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TRANSMITTING  
**am-radio**  
EQUIPMENT





# AM RADIO TRANSMITTING EQUIPMENT CATALOG



**THE MOST TRUSTED NAME IN ELECTRONICS**

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## ABOUT THIS CATALOG

This catalog provides information on RCA AM Radio Transmitting Equipment. Other RCA Broadcast Equipment Catalogs supply information on TV camera, TV film, TV tape, Terminal and Switching, and Audio equipment; also on FM, VHF, and UHF TV transmitters, antennas, and transmission line.

The information contained in this catalog is intended to serve as a buying guide for the user. Complete specifications and ordering information are supplied. Readers who desire more information or individual bulletins on particular equipment items are invited to write to their RCA Broadcast Representative.

## OTHER RCA TECHNICAL PRODUCTS

RCA also manufactures many other electronic products, including: two-way radio and microwave relay communications 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; closed-circuit television systems; and many types of custom-built equipment for industry, the military, educational and medical services. Information describing these products may be obtained from RCA Sales Offices in the United States and Canada or internationally from local RCA Distributors or RCA International Division.

## PRICES

Domestic prices of the equipment shown in this catalog are provided in a separate price list. Equipments are identified by type and MI (Master Item) numbers which are used to identify apparatus on invoices and packing slips. International prices for the various equipment items shown in this catalog are available from RCA Distributors or RCA International Division.

## HOW TO ORDER

The RCA AM Radio Transmitting Equipment shown in this catalog is sold through RCA Broadcast Representatives, who are familiar with broadcast equipment and related problems. These RCA Representatives are located in convenient offices throughout the United States. Domestic orders for equipment, or requests for additional information, should be directed to the nearest RCA Sales Office. International Readers are invited to contact their local RCA Distributor or the RCA International Division Office.

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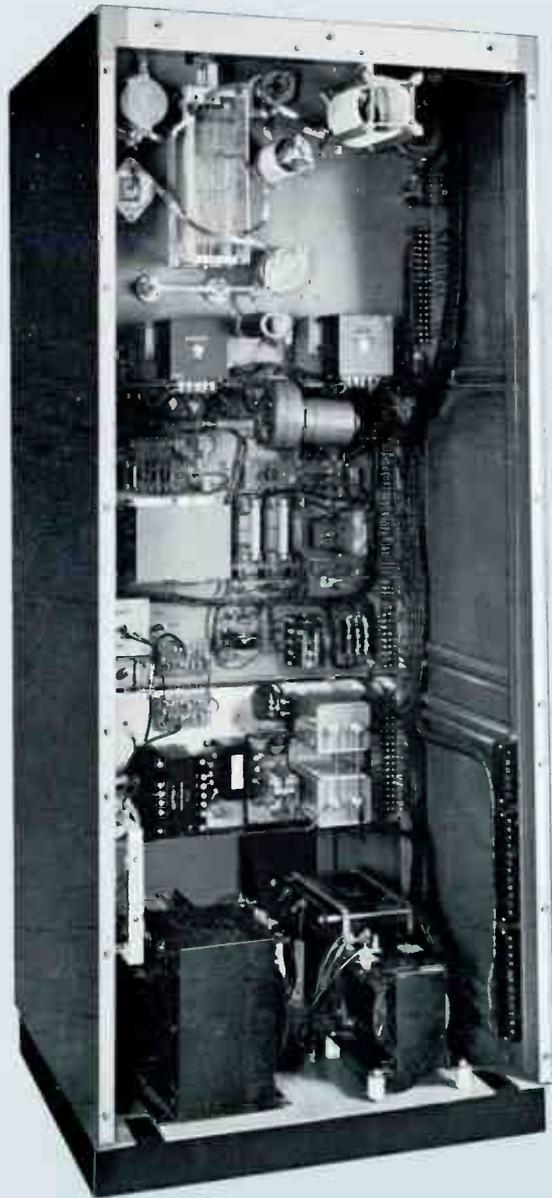
# 1 KW AM Broadcast Transmitter, Type BTA-1R2

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- Excellent frequency response
- Low distortion
- Circuit breaker overload protection
- Low operating costs

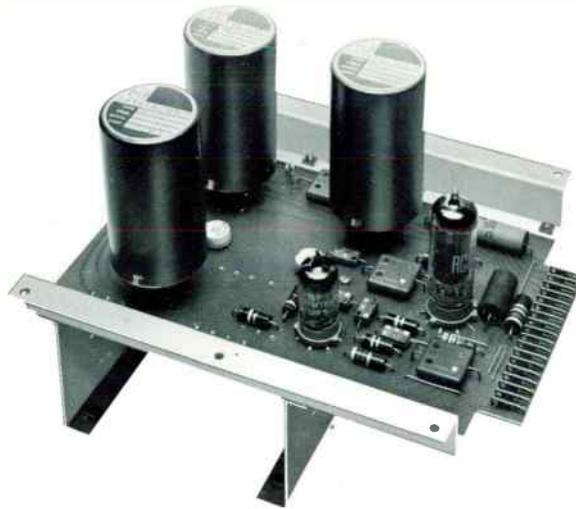


BTA-1R2 Transmitter with front door open showing accessibility of tubes and components. Power amplifier and Modulator tubes are shown on top chassis; below is exciter chassis. All normal operating controls are on two side panels.



Rear view of BTA-1R2, with rear panels removed, showing vertical construction and accessibility of component parts.

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.



## Description

The RCA Type BTA-1R2, 1-kilowatt AM Broadcast Transmitter is designed for reliability, outstanding fidelity, and economical operation. It provides a high quality amplitude modulated signal at any frequency in the 535 to 1620 kilohertz band and is capable of producing a maximum of 1100 Watts.

Highly perfected audio circuits together with a large, high-quality transformer and reactor provide tremendous modulation capability and unusually High Fidelity sound. Stable, long-life tubes and silicon rectifiers have been used throughout the transmitter. Circuit breakers—not fuses—provide complete overload protection.

Provision for remote control and simplified power cutback are reflected in the BTA-1R2 design. Front panel or remote control selection of any two power levels of 1000, 500 or 250 Watts is available. No unnecessarily complicated circuitry or superfluous parts have been included and all components are easily accessible for maintenance and inspection. The transmitter is designed for 208 or 240 Volt operation.

### Functional Design

Improved functional design includes RCA's new color combination. Square construction permits locating the transmitter against the wall, or it can be installed 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 simplified operation. Remote control provisions permit unattended operation of the transmitter.

### Simplified Power Cutback

The BTA-1R2 easily fits into operations where power reduction at night is required. For "day-night" operation the transmitter incorporates a built-in power cutback system. By pressing a switch on the front or at a remote panel, the transmitter can be cut back in power to either 500 or 250 Watts. Efficient operation at the low power levels is achieved by reducing the high voltage by primary taps on the plate transformer.

### Complete Accessibility

The entire transmitter is housed in a single steel cabinet that is mounted on a sturdy welded steel base. Control components are conveniently located on the control panels on both sides of the front door and all meters are at eye level. Easy access is provided by a hinged front door and two interlocked removable panels. Most BTA-1R2 components are mounted on a vertical center chassis. Tubes and overload relays are mounted on the front and the other components are mounted on the rear. Larger power components are mounted on the base.

### Solid State Power Supplies

Three power supplies are used: a low voltage supply for plate and screen voltages of all low voltage tubes, a bias supply for the modulator tubes, and a high voltage supply for the modulator and power amplifier tubes. All power supplies use silicon diodes which results in lower power drain, cooler operation and more reliable performance.

### Power Requirements

The transmitter operates from a 208-240 Volt, 60 Hz single phase power source for the main power. In addition, the crystal heaters require an additional 115 Volt power input. The transmitter can be modified for operation on 50 Hz AC current if desired.

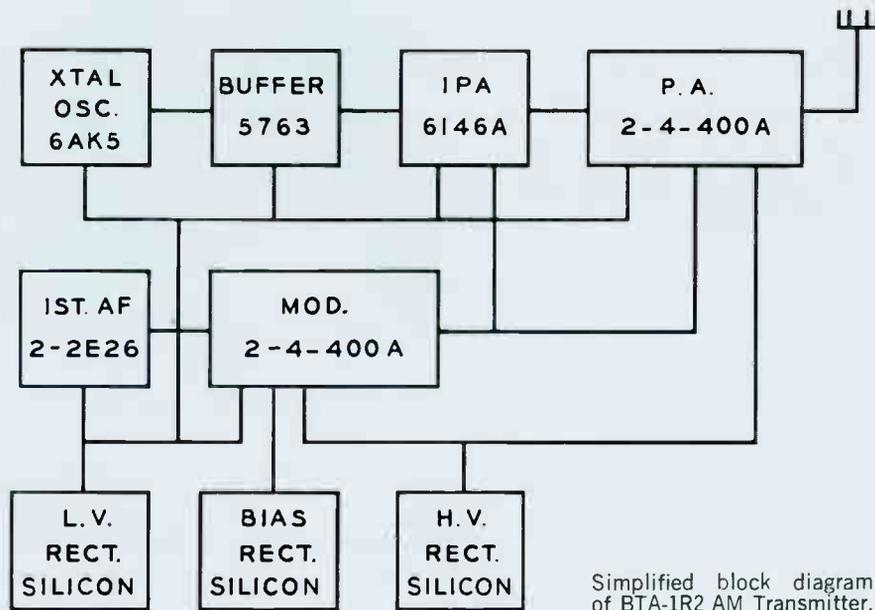
### Switchable Crystal Oscillators

The BTA-1R2 uses an MI-27632-A Crystal Oscillator which has provisions for three switchable TVM-130B temperature controlled crystal units. These units maintain the frequency constant to within plus or minus five hertz. 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 a 6AK5 oscillator tube and a 5763 buffer tube.

### Simple, Straightforward Circuitry

The buffer feeds a single 6146A driver tube which in turn feeds the power amplifier which consists of two 4-400A tubes connected in parallel. Tetrodes have been utilized throughout the RF section of the transmitter reducing the required stages and the power consumption. Tetrodes also eliminate the need of neutralization.

The modulator comprises two 2E26 tubes in push-pull resistance coupled to two 4-400A modulator tubes. The modulator tubes operate as a class AB<sub>1</sub> amplifier without grid current which results in an overall distortion of less than 2 percent up to 10,000 hertz.



## Specifications

### Performance

AF Input Impedance	150/600 Ohms
AF Input Level (100% modulation)	+10 ±2 dBm
AF Response:	
50-7500 Hz	±1 dB
30-10,000 Hz	±1.5 dB
30-12,000 Hz	±2.5 dB
AF Distortion (95% modulation):	
50-10,000 Hz	2%
50-12,000 Hz	3%
Noise (below 100% modulation)	60 dB
Frequency Range	535-1620 kHz
Frequency Stability	±5 Hz
Type of Output	Single ended
Carrier Shift (0-100% modulation)	3%
Output Impedance	40-250 Ohms

### Electrical

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 Hz
Phase	1
Power Consumption:	
(0% modulation)	2900 Watts (approx.)
(100% modulation)	3900 Watts (approx.)
(average program modulation)	3200 Watts (approx.)
Power Factor	90%
Permissible combined line voltage variation and regulation	±5%
Crystal Heater Power Supply	115 Volts 50/60 Hz

### Tube Complement

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

### Mechanical

Height	84" (213.4 cm)
Width	34" (86.4 cm)
Depth	32½" (82.6 cm) (less door handle)
Weight (net)	1700 pounds (772 kg) (approx.)
Altitude Range	0-5000 ft. (0-1524 m)
Ambient Operating Temperature:	
(min.)	-20°C (-4°F)
(max.)	+45°C (113°F)

### Accessories

Operating Spare Tube Kit	MI-27696-A
Recommended Minimum Spare Tube Kit	MI-27695-A
Type BTR-11B Remote Control System	ES-34280
Type BW-11A Frequency Monitor	
(Specify frequency)	ES-34042
Type BW-66F Frequency Monitor	MI-30066-B
Power Max (Negative Peak Limiter)	MI-34654
RF Ammeters	MI-7157-F Series
Ammeter Mounting Panel	MI-34656
Remote RF Pickup Unit (less meter)	MI-27966-B
Remote Antenna Meter	MI-27644 Series
Automatic Logging Equipment	On Application

## Ordering Information

Type BTA-1R2 1000-Watt AM Broadcast Transmitter  
complete ..... ES-27238-C

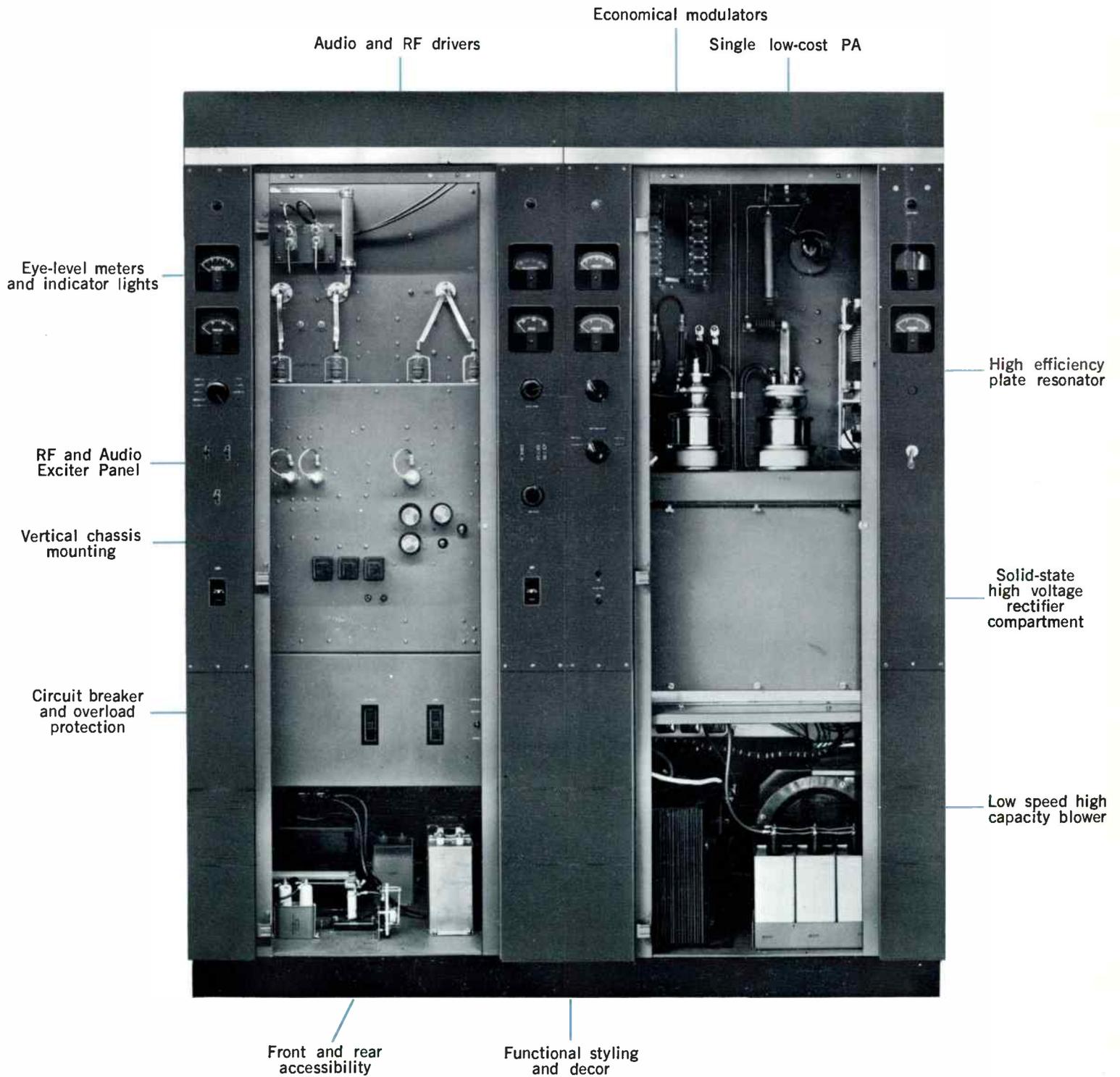
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## 5 KW AM Broadcast Transmitter, Type BTA-5T1

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- Outstanding performance
- Only two tuning controls
- Power economy
- Built-in remote control provisions





## Description

The Type BTA-5T1 is RCA's high-efficiency 5-kilowatt AM Transmitter that has proved a popular choice for its reliable and economical operation. It has been restyled for even greater operating convenience.

The transmitter is designed to provide an amplitude modulated signal at any frequency in the standard broadcast band between 535 and 1620 kilohertz. The nominal power output rating is 5000 Watts; however, it is capable of producing 5500 Watts to compensate for losses in the antenna tuning equipment.

### New High Efficiency PA

The BTA-5T1 Transmitter is an air-cooled transmitter featuring a number of RCA's finest developments, including an important refinement in Class C amplifier design. The high efficiency plate modulated power amplifier permits a single long-life 5762 tube to deliver the nominal 5 kW with 5.5 kW power output capability because the plate efficiency exceeds that of a conventional class C amplifier by 15 percent. As a result, considerable power savings can be realized. The amplifier is the only worthwhile development in class C amplifier design in 25 years. The high-voltage, low-voltage and bias supplies employ silicon type rectifiers throughout.

### Built-in Features

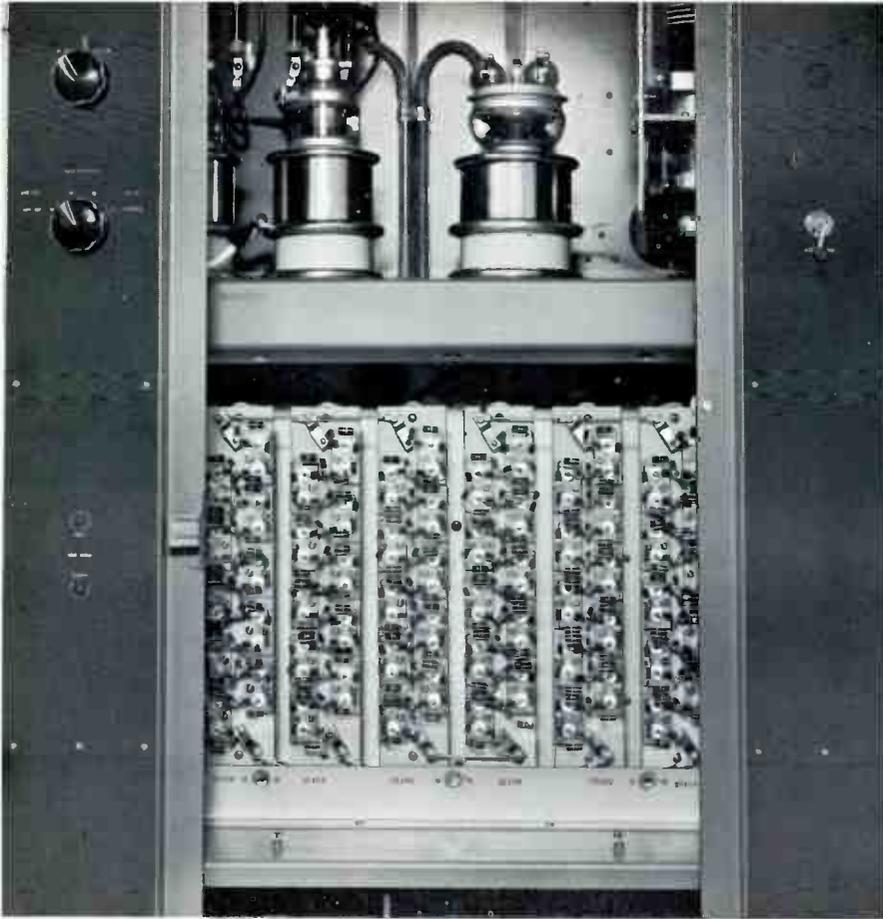
Provisions for increased power, remote control and simplified power cutback are reflected in the RCA Type BTA-5T1. Improved functional design includes RCA's new color combinations to harmonize with the new studio color schemes. All doors and panels are interlocked and grounding switches provide utmost safety for operating personnel. The variable vacuum capacitor used for tuning the PA is operated from the front panel. A delay relay is employed to keep the blower system in operation for one minute after operation has been terminated. This refinement is used to improve tube life.

### 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



IPA and modulator driver stages of the BTA-5T1 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.



Front view of the Silicon Rectifier Chassis of the BTA-5T1. The silicon cells offer improved performance since they are particularly resistant to aging, moisture and wide temperature variations.

of these chassis, while the larger power components are situated in the base of the cabinet. This type of construction provides greater ease in preventive maintenance and faster corrective maintenance.

#### Compact Size

The left hand cabinet contains the BTA-5T1 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 square feet.

#### Stable Circuit Design

The BTA-5T1 Transmitter incorporates RCA's MI-27632-A Crystal Oscillator with switchable temperature-controlled crystals. Each crystal will remain constant within plus or minus five Hertz. The desired crystal can be selected by means of a front panel switch or

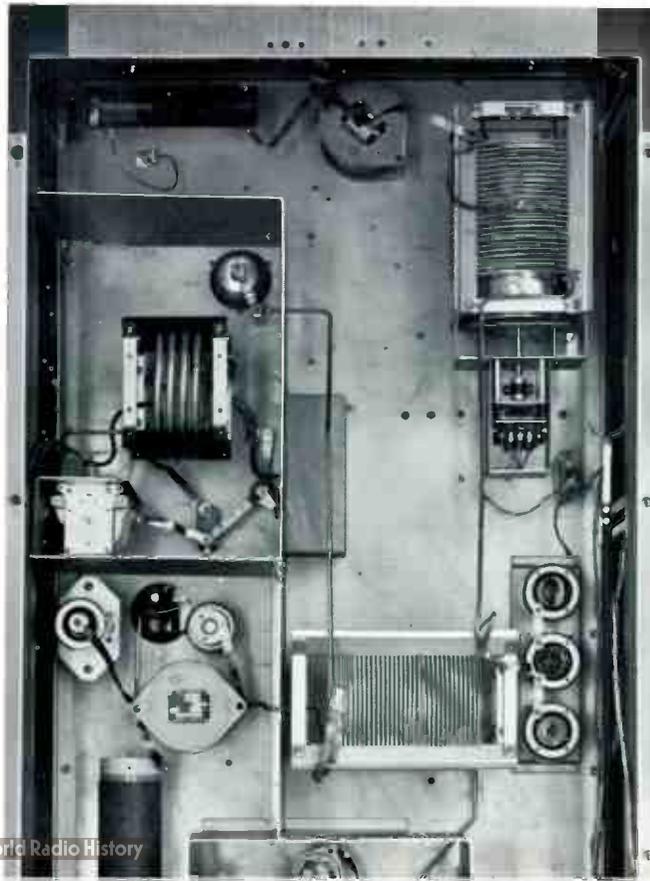
doors are located between the control panels. Rear access to each cabinet is provided by two removable, interlocked panels. Control components are conveniently located on the panels on both sides of the front doors. All meters are at eye level to facilitate readings.

#### Functional Styling

Vertical construction provides complete accessibility to all components. It also permits installation of the transmitter against a side wall, or 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. Other components are mounted on the rear

Rear view of high efficiency PA. Removal of the rear panel provides complete access to circuit components for ease of maintenance.



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 AF stage of the modulator circuit.

#### **Broadband Circuits**

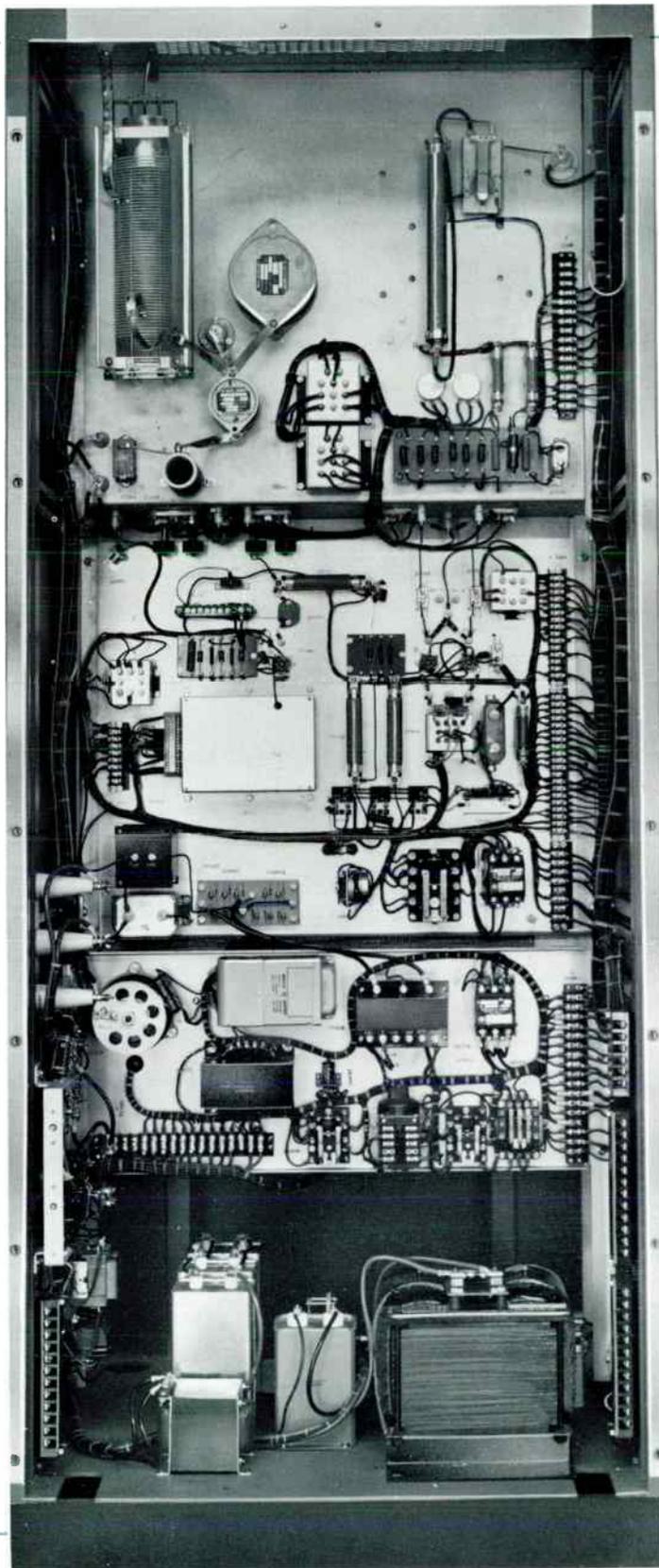
The output of the 6146 IPA stage is broadband and requires no tuning. It drives a pair of 4-125A tubes used as the driver for the 5762 final RF amplifier. A front panel control of a vacuum variable capacitor tunes the plate circuit.

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. Due to the high efficiency of the new power amplifier system, the power input of the modulator is also reduced affording appreciable power economies.

#### **Dependable Semiconductor Power Supply**

The BTA-5T1 incorporates 120 silicon rectifiers in the high-voltage power and supply. 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 adverse-



Rear of the BTA-5T1 exciter-driver cabinet.

ly affected by weather conditions. They can operate at ambient temperatures ranging from  $-20$  degrees C to  $+45$  degrees C and at altitudes up to 7500 feet above sea level. There is no significant aging of the forward drop characteristics. RCA specifications have been set higher than EIA standards by adding an additional 30 percent peak inverse voltage safety factor.

The bias and low-voltage rectifiers are sealed silicon units providing reliable operation.

### Overload Protection

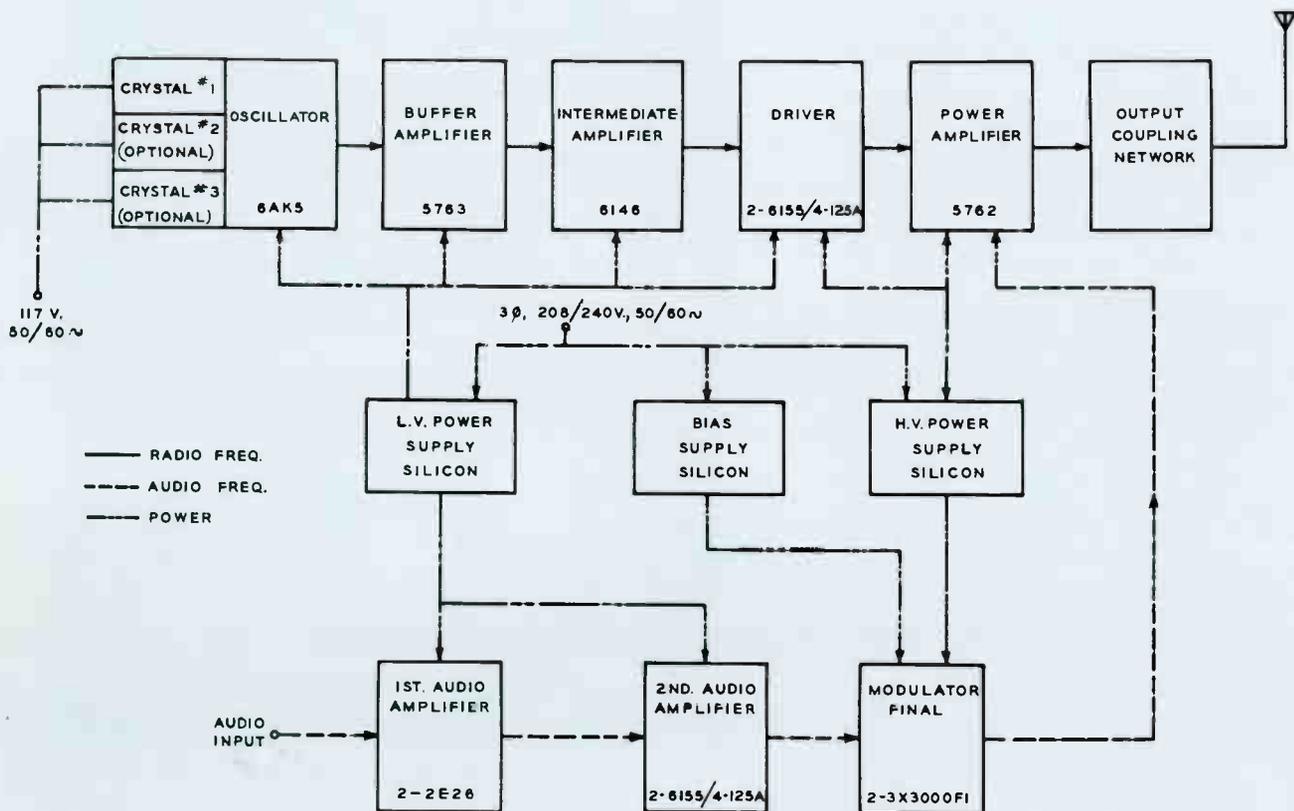
To provide additional reliability, improvements were made in the control and protective circuitry of the BTA-5T1 Transmitter. All primary lines are protected by means

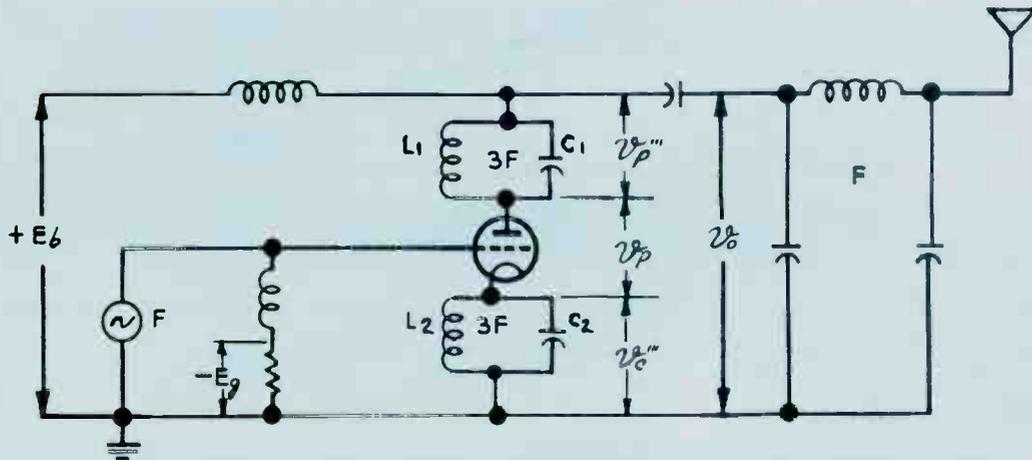
of circuit breakers with instantaneous overload trip protection. Line and high-voltage plate circuit breakers have additional built-in thermal protection. The 3-phase blower is protected by a contactor with the thermal cutoff in each phase. Relay switching is sequential so that filaments will not come on unless the blower is operating. Low voltage is delayed 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-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. A two cycle plate overload relay also permits the transmitter to return to the air automatically after one interruption has occurred.

Starting surges in the plate transformer, high voltage rectifier, and the filter capacitor are eliminated by the use of a step-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-5T1 with the incorporation of this circuit for the suppression of starting transients. The damping circuit and the primary line reactors afford continuous protection against possible operational transients.

Simplified block diagram of BTA-5T1 Transmitter.



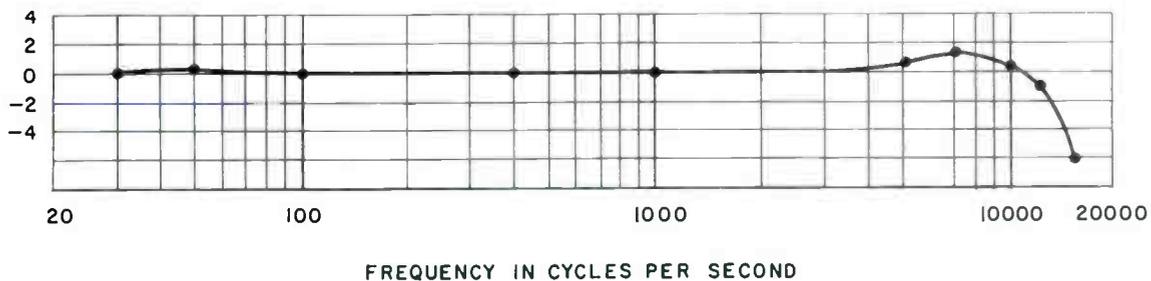


Simplified schematic of the new high efficiency PA stage. The adjustment of the circuit differs from a conventional class "C" only in that the coils  $L_1$  and  $L_2$  are resonated for maximum efficiency.

Audio Frequency Response for BTA-5T1 Transmitter.

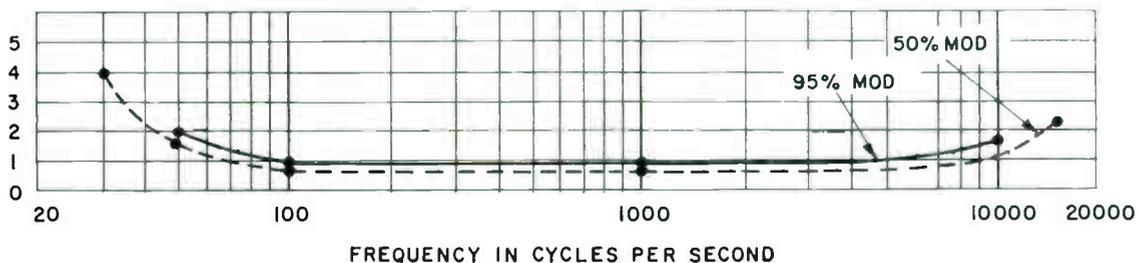
TYPICAL FREQ RESPONSE

DECIBELS



TYPICAL DISTORTION

PERCENT



## Specifications

### Performance

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

### Electrical

RF Voltage (for frequency monitoring) .....	10 V RMS 75 Ohms
RF Voltage (for modulation monitoring) .....	10 V, 75 Ohms
Power Output (nominal) .....	5000 Watts
Power Output Capability .....	5500 Watts
Power Supply .....	208/240 Volts ±11 Volts
Line Frequency.....	60 Hz (50 Hz kit available)
Phase .....	3
Power Consumption:	
(0% modulation).....	10.0 kW
(100% modulation).....	14.5 kW
(Average program modulation).....	11.0 kW
Power Factor .....	90%
Permissible Combined Line Voltage Variation and Regulation.....	±5%
Crystal Heater Power Supply.....	117 Volts 50/60 Hz

### Tube Complement

1 6AK5 Crystal Oscillator
1 5763 Buffer
1 6146 Intermediate Power Amplifier
2 6155/4-125A Driver
1 5762 Power Amplifiers
2 2E26 1st Audio Frequency Amplifier
2 6155/4-125A 2nd Frequency Audio Amplifier
2 3X3000F1 Modulator

### Mechanical

Overall Height.....	88" (223.5 cm)
	(84" or 213.4 cm less floor channels)
Cabinet Height.....	84" (213.4 cm)
	(80" or 203.2 cm less floor channels)
Width.....	69" (175.3 cm)
Depth.....	32½" (82.6 cm) (less door handles)
Overall Depth.....	55" (139.7 cm) (with door open)
Net Weight:	
Transmitter.....	3800 lbs. (1724 kg) (approx.)
Plate Transformer.....	420 lbs. (190.5 kg) (approx.)
Altitude Range .....	0-7500 ft. (0-2286 m)
Ambient Operating Temperature:	
BTA-5T1.....	-20°C (40°F) min.; +45°C (113°F) max.

### Accessories

Complete Set of Tubes for BTA-5T1.....	ES-34230
Recommended Minimum Set of Spare Tubes.....	ES-34208
BTR-11B Remote Control System.....	ES-34280
BTR-20D Remote Control System .....	ES-34274-B
BW-11A AM Frequency Monitor.....	ES-34042
BW-66F AM Modulation Monitor.....	MI-30066-B
RF Ammeter .....	MI-7157-F Series
Ammeter Mounting Panel.....	MI-34656
Antenna Tuning Equipment.....	ES-27256
Power Cutback Kit (1000/500 Watts).....	MI-34646-A
Remote RF Pickup Unit (less meter) .....	MI-27966-B
Remote Antenna Meter.....	MI-27644-Series
Automatic Logging Equipment.....	On Application

## Ordering Information

Type BTA-5T1 5000-Watt Broadcast Transmitter (high-efficiency) including one set of tubes and crystal (Silicon Rectifier). Specify operating frequency and output impedance.....ES-34229

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## 5-10 KW AM Broadcast Transmitter, Type BTA-5U1/10U1

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- Outstanding sound
- High efficiency circuits
- High reliability
- Great overall economy



# High Efficiency 5/10 Kilowatt Transmitter

Only Two  
Tuning Controls

Dependable  
Semi-Conductor  
Power Supply

High  
Efficiency  
Cathode  
and Plate  
Resonators



Built-in Remote  
Control Provisions

Completely  
Air Cooled

Self-contained 5-kW  
Plate Transformer

## 5/10 KW AM Broadcast Transmitter, Type BTA-5U1/10U1

The BTA-5U1 is a 5 kilowatt amplitude modulated, high fidelity, broadcast transmitter for operation in the standard band between 535 and 1620 kilohertz. It is essentially the same as RCA's popular BTA-5T1 model with advanced provisions for power increase to 10 kilowatts.

The RCA BTA-10U1 AM Broadcast Transmitter is the fully converted deluxe BTA-5U1 with a second 5762 Amplifier tube to provide 10 kilowatt output. Both transmitters are outstanding in appearance and reliability, and meet requirements of the FCC and EIA.

The BTA-5U1/10U1 operates from a 208/240 Volt, 50/60 hertz, three-phase

power source for the main power. The crystal heaters require an additional 115-Volt 50/60 hertz single phase AC power input. Both transmitters exceed nominal power output rating to compensate for losses in the antenna tuning equipment.

The spacious cabinet of the BTA-5U1 Transmitter permits internal mounting of the 5 kilowatt plate transformer. There are provisions for easy conversion to higher power at a later date. The transmitter allows simplified power change to 1 kilowatt or 500 Watts, if desired, by installing an optional Power Cutback Kit, MI-34646-A. Similarly, the BTA-10U1 can be operated at 5 kilowatts, or at 1 kilowatt.

### Description

The BTA-5U1/10U1 is an air-cooled transmitter featuring a number of design developments, including an important development in Class C amplifier design. The new high efficiency, plate modulated power amplifier permits one or two long-life 5762 tubes to deliver the nominal 5 or 10 kilowatt with 5.5 or 10.6 kilowatt power output capability. The plate efficiency appreciably exceeds that of a conventional class C amplifier. As a result, considerable power savings can be realized. Referring to the simplified schematic, the circuit arrangement is very similar to a conventional class C amplifier, except for the presence of two high efficiency resonators. The amplifier is stable and easy to adjust. The high-voltage, low-voltage and bias supplies employ silicon rectifiers throughout.

