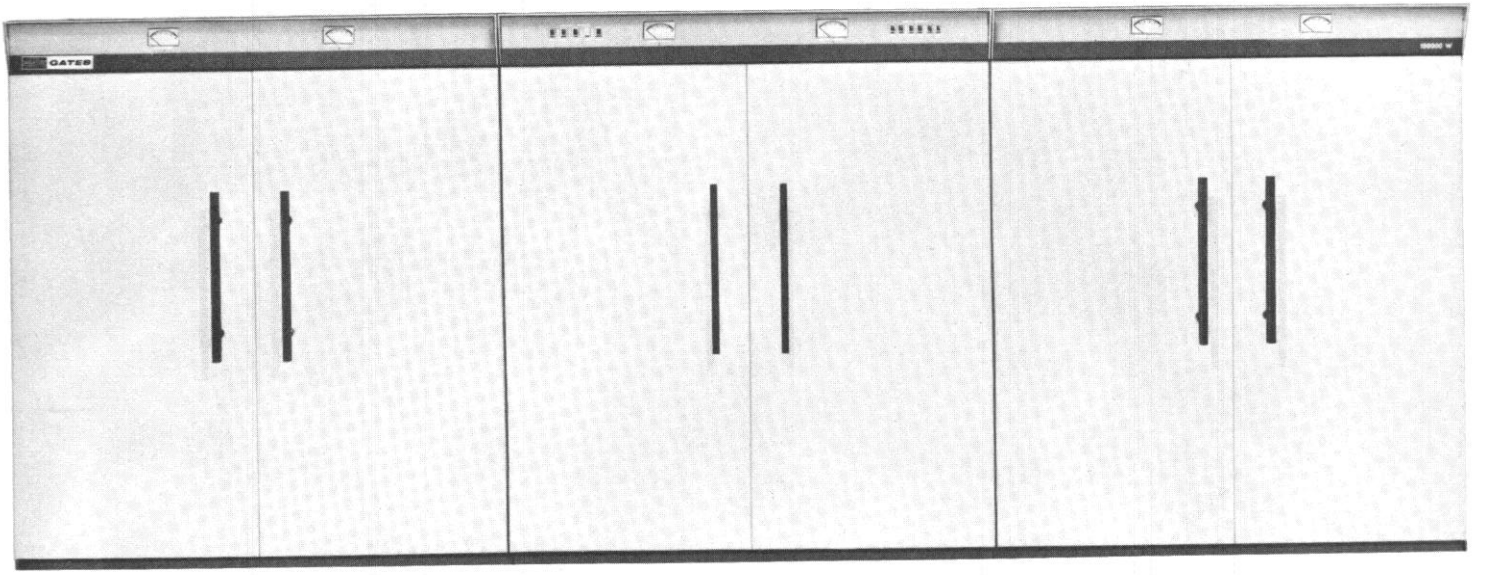
AM BROADCAST TRANSMITTERS

HARRIS INTERTYPE CORPORATION

GATES®
A DIVISION OF HARRIS-INTERTYPE

100,000 Watt Medium Wave Broadcast Transmitter



MODEL VP-100

Gates VP-100 is the most advanced 100 kW medium wave transmitter in the world. It provides an over-all performance superior to that of any other AM broadcast transmitter in the same power range—at lower operating costs. With its amazingly high efficiency, and advanced cooling system design, this transmitter represents the latest state-of-the-art in high power broadcast equipment.

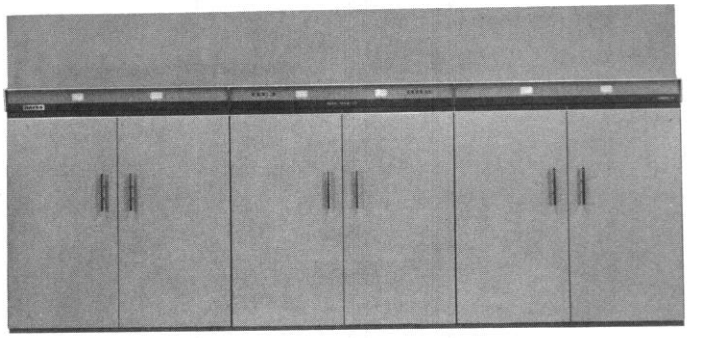
HIGH EFFICIENCY—EXCEEDS 65%: The modulation system employed in the VP-100 transmitter is almost 90% efficient (instead of the usual 50% or 60%), enabling the transmitter to achieve an unusually high over-all efficiency of greater than 65%. This means about one-third less power consumption than that of other high-level plate modulated 100 kW transmitters.

ONLY FIVE TUBES: The entire transmitter employs just five tubes—with modern ceramic 4CV100,000C tetrode power tubes operating well below manufacturer's dissipation ratings. All power supplies utilize long-life solid state silicon rectifiers. Highest quality components, conservatively rated, are used throughout the VP-100 to assure a maximum degree of reliability.

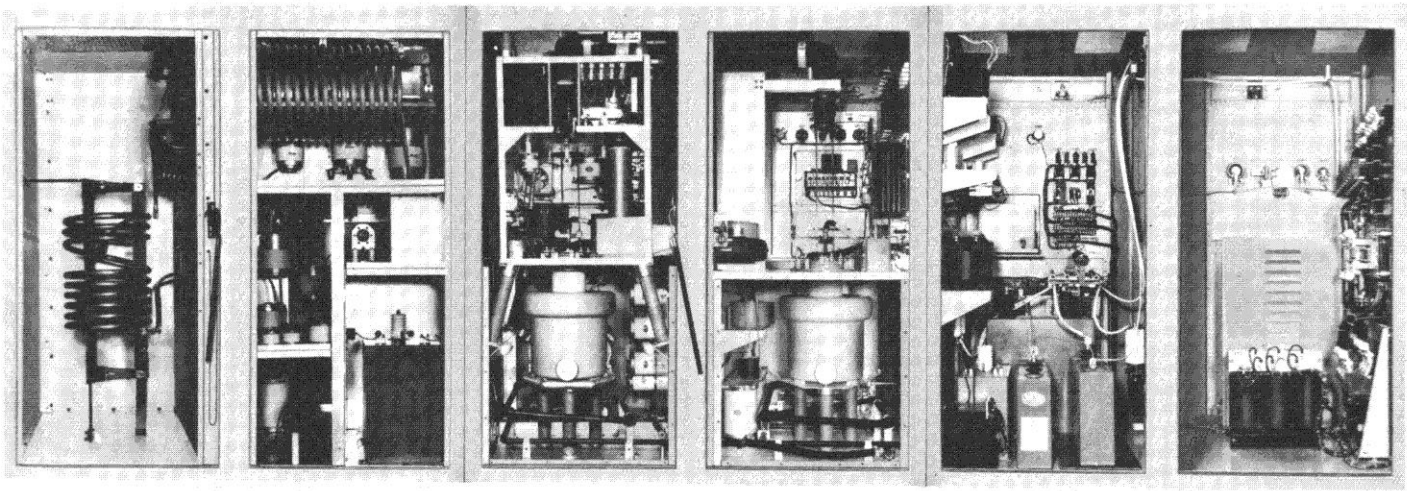
CONTINUOUS 100% MODULATION RATING: This continuous sine wave modulation capability permits a higher average modulation (such as trapezoidal) to boost signal strength, without increasing transmitted carrier power. Another feature of this high efficiency modulation system is convenient front panel carrier power adjustment over a wide range.

QUIET OPERATION: Cooling by the Vapor Phase method reduces noise by eliminating the need for large blowers. The heat exchanger is cooled by a single two horsepower blower, resulting in whisper-quiet operation. Vapor Phase Cooling also extends tube life by helping to eliminate "hot spots" and maintains tube anode temperatures far below those attained by other methods.

GREATLY REDUCED FLOOR SPACE: Due to the high efficiency of the transmitter, and the elimination of large iron core components such as the modulation transformer and modulation reactor, the VP-100 requires only 8.8 square meters (95 square feet) of floor space. The advanced cabinet design provides easy accessibility to all components.



VP-100 with heat exchanger.

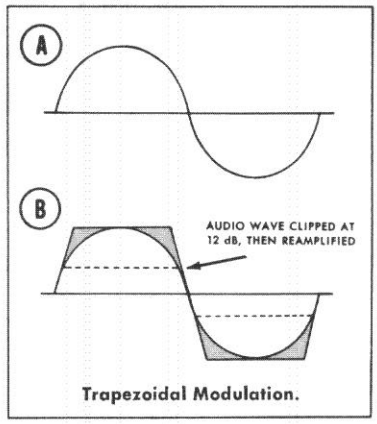


RF Output Cabinet. Power Amplifier and Modulator Cabinet. AC Control Cabinet.

Rear View of VP-100 with doors removed.

RF SECTION: The RF chain is conventional, using a transistorized oscillator, buffer, emitter follower, and a 4CX1500B tetrode tube amplifier to drive a single 4CV100,000C tetrode Class C power output stage. An automatic drive control limits the PA screen current to 2.2 amps, eliminating the usual problem of over dissipating the screen of a tetrode during tune-up. A convenient efficiency meter peaks as the efficiency of the transmitter increases, to allow rapid tuning. No "trial-and-error" tune-up methods are necessary.

THE MODULATION SYSTEM: This advanced system is characterized by low plate dissipation and low tube peak currents; peak cathode currents are about one-half that of other 100 kW transmitters. Average plate dissipation runs substantially below rated levels, and all peak voltages are maintained well below component ratings. Wide frequency response is possible as large reactive components are not used in the system. Control of the transmitter power output over a wide range is by means of a front panel vernier control. No adjustment is necessary in any high power RF circuits, including the loading coil.



Trapezoidal Modulation.

PROTECTIVE CIRCUITS: All major components of the VP-100 are protected by circuit breakers. Tubes and transistors are protected by overload relays or current-limiting devices. A quick-acting series "crowbar" circuit protects against damage from high voltage arcs by limiting the energy in such arcs to less than 10 watt seconds. Protection against voltage standing wave ratios of greater than 1.2 to 1.0 is provided . . . both forward and reflected power is metered at the front panel. In case of momentary RF overloads the VP-100 will recycle twice automatically. Should a third overload occur within a thirty second period, the transmitter will remain off until manually reset. However, if the time between overloads is greater than thirty seconds, continuous recycling will occur.

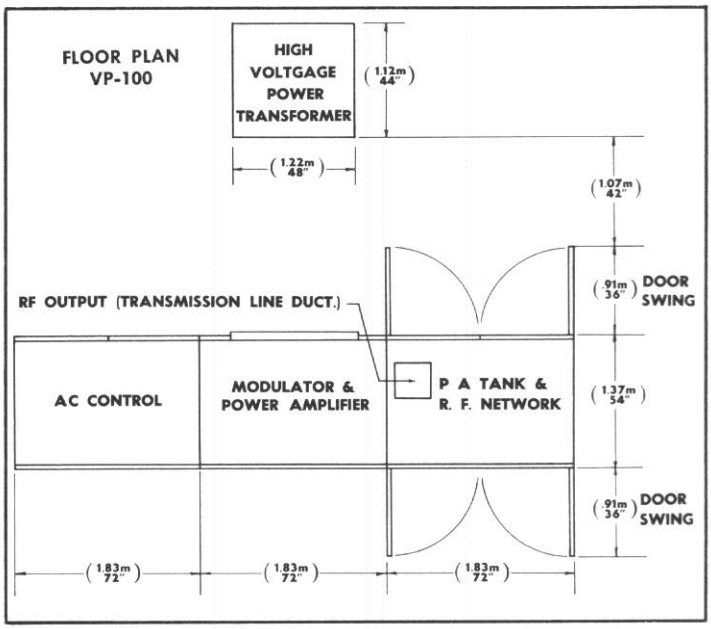
TRAPEZOIDAL RESPONSE: Trapezoidal modulation may be used to gain additional power on the air without increasing transmitted carrier power. To do this the audio input wave (A), at left, is flattened at the top, by clipping, then reamplified to form a trapezoidal wave (B). The shaded areas in the diagram indicate the power gain. All the additional power gained by clipping the audio input is delivered at the output of the transmitter, thus increasing volume at the receiver.

100,000 Watt Medium Wave Broadcast Transmitter–VP-100

DUAL OSCILLATOR AND MODULATOR: Gates has provided redundancy in all transistor sections to relieve any concern over solid state circuitry in high-power transmitters. Although the reliability of transistor circuitry has been proven in transmitters now operating under extreme conditions, this duplication is your double assurance of dependability.

