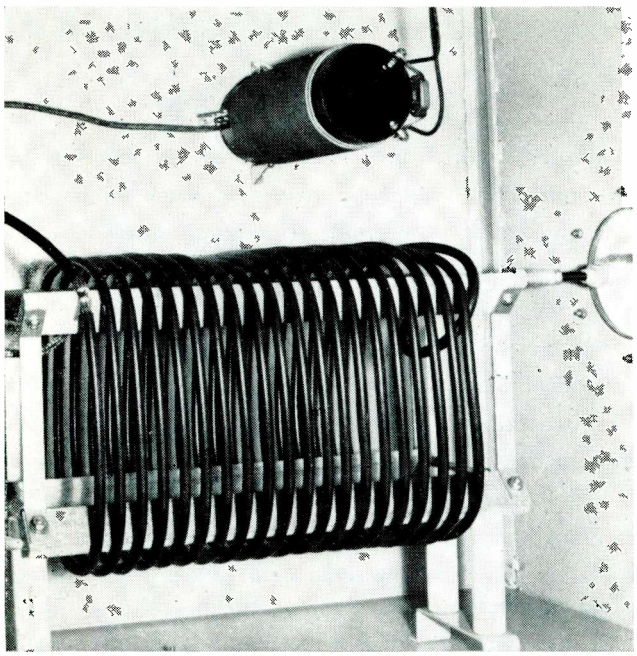
SPECIFICATIONS

Type	Primary Voltage	Secondary Voltage	Capacity	Secondary Taps	Net Weight
A-2101	115/230	115	1 to 1.75 kv.	None	85 lbs.
A-1971	115/230	115	2 to 3 kv.	10% over volt.	201 lbs.
A-2815	115/230	115/230	3 to 7 kv.	None	300 lbs.

Stock Identification:

A-2101	MI-28215-1
A-1971	MI-28215-2
A-2815	MI-28215-3

ANTENNA LIGHTING CHOKE COILS



View showing MI-7112-C Antenna Lighting Choke Coil mounted above isolation coil in weatherproof housing. RCA Type BPA Antenna Tuning Units have provisions for mounting chokes in same housing.

DESCRIPTION

In broadcast transmitter installations where the tower itself forms the antenna, special transformers or radio-frequency choke coils must be employed to feed power to the lighting circuits on the tower. The MI-7112-C Double Winding Choke Coil and MI-27726 Triple Winding Choke Coil have been designed for this purpose. Their electrical characteristics are such that they present a low impedance to commercial lighting frequencies and a high impedance to radio frequencies in the broadcast range. They, therefore, provide a means for supplying energy to the tower lighting circuits and at the same time prevent any appreciable loss of r-f energy supplied to the tower by the radio transmitter.

The coils consist of double or triple windings on a bakelite form, coated with an insulating varnish which binds the turns together and prevents moisture absorption. The coils must be protected from weather by installing them within some weatherproof enclosure. All windings that are not directly connected to the tower or ground should be properly bypassed by suitable capacitors.

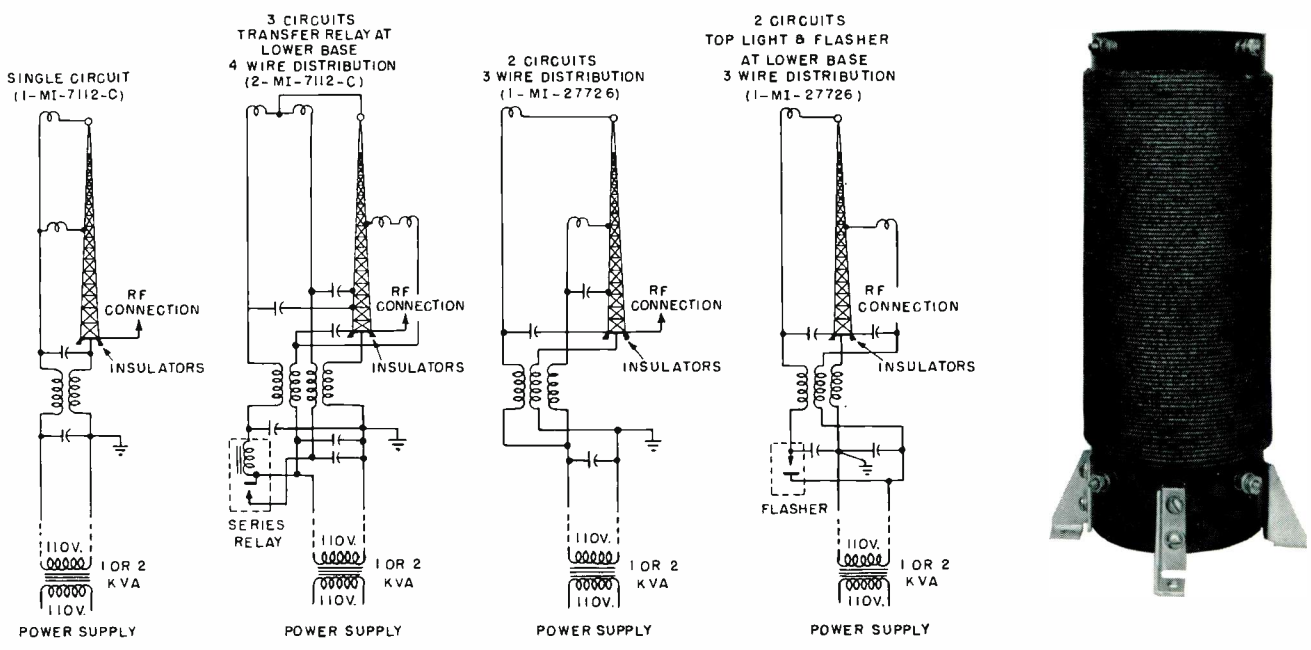
SPECIFICATIONS

Maximum Continuous Current (50/60 cycles)	15 amperes
D-C Resistance (each winding)	Approx. 0.15 ohms
Inductance at 1 mc	360 microhenries
Length	11⅝"
Diameter	4"
Stock Identification:	
Choke Coil, Double Winding	MI-7112-C
Choke Coil, Triple Winding	MI-27726

Accessories

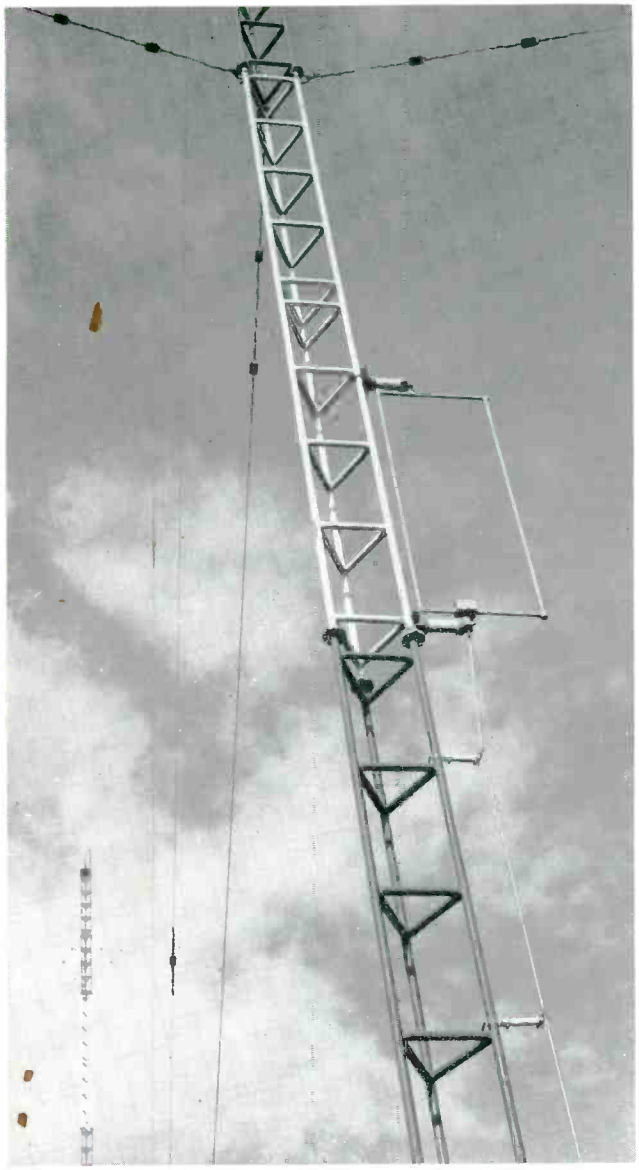
Capacitors .01 MFD	MI-27728-1
Weatherproof Housing	MI-27741

Typical Antenna Tower Lighting System diagrams and close-up view of Choke Coil, MI-7112-C.



AM ANTENNA ACCESSORIES

PHASE SAMPLING LOOPS



FEATURES

- Sampling loops and isolation coils
- Isolation filters
- AM dummy loads
- Remote antenna ammeters
- Bowl insulators

DESCRIPTION

Shielded Sampling Loop, Type 173-10, provides a sensitive and highly accurate method of sampling tower currents in directional antenna arrays. Completely shielded to eliminate electrostatic coupling, the loop responds only to the radiated magnetic field. In addition, it is unaffected by ice accumulation or other weather conditions. Consisting of two turns of insulated No. 10 copper wire enclosed and supported in a ⅞-inch copper tubing shield, the loop is mounted on two heavy porcelain standoff insulators. Sensitivity is adjusted by rotating the loop on a pivot bearing designed to lock in any position. Self impedance is not affected by rotation. The sampling line (70 ohm) enters the loop through the bottom pivot shaft and may be easily connected by removing the cover on the input housing. The loop may be used with pressurized, air insulated or solid dielectric line. Universal brackets permit mounting on any tower leg. The loop measures 72 inches high, 24 inches wide.

Standard Unshielded Loops

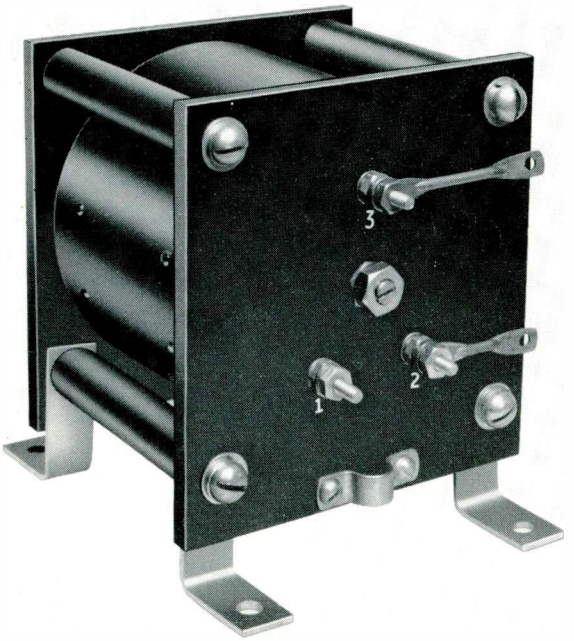
Sampling Loop, Type 173-11-1, is a three sided loop designed for grounding to the tower leg which serves as the fourth side. Sensitivity is adjusted by varying the distance between the outside leg of the loop and the tower. Construction is of heavily plated steel tubing. The assembly includes mounting clamps and all necessary hardware for mounting and for connecting 70 ohm sampling line. Shipped disassembled with instructions and special tools needed for assembly. Dimensions: 73 inches high by 30 inches maximum width.

Sampling Loop, Type 173-11-2, is a fully insulated loop with provision for sensitivity adjustment by varying the loop position in its mounting clamps. The insulated feature permits phase sampling without the use of an isolation filter on simple arrays and low impedance towers. Construction is plated steel and all hardware for mounting and connection of 70 ohm sampling line is furnished. Shipped disassembled with instructions and special tools. Dimensions 73 inches high by 41¼ inches wide.

Equipment Supplied

Shielded, Rotatable, Insulated Sampling Loop (173-10)	MI-27739
Shielded, Rotatable, Insulated Sampling Loop (173-10-2) for use with RG-8U/11U Cable	MI-27759
Unshielded, Grounded Sampling Loop (173-11-1)	MI-27730
Unshielded, Insulated Sampling Loop (173-11-2)	MI-27731

SAMPLING COIL, MI-8217-A



Sturdily built pick-up coil which provides the Phase Monitor with sampling current from antenna for phase and amplitude monitoring.

The antenna current and phase Sampling Coil comprises a tuned circuit constructed with an internal double electrostatic shield, so that the user need provide magnetic shielding only. It is normally mounted in the antenna tuner housing or in a separate housing between the tuner and the antenna. This unit feeds a sampling current to the a Phase Monitor.