Other new design techniques of the transmitter provide simplified tuning, increased safety, longer tube life and improved performance. After initial adjustments, the transmitter can be tuned from the front panel. This is accomplished by only two controls. Provisions for manual or remote control operation are incorporated in the transmitter. For safety, all doors and panels are interlocked and grounding switches protect operating personnel. The transmitter is air-cooled by a single blower housed in the center cabinet.

### Improved Mechanical Design

The BTA-5U1/10U1 Transmitter is housed in three attractively styled cabinets made of anodized aluminumized steel to provide improved magnetic and electrostatic shielding. The left cabinet, or cubicle, contains the Transmitter Driver including exciter and control panel. The center cabinet houses the Modulator and High Voltage Rectifier, and the Blower. In the right hand cabinet is located the Power Amplifier, and the 5-kW Plate Transformer. The plate transformer of the BTA-10U1 is an external unit which can be mounted near the cabinets.

### Accessible Vertical Panel Construction

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. Reach-in accessibility to transmitter components is afforded by hinged front doors 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 where all meters are situated at eye level.

The matched cabinets are designed to combine an attractive ap-

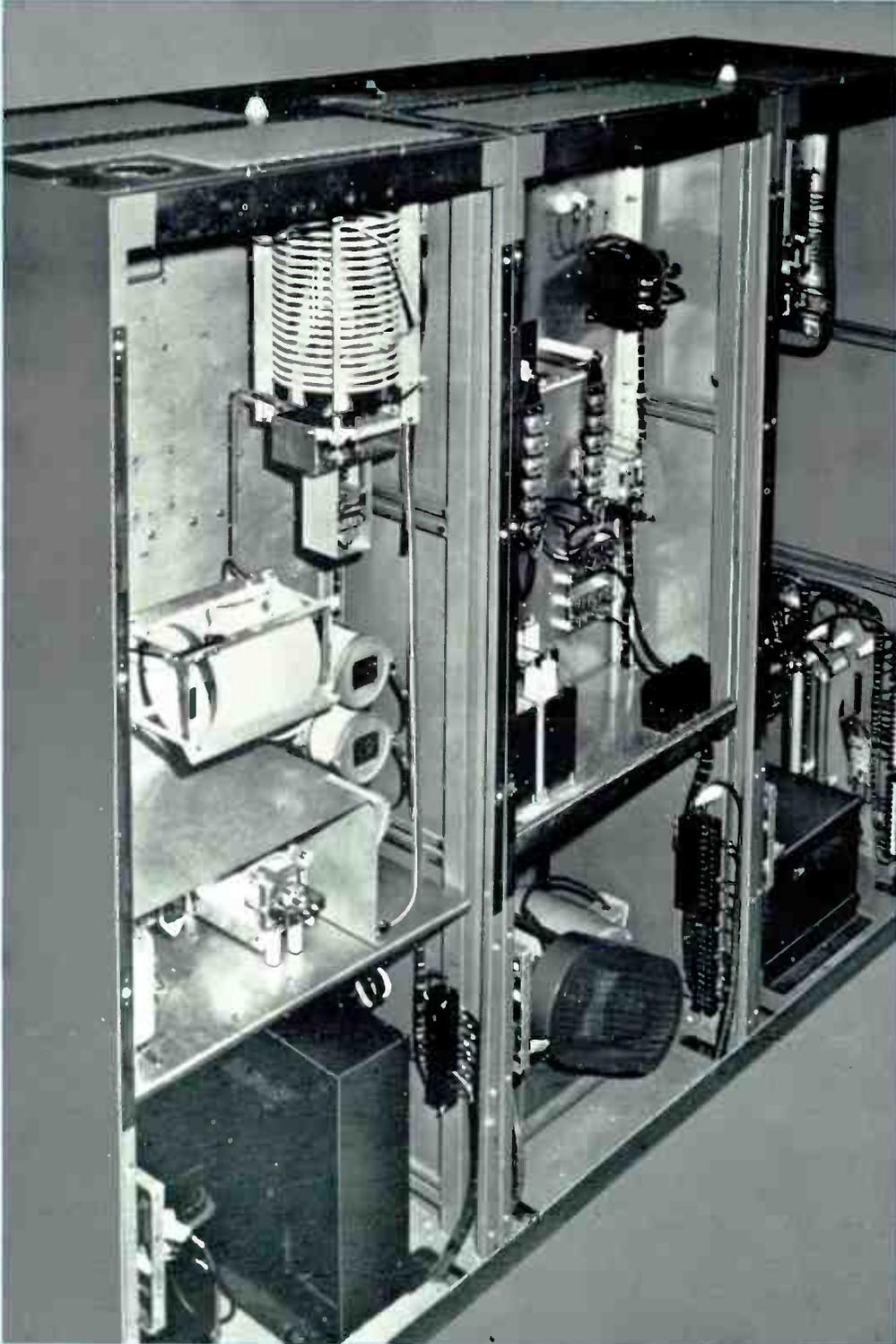
pearance with the utmost in utility. Vertical construction permits easier maintenance and service. It also permits installation of the transmitter against a side wall, or allows other equipment to be placed on either side of the cabinet. The front doors of the transmitter give immediate access to the front of the vertical panels on which circuit components such as tubes and overload relays are mounted. Remaining small components are mounted on the rear of these chassis, while the larger power components are situated in the base of the cabinet.

### Efficient Circuit Design

The BTA-5U1/10U1 Transmitter incorporates RCA MI-27632-A Crystal Oscillator with three, switchable, temperature-controlled crystal positions. Crystal stability is  $\pm 5$  Hz. 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 broad-band 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

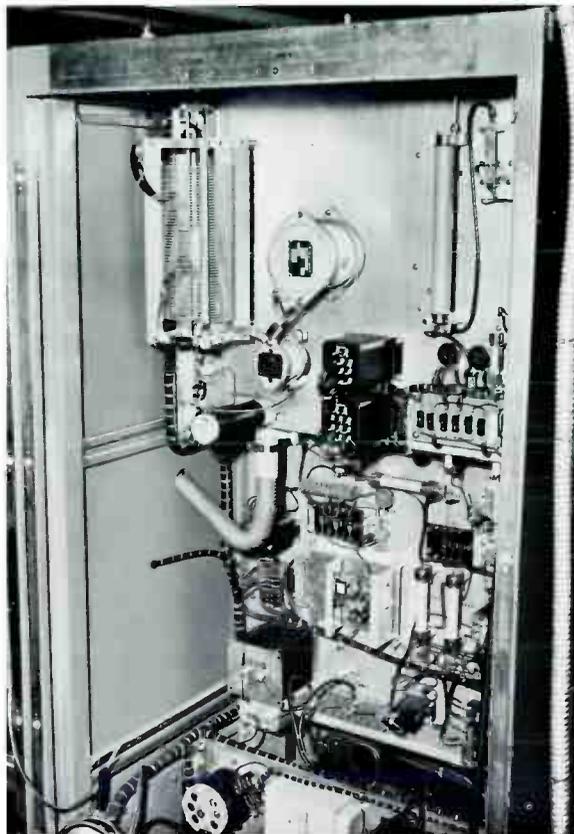
## Select Features

### REACH-IN ACCESSIBILITY



Rear view of transmitter showing vertical construction permitting complete accessibility to all transmitter facilities. The modulation transformer and final PA tank circuitry are seen in foreground, rear of modulator and blower in center cabinet, while heavier components of driver are shown mounted on floor of third cabinet.

**BUILT-IN REMOTE CONTROL**



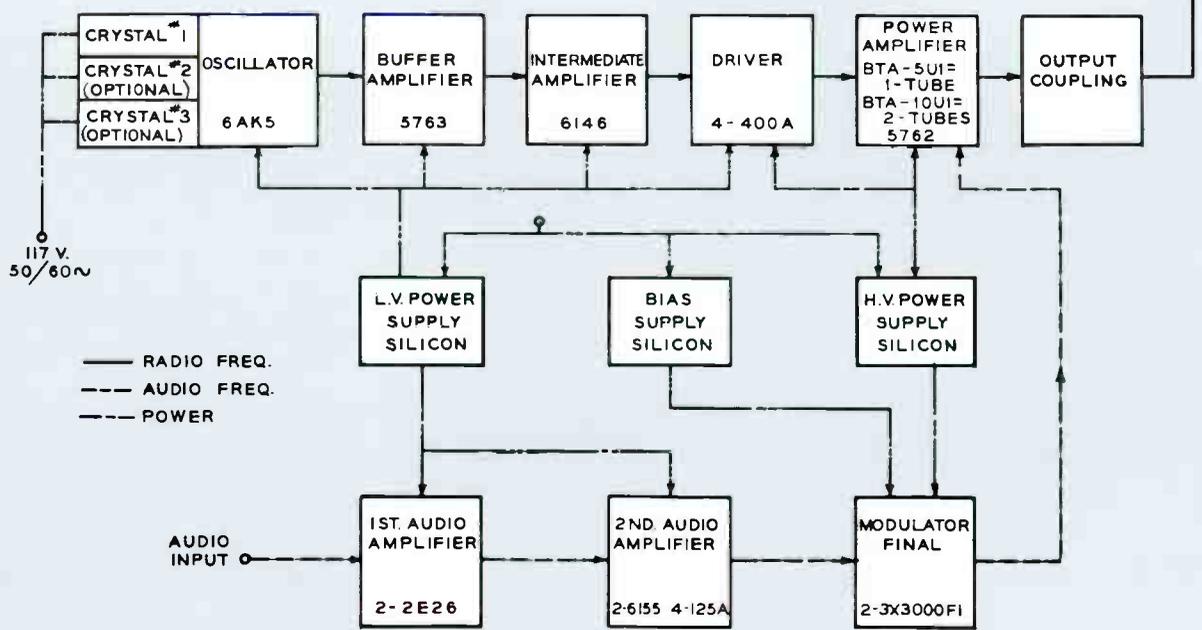
Rear view of BTA-10U1 exciter and control cabinet.

**POWER ECONOMY**



Modulator tubes and silicon high voltage rectifiers with cover removed.

**STABLE CIRCUIT DESIGN**



Block diagram of Type BTA-5U1 and BTA-10U1 Transmitters.



Driver cabinet including exciter and control panel.

very conservatively and a pair of 2E26 tubes used as the first AF stage of the modulator circuit.

The output of the 6146 IPA stage is broadband and requires no tuning. It drives a single 4-400A tube where tuning is accomplished by using a slug-tuned coil controlled from the front panel. This tube, in turn, drives one or two high-efficiency, long life 5762 output triodes. A front panel control of a vacuum variable capacitor tunes the plate circuit.

#### **Broadband Neutralization**

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 remote control. The second harmonic trap uses a slug-tuned coil, thus eliminating the possibility of contact pitting from high RF currents. Neutralization of the PA is achieved by a broadband transformer and a variable vacuum capacitor.

The modulator of the transmitter consists of a pair of 2E26 tubes located in the exciter portion, resistance coupled to drive two 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. Due to the low plate dissipation of the new PA system, the power input of the modulator is also reduced affording appreciable power economies.

#### **Dependable Semiconductor Power Supply**

The BTA-5U1/10U1 incorporates silicon 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  $-20$  degrees to  $+45$  degrees C and at altitudes up to 7500 feet above sea level. There is no significant aging of the forward drop characteristics. Across each of the individual silicon cells a resistor has been shunted so that they will all share equally the peak inverse voltage. RCA specifications have been set higher than EIA standards by adding an additional 30 percent peak inverse voltage safety factor.

## 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 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 as well as to the Power Amplifier tubes in cabinet three.

## Overload Protection

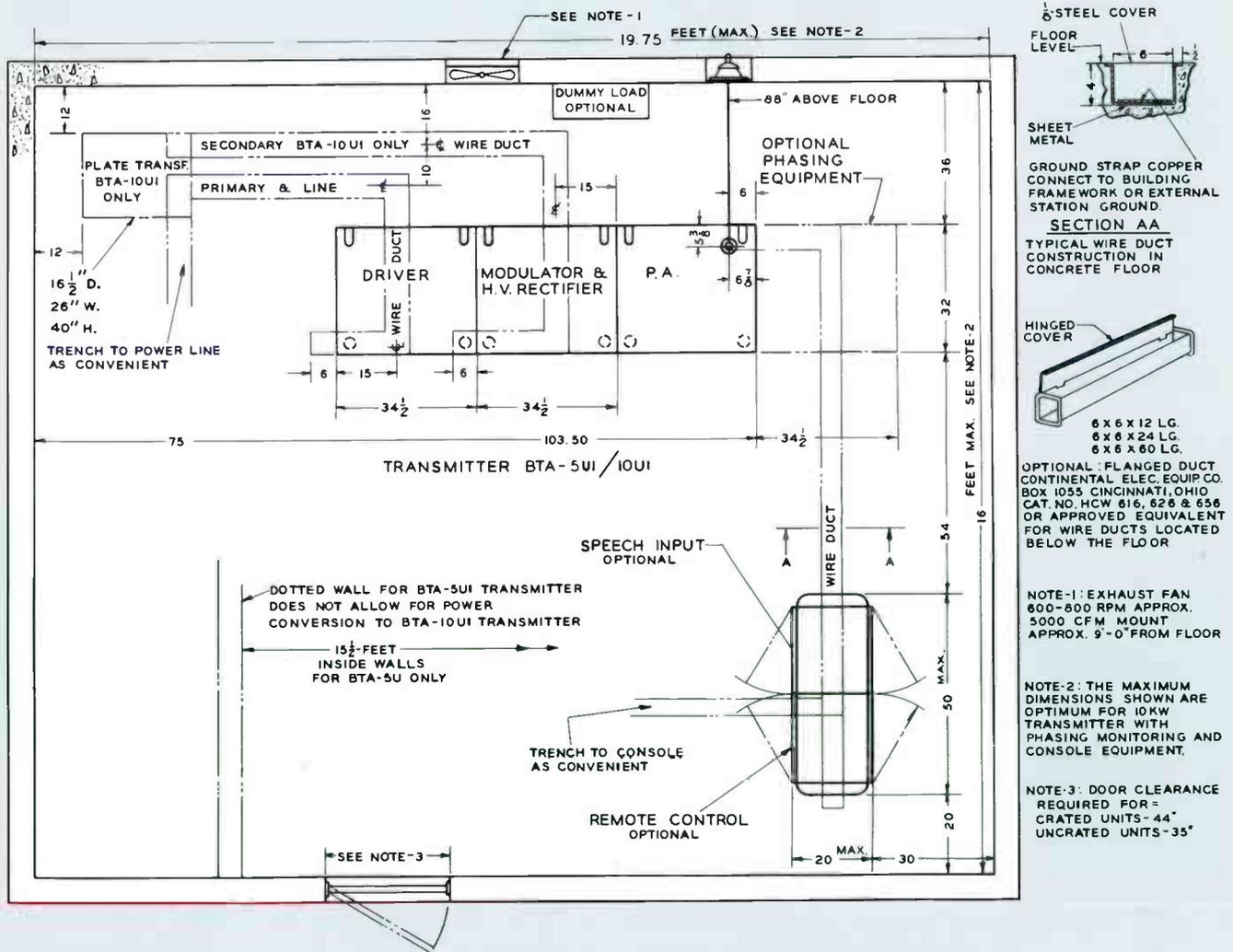
To provide additional reliability, improvements were made in the control and protective circuitry of the transmitter. All primary lines are

protected by means of circuit breakers with instantaneous overload trip protection. Line and high-voltage plate circuit breakers have additional built-in thermal protection. The 3-phase blower is protected by a contactor with a 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 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 potentials are present. Overload protection is also provided in the low-voltage supply, the second AF stage, the IPA stage, the modulator, the PA stage and the high-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. A two cycle plate overload relay also permits the transmitter to return to the air automatically after one interruption has occurred.

Starting surges in the plate transformer, high voltage rectifier, and the filter capacitor are eliminated by the use of a step-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-5U1/10U1 with the incorporation of these circuits for the suppression of starting transients. The damping circuits and the primary line reactors afford continuous protection against possible operational transients.

Typical floor plan for BTA-5U1 and BTA-10U1 transmitters. External plate transformers are required only for the BTA-10U1 transmitter since the transformer for the BTA-5U1 can be mounted in the PA cabinet.





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## 50 KW "Ampliphase" AM Transmitter, Type BTA-50H1

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- Excellent audio quality
- Wide range frequency response
- Solid state rectifiers used throughout
- Proven stability
- Designed for remote control
- Over 110 percent positive modulation capability



Compact in-line construction of BTA-50H1 showing left to right, left hand power amplifier, exciter, right hand power amplifier, and rectifier-control cubicle.

## Description

The RCA Type BTA-50H1 AM Broadcast Transmitter is a completely air-cooled, 50-kW phase-to-amplitude modulated transmitter designed for high fidelity transmission in the standard broadcast band (535 kHz to 1620 kHz). It provides a signal containing exceptionally low distortion and extended frequency response. Measured response is flat within  $\pm 3$  dB from 35 hertz to 25,000 hertz. The equipment is capable of being modulated over the frequency range of 10 hertz to 30,000 hertz. Frequency response has been extended largely through the elimination of unnecessary transformers in the audio system as well as improved circuitry.

Low harmonic distortion with negligible carrier shift at maximum signal output has been achieved in the BTA-50H1 by selection of adequate new tube types and ad-

vanced design throughout the entire equipment. The design features an inherently linear system capable of continuous high modulation levels impervious to inadvertent over-modulation. For example, the transmitter may be modulated 100 percent at any frequency between 30 and 15,000 hertz continuously for many hours without detrimental effects to any of the component parts. A small amount of overall feedback is incorporated to provide the exceptional performance. With the feedback circuit removed, the BTA-50H1 will still meet the FCC specifications for audio frequency response, harmonic distortion and noise.

### Lowest Operating Cost in 50-KW Transmitters

A number of new refinements as well as time tested features which

have proven their worth are incorporated in RCA's latest 50-kW transmitter. Power requirements are moderate for the equipment. Power amplifier plate efficiency of the order of 76 to 80 percent is obtained. Total power consumption for 50-kW carrier power will run approximately 94 kW, approximately 100 kW will be required for average levels of modulation, and approximately 130 kW will be required for 100 percent modulation.

Fewer major components, as compared to those required by many 50-kW transmitters, are used in the BTA-50H1. In addition to the low cost of operation of the transmitter a Power Cutback Kit, MI-27688-A can be added which will permit operation at 10 kW.

Two identical RF chains, each developing a power of 25 kW, are incorporated in this equipment.

Since they are identical, servicing is made easy by comparison of the two chains. Components are directly interchangeable, which allows substitution for comparison purposes. All components are easily accessible which results in a minimum schedule for maintenance. In addition, fewer replacement parts are required for adequate protection against lost air time should a failure occur. Low power consumption, fewer major components and a reduced maintenance schedule make the BTA-50H1 operation cost the lowest in the 50-kW field.

### Remote Control Operation

The BTA-50H1 AM Transmitter has been designed with remote control operation in mind. Ready for use with standard RCA remote control equipment, all transmitter components and wiring are standard in the equipment for FCC required metering and control facilities. In addition, other optional metering and control facilities may be incorporated by utilizing components and wiring that is supplied with the equipment. Details relative to incorporating remote switching to an auxiliary transmitter, dummy load and auxiliary power supplies can be supplied according to the needs of the individual customer.

### Lightweight Type 6697 Tubes in Final PA

One Type 6697 power amplifier tube is used in each of the two RF chains. Each amplifier tube is capable of delivering in excess of the normal 25 kW of modulated power to the common load. The Type 6697 is rated at 35 kW dissipation and under average modulation conditions it is only required to dissipate approximately 14 kW. Operation of the PA tubes so far below their maximum ratings assures the user of long tube life. In addition to providing long life, the 6697 is physically small in size and weighs only 29 pounds. One person, without the aid of mechanical assistance can quickly and easily replace any tube in the transmitter.

One Type 4CX5000A tube is used in each of the driver stages in the two RF chains. The 4CX5000A is also operated well below its maximum ratings and will give long trouble free service. Other tubes

used in this equipment are of the small, low cost variety. Tube complement is such that inventory cost for required spares is kept at a minimum while adequate protection to the broadcaster is maintained.

### Solid State Rectifiers Used Throughout

All power supplies utilize solid state rectifiers. The plate supplies, bias supply and low voltage supply use silicon units which are very conservatively rated to assure long life. The current rating of the units is such that any conceivable load fault is cleared without jeopardizing the diode units. The use of solid state rectifiers permit the transmitter to operate in ambient temperatures as low as  $-20$  degrees centigrade.

### Meets FCC Harmonic Suppression

A completely shielded two section low pass filter is incorporated in the BTA-50H1. It consists of one pi ( $\pi$ ) section and one T section and each inductive series element is completely shielded. Two series-tuned, shunt-connected traps are used to provide added attenuation of the second harmonic.

### Transmitter Equipment

Type BTA-50H1 AM Broadcast Transmitter consists of four equipment cabinets, two of which house the power amplifiers, one the exciter unit and the fourth cabinet the rectifier and control unit. The high-voltage reactor is housed in the lower rear compartment of the exciter cabinet, and the IHV plate transformer in the lower rear compartment of the rectifier and control cabinet.

Each of the four transmitter cabinets measure 44 inches wide by 60 inches deep by 84 inches high, and consists of an all aluminum cubicle erected on a welded steel base. This cubicle consists of a series of panels fabricated and assembled to form a rigid structure. The use of aluminum eliminates unnecessary weight and provides excellent shielding to assure effective confinement of spurious energy. Maximum accessibility to all transmitter components are afforded by 28-inch wide, full-length front doors, while rear access is through two covers

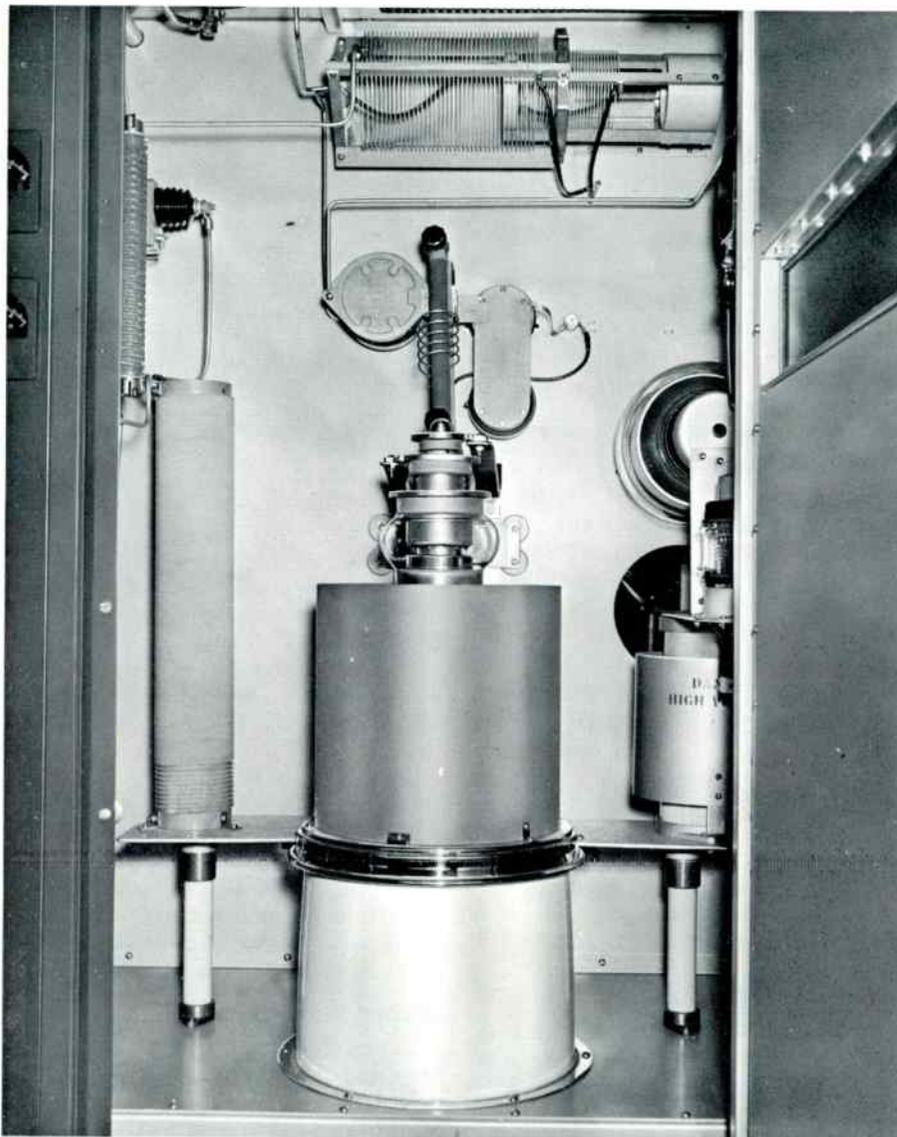
attached with quick-disconnect fasteners for easy removal.

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, giving 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 flanking each of the front doors, 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 to form a continuous duct on the four 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 RF fields. Provision is also made at the top of the cabinets for the addition of an exhaust air duct.

### Power Amplifiers

The left end cabinet and the third cabinet from the left end are identical and contain the final power amplifier stages. The 6697 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, filament transformer and grid leak resistors. The lower rear section contains a low noise blower which cools the 6697 tube and its cabinet and the adjacent half of the exciter cabinet. The two 6697 power amplifiers are designed to supply equal amounts of power to the output network. Because of the balanced dissipation in the two 6697 PA tubes, less air pressure with resultant lower air flow is required for adequate cooling of the power amplifier cubicles. The lower rear panel contains an impingement type air filter for the blower. The PA cabinets are constructed so that the blowers and filters can be mounted externally to the cabinets, if so desired.



Close-up view of one of the dual final power amplifier stages. The new type 6697 tube together with grid circuits and part of the plate circuits are readily accessible from the front of the transmitter.

### Exciter-Modulator

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

Two 807 crystal oscillators are located at the bottom front of the cabinet. The exciter-modulator unit is mounted on sliding rails directly above the drive regulator. It is a

self-contained unit with the RF and AF 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 4CX5000A stages. A meter panel for these stages is located at the bottom of these sub-compartments.

The common output capacitors of the two 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 effected between the

various sections of the filter and the output capacitor. The lower rear section of this cabinet contains high voltage filter reactor and driver DC filament supplies.

### Provisions for Standby Operation

Space is provided in the exciter-modulator cabinet for the mounting of a second exciter-modulator unit. It is mounted on sliding rails like the first unit directly above the drive regulator. Each of the 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. Either of the 807 oscillators in the BTA-50H1 can be instantly switched 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 spare modulator is supplied in the form of an optional kit (ES-34264).

### Rectifier and Control Unit

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 solid state 15-kV, 5-kV, and low-voltage bias supplies. Also included here are the high voltage grounding switches and the 15-kV filter capacitors. The top rear section of the cabinet contains the control relays, overload relays, distribution contactors, and the low power distribution circuit breakers. The distribution breakers and overload relays are readily accessible, even though recessed so that they will not be damaged or improperly operated. The bottom rear of the cabinet contains the 5-kV rectifier components including plate transformer.

### Circuit Description

RF is generated in the BTA-50H1 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. Each signal is then passed through DC modulator stages adjusted so that a phase difference of approximately 135 degrees exists between the two signals. Modulation is applied at this point to each RF channel by a variable resistance type of phase modulator.

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 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 that in turn drive 4CX5000 ceramic, air-cooled, tetrode amplifiers.

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 adjusted to provide the proper load to the power amplifiers.

### Drive Regulator

The drive regulator samples the audio signal, amplifies it, and applies a desired value to the grids of the second IPA, providing adequate drive to the final amplifiers

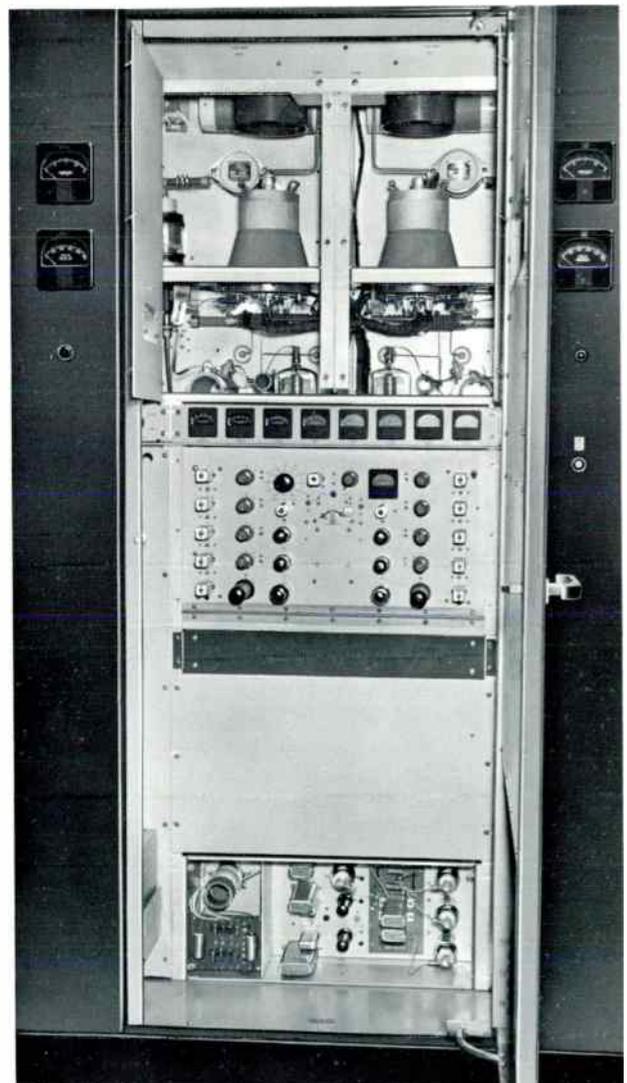
as required by the level of audio input applied to the equipment. This technique contributes considerably to the overall linearity during modulation.

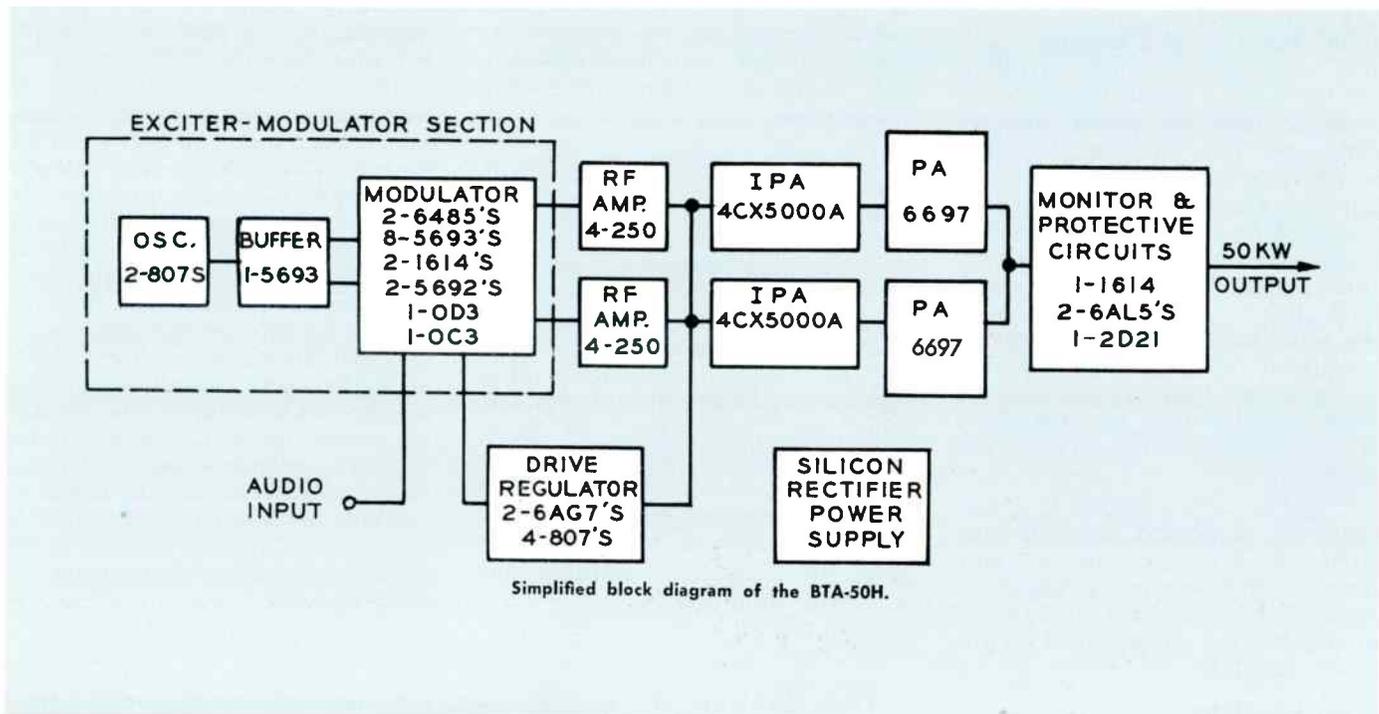
The drive regulator, consisting of three audio amplifiers (two 6AG7's and an 807) driving three 807 cathode followers, is used to control the grid operation conditions of the final power amplifier tubes to assure maximum plate efficiency over the complete audio cycle. During the trough of modulation 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 6697 power amplifier tubes require 15-kV DC at 7.5 Amperes, which is obtained by using RCA silicon power rectifiers in a three phase full wave rectifier circuit. Two other plate voltages, 5-kV and 1-kV, are provided by separate silicon supplies. Bias voltages for all tubes are supplied by an additional supply. The high power distribution equipment for the transmitter consists of an electrically operated air circuit breaker, and a manually operated delta-wye switch for the 15-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.

Front section of the exciter-modulator containing all components from oscillator through the driver stages.

Upper rear of exciter portion of the BTA-50H1 showing the combining and output networks.





Simplified block diagram of the BTA-50H.

Simplified block diagram of the BTA-50H1.

### Transmitter Control

Control circuits in the BTA-50H1 contain a number of features which are designed to provide maximum flexibility in control, protection and operation. Among these are choice of single-button or step-by-step starting, automatic timing and sequencing of starting operations, and location of transmitter faults by a system of indicators. Protection of the operator is achieved by a system of interlocking grounding devices; protection of the equipment by conventional relays and circuit breakers. There are provisions for the protection of the equipment against transmission line irregularities and air failure. A reflectometer is incorporated in the BTA-50H1 that is sensitive to the changes in voltage to current ratio on the output transmission line to the antenna. A great change in transmitter load acts to remove the carrier by removing drive momentarily to allow any RF fault to clear. If, however, the fault persists after removing carrier several times, the plate power is automatically removed.

Control of the transmitter is accomplished from the front of the rectifier and control cabinet. All

necessary wiring to allow control from a remote location or console has been provided. 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 BTA-50H1 can either be turned on by operating the control switches in sequence or by leaving all control switches in the ON 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, that are connected directly in the tube circuit and rectifier ground leads, and the thermal magnetic circuit breakers connected in the AC power leads used as back up protection and disconnect switches. The transmitter circuitry is arranged so that an overload will either lock out the plate circuit or allow a single reclosure that 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 provision of indication lamps on each cabinet that indicate the status of the interlock in that particular cabinet.

### Installation and Layout

Outstanding features of the BTA-50H1 are the small floor space requirements and ease of installation of the transmitter. 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 switch-gear components; and the main plate transformers. The floor plan illustrates a typical layout of the complete equipment. Elimination of the need for under-floor cable trenches and considerable reduction in external air ducts, simplifies installation and reduces costs.

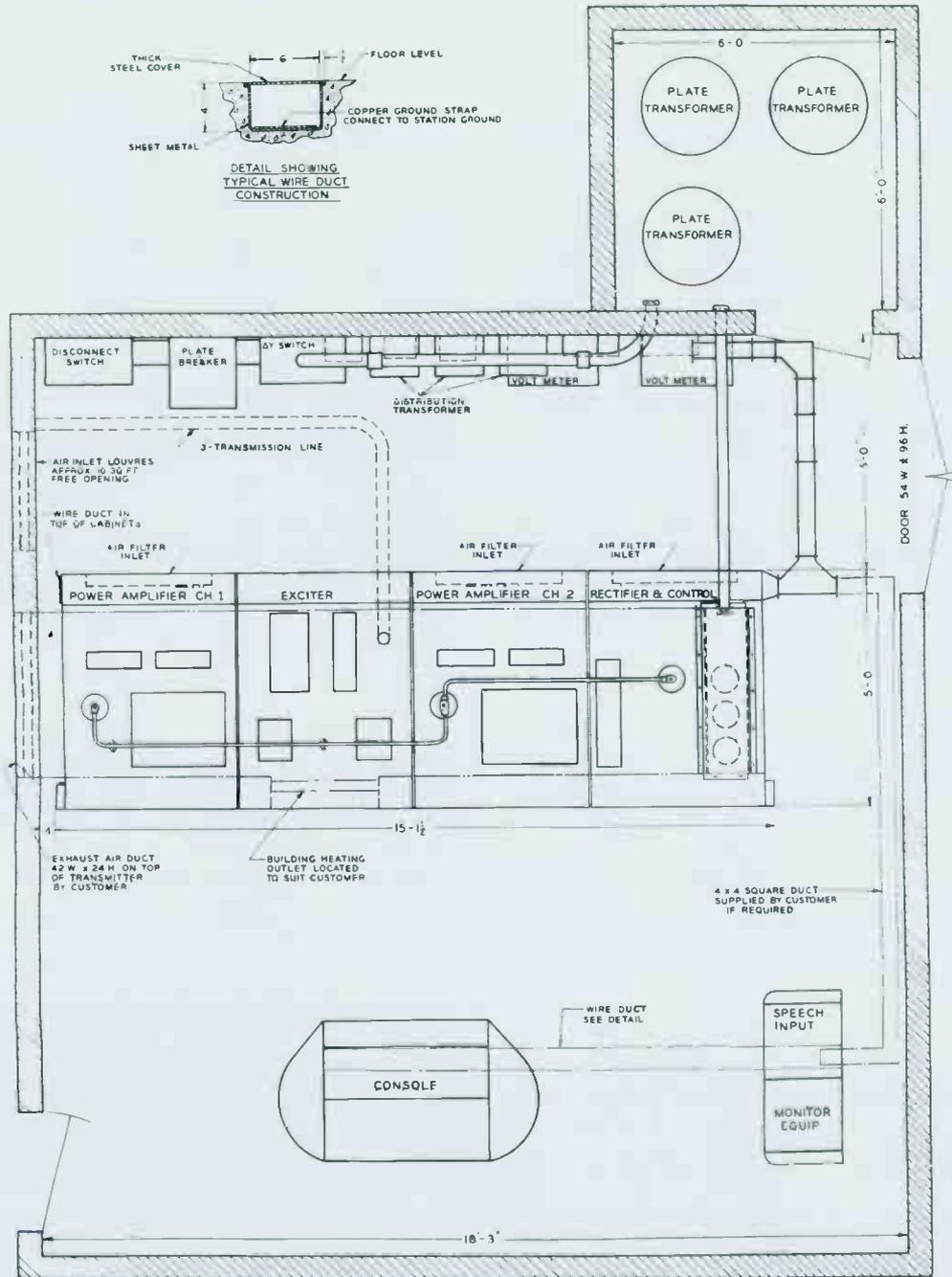
As shown in the layout, it is desirable to leave a passageway at the right end of the frontline cabinets since the circuit breakers and overload relays are most accessible from

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.

Wall mounting as shown on the overall floor plan is suggested to make the BTA-50H1 most adaptable

to existing transmitter buildings. The mounting of these components, however, is not critical as to location. They can be mounted in existing power distribution areas if desired. These components include 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 the BTA-50H1 Transmitter.