DESIGNED FOR A WIDE RANGE OF CLIMATES: The VP-100 will give top performance in a wide range of climates—from hot and humid, to dry and dusty. With Vapor Phase Cooling, ducting outside air into the transmitter is not necessary. All transformers and similar components are hermetically sealed, encased, or vacuum impregnated. All high power radio frequency networks contain silver-plated inductors and vacuum capacitors.

TRANSMITTER LAYOUT: The standard VP-100 consists of three cabinets, a heat exchanger designed for mounting on top of the cabinets, and an external high voltage power transformer. Front and rear doors, and meter panel are magnetically latched. External connections to the transmitter are made through the top of the units so that floor ducts are not necessary.



SPECIFICATIONS

POWER OUTPUT: 100,000 watts nominal unmodulated; capable 110,000 watts.

RF FREQUENCY RANGE: 535 kHz to 1620 kHz.

RF OUTPUT IMPEDANCE: 230 ohms, unbalanced. Other output impedances available as specified.

FREQUENCY STABILITY: ±10 Hz of assigned frequency.

CARRIER SHIFT: Less than 4% at 100% modulation.

MODULATION: High level.

TRAPEZOIDAL MODULATION: Less than 5% tilt or overshoot 100 Hz to 2,000 Hz.

MODULATION LEVEL: 100% sinusoidal, continuously, over an audio frequency range of 50-5000 Hz.

RF HARMONICS: −80 dB below fundamental (well within CCIR requirements).

AUDIO FREQUENCY RESPONSE: ±1.5 dB from 50 to 10,000 Hz, referenced to 1000 Hz at 95% modulation.

AUDIO FREQUENCY DISTORTION: Less than 3% from 100 to 7500 Hz; 4% from 50 to 10,000 Hz at 95% modulation.

NOISE: −55 dB below 1000 Hz, 100% modulated level.

AUDIO INPUT IMPEDANCE: 600/150 ohms, balanced or unbalanced.

AUDIO INPUT LEVEL: +10 dBm ±2 dB at 1000 Hz for 100% modulation.

POWER CONSUMPTION: 155 kW—No Modulation.
160 kW—30% Modulation.
215 kW—100% Modulation.

POWER INPUT: Any specified voltage 380 V to 480 V, ±5%, 3 phase, 50 or 60 Hz as ordered.

POWER FACTOR: 95%.

VOLTAGE REGULATOR: Built-in electronic voltage regulator for all power supplies other than high voltage.

CROWBAR RESPONSE: Less than 5 microsecond operate time.

OVER-ALL EFFICIENCY: 65% @ average modulation.

ALTITUDE: Up to 1829 meters (6000 feet) above sea level (higher on special order).

TEMPERATURE RANGE: Ambient air temperature from −20°C to +50°C (with Dowanol* in water system).

STORAGE TEMPERATURE: −35°C to +60°C.

HUMIDITY: Up to 95% maximum within the above temperature range.

SIZE: Each of the three cabinets measures 1.83 meters (6 feet) wide, 1.37 meters (4.5 feet) deep, and 1.98 meters (6.5 feet) high. The heat exchanger adds another 1.21 meters (4 feet) in height. The HV transformer measures 1.21 x 1.12 x 1.52 meters (48" x 44" x 60").

WEIGHT: Export packed 8165 kilograms (18,000 lbs.). Main transmitter assembly 5443 kg (12,000 lbs.). Power transformers 2268 kg (5000 lbs.). Heat exchanger 454 kg (1000 lbs.).

CUBAGE: Export packed 39.6 cubic meters (1400 cubic feet). Main transmitter assembly 31.6 cu. meters (1115 cu. ft.). Power transformer 3.8 cu. meters (135 cu. ft.). Heat exchanger 4.1 cu. meters (150 cu. ft.).

FINISH: Two-tone beige-gray.

TUBES: Two, 4CV100,000C; two, 4CX1500B; one, F-1099 (damper diode).

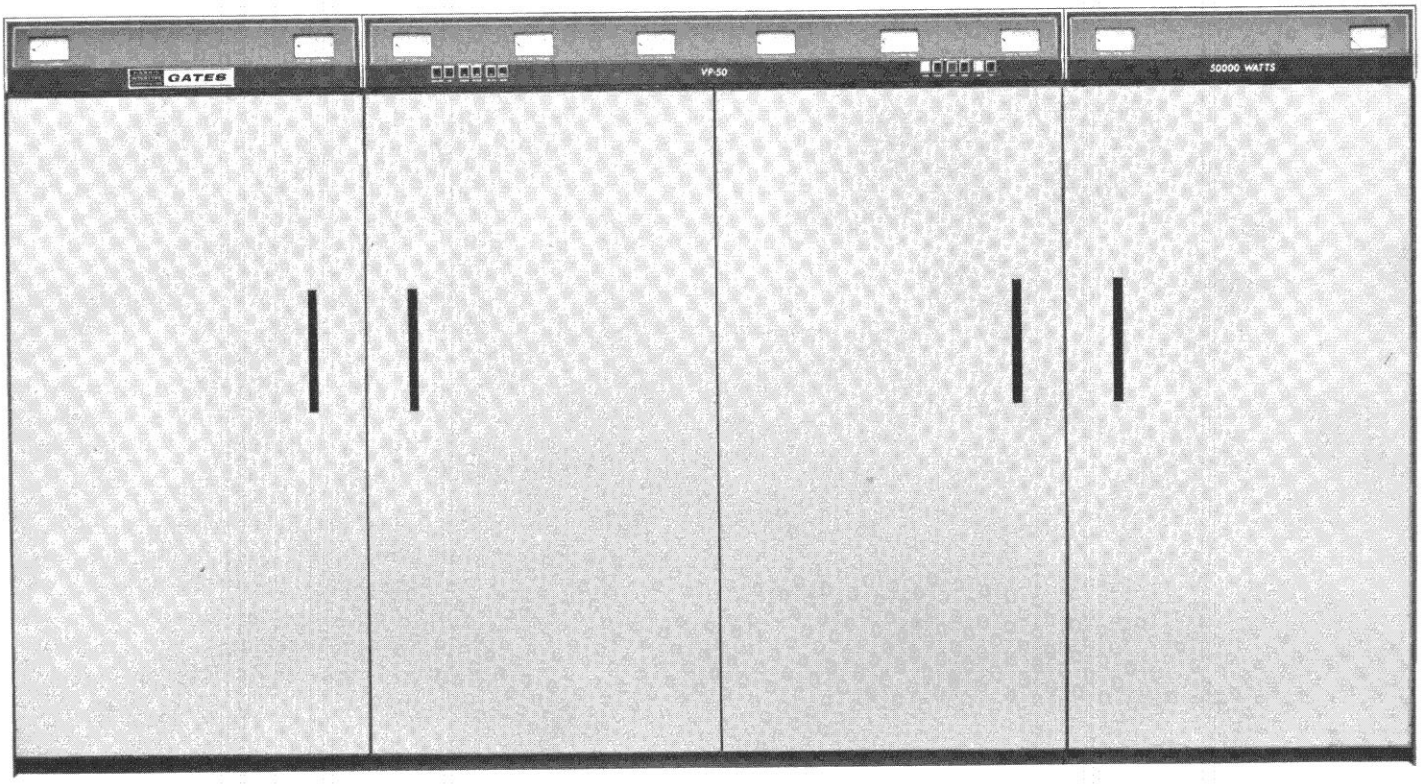
ORDERING INFORMATION

Model VP-100 with one set of tubes and two crystals	**994-6561**
100% set spare tubes for VP-100 transmitter	**990-0566**
Recommended minimum spare tubes for VP-100 transmitter	**990-0567**

*** Trademark of Dow Chemical Company.**

HARRIS INTERTYPE CORPORATION GATES

50,000 Watt Medium Wave Broadcast Transmitter



MODEL VP-50

Inside and out, the VP-50 is the first really new 50,000 watt AM transmitter produced in the last decade. Advanced engineering in the cooling system design has produced the coolest, quietest, and most efficient 50 kW broadcast transmitter ever manufactured.

OPERATING ECONOMY: Vapor cooling of the single triode PA tube and the two triode modulator tubes produces a high level plate modulated transmitter with a power consumption of only 85 kW at 0% modulation. Tube costs are the lowest of any 50 kW transmitter, yet the constant temperature maintained by the cooling system helps to extend tube life. All transmitter components are operated well below manufacturers' ratings for longer, more dependable operation.

WHISPER QUIET OPERATION: With the vapor cooling method employed in the VP-50, large blowers, and associated noise, are eliminated. As a result, the VP-50 is the quietest 50 kW transmitter on the market today.

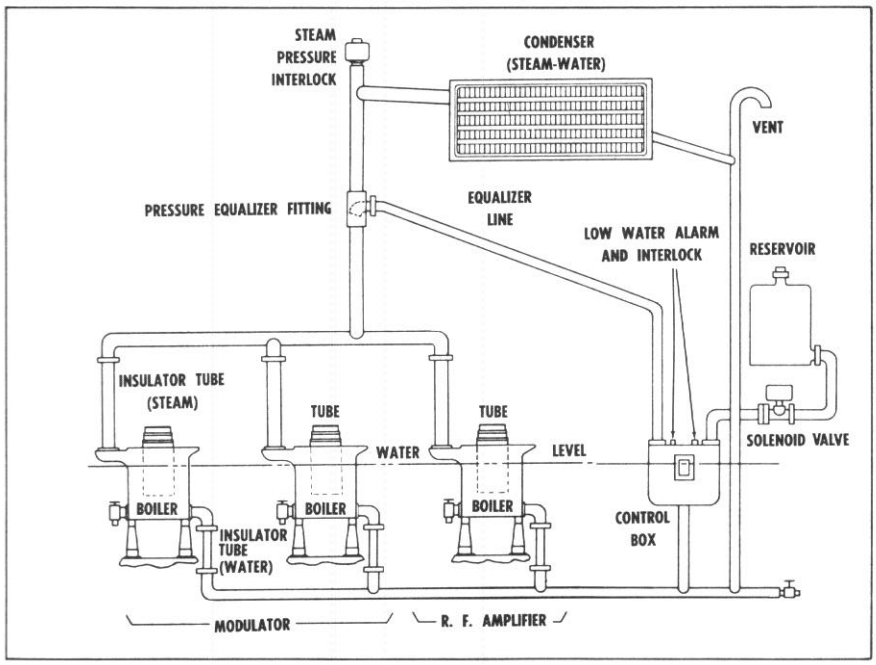
INSTALLATION FLEXIBILITY: The VP-50 is compact in size —designed to fit most existing buildings or to permit construction of low-cost new buildings. It can be installed without complex under-floor wiring ducts, as all high voltage lines are run into the top of the cabinets.

SOLID STATE POWER SUPPLIES: Silicon rectifiers are used throughout the VP-50. The result is greatly improved performance, as silicon cells are particularly resistant to aging, moisture, and extreme temperature variations.

DUAL SOLID STATE EXCITER: Both the oscillator and intermediate RF amplifier are all transistor. In addition, the exciter has a duplicate oscillator and intermediate amplifier for highest reliability. If one unit should fail to operate, the back-up exciter can be switched into service immediately.

POWER AMPLIFIER: A single 4CX3000A IPA tube drives the conservatively rated 7480 triode PA tube to produce a full 50 kW power output.

HIGH LEVEL PLATE MODULATION: The VP-50 uses two 3CV30,000H3 triodes operating Class B to modulate the single 7480 triode final RF amplifier. A conventional three stage audio amplifier is used to drive the modulator tubes. High level plate modulation has the advantage of simplicity, since final amplifier tuning is simplified. Unlike other techniques, high level modulation is not affected by changes in the final RF amplifier loading.



Vapor Phase Cooling.

VAPOR PHASE COOLING:
Cooling by vapor takes advantage of the latent heat of vaporization of water. Raising the temperature of one pound of water 1°F requires one BTU; however, changing a single pound of water at 212°F to steam vapor takes 970 BTU's. Thus, vapor cooling will remove nearly twenty times as much energy as a circulating water system.

As power is applied to the tube anode, dissipation heats the water to 212°F. Further heating causes the water to boil and change to steam. This vapor is passed through a heat exchanger, where it is converted to liquid. Water is returned to the boiler reservoir for re-use.

Water losses are compensated for by the reserve tank, which will replenish the boiler if the water level drops one-quarter inch. Tube anodes have a constant supply of water with fail-safe protection. The vapor system operates near atmospheric pressure and is fully vented.

In the Gates VP-50 transmitter water pumps are not required, as normal vapor pressure will move the steam from the boiler to the heat exchanger, and return water is gravity fed back to the boilers.