Dimension (clearance) ..... 5" x 5" x 5"
Stock Identification MI-8217-A

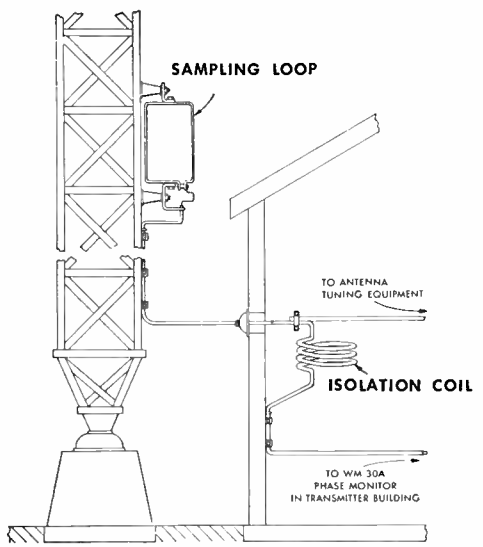
BOWL INSULATORS, MI-27723 and MI-27724

For transmitter carrier powers up to and including 50 kilowatts. Bowl Insulator assemblies are ideal for taking r-f leads into or out of antenna tuner or phasing equipment. The bowls of heavy electrical glass measure have a maximum diameter of $6\frac{15}{16}$ inches and are $4\frac{3}{8}$ inches high including cork gasket. The steel mounting flange is $7\frac{3}{4}$ inches in diameter and has six $\frac{3}{16}$-inch mounting holes. The insulator comes complete with spun aluminum corona shield, threaded lead-in stud, and all mounting hardware.

The same bowl insulator is available with a hollow stud, for use where it is necessary to carry power lighting wires out of the tuner house on the same insulator which carries the r-f conductor.

Stock Identification

Bowl Insulator, complete with fittings, solid stud and shield MI-27723
Bowl Insulator, complete with fittings, hollow stud and shield MI-27724

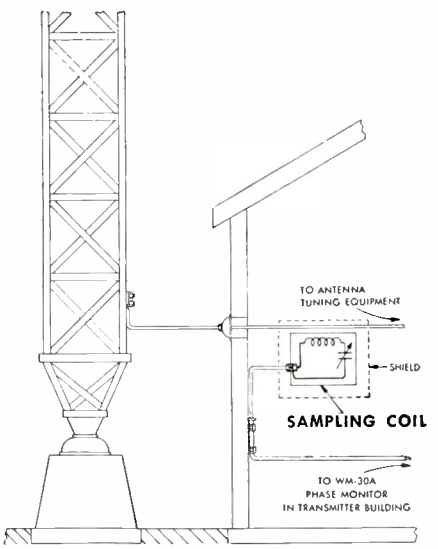


Typical installation of Sampling Loop and Isolation Coil.

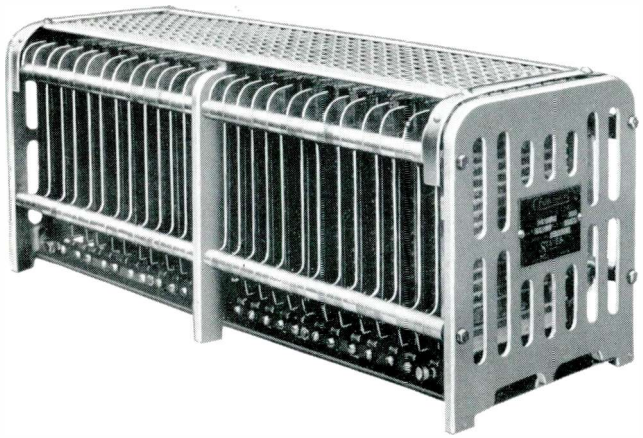
ISOLATION COIL. This inductor is used to present a high impedance which avoids the short-circuiting of the antenna, and yet permits the transmission of the sampling voltage. It is required whenever the sampling line or pickup loop is bonded to the tower.

SAMPLING LOOP. Provides a method of obtaining a voltage (proportional to the antenna current) for operation of the current sampling meter and phase monitor. Rugged copper tubing provides electrostatic shielding for the internal pickup conductor. The Loop is insulated from the tower and may be rotated to permit adjustment of pickup sensitivity.

SAMPLING COIL. Provides an alternate method of obtaining a voltage (proportional to the antenna current) for operation of the Sampling Current Meter and Phase Monitor. The Sampling Coil (MI-8217A) consists of a shielded pick-up coil resonated by a variable capicitor. Tower-mounted installations are avoided and greater accessibility for maintenance is provided.



Typical installation of MI-8217-A Sampling Coil.



AM DUMMY LOADS

DESCRIPTION

Ohm-spun Resistance Loads provide adjustable loads for testing meters, instruments, motors and relays in the field. They are used also in electrical laboratories and on Radio Transmitters where a non-inductive resistance is essential.

The resistors provide the necessary resistance for controlling current and may be mounted either in groups or banks or separately. Construction of the units permit the highest possible wattage dissipation with a minimum wire temperature, as the resistance wire is supported in open air. Ohm-spun units are woven with asbestos thread impregnated with heat resistance cement. The output is little affected by temperature as all the larger wattage units are woven with wire having practically zero temperature co-efficient of resistance.

The Resistance Loads are made in different ampere and voltage capacities to fit individual requirements. The following loads are supplied by RCA at any impedance of frequency specified by the customer:

½ KW AM Dummy Load	Ohm-spun Type "WG"
1 KW AM Dummy Load	Ohm-spun Type "WG"
5 KW AM Dummy Load	Ohm-spun Type "WG"
10 KW AM Dummy Load	Ohm-spun Type "WG"
50 KW AM Water Cooled Load	MI-27029-3

ISOLATION FILTER INDUCTORS

DESCRIPTION

Johnson isolation filters provide high efficiency transfer of a sampling current across the tower base insulator. Used on sampling line when tower is ¼ wave or higher, they present a high shunting impedance at the tower base. Consisting of an inductor (approximately 180 uh) wound of ⅜-inch copper coaxial sampling line and including accessory fittings; they are available in two models:

The 172-74 consists of the isolation inductor only with coaxial fittings and mounted on 4-inch standoff insulators.

The 172-75 is supplied in a heavy, copper plated steel cabinet with a Johnson lead-in bowl at the high voltage termination.

Isolation Inductors consisting of helical winding of coaxial cable are available for isolating the tower sampling loop line from the AM tower. They prevent any appreciable loss of r-f energy supplied to the tower by the radio transmitter. The inductors can be provided with panel wall mounts of weatherproof housings.

Stock Identification

Isolation Filter, ⅜" coaxial type insulated mounting (172-74)	MI-27735
Isolation Filter, ⅜" coaxial type, in cabinet (172-75)	MI-27764
Isolation Inductor RG-11/U, 75 ohms (172-63)	MI-27756-1
Isolation Inductor RG-8/U, 52 ohms (172-64)	MI-27756-2
Isolation Inductor RG-11/U, 75 ohms, Panel Wall Mount (172-65)	MI-27756-3
Isolation Inductor RG-8/U, 52 ohms, Panel Wall Mount (172-66)	MI-27756-4
Isolation Inductor RG-11/U, 75 ohms, in Weatherproof Housing (172-47)	MI-27756-5
Isolation Inductor RG-8/U, 52 ohms, in Waetherproof Housing (172-48)	MI-27756-6
Isolation Inductor ⅜" Styroflex, 50 ohms	MI-27756-7
Isolation Inductor ⅜" Styroflex, 70 ohms	MI-27756-8
Isolation Inductor ⅜" Spirafil, 50 ohms	MI-27756-9
Isolation Inductor ⅜" Spirafil, 70 ohms	MI-27756-10

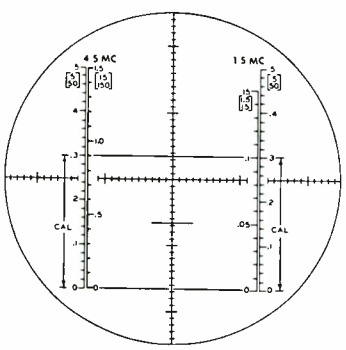
DESCRIPTION (Cont'd)

A feature of special value in television work is the presetting of the sweep positions to provide automatic lock-in on vertical- and horizontal-frequency signals. The sweep-frequency control also is continuously adjustable from 10 cps to 100 kc. The sweep oscillator has excellent stability at high sweep rates, a fast retrace, and adequate linearity throughout its frequency range. The overall frequency range of the oscillator is divided into four basic ranges; a vernier adjustment, which overlaps the basic sweep ranges, provides exact adjustment of the sweep frequency. The amount of sync signal fed to the sweep oscillator may be adjusted by means of a front-panel control. Sweep synchronization is exceptionally stable throughout the sweep range of the oscillator.

A Z-Axis input terminal is provided on the front panel of the WO-91A to permit direct modulation of the control grid of the cathode-ray tube. This is useful in special applications requiring trace blanking and time calibration of the sweep trace. A control switch is also provided for reversing the vertical polarity of the trace. By means of this control, the trace may be displayed in an upright or inverted position.

To facilitate its use, the oscilloscope is equipped with a specially designed single-unit probe and input cable. This WG-300B Direct/Low-Capacitance Probe and Cable is provided with a sliding switch in the probe housing which permits its use in circuits which would not function properly if loaded down by a conventional oscilloscope. A WG-302 RF/IF/VF Signal Tracing Probe is a useful accessory for rapid isolation of trouble in r-f, i-f, and video stages.

New Graph Screen with "VTVM"-type scales simplifies voltage measurement. Here's how:



"Zero" base line corresponds to "Zero" on VTVM scales.

Vertical scales are multipurpose; full-scale points correspond to switch settings of "V" range control.

Scales are linear and are subdivided into voltage values.

SPECIFICATIONS

Performance Specifications

Frequency Response (reference frequency 10 kc):

Vertical Amplifier:

Wide-Band Positions 10 cps to 4.5 mc.....Within ±1 db

High-Sensitivity Positions 10 cps to 0.5 mc.....Within —1 db

High-Sensitivity Positions 10 cps to 1.5 mc.....Within —6 db

Horizontal Amplifier 10 cps to 500 kc.....Within —6 db

Deflection Sensitivity:

Vertical Amplifier:	*Wide-Band Positions* rms	p/p	*High-Sensitivity Positions* rms	p/p	
At V INPUT Connector.....	0.053	0.15	0.018	0.05	volt/in
With WG-300B set to "DIRECT"	0.053	0.15	0.018	0.05	volt/in
With WG-300B set to "LOW CAP"	0.53	1.5	0.18	0.5	volt/in

Horizontal Amplifier at H INPUT terminal.....0.15 rms volt/in

Average Rise Time (Vertical Amplifier):

4.5 MC Positions.....0.1 μsec

1.5 MC Positions.....0.5 μsec

Maximum A-C Input Voltage (in presence of 600 volts d-c).....600 p/p volts

Input Resistance and Capacitance:

Vertical Amplifier:

At V INPUT Connector.....1 megohm shunted by 40 μμf

With WG-300B set to "DIRECT".....1 megohm shunted by 75 μμf

With WG-300B set to "LOW CAP"..10 meghoms shunted by 11 μμf

Horizontal Amplifiers (at H INPUT terminal).....10 megohms shunted by 30 μμf

Sync Input Terminal.....0.5 megohm shunted by 35 μμf

Sweep-Circuit Frequency (variable).....10 to 100,000 cps

Z-Axis Input:

Minimum Input Voltage for Blanking.....12 rms volts

Frequency Response.....3 cps to 500 kc

Tube Complement

1—6AN8	1—12AT7	1—12AX7	1—1V2
2—6J6	1—12AU7	1—5Y3-GT	1—5UP1

Power Supply.....105-125 volts, 50/60 cycles

Power Input.....65 watts

Dimensions.....13½" high, 9" wide, 16½" deep Weight.....30 lbs.

Finish.....Blue-gray hammeroid case, brushed-aluminum panel

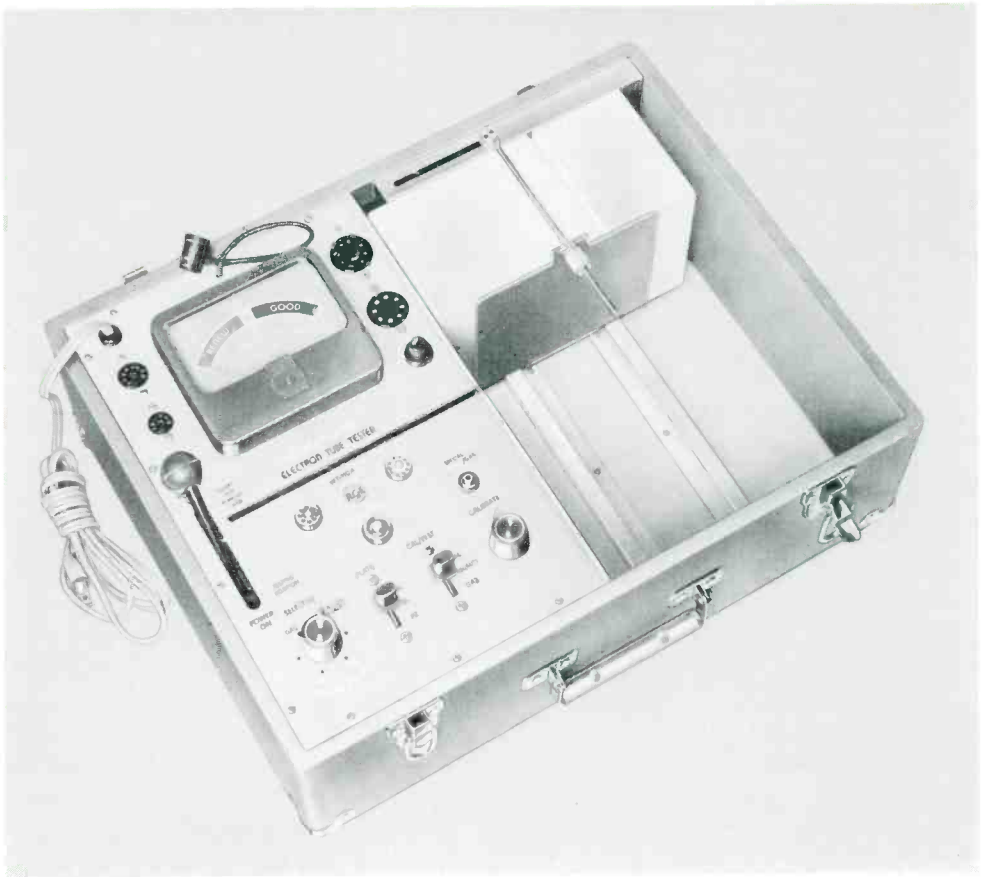
Equipment Supplied

5" Cathode-Ray Oscilloscope.....WO-91A

Including tubes in place, direct/low-capacitance probe and cable, alligator clip, clip insulator, ground cable, green graph screen, and instruction book.