## Specifications

### General

Power Line Requirements:	
Line	460 Volts, 50/60 hertz, 3 phase
Combined Regulation and Variation	Not more than $\pm 5\%$
Power Consumption	94 kW (approx.) at zero modulation
Power Consumption	100 kW (approx.) at average modulation
Power Factor	Better than 90%
Crystal Heaters	110 Volts
Type of Emission	A3
Power Output (at transmitter terminals)	56 kW (max.)
Frequency	Any specified between 535 and 1620 kHz
Frequency Stability	Assigned frequency $\pm 5$ hertz
Type Modulation	Phase to amplitude
AF Input Impedance	150/600 Ohms
Audio Input Level	+10 $\pm 2$ dbm
Audio Response	$\pm 1.5$ dB 30–10,000 Hz
AF Distortion	Less than 3% RMS 50–7500 Hz
Noise Level	60 dB below 100% modulation
Carrier Shift	Less than 5% neg. 100% modulation
Type Output	Unbalanced
Output Impedance	51.5 Ohms or others specified
Spurious Emission (2nd Harmonic and above)	83 dB down

### Mechanical

Cabinet Size	44" wide, 84" high, 63" deep (111.8 cm wide, 213.4 cm high, 160 cm deep)
Overall Weight	12,000 lbs. approx. (545 kg)
Maximum Altitude	7500 ft. (2286 m)
Ambient Temperature	-20°C +45°C
Maximum Cabinet Weight	3,093 lbs., approx. (1403 kg)
PA Cabinet Weights (each)	953 lbs., approx. (432 kg)
Plate Transformer Weight (total)	820 lbs., approx. (372 kg)
Rectifier Weight	3,093 lbs., approx. (1403 kg)
Exciter Weight	1,241 lbs., approx. (563 kg)
Filter Reactor	570 lbs., approx. (259 kg)

### 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
1	OD3	Low Voltage Regulator
1	OC3	Low Voltage Regulator

#### RF Amplifier Section:

2	4-250A	Intermediate Power Amplifier
2	4CX5000A	Driver Amplifier
2	6697	Power Amplifier

#### RF Amplifier 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

#### Monitor Circuits:

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

### Accessories

Complete Set of Operating Tubes	ES-27222-C
Recommended Spare Set of Tubes	ES-27223-C
Spare Modulator Kit	ES-34264
Type BTR-11B Remote Control Equipment (10 Functions)	ES-34280
Type BTR-20D Remote Control Equipment (20 Functions)	ES-34274-B
BTRX-40A—20 Position Extension for BTR-20C	MI-27556
50/10-kW Cutback Kit for BTA-50H1 Transmitter	MI-27688-A
Dummy Load Schedule of Parts and Instructions	ES-34234
BPA-50 Antenna Tuning Unit	MI-28903-A/B
BPA-50 Antenna Tuner (230 ohms)	ES-28903-A
BPA-50 Antenna Tuner (70/51.5 ohms)	ES-28903-B
RF Ammeter (for BPA-50)	MI-7147-Series
Remote RF Pickup Unit (less Meter)	MI-28027-B
Remote Antenna Meter	MI-7157-Series
Type BW-11A Frequency Monitor	ES-34042
Type BW-66F Modulation Monitor	MI-30066-B
AM Carrier-Off Monitor	ES-34251
Automatic Logging Equipment	On Application

## Ordering Information

Type BTA-50H1 50-kW AM Broadcast Transmitter with two crystals, remote meter, one set of operating tubes, silicon rectifiers, and one exciter. Does not include antenna tuning unit. (Specify operating frequency and output impedance) ..... ES-27221-C



- Extends AM radio coverage
- Increased positive peak modulation
- Meets FCC rules
- Only two adjustments to install

## “Power Max” Negative Peak Limiter

### Description

The RCA “Power Max”, MI-34654, is a non-linear limiter designed to extend area coverage of AM broadcast transmitters. With “Power Max” it is possible to modulate the positive peaks as much as 110 to 115 percent, limited only by transmitter capability without exceeding the FCC maximum 100 percent negative peak modulation. The “Power Max” does not clip the negative peaks; it limits the negative peak by rounding off the signal beyond a predetermined point. Many stations can achieve new maximum coverage from present transmitting equipment with “Power Max.”

The equipment is completely housed in a rack-mounting chassis requiring only seven inches of rack space. It is quickly installed in the input of any AM transmitter; and for optimum performance it should be used following an RCA Limiting Amplifier. Only two adjustments are necessary upon installation. The equipment is easy to operate. It contains no tubes, transistors or other active circuits, and has a very small power drain. The gain of the overall system is not changed when the “Power Max” is switched in or out.

The MI-34654, “Power Max”, is essentially a non-linear limiter which rounds off the negative peak modulation envelope so as to prevent overmodulation of the negative peaks in conformity with established FCC operating rules. The unit consists essentially of a 6 dB attenuator pad followed by a non-linear shunt impedance, the impedance of which is a function of voltage amplitude. Thus the effective shunt impedance is reduced with increasing amplitude resulting in lower output at the higher amplitudes. The shunt element is polarized so as to be effective only on negative swings.

Circuit components which include no tubes, transistors or other active circuits, are mounted on a rack mounting chassis measuring 19 inches wide, 5½ inches deep and 7 inches high. All controls are mounted on the 7-inch high front panel. These include: two set-up screw driver adjustments for compression and threshold (use of an oscilloscope for initial set-up is recommended), a power switch, an indicator lamp, and a phase reversal switch. Provision is made to bypass the unit without changing the insertion loss. This permits the “Power Max” to be removed electrically from the circuit whenever desired.

### Specifications

Input Level .....	+16 dBm ±2 dB
Insertion Loss .....	.6 dB
Power Requirement .....	.115 Volts, AC, 60 Hz, 5 Watts
Dimensions Overall.....	.19" wide, 5½" deep, 7" high (48.26 cm, 13.97 cm, 17.78 cm)
Weight.....	Approx. 18 lbs. (8.2 kg)
Finish .....	Silver gray

### Ordering Information

“Power Max” Negative Peak Limiter.....MI-34654



- Maintains proper transmitter output power
- Requires only 5¼ inches in standard rack
- Extended scale meter relay
- Manual—Automatic switch

## Automatic Output Control

### Description

The Automatic Output Control, MI-27564, is designed to stabilize and control transmitter output power within FCC allowed limits or to shut down transmitter operation in case of serious failure. It is easily installed at the output of the transmitter.

In the case of AM transmitters, automatic power control is achieved by sampling the common point current and automatically maintaining it at the value corresponding to the licensed power within a tolerance plus 5 percent and minus 10 percent. This is accomplished by the use of an RCA MI-27966-B or MI-28027-C Remote Pick-up Unit connected at the common-point and operating as an RF to DC current transducer. The output of the transducer is a function of carrier current only and does not respond to the modulation. FM or TV Transmitters are controlled by connecting the output of a reflectometer to the input of the automatic output control. In the case of television transmitters two control units are required to maintain the aural and visual outputs within limits.

The output of the transducer is then fed to the input of the Automatic Output Control which constantly samples this input from the transducer. If it varies beyond the above tolerance, it acts to correct the transmitter output power by operating a motorized transmitter power output control. In the event that the automatic power output control cannot correct the transmitter to proper output level within a selected period (about 1½ minutes) the power control will lock out and sound an alarm at the studio. Provision has been made in the existing remote control system to take manual control and/or to reset the automatic power con-

trol. The unit may be automatically disabled while the carrier is being interrupted for a Conelrad test alarm or when the transmitter is shifted to Conelrad operation.

The Automatic Output Control is contained on a panel mounting chassis, 19 inches wide, 5¼ inches high and 9½ inches deep overall. The panel contains a manual-automatic switch, power-on indicator light and two lights designed to indicate increasing or decreasing power output. A meter relay with contacts that are fixed at upper and lower tolerances is also mounted on the same panel.

### Specifications

Power Requirements .....117 Volts, AC, 50/60 Hz, 25 Watts  
 Fuse .....½ Amp.  
 Meter.....Extended scale, 70  $\mu$ a to 130  $\mu$ a with fixed contacts  
 Dimensions Overall.....19" wide, 5¼" high, 9½" deep  
 (48.26 cm, 13.34 cm, 24.13 cm)  
 Weight .....10 lbs. approx. (4.5 kg.)

#### Accessories

RF Pickup Unit (for AM up to 5 kW) .....MI-27966-B  
 RF Pickup Unit (for AM up to 50 kW) .....MI-28027-C

### Ordering Information

Automatic Output Control.....MI-27564



Reliable logging of 5, 10 or 20 functions

- Suitable for AM, FM and TV
- Compatible with BTR-11B and BTR-20D Remote Control Equipment
- Three built-in alarms
- Solid state electronic switching
- Automatic synchronization in remote systems

## Automatic Logging Equipment, Type BTG-Series

### Description

RCA Automatic Logging Equipment supporting 5, 10 or 20 functions is available for local or remote operation by AM, FM and TV broadcast stations. The system is completely automatic and designed to record all operating parameters required by FCC regulations as well as other crucial or important functions. Each meter reading is scanned at approximately 2-second intervals for a permanent record.

Six Automatic Logging Systems are available. The BTG-5AL (local) or BTG-5AR (remote) systems are designed to measure all required functions for the small AM or FM station. These include such functions as plate voltage, plate current, frequency deviation, power output, and tower light current.

The BTG-10AL/AR 10-function systems will measure the required basic functions for the visual and aural transmitters of the VHF or UHF Television station. It also provides a more flexible logging system for the AM or FM station desiring to record more than basic operating parameters.

The BTG-20AL/AR 20-function logging systems are available for the AM-FM-TV broadcaster desiring flexibility in automatic logging.

A single record alarm unit comprises the BTG-5AL/10AL system. The BTG-5AR/10AR have a single record alarm unit and also an additional remote transmitter unit. The BTG-20AL/AR systems require an extension record unit to mount above a BTG-10AL/AR Record Alarm Unit.

The BTG Record-Alarm units are rack-mounted chassis that contain one or two strip recorders, a centrally located plug-in amplifier-control module and operating control panel; and on the right, two adjustable contact making microammeters and five or ten tally lights indicating the function being logged and associated calibration controls. The unit requires 8¾ inches of rack space. The extension record unit for the BTG-20AL/AR systems is similar and occupies an additional 8¾ inches.

The Remote Transmitter Logging Unit is self-contained on a similar

rack-mounted chassis. A single on-off power switch and a tally light that indicates operating mode occupy the front panel. The studio and transmitter units are connected by a single DC telephone line. The recorder has a high input impedance which makes the accuracy independent of telephone line variations.

In the BTG-systems, easily read recorders automatically log up to five operating parameters each. It is a single point strip chart recorder which operates at a speed of one inch per hour and contains paper for over two weeks of operation. The parameters to be recorded are sequentially selected by a stepping switch. Each function is recorded within a two second period. The chart paper is the inkless pressure sensitive type and, therefore, requires a minimum of attention. Voltage applied to the line for maximum recorder deflection is one volt. The recorder accuracy is within the FCC requirement of two percent. Each recorder is supplied with a legend on which the operator can identify and provide an appropriate scale for each reading.

The BTG Amplifier-Control module is self-contained, solid state, plug-in containing most of the important circuits of the system such as: recorder pulse generator, stepping pulse generator, alarm circuits, removable plug-in operational amplifiers and zener regulated power supplies. Stabilization of the operational amplifier is accomplished by the use of approximately 80 dB of feedback.

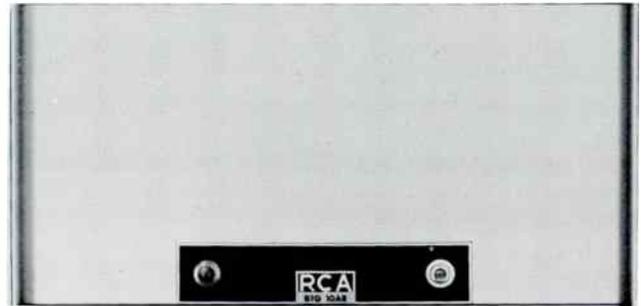
The Automatic Logging System may be expanded to include the BTRA-5B Tone Alarm System (ES-34281). The systems may be expanded for complete remote control by the addition of the BTR-11B Remote Control Equipment (10 functions) or the larger BTR-20D Remote Control Equipment (19 functions). Logging of FM and TV stations require the MI-27568-1 or

MI-27568-2 DC Amplifier unit for use with the frequency modulation monitors.

For automatic AM logging, base and common point currents are monitored via RF pickup units installed at the towers and phasor. These RF samples are fed to transducers which have been calibrated against the station's RF ammeter. The DC variation of the transducer

is recorded on the chart recorder. Frequency deviation signal is obtained from a frequency monitor. Tower lights and flasher are also monitored for proper operation. Various types of transducers are available to provide the standard one Volt DC (full scale) for all readings. Other important optional and accessory equipment is listed below under specifications.

Remote Transmitter Logging Unit



## Specifications

Logging Functions .....	5, 10 or 20
Record Method .....	Inkless, separate calibration for each function on strip chart
Measuring Circuit .....	Galvanometer Movement
Accuracy .....	2% max.
Input Impedance .....	100,000 Ohms
Chart Speed .....	1" (2.54 cm) per hour
Chart Size .....	30 ft. long, 2" wide (9.14 M x 5.08 cm)
Chart Life .....	360 hours (15 days)
Frequency Deviation Alarm .....	Contact making Microammeter 10-0-10 $\mu$ A
Power Output Alarm .....	Contact making Microammeter 0-20 $\mu$ A
Alarm Limits .....	Adjustable
Operating Controls .....	Power On-Off, Stepping On-Off, and Alarm Reset
Adjustments .....	Two: Frequency Deviation Zero Adjust, Amplifier Gain
Power Requirements:	
Studio or Local .....	115 V, AC, 60 Hz, 50 Watts
Transmitter .....	115 V, AC, 60 Hz, 25 Watts
Finish:	
Studio or Local .....	Black and Silver Gray
Transmitter .....	Silver Gray

### Dimensions Overall:

Studio or Local .....	19" wide, 8 $\frac{3}{4}$ " high, 8 $\frac{1}{2}$ " deep (48.26 cm, 22.22 cm, 21.59 cm)
Transmitter .....	19" wide, 8 $\frac{3}{4}$ " high, 12 $\frac{1}{2}$ " deep (48.26 cm, 22.22 cm, 31.75 cm)
Extension (BTG-20AL/AR Only) .....	19" wide, 8 $\frac{3}{4}$ " high (48.26 cm, 22.22 cm)

### Weight:

Studio or Local .....	15 lbs. (approx.) 6.8 kg.
Transmitter .....	10 lbs. (approx.) 4.5 kg.
Extension Unit for BTG-20AL/AR Only .....	5 lbs. (approx.) 2.3 kg.

### Accessories

30-Foot Roll Strip Chart .....	MI-561430
Spare Amplifier-Control Module .....	MI-561433
BTR-11B Remote Control Equipment .....	ES-34280
BTR-20D Remote Control Equipment .....	ES-34274-B
BTRA-5B Tone Alarm System .....	ES-34281-A
BW-11A AM Frequency Monitor .....	ES-34042
BW-66F AM Modulation Monitor .....	MI-30066-B
BW-73A FM Multiplex Monitor .....	ES-560200-A
TBM-3000 McMartin FM Frequency Monitor .....	MI-560315
Power Max (Negative Peak Limiter) .....	MI-34654
Tower Light Monitor .....	MI-27544
Tower Light Monitoring and Control Unit .....	MI-27519
Monitor Amplifier Unit (FM) .....	MI-27568-1
Monitor Amplifier Unit (TV) .....	MI-27568-2
RF Pickup Unit (up to 5 kW) .....	MI-27666-B
RF Pickup Unit (up to 50 kW) .....	MI-28027-C
Current Ratio Alarm .....	MI-27571

## Ordering Information

BTG-5AL 5-Function Local Automatic Logging Equipment .....	ES-561485
BTG-10AL 10-Function Local Automatic Logging Equipment .....	ES-561486
BTG-20AL 20-Function Local Automatic Logging Equipment .....	ES-561487

BTG-5AR 5-Function Remote Automatic Logging Equipment .....	ES-561488
BTG-10AR 10-Function Remote Automatic Logging Equipment .....	ES-561489
BTG-20AR 20-Function Remote Automatic Logging Equipment .....	ES-561490



Studio Control Unit



Transmitter Control Unit

- For AM, FM or TV transmitters
- Provides fail-safe circuit
- Lowest power consumption
- Home-step provision—rapid homing
- DC system operates on proven dial telephone principles

## Remote Control System, Type BTR-11B

### Description

The RCA Type BTR-11B Remote Control System is designed for use with AM, FM or TV broadcast transmitter equipment to remotely control the operation of the station transmitter and associated equipment. With this equipment, AM and FM stations now can be operated entirely from the broadcast studio or other remote point without an engineer 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, etc. may be controlled. Metering of filament voltage,

plate voltage, plate current, antenna current from a common point or base points, tower light current, modulation monitor, and frequency monitor may be read by means of the system.

The radio broadcast transmitter remote control equipment consists essentially of a Studio Control Unit, a Transmitter Control Unit, and a number of auxiliary units, the exact number depending on the functions to be controlled.

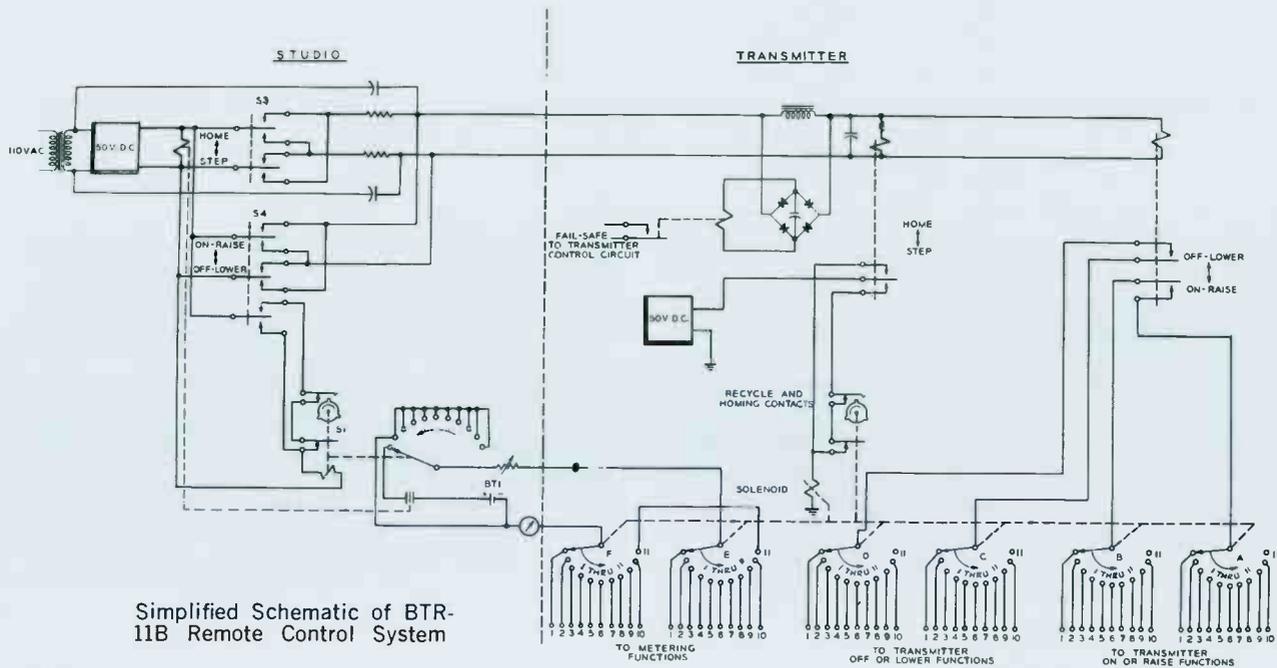
It is possible to control and/or measure the operation of up to 10 transmitter functions with the Type BTR-11B Remote Control System.

The Typical Metering and Control Functions Table contains a sample list of the transmitter circuits that can be measured and the opera-

tions that can be controlled by the Studio Control Unit at the remote location via two telephone lines with a loop resistance of up to 5000 Ohms. The Studio Control Unit is designed for rack mounting at the studio, while the Transmitter Control Unit and most auxiliary equipment is housed at the transmitter site.

### Studio Control Unit

The Studio Control Unit has the following front panel controls: "home-step" switch, "on-raise—off-lower" switch, power switch, indicator lamp, meter, and function indicator dial. The Transmitter Control Unit has a power switch, indicator lamp, function indicator dial, step switch, and "on-raise—off-lower" switch to facilitate local set-up or test operations.



Simplified Schematic of BTR-11B Remote Control System

**Typical Control and Metering Functions for BTA-5T AM 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 Resel	Plate Current
5	Tower Lights On-Off	Tower Lighting Current
6		Frequency Deviation
7		% Modulation
8	Spare	
9	Spare	
10	Spare	
11	Home	Calibrate

**Specifications**

- Control Functions .....10
- Power Requirements .....117 Volts, AC, 50/60 Hz
- Power Consumption and/or metering .....25 Watts maximum
- Calibration .....Standard cell
- Meter .....0 to 150 percent (200 microamps)
- Telephone Line ....Special DC; 5000 Ohms loop resistance max.
- Fail Safe Control.....Meets FCC requirements
- Dimensions (overall):
  - BTR-11B Transmitter Control Unit.....19" wide, 10½" high, 11" deep (48.26 cm, 26.67 cm, 27.94 cm)
  - BTR-11B Studio Control Unit.....19" wide, 10½" high, 6" deep (48.26 cm, 26.67 cm, 15.25 cm)
- Weight (approx.):
  - BTR-11B Transmitter Control Unit.....18 lbs. (8.17 kg.)
  - BTR-11B Studio Control Unit.....18 lbs. (8.17 kg.)

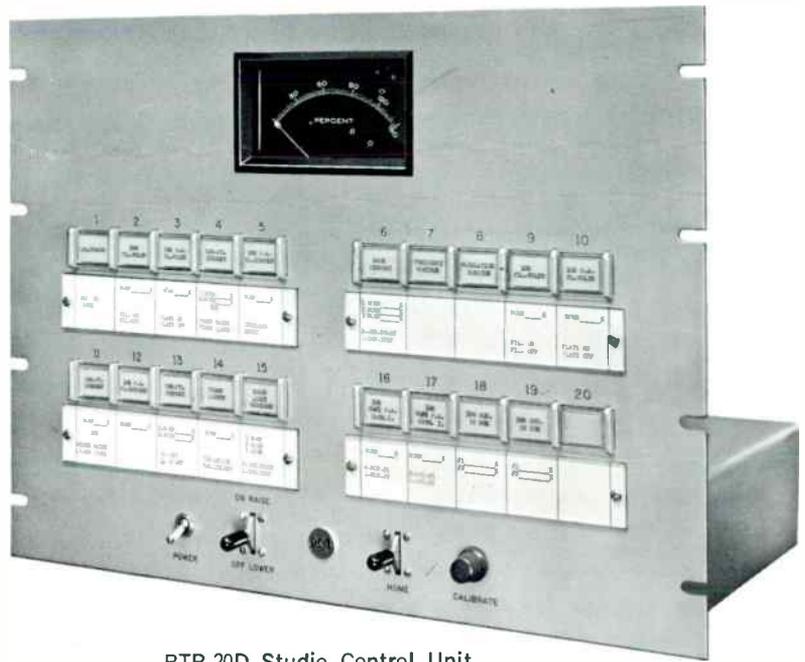
**Accessories**

- 2-Meter Panels (AM Monitoring).....ES-27220
- AC Voltage Pickup .....MI-27516
- Tower Lighting Monitoring and Control Unit.....MI-27519
- Tower Light Monitoring Unit.....MI-27544
- Latching Relay Panel (including two relays).....MI-27509-A
- Latching Relay, DPST, 6 Amperes .....MI-27524-1
- Latching Relay, DPST, 30 Amperes .....MI-27524-2
- Latching Relay, 4DPT, 0.5 Ampere .....MI-27524-3
- RF Relay, 12.5 Amperes .....MI-27545-1
- Momentary Relay, DPDT, 15-20 Amperes .....MI-27545-2
- Momentary Relay Panel (including two relays) .....MI-27546
- RF Contactor, Latching Type, SPDT, 25 Amperes .....MI-27755-1
- RF Contactor, DPDT, 25 Amperes .....MI-27755-2
- Remote RF Pickup (rated up to 50 kW) .....MI-28027-C
- Remote RF Pickup (rated up to 5 kW) .....MI-27966-B
- Meter Commutator .....MI-27555
- Remote Control Accessory Kit for BTA-50G.....MI-27687
- 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
- Temperature Indicator, Indoor -30°F to +150°F.....MI-27550-1
- Temperature Indicator, Outdoor -30°F to +150°F.....MI-27550-2
- FM Monitor Preamp, McMartin .....TBM-2500

**Ordering Information**

- BTR-11B Remote Control System (10 functions).....ES-34280
- Consisting of:
  - 1 Studio Control Unit.....MI-27537
  - 1 Transmitter Control Unit.....MI-27538-A

- Pushbutton selection of function position from studio position
- Provisions for checking metering circuit calibration at control point
- Operates without vacuum tubes amplifiers, oscillators or tuned circuits
- Easy accessibility to all terminal connections and components



BTR-20D Studio Control Unit

## Remote Control System, Type BTR-20D/20DT

### Description

The RCA Type BTR-20D/DT Remote Control System is designed for use with AM, FM or TV broadcast transmitter equipment to remotely control the operation of the station transmitter and associated equipment. With this unit AM and FM stations now can be operated entirely from the broadcast studio or other remote point without the presence of an engineer at the transmitter site.

The Type BTR-20D/DT Remote Control System provides control or measurement facilities of all essential transmitter functions.

#### Up to 19 Control and Metering Functions

Provisions are made for nineteen control functions of on-off or raise-lower controls and for nineteen measuring functions. Typical control functions are: Filament On-Off, Plate On-Off, Overload Reset, Daytime Antenna Pattern - Nighttime Antenna Pattern, Power Raise-Lower, Tower Lights On-Off and Main Transmitter-Auxiliary Transmitter.

Typical measuring functions include: plate voltage, plate current, frequency, modulation percentage, power output, tower light current and building temperature.

#### Studio Control Unit

The Typical Metering and Control Functions Table contains a sample list of the transmitter circuits that can be measured and the operations that can be controlled by the Studio Control Unit at the remote location. The Studio 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 provides the following front-panel controls: "home" switch; "on raise/off lower" switch; twenty illuminated, push-button, function-selector switches; calibration control; and a power switch. On the Transmitter Control Unit there is a power switch, step switch, "on raise/off lower" switch, indicator lamp, and an aperture behind which the number of the function being metered or controlled appears. This facilitates local set up or test operation.

#### Home-Step Provision

Stepping switches located in both studio and transmitter units can be rotated to the desired position by depressing the related switch-indicator. The push button for the applicable position of the stepping switch is illuminated. A "home" switch is provided in the studio unit to place the stepping switches in the two units in synchronization.

A pulser is incorporated in the studio unit to operate both steppers. By depressing the push-button of the desired position, the stepping switches in the two units will move to that position and stop. It requires a maximum of four seconds for the units to move from any position to any other position. Illuminated switches indicate operating mode or position of the stepping switches. The mode to which the stepping switch is set can be read at the Transmitter unit by a dial attached to the shaft of the stepping switch.

A blank sheet of drafting film is provided on which can be typed any desired legend to be cut out and inserted in the push-buttons. A chart cover is provided below each push-

button on which normal meter readings and switch functions can be indicated.

### Fail-Safe Circuit

It is possible to read on the studio meter any desired transmitter meter reading in any position of the stepping switches. With the addition of the accessory, MI-27555 Meter Commutator, up to twelve readings can be made on any one position of the BTR-20D/DT. Means are provided for calibrating the line resistance by means of a standard cell. A fail-safe circuit is provided in the equipment system 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 BTR-20D Remote Control System requires the use of two "signal service" telephone pairs. In-as-much as these lines carry only DC they can be rented at a minimum rate.

The BTR-20D requires a two-way voice quality transmission path which can consist of a single telephone line, a microwave system, a microwave system from studio to

transmitter and a 960 MHz system from the transmitter to the studio or other arrangement where governmental regulations permit.

A number of auxiliary equipments are available to expand the facilities or to make more flexible the operation of RCA Remote Control Systems.

### Remote RF Pickup

Remote RF Pickup, MI-28027-B, provides the means of observing the antenna current at the studio control unit. The pickup coil is coupled to the antenna lead where it samples the transmitter RF output. 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. It is satisfactory for use with all transmitters up to and including 50 kW. Remote RF Pickup, MI-27966, is similar to the above but is rated only for 5 kW transmitters or a total current of 20 Amperes.

### Accessory Meter Panel

Meter Panel (AM Monitoring), ES-27220, provides the means of monitoring the frequency and mod-

ulation 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.

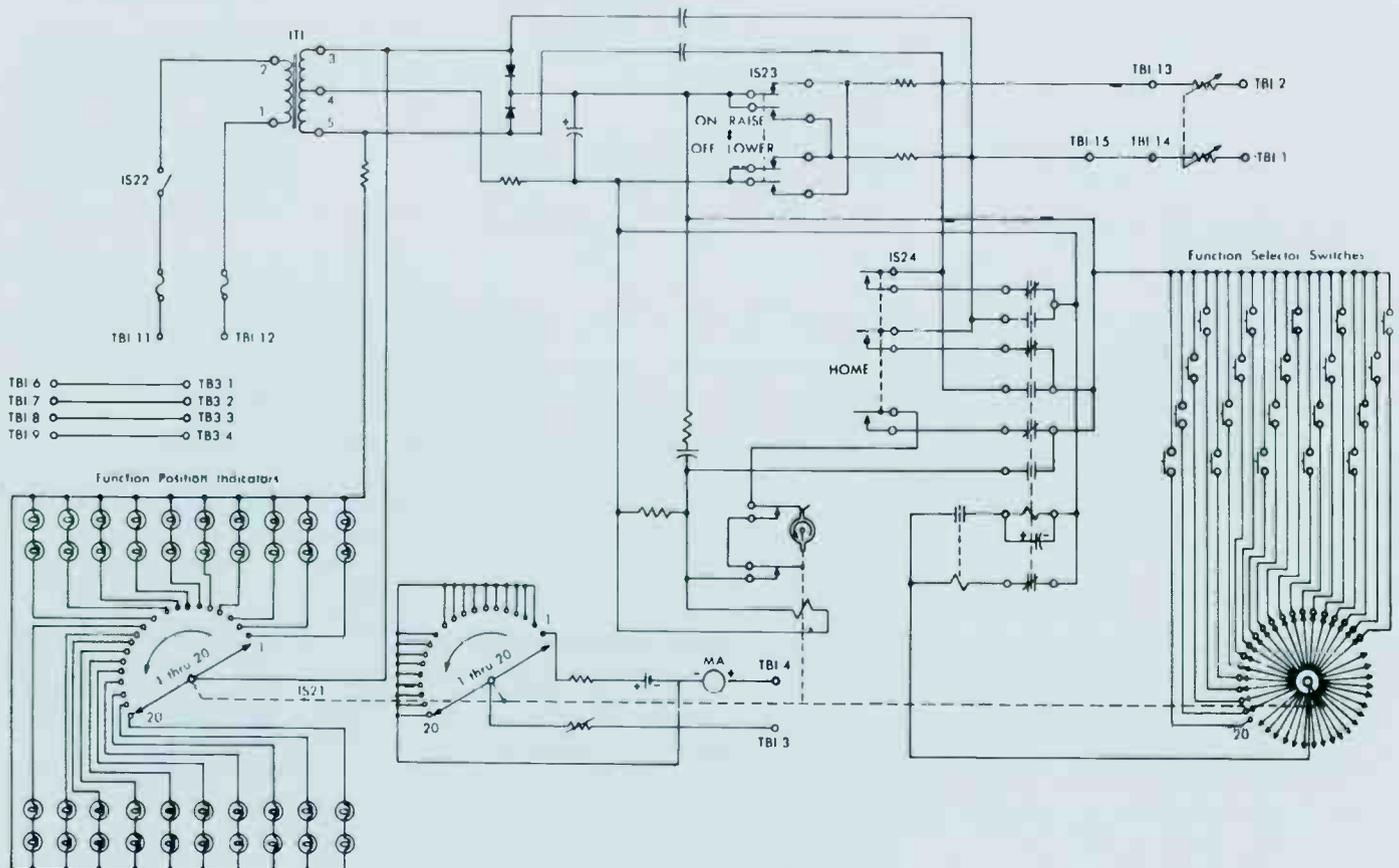
### AC Voltage Pickup

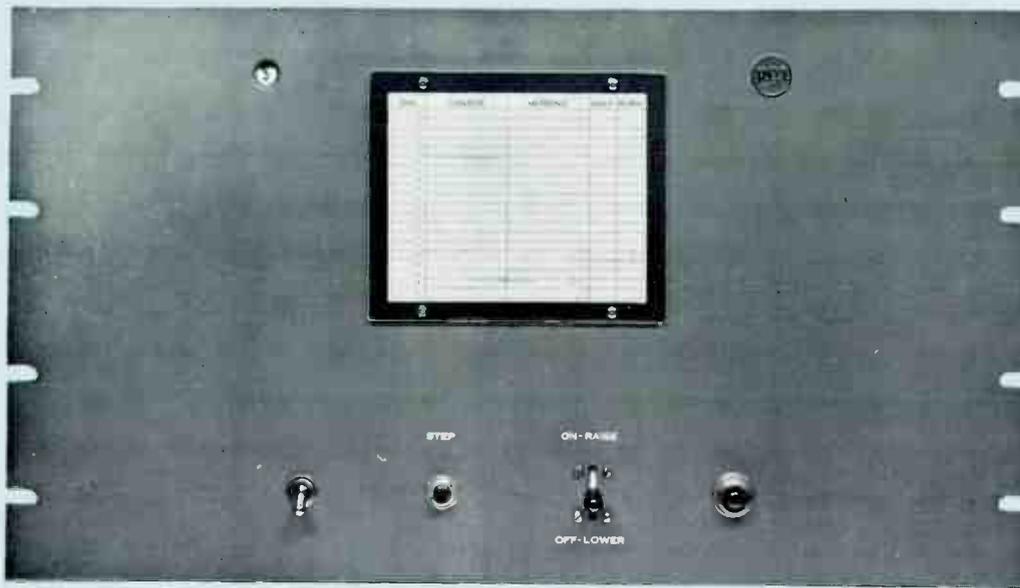
AC Voltage Pickup, MI-27516, is installed at the transmitter and is connected to the transmitter control unit metering section. It provides an indication of the transmitter filament bus or line voltage on the studio control meter.

### Tower Lighting Equipment

Tower Lighting Monitoring and Control 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 DC 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.

Simplified Schematic of Remote Control System.





Front view of BTR-20D/DT Transmitter Control Unit.

Tower Lighting Unit, MI-27544, is similar to the above in that it will measure antenna lighting current up to 20 Amperes. It does not incorporate switching for control purposes and is recommended in instances where a photo-cell or other means are used to control the lighting circuits.

Temperature Indicators, MI-27550-1 and MI-27550-2, permit temperature readings from  $-30$  to  $+150$  degrees F over the remote control system. The MI-27550-1 is designed for indoor use and the MI-27550-2 for outdoor use.

#### Latching Relay Panel

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 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. This device is not required on RCA transmitters that are designed for remote control, but is offered as a convenience in adapting older equipment to remote operation.

#### Typical Control and Metering Function for AM BTA-1R2 AM Transmitter (3 towers) and BTF-5E FM Transmitter Controlled by BTR-20D/DT 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	FM Frequency Deviation
17		
18		
19	Tower Lights On-Off	Lighting Current
20	Home	Calibrate

## Specifications

Control Functions .....19  
 Power Requirements .....117 Volts, AC, 50/60 Hz  
 Power Consumption and/or metering .....25 Watts maximum  
 Calibration .....Standard cell  
 Meter .....0 to 150 percent (200 microamps)  
 Telephone Line .....Special DC 500 Ohms loops  
 resistance max.

Fail Safe.....Meets FCC requirements

### Dimensions (overall):

#### BTR-20D/DT Transmitter

Control Unit.....19" wide, 10" high, 12 $\frac{7}{8}$ " deep  
 (48 cm wide, 25 cm high, 33 cm deep)

#### BTR-20D/DT Studio

Control Unit .....19" wide, 10" high, 8 $\frac{7}{8}$ " deep  
 (48 cm wide, 25 cm high, 22 cm deep)

### Weight (approx.):

BTR-20D/DT Transmitter Control Unit .....20 lbs. (9.07 kg.)

BTR-20D/DT Studio Control Unit .....20 lbs. (9.07 kg.)

## Accessories

Type BTRX-40A Extension Unit (19 functions).....MI-27556  
 2-Meter Panels (AM Monitoring).....ES-27220  
 AC Voltage Pickup, 115/230 Volt .....MI-27516  
 Tower Lighting Monitoring and Control Unit.....MI-27519  
 Tower Light Monitoring Unit.....MI-27544  
 Weatherproof Enclosure for MI-27544.....MI-27543  
 Latching Relay Panel (including two relays).....MI-27509-A  
 Latching Relay, DPST, 6 Amperes .....MI-27524-1  
 Latching Relay, DPST, 30 Amperes .....MI-27524-2  
 Latching Relay, 4DPT, 0.5 Ampere .....MI-27524-3  
 RF Relay, 12.5 Amperes .....MI-27545-1  
 Momentary Relay, DPDT, 15-20 Amperes .....MI-27545-2  
 RF Contactor, Latching Type, SPDT, 25 Amperes.....MI-27755-1  
 RF Contactor, DPDT, 25 Amperes .....MI-27755-2  
 Remote RF Pickup (rated up to 50 kW) .....MI-28027-B  
 Remote RF Pickup (rated up to 5 kW) .....MI-27966-B  
 12 Function Meter Commutator.....MI-27555  
 Remote Control Accessory Kit for BTA-50G.....MI-27687  
 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  
 Temperature Indicator,  
 Indoor -30°F to +150°F.....MI-27550-1  
 Temperature Indicator,  
 Outdoor -30°F to +150°F.....MI-27550-2  
 FM Monitor Preamplifier, McMartin.....TBM-2500  
 DC Voltage Amplifier, 2 Channel .....MI-27568-1  
 DC Voltage Amplifier, 5 Channel .....MI-27568-2

## Ordering Information

BTR-20D Remote Control System (19 functions) .....ES-34274-B  
 Consisting of:

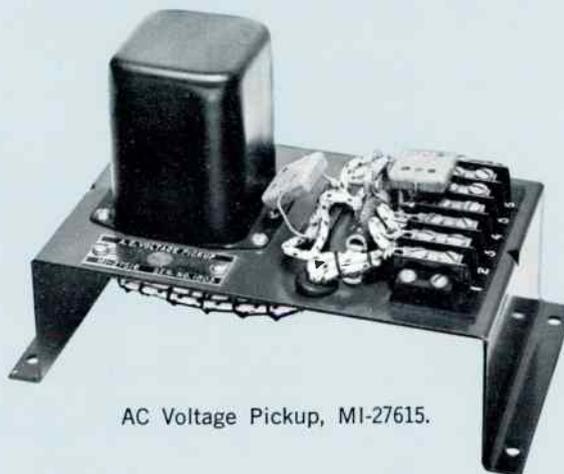
1 Studio Control Unit .....MI-27539-C  
 1 Transmitter Control Unit .....MI-27526-B

BTR-20DT Remote Control System .....ES-34274-C  
 Consisting of:

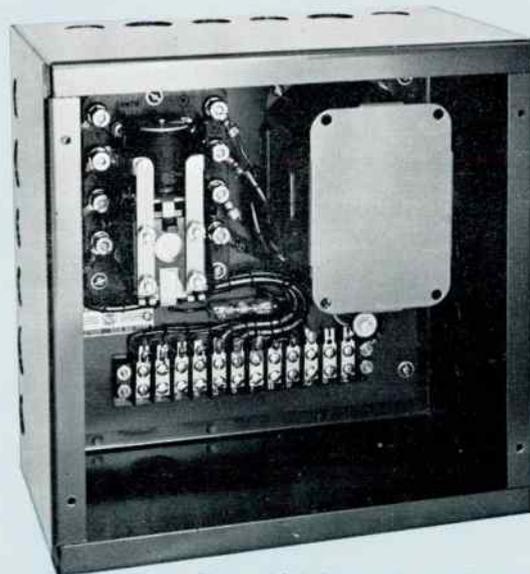
1 Studio Control Unit .....MI-27539-D  
 1 Transmitter Control Unit .....MI-27526-C



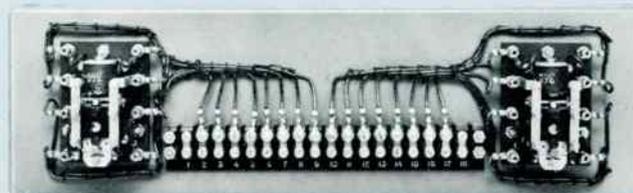
Meter Panel, ES-27220  
for AM Monitoring.