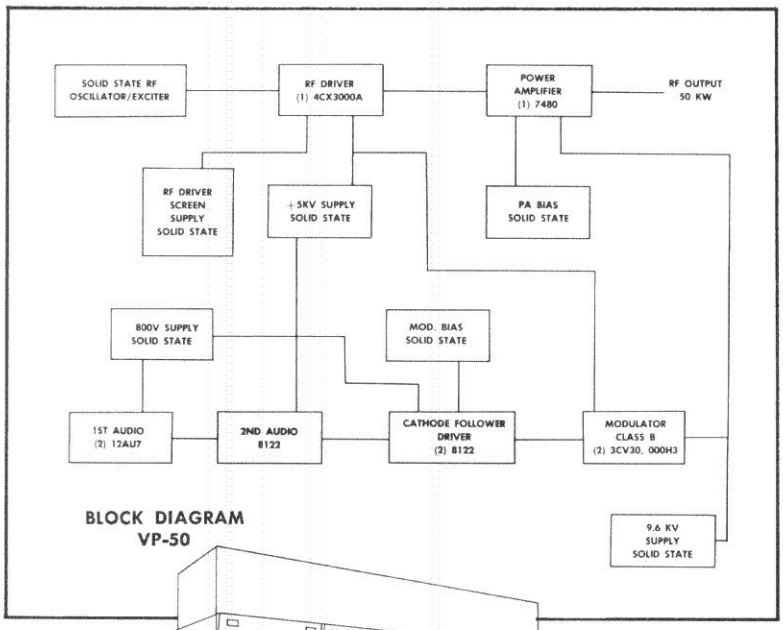
Easy to handle PA tube.

PROTECTIVE DEVICES: DC overload relays are provided, as well as AC overload relays, which are used in conjunction with the start contactors in the HV power supply. Magnetic breakers protect the bias, screen and intermediate high voltage supplies. In case of RF overload, the output VSWR circuit will automatically turn off the transmitter and recycle up to three times, giving momentary troubles a chance to clear.

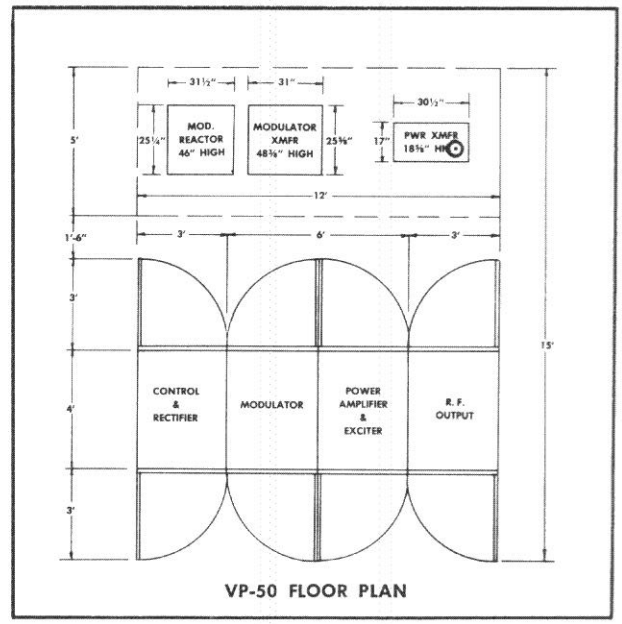
OPERATING SIMPLICITY: Automatic sequence control circuits are provided. This assures simple and fool-proof operation, and helps avoid costly errors. With a total of 14 meters, including 10 located on the front of the main transmitter assembly, all vital transmitter circuits can be monitored constantly. The few tuning controls that require adjustment are readily accessible through the front doors.

EASY MAINTENANCE: Full front and rear access to all components makes the VP-50 one of the easiest to maintain high power transmitters ever designed. Ideal for use in all climates, this transmitter greatly reduces the problems of cleaning and filtering of outside air required in forced air systems. The cooling system requires little attention other than maintaining the proper purity and water level in the reservoir tank.

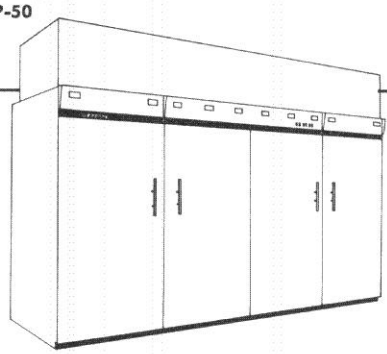
50,000 Watt Medium Wave Broadcast Transmitter—VP-50



BLOCK DIAGRAM
VP-50



VP-50 FLOOR PLAN



SPECIFICATIONS

POWER OUTPUTS: 50,000 watts (rated), 55,000 watts (capable). Convenient power reduction to 25,000 or 10,000 watts.

RF FREQUENCY RANGE: 535 kHz to 1620 kHz, supplied to frequency as ordered.

RF OUTPUT IMPEDANCE: Any impedances from 50 to 300 ohms.

FREQUENCY STABILITY: ±2 Hz.

CARRIER SHIFT: Less than 3% at 100% modulation.

RF HARMONICS: Exceeds FCC and CCIR specifications.

AUDIO FREQUENCY RESPONSE: ±1 dB, 50 to 7500 Hz ±1½ dB, 30 to 12,000 Hz.

AUDIO FREQUENCY DISTORTION: Less than 3%, 50 to 7500 Hz at 95% modulation.

NOISE: (Unweighted) −60 dB or better below 100% modulation.

AUDIO INPUT: 600/150 ohms at +10 dBm ±2 dB for 100% modulation.

POWER CONSUMPTION:

	50 kW Output	25 kW Output
0% modulation	85 kW	48 kW
30% modulation	95 kW	53 kW
100% modulation	125 kW	69 kW

POWER INPUT: 380 V, or 460 V, 3 phase, 50 or 60 Hz as ordered.

POWER FACTOR: 90% or better.

ALTITUDE: To 6,000 feet standard (higher on special order).

TEMPERATURE RANGE: −20°C to +50°C (with Dowanol* in water system).
* Trademark Dow Chemical Co. (Used only where temperatures go below 0°C.)

HUMIDITY: 95%.

SIZE: 78" high, 144" wide, 48" deep (transmitter cabinet). External components include: Modulation transformer, modulation reactor, and power transformer. Heat exchanger mounted on top of VP-50 adds 24" to overall height.

WEIGHT: 12,000 lbs. unpacked (approximate).
14,250 lbs. domestic packed (approximate).
15,500 lbs. export packed (approximate).

CUBAGE: 1003.5 cu. ft.

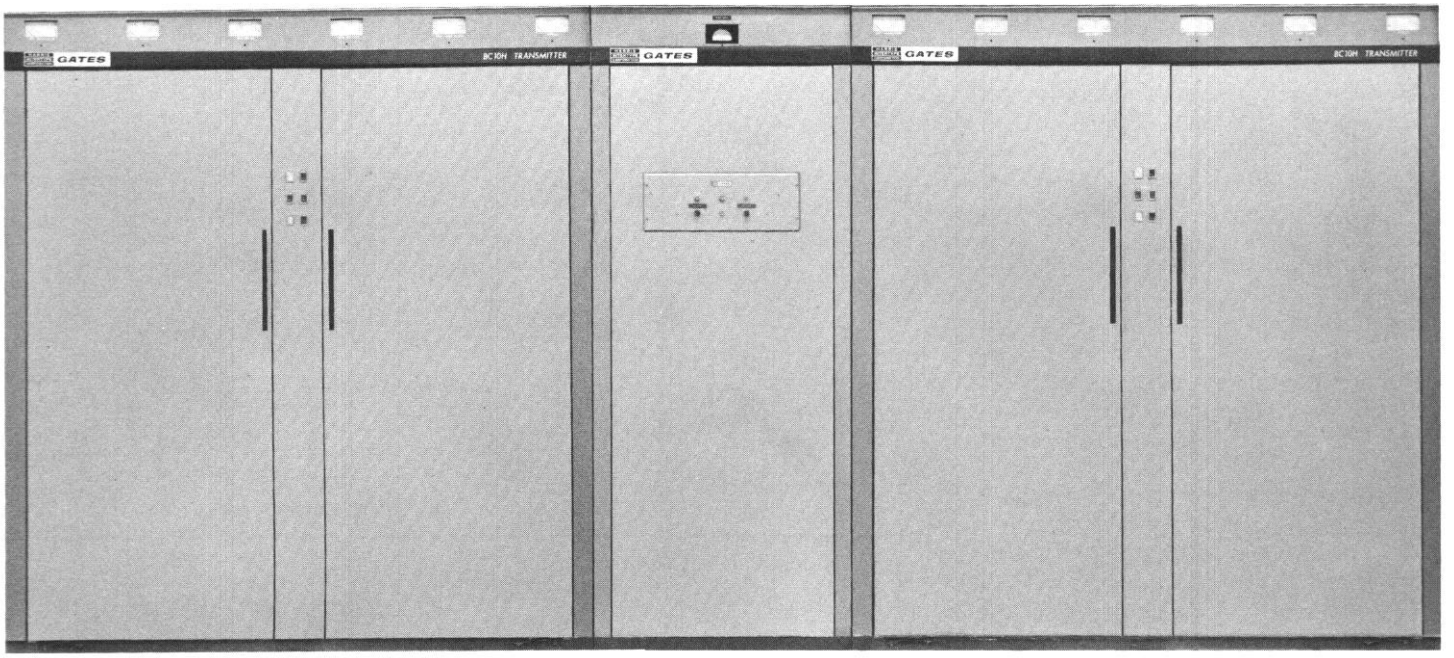
FINISH: Beige-gray.

TUBES USED: (1) 7480; (2) 3CV30000H3; 4CX3000A; (4) 8122; (3) 12AU7.

ORDERING INFORMATION

Model VP-50 with one set of tubes and two crystals	**994-6523**
100% set of spare tubes for VP-50 transmitter	**990-0537**
Recommended minimum spare tubes for VP-50 transmitter	**990-0538**

20,000 Watt Medium Wave Transmitter



MODEL BC-20H

The BC-20H, 20 kW transmitter consists of two standard BC-10H 10 kW transmitters, a 20 kW combiner, and a common drive unit. All components are housed within the transmitter cabinet, eliminating the need for external ducting and enclosures. Askarel (oil) filled modulation transformers are provided as standard equipment for added reliability.

SOLID STATE CIRCUITRY: The BC-20H employs transistors in all circuitry except the RF driver, power amplifier and modulator for superior performance. Only ten tubes are used in the entire transmitter.

RF SECTION: In addition to the oscillator/exciter incorporated in each 10 kW transmitter, a third oscillator is provided in the BC-20H to permit maximum operating flexibility. This independent exciter is used as a common drive to each transmitter and is enclosed in the center cabinet. Output of this unit is split and drives independent buffer amplifiers for isolation and phase adjustment. The RF signal then feeds individual oscillators in each 10 kW transmitter, which in turn excites the 4-400 driver and the high level plate modulated 3CX2500F3 power amplifiers. Overall efficiency of the power amplifiers is typically 85% or better, a direct benefit of the high efficiency RF circuits that are utilized.

RF output of each transmitter is fed into a bridged-tee combiner network, housed in the middle cabinet. A 10 kW dummy load is provided with an in-line RF ammeter for visual indication of current to the reject branch of the combiner network. Under optimum conditions, no current will exist in this branch. No critical adjustments are required and simplified overall operation is stable.