AUTOMATIC ELECTRON-TUBE TESTER

TYPE WT-110A



FEATURES

- Provides rapid check for all popular receiving type tubes for general quality, including interelectrode shorts and leakage
- Tube-pin and test-voltage connections automatically set up by use of individual punched card for each tube type
- Cards for new tube types can be prepared by user
- Front panel calibration control permits compensation for above or below normal line voltage
- Easily replaceable screw-mounted tube sockets
- Lightweight, portable instrument housed in plastic covered case

USES

The RCA WT-110A Automatic Electron-Tube Tester is designed to give a rapid check of a tube's usability by checking transconductance, gas, shorts between elements, and balance between sections of twin type tubes. In a matter of seconds readings are provided on a 4½" meter in terms of "Renew — ? — Good" for all popular receiving type tubes. Other tube types can be included merely by preparing punched cards for those types of special interest. The gas condition of the tube is also indicated on the meter.

The outstanding feature of the WT-110A is the use of an individual punched card for each different type tube to automatically set up all tube-pin and test-voltage connections when the card is inserted into the panel slot of the tester. It is not necessary to adjust external switches or other controls to set up pin and operating-voltage connections for the tube. The WT-110A is designed for general service and testing use by skilled or unskilled personnel.

DESCRIPTION

The WT-110A Automatic Electron-Tube Tester is a modern high-speed test device utilizing methods of automation. The "brain" or control-center of the instrument consists of a matrix made up of two gold plated printed circuit boards interconnected by gold plated pins, springs and eyelets. The matrix is activated by inserting a punched card and slipping the power lever into operating position. This simple process immediately sets-up a combination of from 15 to 20 circuits which permit: socket connections to as many as ten pins, 220 combinations of heater voltage, 10 bias voltages, 5 plate voltages, 11 values of cathode resistors, 2 screen voltages and 50 quality sensitivity ranges. In a matter of seconds the tester gives a true indication of a tube's usability by checking transconductance, gas, shorts between elements and balance between sections of twin type tubes. It also tests each section of multi-section type tubes with no paralleling of sections.

A set of pre-punched cards for 7-pin and 9-pin miniature, octal- and loctal-type receiving tubes is supplied with the WT-110A. The cards, made of durable plastic, are permanently hinged in the case adjacent to the tester and are indexed in numerical-alphabetical sequence by tube type. The punched-card system accommodates the popular receiving-tube types employed in television and radio receivers, including diodes, triodes, tetrodes, pentodes, and multiunit receiving tubes which have similar and dissimilar units. The instrument can also be used to check certain industrial type tubes. Cards may be prepared for additional tube types. Card punching information is obtainable from the Radio Corporation of America.

The Automatic Electron-Tube Tester has a front panel calibration control to permit compensation for above- or below-normal line voltage, easily replaceable screw-mounted tube sockets, and steel pin-straighteners mounted on the front panel. Special provisions are included for making high-resistance interelectrode leakage and low-value gas-current tests on certain tube types. These special provisions make possible a better evaluation of tube types used in applications having critical leakage or gas limitations.

The WT-110A is housed in an attractive blue plastic-covered case with detachable cover. The panel is satin-finished aluminum. A 4½" clear-reading meter scaled 0-100 μamps indicates tube condition at a glance. Weight of the instrument, with cards, is approximately 25 pounds. The unit measures 17¼" wide, 13¼" deep and 6⅝" high. Power consumption is approximately 50 watts.

Certain tube types which have bases and pin arrangements different from those provided for on the WT-110A may be tested if an appropriate tube-socket adapter is used. These adapters, which plug into the octal socket on the WT-110A panel, are available as accessory equipment. One set accommodates tubes with small 4-pin, 5-pin, 6-pin or 7-pin bases and medium 7-pin bases; another set is available for testing 7-lead in-line subminiature tubes; and there is a set to accommodate testing of 8-lead circular subminiature tubes.

SPECIFICATIONS

Electrical Specifications

Power Requirements..... 117 volts, a-c, 50 or 60 cycles, single phase

Power Consumption..... .....50 watts

Circuits.....Automatic matrix activated by punched card with provisions for: 220 combinations of heater voltage; 10 bias voltages; 5 plate voltages; 11 values of cathode resistors; 2 screen voltages; 50 quality sensitivity ranges

Mechanical Specifications

Socket connections.....Up to ten pins

Dimensions:

Width ..... 17¼"

Depth ..... 13¼"

Height ..... 6⅝"

Weight .... 25 lbs.

Finish..... .....Satin-finished alumninum panel, blue plastic covered case

Equipment Supplied

Automatic Electron-Tube Tester.....WT-110A
Including Tube Tester with 1 set of punched cards, one master punched card, one test card, warranty registration card, and instruction booklet.

Accessory Equipment

Tube Socket Adapter Set.....WG-337A
4 adapters for testing tubes with small 4-pin bases, small 5-pin bases, small 6-pin bases, and small and medium 7-pin bases in WT-110A

Tube Socket Adapter.....WG-338A
For testing 7-Lead In-Line Subminiature Tubes in RCA WT-110A

Tube Socket Adapter.....WG-339A
For testing 8-Lead Circular Subminiature Tubes in WT-110A

MASTER VOLTOHMYST

TYPE WV-87B

FEATURES

- **Direct readings of peak-to-peak values of complex waves for signal-tracing in TV receivers and other electronic devices employing pulse trigger and timing circuits**
- **Tracking error of meter less than ±1%**
- **Negative-feedback bridge circuit for good scale linearity and freedom from effects of line-voltage variations**
- **Fully enclosed metal case for strength and for stability in r-f fields**
- **Direct-current readings as low as 10 microamperes for applications requiring extremely high meter sensitivity**

USES

The WV-87B Master VoltOhmyst is a deluxe instrument useful for television, radar, and other types of pulse work. It has facilities for the direct measurement, on separate scales, of peak-to-peak voltage values of complex waveforms and the rms voltage values of sine waves. It also reads d-c voltage, resistance, and direct current. Vacuum tubes are employed in all functions except current measurement to assure excellent sensitivity and stability.

DESCRIPTION

The WV-87B VoltOhmyst is encased in metal to provide stability in r-f fields and features a negative-feedback bridge circuit for good scale linearity and freedom from effects of line-voltage variations, a 200-microampere meter movement having a tracking error of no more than plus or minus one per cent, and a ratio increase of approximately 3 to 1 in the full-scale voltage points. The meter is electronically protected against burn-out on all a-c and d-c voltage and resistance ranges. It has a large, full-view 8½" meter which makes it especially useful as a permanently mounted instrument, though it is lightweight and has a carrying handle for easy portability.

Furnished with the instrument is a Type WG-299C DC/AC-ohms probe, and cables for use in making a wide variety of accurate electrical measurements, alligator clip insulator and instruction booklet. The instrument has portable carrying handle and is suited for permanent rack-mounting.

SPECIFICATIONS

D-C Voltmeter:	
Ranges	0 to 1.5, 5, 15, 150, 500, 1500 volts
Input Resistance	11 megohms at all ranges
Sensitivity	7.3 megohms/volt on 1.5-volt range
Overall Accuracy	±3% of full scale
A-C Voltmeter:	
Peak-to-Peak Ranges	0 to 4, 14, 42, 140, 420, 1400 and 4200 volts
RMS Ranges (for Sine Wave)	0 to 1.5, 5, 15, 50, 150, 500 and 1500 volts
Overall Accuracy	±3% of full scale
Input Resistance and Capacitance	0.83 megohm shunted by 85 μμf (with direct probe and cable at 1.5, 5, 15, 50 and 150-volt ranges)
Frequency Response	30 cps to 3 mc up to and including the 500-volt range for source impedance of approximately 100 ohms or lower
Ohmmeter	0 to 1000 megohms in 7 ranges
Direct Current Meter:	
Nine Ranges	0 to 0.5, 1.5, 5, 15, 50, 150, 500 milliampers; 0 to 1.5, 15 amperes
Overall Accuracy	±3% of full scale
Tube and Battery Complement:	
2—6AL5 1—12AU7	
Power Line Requirements	105-125 volts, 50/60 cycles, 5 watts
Dimensions	10" high, 13½" wide, 7" deep
Weight	8 lbs.
Finish	Blue-gray hamnieroid case, satin-aluminum panel
Stock Identification	WV-87B

SENIOR VOLTOHMYST
TYPE WV-98A

The WV-98A Senior VoltOhmyst provides direct peak-to-peak measurement of complex wave shapes up to 1400 volts and is especially useful for television signal tracing and industrial servicing. Quantitative measurements of practically all of the important complex waveform voltages found in video, sync and deflection circuits can be obtained with the instrument. The WV-98A is a deluxe instrument having such refinements as seven non-skip ranges on all functions, wide frequency range and extended voltage range. It is provided with a Type WG-299B DC/AC Ohms Probe and shielded cable. Avaliable as accessories are a slip-on crystal probe, WG-301A, which permits rms measurements in r-f circuits up to 250 mc, a high-voltage probe, type WG-289, and a multiplier resistor, WG-206, which extended the d-c voltage range of the instrument to 50,000 volts, and multiplies all scales by 100 times.

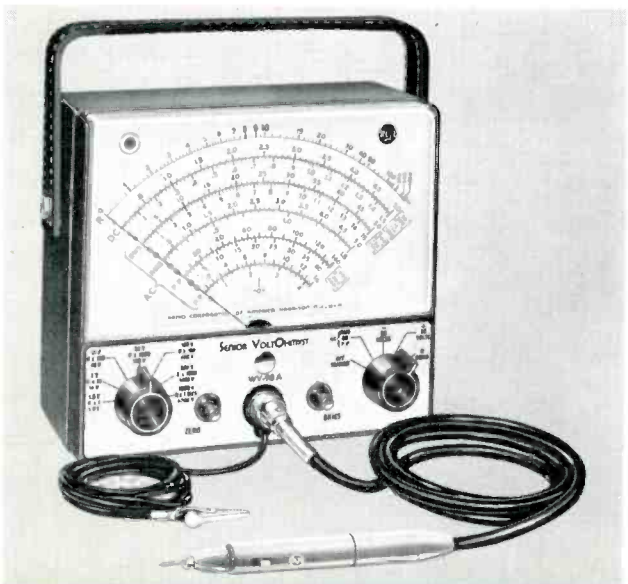
SPECIFICATIONS

D-C Voltmeter:
- Seven Continuous Ranges: 0 to 1.5, 5, 15, 50, 150, 500, 1500 volts
- Input Resistance (including 1 megohm in D-C Probe): 11 megohms
- Sensitivity for the 1.5 Volt Range: 7.3 megohms-per-volt
- Over-all Accuracy: ±3% of full scale

A-C Voltmeter:
- Peak-to-Peak Ranges: 0 to 4, 14, 42, 140, 420, 1400, 4200 volts
- RMS Ranges (for sine waves): 0 to 1.5, 5, 15, 50, 150, 500 1500 volts
- Input Resistance and Capacitance with WG-218 Probe and Cable
  - 0.83 megohm shunted by 70 μμf at 1.5, 5, 15, 50, 150 volt ranges
  - 1.3 megohms shunted by 60 μμf at 500 volt range
  - 1.5 megohms shunted by 60 μμf at 1500 volt range
- Frequency Response with WG-299B
  - Direct Probe and Cable: Flat from 30 cps to 3 mc at 1.5, 5, 15, 50, 150 and 500 volt ranges
- Over-all Accuracy: ±3% of full scale at all ranges

Ohmmeter:
- Seven Continuous Ranges: 0 to 1000 megohms
- Center Scale Values: 10, 100, 1000, 10,000 ohms; 0.1, 1, 10 megohms

Tube and Battery Complement: 1—6AL5 1—12AU7
Power Supply: 105-125 volts, 50/60 cycles, 5 watts
Dimensions: 6½" high, 7" wide, 3¾" deep
Weight: 6 lbs.
Finish: Blue-gray hammeraid case, satin-aluminum panel
Stock Identification: WV-98A



VOLTOHMYST, TYPE WV-77E

A low cost service voltohmyst providing versatility, accuracy and dependability, the WV-77E embodies all standard features such as standard 11 megohm input resistance, (1 megohm in d-c probe), low-input capacitance on d-c functions, ability to measure d-c in the presence of a-c and vice versa, burn-out proof meter circuit, metal-case shielding against r-f, ±1% multiplier resistors, d-c polarity reversing switch, negative feedback bridge circuit, zero-center scale, plus wide frequency response and extended voltage ranges, positive-polarity ohms probe for quick testing of electrolytic capacitors, and many other features. The equipment is factory-built and tested, and calibrated to the finest laboratory standards. A Type WV-77K Voltohmyst Kit is an unwired version of the same equipment.