AC Voltage Pickup, MI-27615.



Tower Lighting Unit, MI-27519.



Latching Relay Panel, MI-27509-A.



Receiver Unit, MI-27553-A



Transmitter Unit, MI-27551-A

- Basic unit provides up to 4 simultaneous alarm/status functions, and can be expanded to 8 functions
- Reserve battery supply for fail-safe operation
- Occupies 7 inches in standard rack
- Standard transformer components

## Tone Alarm Equipment, Type BTRA-5C

### Description

The RCA Type BTRA-5C Tone Alarm Equipment is an automatic system based on a series of tone generators that can provide up to five simultaneous alarm or status functions when installed at studio and transmitter locations. The system is comprised of the MI-27551-A BTRA-5C Transmitter Unit and the MI-27553-A BTRA-5C Studio Unit which are connected by a voice quality telephone line on radio transmission path. When used in conjunction with the BTR-11B or BTR-20D or DT Remote Control Equipment, an additional telephone line or signal channel is not required.

The alarm system consists of a series of tone generators located at the transmitter. Should trouble develop, the tone generator trips out and a selective detector in the studio then flashes an alarm. The tone alarm system may be used to indicate such varied functions as transmitter overload, out of tolerance operation, burglar alarm, standby generator status, over temperature conditions or other applications.

Both transmitter and studio units are mounted on panel-mounting chassis 19 inches wide, 7 inches high

and 8 $\frac{3}{8}$  inches deep overall. The transmitter panel includes an indicator light indicating when power is on, and a power switch. It operates from a 117 Volt, 50/60 Hz AC line and power consumption is approximately 6 Watts. A storage battery is provided for fail-safe operation. The battery is constantly being charged while the equipment is in operation for instantaneous operation if power fails. The oscillator units operating at four different frequencies are epoxy encapsulated.

The alarm tones are transmitted from the transmitter to the studio and fed into a resonant reed relay with reeds tuned to the exact frequencies. Each of these detectors will flash an alarm if the tone to which it is tuned is removed. The studio unit panel has provisions for five lighted display screens to indicate the fault. There is also a power switch, power-on indicator lamp, and reset button. There is a gain control on both studio and transmitter chassis to regulate the levels.

### Specifications

Number of Alarm/Status Functions .....	5
Power Requirements .....	117 Volts, AC, 50/60 Hz, 6 Watts
Dimensions (overall—both units).....	19" wide, 7" high, 8 $\frac{3}{8}$ " deep (48.26 cm, 17.78 cm, 21.27 cm)

#### Weight:

Transmitter Unit, MI-27551-A .....	Approx. 10 lbs. (4.5 kg.)
Receiver Unit, MI-27553-A .....	Approx. 10 lbs. (4.5 kg.)

### Ordering Information

BTRA-5C Tone Alarm Equipment .....	ES-34281-A
Including the following:	
1 Transmitter Unit .....	MI-27551-A
1 Studio Unit complete with four clear caps, four red and four green bases for display screens, sheet of 8 $\frac{1}{2}$ by 11-inch Mylar Film and lamp changing tool .....	MI-27553-A



- Crystal or conventional operation
- Tuning from 540 to 1600 KHz
- Front Panel Speaker
- 175-Hour Mercury Battery
- Use as Null Detector

## AM Field Intensity Meter

### Description

The FIM-135 is a lightweight, compact field intensity meter incorporating all the latest innovations for portable test instruments. Dial locks provide a fixed setting at any point across the entire broadcast range from 540 to 1600 kHz. The receiver mode of operation offers a choice between the ease and accuracy of crystal control or the versatility of conventional tuning. A special input jack permits the receiver to be used as a null detector for RF bridge measurements.

Tautband meter movement accurately displays from 10 microvolts per meter to 10 Volts per meter, making it equally effective for interference studies at low signal strength and for close-in measurements on high-power directional arrays. A high degree of selectivity is assured by establishing an overall bandwidth of 7 kHz at 1000 kHz for the half voltage response. Accurate measurements are easily obtained by direct reading on all ranges, with a calibration method that compensates

for the variations in transistor and battery characteristics.

#### All Solid State

By employing all solid-state components, the nominal drain on the mercury battery establishes a longer and more linear battery-life curve of up to 175 hours.

#### Front Panel Speaker

The audio portion features a front panel speaker with independent volume control plus a jack for optional headphone operation.

### Specifications

Frequency Range .....540 to 1600 kHz  
 Field Intensity Range .....10 uV/m to 10 V/m  
 Overall Accuracy .....±5%  
 Output Indicator .....Tautband meter, direct reading, with logarithmic scale graduated 1 to 10. Phone jack and panel speaker  
 Antenna .....Shielded, unbalanced loop  
 Power Requirements .....Two 4.2 Volt mercury batteries

Battery Life .....175 hours (without audio)  
 Overall Dimensions (Closed) .....6½" H, 10½" W, 6½" D  
 (16.51 cm, 25.72 cm, 16.51 cm)  
 Weight Including Batteries .....9 pounds, 2 ounces (4.1 kg)

#### Accessories

Double Headset, 24,000 Ohms Impedance .....MI-11750  
 Battery .....Mallory Type TR-233 or equal  
 Optional Crystal .....Specify Frequency

8RB

## Ordering Information

AM Field Intensity Meter,  
 Transistorized Model FIM-135 .....MI-561434



- Continuous reading deviation meter
- Wide input range
- Minimum accuracy at subcarrier frequency  $\pm 5$  hertz for 1 year
- Protected trimmer adjustments for frequency calibration
- Warning lamp indicates failure of transmitter carrier or monitor crystal oscillator
- Provision for simultaneous operation of remote indicating or recording meter

## Frequency Monitors, Types BW-11A/11AT

### Description

The RCA Frequency Deviation Monitors BW-11A and BW-11AT indicate continuously, and directly in hertz 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 MHz 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  $\pm 10$  hertz

maximum and will provide an accurate and convenient method of calibrating and monitoring the color frequency standard now used by stations originating color programs.

#### Monitoring Provisions

The monitor is AC operated and is mounted on a single relay rack panel. Coupling of the BW-11A Monitor to the 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.

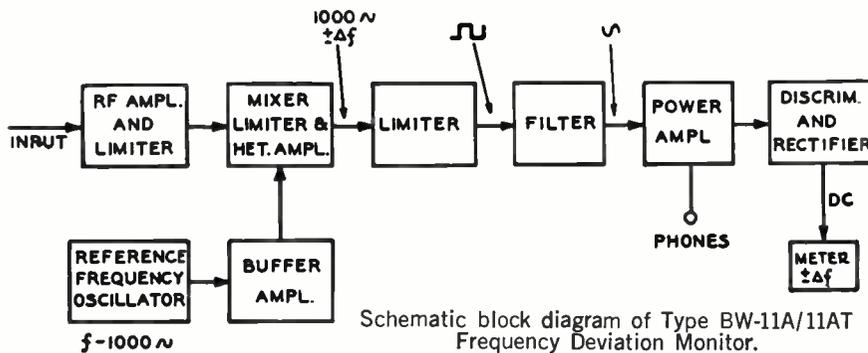
#### One Tuning Adjustment

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.

#### Heavy Duty Features

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 push-button switch. The monitor switch controls power for all circuits except the oven heater which is thermostatically controlled and functions whenever the power cable is connected to the AC power source. The check pushbutton switch permits a



Schematic block diagram of Type BW-11A/11AT Frequency Deviation Monitor.

quick check on all circuits. When the monitor is working normally and this button is pressed, the meter deflection increases by approximately 5 Hz. A change appreciably different from 5 Hz indicates a defective circuit.

### Circuit Description

The circuit arrangement of the BW-11A/11AT is shown in the accompanying block diagram. Voltage from a temperature-controlled piezoelectric oscillator (frequency  $f - 1000$  Hz) 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 ( $1000 \text{ Hz} \pm \Delta f$ ) by a filter stage. After power amplification the audio frequency is applied to a discriminator and rectifier circuit, from which DC is obtained. The amplitude and polarity of the DC is determined by the deviation from 1000 Hz. Deviation is indicated on a linearly calibrated zero-center meter with a scale calibration of  $\pm 30$  Hz. A jack is provided for a remote indicating or recording meter, which can be operated simultaneously with the panel meter.

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 are employed to minimize these effects.

### Operational Convenience

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  $15\frac{3}{4}$ -inch vertical space in a standard 19-inch cabinet rack. To facilitate maintenance, the bottom section of the front panel may be lowered to expose the monitor circuits for continuity checks, and all the routine maintenance controls. An MI-34070 Crystal Unit specially ground to 1000 hertz below the transmitter frequency is provided for the BW-11A, and MI-7962-C Crystal Unit especially ground for the sub-carrier frequency is specified for the BW-11AT Monitor.

## Specifications

	Model BW-11A	Model BW-11AT
Frequency Range	500 to 2000 kHz	3.579545 MHz
Frequency Deviation Range (readable to 1 Hz)	$\pm 30$ Hz	$\pm 30$ Hz
Accuracy	$\pm 10$ parts per million	$\pm 1$ Hz for 30 days $\pm 5$ Hz 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 Hz, single phase	
Power Input	120 Watts	

Dimensions.....19" wide, 15 $\frac{3}{4}$ " high, 9 $\frac{5}{8}$ " deep  
(48.26 cm, 40 cm, 24.45 cm)  
Weight.....60 lbs. (27.2 kg)  
Finish .....Silver 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

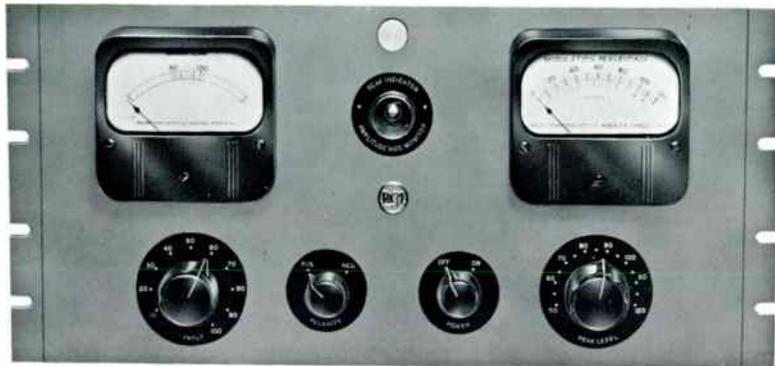
### Accessories

Remote Meter (order from Replacement Parts).....SN-93688  
Tube Kit for BW-11A/AT.....MI-8295  
Crystal Unit for BW-11A (specify frequency).....MI-34070  
Crystal Unit for BW-11AT  
(frequency 1192.848 kHz).....MI-7962-C

## Ordering Information

BW-11A AM Broadcast Frequency Monitor complete including Crystal Unit MI-34070.  
(Specify operating frequency).....ES-34042

BW-11AT Color TV Sub-Carrier Frequency Monitor complete including Crystal Unit, MI-34075.  
(Specify operating frequency).....ES-34040-A



- Operates at low RF input power
- Indicates either positive or negative peaks in percentage modulation and in decibels
- 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

## AM Modulation Monitor, Type BW-66F

### Description

The RCA Type BW-66F, Modulation Monitor is designed to give continuous direct reading indications of percentage modulation in the carriers of broadcast transmitters operating in the range of 500 to 2500 kilohertz. Up to four remote meters may be used for remote control operation. The BW-66F serves to measure the percentage of modulation on either positive or negative peaks; indicate modulation peaks above a selected level by flashing a light or keying a relay suitable for operating an audible or visual alarm; act as a high quality detector for program monitoring; and provide a linear detector for measuring transmitter audio performance.

The RCA BW-66F consists of three essential elements: A linear detector, a peak voltmeter, and a

trigger circuit which flashes a light whenever the modulation momentarily exceeds any selected value.

The linear detector 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 DC 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 percent distortion. The high impedance output circuit can be connected directly

to the RCA WM-17A 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 indication when the modulation exceeds a desired level.

The instrument has four convenient controls on the front panel. They are the RF 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, the Power Switch, and the Peak Level Control which is calibrated from 50 to 120 percent modulation and is used for setting the lowest value of percent modulation at which it is desired to have the over-modulation 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 percent and is also calibrated in decibels using 100

percent modulation as zero dB. A switch is provided so that either the positive or negative peak values may be measured. Terminals are provided for connecting one to four remote modulation meters. Two RF input terminals, a power receptacle and a terminal board for all other connections are mounted on the back of the chassis.

## Specifications

Carrier Frequency Range .....	500 to 2500 kHz	
Modulation Percentage Range:		
Negative Peaks .....	0 to 100%	
Positive Peaks .....	0 to 120%	
Meter Accuracy.....	Better than $\pm 2\%$ at 100% modulation, or $\pm 4\%$ at any other percentage	
Audio Frequency Response:		
Meter Indication, 30 to 15,000 Hz .....	$\pm 0.5$ dB	
Meter Circuit, 50 to 15,000 Hz .....	$\pm 0.1$ dB	
Audio Output		
Circuits:	<b>Monitoring</b>	<b>Measuring</b>
Source Impedance	600 Ohms	20,000 Ohms
Level at 100%		
Modulation .....	1 Volt rms	3 Volts rms
Response .....	$\pm 1$ dB, 30- 15,000 Hz	$\pm 0.5$ dB, 30- 45,000 Hz
Distortion .....	Less than 1%	Less than 0.2%
Noise Level Below		
100% Modulation	Better than 60 dB	Better than 70 dB

RF Input Power .....	0.35 Watts min.; 6 Watts max.
RF Input Impedance, Broadcast Band .....	Approx. 75 Ohms
Power Supply .....	110-125 Volts, 50/60 Hz, 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, 8 $\frac{3}{4}$ " high, 11" deep (48.26 cm, 22.22 cm, 27.94 cm)
Weight .....	37 lbs. (16.78 kg.)
FCC Approval Number .....	1559

### Accessories

Spare Tube Kit for BW-66F .....	MI-30450
Extension Modulation Meter .....	MI-27549-2
High Frequency Kit:	
Permits operation up to 30 MHz .....	MI-34078

## Ordering Information

BW-66F AM Modulation Monitor including  
tubes in place, 8-foot power cord with plugs,  
and Instruction Book .....MI-30066-B



Transistor Phase Monitor Type 112.

- New Solid State Monitors for Multi-Tower Directional AM Systems
- Provisions for remote control operations
- Provide direct phase and current indications
- Unaffected by modulation
- Simplified operation

## AM Antenna Phase Monitors

### Description

Two solid state AM Antenna Phase Monitors offering improved indications of phase relations in directional antenna systems are available. The monitors are used to indicate relative current amplitudes in the antenna system, as well as for measuring directional array phase relations. The Type 112 is designed as a solid state replacement for the well-known Type 108E and can be used with systems with up to 9 towers. For systems containing up to 12 towers, the Type PPM-101A, a deluxe precision model is available.

#### Type 112 Phase Monitor

The Type 112 Phase Monitor is newly styled for simplified operation. Stable solid state circuits are unaffected by modulation when presenting phase angle readings on a new continuous 0 to 180 degree scale panel meter. Loop current appears on a single meter as a

percentage of the reference tower current. Automatic day-night switching of reference levels can be incorporated if desired. The proportional linear DC voltage which permits phase angle and loop current indications on the chart recorder and digital voltmeter, can be fed over lines to an accessory Model 113 Remote Meter Panel.

The Type PPM-101A Precision Phase Monitor is a deluxe instru-

ment designed for monitoring directional arrays where a high degree of resolution and stability is required. Phase angle readings are presented on an illuminated in-line readout panel of a digital counter with a resolution of 0.1 degrees. Current ratio between the reference and measured tower is read on the current ratio meter as a deviation from normal value with a resolution of 0.1 percent.

Remote Meter Panel for Transistor Phase Monitor Type 113.



Precision Phase Monitor Type PPM-101A



## Specifications

	<b>Solid State Model 112</b>	<b>Precision Model PPM-101A</b>
Frequency Range .....	540 to 1600 kHz	100 kHz to 2 MHz
Phase Resolution .....	0.5°	0.1°
Absolute Phase Accuracy .....	±1.0°	±0.1**
Phase Angle Range.....	0 to 360°	0 to 360°
Input Impedance .....	51 to 75 Ohms	50 to 72 Ohms
Input Level .....	1.5 to 20 Volts, rms	1.0 to 20 Volts, rms
Number of Inputs.....	Up to 9	Up to 12
Method of Readout.....	Linear DC voltage on a chart recorder, digital voltmeter or remote metering panel. (Optional Model 113)	Illuminated in-line digital display on a separate digital counter device
Phase Angle Voltage Output .....	Adjustable from 0 to 3.5 Volts (max. voltage equals 180°)	Not applicable

\* Repeatable not absolute accuracy.

	<b>Solid State Model 112</b>	<b>Precision Model PPM-101A</b>
Loop Current Voltage Output .....	Adjustable from 0 to 3.0 Volts (max. voltage equals 100%)	Not applicable
Loop Current Meter Accuracy .....	2%	Not applicable
Loop Current Meter Resolution .....	0.5%	0.1%
Digital Counter Accuracy .....	—	±1 count ± reference frequency stability
Internal Reference Frequency Stability .....	—	5 parts in 10 <sup>8</sup> short term, 5 parts in 10 <sup>7</sup> per week
Power Requirements .....	115/230 Volts, 50/60 Hz, 15 Watts	115/230 Volts, 50/60 Hz, 95 Watts
Overall Size .....	19" wide, 7" high, 14" deep (48.26 cm, 17.78 cm, 36.56 cm)	19" wide, 15¾" high, 14" deep (48.26 cm, 45.45 cm, 35.56 cm)
Weight .....	20 lbs. max. (9 kg.)	—

## Ordering Information

Transistor Phase Monitor.....Nems-Clarke Type 112  
 Precision Phase Monitor.....Nems-Clarke Type PPM-101A  
 Remote Meter Panel for Type 112.....Nems-Clarke Model 113

Broadcast Stations are requested to include the following information when ordering phase monitors:

1. Station Call Letters
2. Number of Towers
3. Impedance and Type Number of sampling lines. Also, indicate cable end fittings.
4. Type of Pattern
  - a. DA-1 Reference Tower #.....

- b. DA-2 Reference Tower #..... Day  
 Reference Tower #.....Night
- c. DA-3 Supply diagram of tower configuration and reference tower for each pattern.
- d. DA-N Reference Tower #..... and Tower #..... of omni-directional pattern.
5. Type of Remote Control System, if any.
6. Indicate meter scale requirements when ordering Type 112 for each tower. The standard scale is 0-150%, which is readily available, and can be specified if individual tower currents are not known.



- All essential units may be contained in one rack
- Reserve space in rack for optional equipment
- Suitable for fitting in a flush position to a side or rear wall
- Drilled and tapped for standard 19-inch panels

## AM Input, Monitoring & Test Equipment

### Description

High-quality measuring, monitoring and service test equipment is an important adjunct of AM station facilities; and many items of such equipment are necessary to maintain broadcast operations and assure compliance with FCC standards. A diversified line of equipment is made available by RCA to meet practically every test and measurement requirement.

Information in this catalog is offered only as a general guide, since individual requirements will dictate the final selection to be made. The minimum equipment suggested for a single AM station will permit the station to perform most all of the required measurements. Multiple studio and control rooms, remote transmitter location, transmission link equipment and other facilities may demand a greater variety and/or additional items of the same equipment. RCA Broadcast Sales Engineers will gladly assist in planning equipment lists to handle the particular monitoring, maintenance

and test requirements for any station, large or small.

#### Monitoring Equipment

A standard 19-inch cabinet rack is sufficient to house all essential equipment needed to fulfill FCC monitoring requirements and necessary input functions.

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.
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 AGC Amplifier Type BA-43/45 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. The BA-43/46 together form a peak limiter unit with an abrupt limiting threshold and a rapid attack time.
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.

- The Circuit Breaker Panel, MI-26176, provides master switch and fuses for the rack mounted equipment.

### Station Accessories

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

- An additional RCA Standard Jack Panel Type BJ-12 or BJ-24.
- An RCA Monitoring Amplifier Type BA-34 or BA-44.
- An RCA VU Meter Panel Type BI-5B.
- An RCA Line Equalizer.
- An RCA Program Amplifier Type BA-43.

### Accessories for Remote Operation

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

- The RCA Remote Control System, Type BTR-11B or BTR-20D for unattended transmitter operation.
- An RCA Monitor Amplifier Type BA-34 or BA-44.

### Audio Test Facilities

Test instruments required by the AM Broadcast station to measure audio facilities are largely dictated by the "proof-of-performance" measurements required by the Federal Communications Commission. Such equipment must be sufficient to measure AM output noise level, the audio frequency harmonic distortion, and the audio frequency response under normal program operation as defined by the FCC. In addition, the broadcast station will undoubtedly be equipped to make other measurements such as power output, carrier frequency stability, carrier shift, carrier noise level, output voltage, and other systems tests.

### Test Equipment

The major items of test equipment required to adequately make the above measurements include: A good modulation monitor which provides a low distortion, audio output with sufficient level for feeding a noise and distortion meter. The Hewlett Packard Model 206A Audio Oscillator provides a quality tone source in the system as well as a calibrated attenuator and Volt meter. An output transformer is provided, which, in conjunction with a front panel switch, allows selection of 50/150/600 Ohm balanced or unbalanced output. This is an ideal signal source for proof of

performance and general audio testing.

The Hewlett Packard 330 Series of Distortion Meters provide a companion unit to the HP-206A Audio Oscillator. Four models are available: the 331A, 332A which has an AM detector, the 333A which features automatic nulling, and the 334A which has both automatic nulling and AM detector. The use of this Analyzer in conjunction with the 206A Oscillator permits a complete audio proof of performance.

### Accessory Test Equipment

A Tektronix Model 535A or 545B Oscilloscope is also useful in making the audio measurements. A scope is useful for making measurements at the output of the transmitter as well as following the noise and distortion meter.

While many stations will rely on their consultant or an outside engineering service to run field intensity surveys, some stations may wish to include a good field intensity meter to sample signal strength in their area, and to perform their own measurements on spurious emissions and magnitude of RF harmonics. A clamp-on ammeter or Wattmeter, vacuum tube voltmeter, dummy loads, and RF signal generator may also find a useful place in the station for making other audio measurements.

## Ordering Information

### Input and Monitoring Equipment:

AM Frequency Deviation Monitor, Type BW-11A .....	ES-34042
AM Modulation Monitor Monitor, Type BW-66F .....	MI-30066-B
Program Amplifier, Type BA-43A .....	MI-11454
AGC Unit .....	MI-11455
Limiter Unit .....	MI-11456

### Test and Measuring Equipment:

Audio Oscillator (Hewlett-Packard) .....	Model 206A
Distortion Meter (Hewlett-Packard) .....	Model 330 Series
Cathode-Ray Oscilloscope (Tektronix) .....	Model 535A/545B

### Transmitter Audio and Monitoring Accessories:

Cabinet Rack, Type BR-84B .....	ES-30951-B84
Single Trim Strip for BR-84B .....	MI-30566-G84
Double Jack Panel, Type BJ-24 .....	MI-11645
Single Jack Panel, Type BJ-12 .....	MI-11646
Double Jack Panel Mat .....	MI-11647-2
Single Jack Panel Mat .....	MI-11647-1

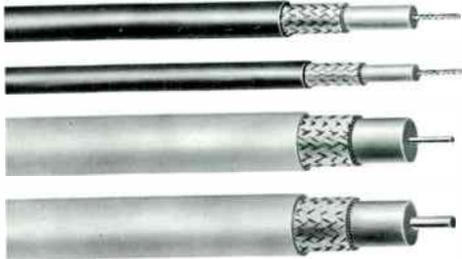
Terminal Board Mounting Bracket .....	MI-4570-A2
Terminal Power Strip .....	MI-4568
Terminal Audio Block .....	MI-4569
Interconnection Cable (Rack Wiring) 100 ft. ....	MI-33
Interconnection Cable (AC and Fil. Circuits) 100 ft. ....	MI-35
Black Panels (Specify Height) .....	MI-36547-Series
Panel and Shelf, Type BR-22C .....	MI-11597-B

### Remote Monitoring Accessories:

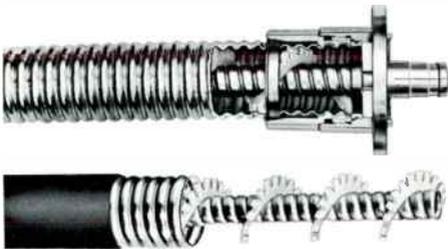
Monitoring Amplifier, Type BA-34C .....	MI-11437-C
Utility Preamplifier, Type BA-31C .....	MI-11444-C
Line Equalizer, Type BE-2A .....	MI-11752
VU Meter Panel, Type BI-5B .....	MI-12665-G
2-Foot Patch Cord .....	MI-4652-2B
Pressure Microphone, Type BK-1A .....	MI-11007
Desk Stand for BK-1A .....	MI-11008
Microphone Cable Plug .....	MI-4630-B



RIGID COPPER



FLEXIBLE RG/U



FLEXIBLE HELIAX

- Wide Choice of Styles and Sizes
- High Efficiency and Minimum VSWR
- Precision Mated Rigid Line Flanges
- Ease of Assembly
- Durable Construction

## AM-FM Coaxial Transmission Line

### Description

RCA coaxial transmission line provides an efficient means for transferring RF power to AM and FM antennas. Featuring economy, high efficiency and time saving installation, RCA line is manufactured in various sizes and types to accommodate a wide range of power and frequency requirements. RCA transmission line equipment includes the adapters, hangers and line dehydrators necessary to complete an installation.

#### Rigid 1 $\frac{5}{8}$ and 3 $\frac{1}{8}$ -Inch Line

Installation of outdoor rigid 1 $\frac{5}{8}$ -inch or 3 $\frac{1}{8}$ -inch line is made easy

by the RCA developed flange line now used in all types of RF transmitting systems. This line is supplied in convenient 20-foot lengths with flanges already heliarc welded to the ends. Line sections are easily bolted together, with gasketed mating flanges automatically sealing the line for pressure. No special tools, torches or soldering are necessary. Lengths shorter than the standard 20 feet may be obtained by ordering the desired lengths with flanges welded on at the factory. Or, 20-foot sections may be cut, and flanged-to-unflanged line adapters used, if desired.

RCA rigid lines have a rolled groove at one end of the outer conductor. This allows the inner conductor to move in only one direction. The rolled groove supports the end insulator, and also supports the inner conductor when the line is in a vertical position. The opposite end is free to permit removal of the inner conductor for inspection.

#### Heliax® and RG Cable

Semi-rigid Heliax is specified for many installations, particularly where odd bends or curves are re-

© Andrew Corporation

**QUICK REFERENCE CHART  
RCA TRANSMISSION LINE EQUIPMENT**

Order Reference Number	Size (Inches)	Description	Power (KW @ 1 MHz)	Z (OHMS)	Dielectric	Class of Service And Notes
<b>RIGID COPPER LINE</b>						
MI-19112	1 $\frac{5}{8}$	Flanged, Steatite, 20' Lengths	25	51.5	Air	} AM-FM. Moderate installation cost. Line sections replaceable. Requires gassing.
MI-19113	3 $\frac{5}{8}$	Flanged, Steatite, 20' Lengths	94	51.5	Air	
MI-27791K	3 $\frac{5}{8}$	Unflanged, Teflon, 20' Lengths	94	50.0	Air	For interior use.
<b>FLEXIBLE HELIAX LINE</b>						
(See Heliax Section for Types and Description)	1/4-5	Coaxial Copper Conductors, Polyethylene Insulation	(See Power Curves for Each Type)	50, 75	Air	} Low installation cost. Accommodates odd-shaped towers. Difficult to repair or replace. Foam type not recommended for FM.
	1/4-3	Coaxial Copper Conductors, Polyethylene Insulation		50, 75	Polyethylene Foam	
<b>FLEXIBLE RG CABLES</b>						
RG-8U	.405	Bare Copper Inner Conductor, Tinned Outer Braid		52	Polyethylene	} Low cost for AM use only.
RG-11U	.405	Tinned Copper Inner Conductor and Outer Braid		75	Polyethylene	
RG-17U	.870	Bare Copper Inner Conductor, Tinned Outer Braid		52	Polyethylene	
For information on rigid line mounting accessories, refer to section on "Hangers."						

quired. The line is quickly installed and the foam dielectric type requires no gassing. If the foam type is used for FM systems, however, a special gas line must be installed along with the Heliac, since the FM antenna feed line must be gassed. Repair of a damaged Heliac transmission line usually requires replacement of the entire line, since splicing of line sections on the tower is difficult. RG cables are inexpensive and convenient for low power AM installations.

**Complete Accessories**

RCA offers a complete line of adapters and hangers to meet every installation requirement. Special adapters and reducers permit joining lines of different types and sizes. Hangers include insulated

types for base insulated towers, spring suspended expansion hangers, lateral braces and direct mounting anchors. There are types for mounting to round, flat or angular tower members. A complete line of special hanger kits simplifies the indoor part of the installation. Line dehydrators are available in both automatic and manual types with capacities of up to three cubic feet per minute.

**Selecting Type of Line**

Choice of line depends mainly upon frequency and power to be handled. Selection of the proper line will provide the most economical and efficient installation.

The Quick Reference Chart presents the broad characteristics

of RCA transmission line, and identifies each type with the service recommended. Before ordering transmission line or fittings, a dimensional layout should be made of the transmission line run from the transmitter, up the tower to the antenna. This and other planning and installation procedures are described briefly in later pages of this catalog.

**Other RCA Transmission Line**

This catalog presents the characteristics and specifications of RCA Steatite insulated AM and FM transmission lines. RCA Teflon insulated lines, widely used in VHF and UHF television systems are described in the RCA TV transmission line catalog.

# 1 5/8-Inch 51.5 Ohm Rigid Copper Line

## Description

RCA 1 5/8-inch transmission line, MI-19112, is a hard tempered copper line with a nominal impedance of 51.5 ohms. Because of its low impedance and high efficiency, this type line is widely used in AM and FM installations.

The line is supplied in 20-foot lengths with flanges welded to the ends. The inner conductor is 5/8-inch diameter and uses low loss Steatite wafer insulators spaced 12 inches apart. The outer conductor is designed to allow for removal of the inner conductor for inspection. Line may be ordered in lengths less than 20 feet. When ordering special lengths, specify length and the MI-number designating the flange configuration desired.

## SPECIFICATIONS

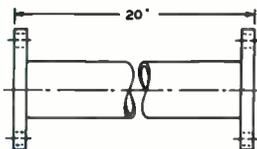
Stock Identification .....	MI-19112
Size .....	1 5/8 inches
Insulator Type and Spacing .....	Steatite Wafer, 12 inches
Impedance .....	51.5 ohms
AM Power Rating, Based on 100% modulation and Unity VSWR* (at 1.0 MHz) .....	25 kW
FM Power Rating (at 100 MHz) .....	10 kW
Voltage RMS 60 Hz .....	11 kV
Attenuation, dB/100 ft. @ 1 MHz .....	.0204 dB
Attenuation, dB/100 ft. @ 100 MHz .....	.234 dB
Velocity .....	.96.3%
O. D. — Outer Conductor .....	1.527 inches
I. D. — Outer Conductor .....	1.429 inches
O. D. — Inner Conductor .....	.625 inches
I. D. — Inner Conductor .....	.569 inches

\* Power ratings for other values of VSWR are obtained by dividing the rated power by the VSWR.

### TRANSMISSION LINE



Supplied in standard 20-foot lengths or special lengths less than 20 feet. Includes solderless inner connector, O-ring and hardware, flanges attached MI-19112-1



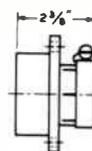
Same as MI-19112-1 but with only one flange .....MI-19112-1-F  
Same as MI-19112-1 but with no flanges ..... MI-19112-1-NF

MI-19112-1, MI-19112-1-F, MI-19112-1-NF

### ADAPTER (GASSED)



Couples flanged to unflanged line. Complete with inner connector, O-ring and hardware.

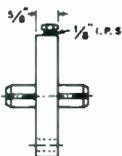


MI-19112-4

### GAS STOP



Seals gassed section from un-gassed section of line. Inserted between two flanged sections of line.

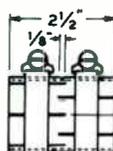


MI-19112-5

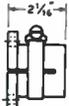
### STRAIGHT COUPLING (UNGASSED)



Couples 1 5/8 unflanged line (not for gassed line). Outer and inner connectors and clamps.



MI-19112-8

<p align="center"><b>SPECIAL INNER CONDUCTOR</b></p> <p>For splicing lengths of line cut at points between support insulators. As supplied is 0.645 O. D. x 0.569 I. D. x 12 feet long. Fits inner connector MI-19112-11.</p> <p align="center"><b>MI-19112-9</b></p>	<p align="center"><b>O-RING GASKET</b></p> <p>Synthetic gasket for use between pressure tight flanges.</p> <p align="center"><b>MI-19112-10</b></p>
<p align="center"><b>INNER CONNECTOR</b></p> <p>Solderless inner connector for joining inner conductors of 1<math>\frac{1}{2}</math>-inch 51.5 ohm line.</p> <p align="center"><b>MI-19112-11</b></p>	<p align="center"><b>ADAPTER (UNGASSED)</b></p>  <p>Couples flanged to unflanged line. Complete with inner connector, hardware and clamp.</p>
<p align="center"><b>90° ELBOW</b></p>  <p>Full 360° swivel flanges, Teflon insulated. Supplied with two connectors, O-ring, hardware. <b>MI-19112-18</b></p> <p>Same as MI-19112-18 but flange on long leg omitted. <b>MI-19112-18-IF</b></p> <p>Same as MI-19112-18 but both flanges omitted MI-19112-18-NF</p> <p align="center"><b>MI-19112-18, MI-19112-18-IF, MI-19112-18-NF</b></p>	<p align="center"><b>FIXED FLANGE</b></p>  <p>Same as used with transmission line. Adapts end of field cut line. Installed by silver soldering.</p> <p align="center"><b>MI-19112-20</b></p>
<p align="center"><b>SWIVEL FLANGE</b></p> <p>Similar to MI-19112-20 but flange rotates 360°.</p> <p align="center"><b>MI-19112-21</b></p>	<p align="center"><b>45° ELBOW</b></p>  <p>Same as MI-19112-18, -18-IF, -18-NF, but 45°.</p> <p align="center"><b>MI-19112-22, MI-19112-22-IF, MI-19112-22-NF</b></p>
<p align="center"><b>REDUCER (UNGASSED)</b></p> <p>Special built-in connector at one end and type "N" 51.5-Ohm jack at other. Supplied with integral outer connector and special clamp.</p> <p align="center"><b>MI-19112-58</b></p>	<p align="center"><b>ADAPTER (UNGASSED)</b></p> <p>Serves purpose similar to MI-19112-4 except installed by soft soldering. Made in one piece. Bolts not included.</p> <p align="center"><b>MI-19112-60</b></p>
<p align="center"><b>REDUCER (GASSED)</b></p> <p>Similar to MI-19112-58 but with flange and O-ring for use on gassed line.</p> <p align="center"><b>MI-19112-59</b></p>	<p align="center"><b>ADAPTER</b></p> <p>Six inches long, adapts 50-Ohm EIA flange to 51.5-Ohm unflanged (no connectors). For FM use.</p> <p align="center"><b>MI-19112-61</b></p>
<p align="center"><b>ADAPTER</b></p> <p>Six inches long, adapts 50-Ohm EIA flange male to 51.5-Ohm flange male (no connectors).</p> <p align="center"><b>MI-19112-62</b></p>	<p align="center"><b>ADAPTER</b></p> <p>Six inches long, adapts 50-Ohm EIA flange male to 51.5-Ohm flange male (no connectors).</p> <p align="center"><b>MI-19112-62</b></p>

# 3/8-Inch 51.5 Ohm Rigid Copper Line

## DESCRIPTION

RCA 3/8-inch transmission line, MI-19113, is a hard tempered copper line designed for efficient transfer of RF power in AM and FM installations.

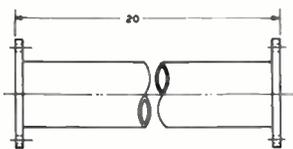
The line is supplied in 20-foot lengths with flanges heliarc welded to the ends. Components are ruggedly and precisely constructed. Mitre elbows are fabricated with thick wall tubing and Teflon dielectric inner conductor supports. The inner conductor is 1.2-inch diameter and is supported by Steatite insulators. The outer conductor is designed to permit removal of the inner conductor for inspection. Line may be ordered in lengths less than 20 feet. When ordering special lengths, specify length and the MI- number that designates the flange configuration desired.

## SPECIFICATIONS

Stock Identification .....	MI-19113
Size .....	3/8 inches
Insulator Type and Spacing .....	Steatite Wafer, 12 inches
Impedance .....	51.5 ohms
AM Power Rating, based on 100% modulation and unity VSWR* (at 1.0 MHz) .....	94 kW
FM Power Rating (at 100 MHz) .....	42 kW
Voltage RMS 60 Hz .....	18 kV
Attenuation, dB/100 ft. @ 1 MHz .....	.0104 dB
Attenuation, dB/100 ft. @ 100 MHz .....	.145 dB
Velocity .....	.93%
Outer Conductor O. D. ....	3.125 inches
Outer Conductor I. D. ....	3.027 inches
Inner Conductor O. D. ....	1.200 inches
Inner Conductor I. D. ....	1.136 inches

\* Power ratings for other values of VSWR are obtained by dividing the rated power by the VSWR.

### TRANSMISSION LINE



Supplied in standard 20-foot lengths or special lengths less than 20 feet. Includes solderless inner connector, O-ring and hardware, flanges attached  
MI-19113-C-1

Same as MI-19113 but with only one flange .....MI-19113-C-1-F

Same as MI-19113-1 but with no flanges .....MI-19113-C-1-NF

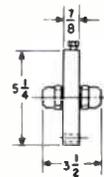
Same as MI-19113-C-1 but one of the two flanges is a swivel flange. (For replacement only — not to be ordered for new installations) .MI-19113-C-1-SF

MI-19113-C-1, MI-19113-C-1-F, MI-19113-C-1-NF,  
MI-19113-C-1-SF

### GAS STOP



Inserted between two flanged sections of line to seal gassed section from ungassed section.

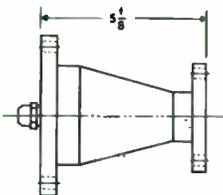


MI-19113-C-5

### REDUCER (GASSED)



Flanged coupling for reducing from 3/8-inch 51.5-Ohm line. Supplied with inner conductor and connectors, O-ring gaskets and hardware.

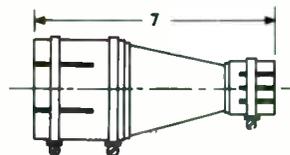


MI-19113-C-6

### REDUCER (UNGASSED)



Couples 3/8-inch 51.5-Ohm to 1/8-inch 51.5-Ohm unflanged lines. Includes outer and inner conductors and connectors, clamps.



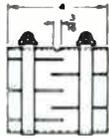
MI-19113-C-7

**STRAIGHT COUPLING (UNGASSED)**



Couples unflanged lines (not for gassed line). Consists of sleeve, inner connectors and two 3/8-inch adjustable clamps. ....MI-19113-C-8

Same as MI-19113-C-8, less inner connector MI-19113-C-8NB



MI-19113-C-8, MI-19113-C-8NB

**SPECIAL INNER CONDUCTOR**

For splicing lengths of line cut at points between support insulators. As supplied is 1.282 O. D. x 1.136 I. D. x 12 feet long. Fits inner connector, MI-19113-C-11.

MI-19113-C-9

**O-RING GASKET**

Synthetic gasket for use between pressure tight flanges.

MI-19113-C-10

**INNER CONNECTOR**



Solderless inner connector for joining inner conductors of 3/8-inch 51.5-Ohm line.

MI-19113-C-11

**COVER PLATE**



Used to cap end of 3/8-inch line to keep moisture out during installation or for other temporary capping of line.

MI-19113-C-13

**END SEAL**

Steatite insulated, 1/8" I. P. S. port for gas admission or bleeding the line. Overall length 4 1/2 inches. Furnished with solderless inner conductor, O-ring gasket and hardware.