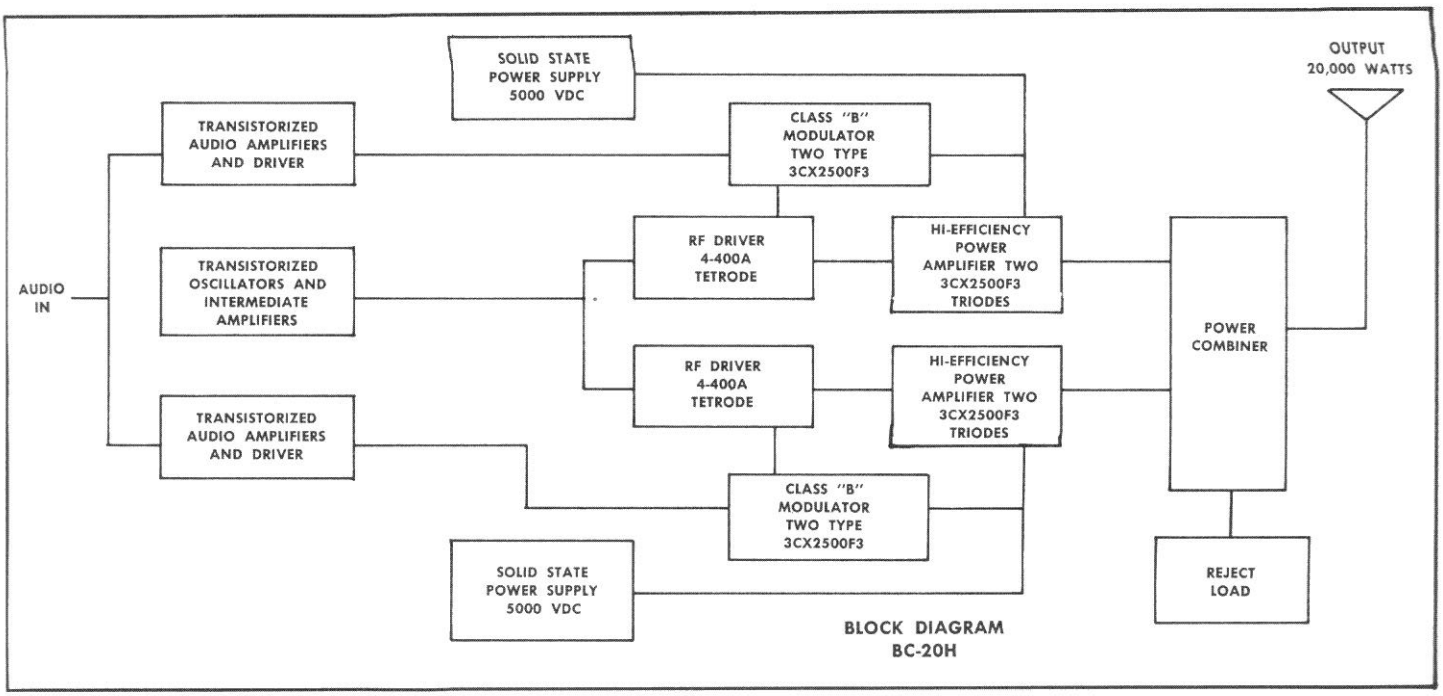
In the event that maintenance or adjustment, such as initial tune-up of the transmitters is required, the 10 kW dummy load may be switched manually so that the output of one power amplifier feeds the load directly while the other amplifier can drive the antenna system. While in the combined mode, monitoring is accomplished by a pickup loop at the combiner output for indication of modulation level of the entire transmitter system.

AUDIO SECTION: Audio is processed by a transistorized audio amplifier which drives the Class B 3CX2500F3 modulators. High level plate modulation techniques are used with enhanced performance obtained by applying audio to the RF driver stage.

20,000 Watt Medium Wave Transmitter—BC-20H

RELIABILITY: The design philosophy employed in the BC-20H assures long term operation with no lost air time. 100% redundancy of equipment means that a signal can remain on the air with no down time for maintenance. One transmitter can be turned off while the other continues to operate.

ADDITIONAL FEATURES: Important features include reliable silicon diodes in all power supplies; built-in circuitry for remote control; ample cooling for all climatic conditions with quiet, low-speed blowers; and low operating cost, with only two tube types used in the BC-20H.



BLOCK DIAGRAM
BC-20H

SPECIFICATIONS

POWER OUTPUT: (Rated) 20,000 watts. (Capable) 21,600 watts.

RF FREQUENCY RANGE: 535 kHz to 1620 kHz, supplied to one frequency as ordered.

RF OUTPUT IMPEDANCE: Supplied for 50 ohms, or other as specified.

RF FREQUENCY STABILITY: ±2 Hz.

CARRIER SHIFT: Less than 3% at 100% modulation.

RF HARMONICS: Meets or exceeds FCC specifications.

AUDIO FREQUENCY RESPONSE: ±1 dB, 50 to 10,000 Hz. ±1½ dB, 30-12,000 Hz.

AUDIO FREQUENCY DISTORTION: 2.5% or less 50 Hz to 10,000 Hz at 95% modulation.

NOISE: (Unweighted) 60 dB or better below 100% modulation.

AUDIO INPUT: 600/150 ohms at +10 dBm, ±2 dB.

POWER INPUT: 208/230 volts, 3 phase, 50 or 60 Hz. 37 kW no modulation. 42 kW average modulation. 55 kW 100% modulation.

AMBIENT TEMPERATURE RANGE: −20° to +50°C.

ALTITUDE: To 7,500 feet standard (higher altitudes on special order).

SIZE: 78" high, 177" wide, 32" deep (completely self-contained).

WEIGHT: 5200 lbs. unpacked (approximate). 6800 lbs. export packed (approximate).

CUBAGE: 390 cubic feet packed.

FINISH: Beige-gray.

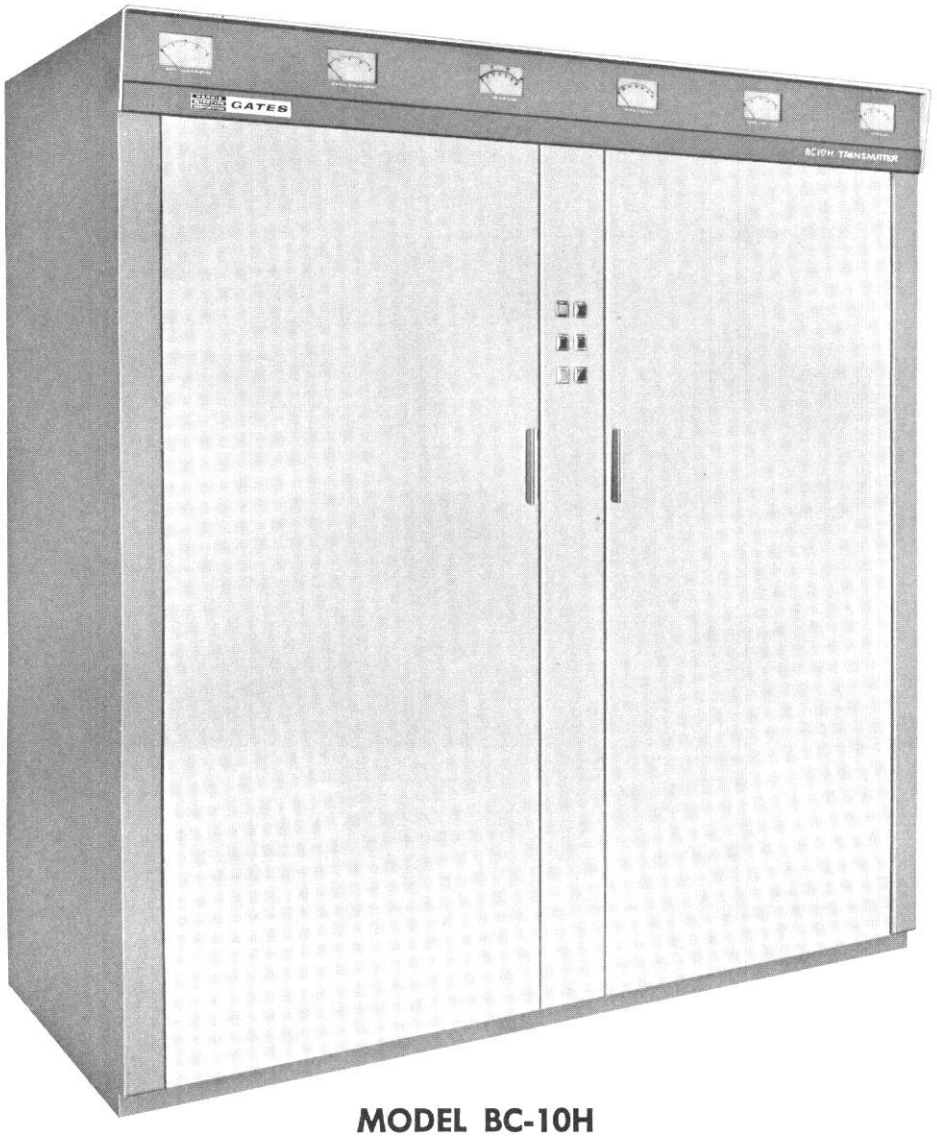
TUBES USED: (8) 3CX2500F3; (2) 4-400A. Total: 10.

GENERAL INFORMATION: Monitors: 10 RF volts output at 50/70 ohms for frequency and modulation monitors.

ORDERING INFORMATION

Model BC-20H transmitter, consisting of two standard BC-10H 10 kW transmitters, a 20 kW combiner and a common drive unit 994-6669

10,000 Watt Medium Wave Broadcast Transmitter



MODEL BC-10H

The most outstanding 10,000 watt AM transmitter on the market today, the BC-10H has gained wide acceptance and approval from broadcasters throughout the country in the two years since its introduction. Excellent on-the-air quality, high reliability, and low operating costs are proven features that have helped to make the BC-10H so popular.

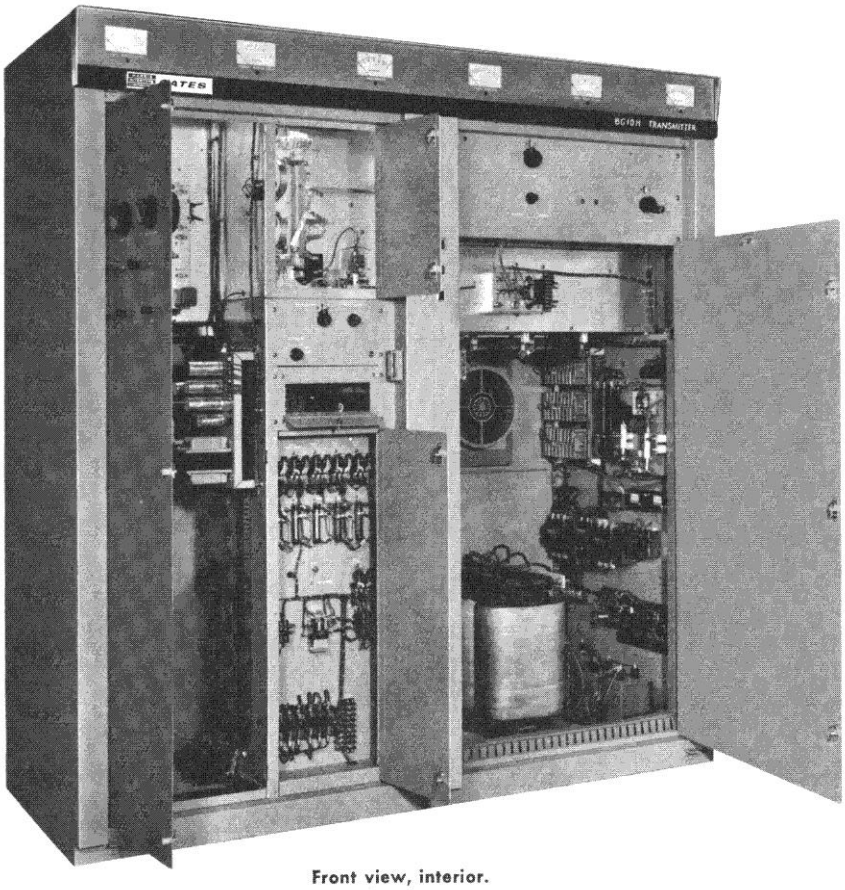
SOLID STATE CIRCUITRY: The BC-10H uses transistors in all circuits except the RF driver, power amplifier and modulator to provide a richer, fuller sound for the listener, and increased reliability for the broadcaster.

LOW TUBE COST: Ceramic type 3CX2500F3 triode tubes are used in the power amplifier and modulators, and a type 4-400A tetrode is used as the RF driver. All tubes are operated well below their maximum ratings for long tube life. This combination provides the lowest cost tube complement of any 10 kW AM broadcast transmitter on the market today.

RF SECTION: Two transistor oscillators are instantly switchable, and oscillator output is amplified to provide the proper signal level for the driver, a 4-400A tetrode, which is modulated to improve the over-all transmitter performance. The 4-400A drives two 3CX2500F3 power amplifiers which are high level plate modulated. These air-cooled power amplifiers have an efficiency as high as 90%, and feed a full Tee network. The RF output capability of the BC-10H, 10,800 watts, easily accommodates complicated multi-tower phasors.

AUDIO SECTION: Four push-pull solid state audio amplifier stages amplify the audio signal from input level to full drive power for the modulator stage. The modulator consists of two 3CX2500F3 triodes, operated Class AB_1. Inverse feedback, and an advanced design low leakage reactance modulation transformer/reactor group, results in signal quality of the highest fidelity. The modulation transformer is oil (Askarel) filled.

10,000 Watt Medium Wave Broadcast Transmitter—BC-10H



Front view, interior.

antenna coupler. Either of these then becomes a bonus factor in harmonic suppression.

EFFICIENT COOLING: Individual low-speed Rotron blowers in the RF and modulator stages, and a specially designed air exhaust, allow only a limited amount of direct heat to be dissipated into the interior of the BC-10H—for extra-cool operation.