SPECIFICATIONS

DC Voltmeter:
- Ranges: 0 to 1.5, 5, 15, 50, 150, 500, 1500 volts (7 overlapping ranges)
- Accuracy: ±3% of full scale
- Input Resistance: Standard 11 megohms (1 megohm in probe tip)

AC Voltmeter:
- Ranges (rms): 0 to 1.5, 5, 15, 50, 150, 500, 1500 volts (7 overlapping ranges)
- Ranges (peak-to-peak): 0 to 4, 14, 40, 140, 400, 1400, 4000 volts (7 overlapping ranges)
- Accuracy: ±5% of full scale
- Frequency Response: Flat with ±5% from 40 cycles to 5 mc on the 1.5, 5, and 15-volt rms ranges and the 4, 14, and 40-volt peak-to-peak voltage ranges.

Ohmmeter:
- Ranges: 0 ohm to 1000 megohms (7 overlapping ranges)
- Center Scale Values: 10 ohms, 100 ohms, 1000 ohms, 10,000 ohms, 100,000 ohms, 1.0 megohm, 10 megohms
- Zero-center indication for discriminator alignment

Power Supply: 105-125 volts, 50-60 cps, 5 watts input (approx.)
Tube and Battery Complement: 1—6AL5, 1—VSO35, 1—12AU7A
Dimensions: 7¾" high, 4¾" deep, 5⅝" wide
Weight: 5 lbs.

Stock Identification

Voltohmyst (factory wired and tested): WV-77E
Voltohmyst (unwired, not tested): WV-77K

FIELD INTENSITY METER

TYPE WX-2D

FEATURES

- Truly portable—weight, approximately 12½ lbs. including batteries—size approximately 12" x 8½" x 5½"
- Reads directly in microvolts per meter —no correction factor charts are needed
- Stable in operation—calibrates readily in presence of strong fields
- Wide sensitivity range—10 microvolts/meter to 10 volts/meter
- Accurate—built-in calibrating oscillator

USES

The type WX-2D Intensity Meter is a small, accurate and truly portable instrument, especially adapted for field use by Broadcast Station Engineers and Consultants. Designed for battery operation, it provides for a wide range of measurement (10 μv/meter to 10 v/meter) in conducting broadcast band (540 to 1600 kc) field intensity surveys. It makes possible close-in measurements on high-powered directional arrays, as well as interference studies where very low signal strengths are encountered.

DESCRIPTION

The Type WX-2D Field Intensity Meter is direct reading in microvolts per meter without the aid or necessity of charts, curves, correction factors, or computations of any kind. In the WX-2D, a statically shielded, unbalanced loop is used as an integral part of the instrument cover. The loop has only a few turns, thus the natural resonant frequency is very much higher than the highest frequency in the operating range. The high side of the loop is loaded with a high "Q" coil to provide the total inductance required for the operating range. Injection of the calibrating voltage into the loop circuit is by means of a small toroidal-wound inductance. The "Q" of the loop circuit is approximately 100 at one megacycle. This high "Q", plus the use of a stage of radio frequency amplification, results in a very high order of image rejection. This feature is desirable since the large increase in the number of stations in some localities has made impractical the use of field intensity meters having insufficient front-end selectivity. By careful design, other spurious responses, such as i-f harmonics, have been greatly reduced. The use of crystal diodes for metering purposes eliminates the meter errors due to varying cathode voltages on thermionic rectifiers. The crystals are used in special circuits which swamp out variations due to temperature, etc. The meter will indicate accurately with filament voltages as low as one volt and plate voltages as low as 45 volts.

Ordinary flashlight cells, obtainable everywhere, are used for the filament. A 67-volt battery of the size in common use in small camera-type radios is used for plate supply. The total plate drain of the receiver is 8 ma. The filament drain is 300 ma. Separate batteries are used for the calibrating oscillator. All batteries are carried in a compartment accessible through a door in the rear of the instrument. Provision is made for checking battery voltages with the same meter as used for field intensity indication.

All tubes are quick-heating filamentary types so that the WX-2D stabilizes within a few seconds, thus it is not necessary to keep the instrument operating between readings. The direct reading feature of the WX-2D simplifies field intensity measurements and eliminates the needs of the usual attenuator readings, meter readings and multiplication factors. A wide sensitivity range, 10 volts per meter to 10 microvolts per meter, permits maximum flexibility of operation within the range of 540 to 1600 kc.

Despite its small size and compactness, nothing has been sacrificed in the way of quality or workmanship. Components of the highest quality are used throughout. The design is such that all components are accessible. Broadcast Station Engineers and Consultants will find that it offers extreme flexibility in use and fills a long-felt need for a light-weight, portable instrument.

SPECIFICATIONS

Performance Specifications

Frequency Range.....540-1600 kc
Sensitivity.....10 μv/m to 10 v/m (all frequencies)
Power Supply
(not supplied with equipment).....2 67½ VB—5 1½ unit cells (RCA VS016)—(RCA VS001)
Antenna.....Built in loop with electro-static shield
Dimensions.....9" high, 13" wide, 5¾" deep
Weight .....12.6 lbs.

Tube Complement

4—1T4 2—1R5

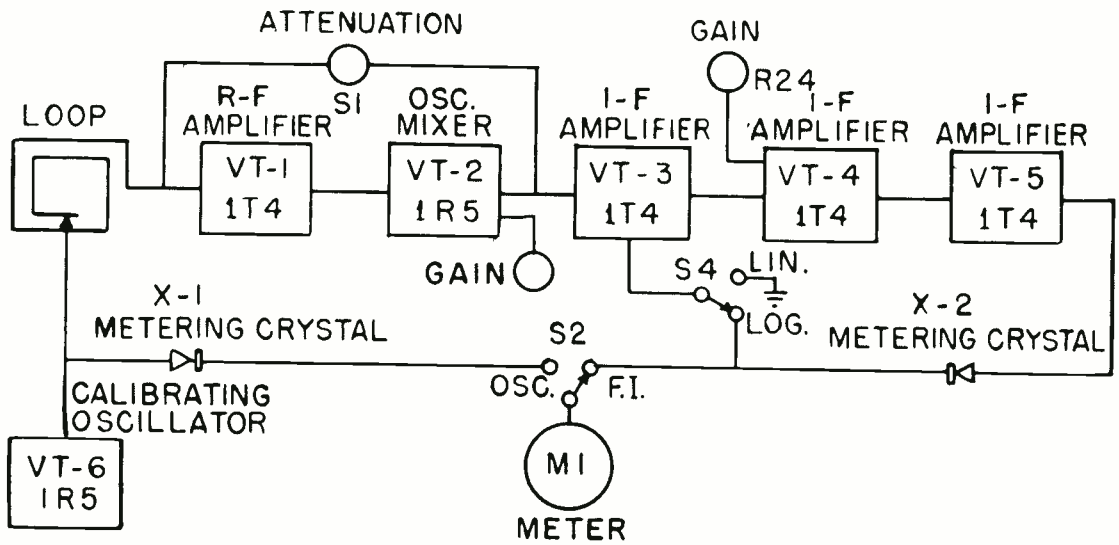
Equipment Supplied

WX-2D Field Intensity Meter.....MI-30002-D
(Including electron tubes in place, Instruction Book IB-4002-4 and Instruction Book Addenda IB-4002-4A)

Accessory Equipment

Type 121 Recording Amplifier

Block diagram, Field Intensity Meter, Type WX-2D.



FIELD INTENSITY METER AND TEST SET

Type BW-7A

FEATURES

- Continuous tuning—no band changing necessary
- Combined lab-quality signal generator and receiver in one convenient case
- Sufficient power to excite antenna under test over long transmission line lengths
- Eliminates "setting-up" separate transmitters, receivers, bridges, etc.
- Output for a standard Esterline-Angus Recorder
- Measures either "average" or "peak-of-sync" value of television signals
- Operates either from 6 volt battery or 115 volt, 50/60 cycle supply

USES

The Type BW-7A R-F Test Set and Field Intensity Meter is especially designed to provide an accurate, self-contained, easy-to-operate instrument for the measurement of radio-frequency field intensities in the range of 54 to 240 megacycles. It is suitable for AM, FM and Television measurement use. The frequency range covers those frequencies assigned to VHF television and FM broadcasting—as well as frequencies, lying within the limits of 54 to 240 mc, that are assigned to aeronautical and other public services.

DESCRIPTION

The Type BW-7A R-F Test Set is designed to fill a very definite place in the VHF measurement field. It combines in one instrument a field intensity meter which is more accurate and more convenient to use than any heretofore available, a standard signal generator of laboratory quality, and a laboratory quality receiver continuously tunable from 54 to 240 megacycles.

The combination of an accurate signal generator in the same case with a fine receiver results in a test instrument of exceptional utility. For example, in making impedance measurements with a slotted line or r-f bridge, there is available in one self-contained package both the exciter for the line or bridge and a supersensitive receiver for use as a detector. Another example of the utility and flexibility of this instrument would be its use in measuring the characteristics of antennas within its frequency range. The signal generator has sufficient power to excite the antenna under measurement over a very considerable length of transmission line with the receiver being used in conjunction with a simple antenna to receive the radiated signal and measure it in known values over a very wide range. Engineers doing antenna work, who have heretofore found it necessary to set up transmitters, receivers, bridges, etc., with their attendant weight, inconvenience, and lack of flexibility, will appreciate the convenience of operation of the Type BW-7A R-F Test Set and the time and money that will be saved because of the more expeditious way in which their work can be carried out.

Since means are available for standardizing the gain of the receiver and varying this gain in known increments, the test set consitutes an r-f voltmeter for general laboratory work. Likewise, engineers engaged in receiver work will find the wide range and accuracy of the signal-generator portion of the test set of particular advantage in their work.

When used for field intensity measurements the calibrated dipole receiving antenna is connected to the receiver portion of the test set and the gain and step attenuators adjusted until the reading on the output meter is, for example, full scale. The input of the receiver is then switched to the signal generator adjusted until the same reading is obtained. The field strength is then known from the effective height of the antenna and the output of the signal generator. Special provision is made to insure that such variables as the attenuation of the antenna transmission line with frequency, the absolute value of the receiver input termination, and other factors affecting the accuracy as a field strength meter are compensated for. It has long been recognized that a substitution type of field strength measurement could, when the proper precautions are taken, be made the most accurate of any known method of measuring this quantity. The BW-7A R-F Test Set has set a new standard of accuracy for field strength measurements in the VHF region. Additional features of the BW-7A R-F Test Set are provision for operating, without auxiliary equipment, a 1-ma Esterline-Angus recorder; provision for measuring in terms of either the average or the peak-of-sync value of television signals; and provision for aural monitoring of either AM or FM signals. The test set operates either from a 6-volt storage battery or from a 115-volt 50- or 60-cycle supply without any changes whatever; all that is necessary is to attach the proper power cable. The set occupies only 215 sq. in. of bench space.

SPECIFICATIONS

Performance Specifications

Frequency Range.....54 mc to 240 mc

Type of Tuning.....Continuous. No coil changing necessary in either the receiver or the signal generator.

I-f Frequency .....21.4 mc

Image Rejection.....Not less than 37 db anywhere in the tuning range. Typical values are 49 db at 60 mc and 37 db at 240 mc.

Signal Generator.....Output metered and continuously variable from 1.0 μv to 100,000 μv.

Field Intensity Range.....1.5 μv/m to 10 v/m at 54 mc; 6.0 μv/m to 10 v/m at 220 mc

Tube Complement

1 6J4	1 6AB4	1 6AL5	2 12AU7
1 6AK5	5 6BH6	1 6J6	1 6SN7

Power Supply.....110-120 volts a-c, 50/60 cycles, single phase
6 volts d-c, 10 amperes

Weight.....Test Set, 47.5 lbs. Accessories and case, 20 lbs.

Dimensions.....Length, 20 in.; width, 11 in.; height, 15 in.