MI-19113-C-17

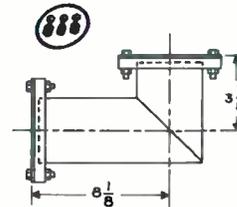
**90° ELBOW**



Full 360° swivel flanges. Teflon insulated. Supplied with two connectors, O-ring gasket, hardware. ....MI-19113-C-18

Same as MI-19113-C-18, but flange is omitted from short leg. ....MI-19113-C-18-F

Same as MI-19113-C-18, but both flanges are omitted. ....MI-19113-C-18-NF



MI-19113-C-18, MI-19113-C-18-F, MI-19113-C-18-NF

**HARDWARE KIT**

Kit consisting of six bolts, nuts and lockwashers for 3/8-inch line.

MI-19113-C-19

**FIXED FLANGE**

Same as supplied on transmission line. Adapts ends of field cut line. Installed by silver soldering.

MI-19113-C-20

**SWIVEL FLANGE**

Similar to MI-19113-C-20 but flange is free to rotate.

MI-19113-C-21

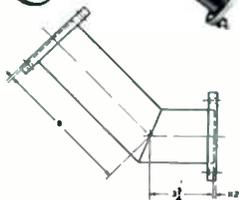
**45° ELBOW**



Same as MI-19113-C-18 except 45° .....MI-19113-C-22

Same as MI-19113-C-22 except flange is omitted from short leg .....MI-19113-C-22-F

Same as MI-19113-C-22 except both flanges are omitted. ....MI-19113-C-22-NF



MI-19113-C-22, MI-19113-C-22-F, MI-19113-C-22-NF

**CUT-OFF GAUGE**

Special tool for cutting and dressing end of 1.282 O. D. inner conductor to insure precision cut .....MI-19113-C-51  
Similar to MI-19113-C-51, but for use on 1.200 O. D. inner conductor .....MI-19113-C-54

MI-19113-C-51, MI-19113-C-54

**ADAPTER, SOFT SOLDER**



Adapts unflanged to flanged line. Made in one piece. Bolts not included.

MI-19113-C-55

## 3/8-Inch Rigid Line (Continued)

### ADAPTER, FLANGED

Adapts unflanged to flanged line. Not pressure tight. For ungasged line. Adapter two inches long.

**MI-19113-C-60**

### REDUCER (UNGASSED)

Cone reducer with special built in connector at one end and type "N" 51.5-Ohm jack at other. Supplied with integral outer connector and special clamp.

**MI-19113-C-58**

## 3/8-Inch 50 Ohm Ungassed Rigid Copper Line

### Description

RCA Type MI-27791-K is a hard tempered unflanged copper line designed for interior use in FM and VHF television installations. This line has excellent VSWR characteristics and operates efficiently at VHF frequencies (channels 2-13 and the 88 to 108 mc. FM band). Its high efficiency is attributed to the use of low loss Teflon dielectric. Components are ruggedly and precisely constructed, all outer conductor joints being heliarc welded. Mitre elbows are constructed of

heavy wall tubing. A complete line of components provide installation versatility.

The use of MI-27791-K transmission line and components on FM installation avoids the need for inner conductor adaptors and requires only the use of a single MI-27998-4C Flange Adapter (see Special Adapters) to permit connection to a MI-19089-4 Gas Stop or other components having 3/8-inch 50-Ohm EIA flange connections.

### TRANSMISSION LINE

This line is supplied in 20-foot lengths unflanged. The outer conductor is 3/8" O.D. with an inner conductor of 1.315" diameter which is supported by Teflon insulators. The outer conductor is designed to allow for removing the inner conductor for inspection.



**MI-27791-K-1**

### COUPLING, 45° MITRE ELBOW

Same as MI-27791-K-2A except 45°.

**MI-27791-K-2B**

### COUPLING



Special coupling consisting of an outer sleeve, inner connector and two adjustable clamps for joining sections of line, elbows and other line fittings.

**MI-27791-K-4A**

### COUPLING, 90° MITRE ELBOW



A 90° Mitre Elbow having unequal length legs without flanges. The inner conductor is supported by Teflon insulators.

**MI-27791-K-2A**

### INNER CONNECTOR



A specially designed solderless inner connector for joining the 1.315" inner conductor of MI-27791-K Teflon line.

**MI-27791-K-4B**

# Special Adapters

## ADJUSTABLE CLAMP

A stainless steel clamp used to secure 3/8" unflanged line and fittings.

**MI-27791-K-4C**

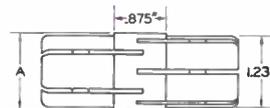
## REDUCER



An unflanged cone reducer with a special built-in connector at one end and a type "N" 50-Ohm jack at the other.

**MI-27791-K-5A**

## INNER CONNECTOR ADAPTERS



Adapter used between 3/8-inch EIA 50-Ohm female flange and MI-19113 (Steatite) female flange .....MI-27988-4A

For adapting EIA 3/8-inch to MI-19313 (Teflon) ..MI-27988-4B

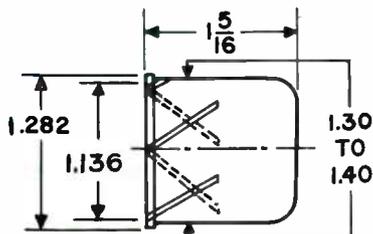
TYPE	DIM. A.	TO ADAPT
27988-4A	1.136	MI-19113C to MI-19089
27988-4B	1.232	MI-19313 to MI-19089

**MI-27988-4A, MI-27988-4B**

## INSERT BUSHING



Reduces inside diameter of the inner conductor of MI-19313 or MI-27791-K line to mate with inner conductor connector for MI-19113-C components.



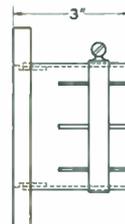
**MI-19313-11**

## ADAPTER FLANGE (UNGASSED)



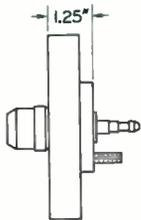
Adapts unflanged 3/8-inch 50-Ohm (MI-27791-K) to 3/8-inch EIA flanged components.

Recesses inner conductor .88" to mate with MI-19089 or 3/8" 50-Ohm EIA anchor type inner conductor connector.



**MI-27988-4C**

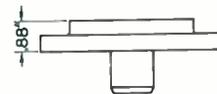
**QUICK STEP REDUCER (3/8 to 7/8)**



Used between flanged 3/8-inch 51.5-Ohm and 7/8-inch EIA flanged components.

**MI-27988-5A**

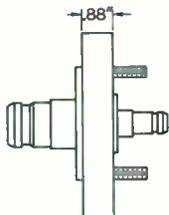
**QUICK STEP REDUCER (3/8 to 1 1/8)**



Used between flanged 3/8-inch 51.5-Ohm and 1 1/8-inch 50-Ohm EIA flanged components.

**MI-27988-5B**

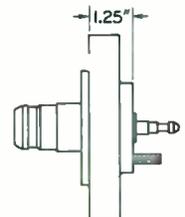
**QUICK STEP REDUCER (EIA 3/8 to 1 1/8)**



Used between flanged EIA 3/8-inch and flanged EIA 1 1/8-inch components.

**MI-27988-5C**

**QUICK STEP REDUCER (EIA 3/8 to 7/8)**

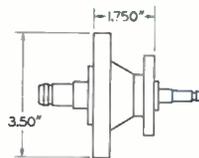


Used between flanged 3/8-inch 50-Ohm EIA and 7/8-inch 50-Ohm flanged components.

**MI-27988-5D**

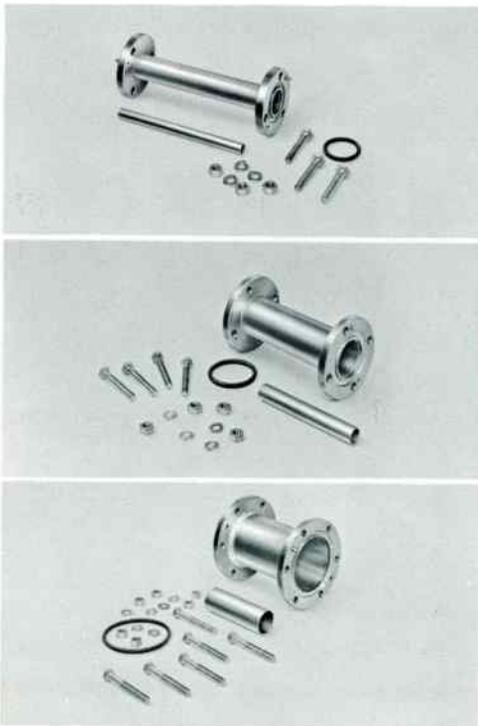
## Special Adapters (continued)

### QUICK STEP REDUCER (EIA 1 1/8 to 7/8)



Used between flanged 1 1/8-inch 50-Ohm EIA and flanged 7/8-inch 50-Ohm EIA components.

**MI-27988-5E**



### MALE TO MALE ADAPTERS (EIA)

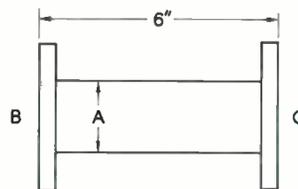
#### MALE TO MALE ADAPTERS (EIA)

Six inches long. Used between flanged components, having integral inner conductor connectors.

To connect 7/8-inch components .....MI-27988-7C

To connect 1 1/8-inch components .....MI-27988-7D

To connect 3/8-inch components .....MI-27988-7E



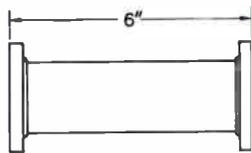
TYPE	SIZE (A)	ENDS MATE WITH	
		(B)	(C)
27988-7A	3/8	19113-C	19089
27988-7B	3/8	19113-C	27791 (female)
27988-7C*	7/8	7/8" EIA	7/8" EIA
27988-7D*	1 1/8	1 1/8" EIA	1 1/8" EIA
27988-7E*	3/8	19089	19089
27988-7F	1 1/8	19112-NF**	1 1/8" EIA
27988-7G	1 1/8	19112	1 1/8" EIA

\*Male to male adapters.

\*\*Non-flanged for sleeve coupling.

**MI-27988-7C, MI-27988-7D, MI-27988-7E**

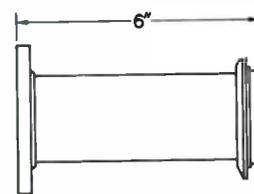
**ADAPTER SECTION (3 1/8 to 3 1/8)**



Six inches long. Used to connect 3 1/8-inch 51.5-Ohm flanged to 3 1/8-inch 50-Ohm flanged EIA components.

**MI-27988-7A**

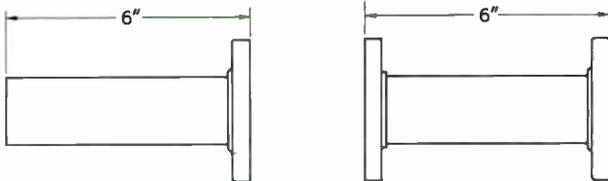
**ADAPTER SECTION (3 1/8 to MI-27791)**



Six inches long. Used to connect 3 1/8-inch 51.5-Ohm flanged to MI-27791 universal male components.

**MI-27988-7B**

**ADAPTER SECTION (6 inches long)**

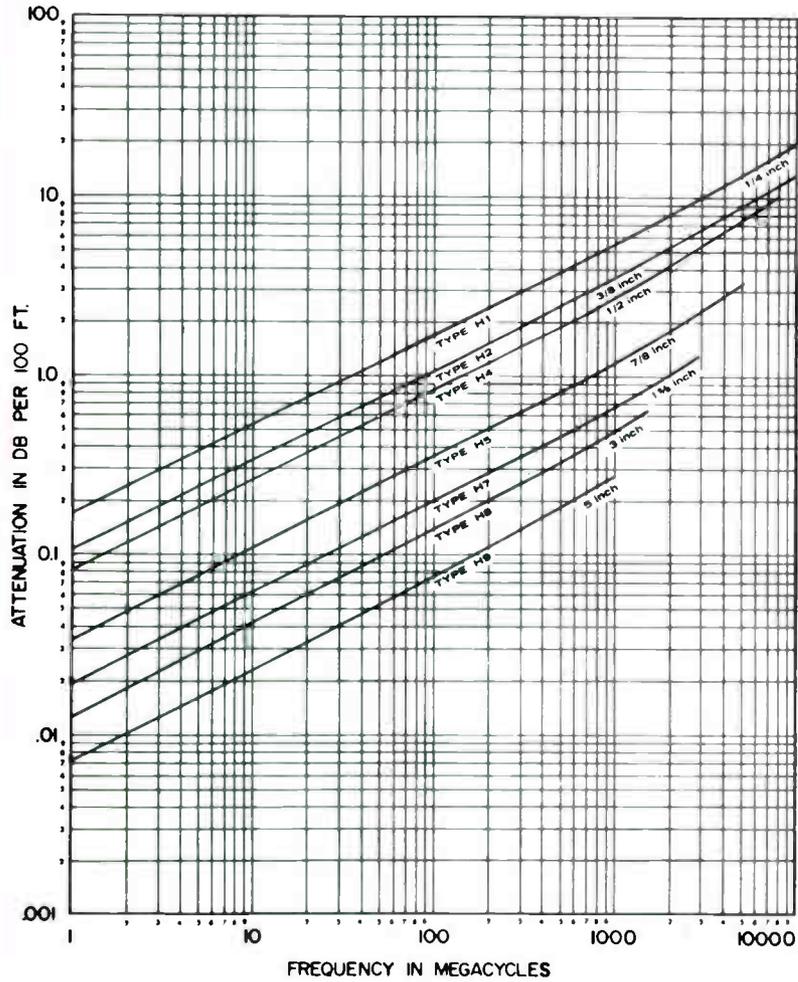


Six inches long. Adapts unflanged 1 1/8-inch 51.5-Ohm line to 50-Ohm 1 1/8-inch EIA flange (less inner conductor connectors).  
MI-27988-7F

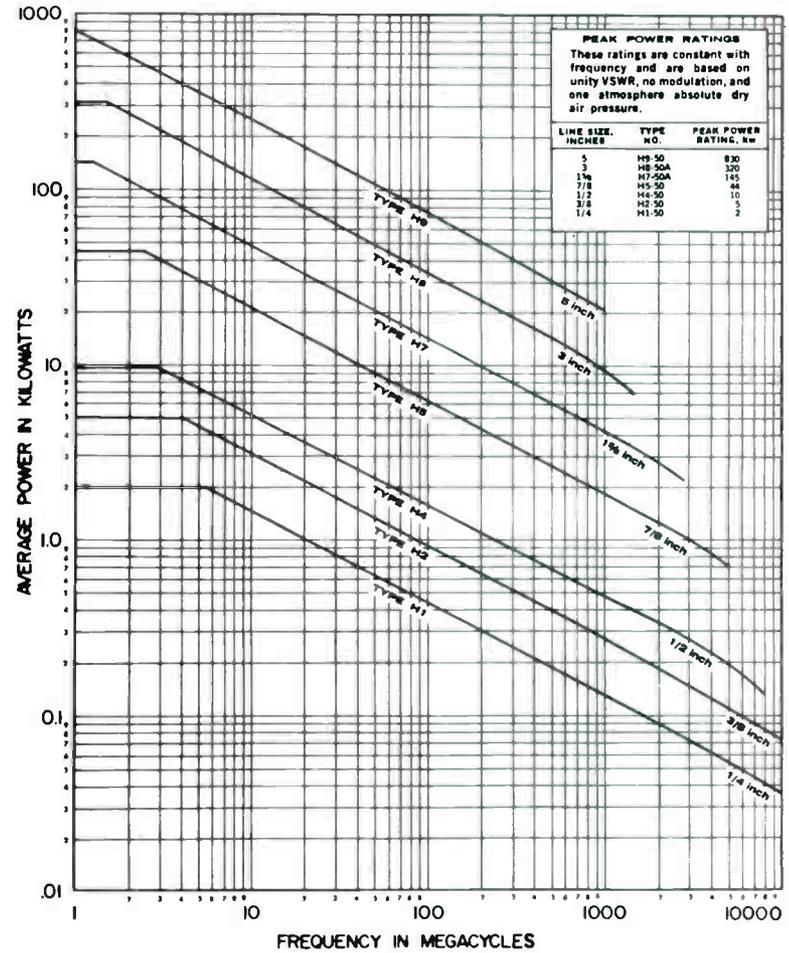
Six inches long. Adapts flanged 1 1/8-inch 51.5-Ohm line to 50-Ohm 1 1/8-inch EIA flange (less inner conductor connectors).  
MI-27988-7G

**MI-27988-7F, MI-27988-7G**

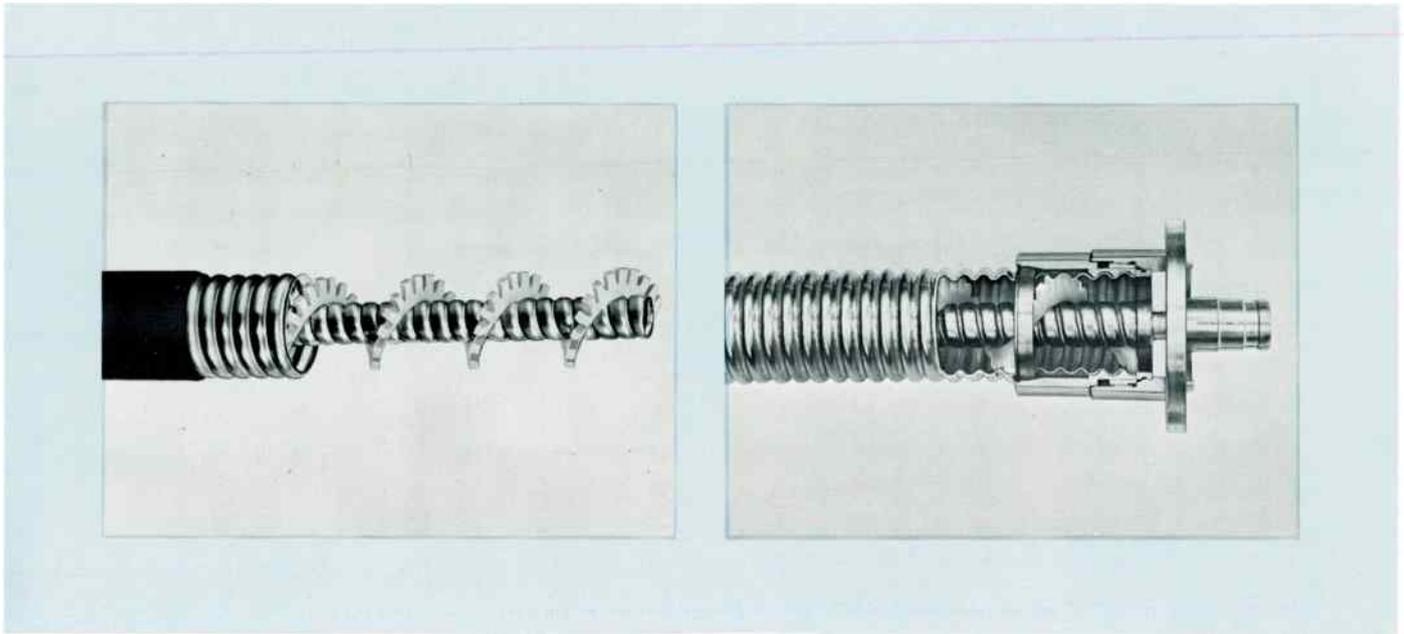
### ATTENUATION AND POWER CURVES FOR 50-OHM AIR DIELECTRIC HELIAX AT UNITY VSWR



ATTENUATION CURVE



POWER CURVE



## Flexible Heliax Air Dielectric Line

### DESCRIPTION

Heliax<sup>®</sup> is a flexible coaxial cable designed for both AM and FM installations. For maximum flexibility, it employs high conductivity corrugated copper outer conductors and is available with either 50- or 75-ohm

impedances. Supplied with or without a polyethylene jacket, Heliax is lighter weight and possibly less susceptible to damage than rigid copper line of comparable size. There are two types, air dielectric or polyethylene foam dielectric types. Sizes

range from instrumentation type 1/4-inch diameter cable to five-inch cable for high power. Complete data on types are given in the table. Included are complete accessories such as hangers, connectors, gas fittings and dehydrating equipment.

### SPECIFICATIONS AND ORDERING INFORMATION

#### Description

Heliax Cable, without jacket.....	H1-50	H2-50	H4-50	H5-50	H5-75	H7-50A	H7-75A	H8-50A	H8-75A	H9-50
Heliax Cable with Polyethylene Jacket.....	HJ1-50	HJ2-50	HJ4-50	HJ5-50	HJ5-75	HJ7-50A	HJ7-75A	HJ8-50A	HJ8-75A	HJ9-50
Nominal size, inch.....	1/4	3/8	1/2	7/8	7/8	1 1/8	1 1/8	3 1/8	3 1/8	5
Characteristic impedance, ohms.....	50	50	50	50	75	50	75	50	75	50
Velocity, percent.....	85	85.0	91.4	91.6	90.0	92.1	92.4	93.3	93.6	93.0
Peak power rating, kW.....	2	10.0	9.8-	44.0	29.0	145	98.0	320.0	210.0	830.0
Attenuation (see curve).....	—	—	—	—	—	—	—	—	—	—
Insulation .....	Poly-ethylene spiral									
Copper Outer Conductor, Major diameter .....	.250	.375	.500	1.005	1.005	1.830	1.830	3.75	3.75	5.00
Outside diameter over jacket.....	.290	.435	.580	1.115	1.115	2.0	2.0	3.02	3.02	5.20
Minimum Bending Radius, inches.....	2.5	3.75	5.0	10.0	10.0	20.0	20.0	30.0	30.0	50.00
Weight, pounds per foot, unjacketed.....	.06	.12	.21	0.43	0.410	0.72	0.718	1.21	1.20	3.08
Weight, pounds per foot, jacketed.....	.07	.14	.27	0.53	0.51	1.04	1.04	1.78	1.78	4.59

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## Accessories For Flexible Heliax Air Dielectric Line

### H1 — H2 — H4 HELIAX ACCESSORIES

Description	Ordering Information		
	H1 Line (1/4-inch)	H2 Line (3/8-inch)	H3 Line (1/2-inch)
Type N Jack (female) .....	71N	72N	74N
Type N Plug (male) .....	71W	72W	74W
Splice .....	71N/71W*	72N/72W*	74Z
End Terminal .....	13212-2**	13212-2**	74T
Grounding Kit, unjacketed .....	26892-1	26892-1	26891-1
Grounding Kit, jacketed .....	26892-2	26892-2	26892-2
Insulated Rigid Hanger .....	11662-3	11662-3	11662-3
Stainless Steel Wraplock .....	12395-1	12395-1	12395-1

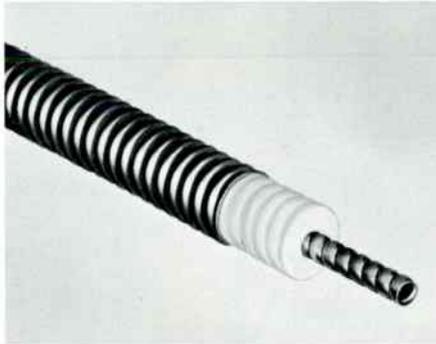
\* Splice made with mating jack and plug.

\*\* Used with type N Plug for selected line size.

### H5 — H7 — H8 HELIAX ACCESSORIES

Description	Ordering Information		
	H5 Line (7/8-inch)	H7 Line (1 1/8-inch)	H8 Line (3-inch)
EIA Flange Connector, 50 Ohm .....	75R	77R	22R
EIA Flange Connector, 75 Ohm .....	75R-75	77R-75	22R-75
EIA Flange Connector, 100 Ohm .....	—	77R-100	—
Type N Jack, 50 Ohm .....	75N	77N	—
Type N Jack, 100 Ohm .....	75N-100	—	—
UHF Jack, 50 Ohm .....	75U	77U	—
UHF Jack, 75 Ohm .....	75U-75	—	—
End Terminal, 50 Ohm .....	75T	2061	2062
End Terminal, 75 Ohm .....	75T-75	2071	2072
End Terminal, 100 Ohm .....	75T-100	80799	—
Miter Elbow, 50 Ohm .....	1060	1061	1062
Miter Elbow, 75 Ohm .....	1070	1071	1072
Gas Barrier, 50 Ohm .....	1260A	1261B	1262A
Gas Barrier, 75 Ohm .....	—	1271	1272
Reducer Connector, 50 Ohm .....	1860	77S	1862
Reducer Connector, 75 Ohm .....	—	—	1861
Inner Connector, 50 Ohm .....	18275	15069	23817
Inner Connector, 75 Ohm .....	25385	24259	24530
Inner Connector Adapter, 50 to 51.5-Ohm .....	4850	4851	—
Inner Connector Adapter, 50 to 75 Ohm .....	25388	—	—
Hoisting Kit .....	19256A	24312	23146
Grounding Kit .....	24810	24811	23145
Hanger .....	—	—	22417
Insulated Hanger .....	11662-2	24622	22418
Wraplock .....	12395-1	12395-1	—
Automatic Dehydrator .....	1910A	1910A	1910A
Dry Air Pump .....	878A	878A	878A
Nitrogen Tank Fittings .....	858	858	858

# Flexible Heliax Foam Dielectric Line



## DESCRIPTION

Heliax foam dielectric cables are similar in construction and application to the air dielectric types, except that they employ a foamed polyethylene dielectric which completely fills the space between the inner and outer conductors. These cables are well suited to AM installations

where line pressurization is not required. Sizes range from 1/4-inch to three inches diameter. All types are available either plain or with polyethylene jacket. 50 or 75-Ohm types are available for two line sizes. The table lists the types, sizes and characteristics.

## SPECIFICATIONS AND ORDERING INFORMATION

### Description

	FH1-50	FH2-50	FH4-50A	FH4-75	FH5-50	FH5-75	FH7-50	FH8-50
Foam Heliax, without jacket .....	FH1-50	FH2-50	FH4-50A	FH4-75	FH5-50	FH5-75	FH7-50	FH8-50
Foam Heliax, with jacket .....	FHJ1-50	FHJ2-50	FHJ4-50A	FHJ4-75	FHJ5-50	FHJ5-75	FHJ7-50	FHJ8-50
Nominal size, inches .....	1/4	3/8	1/2	1/2	7/8	7/8	1 1/8	3
Characteristic Impedance, Ohms .....	50	50	50	75	50	75	50	50
Velocity, percent .....	79	79	79	79	79	79	79	92
Peak power rating, kW .....	5.0	8.0	19	12.7	44	29	145	320
Attenuation, see curve .....	—	—	—	—	—	—	—	—
Copper out conductor major diameter, inches .....	.250	.375	.540	.540	.980	.980	1.830	2.85
Outside diameter over jacket, inches .....	.290	.435	.620	.620	1.09	1.09	2.0	3.02
Minimum bending radius, inches .....	2.5	3.75	5.0	5.0	10.0	10.0	20	50
Weight, pounds per ft. unjacketed .....	.05	.10	.20	.20	.32	.32	1.03	1.21
Weight, pounds per ft. jacketed .....	.06	.12	.24	.24	.42	.42	1.35	1.78

### FH1 AND FH2 FOAM HELIAX ACCESSORIES

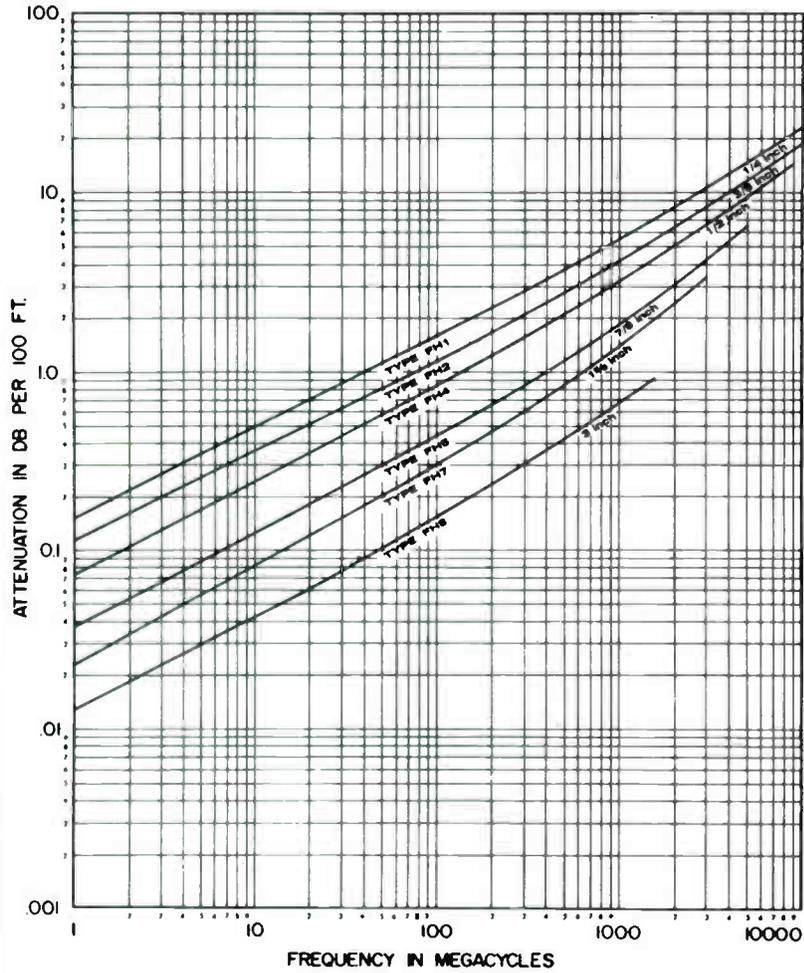
Description	Ordering Information	
	FH1 Line (1/4")	FH2 Line (3/8")
Type UHF Jack (female) .....	41U	42U
Type UHF Plug (male) .....	41P	42P
Type N Jack (female) .....	41N	42N
Type N Plug (male) .....	41W	42W
End Terminal Adaptor .....	13212-2*	13212-2*
Stainless Steel Wraplock .....	12395-1	12395-1
Copperweld Tie Wires .....	27290	27290
Insulated Mounting Clamp .....	11662-3**	11662-3**

\* Use with type N Plug.  
\*\* For 1/2-inch cable, shim for smaller sizes.

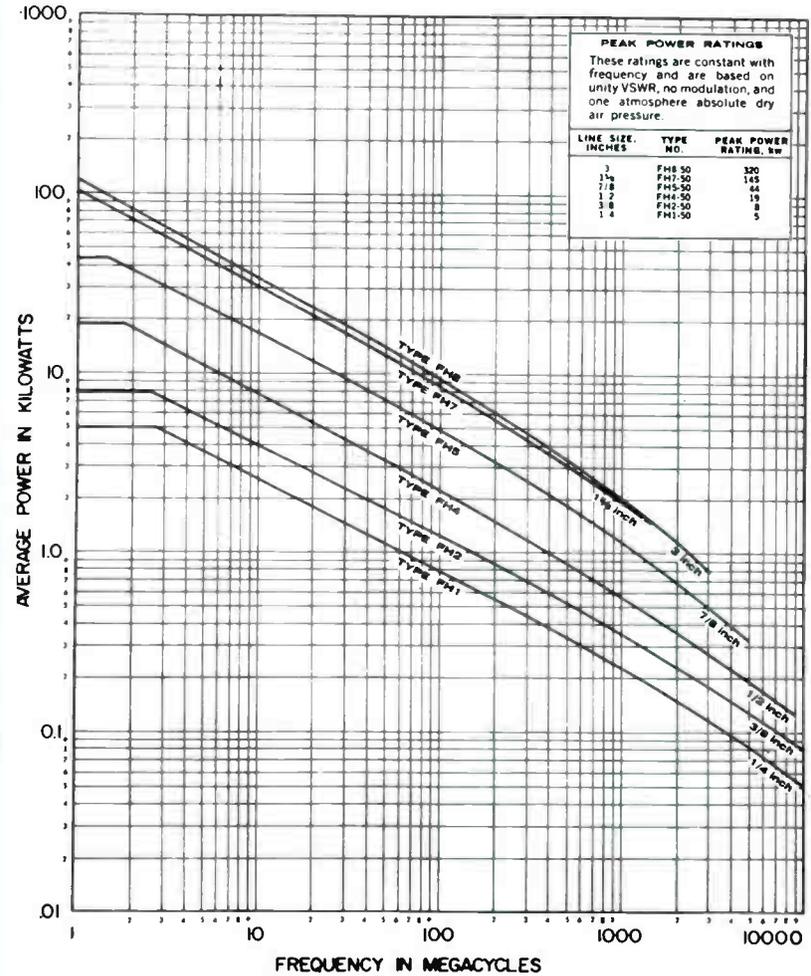
### FH4, FH5, FH7, FH8 (50 ohm) FOAM HELIAX ACCESSORIES

Description	Ordering Information			
	FH4 (1/2")	FH5 (7/8")	FH7 (1 1/8")	FH8 (3")
EIA Flange .....	44AR	45AR	47R	48R
Splice .....	44AZ	45AZ	47Z	48Z
Type LC Plug (male) .....	44AM	45AM	—	—
Type LC Jack (female) .....	44AL	45AL	47L	—
Type UHF Plug (male) .....	44AP	45AP	—	—
Type UHF Jack (female) .....	44AU	45AU	—	—
Type N Plug (male) .....	44AN	45AN	47W	—
Type N Plug (female) .....	44AW	45AW	47N	—
End Terminal .....	44AT	45AT	2061	—
Grounding Kit, unjacketed .....	26892-1	24810-1	24811-1	—
Grounding Kit, jacketed .....	26892-2	24810-2	24811-2	—
Stainless Steel Wraplock .....	12395-1	12395-1	12395-1	—
Insulated Mounting Clamp .....	11662-3	11662-2	24622	—

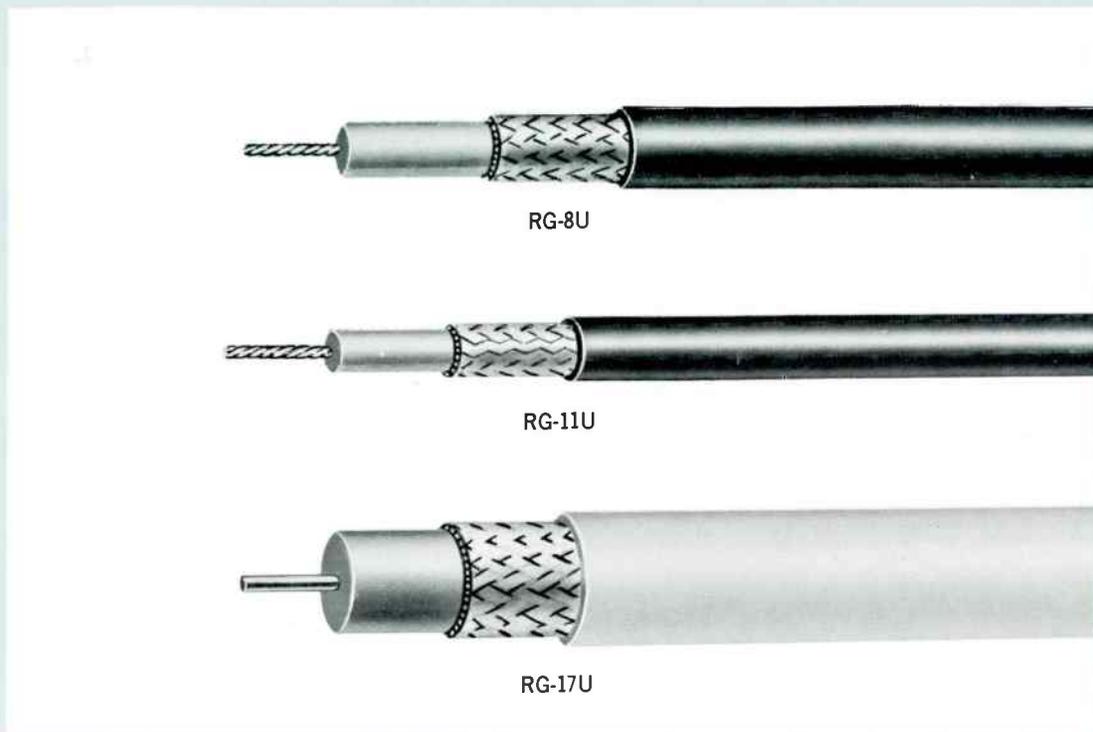
### ATTENUATION AND POWER CURVES FOR 50-OHM FOAM HELIAX AT UNITY VSWR



ATTENUATION CURVES



POWER CURVES



## Flexible RG/U Type Coaxial Cable

### DESCRIPTION

RG/U cables are solid dielectric types suitable for low power AM installations. These cables employ the maximum dielectric qualities of polyethylene with its flexibility and low moisture absorption qualities. The bending radius of these cables is ten times the outside cable diameter and is maintained over a large temperature range.

RG/U types are available in three sizes and with impedances of 52 or 75 ohms. Available types with their sizes and electrical characteristics are given in the accompanying table.

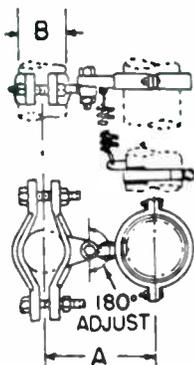
### SPECIFICATIONS

Type	O. D. Inches	Description	Power Rating*	Z Ohms	Attenuation DB/100 Ft. @ 1 MHz
RG-8U	.405	Tinned outer braid	1,320W	52	.16
RG-11U	.405	Tinned inner and outer conductors	920W	75	.18
RG-17U	.870	Tinned outer braid	5,150W	52	.060

\* For 100% modulation at 1 MHz and unity VSWR.

# Expansion Hangers, 1 5/8-Inch Rigid Line

## GROUNDING, CLAMP ON ROUND MEMBERS



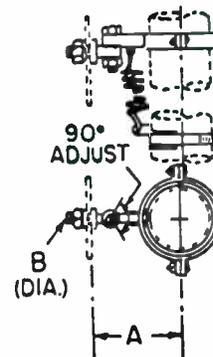
Spring Hanger for single line. Complete with clamps and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.

### Dimensions (Inches)

A	B	Ref. No.
4 3/8 - 5	1 - 2 1/4	MI-19312-23
7 7/8 - 8 1/2	1 - 2 1/4	MI-19312-24
5 1/8 - 6 1/8	2 1/4 - 5	MI-19312-26
8 3/8 - 9 15/16	2 1/4 - 5	MI-19312-27

MI-19312-23, MI-19312-24, MI-19312-26, MI-19312-27

## GROUNDING, MOUNT THROUGH HOLE



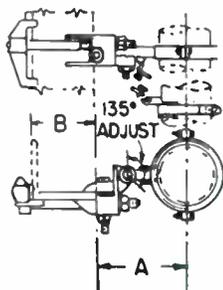
Spring hanger for single line. Complete with clamps and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.

### Dimensions (Inches)

A	B	Ref. No.
4 1/4	1/2	MI-19312-32
7 3/4	1/2	MI-19312-33

MI-19312-32, MI-19312-33

## GROUNDING, CLAMP ON ANGLE MEMBERS



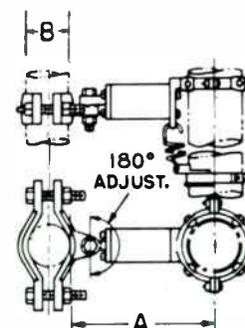
Spring hanger for single line. Complete with clamp and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.

### Dimensions (Inches)

A	B	Ref. No.
4 3/4	7 (max.)	MI-19312-29
8 1/4	7 (max.)	MI-19312-30

MI-19312-29, MI-19312-30

## INSULATED, CLAMP ON ROUND MEMBERS



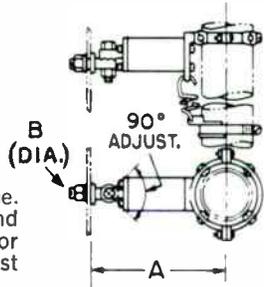
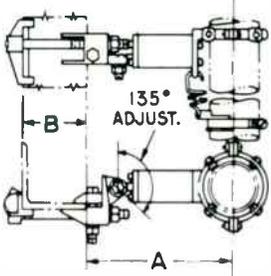
Spring hanger for single line. Complete with clamps and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.