OPERATING ECONOMY: Long tube life, low tube cost, and the highly efficient tank circuit combine to make economy of operation an important feature of the BC-10H.

ACCESSIBILITY: Designed for easy servicing, the transmitter front features 2 full length doors, with operational controls located between the two. Meters which indicate transmitter operating parameters are located across the front of the cabinet, above the doors. All necessary tuning controls are adjustable in full view of these meters. Further access to the transmitter from the front may be gained by releasing the catches on various front access panels. In addition, 4 panels may be removed from the rear of the transmitter for 100% accessibility.

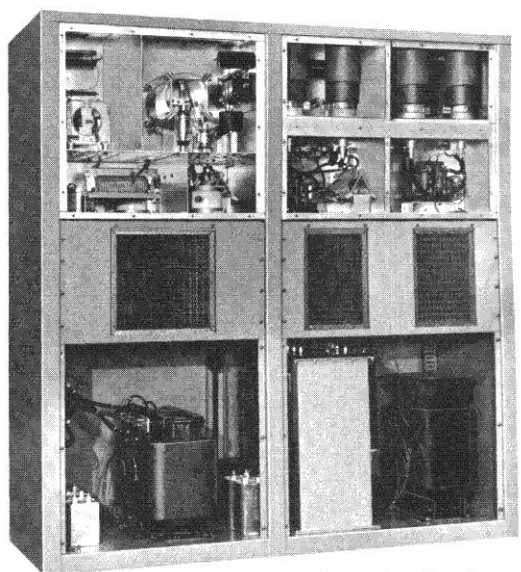
The BC-10H is completely self-contained within one cabinet.

INTERCHANGEABILITY: Added tube life may be achieved from the 3CX2500F3 triodes by interchanging the modulators and the power amplifiers, as the same tube type is used in both stages.

SOLID STATE POWER SUPPLIES: Lifetime silicon rectifiers in all power supplies provide a 2 to 1 voltage and a 5 to 1 current safety factor. This high margin of safety assures trouble-free performance.

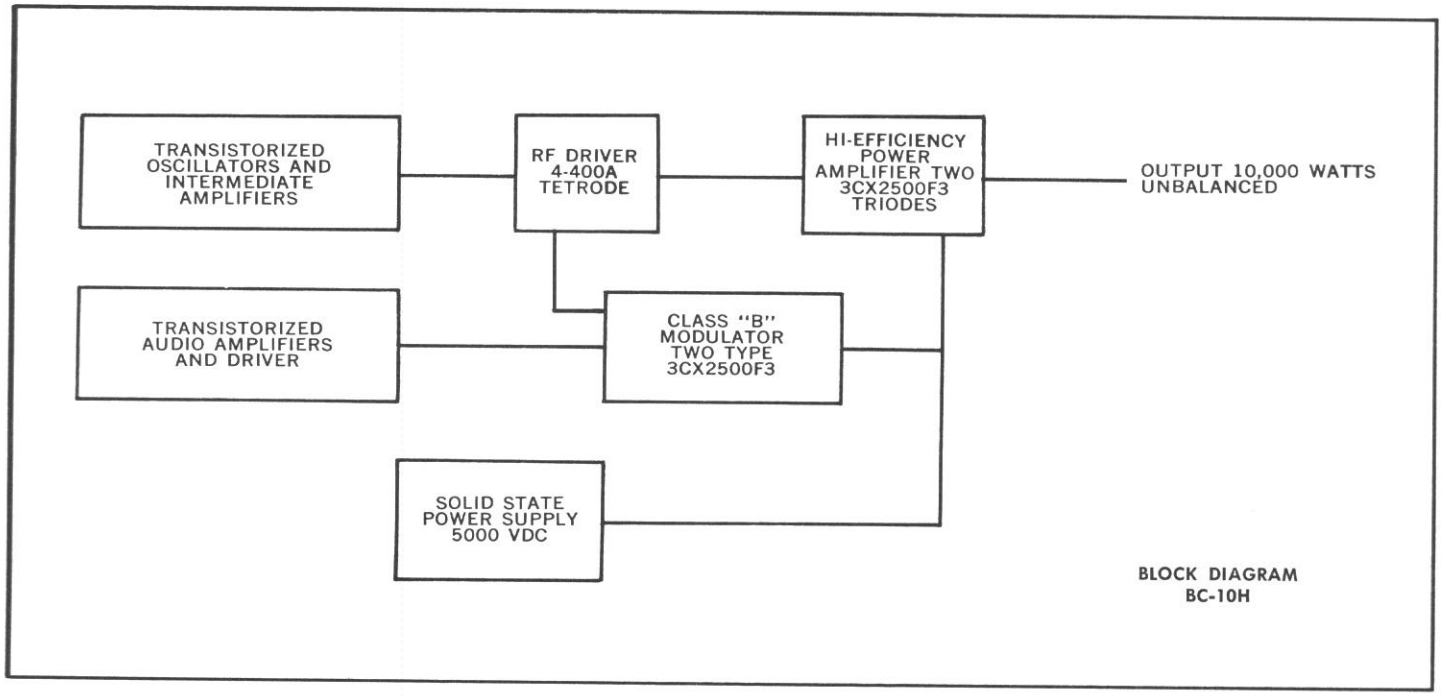
CONTROL CIRCUITRY: Careful attention has been given to the design of the control circuitry in the BC-10H. Complete AC and DC overload protection is standard equipment. A recycling feature, which will automatically turn the transmitter off when an overload occurs, is built-in.

HARMONIC RADIATION: A full Tee network and second harmonic trap are assurance that the BC-10H can exceed harmonic reduction regulations within the transmitter itself without relying on the harmonic attenuation of a phasor or



Rear view, interior.

10,000 Watt Medium Wave Broadcast Transmitter—BC-10H



BLOCK DIAGRAM BC-10H

SPECIFICATIONS

POWER OUTPUT: (Rated) 10,000 watts. (Capable) 10,800 watts. Power reduction to approximately 2,500 watts included.

RF FREQUENCY RANGE: 535 kHz to 1620 kHz supplied to one frequency as ordered.

RF OUTPUT IMPEDANCE: Supplied for 50 ohms, or other as specified.

RF FREQUENCY STABILITY: ±2 Hz.

CARRIER SHIFT: Less than 3% at 100% modulation.

RF HARMONICS: Meets or exceeds FCC specifications.

AUDIO FREQUENCY RESPONSE: ±1 dB, 50 to 10,000 Hz. ±1½ dB, 30-12,000 Hz.

AUDIO FREQUENCY DISTORTION: 2.5% or less 50 Hz to 10,000 Hz at 95% modulation.

NOISE: (Unweighted) 60 dB or better below 100% modulation.

AUDIO INPUT: 600/150 ohms at +10 dBm, ±2 dB

POWER INPUT: 208/230 volts, 3 phase, 50 or 60 Hz. 18.5 kW zero modulation. 21.0 kW average modulation. 27.5 kW 100% modulation.

AMBIENT TEMPERATURE RANGE: −20°C to +50°C.

ALTITUDE: To 7,500 ft. standard (higher altitudes on special order).

SIZE: 78" high, 72" wide, 32" deep (completely self-contained).

WEIGHT: 2,500 lbs. unpacked (approximate). 3,050 lbs. domestic packed (approximate). 3,250 lbs. export packed (approximate).

CUBAGE: 184 cubic feet packed.

FINISH: Beige-gray.

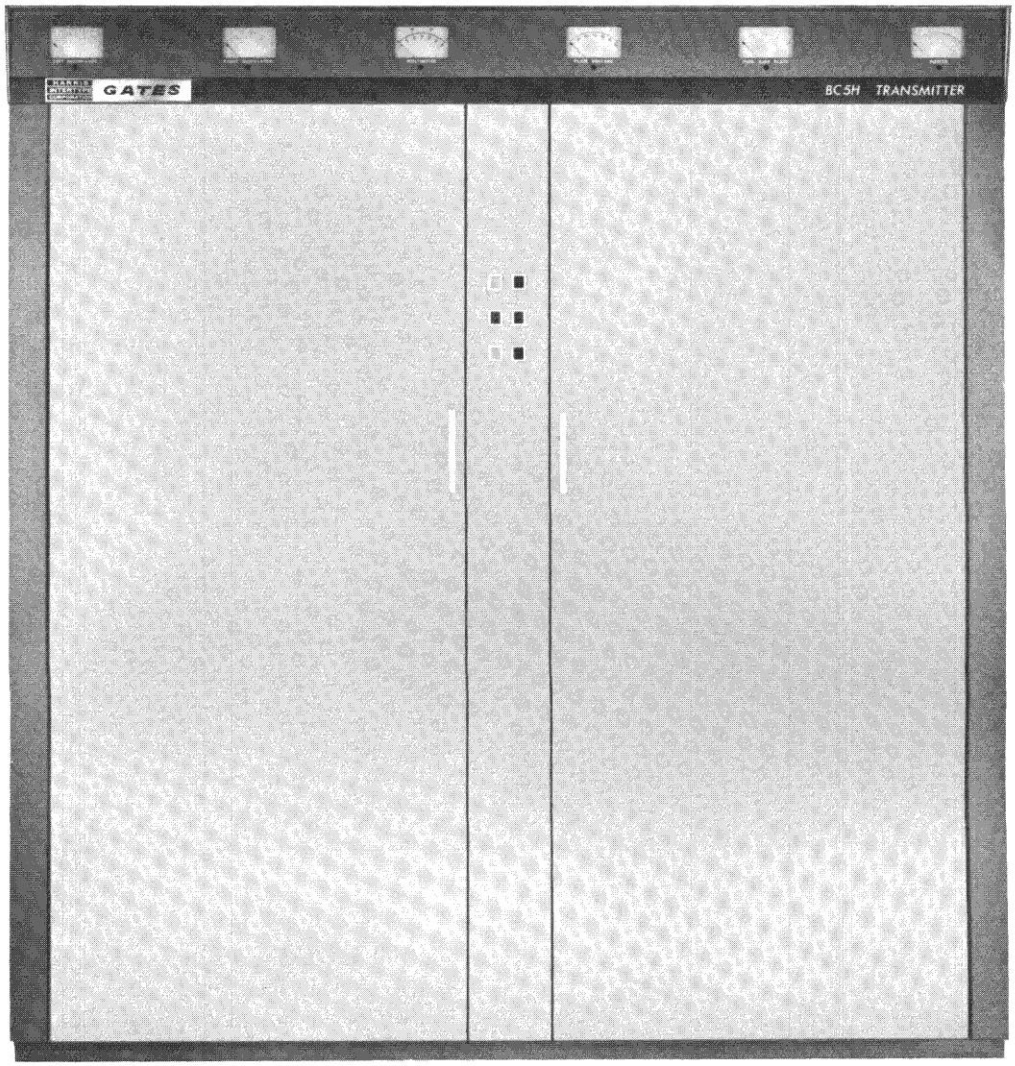
TUBES USED: (4) 3CX2500F3, (1) 4-400A. Total—5.

GENERAL INFORMATION Monitors: 10 RF volts output at 50/70 ohms for frequency and modulation monitors.

ORDERING INFORMATION

Model BC-10H transmitter with one set of tubes and two crystals	**994-6522**
100% set spare tubes for BC-10H transmitter	**990-0539**
Set of spare transistors for BC-10H (diodes not included)	**990-0540**
Kit for remote control of power output	**994-6548**

5000 Watt Medium Wave Broadcast Transmitter



MODEL BC-5H

Representing the finest in engineering design, the BC-5H provides superb over-all performance, with top quality audio, high reliability, and extra low power consumption through the use of high efficiency power amplifier circuits.