Equipment Supplied

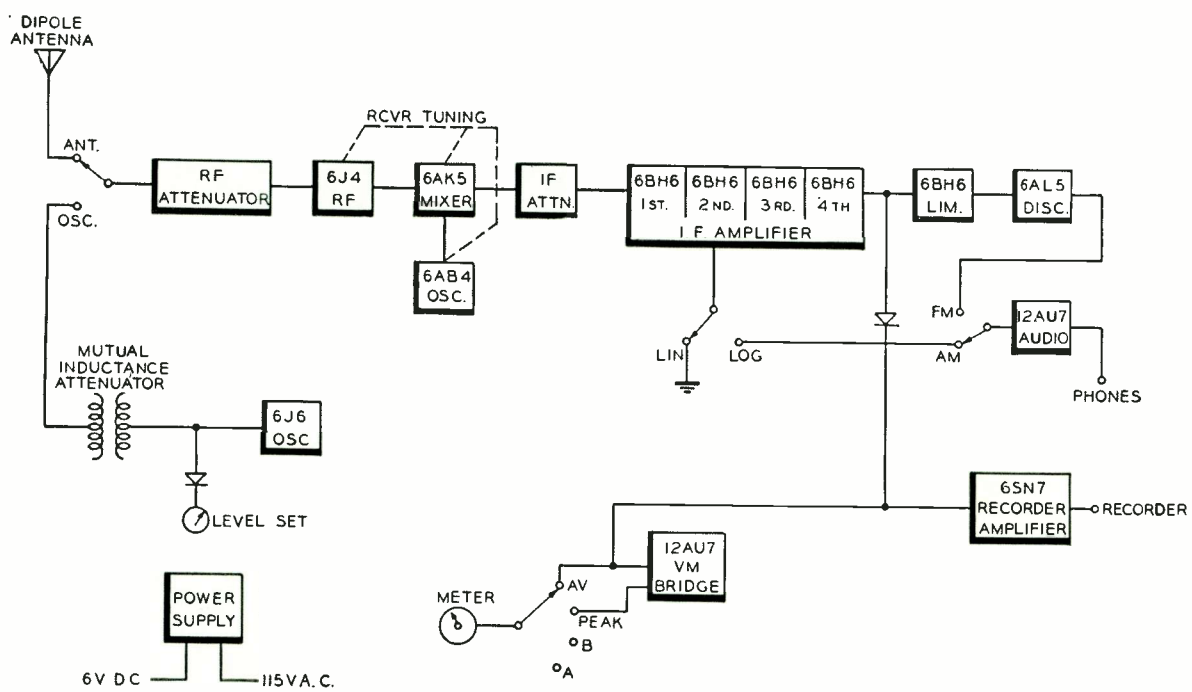
BW-7A R-F Test Set and Field Intensity Meter.....MI-19384
(Complete with tubes in place and including power cord, battery cable, coaxial lead, antenna carrying case containing: tripod, mast section and tee, extension mast section, two low-frequency dipole elements, 35-foot antenna cable and a 40 db attenuator, and Instruction Book IB-30229)

Optional and Accessory Equipment

1 ma Esterline-Angus Recorder

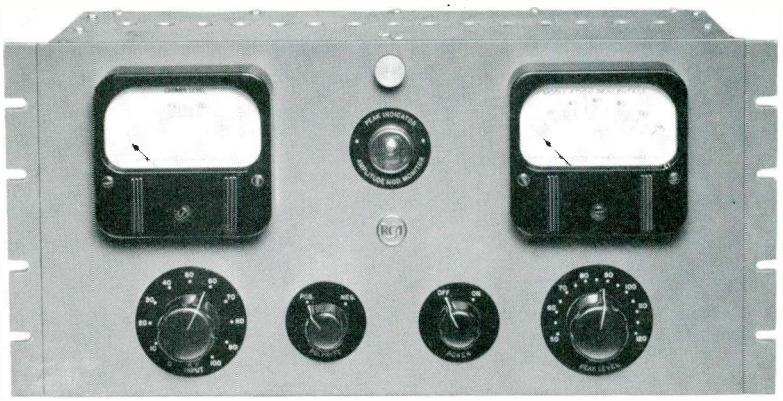
Type 110 Mobile Recording Drive Assembly

Circuit block diagram of the BW-7A Field Intensity Meter.



AM MODULATION MONITOR

TYPE BW-66F



FEATURES

- Operates at low R-F input power (0.35 watt in 75 ohms)
- Indicates either positive or negative peaks in percentage modulation and in decibels
- Meets all FCC specifications for modulation monitors
- Carrier amplitude shift with modulation can be measured
- High impedance, low distortion output circuit permits use of RCA WM-71A or 69-C Distortion and Noise Meter
- Low impedance, low distortion output circuit for aural monitoring
- Up to four remote meters can be used
- No input circuit to tune, avoiding side-clipping and distortion
- Can be serviced without removal from rack

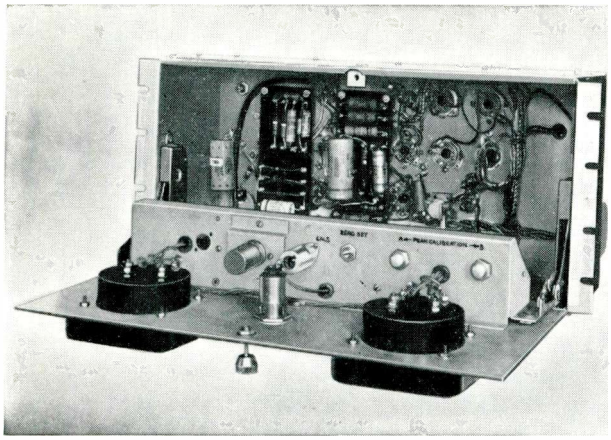
USES

The RCA Type BW-66F, Modulation Monitor is designed to give continuous direct reading indications of percentage modulation in the carriers of broadcast or other transmitters operating in the range of 500 to 2500 kc. Up to four remote meters may be used for remote transmitter control operations. This Modulation Monitor performs the following specific functions:

1. Measurement of percentage of modulation on either positive or negative peaks.
2. Overmodulation indication.
3. Program level monitoring.
4. Measurement of carrier shift when modulation is applied.
5. Measurement of transmitter audio-frequency response.
6. Contains demodulation for distortion measurements.

DESCRIPTION

The RCA BW-66F consists of three essential elements: (1) A linear diode rectifier which gives an instantaneous output voltage proportional to the carrier envelope, (2) a peak voltmeter which gives a continuous indication of the peak modulation, and (3) a trigger circuit which flashes



BW-66F AM Modulation Monitor with hinged front panel lowered.

a light whenever the modulation momentarily exceeds any previously set value.

The linear rectifier is designed for operation at a low power level, which greatly simplifies the coupling to the transmitter. In the output of the linear rectifier is a d-c meter, which indicates the carrier level at which the instrument is operating and also shows any carrier shift during modulation.

In addition, two auxiliary audio output circuits operating from a separate diode rectifier are provided. One of these at 600 ohms, is intended for audible monitoring; the other, a high-impedance circuit, gives a faithful reproduction of the carrier envelope with less than 0.2% distortion. The high impedance output circuit can be connected directly to the RCA WM-71A Distortion and Noise Meter, enabling overall fidelity and noise measurements to be made on the transmitter.

The BW-66F is designed for standard rack mounting. Panel meters indicate both the modulation percentage and the carrier level. Provision is made for connecting a remote alarm, or a counter for recording the periods when the percentage modulation exceeds that desired to be maintained by the station. An over-modulation alarm or flashing lamp is provided to give instant warning when the modulation exceeds the established level.

The instrument has four conveniently disposed controls mounted upon the front panel. They are the R-F Input Control which is used for adjusting the signal input to the monitor, the Polarity Switch which allows either positive or negative peaks to be measured, depending upon the switch position, the Power Switch permitting the monitor to be turned on or off from the front panel, and the Peak Level Control which is calibrated from 50 to 120% modulation and is used for setting the lowest value of percent modulation at which it is desired to have the overmodulation alarm operate.

Two panel mounting meters having illuminated scales are provided. The carrier meter includes a scale calibrated from 80 to 120 with a red mark at 100. Normal operation is obtained when the pointer is set at this mark and denotes the correct radio frequency input level. The Modulation Percentage Meter has a range of zero to 120% and is also calibrated in decibels using 100% modulation as zero db. A polarity switch is provided so that either the positive or negative peak values may be measured. The accuracy of measurement of percentage modulation is greater than that required by the FCC, which is ±2% at 100% modulation and ±4% of full scale at any other percentage of modulation. The frequency response of the modulation meter circuit is 30 to 15,000 cps ±½ db. Terminals are provided for connecting one to four remote modulation meters. Two r-f input terminals, a power receptacle and a terminal board for all other connections are mounted on the back of the chassis.

SPECIFICATIONS

Performance Specifications

Carrier Frequency Range	500 to 2500 kc	
Modulation Percentage Range:		
Negative Peaks	0 to 100%	
Positive Peaks	0 to 120%	
Meter Accuracy	Better than ±2% at 100% modulation, or ±4% at any other percentage	
Audio Frequency Response:		
Meter Indication, 30 to 15,000 cps	±0.5 db	
Meter Circuit, 50 to 15,000 cps	±0.1 db	
Audio Output Circuits:	*Monitoring*	*Measuring*
Source Impedance	600 ohms	20,000 ohms
Level at 100% Modulation	1 volt rms	3 volts rms
Response	±1 db, 30-15,000 cy.	±0.5 db, 30-45,000 cy.
Distortion	Less than 1%	Less than 0.2%
Noise Level Below 100% Modulation	Better than 60 db	Better than 70 db
R-F Input Power	0.35 watts min.; 6 watts max.	
R-F Input Impedance, Broadcast Band	Approx. 75 ohms	
Power Supply	110-125 volts, 50/60 cycles, single phase	
Power Input	110 watts	

Tube Complement

2—6AL5	2—884
1—6C4	2—OD3
1—6AQ5	1—5V4G
1—5814	2—1N97 Crystal Diodes

Dimensions	19" wide, 8¾" high, 11" deep
Weight	37 lbs.
Finish	Umber gray
FCC Approval Number	1559

Equipment Supplied

BW-66F AM Modulation Monitor MI-30066-B
Including Monitor with tubes in place, 8-foot power cord with plugs, and Instruction Book IB-24953

Optional and Accessory Equipment

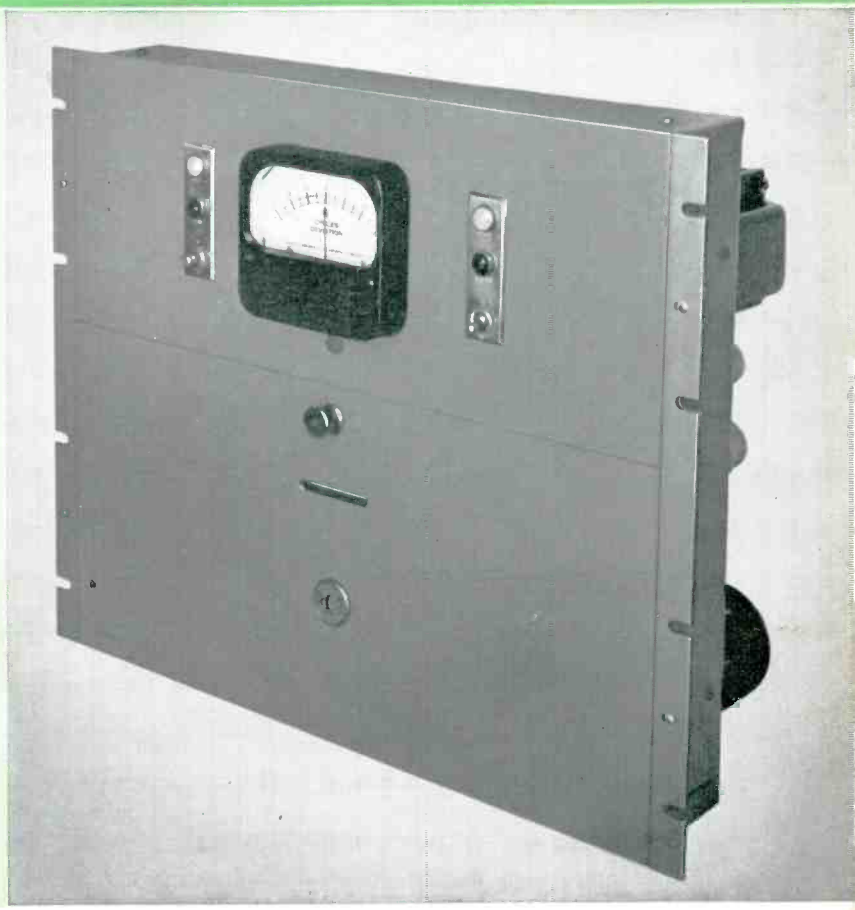
Spare Tube Kit for BW-66F MI-30450
Remote Meter ..... Stock #59160

FREQUENCY MONITORS

AM TYPE BW-11A AND COLOR TV SUB-CARRIER TYPE BW-11AT

FEATURES

- Continuous reading deviation meter
- Wide input range
- Minimum accuracy at subcarrier frequency ±1 cycle for 30 days and ±5 cycles for 1 year
- Protected trimmer adjustments for frequency calibration
- Warning lamp system indicates failure of either transmitter carrier or monitor crystal oscillator
- Provision for simultaneous operation of remote indicating or recording meter



USES

The RCA Frequency Deviation Monitors BW-11A and BW-11AT indicate continuously, and directly in cycles-per-second the magnitude and direction of any departure of the carrier signal from its proper frequency. The two models are used as follows:

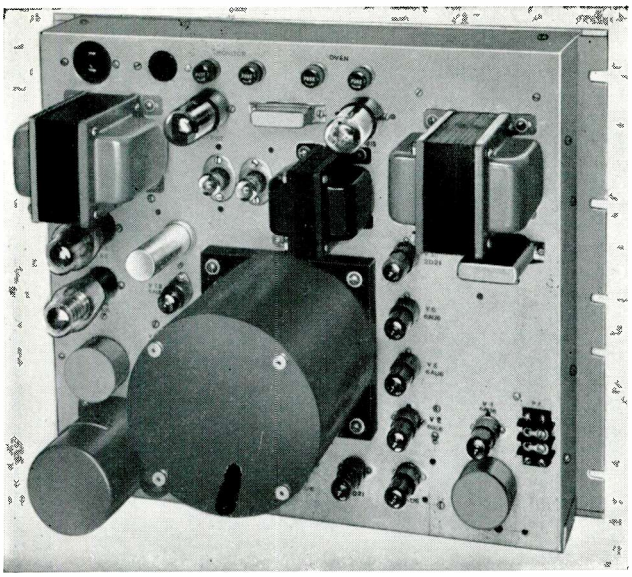
1. Type BW-11A for AM broadcast stations to measure departure of the carrier from its assigned channel frequency.
2. Type BW-11AT for TV broadcast stations to measure departure of the color subcarrier from 3.579545 mc standard frequency.