### Dimensions (Inches)

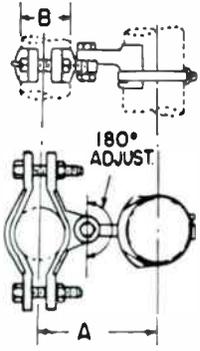
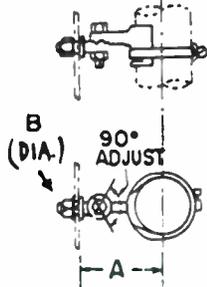
A	B	Ref. No.
8 1/8 - 9 3/8	1 - 2 1/4	MI-19312-25
8 3/8 - 9 13/8	2 1/4 - 5	MI-19312-28

MI-19312-25, MI-19312-28

## Expansion Hangers, 1 5/8-Inch Rigid Line (Continued)

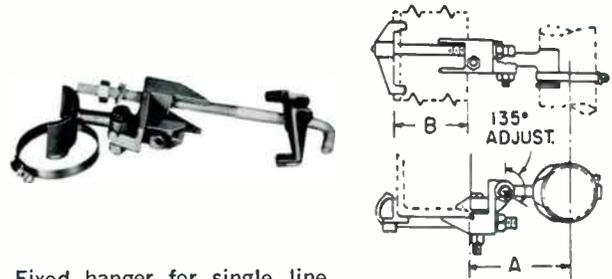
INSULATED, MOUNT THROUGH HOLE		INSULATED, CLAMP ON ANGLE MEMBERS	
			
Spring hanger for single line. Complete with clamps and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.		Spring hanger for single line. Complete with clamp and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.	
<b>Dimensions (Inches)</b> <b>A</b> 7 3/4 <b>B</b> 1/2 <b>MI-19312-34</b>		<b>Dimensions (Inches)</b> <b>A</b> 8 1/4 <b>B</b> 7 (Ma.x.) <b>MI-19312-31</b>	
<b>Ref. No.</b> MI-19312-34		<b>Ref. No.</b> MI-19312-31	

## Fixed Hangers, 1 5/8-Inch Rigid Line

GROUNDED, CLAMP ON ROUND MEMBERS		GROUNDED, MOUNT THROUGH HOLE	
			
Fixed hanger for single line. Complete with clamp and pivot bolt to compensate for line misalignment.		Fixed hanger for single line. Requires mounting hole. Complete with clamp and pivot bolt to compensate for line misalignment.	
<b>Dimensions (Inches)</b> <b>A</b> 4 3/8 - 5 <b>B</b> 1 - 2 1/4 <b>MI-19312-41, MI-19312-42</b>		<b>Dimensions (Inches)</b> <b>A</b> 3 13/16 <b>B</b> 3/8 <b>MI-19312-44, MI-19312-47</b>	
<b>Ref. No.</b> MI-19312-41, MI-19312-42		<b>Ref. No.</b> MI-19312-44, MI-19312-47	

## Fixed Hangers, 1 $\frac{5}{8}$ -Inch Rigid Line (Continued)

### GROUNDING, CLAMP ON ANGLE MEMBERS



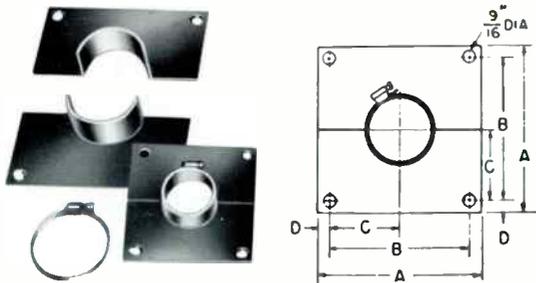
Fixed hanger for single line. Complete with clamp and pivot bolt to compensate for line misalignment.

Dimensions (Inches)		Ref. No.
A	B	
4 $\frac{3}{4}$	1 - 7	MI-19312-43

MI-19312-43

## Miscellaneous 1 $\frac{5}{8}$ -Inch Rigid Line Hanger Accessories

### GROUNDING HORIZONTAL ANCHOR

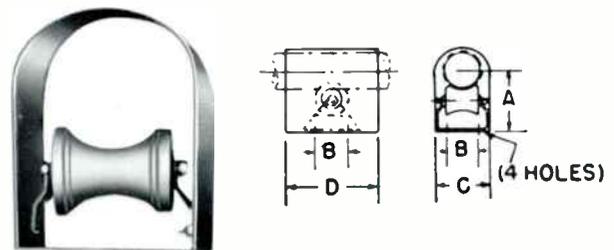


Supports single line at point of wall entry. One required on each side of wall. Furnished split in two pieces with clamp. Mounting bolts not supplied.

Dimensions (Inches)				Ref. No.
A	B	C	D	
6	4 $\frac{7}{8}$	3	$\frac{5}{16}$	MI-119312-17

MI-19312-17

### GROUNDING HORIZONTAL ROLLER ASSEMBLY

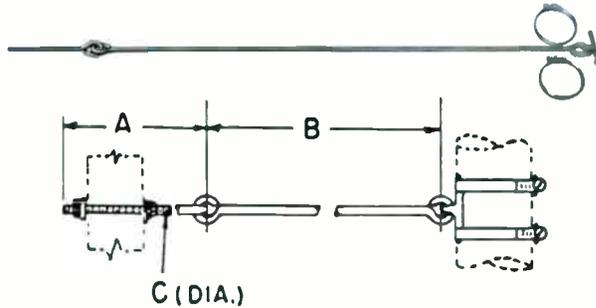


Supports single line. Roller permits line expansion. Hood protects roller. Mounting bolts not supplied.

Dimensions (Inches)				Ref. No.
A	B	C	D	
2 $\frac{1}{16}$	1 $\frac{1}{16}$	3 $\frac{1}{16}$	6	MI-19312-35

MI-19312-35

### GROUNDING LATERAL BRACE

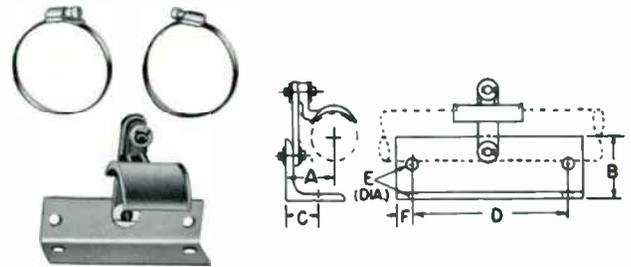


Maintains single line at fixed distance from tower or building. Mounts through single hole. Complete with two clamps.

Dimensions (Inches)			Ref. No.
A	B	C	
8	38½	½	MI-19312-36

MI-19312-36

### GROUNDING SWIVEL HANGER



For single line, horizontal run, accommodates uneven terrain. Also compensates for some line expansion and misalignment. Angle support may be mounted horizontally or vertically. Complete with clamps.

Dimensions (Inches)					Ref. No.
B	C	D	E	F	
2 17/32	1½	5	9/32	½	MI-19312-37

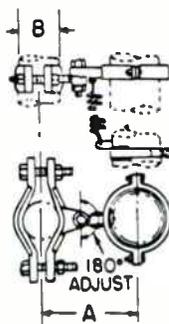
MI-19312-37

## Expansion Hangers, 3/8-Inch Rigid Line

### GROUNDING, CLAMP ON ROUND MEMBERS



Spring hanger for single line. Complete with clamps and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.



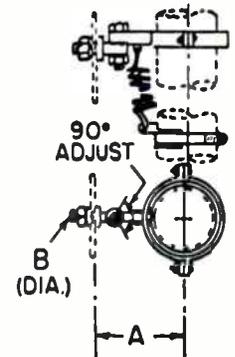
Dimensions (Inches)		Ref. No.
A	B	
5½ - 5¾	1 - 2¼	MI-19313-23
8¼ - 9¾	1 - 2¼	MI-19313-24
5¾ - 7¾	2¼ - 5	MI-19313-26
9¾ - 10¾	2¼ - 5	MI-19313-27

MI-19313-23, MI-19313-24, MI-19313-26, MI-19313-27

### GROUNDING, MOUNT THROUGH HOLE



Spring hanger for single line. Requires mounting hole. Complete with clamps and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.

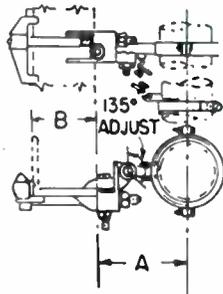


Dimensions (Inches)		Ref. No.
A	B	
5	½	MI-19313-32
8¼	½	MI-19313-33

MI-19313-32, MI-19313-33

# Expansion Hangers, 3/8-Inch Rigid Line (Continued)

## GROUNDING, CLAMP ON ANGLE MEMBERS

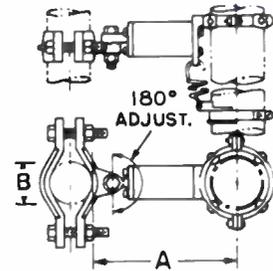


Spring hanger for single line. Complete with clamp and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.

Dimensions (Inches)		Ref. No.
A	B	
5 1/2	7 (Max.)	MI-19313-29
9 1/6	7 (Max.)	MI-19313-30

MI-19313-29, MI-19313-30

## INSULATED, CLAMP ON ROUND MEMBERS

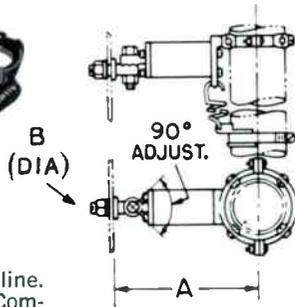


Spring hanger for single line. Complete with clamps and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.

Dimensions (Inches)		Ref. No.
A	B	
8 1/6 - 9 1/6	1 - 2 1/4	MI-19313-25
9 3/8 - 10 3/4	2 1/4 - 5	MI-19313-28

MI-19313-25, MI-19313-28

## INSULATED, MOUNT THROUGH HOLE

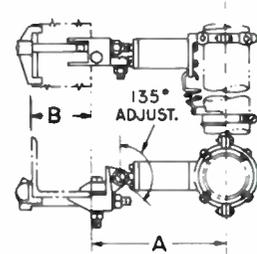


Spring hanger for single line. Mounting hole required. Complete with clamps and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.

Dimensions (Inches)		Ref. No.
A	B	
8 1/6	1/2	MI-19313-34

MI-19313-34

## INSULATED, CLAMP ON ANGLE MEMBERS



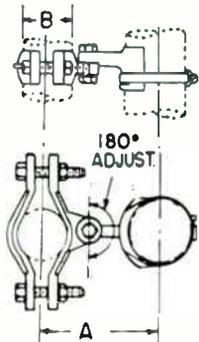
Spring hanger for single line. Complete with clamp and pivot bolt to compensate for line misalignment. Spring must be preloaded at installation.

Dimensions (Inches)		Ref. No.
A	B	
9 1/6	7 (Max.)	MI-19313-31

MI-19313-31

# Fixed Hangers, 3/8-Inch Rigid Line

## GROUNDING, CLAMP ON ROUND MEMBERS

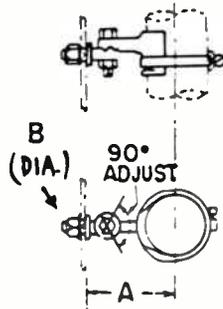


Fixed hanger for single line. Complete with clamp and pivot bolt to compensate for line misalignment.

Dimensions (Inches)		Ref. No.
A	B	
5 1/8 - 5 3/4	1 - 2 1/4	MI-19313-41
5 1/6 - 7 1/6	2 1/4 - 5	MI-19313-42

MI-19313-41, MI-19313-42

## GROUNDING, MOUNT THROUGH HOLE

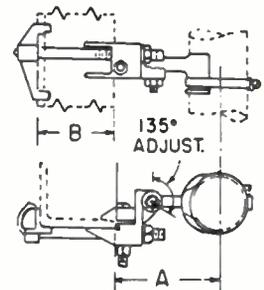


Fixed hanger for single line. Requires mounting hole. Complete with clamp and pivot bolt to compensate for line misalignment.

Dimensions (Inches)		Ref. No.
A	B	
5	1/2	MI-19313-44
8 1/6	1/2	MI-19313-47

MI-19313-44, MI-19313-47

## GROUNDING, CLAMP ON ANGLE MEMBERS



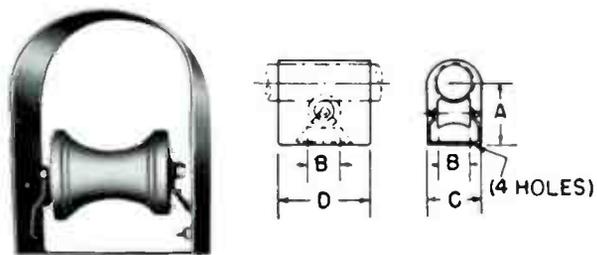
Fixed hanger for single line. Complete with clamp and pivot bolt to compensate for line misalignment.

Dimensions (Inches)		Ref. No.
A	B	
5 1/2	1 - 7	MI-19313-43

MI-19313-43

Miscellaneous 3/8-Inch  
Rigid Line Hanger  
Accessories

**GROUNDING HORIZONTAL ROLLER ASSEMBLY**



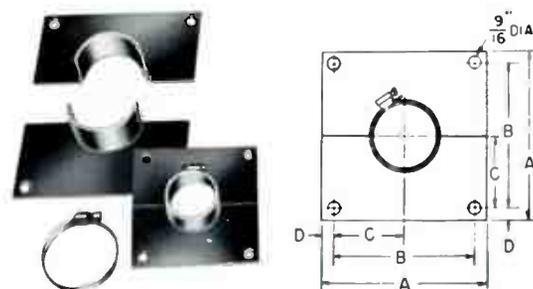
Supports single line. Roller permits line expansion. Hood protects roller. Mounting bolts not supplied.

**Dimensions (Inches)**

A	B	C	D	Ref. No.
5 1/8	3	4 3/4	8	MI-19313-35

MI-19313-35

**GROUNDING HORIZONTAL ANCHOR**



Supports single line at point of wall entry. One required on each side of wall. Furnished in two pieces with clamp. Mounting bolts not supplied.

**Dimensions (Inches)**

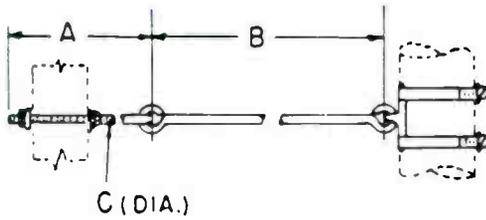
A	B	C	D	Ref. No.
8	6 7/8	4	7/8	MI-19313-17

MI-19313-17

### GROUNDING LATERAL BRACE



Maintains single line at fixed distance from tower or building. Mounts through single hole. Complete with two clamps.

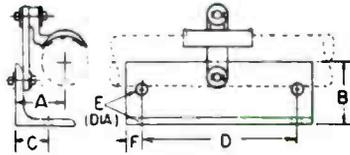


#### Dimensions (Inches)

A	B	C	Ref. No.
8	38½	½	MI-19313-36

MI-19313-36

### GROUNDING SWIVEL HANGER



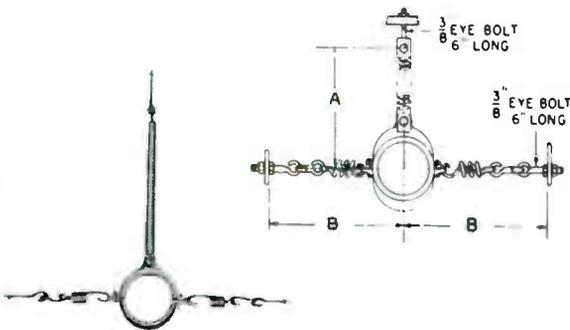
For single line, horizontal run. Accommodates uneven terrain. Also compensates for some line expansion and misalignment. Angle support may be mounted horizontally or vertically. Complete with clamps.

#### Dimensions (Inches)

B	C	D	E	F	Ref. No.
2 17/32	1 1/8	5	3/16	½	MI-19313-37

MI-19313-37

### GROUNDING 3-POINT HANGER



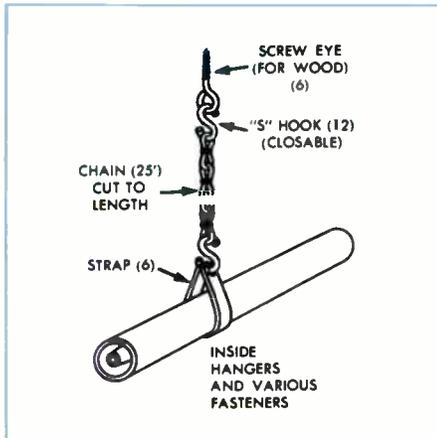
Spring hanger for horizontal suspension of single line. Anchored at three points. Complete with eye bolts and springs.

#### Dimensions (Inches)

A	B	Ref. No.
20¾	15	MI-19313-50

MI-19313-50

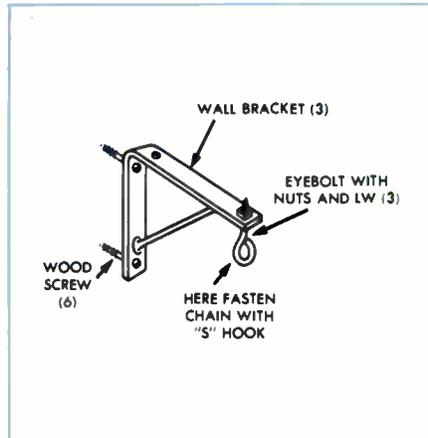
# Indoor Hanger Kits, 1 $\frac{5}{8}$ -, 3 $\frac{1}{8}$ -, 6 $\frac{1}{8}$ -Inch Rigid Line



## HANGER AND FASTENER KIT

Attaches to line for ceiling support. Consists of stainless steel straps, 25 feet of chain and hardware for supporting line at six points. Chain tensile strength 260 pounds.

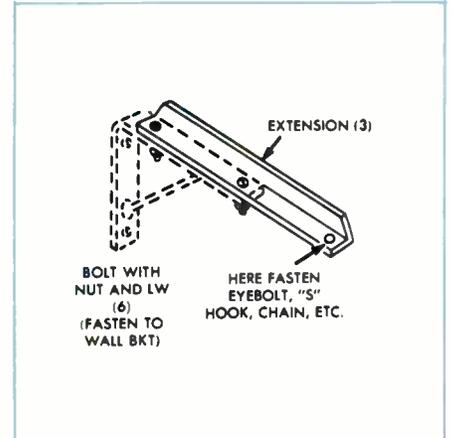
3 $\frac{1}{8}$ -Inch Line: MI-27700



## WALL BRACKET KIT

For supporting line from wall of building. Consists of three heavy duty brackets 1 $\frac{1}{2}$  inches wide with 7 $\frac{1}{2}$ -inch arms and mounting hardware for supporting line at three points.

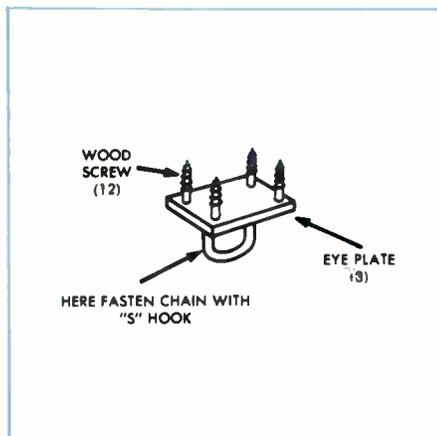
3 $\frac{1}{8}$ -Inch Line: MI-27702



## WALL BRACKET EXTENSION KIT

For use with Wall Bracket Kit to extend line out from wall of building. Consists of three heavy duty angle extensions and hardware. Extension angles are 12 inches long,  $\frac{1}{8}$  inch thick and  $\frac{1}{4}$  inch each side.

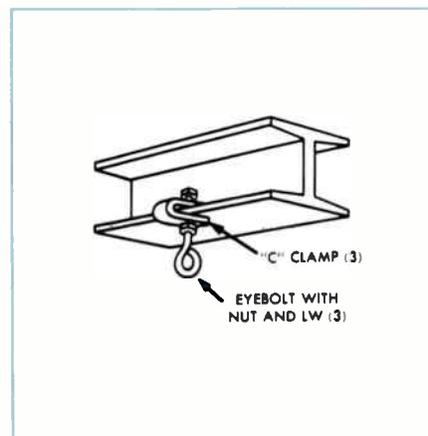
3 $\frac{1}{8}$ -Inch Line: MI-27703



## HANGER PLATE MOUNTING KIT

For attaching Hanger and Fastener Kit to plaster or wood surfaces. Consists of three steel eye plates and mounting hardware.

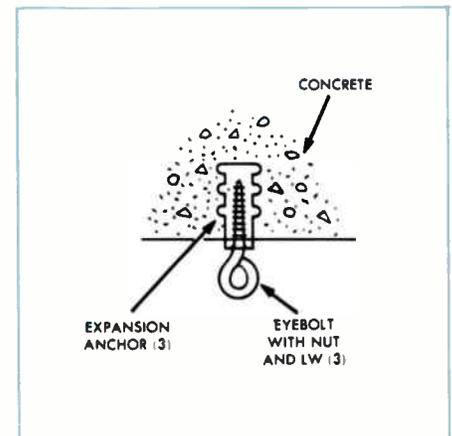
MI-27704



## "I" BEAM MOUNTING KIT

Special hanger for attaching Hanger and Fastener Kit to "I" beam. Consists of three clamps, eye bolts and hardware for three supporting points.

MI-27705



## CONCRETE MOUNTING KIT

For attaching Hanger and Fastener Kit to concrete wall or ceiling. Consists of eye bolts and expansion anchors for three supporting points.

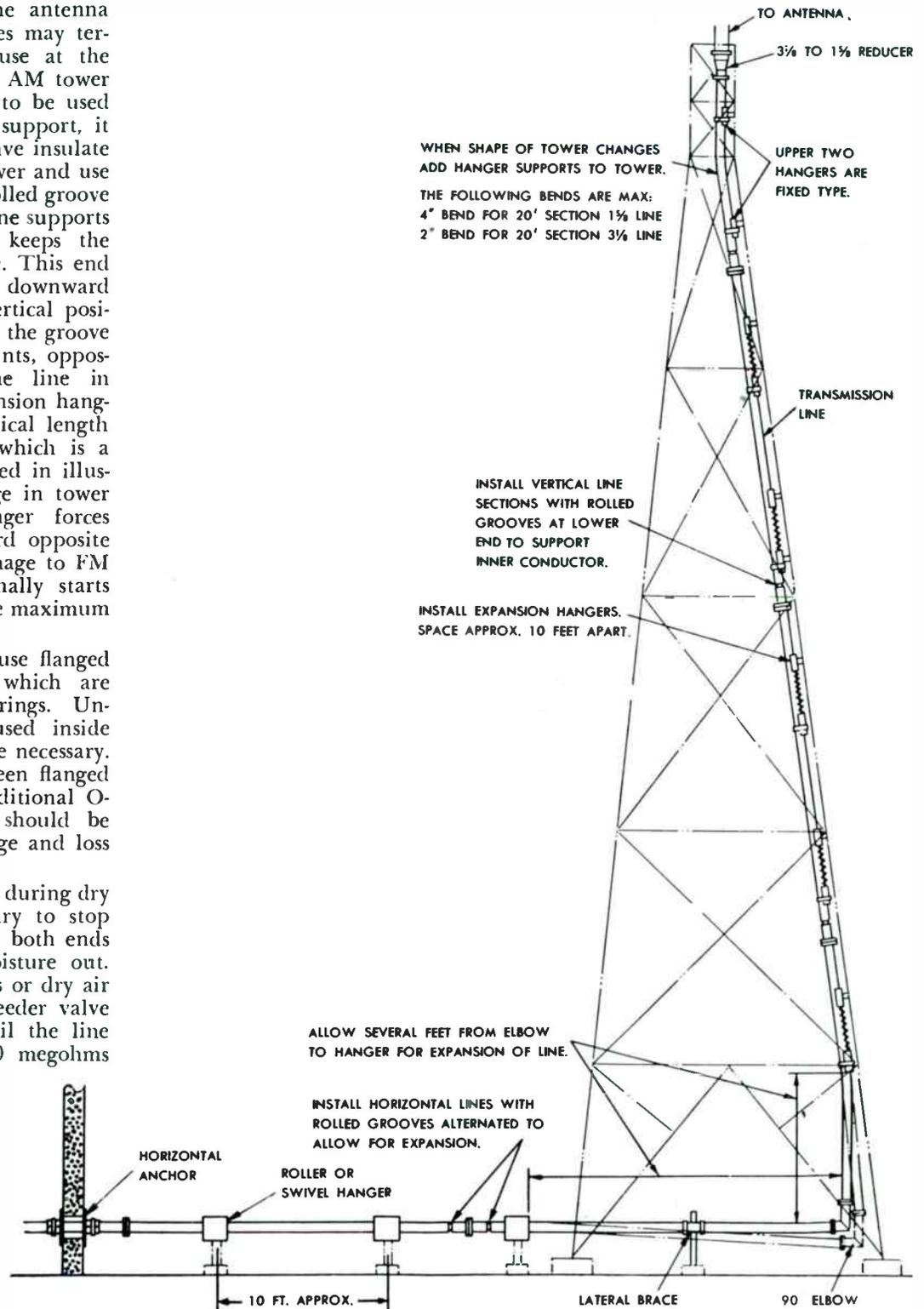
MI-27706

# Layout and Installation of Rigid Transmission Line

A dimensioned layout of the entire transmission line run is helpful in ordering line and fittings. FM lines usually require a horizontal run from the transmitter, and a vertical run up the tower to the antenna feed line; while AM lines may terminate in a tuning house at the base of the tower. If the AM tower is base insulated and is to be used also as an FM antenna support, it is necessary to quarter-wave insulate the FM line from the tower and use insulated hangers. The rolled groove at one end of the RCA line supports the end insulator and keeps the inner conductor in place. This end should always be placed downward when the line is in a vertical position. For horizontal runs, the groove is placed at alternate joints, opposing grooves locking the line in position. Note that expansion hangers are used for the vertical length except the top hanger which is a fixed hanger (two are used in illustration because of change in tower shape). The fixed hanger forces thermal expansion toward opposite end of line to avoid damage to FM antenna. Assembly normally starts from this hanger. Observe maximum line bending radii.

Outdoor runs should use flanged type line and fittings which are pressure sealed by O-rings. Unflanged lines may be used inside where gassing may not be necessary. Gas stops are used between flanged and unflanged lines. Additional O-rings and flange bolts should be ordered to replace damage and loss during installation.

Make installations only during dry weather. If it is necessary to stop work, use cover plates at both ends of the line to keep moisture out. When completed, dry gas or dry air is applied through a bleeder valve at the antenna end until the line shows a resistance of 80 megohms or more.



## Dehydrators For Coaxial Line, MI-563170 Series

The MI-563170-1/2/3 Dehydrator is designed to maintain transmission lines feeding broadcast antennas free of moisture. Each model provides a continuous supply of dry air at the rate of one standard cubic foot per minute. The Dew Point, or temperature at which moisture will condense out of the delivered air, is less than  $-40$  degrees Fahrenheit when referred to a standard atmosphere.

All units will deliver their maximum

SCF capacity continuously for normal operation. During initial charging of cable systems or during emergency periods, the units are capable of delivering more than the specified SCFD. Operation is fully automatic. Only three connections are necessary for simple installation.

The complete Dehydrator system with alarm facilities is housed in a single cabinet which occupies a minimum of floor space.



MI-563170-1



MI-563170-3



MI-563170-2

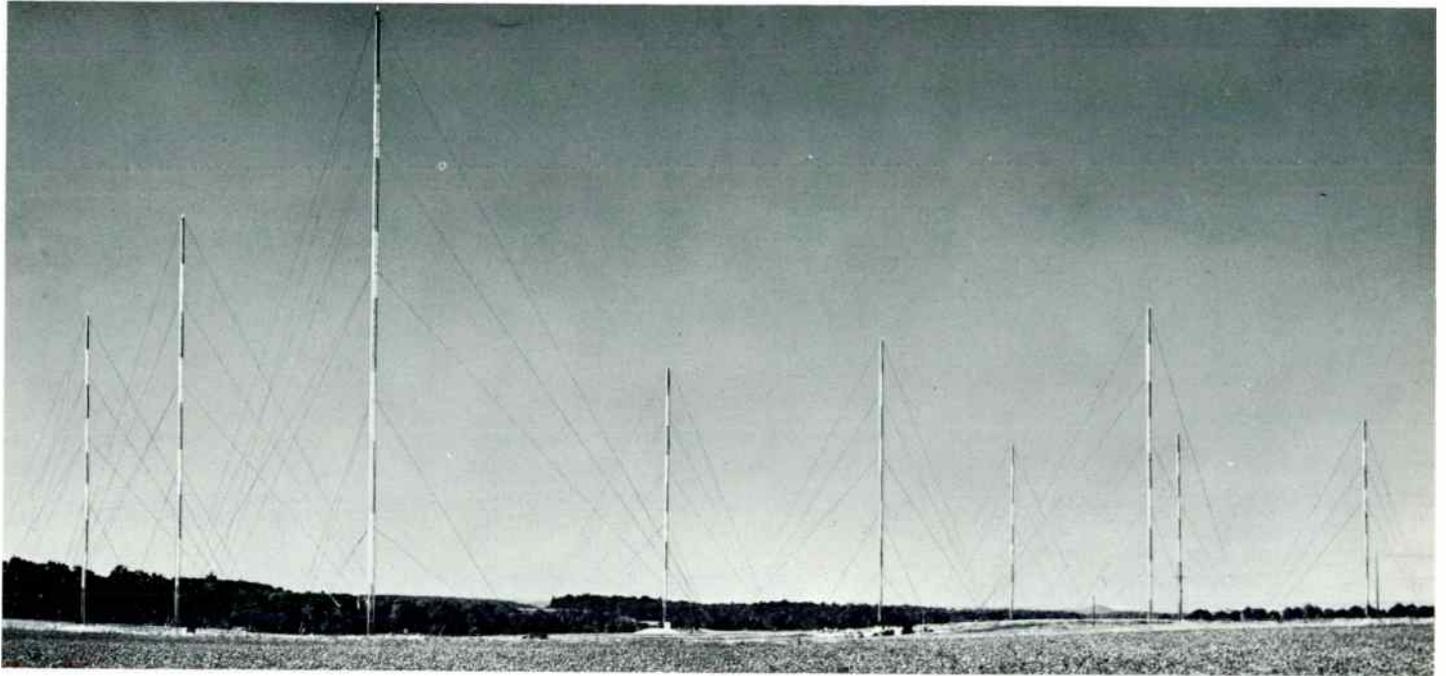
## Specifications and Ordering Information

Ordering Information	MI-563170-1	MI-563170-2	MI-563170-3
<b>Output:</b>			
Flow Rate .....	1 SCFM	2 SCFM	3 SCFM
Dew Point .....	$-40^{\circ}\text{F}$	$-40^{\circ}\text{F}$	$-40^{\circ}\text{F}$
Pressure (Adjustable) .....	1-15 lbf/in <sup>2</sup>	1-15 lbf/in <sup>2</sup>	1-15 lbf/in <sup>2</sup>
<b>Input:</b>			
Max. Temperature .....	125°F	125°F	125°F
Humidity .....	100%	100%	100%
Internal Operating Pressure ....	55-70	55-70	55-70
Motor Size .....	½ hp	¾ hp	1½ hp
Electrical Requirements .....	115 Volts, single phase, 60 Hz, 50 Hz*	115 Volts, single phase, 60 Hz, 50 Hz*	115 Volts, single phase, 60 Hz, 50 Hz*
<b>Line Capacity</b> .....			
	10,000 ft. 1½" line	40,000 ft. 1½" line	
	2,500 ft. 3½" line	10,000 ft. 3½" line	
	700 ft. 6½" line	3,000 ft. 6½" line	
		1,000 ft. 9¾" line	
<b>Dimensions:</b>			
Height .....	20" (51 cm)	28" (71 cm)	42" (107 cm)
Width .....	22" (56 cm)	22" (56 cm)	22" (56 cm)
Depth .....	15" (38 cm)	15" (38 cm)	18" (46 cm)
Weight .....	95 lbs. (43 kg.)	117 lbs. (53 kg.)	200 lbs. (91 kg.)

\* Available on special order. Requires 50 Hz motor.

### Accessory

Single Line Gassing Accessory Kit .....MI-19315-20



- Wide selection of AM or FM Antenna Towers
- Self-supporting or guyed types of standard or custom-made designs
- Complete line of tower accessories

## AM-FM Antenna Towers

### Description

RCA is well-qualified to assist in the planning and selection of proper AM towers and of a qualified erector to complete the installation. A wide selection is available for all AM and FM applications . . . including standard self-supporting, guyed, and custom designs.

#### Guyed Towers

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 about 80 percent the tower height.

#### Self-Supporting Towers

Self-supporting towers are especially advantageous in city and con-

gested districts where land is expensive. For estimating required space for a self-supporting tower, the distance between tower legs can normally be considered as 10 percent the height of the structure.

#### 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-pound loading. This means that the tower members are designed to resist a horizontal wind pressure of 30 pounds per square foot of projected area on all flat surfaces and 20 pounds on round surfaces. This is the equivalent of an actual wind velocity of 86.6 miles per hour. Towers with higher wind load ratings are, of course, available. Towers are designed in accordance with EIA specifications RS-222.

#### Tower Accessory Equipment

A number of accessories to complete various AM and FM broadcast towers are available. Most of them are fully described in specialized catalogs for these products. They include: FM antennas; FM transmission line, hangers and dehydrators; FM/AM isolation unit; material for ground systems; AM transmission line and hangers; antenna tuners; AM phasing systems (including power dividing networks, phase sampling loops, phase sampling lines and isolation coils); and tower lighting equipment (including tower lighting kits and photo electric control, lighting chokes and air core lighting transformers).

#### FM Antenna Equipment

RCA has a complete line of FM antennas and accessories; both horizontally and vertically polarized antennas are available. Coaxial transmission line which may be either

of the rigid or flexible type is used to conduct power from the transmitter to the antenna. Lines which use air as a dielectric will require pressurization using nitrogen or dry air to prevent condensation from accumulating inside the line. Various sized dehydrators and specialized hardware are available.

If the tower upon which the antenna is mounted is an insulated AM radiator, some means of isolating the effect of grounded transmission line where it crosses the base insulator must be provided. Using insulated hangers, a quarter wave balun at the AM frequency may be constructed or, under some circumstances, a Type BAF-14A FM/AM isolation unit, may be used.

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.

### Material for Ground Systems

In order to obtain reasonable radiation efficiency and, in the case of directional arrays, to stabilize the radiation pattern a system of buried radial copper wires extending outward from the tower base must be installed. RCA can supply the wire, copper strap, and ground mats required to meet the consultant's ground system specifications. Ground system installation may be included with the tower contract.

### Antenna Tuners

In most cases the impedance of the transmission line and the base impedance of the tower are not alike and it is necessary to install

an antenna tuner at the base of the tower to transform the antenna impedance to the transmission line impedance. RCA markets a standard group of antenna tuners for low and medium power use. In the higher power range antenna tuning units are custom built.

### AM Phasing Equipment

Multiple tower AM arrays are used to achieve specific horizontal and vertical radiation patterns as required by allocation or economic factors related to coverage. Varying amounts of power at various phase angles are fed to the various towers. RCA is in a position to supply all of the elements of phasing, power dividing, and antenna tuning units.

#### 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 .....

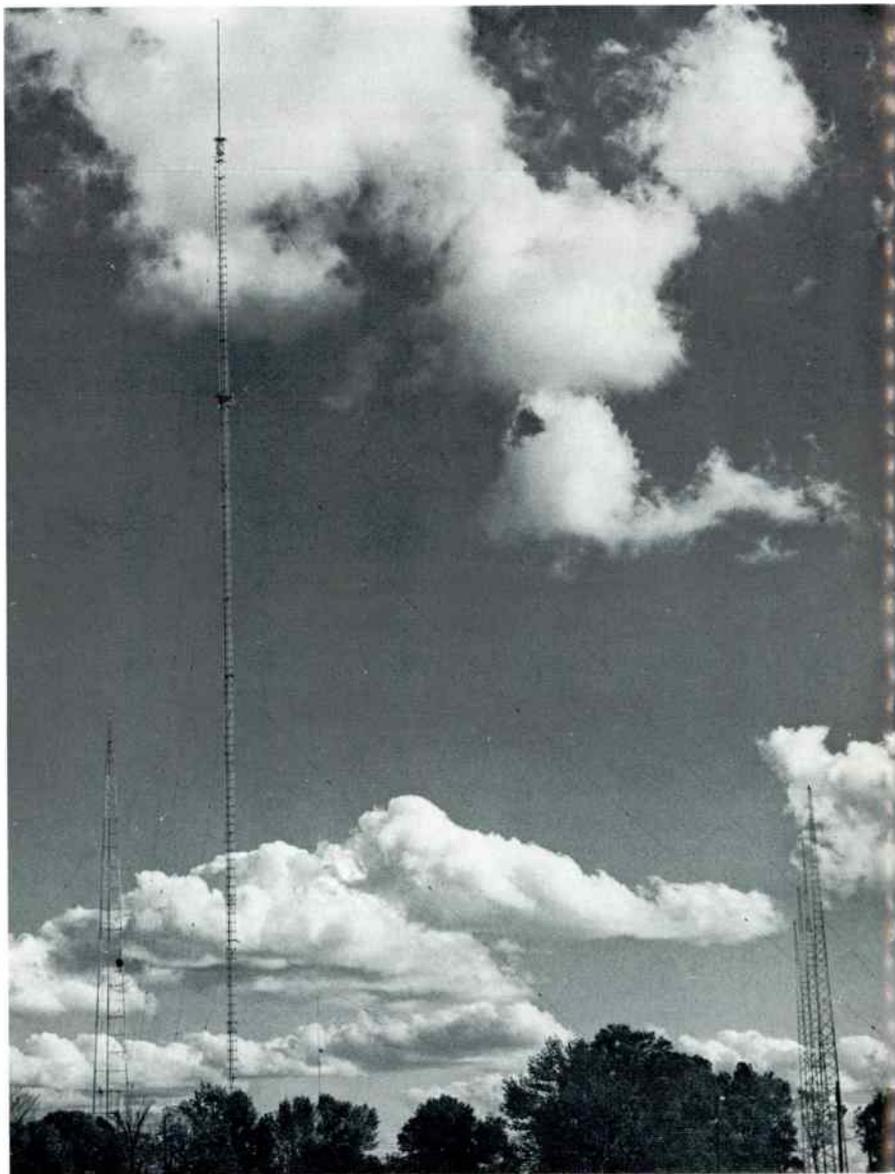
Description.....

Transmission Lines: Size ..... No. ....

Design Load .....Lbs. per square foot  
(Based on local weather conditions and relevant building codes.)

##### Remarks:

(Special requirements, site accessibility, etc.)



In these multi-tower arrays, methods for sampling the phase and amplitude of the RF voltage in each tower and conveying this sample to the phase measuring equipment located in the transmitter house are required. Accessory phase sampling loops, which are normally mounted on the individual towers, phase sampling lines to connect the loops to the measuring device, and means for isolating the grounded sampling lines where they cross the tower base insulator are also available.

### Antenna Feed Bus

The antenna tuning unit output should be connected to the tower by means of copper tubing which

is not normally supplied with the antenna or transmitting equipment. The tubing may be obtained from local sources and should be flattened and drilled at the ends so that it may be connected to the antenna tuning unit output feedthrough insulator and attached to the tower by bolt or brazing. At a point between the tower and the feedthrough 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 thus keeping lightning discharges from damaging the radio equipment.

### Tower Lighting

The configuration of tower lights and the lighting equipment must conform to applicable government specifications. The AC power required to operate the lights may be conducted on wires which are buried in the ground or carried on the same poles which carry the transmission line from the transmitter house to the antenna tuning unit. The AC power lines will have to be isolated from the RF power where they cross the base insulator. This isolation can be provided either through the use of an antenna lighting choke and appropriate bypass condensers or by the use of an air core lighting transformer.