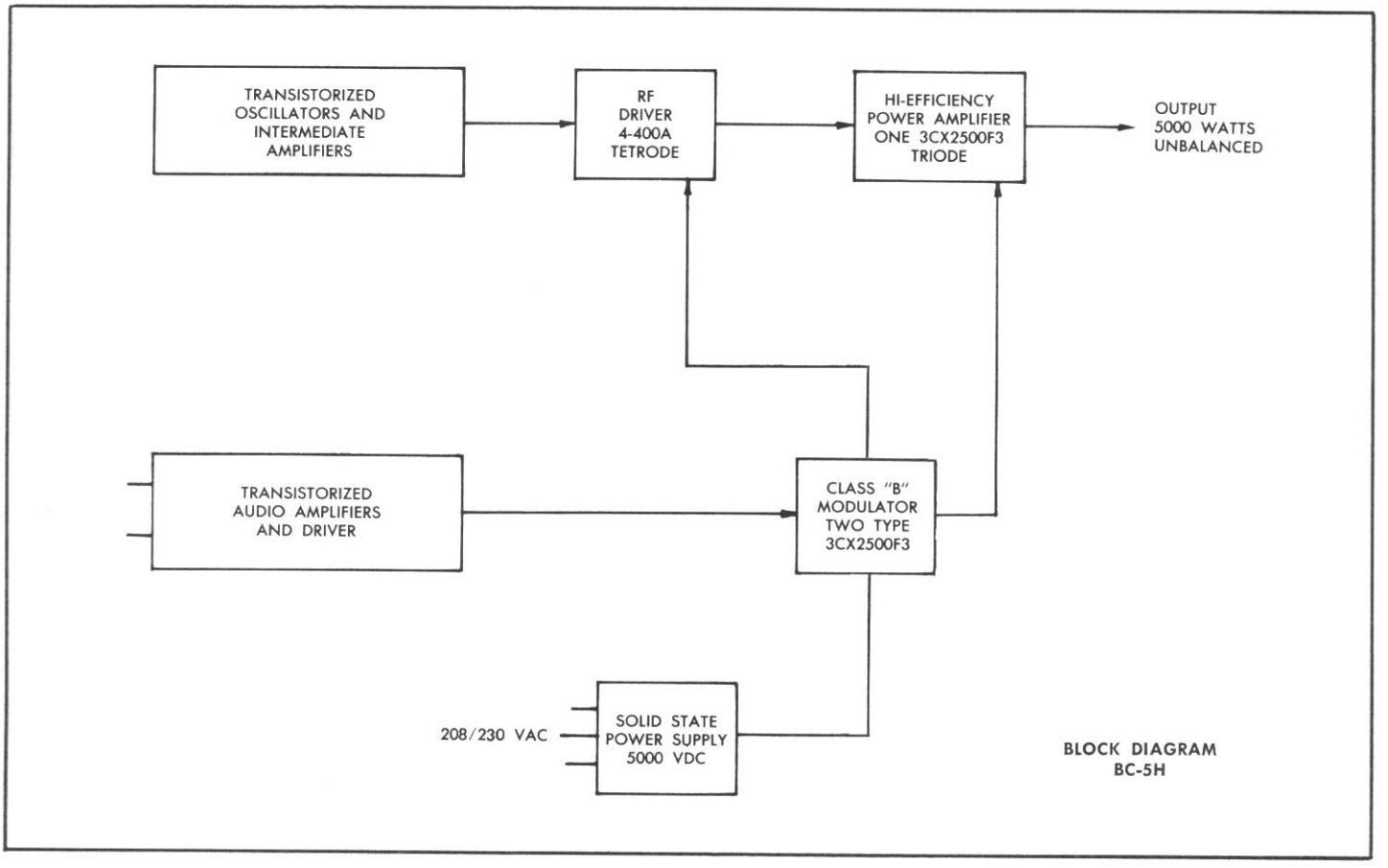
The transmitter is completely self-contained, and requires a floor space of only 72 inches (wide) and 32 inches (deep). The over-all height is 78 inches.

Other features that have helped to make the BC-5H the most popular broadcast transmitter in its power range are: large edgewound silver plated tank and Tee network coils; a low leakage reactance modulation transformer for excellent sound quality; a design that permits easy attachment of remote control; unusually high efficiency; and lowest tube cost of any 5000 watt AM transmitter.

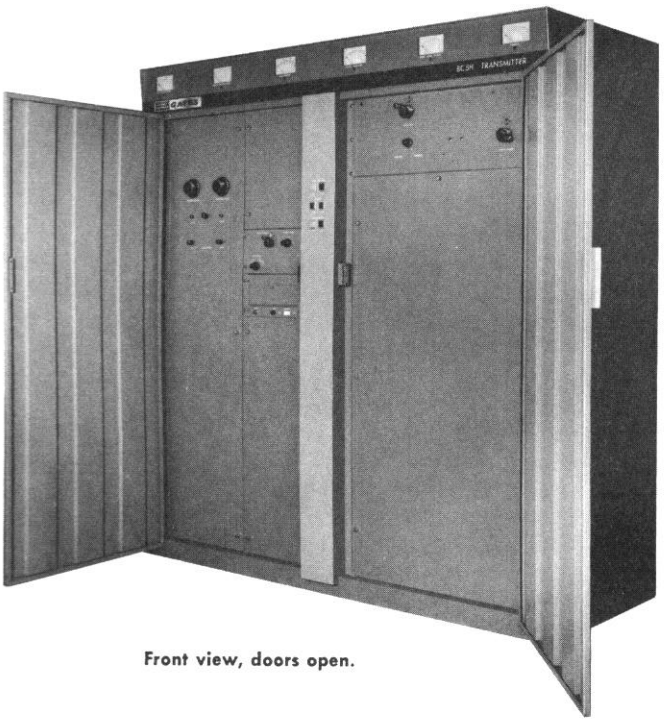
TRANSMISSION FIDELITY: Wide frequency response and low carrier shift are important considerations in the design of an AM transmitter. The extremely wide audio response and superior reproduction of audio dynamic range in the BC-5H testify to its advanced engineering development—evident to all who hear this transmitter's excellent broadcast signal.

RF SECTION: In the RF circuit, a transistor oscillator (instantly switchable to a back-up oscillator), drives a transistorized amplifier, which provides drive for the type 4-400A tetrode RF driver. This driver stage is modulated to improve the over-all performance of the transmitter. The 4-400A drives a single 3CX2500F3 power amplifier tube, which is high level plate modulated, and uses high efficiency RF circuits to improve the power amplifier efficiency to 90%. The power amplifier feeds a full Tee network.

5000 Watt Medium Wave Broadcast Transmitter—BC-5H



BLOCK DIAGRAM
BC-5H



Front view, doors open.

AUDIO SECTION: Four push-pull solid state audio amplifier stages amplify the audio signal from input level to full drive power for the modulator stage. The modulator stage, consisting of two Class B type 3CX2500F3 triodes, provides more than ample power to high level modulate the power amplifier, and modulate the RF driver. Inverse feedback, and an advanced design low leakage reactance modulation transformer/reactor group, results in signal quality of the highest fidelity. The rugged modulation transformer is oil (Askarel) filled for additional protection.

TUBE INTERCHANGE: Both the RF power amplifier and modulator stages use 3CX2500F3 long-life triodes. By periodic rotation many added tube life hours may be gained. Only four tubes of two different types are used in the entire transmitter.

SOLID STATE POWER SUPPLIES: Five separate power supplies assure fine regulation, and add to reliability. Lifetime silicon rectifiers in all power supplies provide a 2 to 1 voltage and a 5 to 1 current safety factor.

HARMONIC ATTENUATION: Harmonic reduction meets rigid FCC regulations, and is achieved through the use of a Tee network in the output circuit, and a second harmonic filter. The harmonic attenuation from the phasor or antenna coupler thus becomes a bonus for still greater harmonic reduction.

5000 Watt Medium Wave Broadcast Transmitter—BC-5H

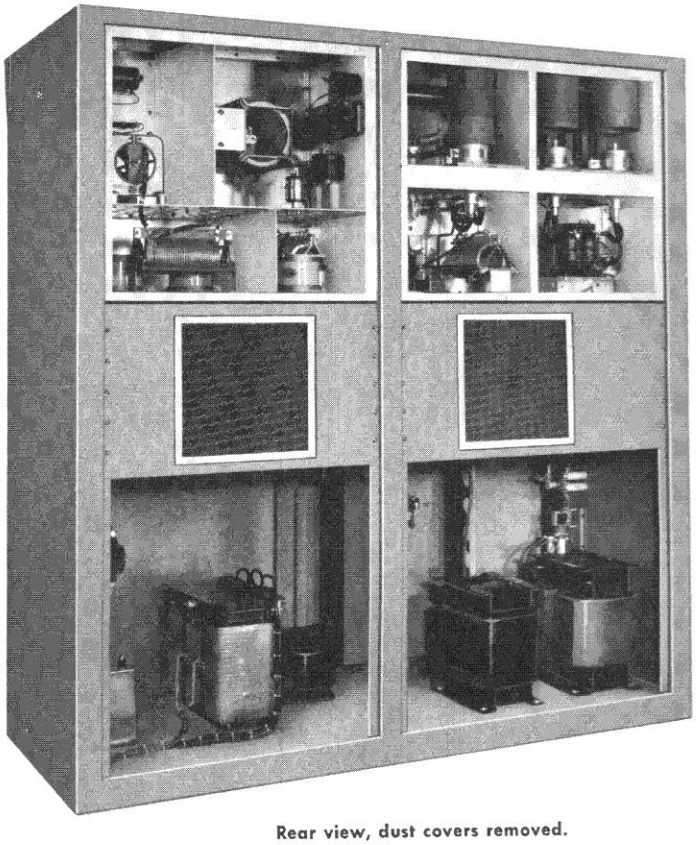
REMOTE CONTROL: Use of relays in the transmitter control circuits makes installation of remote control simple. Terminals are factory installed in the transmitter, so that circuits to be remote controlled may be easily connected.

PROTECTIVE CIRCUITS: Relays are provided for overload, start/stop and interlock circuits, along with pressure type switches. An output power/VSWR meter is standard equipment, and is interlocked in the transmitter control circuitry as a protective device against antenna system malfunction.

RECYCLING: In the event of a direct short in the high voltage supply, the transmitter will recycle three times and then shut down. In the event of flashover, due to an electrical storm, the transmitter will momentarily shut down and then return to the air with no mechanical limit on the number of times recycling may occur.

EFFICIENT COOLING: One low speed Rotron blower cools all tubes, and a special air exhaust vents heat directly to the transmitter exterior to prevent heat circulation within the transmitter cabinet.

ACCESSIBILITY: The BC-5H is 100% accessible, with full length front doors, drop down front panels and removable rear panels. The transmitter control panel is located between the two front doors, and necessary tuning controls are adjustable from the front, in full view of meters which indicate operating parameters.



Rear view, dust covers removed.

SPECIFICATIONS

POWER OUTPUT: (Rated) 5000 watts. (Capable) 5600 watts. Power reduction to approximately 1000 or 500 watts available.

RF FREQUENCY RANGE: 535 kHz to 1620 kHz—supplied to one frequency as ordered.

RF OUTPUT IMPEDANCE: Supplied for 50 ohms, or other as specified.

RF FREQUENCY STABILITY: ±2 Hz.

CARRIER SHIFT: Less than 3% at 100% modulation.

RF HARMONICS: Meets or exceeds FCC specifications.

AUDIO FREQUENCY RESPONSE: ±1 dB 50 to 10,000 Hz. ±1½ dB 30 to 12,000 Hz.

AUDIO FREQUENCY DISTORTION: 2.5% or less 50 Hz to 10,000 Hz at 95% modulation.

NOISE: (Unweighted) 60 dB or better below 100% modulation.

AUDIO INPUT: 600/150 ohms at +10 dBm, ±2 dB.

POWER INPUT: 208/230 volts, 3 phase, 50 or 60 Hz. 10.7 kW zero modulation. 11.9 kW average modulation. 15.6 kW 100% modulation.

AMBIENT TEMPERATURE RANGE: −20°C to +50°C.

ALTITUDE: To 7500 feet standard (higher altitudes on special order).

SIZE: 78" high, 72" wide, 32" deep. Completely self-contained.

WEIGHT: 1850 lbs. unpacked (approximate); 2200 lbs. domestic packed (approximate); 2450 lbs. export packed (approximate).

CUBAGE: 120 cubic feet packed.

FINISH: Beige-gray.

TUBES USED: (3)3CX2500F3, (1)4-400A.