The BW-11A monitor bears FCC approval for use in standard broadcast stations. The BW-11AT more than meets FCC requirement for subcarrier accuracy of ±10 cycles maximum and will provide an accurate and convenient method of calibrating and monitoring the color frequency standard now used by stations originating color programs.

DESCRIPTION

The circuit arrangement of the BW-11A/11AT is shown in the accompanying block diagram. Voltage from a temperature-controlled piezo-electric oscillator (frequency f —1000 cycles) and the carrier to be monitored (frequency $f \pm \Delta f$) are amplified and fed to a converter tube from which their difference frequency (1000 $\pm \Delta f$) is obtained. This audio-frequency is converted to a constant amplitude square wave by means of a limiter amplifier and then restored to a constant amplitude sine wave of frequency (1000 cycles $\pm \Delta f$) by a filter stage. After power amplification the audio frequency is applied to a discriminator and rectifier circuit, from which d-c is obtained. The amplitude and polarity of the d-c is determined by the deviation from 1000 cps. Deviation is indicated on a linearly calibrated zero-center meter with a scale calibration of ±30 cps. A jack is provided for a remote indicating or recording meter, which can be operated simultaneously with the panel meter.

The monitor is a-c operated and is mounted on a single relay rack panel. Coupling of the BW-11A Monitor to the



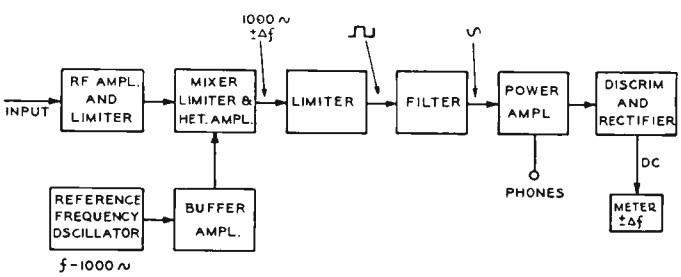
Rear view of BW-11A Frequency Monitor.

transmitter is obtained from a short length of wire attached to the input terminals to act as an antenna. The BW-11AT Monitor's input voltage is obtained by "looping through" a coaxial cable circuit carrying a subcarrier signal.

The oscillator crystal is maintained at a constant temperature by means of a mercury thermostat-controlled oven. Additional isolation against external influences is effected by the use of low heat conductivity wire to the crystal circuits and thermal cutout. No tuning adjustments are required other than the setting of a single capacitor. A wideband amplifier increases the crystal signal uniformly over the frequency range.

Circuits are designed so that wide variations in tube characteristics and line voltage cause negligible error in deviation indications. Negative feedback is used on the power amplifier, and in other circuits, limiting and voltage regulation minimize these effects.

Since the equipment is designed to operate continuously without adjustment, only two switches are provided on the front panel, the monitor toggle switch, and the check pushbutton switch. The monitor switch controls power for all



Schematic block diagram of Type BW-11A/11AT Frequency Deviation Monitor.

circuits except the oven heater which is thermostatically controlled and functions whenever the power cable is connected to the a-c power source. The check pushbutton switch permits a quick check on all circuits. When the monitor is working normally, and this button is pressed, the meter deflection increases by approximately 5 cps. A change appreciably different from 5 cps indicates a defective circuit.

The oven thermometer is visible through a slot in the lower section of the front panel and it is illuminated for easy reading. Tubes and crystal oven, located on the back of the chassis, are easily accessible for servicing. The monitor is contained in a single unit which occupies a 15¾-inch vertical space in a standard 19-inch cabinet rack. To facilitate maintenance, the bottom section of the front panel may be lowered and the upper section raised. Lowering the bottom section exposes most of the monitor circuits for continuity checks, and all the routine maintenance controls. The equipment is shipped with all components in place except the crystal. An MI-7982-B Crystal Unit specially ground to 1000 cycles below the transmitter frequency is provided for the BW-11A, and MI-7962-C Crystal Unit especially ground for the subcarrier frequency is specified for the BW-11AT Monitor.

SPECIFICATIONS

Performance Specifications

	Model BW-11A	Model BW-11AT
Frequency Range	500 to 2000 kc	3.579545
Frequency Deviation Range (readable to 1 cycle)	±30 cycles	±30 cycles
Accuracy	±10 parts per million	±1 cy. for 30 days ±5 cy. for 1 year
R-F Input Voltage	Approx. 10 mv to 25 volts	Approx. 0.15 to 25 volts
Power Supply	105-130 volts, 50/60 cycles, single phase	
Power Input	120 watts	
Dimensions	19" wide, 15¾" high, 9⅝" deep	
Weight	60 lbs.	
Finish	Umber gray	
FCC Approval Number for BW-11A	1471	

Tube Complement

5—6AU6
1—6BE6
1—6V6-GT
3—6AL5
2—2D21
1—5Y3-GT
2—OC3/VR105

Equipment Supplied

BW-11A AM Broadcast Frequency Monitor.....MI-30011-B
Crystal Unit, Type TMV-135L, (MI-7962-B) must be ordered separately.
BW-11AT Color TV Sub-Carrier Frequency Monitor.....ES-34040-A
Including Frequency Monitor (MI-30011-B), complete with tubes in place, 8-foot power cord with plugs, fuses, tuning tool, thermometer, thermostat, Crystal Unit, Type VC-1-NS, (MI-7962-C) and instruction booklet.

Optional and Accessory Equipment

Remote Meter.....MI-93688
Tube Kit for BW-11A/11AT.....MI-8295
Type TMV-135L Crystal Unit for BW-11A.....MI-7962-B
Type VC-1-NS Crystal Unit for BW-11AT.....MI-7962-C

FREQUENCY MONITOR AND MODULATION METER

TYPE 335-BR

FEATURES

- Provides accurate check that FM transmitter is operating within FCC specifications
- Operates reliably over long periods of time
- Compact size, requires minimum rack space
- External meters may be remotely located
- Simplified operation, no adjustments necessary during operation
- Continuous indication of broadcast frequency and modulation

USES

The Type 335-BR Frequency and Modulation Meter monitors FM transmitters reliably, accurately, over long periods of time. No adjustments are necessary during operation, and because the instrument does not depend on a tuned circuit, it is not necessary to re-set the carrier level or re-align circuits. The instrument is specifically designed to operate without adjustment week after week. It gives continuous indication of broadcast frequency and of modulation level at all times, and has FCC type approval.

DESCRIPTION

A low-temperature co-efficient crystal, oscillating inside a temperature-controlled oven, provides a reference standard of approximately 5 mc. The output of this crystal oscillator is multiplied 20 times, and mixed with the transmitter frequency to form a 200 kc intermediate frequency. This frequency is fed into electronic counter circuits, which measure the intermediate frequency and thereby indicate th carrier deviation. The linear counter circuits also provide a measurement of percentage modulation as well as

DESCRIPTION (Continued)

an audio output signal for measurement and monitoring purposes.

The electronic counter circuits are unusually stable, are independent of signal level, tube characteristics and tube voltages, and require no adjustment except at long intervals. To check the accuracy of the counter circuits, a crystal-controlled oscillator at 200 kc is provided. This check is operated by a front-panel switch, and is usually only required at one-week intervals.

The 335-BR includes provision for operation of a remote modulation meter, as well as remote peak modulation indicator lamp. The percentage modulation at which the lamp flashes a warning is adjusted on the front panel.

An audio output signal, provided for measurement purposes, has residual distortion of less than 0.25%, and the noise level is at least 75 db below 100% modulation at low frequencies. Frequency response is flat within 0.5 db of standard de-emphasis curve, 20 cps to 20 kc. A demodulated signal for remote or local aural monitoring is also provided at 1 VU level.

Simple to install, compact in size, this new FM monitor can be supplied in a cabinet, or for relay rack mounting. Construction throughout is in accordance with engineering practices proven satisfactory for broadcast equipment. Components are rigidly mounted on bakelite cards; bathtub, mica and oil-filled condensers are used where voltages exceed 50 volts. Instrument is furnished in standard RCA umber gray finish.

SPECIFICATIONS

Frequency Monitor:
- Frequency Range.....Any frequency, 88 mc to 108 mc Supplied with crystal frequency matching customer's transmitter.
- Deviation Range.....+3 kc to −3 kc mean frequency deviation
- Accuracy.....Deviation indicator accuracy better than ±1000 cps (±.001%)
- Power Required.....Approximately 2 watts. Operates satisfactorily at levels above and below 2 watts

Modulation Meter:
- Modulation Range.....Meter reads full scale on modulation swing of 100 kc. Scale calibrated to 100% at 75 kc; 133% at 100 kc.
- Accuracy.....Within 5% modulation percentage over entire scale
- Meter Characteristics.....Meter damped in accordance with FCC requirements. Reads peak value of modulation peak of duration between 40 and 90 milliseconds. Meter returns from full reading to 10% of full value within 500 to 800 milliseconds.
- Frequency Response.....Flat within ±½ db from 50 to 15,000 cps
- External Meters.....Provision is made for installation of remote meter having full scale sensitivity of 400 microamperes. Scale should indicate 100% modulation at 300 microamperes. Extra meters can be supplied with unit.

Peak Limit Indicator:
- Peak Limit Range.....From 50% to 120% modulation (75 kc = 100%). Provision for external peak limit indicators.

Audio Output:
- Frequency Range.....20 cps to 20 kc. Response flat within ±½ db. Equipped with standard 75 microsecond de-emphasis circuit.
- Distortion.....Less than 0.25% at 100% modulation
- Output Voltage.....10 volts into 20,000 ohms, at low frequencies (at 100% modulation)
- Noise.....At least 75 db below audio output level resulting from 100% modulation at low frequencies
- Monitoring Output.....1.0 mw into 600 ohms, balanced, at 100% modulation (at low frequencies.

Tube Complement

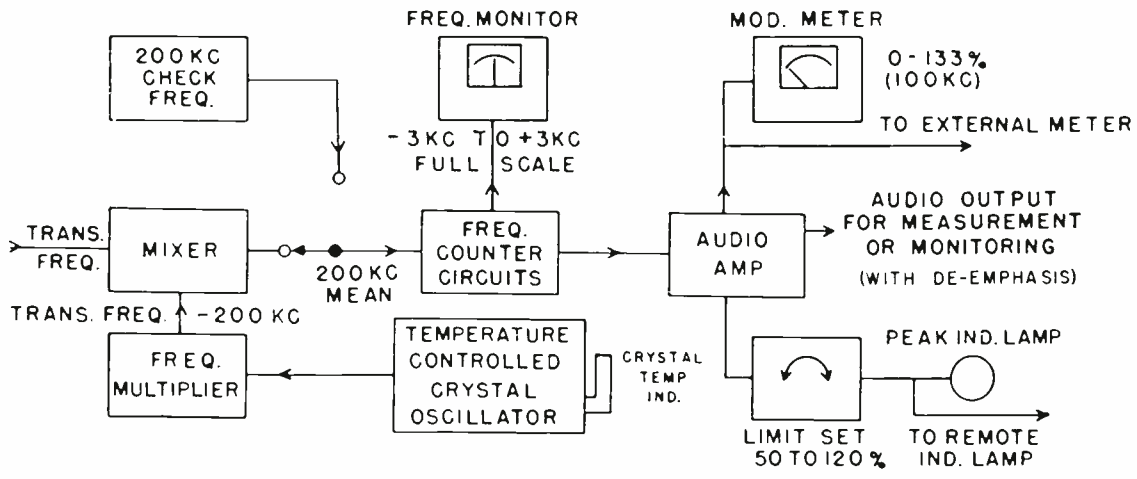
2—6AC7	1—5R4GY
1—7F8	2—VR-75
6—6V6	1—6Y6G
1—6SL7-GT	1—6SJ7
1—2050	

- Size.....Front panel 10½" high x 19" wide x 14½" deep
- Weight.....45 lbs. net
- Power.....115 volts 50/60 cps primary power. Requires approximately 165 watts.
- Stock Identification.....335-BR

Accessory Equipment

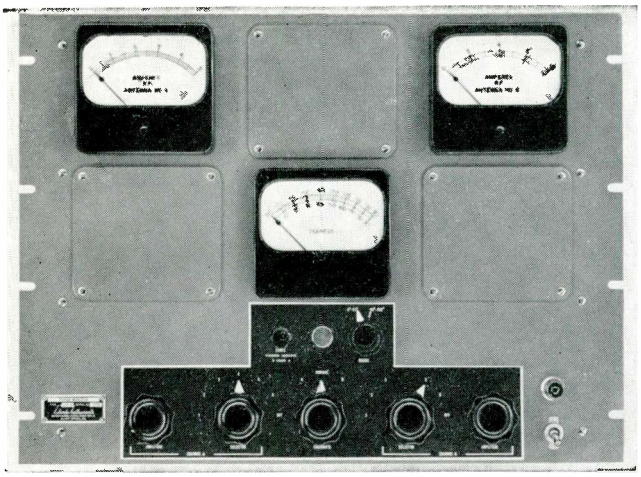
Remote Modulation Meter.....HP-112-13

MODEL 335B FM FREQUENCY MONITOR AND MODULATION METER



PHASE MONITOR

Model 108-E



FEATURES

- Includes remote antenna current meters
- Tailored to specific station requirements
- Unaffected by modulation
- Low power consumption
- Simplified operation
- Direct phase indication

USES

The Phase Monitor, Model 108-E, is an instrument designed to provide an indication of phase relationships in a directional antenna system. Each instrument is tailored for the particular installation and incorporates provision for indicating the relative amplitudes of the currents in the various antennas as well as the phase relation. It is particularly useful in checking the directional arrays to insure proper phasing. Hence proper field pattern can be maintained. The 108-E provides remote indication for arrays employing up to five elements. By using accessory meters it will monitor up to nine towers.