WIND VELOCITY AND CORRESPONDING WIND PRESSURE ON TOWERS—EIA STANDARD SPECIFICATION

Actual Wind Velocity MPH	Wind Pressure on Flat Surfaces $P = .004 V^2$	Wind Pressure on Round Surfaces	Estimated Survival Velocities F. S. 1.65
10	.4	.266	12.9
20	1.6	1.067	25.8
30	3.6	2.4	38.6
40	6.4	4.27	51.5
50	10.0	6.67	64.4
60	14.4	9.6	77.3
70.7	20.0	13.33	91.1
80	25.6	17.1	103.0
86.6	30.0	20.0	111.5
90	32.4	21.6	115.9
100	40.0	26.7	128.8
110	48.4	32.3	141.7
111.8	50.0	33.3	144.0
120	57.6	38.5	154.6
122.5	60.0	40.0	157.8
130	67.6	45.0	167.4
132.3	70.0	46.67	170.4
140	78.4	52.33	180.3
141.4	80.0	53.33	182.1
150	90.0	60.0	193.2
160	102.2	68.2	206.1
170	115.6	77.0	219.0
180	129.6	86.6	231.8
190	144.4	96.3	244.7
200	160.0	106.66	257.6

At left—WSBT-AM/FM/TV's antenna farm showing first WSBT-TV television tower and new high-rise guyed TV tower for increased power. At the far right are the four towers used in the WSBT-AM sectional array.

## Ordering Information

### Tower Accessories

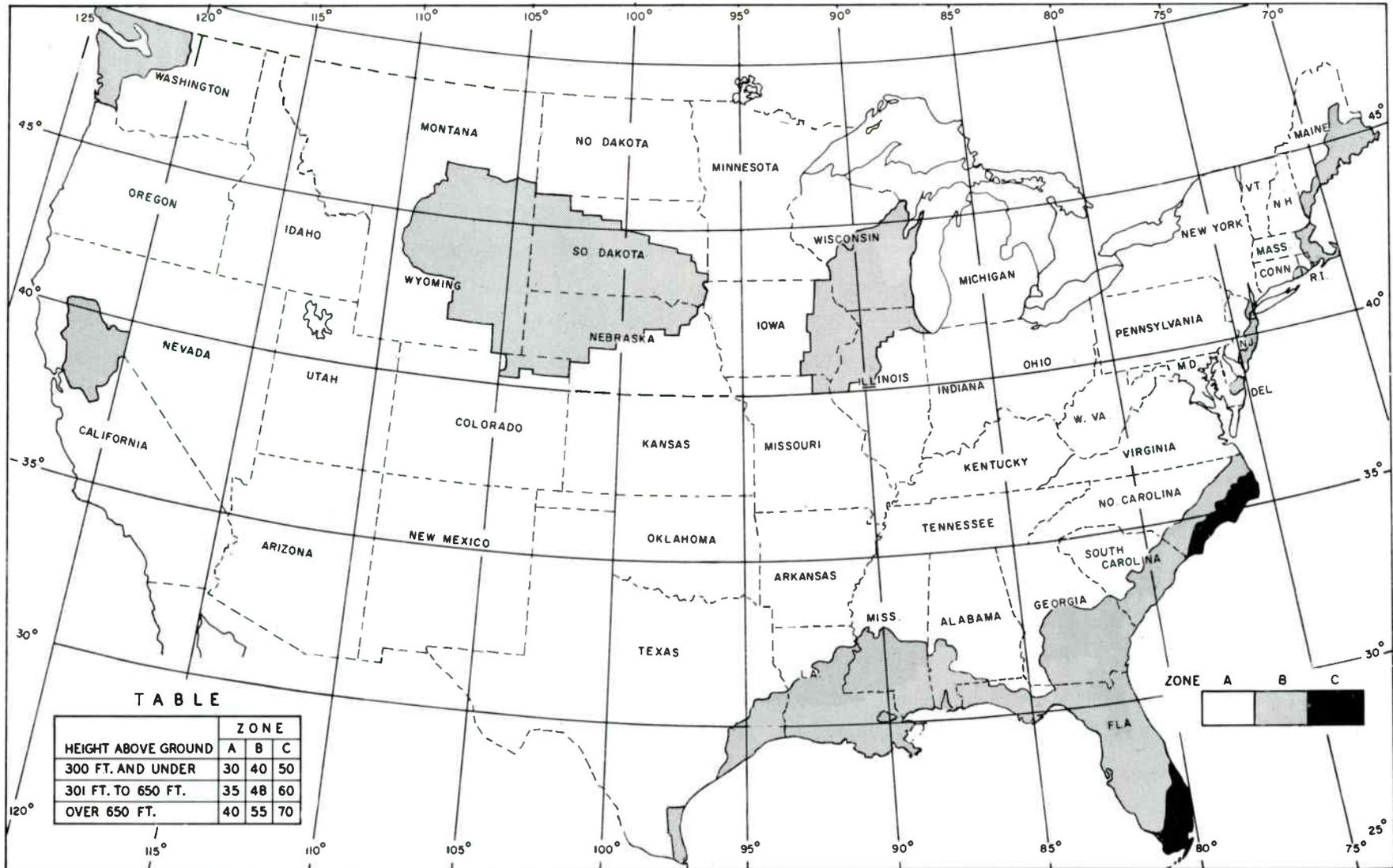
8 ft. by 24 ft. Section Expanded Copper Ground Screen .....	MI-27765
No. 10 Copper Wire.....	MI-28405-8
3" by .020 Ground Strap.....	MI-28405-A4
Double RF Antenna Lighting Choke.....	MI-7112-C
Triple RF Antenna Lighting Choke .....	MI-27726-A
Capacitor for Lighting Chokes.....	MI-27728-1
Weatherproof Housing .....	MI-27741
1750 Watt Hughey and Phillips Transformer.....	MI-28215-A1
3500 Watt Hughey and Phillips Transformer.....	MI-28215-A2
3000 Watt Fisher Pierce Photo-Cell	
6000 Watt Fisher Pierce Photo-Cell	
Fisher Pierce Light Control Relays .....	251-A
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	A-4

(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.)

For other Antenna Accessories See appropriate RCA Catalogs.

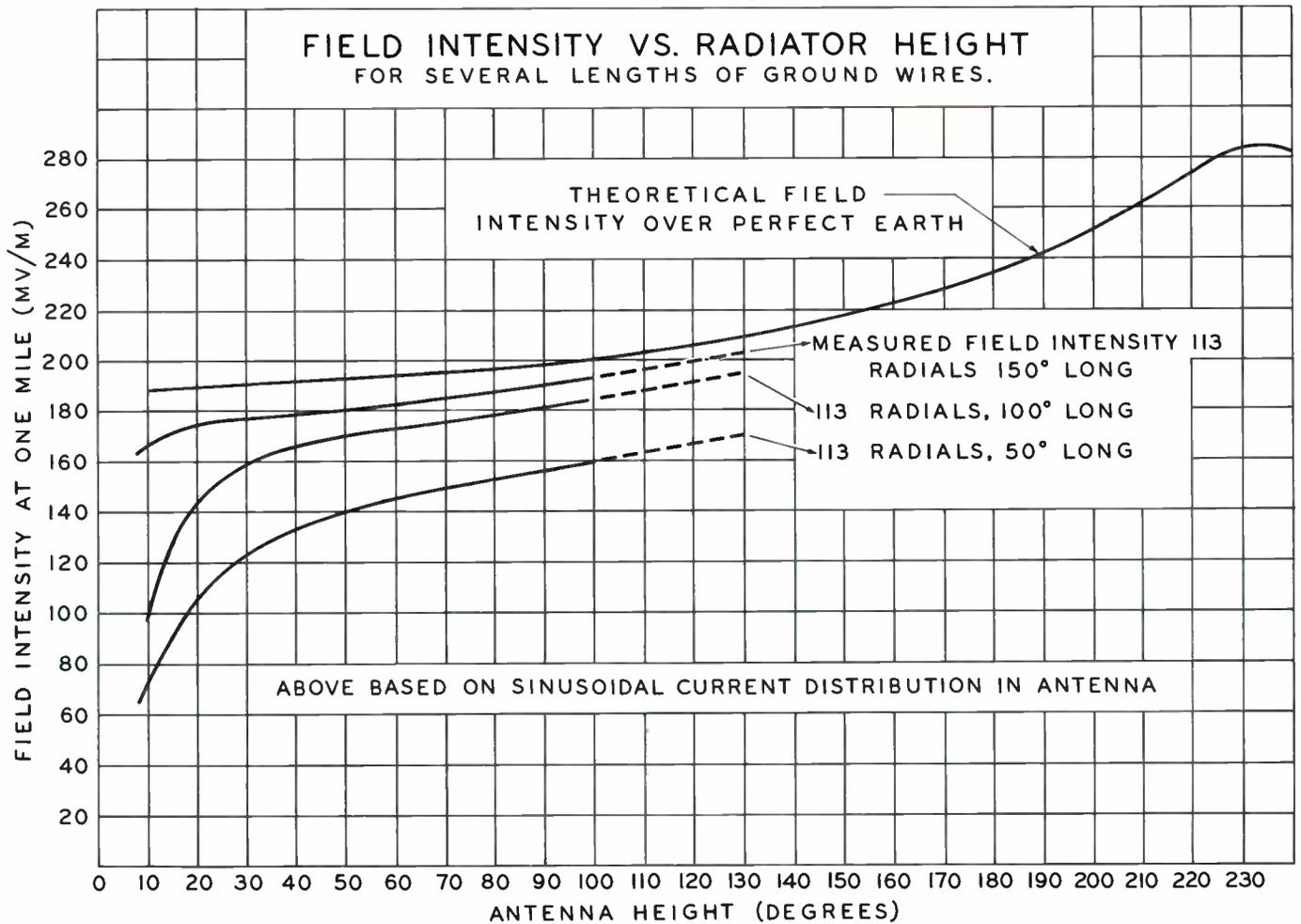
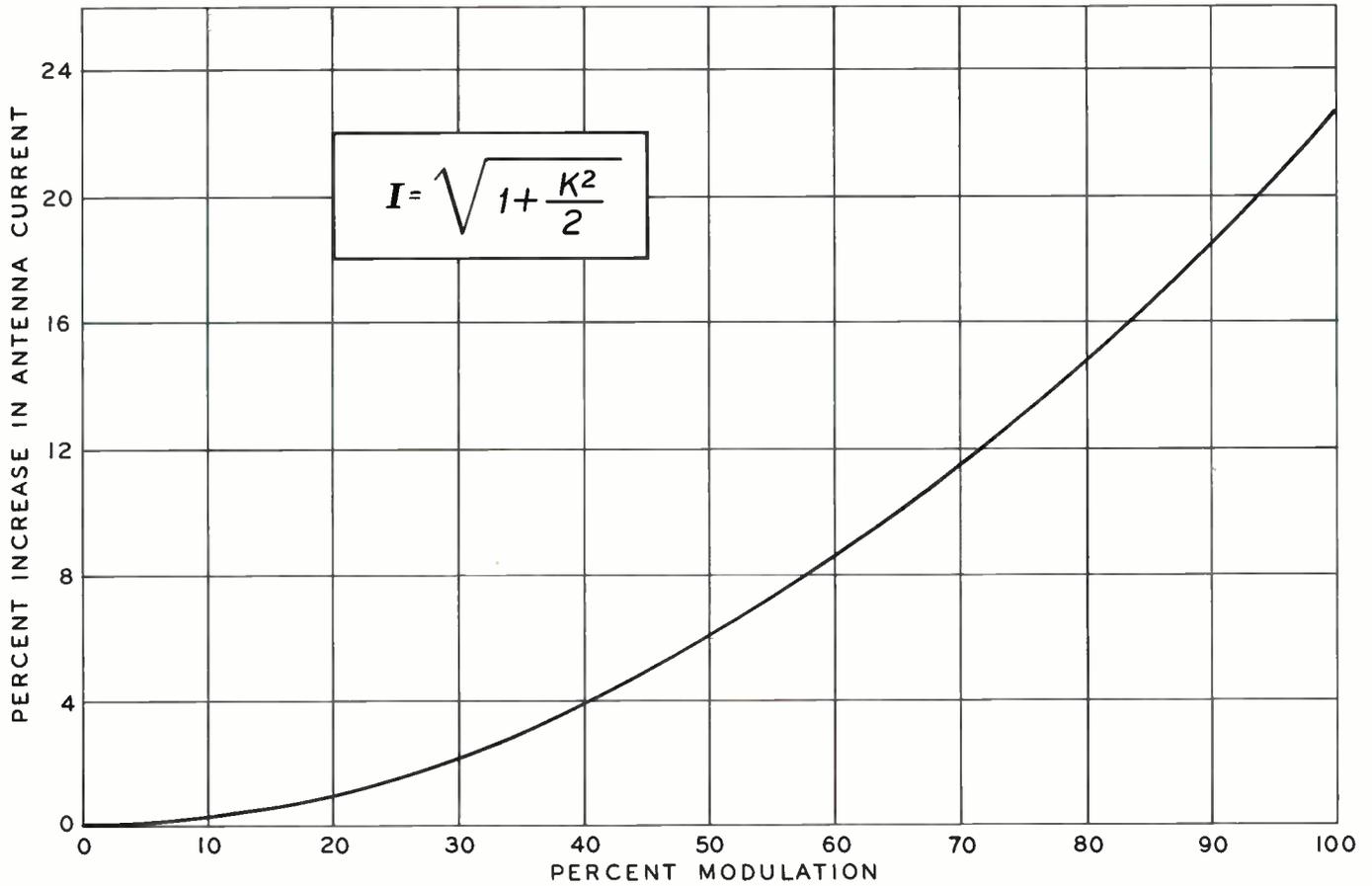


The above map and table, extracted from EIA Standard RS-222, gives minimum windload design pressures in pounds per square foot on flat surfaces with no ice for the zones indicated. This map, as well as the table, must be interpreted in view of local knowledge and applicable building codes. See Table 1 of RS-222 for zone boundaries listed by state and county.

# FOOTAGE TABLE FOR BROADCAST TOWER HEIGHTS

550 kHz TO 1070 kHz					1080 kHz TO 1600 kHz				
kHz	METERS	1 WAVE	½ WAVE	¼ WAVE	kHz	METERS	1 WAVE	½ WAVE	¼ WAVE
550	545	1787.6	893.8	446.8	1080	277.8	911.1	455.5	227.7
560	536	1758.0	879.0	439.5	1090	275.2	902.6	451.3	225.6
570	526	1725.3	862.6	431.3	1100	272.7	894.4	447.2	223.6
580	517	1695.7	847.8	423.9	1110	270.3	886.5	443.2	221.6
590	509	1669.5	834.7	417.3	1120	267.9	879.0	439.5	219.7
600	500	1640.0	820.0	410.0	1130	265.5	870.8	435.4	217.7
610	492	1612.7	806.3	403.1	1140	263.2	862.6	431.3	215.6
620	484	1587.5	799.7	396.8	1150	260.9	855.7	427.8	213.9
630	476	1561.2	780.6	390.3	1160	258.6	847.8	423.9	211.9
640	469	1546.3	773.1	386.5	1170	256.4	840.9	420.4	210.2
650	462	1515.3	757.6	378.8	1180	254.2	834.7	417.3	208.6
660	455	1492.4	746.2	373.1	1190	252.1	826.8	413.4	206.7
670	448	1469.4	734.7	367.3	1200	250.0	820.0	410.0	205.0
680	441	1446.4	723.2	361.1	1210	247.9	813.1	406.5	203.2
690	435	1426.8	713.4	356.2	1220	245.9	806.3	403.1	201.5
700	429	1407.1	703.5	351.2	1230	243.9	799.1	399.5	199.7
710	423	1387.4	693.7	346.8	1240	241.9	793.7	396.8	198.4
720	417	1367.7	683.8	341.9	1250	240.0	787.2	393.6	196.8
730	411	1348.0	674.0	337.0	1260	238.1	780.9	390.4	195.2
740	405	1328.4	664.2	332.1	1270	236.2	774.7	387.3	193.6
750	400	1312.0	656.0	328.0	1280	234.4	768.8	384.4	192.2
760	395	1295.6	647.8	323.4	1290	232.6	762.9	381.4	190.7
770	390	1279.2	639.6	319.8	1300	230.8	757.0	378.5	189.2
780	385	1262.8	631.4	315.7	1310	229.0	751.1	375.5	187.7
790	380	1246.4	623.2	311.6	1320	227.3	746.2	373.1	186.5
800	375	1230.0	615.0	307.5	1330	225.6	739.9	369.9	184.9
810	370	1213.6	606.8	303.4	1340	223.9	734.7	367.3	183.6
820	366	1200.4	600.2	300.1	1350	222.2	728.8	364.4	182.2
830	361	1184.0	592.0	296.0	1360	220.6	723.2	361.1	180.5
840	357	1170.9	585.4	292.7	1370	219.0	718.3	359.1	179.5
850	353	1157.8	578.9	289.4	1380	217.4	713.4	356.2	178.1
860	349	1144.7	572.3	286.1	1390	215.8	707.8	353.1	176.5
870	345	1131.6	565.8	282.9	1400	214.3	703.5	351.2	175.6
880	341	1118.4	559.2	279.6	1410	212.8	696.9	348.4	174.2
890	337	1105.3	552.6	276.3	1420	211.3	693.7	346.8	173.4
900	333	1092.2	546.1	273.0	1430	209.8	688.1	344.0	172.0
910	330	1082.4	541.2	270.6	1440	208.3	683.8	341.9	170.9
920	326	1069.2	534.6	267.3	1450	206.9	678.6	339.3	169.6
930	323	1059.4	529.7	264.8	1460	205.5	674.0	337.0	168.5
940	319	1046.3	523.1	261.5	1470	204.1	669.4	334.7	167.3
950	316	1036.4	518.2	259.1	1480	202.7	664.2	332.1	166.5
960	313	1026.6	513.3	256.6	1490	201.3	660.2	330.1	165.0
970	309	1013.5	506.7	253.3	1500	200.0	656.0	328.0	164.0
980	306	1003.6	501.8	250.9	1510	198.7	651.7	325.8	162.9
990	303	993.8	496.9	248.4	1520	197.4	647.8	323.4	161.7
1000	300	984.0	492.0	246.0	1530	196.1	643.2	321.6	160.8
1010	297	974.1	487.5	243.7	1540	194.8	639.6	319.8	159.9
1020	294.1	964.6	482.3	241.1	1550	193.5	634.6	317.3	158.6
1030	291.3	955.3	477.6	238.8	1560	192.3	631.4	315.7	157.8
1040	288.5	946.2	473.1	236.5	1570	191.1	626.8	313.4	156.7
1050	285.7	937.1	468.5	234.2	1580	189.9	623.2	311.6	155.8
1060	283.0	928.2	464.1	232.0	1590	188.7	618.9	309.4	154.7
1070	280.4	919.7	459.8	229.9	1600	187.5	615.0	307.5	153.7

# RELATION BETWEEN ANTENNA CURRENT AND MODULATION





BTA-1R2 Transmitter with matching left-wing phasing cabinet.

- 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

## AM Antenna Phasing Equipment

### Description

RCA Phasing and Branching Equipment is custom-built to provide precise coverage patterns to fully meet the requirements of the FCC. This “custom” equipment is designed to assure “tailored” patterns for optimum day and night coverage. 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.

Where required, front-panel-controlled rotary coils provide independent current amplitude control for each antenna, affording maxi-

mum 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.

Equipment is available in a wide variety of arrangements. These custom equipments may be housed in one or more of the RCA stylized cabinets or may be installed on open panel type construction. 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 to match the color scheme of RCA broadcast transmitters. The cabinet provides a matched wing for housing the phasing equipment when used with the RCA 1R2 or 5T, 5U/10U 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 the cabinet requirement chart will prove helpful. Each cabinet measures 84-inches high, 34-inches wide, and 33-inches deep.

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.

### Line Terminating Equipment

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 ratings are incorporated in a flexible design, permitting proper impedance transformation over a wide range of antenna impedances. RF pattern switching relays are provided with contacts to permit remote indication of their operation.

### CABINET REQUIREMENT CHART

	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)

Pattern switching is completely coordinated with the transmitter control circuit from a centralized switching operation. 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.

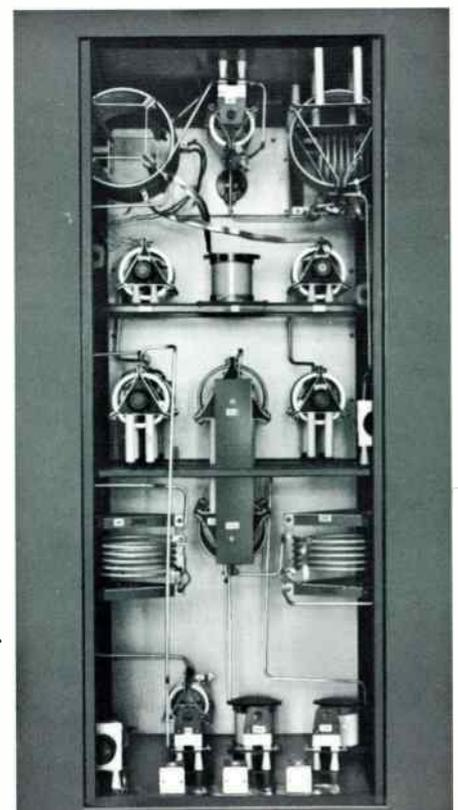
### Open-Type Wall Units

Open-type 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. Remote metering kits can also be included for convenient remote indication of the antenna current.

Line Terminating units for transmitters up to 50 kW are available from RCA on a custom basis or as a complete kit of components for assembly by the radio station. Components include feed-through, bowl insulators, 6-inch RF 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. 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.

1-KW, 5-KW  
and 10-KW  
AM Phasing  
and Branching  
Equipment

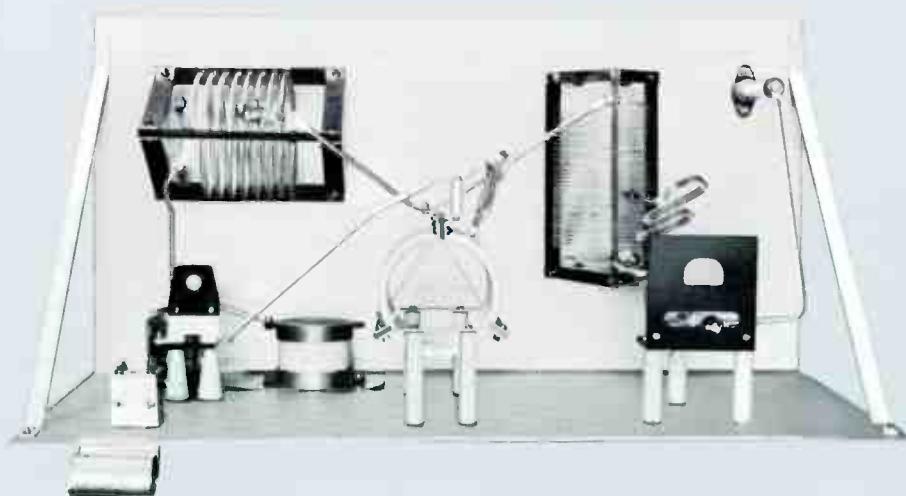
Custom Phasing Cabinet.



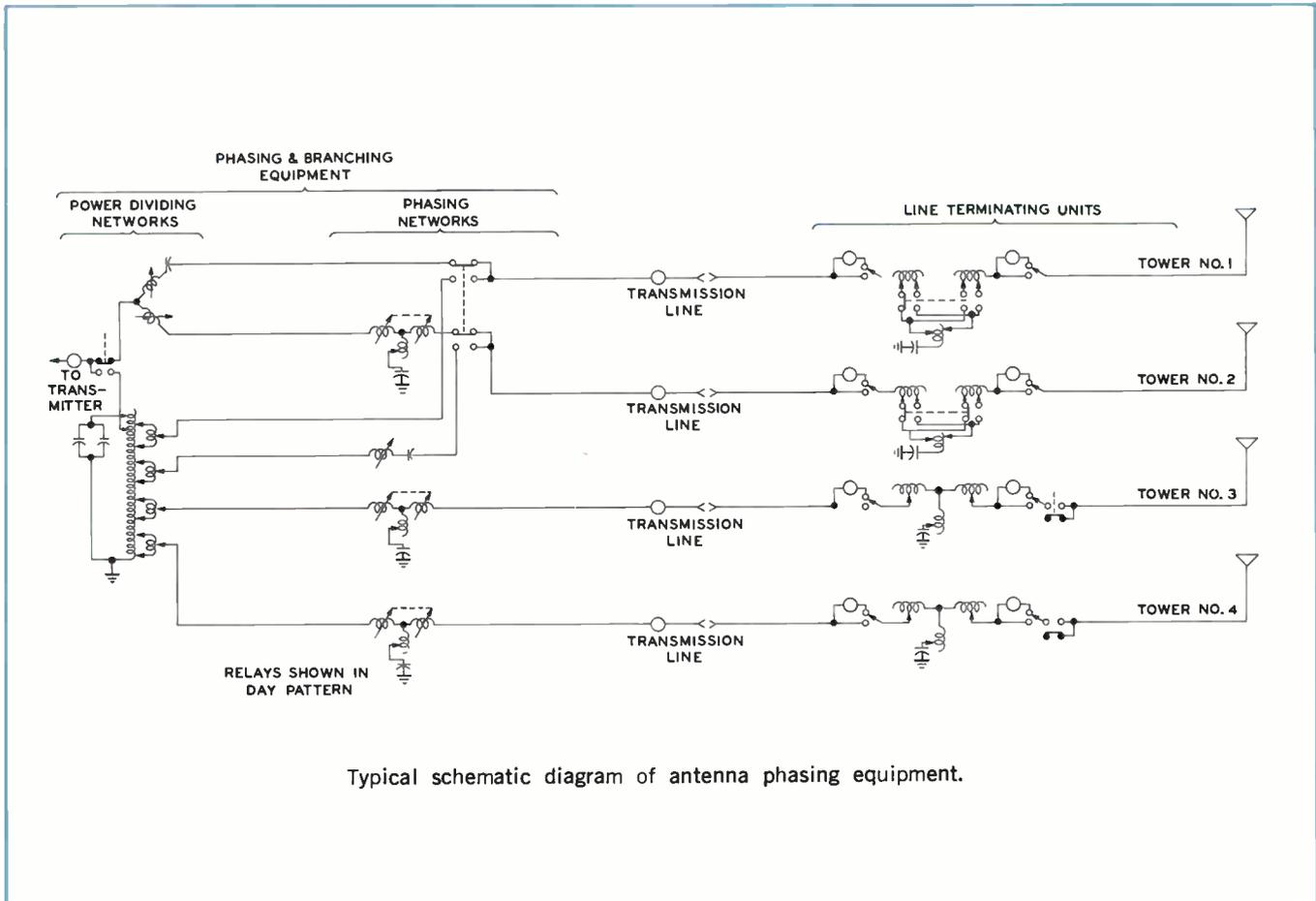
1-KW, 5-KW  
and 10-KW  
Line  
Terminating  
Equipment



Line Terminating Unit installed in weatherproof cabinet.



Line Terminating Unit  
installed on open panel.



### 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 daytime operation or different pattern night and day).
- (f) Type of cabinet desired (5/10 kW equipment).
- (g) Type antenna current sampling system desired.

### AM Phasing Accessories

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 MHz at 25 amp.) .....MI-27755-1

DPDT RF Contactors  
 (for use up to 17 kV at 2 MHz at 25 amp.) .....MI-27755-2  
 SPDT RF Contactors  
 (for use up to 22 kV at 2 MHz at 25 amp.) .....MI-27755-3  
 DPDT RF Contactors  
 (for use up to 22 kV at 2 MHz at 25 amp.) .....MI-27755-4



- Custom-built arrangements available for any requirement
- Make-before-break switches avoid damage to antenna ammeter from static discharges
- Optional remote metering provisions

## AM Antenna Tuning Units

### Description

The RCA Type BPA Series of Antenna Tuning Units serve to provide an impedance match at broadcast frequencies between series fed vertical radiators and either coaxial or open wire transmission lines. They also aid in suppressing harmonics.

Four models of BPA-21 1-kW Antenna Tuning Units are available.

They differ only in the type of accessories, such as remote metering or tower lighting chokes provided with the units. Remote meter kits and tower lighting chokes can be added at any time to the basic MI-27767-A unit. An MI-27725 Antenna Tuning Unit, without provision for future addition of lighting chokes or remote meter is also available.

All models of the BPA-21 and the MI-27725 include an RF Antenna Ammeter. Tower height and frequency should be specified in the order to permit determination of the correct ammeter scale range. The antenna reactance and resistance should be specified if the antenna is other than a base fed vertical radiator of uniform cross section.

### Specifications

Frequency Range .....	*800 kHz to 1600 kHz
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)
Height .....	28 $\frac{1}{4}$ " (71.44 cm)
Width .....	22 $\frac{1}{8}$ " (56.20 cm)
Depth .....	16 $\frac{3}{4}$ " (42.55 cm)
Weight (net) .....	.65 lbs. (29.5 kg)

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

#### Accessories

Horn Gap .....	MI-27771
Insulator Bowl .....	MI-27798
Remote Meter Pick-up Unit .....	MI-28027-C
Double Winding RF Antenna Lighting Choke Coil with 2 Capacitors .....	ES-27241

Triple Winding RF Antenna Lighting Choke Coil with 4 Capacitors .....	ES-27242
Double Winding RF Antenna Lighting Choke Coil with 2 Capacitors and Weatherproof Housing .....	ES-27243
Triple Winding RF Antenna Lighting Choke Coil with 4 Capacitors and Weatherproof Housing .....	ES-27244
Ammeter .....	**MI-7147
Remote Indicating Ammeter for 3-inch Case .....	**MI-28037-B
Remote Indicating Ammeter for 4-inch Case .....	**MI-28037
Remote Indicating Ammeter for 4-inch RCA Case .....	**MI-27644

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

### Ordering Information

Type BPA-21A Antenna Tuning Unit .....	MI-27767-A
Type BPA-21B Antenna Tuning Unit with Remote Metering .....	MI-27767-B
Type BPA-21C Antenna Tuning Unit with Remote Metering and Two-Wire Lighting Choke .....	MI-27767-C
Type BPA-21D Antenna Tuning Unit with Remote Metering and Three-Wire Tower Lighting Choke .....	MI-27767-D
250/1000 Watt Antenna Tuning Unit less Remote Meter Kit and Remote Meter .....	MI-27725

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

## Description

The BPA-5A (5 kW) and BPA-10A (10 kW) Antenna Tuning Units serve the double purpose of matching antennas to either coaxial or open-wire transmission lines and of suppressing 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. Rear flanges are 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 RF Pickup Unit, MI-28027-C, for the BPA-10A; or MI-27966-B for the BPA-5A, 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-27724 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 RF Antenna Lighting Choke Coils, if desired.

The units are custom built to meet customer requirements. When ordering specify:

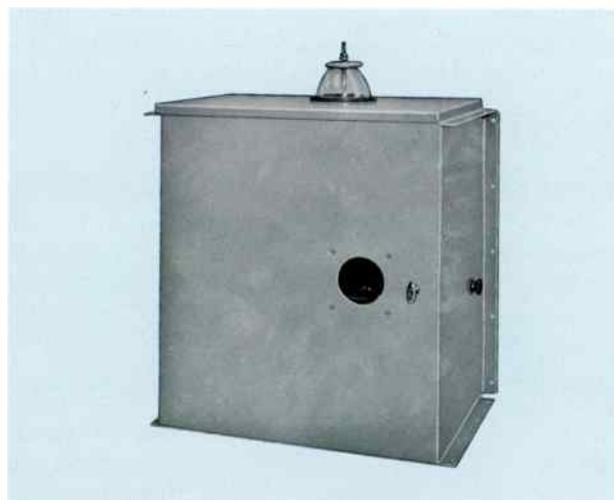
- (1) Transmitter carrier power.
- (2) Transmitter frequency.
- (3) Transmission line impedance.
- (4) Tower type and height, or if the antenna to be used is other than a base-fed vertical radiator of uniform cross section, the antenna resistance and reactance.

## Specifications

Frequency Range .....	540 kHz to 1700 kHz
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
	(104.14 cm, 86.36 cm, 58.42 cm)
Weight (net) .....	330 lbs. (149.7 kg.)

### Accessories

Insulator Bowl, complete with fittings, 10¼" solid stud and shield .....	MI-27723
Insulator Bowl, complete with fittings, hollow stud and shield .....	MI-27724
50 kW Remote RF Pick-up Unit (less meter) .....	MI-28027-C
5 kW Remote RF Pick-up Unit (less meter) .....	MI-27966-B
Remote Indicating Ammeter, 4-inch Case, Black Scale .....	MI-28037
Remote Indicating Ammeter, 3-inch Case, Black Scale .....	MI-28037-B



Double Winding RF Antenna Lighting Choke Coil with 2 capacitors .....	ES-27241
Triple Winding RF Antenna Lighting Choke Coil with 4 capacitors .....	ES-27242

## Ordering Information

BPA-5A .....	MI-27789-A
BPA-10A .....	MI-27790-A



Type C0019  
Sampling Loop.

- Sampling loops and isolation coils
- Isolation filters
- AM dummy loads
- Remote antenna ammeters
- Bowl insulators

## AM Antenna Accessories

### PHASE SAMPLING LOOPS

Phase Sampling Loops provide a method of obtaining a voltage (proportional to antenna current) for the operation of the current sampling meter and phase monitor. The current sampling meters and phase monitors are normally mounted adjacent to the transmitter, and connection between the phase sampling loop and the meter is made with a small diameter coaxial cable. The outer conductor of the coaxial cable is grounded, and some provision must be made to isolate this ground where the sampling cable crosses the tower base insulator.

As indicated below, RCA offers a wide range of phase sampling loops.

#### Shielded, Rotatable, Insulated Sampling Loops

The type C0019 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. 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 enters the loop through the bottom pivot shaft. Universal brackets permit mounting on any tower leg.

#### Unshielded, Grounded, Fixed Loops

The 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.

#### Unshielded, Insulated, Rotatable Loops

The 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 41½ inches wide.

#### Isolation Inductor

The Isolation Coil 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 pick-up loop is bonded to the tower.

Isolation Inductors consist of helical winding of coaxial cable.

## Ordering Information

Type C0019 Shielded, Rotatable, Insulated Sampling Loop for use with RG Cable .....MI-561522

Type 173-11-1 Unshielded, Grounded Sampling Loop for use with RG Cable .....MI-27730

Type 173-11-2 Unshielded, Insulated Sampling Loop for use with RG Cable .....MI-27731

The inductors can be provided with panel wall mounts or on special order in weatherproof housings.

### Bowl Insulators

For transmitter carrier powers up to and including 50 kW. Bowl Insulator assemblies are ideal for taking RF leads into or out of antenna tuner or phasing equipment. The bowls of heavy electrical glass measure have a maximum diameter of  $6\frac{1}{8}$  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.

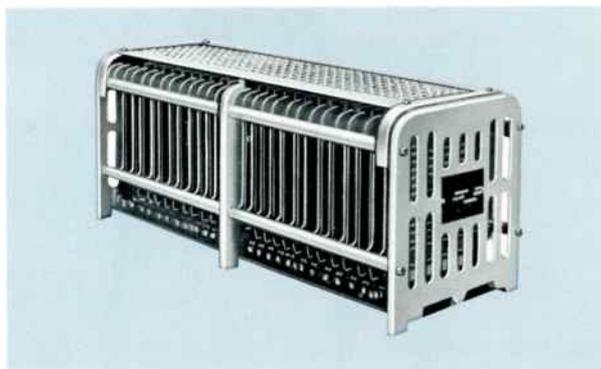
The same bowl insulator is available with a hollow stud, for use where it is necessary to carry power lighting wires out of the tuner house on the same insulator which carries the RF conductor.

### Ohm-Spun Dummy Loads

Ohm-spun Resistance Loads are used with AM Broadcast Transmitters where a relatively non-inductive resistance is essential.

The Ohm-Spun Loads are made in different power handling capacities to fit individual requirements. The loads listed are supplied by RCA at any impedance specified by the customer.

Ohm-Spun Dummy Load.



### Compensating Networks

Networks which can be adjusted to compensate for the small reactance of Ohm-spun Type WG Resistance Loads are available. These networks consist of a fixed tapped inductor on which is mounted a fixed mica capacitor. When mounted in close proximity to the load the inductor can be adjusted by means of an RF bridge to "tune out" the load inductance.

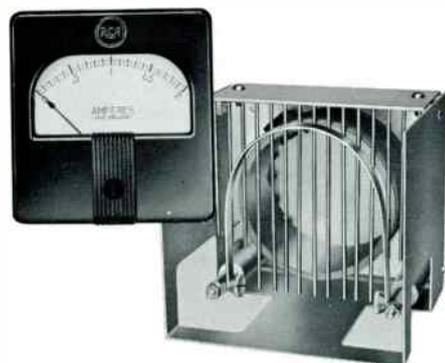
### 50 kW Water-Cooled Dummy Loads

Water-Cooled 50 kW wire-wound 50 or 230 Ohm Dummy Load resistor assemblies are available either separately or in combination with the equipment required for calorimetric power measurement.

The MI-27029 Resistor Assemblies include the resistor mounted

in a housing with water inlet and outlet connections for installation as required.

Complete 50 kW Dummy Loads include an MI-27029 Resistor assembly mounted on a metal panel in a perforated housing and fitted with either a bowl insulator or coaxial input connection as required. A flowmeter, thermometers, thermometer wells, copper tubing and fittings, valves and hose are supplied to be assembled by the customer in the form most desirable for his application. A water flow interlock in the flowmeter can be connected to the transmitter interlock circuitry for protection of the load. Dummy Loads for use at power levels up to 200 kW either with or without heat exchangers are available on special order.



### METERING KITS

RCA Remote Metering Kits provide a means of observing the antenna current at a remote location. It is also used with the Automatic Output Control to act as an RF to DC current transducer. The kits comprise a Remote RF Pickup Unit (temperature compensated) and a Remote Antenna Meter. Remote RF Pickup Unit, MI-28027-C, should be specified for metering of base cur-

rents up to 50-kW power, and MI-27966-B Pickup Unit for metering of base currents up to 5-kW power. The Antenna Meters are black face 3- or 4-inch units designed to match RCA transmitter meters. These meters have a 1 mA DC movement, and are available in various scale ranges to match the scale of the antenna ammeter. When ordering, specify desired meter scale.

## Specifications

### REMOTE METERING KIT

Dimensions .....7" high, 7 $\frac{3}{8}$ " wide, 5 $\frac{3}{8}$ " deep

#### Sensitivity:

1-30 Amperes .....At 1600 kHz  
3-30 Amperes .....At 540 kHz

### METER

Dimension .....3" and 4" rectangular case  
Scale Ranges .....0-2, 0-3, 0-5, 0-8, 0-10, 0-15, 0-20, 0-30 Amps.  
Sensitivity .....1 mA DC movement

## Ordering Information

### Remote RF Pickup Unit (less Meter):

For base currents to 50-kW power .....MI-28027-C  
For base currents to 5-kW power .....MI-27966-B

### Remote Antenna Current Meter:

3" Black Scale .....MI-28037-B  
4" Black Scale .....MI-28037  
4" Black Scale .....MI-27644  
4" Black Scale  
(for use with BTA-1R1, 5T, 5U/10U) .....MI-27644-A

## Ordering Information

### Isolation Inductors

Isolation Inductor RG8U 52 Ohms. Mates with UHF Plug .....	M125-RG8
Isolation Inductor RG11U 75 Ohms. Mates with UHF Plug .....	M125-RG11
Isolation Inductor 1/2" Foam Heliax 50 Ohms. Mates with UHF Plug .....	M135-FH4
Isolation Inductor 1/2" Foam Alum. Heliax 50 Ohms Mates with UHF Plug .....	M135-FLJ4
Isolation Inductor 1/2" Foamflex 50 Ohms. Mates with UHF Plug .....	M135-FX12-50
Isolation Inductor 1/2" Foamflex Jacketed 50 Ohms. Mates with UHF Plug .....	M135-FX12-50H
Isolation Inductor 1/2" Foamflex 70 Ohms. Mates with UHF Plug .....	M135-FX12-70
Isolation Inductor 1/2" Foamflex Jacketed 70 Ohms Mates with UHF Plug .....	M135-FX12-70H
Isolation Inductor 1/2" Styroflex 50 Ohms. Mates with UHF Plug .....	M135-ST12-50
Isolation Inductor 1/2" Styroflex Jacketed 50 Ohms. Mates with UHF Plug .....	M135-ST12-50H
Isolation Inductor 1/2" Styroflex 70 Ohms. Mates with UHF Plug .....	M135-ST12-70
Isolation Inductor 1/2" Styroflex Jacketed 70 Ohms. Mates with UHF Plug .....	M135-ST12-70H
Isolation Inductor 3/8" Foamflex 50 Ohms. Mates with UHF Plug .....	M150-FX38-50
Isolation Inductor 3/8" Foamflex Jacketed 50 Ohms. Mates with UHF Plug .....	M150-FX38-50H
Isolation Inductor 3/8" Foamflex 70 Ohms. Mates with UHF Plug .....	M150-FX38-70
Isolation Inductor 3/8" Foamflex Jacketed 70 Ohms. Mates with UHF Plug .....	M150-FX38-70H

Isolation Inductor 3/8" Styroflex 50 Ohms. Mates with UHF Plug .....	M150-ST38-50
Isolation Inductor 3/8" Styroflex Jacketed 50 Ohms. Mates with UHF Plug .....	M150-ST38-50H
Weatherproof Housing for Isolation Inductors .....	On Request

### Bowl Insulators

Bowl Insulator, complete with fittings, solid stud and shield .....	MI-27723
Bowl Insulator, complete with fittings, hollow stud and shield .....	MI-27724

### Ohm-Spun Dummy Loads

1/2 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"
20 KW AM Dummy Load .....	Ohm-Spun Type "WG"

### Compensating Networks

Compensating Network for 1.0 kW 50 Ohm Type WG Load
Compensating Network for 5.0 kW 50 Ohm Type WG Load
Compensating Network for 10.0 kW 230 Ohm Type WG Load
Compensating Network for 20.0 kW 230 Ohm Type WG Load

### 50 kW Water-Cooled Dummy Loads

50 kW 50 Ohm Water-Cooled Resistor Assembly .....	MI-27029-3
50 kW 230 Ohm Water-Cooled Resistor Assembly .....	MI-27029-2
50 kW Water-Cooled Dummy Load complete with resistor assembly, flowmeter, thermometers, valves, hoses and fittings (specify 50 or 230 Ohm.)	