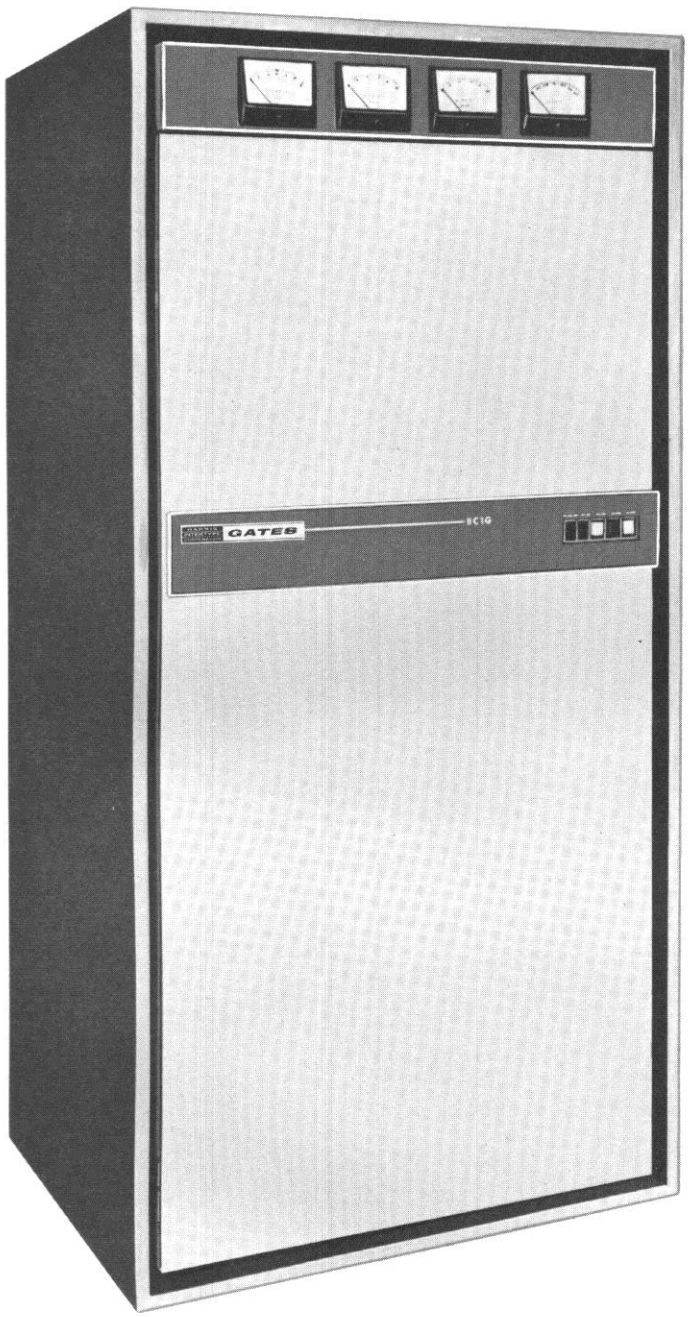
GENERAL INFORMATION: Monitors: 10 RF volts output at 50/70 ohms for frequency and modulation monitors.

ORDERING INFORMATION

Model BC-5H transmitter with one set of tubes and two crystals	994-6521
100% set spare tubes for BC-5H transmitter	990-0535
100% set spare transistors for BC-5H (diodes not included)	990-0540
Kit for remote control of power output	994-6548

HARRIS INTERTYPE CORPORATION GATES

1000/250 Watt AM Broadcast Transmitter



MODEL BC-1G

The "Big G" offers you all of the really important features you look for in a 1 kW AM transmitter . . . such as wide frequency response, great reliability and low operating costs. Another big feature is the high fidelity sound, achieved through low distortion—sound with an unusually rich quality that has become a "Big G" trade-mark.

AUDIO SECTION: Wider frequency response, low harmonic distortion, and low noise . . . the basis of the "Big G's" fine sound . . . result from a unique circuit arrangement. A new low leakage modulation transformer, combined with superb high frequency response has produced typical distortion readings of 1.5% or less at the critical 7000 Hz audio frequency. Push-pull 807 tubes modulate the husky 833A high level modulator tubes, producing an abundance of extra power to provide full performance as tubes age.

RF SECTION: Dual vacuum-type ovenless crystal units provide utmost stability. Frequency adjustment and crystal changeover are made from the front, as are all transmitter control functions. There are four RF stages to assure good frequency stability. Dual long-life 833A tubes feed a generous 1000 watts into a Tee network for exact loading and superior harmonic attenuation. The final amplifier and Tee network are tuned by large, variable edgewound coils.

BUILT-IN DUMMY ANTENNA: The BC-1G may be tested at a full 1 kilowatt output with 100% modulation, using this built-in antenna feature.

POWER REDUCTION: Class IV stations will particularly appreciate the quick and efficient way the BC-1G reduces power to 250 watts. Switching in the primary of the main plate transformer eliminates power consuming, voltage dropping resistors. Plate voltage is reduced on both the power amplifier and modulator tubes, resulting in the possibility of hundreds of added tube hours, as well as savings in power costs.

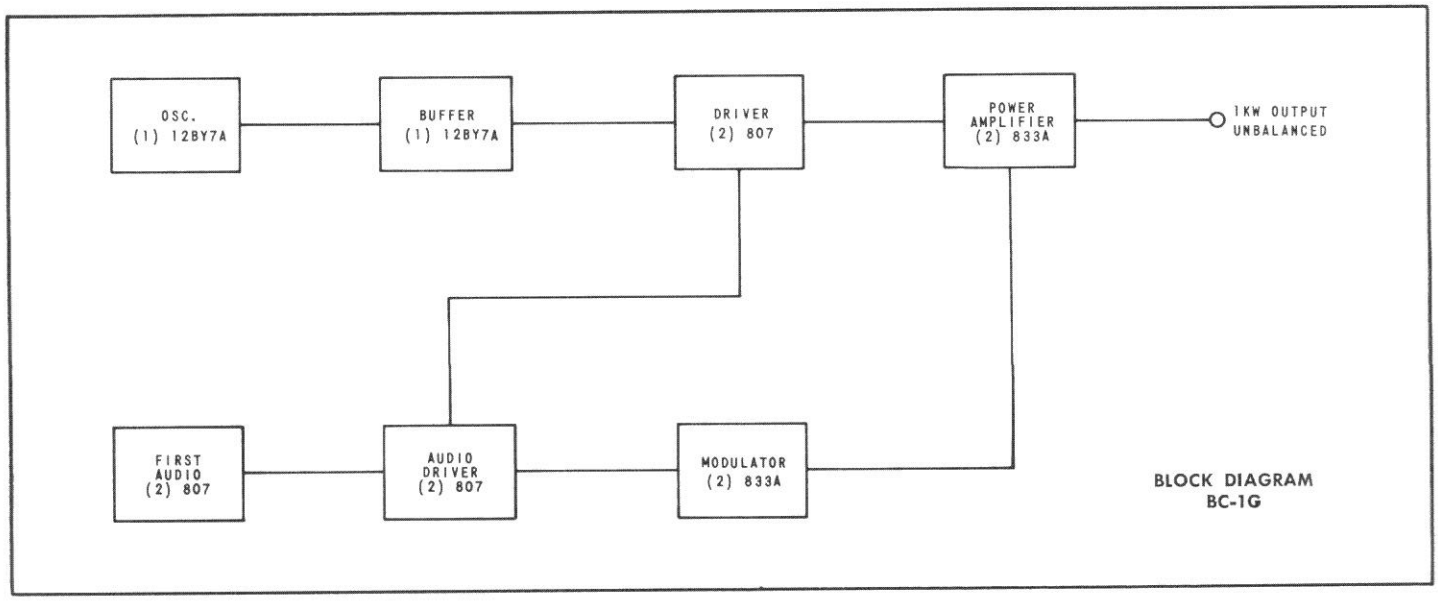
POWER AMPLIFIER TUBES: In search of the most reliable power tube, based both on performance and cost per hour, Gates engineers tested every known tube type available for this service. The result was the selection of the 833A tube for both RF and modulator circuits. The 833A provides a combined hourly tube cost of approximately 2¢, and has worldwide availability. Being a solid, husky triode, it is more tolerant to spurious emissions, and changing operating conditions caused by variances in load or fluctuations in cooling.

REMOTE CONTROL: Built-in metering kits are provided for both plate voltage and plate current. The use of relays throughout permits almost instantaneous adaption to remote control, and eliminates the need for outboard attachments. All electrical connections for remote controlling are brought out to terminal boards.

RECTIFIER SYSTEM: The BC-1G solid state model has three separate power supplies, all with large silicon rectifiers for lower power consumption, lifetime reliability. The three are: (1) main HV supply, (2) intermediate supply, and (3) bias supply.

HARRIS INTERTYPE CORPORATION GATES

1000/250 Watt AM Broadcast Transmitter—BC-1G



BLOCK DIAGRAM
BC-1G

COOLING: The "Big G" was designed from the outset with ideal cooling as a major engineering objective. In the transmitter, parts location is of great importance, and is combined with an intelligent convection cooling system and suction fan ventilation in the top of the cabinet. Fresh air is drawn through dual removable filters at the back base of the transmitter, circulated through every part of the equipment, and then exhausted at the top. Heat generating power tubes are located in the direct air stream. Component and tube life are greatly lengthened by the cool-running operation.

GENERAL DESIGN: The transmitter is completely self-contained in a sturdy steel cabinet. An attractive front door is hinged on the left and opens to expose all tuning controls. Color-coded switches for start-stop and power change functions are accessible from the front when the door is closed. These switches illuminate to show the transmitter operating status at a glance. Behind the front door is a full-length perforated grill for protection when the transmitter is operating . . . it may be removed in seconds by means of snap locks. The back panel is easily removed by turning two thumb screws.

SPECIFICATIONS

POWER OUTPUT: 1000/250 watts. Capable output to accommodate phasor loss, etc., 1100 watts. Also available in a 1000/500 watt model.

RF FREQUENCY RANGE: 540-2000 kHz (as ordered).

RF OUTPUT IMPEDANCE: 50/70 ohms. Other output impedances available on special order.

FREQUENCY STABILITY: ±5 Hz or better.

CARRIER SHIFT: 3% or less with adequate power mains. Typical is 2%.

MODULATION: High level Class B.

AUDIO RESPONSE: ±1½ dB 30-12,000 Hz 95% modulation. Under practical programming conditions ±1½ dB 30-16,000 Hz.

AUDIO DISTORTION: 3% or less 50-10,000 Hz 90% modulation. Under practical programming conditions 2% or less 50-16,000 Hz.

NOISE: (1000 watts) 60 dB or better below 100% modulation. (250 watts) 55 dB or better below 100% modulation.

AUDIO INPUT IMPEDANCE: 150 or 600 ohms at +16 dBm ±2 dB.

POWER CONSUMPTION: 1 kW; 0 modulation, 2650 watts; program modulation, 3150 watts; 100% modulation, 3850 watts. 250 watts; 0 modulation, 1650 watts, programming modulation, 1825 watts; 100% modulation, 2050 watts.

POWER INPUT: 230 volt, 1 phase, 3 wire, 50/60 Hz. (208 volts also available when specified).

DUMMY ANTENNA: 50 ohms. Capable 100% program modulation continuous or 100% sine wave modulation for 20 minutes on and 5 minutes off.

TEMPERATURE: −20° to +50°C (silicon). +5° to +50°C (mercury rectifier).

SIZE: 78" high, 37" wide, 29" deep. Front door swing 32".

WEIGHT: Net, 1000 lbs. Domestic packed, 1140 lbs. Export packed, 1490 lbs. Cubage: 110.

TUBES: (2) 12BY7A crystal oscillator and buffer, (2) 807 intermediate driver amplifiers, (2) 833A RF power amplifiers, (2) 807 1st audio amplifiers, (2) 807 2nd audio amplifiers, (2) 833A modulators. If tube rectifier model purchased, add: (2) 8008 HV rectifiers, (2) 866/866A intermediate voltage rectifiers.

ORDERING INFORMATION

BC-1G transmitter, 1000/250 watts, solid state rectifier model, with tubes, and 1 vacuum crystal_____994-6245

BC-1G transmitter, 1000/250 watts, tube rectifier model, with tubes and 1 vacuum crystal_____994-6245B

Spare 100% tube complement for 994-6245 model_____990-0471

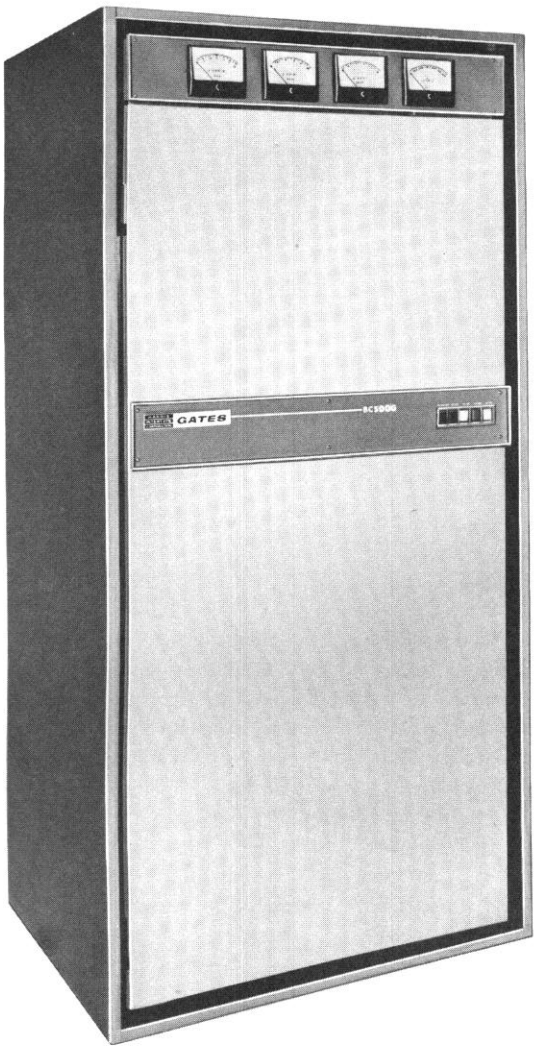
Spare 100% tube complement for 994-6245B model_____990-0472

Output power remote control kit_____994-6326

NOTES: (1) Be sure to specify carrier frequency when ordering. (2) Available for 208 volts, 3 wire, at slight additional cost. (3) Packed weight of 994-6245B tube rectifier model is 25 lbs. greater. (4) Power consumption of the BC-1G with tube rectifiers is slightly higher due to addition of filament transformers.