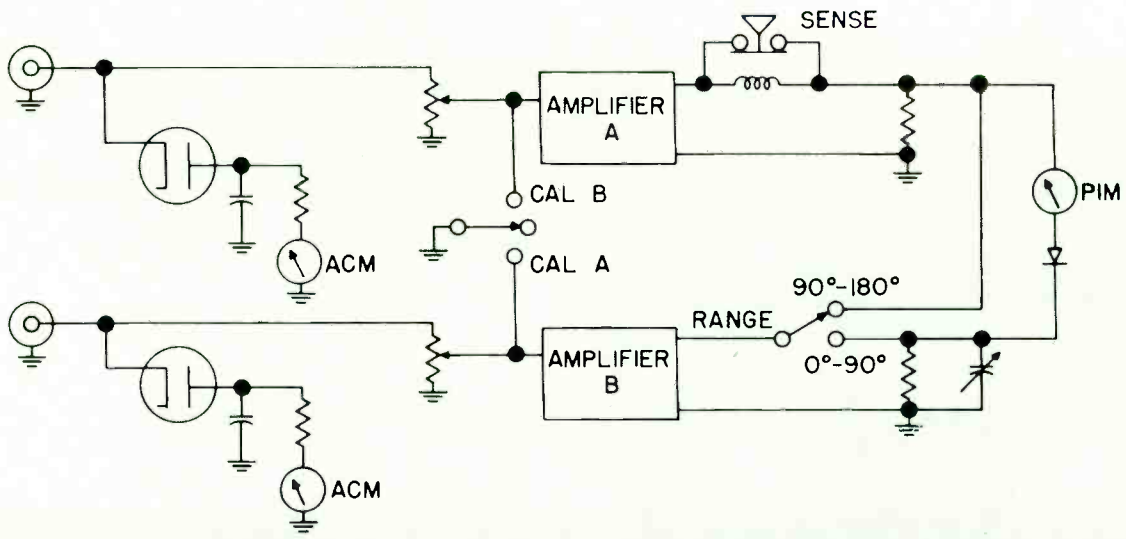
The operation of the instrument is simple. The two Selector switches are set to the two elements to be compared. The outputs of the amplifiers are adjusted to a red mark on the meter. The switch is thrown, and the phase difference is immediately indicated. This indication is not affected by modulation provided 100 percent modulation is not exceeded.

DESCRIPTION

The Model 108-E Phase Monitor is designed to fit in a standard mounting rack. The unit measures 19 inches wide, 14 inches high, and 7 inches deep; and it weighs 20 pounds. When six or more towers are monitored the meters for the extra towers are mounted on a separate 3-meter panel, which adds an additional five inches to the height of the unit. The standard front panel color is umber gray.

Terminals having a nominal value of 51 ohms or 72 ohms, as specified by the user, are provided at the rear of the instrument for connection to the transmission lines from the sampling loops. These terminations are substantially resistive, having a nominal value of 72 ohms or 51 ohms as specified by the customer. The voltage appearing across the termination is rectified by the associated diode, and the direct current resulting from this rectification is metered by the remote antenna meter on the panel of the instrument. The constants of the circuit are so chosen that proportional relationship exists between the current in the regular antenna ammeter and the current flowing in the d-c instrument on the phasemeter panel. Linear rectifiers are employed, and the indication does not vary with modulation as is the case when thermoammeters are used.

By means of selector switches associated with the input to two amplifier channels, the voltage across the termination of any of the transmission lines can be fed to a potentiometer in the grid circuit of either channel's amplifier tube. These potentiometers are used to adjust the amplitudes of the amplifier inputs to provide for equal voltages across



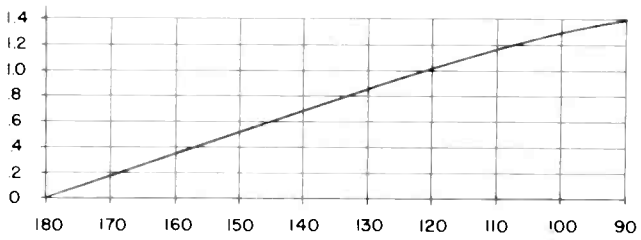
Functional block diagram of the Model 108-E Phase Monitor.

the amplifier outputs. The two amplifier channels feed into a common voltmeter circuit which adds the voltages and gives an indication of the vector sum. Since the outputs of the amplifiers have been individually adjusted to the same value, the channel meter gives an indication directly in degrees. A switching circuit permits the equal outputs of the two amplifiers to be combined in either of two ways. With the Range switch set in the 0-90 degree position the outputs of the amplifiers are combined in series, and the voltmeter reads the vector sum under this condition. With the switch in 90-180 degree position the outputs of the two amplifiers are in parallel, and the meter reads the vector sum under this condition. Provision is made for indicating which one of the two elements being compared has a leading phase angle with respect to the other.

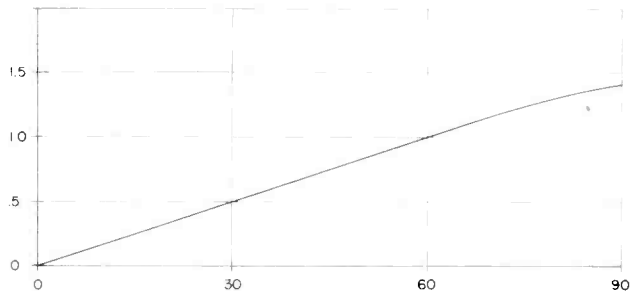
SPECIFICATIONS

Frequency Range	100 kc to 2 mc*
Phase Angle Range	0 to 360 degrees
Monitoring Accuracy	1 degree
Resolution	½ degree
Number of Antennas	2 to 5†
R-F Input Impedance	51 or 72 ohms nominal
R-F Voltage Range	1 to 7 volts
Tube Complement: 2—6AU6, 2—OB3, 1—5Y3, 3—6AL5	
Power Supply	105-125 volts, a-c, single phase
Power Consumption	80 watts
Dimensions	19" wide, 14" high, 7" deep
Weight	20 lbs.
Finish	Umber gray
Stock Identification	108-E

* Normally prepared for 540 to 1600 kc, but other ranges can be prepared on special order.
† 3-Meter Panels are available to monitor additional towers.

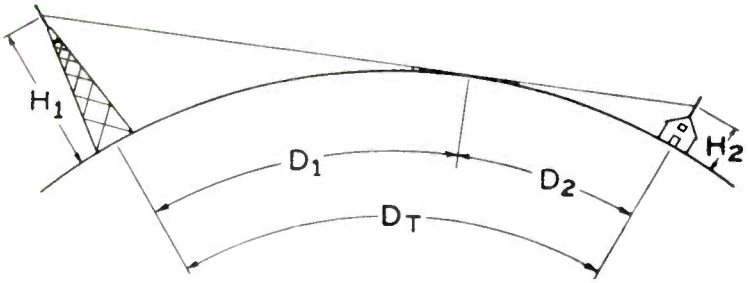


Voltage as a function of Phase Angle for 180°-90° Range.



Voltage as a function of Phase Angle for 0°-90° Range.

RANGE FOR PROPAGATION OVER OPTICAL PATH HORIZON CALCULATIONS

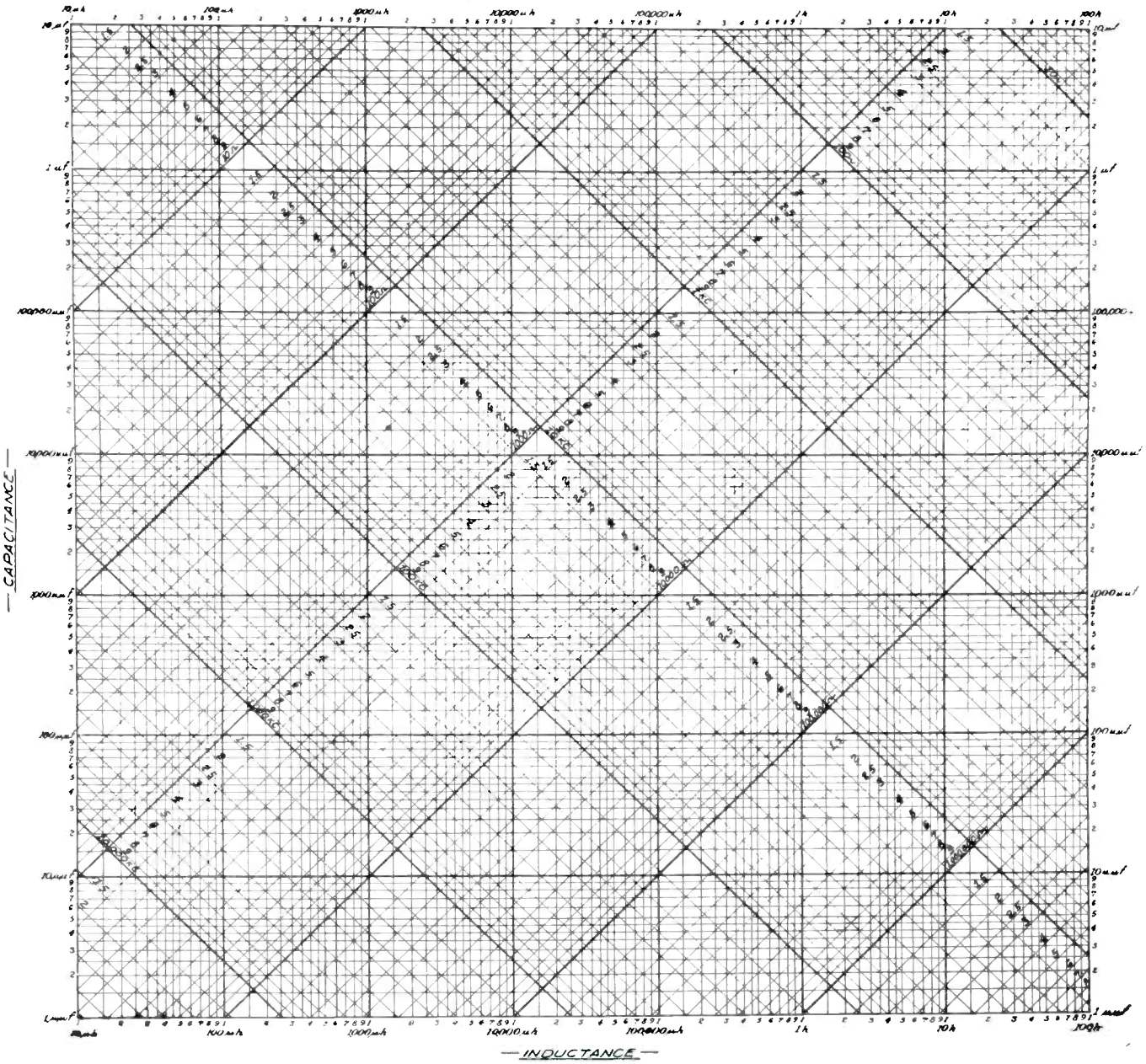


$$D_1 = K\sqrt{H_1} \qquad D_2 = K\sqrt{H_2}$$

$$D_T = D_1 + D_2 = K\left[\sqrt{H_1} + \sqrt{H_2}\right]$$

K = 1.22 WHERE "D" IS IN MILES AND "H" IS IN FEET
K = 3.57 WHERE "D" IS IN KILOMETERS AND "H" IS IN METERS
THE ABOVE FORMULAE NEGLECT REFRACTION AND DIFFRACTION