### RF METERS

Spare RF Ammeters furnished with an internal or external thermocouple provide a means of metering antenna base current and transmitter output line current. The meters are calibrated for mounting on 1/8-inch steel panel or housing such as the transmitter or antenna tuning unit.

Three series of meters are avail-

able. The MI-7147 Series provides a three-inch, white face meter in rectangular case with expanded scale ranges of 0-2 to 0-20 Amperes. It has an internal thermocouple and is designed for use with the BPA Series of Antenna Tuning Units. The MI-28048 Meter Series is similar except for black face. The MI-7157-F Series of RF Meters have a four-inch square case, black face,

and expanded scale ranges of 0-2 to 0-25 Amperes. The MI-7157-G Series are similar except cases measure 3 1/2 inches square. Each meter has an external thermocouple. "F" Series meters match those used on the BTA-1M, 1R, and BTA-5H/10H transmitters, and "G" Series meters those on BTA-5U/10U transmitters.

## Ordering Information

3" RF Meter, 0-2 Amp., white face .....	MI-7147-2
3" RF Meter, 0-3 Amp., white face .....	MI-7147-3
3" RF Meter, 0-5 Amp., white face .....	MI-7147-5
3" RF Meter, 0-8 Amp., white face .....	MI-7147-8
3" RF Meter, 0-10 Amp., white face .....	MI-7147-10
3" RF Meter, 0-15 Amp., white face .....	MI-7147-15
3" RF Meter, 0-20 Amp., white face .....	MI-7147-20
3" RF Meter, 0-2 Amp., black face .....	MI-28048-2
3" RF Meter, 0-3 Amp., black face .....	MI-28048-3

3" RF Meter, 0-5 Amp., black face .....	MI-28048-5
3" RF Meter, 0-8 Amp., black face .....	MI-28048-8
3" RF Meter, 0-10 Amp., black face .....	MI-28048-10
4" RF Meter, 0-2 Amp., black face .....	MI-7157-F2/G2
4" RF Meter, 0-3 Amp., black face .....	MI-7157-F3/G3
4" RF Meter, 0-5 Amp., black face .....	MI-7157-F5/G5
4" RF Meter, 0-8 Amp., black face .....	MI-7157-F8/G8
4" RF Meter, 0-10 Amp., black face .....	MI-7157-F10/G10
4" RF Meter, 0-15 Amp., black face .....	MI-7157-F15/G15
4" RF Meter, 0-20 Amp., black face .....	MI-7157-F20/G20
4" RF Meter, 0-25 Amp., black face .....	MI-7157-F25/G25

## ANTENNA LIGHTING CHOKE COILS

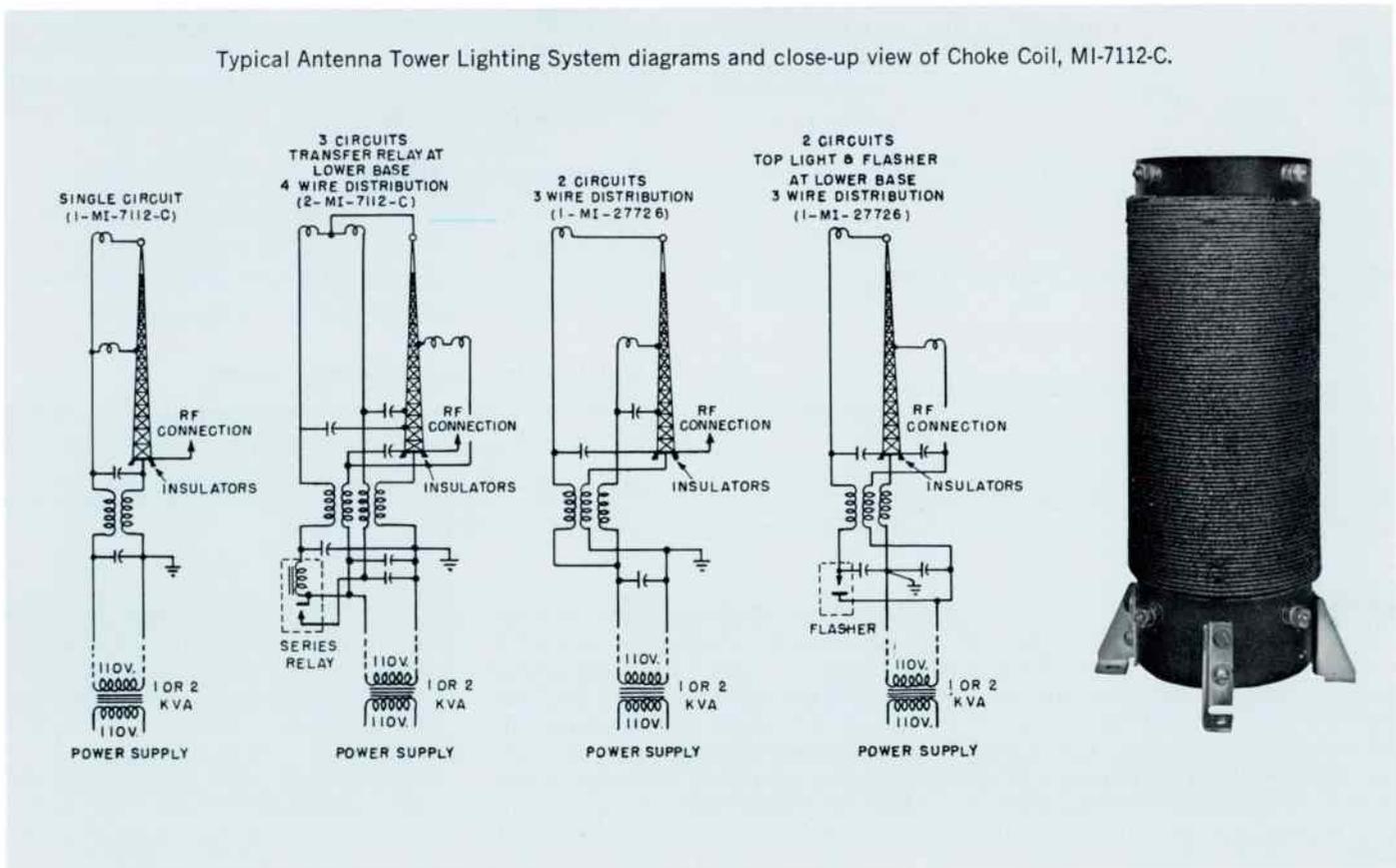
In broadcast transmitter installations where the tower itself forms the antenna, special transformers or radio-frequency choke coils must be employed to feed power to the lighting circuits on the tower. The MI-7112-C Double Winding Choke Coil and MI-27726-A Triple Winding Choke Coil have been designed 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 RF 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.

Typical Antenna Tower Lighting System diagrams and close-up view of Choke Coil, MI-7112-C.



## Specifications

Maximum Continuous Current (50/60 Hz)	.....15 Amperes
DC Resistance (each winding)	.....Approx. 0.15 Ohms
Inductance at 1 MHz	.....360 microhenries
Length	.....11 $\frac{5}{8}$ "
Diameter	.....4"

## Accessories

Capacitors .01 MFD	.....MI-27728-1
Weatherproof Housing	.....MI-27741

## Ordering Information

Choke Coil, Double Winding	.....MI-7112-C
Choke Coil, Triple Winding	.....MI-27726-A

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Control, Automatic Output .....	34	B.6314	27564
Control Unit, Tower Light Monitoring .....	38	B.6602	27519
Crystals, AM:			
TVM-129B Unit (Specify freq. and trans. type) .....	—	—	27494
TVM-130B Unit (BTA-500R/1R1/5R/5R1/5T1/5U1/10U1) .....	—	—	27493
BW-11B Unit (specify frequency) .....	46	B.6412	34070
Current Radio Alarm .....	38	B.6602	27571
Dehydrators:			
1 SCFM Capacity .....	80	B.6200	563170-1
2 SCFM Capacity .....	80	B.6200	563170-2
3 SCFM Capacity .....	80	B.6200	563170-3

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Extension Meter:			
For BW-66F .....	48	B.6414	27549-2
For BW-11A .....	46	B.6412	SN93688
Extension, 20 Position (For BTR-20D Remote Control System) .....	42	B.6604	27556
Field Intensity Meter, Nems-Clarke Type FIM-135 .....	44	B.6316	561434
Frequency Monitor, BW-11A .....	45	B.6412	ES-34042
Gassing Accessory Kit, Single Line .....	80	B.6200	19315-20
Ground Strap, 3" x .020 (1 lb. per 4.51 ft.) .....	99	B.6750	28405-A4
Hangers (See Transmission Line) .....	53	B.6200	—
Hazard Markers (Set of 3 including installation material) .....	83	B.6250	Custom
Heliac Cable/Transmission Line .....	65	B.6200	—
High-Frequency Kit (For BW-66F AM Modulation Monitor) .....	48	B.6414	34078
Horn Gap .....	91	B.6270	27771
Housing, Weatherproof:			
For RF Antenna Lightning Chokes .....	95	B.6272	27741
For Isolation Inductors .....	93	B.6272	Custom
Isolation Coils, AM:			
RG-8U, 52 Ohms .....	94	B.6272	M125-RG8
RG-11U, 75 Ohms .....	94	B.6272	M125-RG11
1/2" Foam Heliac 50 Ohms .....	94	B.6272	M135-FH4
1/2" Foam Alum. Heliac 50 Ohms .....	94	B.6272	M135-FLJ4
1/2" Foamflex 50 Ohms .....	94	B.6272	M135-FX-12-50
1/2" Foamflex Jacketed 50 Ohms .....	94	B.6272	B135-FX-12-50H
1/2" Foamflex 70 Ohms .....	94	B.6272	M135-FX-12-70
1/2" Foamflex Jacketed 70 Ohms .....	94	B.6272	M135-FX-12-70H
1/2" Styroflex 50 Ohms .....	94	B.6272	M135-ST-12-50
1/2" Styroflex Jacketed 50 Ohms .....	94	B.6272	M135-ST-12-50H
1/2" Styroflex 70 Ohms .....	94	B.6272	M135-ST-12-70
1/2" Styroflex Jacketed 70 Ohms .....	94	B.6272	M135-ST-12-70H
3/8" Foamflex 50 Ohms .....	94	B.6272	M150-FX-38-50
3/8" Foamflex Jacketed 50 Ohms .....	94	B.6272	M150-FX-38-50H
3/8" Foamflex 70 Ohms .....	94	B.6272	M150-FX-38-70
3/8" Foamflex Jacketed 70 Ohms .....	94	B.6272	M150-FX-38-70H
3/8" Styroflex 50 Ohms .....	94	B.6272	M150-ST-38-50
3/8" Styroflex Jacketed 50 Ohms .....	94	B.6272	M150-ST-38-50H
Custom Built .....	94	B.6272	—
Input and Monitoring Equipment .....	51	B.6450	Custom
Insulator:			
Bowl Type 135-15-1, Solid Stud .....	93	B.6272	27723
Bowl Type 135-15-8, Hollow Stud .....	93	B.6272	27724
Bowl Type .....	91	B.6270	27798
Latching Relay:			
DPDT 6 Amps. 115 V. 3 Amps. 230 V. ....	38	B.6602	27524-1
DPDT 20 Amps., 115/230 V. ....	38	B.6602	27524-2
4PDT 0.5 Amp., 115 V. ....	38	B.6602	27524-3
Latching Relay Panel with 2 Relays .....	38	B.6602	27509-A
Light Control Relays, Fisher Pierce .....	99	B.6750	251-A

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<b>Lighting Choke:</b>			
Double Winding (RF Antenna with Two Capacitors) .....	91	B.6270	ES-27241
Triple Winding (RF Antenna with Four Capacitors) .....	91	B.6270	ES-27242
Double Winding (RF Antenna with Two Capacitors and Weatherproof Housing) .....	91	B.6270	ES-27243
Triple Winding (RF Antenna with Four Capacitors and Weatherproof Housing) .....	91	B.6270	ES-27244
Double Winding RF Antenna .....	83	B.6250	7112-C
Triple Winding RF Antenna .....	83	B.6250	27726-A
<b>Meter:</b>			
<b>Extension:</b>			
Modulation .....	48	B.6414	27549-2
BW-11A Frequency Monitor .....	46	B.6412	SN93688
<b>Field Intensity:</b>			
Nems-Clarke Type FIM-135 .....	44	B.6316	561434
<b>Remote Antenna:</b>			
Indicating Ammeter for 3-Inch Case .....	95	B.6272	28037-B
Indicating Ammeter for 4-Inch Case .....	95	B.6272	28037
Indicating Ammeter for 4-Inch RCA Case .....	95	B.6272	27644
3" RF Meter, 0-15 Amp. Black Face .....	91	B.6270	28037-B15
3" RF Meter, 0-20 Amp. Black Face .....	91	B.6270	28037-B20
4" RF Meter, 0-2 Amp. Black Face .....	91	B.6270	28037-2
4" RF Meter, 0-3 Amp. Black Face .....	91	B.6270	28037-3
4" RF Meter, 0-5 Amp. Black Face .....	91	B.6270	28037-5
4" RF Meter, 0-6 Amp. Black Face .....	91	B.6270	28037-6
4" RF Meter, 0-8 Amp. Black Face .....	91	B.6270	28037-8
4" RF Meter, 0-10 Amp. Black Face .....	91	B.6270	28037-10
4" RF Meter, 0-15 Amp. Black Face .....	91	B.6270	28037-15
4" RF Meter, 0-20 Amp. Black Face .....	91	B.6270	28037-20
4" RF Meter, 0-25 Amp. Black Face .....	91	B.6270	28037-25
4" RF Meter, 0-30 Amp. Black Face .....	91	B.6270	28037-30
4" RF Meter, 0-40 Amp. Black Face .....	91	B.6270	28037-40
4" RF Meter, 0-2 Amp. Black Face, RCA Case .....	91	B.6270	27644-2
4" RF Meter, 0-3 Amp. Black Face, RCA Case .....	91	B.6270	27644-3
4" RF Meter, 0-5 Amp. Black Face, RCA Case .....	91	B.6270	27644-5
4" RF Meter, 0-6 Amp. Black Face, RCA Case .....	91	B.6270	27644-6
4" RF Meter, 0-8 Amp. Black Face, RCA Case .....	91	B.6270	27644-8
4" RF Meter, 0-10 Amp. Black Face, RCA Case .....	91	B.6270	27644-10
4" RF Meter, 0-15 Amp. Black Face, RCA Case .....	91	B.6270	27644-15
4" RF Meter, 0-25 Amp. Black Face, RCA Case .....	91	B.6270	27644-25
4" RF Meter, 0-40 Amp. Black Face, RCA Case .....	91	B.6270	27644-40
<b>Tube Hour;</b>			
4" Westinghouse, 230 V 60 Hz .....	24	B.6007	34614-1
Meter Commutator (12-Function) .....	38	B.6602	27555
<b>Meter Panel and Switch:</b>			
3-Inch (For Use with LTU Open Panel) .....	90	B.6260	27760
3-Inch (For Use with LTU Weatherproof Cabinet) .....	90	B.6260	7486-B
Modulation Monitor, AM with Tubes, BW-66F .....	47	B.6414	30066-B
Modulator, Spare Unit (For BTA-50H1) .....	32	B.6050	ES-34264
Module, Spare Amplifier-Control (For Automatic Logging) .....	36	B.6608	561433
Momentary Relay Panel with 2 Relays .....	38	B.6602	27546

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Monitor:			
BW-11A Frequency .....	45	B.6412	ES-34042
BW-66F Modulation .....	47	B.6414	30066-B
Monitoring Unit, for Individual Tower Lights .....	36	B.6608	27544
Mount:			
For RF Ammeters MI-7175-F Series .....	—	—	34656
For RF Ammeters MI-7175-G Series .....	—	—	34651
Mounting Panel for RF Meter .....	6	B.6506	34656
Negative Peak Limiter ("Power Max") .....	33	B.6310	34654
Output Control, Automatic .....	34	B.6314	27564
Panel:			
AM Monitoring Dual Meter .....	38	B.6602	ES-27220
Latching Relay (Incl. 2 Relays) .....	38	B.6602	27509-A
Momentary Relay (Incl. 2 Relays) .....	38	B.6602	27546
Remote Meter (For Type 112 Antenna Phase Monitor) .....	50	B.6416	113
RF Meter Mounting .....	5	B.6001	34656
3-Inch Meter and Switch .....	90	B.6260	7486-B
3-Inch Meter and Switch .....	90	B.6260	27760
Paper, Strip Chart Recording, Box of 6 Rolls (For Automatic Logging) .....	36	B.6608	561430
Phase Monitor:			
Nems-Clarke PPM101A:			
Precision Direct Digital, Handles Up to 12 Towers .....	49	B.6414	PPM-101A
Nems-Clarke 112, 51 or 70 Ohm Inputs:			
2 Towers .....	49	B.6416	—
3 Towers .....	49	B.6416	—
4 Towers .....	49	B.6416	—
5 Towers .....	49	B.6416	—
6 Towers .....	49	B.6416	—
7 Towers .....	49	B.6416	—
8 Towers .....	49	B.6416	—
9 Towers .....	49	B.6416	—
Phase Sampling Loops:			
Unshielded Grounded, Fixed Type 173-11-1 .....	93	B.6272	27730
Unshielded, Grounded, Rotatable Type 173-11-2 .....	93	B.6272	27731
Unshielded, Grounded, Fixed Angle Iron Type B0045 .....	93	B.6762	—
Shielded, Insulated, Rotatable, Type C0019 .....	93	B.6762	561522
Shielded, Insulated, Rotatable, Type 173-10-1 .....	93	B.6272	27729
Phasing Equipment, AM Antenna .....	87	B.6260	Custom
Photo-Cells:			
3000 Watt, Fisher Pierce .....	83	B.6250	—
6000 Watt, Fisher Pierce .....	83	B.6250	—
Plug-in Meter Bracket Shorting Bar and Meter Plug .....	90	B.6260	27763
Power Conversion Kit (BTA-5U1 to BTA-10U1) .....	24	B.6007	ES-34279
Power Cutback Kit:			
For BTA-5T1/5U1 (5-kW to 1000 or 500 W) .....	16	B.6005	34646-A
For BTA-10U1 (10-kW to 5-kW) .....	24	B.6007	ES-34285
For BTA-10U1 (10-kW to 1000 to 500 W) .....	24	B.6007	ES-34287
For BTA-50H1 (50 kW to 10 kW) .....	32	B.6050	27688-A

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"Power Max" (Negative Peak Limiter) .....	33	B.6310	34654
Relay			
Latching;			
6 Amps., 115 V/3 Amp. 230 V (for oscillator switching) .....	38	B.6602	27524-1
DPST, 20 Amps., 115/230 V .....	38	B.6602	27524-2
4PDT, 0.5 Amp., 115 V. ....	38	B.6602	27524-3
Light Control, Fisher Pierce .....	83	B.6250	251-A
Momentary, DPDT, 15-20 Amps. ....	38	B.6602	27545-2
RF, 12.5 Amp. ....	38	B.6602	27545-1
Relay Panel:			
Latching, Incl. 2 Relays .....	38	B.6602	27509-A
Momentary, Incl. 2 Relays .....	38	B.6602	27546
Remote Accessories:			
Hardware for BTA-5/10H, 5/10G .....	38	B.6602	27540
Hardware for BTA-5E/5F/10E/10F .....	38	B.6602	27552
Kit for BTA-50G Transmitter .....	38	B.6602	27687
Remote Controls:			
Type BTR-11B .....	37	B.6602	ES-34280
Type BTR-20D .....	39	B.6604	ES-34274-B
Type BTR-20DT .....	39	B.6604	ES-34274-C
Type BTRX-40A .....	39	B.6604	27556
Remote Filament Control (For BTA-5/10H) .....	38	B.6602	27518
Remote Meter Panel for Nems-Clarke Phase Monitor, Type 112 .....	50	B.6416	113
Remote Output Control (For BTA-5/10H) .....	38	B.6602	27517
Remote Power Cutback Kit (For BTA-5/10H, 5/10G) .....	38	B.6602	27520
Remote RF Pickup Unit:			
50 kW Base, less Meter .....	95	B.6272	28027-C
5 kW Base Current, less Meter .....	95	B.6272	27966-B
RF Ammeters:			
3" RF Meter, 0-2 Amp. White Face .....	95	B.6272	7147-2
3" RF Meter, 0-3 Amp. White Face .....	95	B.6272	7147-3
3" RF Meter, 0-5 Amp. White Face .....	95	B.6272	7147-5
3" RF Meter, 0-8 Amp. White Face .....	95	B.6272	7147-8
3" RF Meter, 0-10 Amp. White Face .....	95	B.6272	7147-10
3" RF Meter, 0-15 Amp. White Face .....	95	B.6272	7147-15
3" RF Meter, 0-20 Amp. White Face .....	95	B.6272	7147-20
3" RF Meter, 0-2 Amp. Black Face .....	95	B.6272	28048-2
3" RF Meter, 0-3 Amp. Black Face .....	95	B.6272	28048-3
3" RF Meter, 0-5 Amp. Black Face .....	95	B.6272	28048-5
3" RF Meter, 0-8 Amp. Black Face .....	95	B.6272	28048-8
3" RF Meter, 0-10 Amp. Black Face .....	95	B.6272	28048-10
3½" RF Meter, 0-2 Amp. Black Face .....	95	B.6272	7157-G2
3½" RF Meter, 0-3 Amp. Black Face .....	95	B.6272	7157-G3
3½" RF Meter, 0-5 Amp. Black Face .....	95	B.6272	7157-G5
3½" RF Meter, 0-8 Amp. Black Face .....	95	B.6272	7157-G8
3½" RF Meter, 0-10 Amp. Black Face .....	95	B.6272	7157-G10
3½" RF Meter, 0-15 Amp. Black Face .....	95	B.6272	7157-G15
3½" RF Meter, 0-20 Amp. Black Face .....	95	B.6272	7157-G20
3½" RF Meter, 0-25 Amp. Black Face .....	95	B.6272	7157-G25
4" RF Meter, 0-2 Amp. Black Face .....	95	B.6272	7157-F2

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RF Ammeters: (Continued)			
4" RF Meter, 0-3 Amp. Black Face .....	95	B.6272	7157-F3
4" RF Meter, 0-5 Amp. Black Face .....	95	B.6272	7157-F5
4" RF Meter, 0-8 Amp. Black Face .....	95	B.6272	7157-F8
4" RF Meter, 0-10 Amp. Black Face .....	95	B.6272	7157-F10
4" RF Meter, 0-15 Amp. Black Face .....	95	B.6272	7157-F15
4" RF Meter, 0-20 Amp. Black Face .....	95	B.6272	7157-F20
4" RF Meter, 0-25 Amp. Black Face .....	95	B.6272	7157-F25
4" RF Meter, 0-40 Amp. Black Face .....	95	B.6272	7157-F40
RF Ammeter Mounting Panel (For MI-7157-F Meters) .....	8	B.6001	34656
RF Ammeter Mounting Panel (For MI-7157-G Meters) .....	24	B.6007	34651
RF Contactor:			
SPDT, AM Phasing Type 145-101-13 .....	90	B.6260	27755-1
DPDT, AM Phasing Type 145-102-13 .....	90	B.6260	27755-2
SPDT, AM Phasing Type 145-201-13 .....	90	B.6260	27755-3
DPDT, AM Phasing Type 145-202-13 .....	90	B.6260	27755-4
RF Loads:			
½ kW 50 Ohm, Ohmspun .....	95	B.6272	—
½ kW 70 Ohm, Ohmspun .....	95	B.6272	—
½ kW 230 or 240 Ohm, Ohmspun .....	95	B.6272	—
1 kW 50 Ohm, Ohmspun .....	95	B.6272	—
1 kW 70 Ohm, Ohmspun .....	95	B.6272	—
1 kW 75 Ohm, Ohmspun .....	95	B.6272	—
1 kW 230 or 240 Ohm, Ohmspun .....	95	B.6272	—
5 kW 50 Ohm, Ohmspun .....	95	B.6272	—
5 kW 70 Ohm, Ohmspun .....	95	B.6272	—
5 kW 75 Ohm, Ohmspun .....	95	B.6272	—
5 kW 230 or 240 Ohm, Ohmspun .....	95	B.6272	—
10 kW 50 Ohm, Ohmspun .....	95	B.6272	—
10 kW 70 Ohm, Ohmspun .....	95	B.6272	—
10 kW 75 Ohm, Ohmspun .....	95	B.6272	—
10 kW 230 or 240 Ohm .....	95	B.6272	—
50 kW AM Water Cooled 50 Ohm (with housing only) .....	95	B.6272	27029-3
50 kW AM Water Cooled 50 Ohm (with housing, flow meter, lines, etc.) .....	95	B.6272	—
RF Meter Mounting Panel .....	5	B.6001	34656
RF Pickup Unit:			
Remote Metering of base currents up to 5 kW Power .....	95	B.6272	27966-B
Remote metering of base currents up to 50 kW Power .....	95	B.6272	28027-C
Screen, 8' x 24' Section Expanded Copper Ground .....	83	B.6250	27765
Strap, 3" x .020 Ground (1 lb. per 4.51 ft.) .....	83	B.6250	28405-A4
Strip Chart Recording Paper (Box of 6 rolls) .....	36	B.6608	561430
Temperature Indicator:			
Indoor (—30 to 150°F) .....	38	B.6602	27550-1
Outdoor (—30 to 150°F) .....	38	B.6602	27550-2
Tone Alarm System, Type BTRA-5C .....	43	B.6605	ES-34281-A
Towers (For AM-FM Antennas) .....	81	B.6250	Custom
Tower Light Monitoring Unit .....	36	B.6608	27544
Tower Light Monitoring & Control Unit .....	36	B.6608	27519

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<b>Tower Lighting Kits:</b>			
For Towers up to 150 feet .....	83	B.6250	FAA-A1
For Towers 151 to 300 feet .....	83	B.6250	FAA-A2
For Towers 301 to 450 feet .....	83	B.6250	FAA-A3
For Towers over 451 feet .....	83	B.6250	—
<b>Transformer:</b>			
1750 Watts, Hughey & Phillips T1-2017 .....	83	B.6250	28215-A1
3500 Watts, Hughey & Phillips T1-2035 .....	83	B.6250	28215-A2
<b>Transmission Line:</b>			
<b>1½", 51.5 Ohm Rigid Copper Line;</b>			
20' Length, Flanged .....	55	B.6200	19112-1
20' Length, One Flange .....	55	B.6200	19112-1-F
20' Length, No Flange .....	55	B.6200	19112-1-NF
Adapter Plain to Flange Line .....	55	B.6200	19112-4
Gas Stop .....	55	B.6200	19112-5
Straight Coupling (Includes Bullet) .....	55	B.6200	19112-8
Special Size Inner Conductor for TV Splicing .....	56	B.6200	19112-9
"O" Ring Gasket .....	56	B.6200	19112-10
Innerconnector .....	56	B.6200	19112-11
Adapter Flanged to Unflanged Line, Clamp Type .....	56	B.6200	19112-16
90° Miter Elbow .....	56	B.6200	19112-18
90° Miter Elbow (One Flange) .....	56	B.6200	19112-18-1F
90° Miter Elbow (No Flange) .....	56	B.6200	19112-18-NF
1½" Fixed Flange .....	56	B.6200	19112-20
1½" Swivel Flange .....	56	B.6200	19112-21
45° Miter Elbow .....	56	B.6200	19112-22
45° Miter Elbow (One Flange) .....	56	B.6200	19112-22-1F
45° Miter Elbow (No Flange) .....	56	B.6200	19112-22-NF
Reducer 1½" Type "N" (Ungassed—No Flange) .....	56	B.6200	19112-58
1½" Reducer to Type "N" (Gassed—Flanged) .....	56	B.6200	19112-59
Field Flange .....	56	B.6200	19112-60
Adapter 1½" Ohm Unflanged to 1½" 50 Ohm EIA Flange (No Bullets) 6" long .....	56	B.6200	19112-61
Adapter 1½" 51.5 Ohm Flange Male to 1½" 50 Ohm Flange Male (No Bullets) 6" long .....	56	B.6200	19112-62
<b>3½" 51.5 Ohm Rigid Copper Line;</b>			
20' Length, Flanged .....	57	B.6200	19113-C-1
20' Length, One Flange .....	57	B.6200	19113-C-1F
20' Length, No Flange .....	57	B.6200	19113-C-1NF
20' Length, One Fixed Flange, One Swivel Flange .....	57	B.6200	19113-C-1SF
Gas Stop .....	57	B.6200	19113-C-5
Reducer (Gassed) .....	57	B.6200	19113-C-6
Reducer (Ungassed) .....	57	B.6200	19113-C-7
Straight Coupling (includes Bullet and 2 Hose Clamps) .....	58	B.6200	19113-C-8
Straight Coupling (less Bullet but including 2 Hose Clamps) .....	58	B.6200	19113-C-8NB
Tube (Inner Conductor for TV Splicing) .....	58	B.6200	19113-C-9
O-Ring Gasket .....	58	B.6200	19113-C-10
Innerconnector .....	58	B.6200	19113-C-11
Cover Plate .....	58	B.6200	19113-C-13
End Seal .....	58	B.6200	19113-C-17
90° Miter Elbow, Flanged .....	58	B.6200	19113-C-18
90° Miter Elbow, One Flange .....	58	B.6200	19113-C-18F
90° Miter Elbow, No Flange .....	58	B.6200	19113-C-18NF
Hardware Kit .....	58	B.6200	19113-C-19

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<b>Transmission Line: (Continued)</b>			
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Swivel Flange .....	58	B.6200	19113-C-21
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45° Miter Elbow, One Flange .....	58	B.6200	19113-C-22F
45° Miter Elbow, No Flange .....	58	B.6200	19113-C-22NF
Cut-Off Gauge .....	58	B.6200	19113-C-51
Cut-Off Gauge .....	58	B.6200	19113-C-54
Adapter, Soft Solder .....	58	B.6200	19113-C-55
Reducer (Ungassed) .....	59	B.6200	19113-C-58
Flanged to Unflanged Coupling (Ungassed Mechanical) .....	59	B.6200	19113-C-60
<b>3/8" 50 Ohm Ungassed Rigid Copper Line;</b>			
20' Length, Unflanged .....	59	B.6200	27791-K-1
Coupling, 90° Miter Elbow .....	59	B.6200	27791-K-2A
Coupling, 45° Miter Elbow .....	59	B.6200	27791-K-2B
Coupling .....	59	B.6200	27791-K-4A
Inner Connector .....	59	B.6200	27791-K-4B
Adjustable Clamp .....	60	B.6200	27791-K-4C
Reducer to Type N Fitting .....	60	B.6200	27791-K-5A
<b>Special Adapters;</b>			
Inner Connector Adapter .....	60	B.6200	27988-4A
Inner Connector Adapter .....	60	B.6200	27988-4B
Insert Bushing .....	60	B.6200	19313-11
Adapter Flanged, Ungassed .....	60	B.6200	27988-4C
Quick Step Reducer (3/8" to 7/8") .....	61	B.6200	27988-5A
Quick Step Reducer (3/8" to 1 1/8") .....	61	B.6200	27988-5B
Quick Step Reducer (EIA 3/8" to 1 1/8") .....	61	B.6200	27988-5C
Quick Step Reducer (EIA 3/8" to 7/8") .....	61	B.6200	27988-5D
Quick Step Reducer (EIA 1 1/8" to 7/8") .....	62	B.6200	27988-5E
Adapter Section (3/8" to 3/8") .....	62	B.6200	27988-7A
Adapter Section (3/8" to MI-27791-K) .....	62	B.6200	27988-7B
Male to Male Adapters (7/8") .....	62	B.6200	27988-7C
Male to Male Adapters (1 1/8") .....	62	B.6200	27988-7D
Male to Male Adapters (3/8") .....	62	B.6200	27988-7E
Male to Male Adapters (1 1/8" NF to 1 1/8" EIA) .....	62	B.6200	27988-7F
Male to Male Adapters (1 1/8" to 1 1/8" EIA) .....	62	B.6200	27988-7G
Flexible Helix Air Dielectric Line .....	65	B.6200	—
Accessories for Flexible Helix Air Dielectric Line .....	66	B.6200	—
Flexible Helix Foam Dielectric Line .....	67	B.6200	—
Accessories for Flexible Helix Foam Dielectric Line .....	67	B.6200	—
<b>Flexible RG/U Type Coaxial Cable;</b>			
RG-8AU, 52 Ohms, Low Temp. Jacket .....	69	B.6200	74A
RG-11AU, 75 Ohms, Low Temp. Jacket .....	69	B.6200	83A
RG-17AU, 52 Ohms, Low Temp. Jacket .....	69	B.6200	47A
<b>Hangers;</b>			
<b>Expansion Type 1 1/8" Single Line,</b>			
Pivot, Grounded Clamp on Round Members, 1" to 2 1/4" Short .....	70	B.6200	19312-23
Pivot, Grounded Clamp on Round Members, 1" to 2 1/4" Long .....	70	B.6200	19312-24
Pivot, Grounded Clamp on Round Members, 2 1/4" to 5" Short .....	70	B.6200	19312-26
Pivot, Grounded Clamp on Round Members, 2 1/4" to 5" Long .....	70	B.6200	19312-27
Pivot, Insulated Clamp on Round Members, 1" to 2 1/4" .....	70	B.6200	19312-25
Pivot, Insulated Clamp on Round Members, 2 1/4" to 5" .....	70	B.6200	19312-28
Grounded, Clamp on Angle Members .....	70	B.6200	19312-29
Grounded, Clamp on Angle Members .....	70	B.6200	19312-30
Pivot, Grounded Mount Through Hole, Short .....	70	B.6200	19312-32

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<b>Transmission Line: (Continued)</b>			
<b>Hangers:</b>			
Pivot, Grounded Mount Through Hole, Long .....	70	B.6200	19312-33
Pivot, Insulated Mount Through Hole .....	71	B.6200	19312-34
Pivot, Insulated Clamp on Angle Member, Long .....	71	B.6200	19312-31
<b>Fixed, 1½" Rigid Line,</b>			
Grounded, Clamp on Round Members .....	71	B.6200	19312-41
Grounded, Clamp on Round Members .....	71	B.6200	19312-42
Grounded, Mount Through Hole .....	71	B.6200	19312-44
Grounded, Mount Through Hole .....	71	B.6200	19312-47
Grounded, Clamp on Angle Members .....	72	B.6200	19312-43
<b>Miscellaneous 1½" Rigid Line Hanger Accessories,</b>			
Grounded Horizontal Anchor .....	72	B.6200	19312-17
Grounded Horizontal Roller Assembly .....	72	B.6200	19312-35
Grounded Lateral Brace .....	73	B.6200	19312-36
Grounded Swivel Hanger .....	73	B.6200	19312-37
<b>Expansion, 3¾" Rigid Line,</b>			
Grounded, Clamp on Round Members (1" to 2¼" Short) .....	73	B.6200	19313-23
Grounded, Clamp on Round Members (1" to 2¼" Long) .....	73	B.6200	19313-24
Grounded, Clamp on Round Members (2¼" to 5" Short) .....	73	B.6200	19313-26
Grounded, Clamp on Round Members (2¼" to 5" Long) .....	73	B.6200	19313-27
Grounded, Mount Through Hole, Short .....	73	B.6200	19313-32
Grounded, Mount Through Hole, Long .....	73	B.6200	19313-33
Grounded, Clamp on Angle Members, Short .....	74	B.6200	19313-29
Grounded, Clamp on Angle Members, Long .....	74	B.6200	19313-30
Insulated, Clamp on Round Members (1" to 2¼" Long) .....	74	B.6200	19313-25
Insulated, Clamp on Round Members (2¼" to 5" Long) .....	74	B.6200	19313-28
Insulated, Mount Through Hole .....	74	B.6200	19313-34
Insulated, Clamp on Angle Members .....	74	B.6200	19313-31
<b>Fixed, 3¾" Rigid Line,</b>			
Pivot, Grounded Clamp on Round Members (1" to 2¼" Short) .....	75	B.6200	19313-41
Pivot, Grounded Clamp on Round Members (2¼" to 5" Short) .....	75	B.6200	19313-42
Pivot, Grounded Mount Through Hole, Short .....	75	B.6200	19313-44
Pivot, Grounded Mount Through Hole, Long .....	75	B.6200	19313-47
Pivot, Grounded Clamp on Angle Members, Short .....	75	B.6200	19313-43
<b>Miscellaneous 3¾" Rigid Line Accessories,</b>			
Grounded Horizontal Roller Assembly .....	76	B.6200	19313-35
Grounded Horizontal Anchor .....	76	B.6200	19313-17
Grounded Lateral Brace .....	77	B.6200	19313-36
Grounded Swivel Hanger .....	77	B.6200	19313-37
Grounded 3-Point Hanger .....	77	B.6200	19313-50
<b>Indoor Hanger Kits:</b>			
Hanger & Fastener Kit for 3¾" Line .....	78	B.6200	27700
Wall Bracket Kit .....	78	B.6200	27702
Wall Bracket Extension Kit .....	78	B.6200	27703
Hanger Plate Mounting Kit .....	78	B.6200	27704
"I" Beam Mounting Kit .....	78	B.6200	27705
Concrete Mounting Kit .....	78	B.6200	27706
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BTA-5T1 5kW AM Broadcast .....	9	B.6005	ES-34229
BTA-5U1 5-kW AM Broadcast .....	17	B.6007	ES-27285
BTA-10U1 10-kW AM Broadcast .....	17	B.6007	ES-27286
BTA-50H1 50-kW AM "Ampliphase" .....	25	B.6050	ES-27221-C
Tube Hour Meter, 4" Westinghouse, 230V, 60 Hz .....	24	B.6007	34614-1

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<b>Tube Kit:</b>			
For BW-11A AM Frequency Monitor .....	46	B.6412	8295
For BW-66F AM Modulation Monitor .....	48	B.6414	30450
<b>Tubes:</b>			
Complete Spare Kit;			
For BTA-1R2 .....	8	B.6001	ES-27695-A
For BTA-5T1 .....	16	B.6005	ES-34230
For BTA-5U1 .....	24	B.6007	ES-34233
For BTA-10U1 .....	24	B.6007	ES-27290
For BTA-50H1 .....	32	B.6050	ES-27222-C
Recommended Minimum Spare Kit;			
For BTA-1R2 .....	8	B.6001	ES-27696-A
For BTA-5T1 .....	16	B.6005	ES-34208
For BTA-5U1/10U1 .....	24	B.6007	ES-27291
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<b>Weatherproof Housing:</b>			
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