CHART of FREQUENCY or IMPEDANCE vs INDUCTANCE and CAPACITANCE



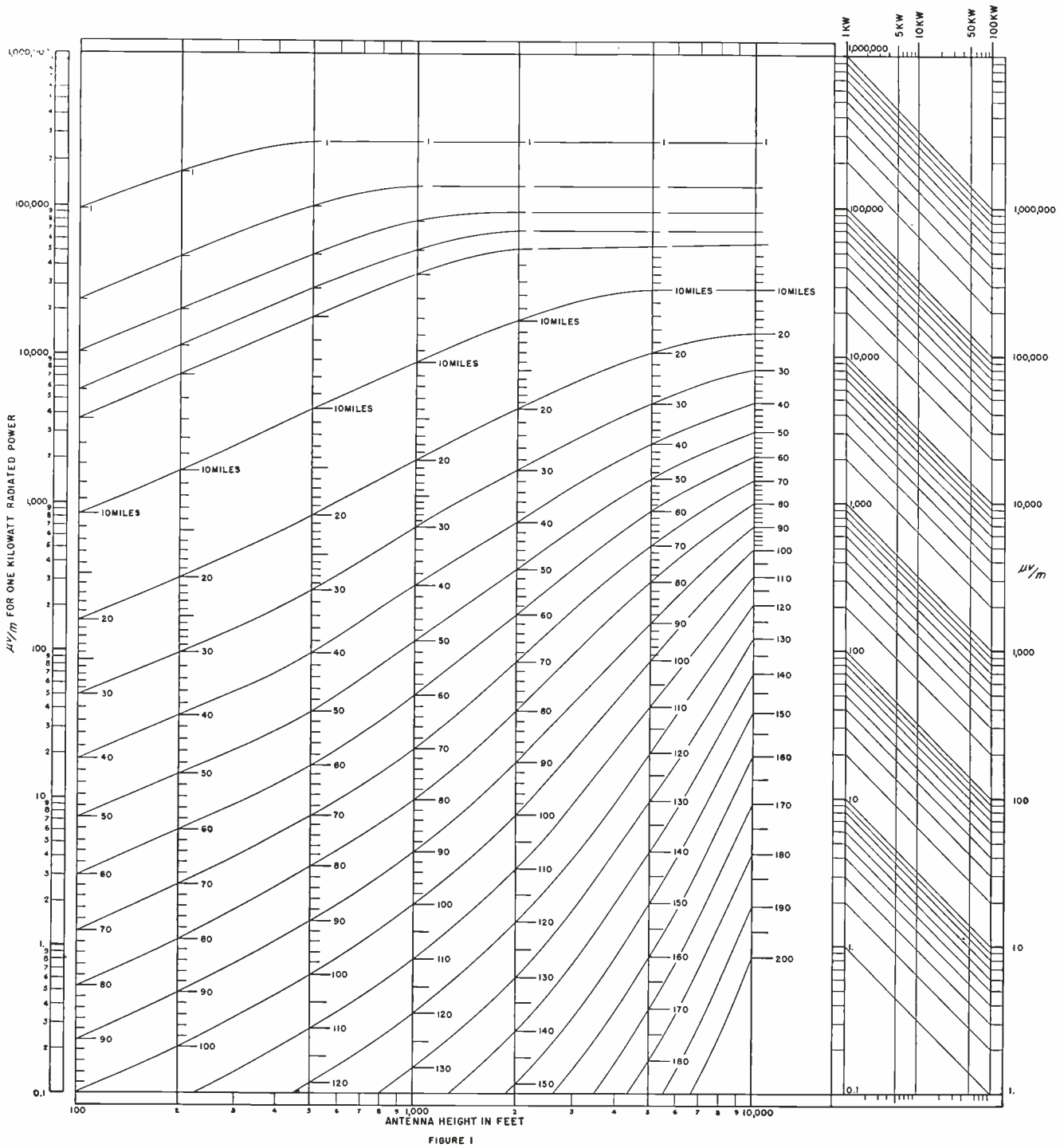
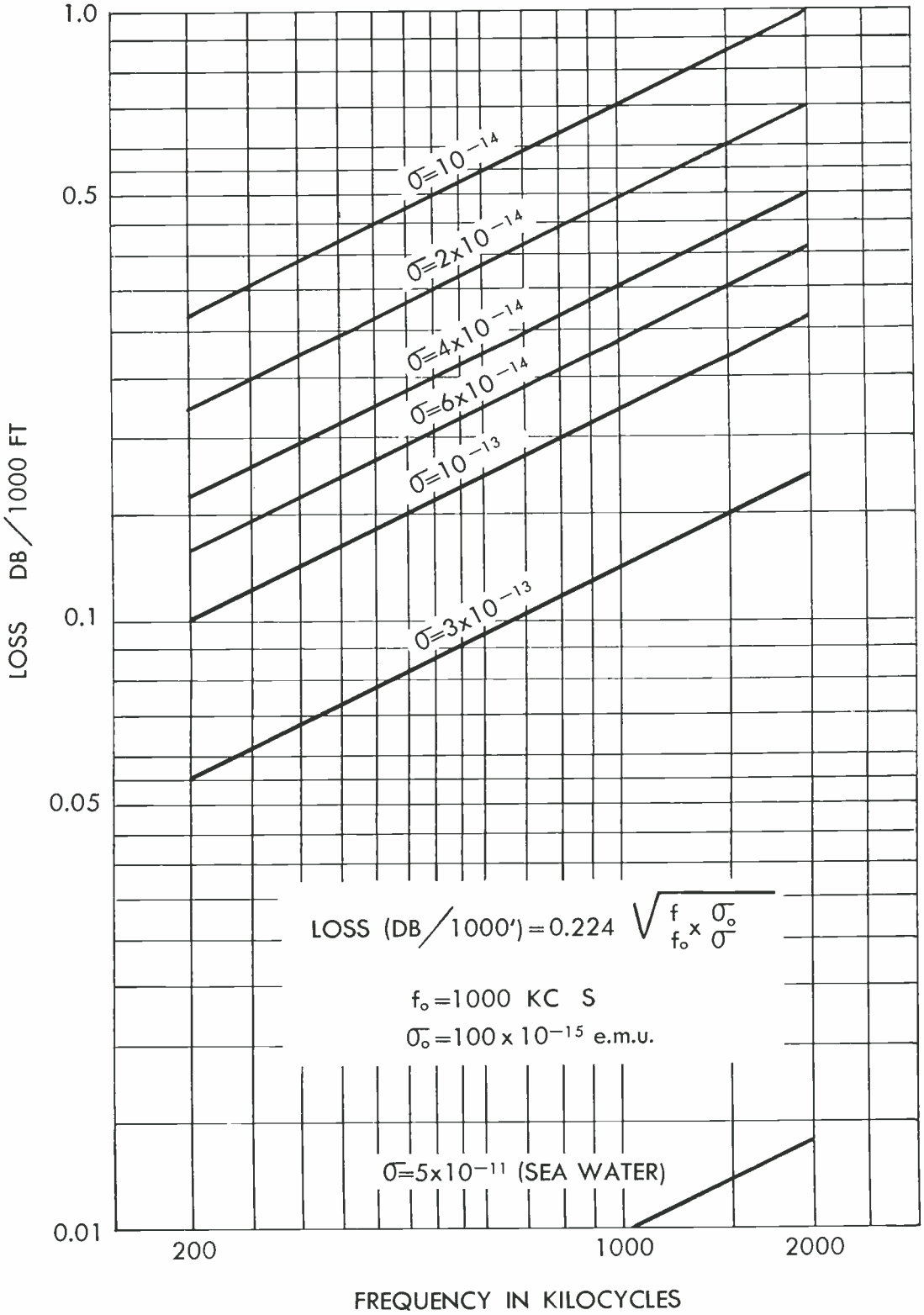


FIGURE 1

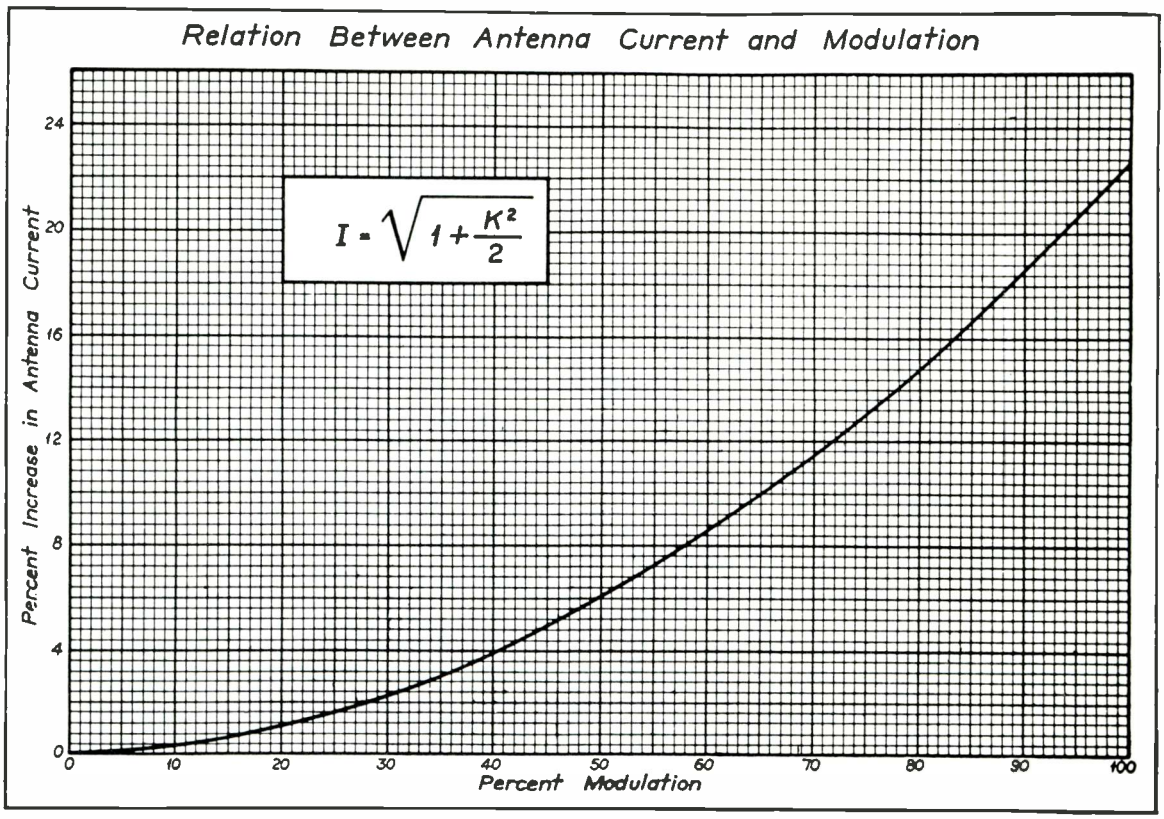
GROUND WAVE SIGNAL RANGE FOR FM BROADCASTING

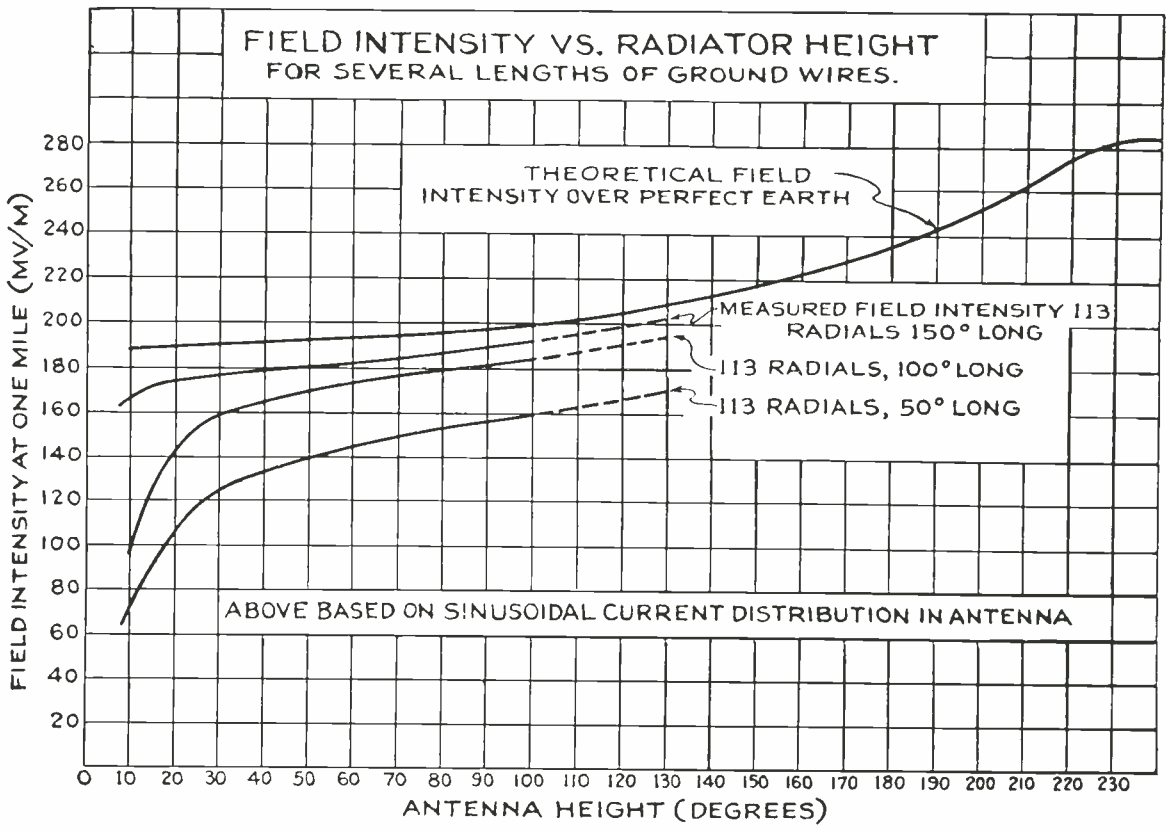
98 mc, $\sigma = 5 \times 10^{-14}$ e.m.u., $\epsilon = 15$, RECEIVING ANTENNA HEIGHT 30 FEET
FOR HORIZONTAL (AND APPROX. FOR VERTICAL) POLARIZATION

83911



LOSS (DB PER 1000 FT.) OF RCA 6 WIRE TRANSMISSION LINE
LINE HEIGHT 12', WIRE SPACING 15", WIRE SIZE #8, Z_o=230 Ω





EFFECT OF GROUND WIRES ON FIELD STRENGTH

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1 5/8" HARD COPPER 72-OHM STEATITE COAXIAL LINE AND FITTINGS (MI-19310 Series)

1⅝" HARD COPPER 72-OHM STEATITE COAXIAL LINE AND FITTINGS (MI-19112 Series) (Continued)

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