HARRIS INTERTYPE CORPORATION GATES

500 Watt AM Broadcast Transmitter



MODEL BC-500G

The B-500G broadcast transmitter is essentially the same transmitter as the BC-1G, 1,000 watt model described on pages 20 and 21. It differs only in the use of a single type 833A RF power tube. So complete is standardization that an increase to 1,000 watts at any later date is easily accomplished. As the basic design is around 1,000 watt construction, a bonus of conservatism is built into this 500 watt model.

All of the features found in the 1,000 watt BC-1G are also found in the BC-500G. These features include: a built-in dummy antenna for easier maintenance, solid state power supplies throughout, total accessibility from the front, modulation of the RF driver and power amplifiers, inverse feedback and lower distortion. RF harmonic reduction meets FCC regulations within the transmitter itself as the Pi-Tee output network does not assume that the outside antenna coupler will perform this function. The specifications herein are pertinent to the Model BC-500G, 500 watt transmitter. Any other data is the same as the Model BC-1G.

SPECIFICATIONS

POWER OUTPUT: FCC rated 500 watts. Capability 550 watts.

RF FREQUENCY RANGE: 540 kHz to 2000 kHz (as ordered).

RF OUTPUT IMPEDANCE: 50/70 ohms.

FREQUENCY STABILITY: ±5 Hz.

CARRIER SHIFT: 3% or less at 100% modulation.

AUDIO RESPONSE: ±1½ dB, 30-12,000 Hz. (Typical: ±1½ dB, 30-16,000 Hz under practical programming conditions.)

AUDIO DISTORTION: 3% or less 50-10,000 Hz at 95% modulation.

NOISE: 60 dB, or better, below 100% modulation level.

AUDIO INPUT: 150 or 600 ohms, +9 dBm, ±2 dB for 100% modulation.

POWER INPUT: 230 volts, 3 wire, 50/60 Hz single phase. Power consumption (0 modulation) 1900 watts; (program modulation) 2200 watts; (100% modulation) 2600 watts.

DUMMY ANTENNA: 50 ohms.

MONITORS: Will accommodate all current models. Gates FCC approved M-4990 Frequency Monitor and **M-6659** Modulation Monitor recommended.

SIZE: 78" high, 37" wide, 29" deep. Front door swing 32".

WEIGHT AND CUBAGE: (Domestic) 950 lbs. net., 1100 lbs. packed. (Export) 1350 lbs. packed. Cubage: 100.

FINISH: Two-tone beige-gray.

TUBES: 12BY7A oscillator, 12BY7A 1st IPA, (2) 807 2nd IPA, (1) 833A power amplifier, (2) 807 1st audio, (2) 807 2nd audio, (2) 833A modulators.

ORDERING INFORMATION

Model BC-500G AM broadcast transmitter, 500 watts, with tubes, one crystal, silicon rectifiers 994-6333

Spare 100% tube complement for BC-500G 990-0481

Recommended minimum spare tube kit for BC-500G 990-0479

NOTES: (1) Be sure to specify carrier frequency when ordering. (2) Available for 208 volts, 3 wire, at slight additional cost. (3) Available on special order with tube rectifiers at no increase in price. (4) 500 watt stations may use a 1000 watt transmitter operated at 500 watts power. If 1000 watts is later contemplated, the customer should purchase the Model BC-1G.

HARRIS INTERTYPE CORPORATION **GATES**

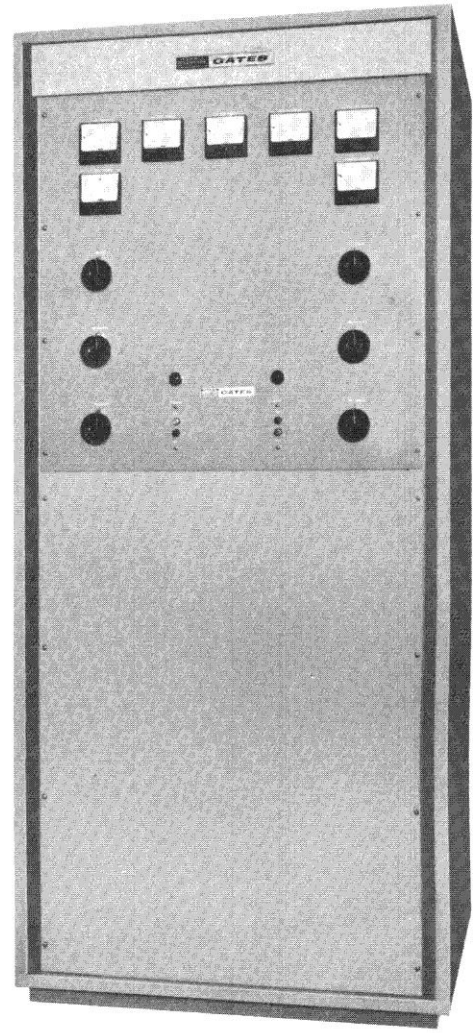
250 Watt AM Broadcast Transmitter

MODEL BC-250GY

Gates 250 watt AM broadcast transmitter is a performance-plus, high fidelity transmitter, complete in every detail for today's modern broadcasting. Features include attractive shadow mold styling, vacuum crystal, and full size back door for 100% accessibility. Fully FCC type approved, Gates BC-250GY transmitter has a world-wide reputation for long, trouble-free service. From Greenland to the Marianas, broadcasters acclaim the excellence and simplicity of this most widely used 250 watt medium wave transmitter.

RADIO FREQUENCY AND AUDIO STAGES: The RF tube line-up consists of a 12BY7 in an oscillator circuit that utilizes a vacuum crystal. A second 12BY7 is used as an intermediate power amplifier to drive a rugged 813, which in turn feeds the parallel 810 power amplifiers. The audio section is push-pull with 6L6 driver tubes operating into the Class B 810 modulator tubes. Interchange of power amplifier and modulator tubes gives added economy and longer tube life.

OPERATING FEATURES: The emphasis is on accessibility, ease of service and well ventilated design. Convection cooling is employed. As a result, the BC-250GY transmitter is silent in operation, and may be operated adjacent to a microphone. Vertical construction permits "walk-in" access. The audio section is a hinged sub-section. Seven meters allow direct simultaneous reading of all important functions. For a conservative, superb performing transmitter, the Model BC-250GY will fill the needs of most discriminating broadcasters.



SPECIFICATIONS

POWER OUTPUT: Rated 250 watts, capable 280 watts.

FREQUENCY RANGE: 540-1620 kHz, as ordered.

RF OUTPUT IMPEDANCE: 30/300 ohms unbalanced, as ordered.

FREQUENCY STABILITY: ±5 Hz.

CARRIER SHIFT: 3% or less, 100% modulation.

MODULATION: High-level plate.

AUDIO RESPONSE: ±1.5 dB 30-10,000 Hz.

AUDIO DISTORTION: 3% or less, 50-7500 Hz at 90% modulation.

NOISE: 55 dB below 100% modulation.

AUDIO INPUT: 500/600 ohms at +8 dBm ±2 dB, 100% modulation.

POWER CONSUMPTION: 1.6 kW at 90% modulation.

POWER INPUT: 230 volts AC, 2 wire, single phase, 50/60 Hz.

POWER FACTOR: Better than 90%.

MONITORS: Will accommodate all modern frequency and modulation monitors.

SIZE: 78" high, 34" wide, 33" deep.

WEIGHT: Domestic, packed—770 lbs.; export—900 lbs.

CUBAGE: 112.

FINISH: Two-tone beige-gray.

TUBES: (4) 810, (2) 6L6, (2) 12BY7, (1) 813, (2) 8008, (1) 5Y4G.

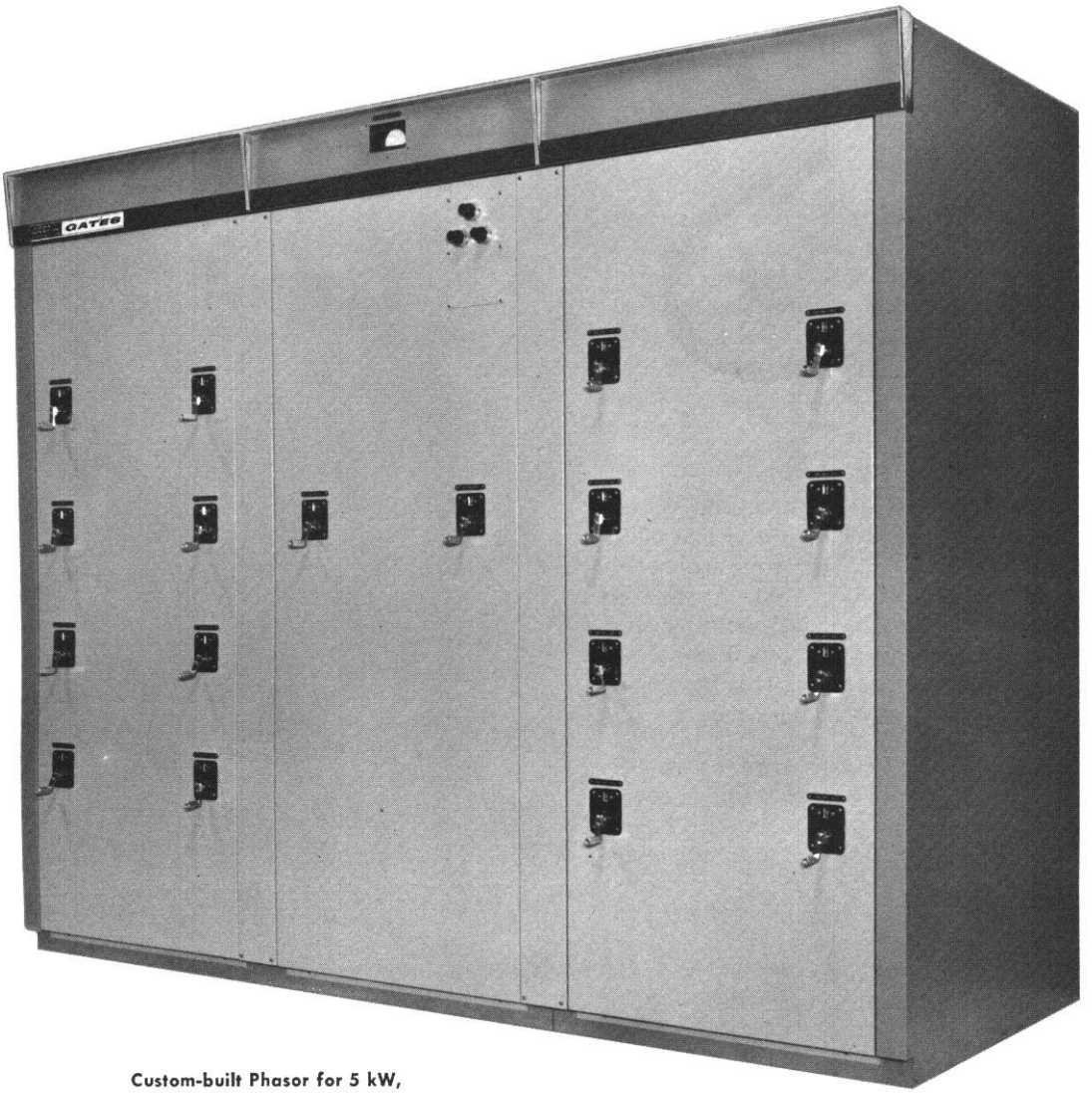
ORDERING INFORMATION

BC-250GY Transmitter, 250 watts, complete with one set of tubes and one vacuum crystal	**994-3760**
Spare 100% set of tubes	**990-0507**
Recommended minimum set of spare tubes	**990-0508**

NOTE: Please state carrier frequency and RF output impedance when ordering.

HARRIS INTERTYPE CORPORATION GATES

Antenna Phasing Equipment



Custom-built Phasor for 5 kW, 5-tower directional AM station.

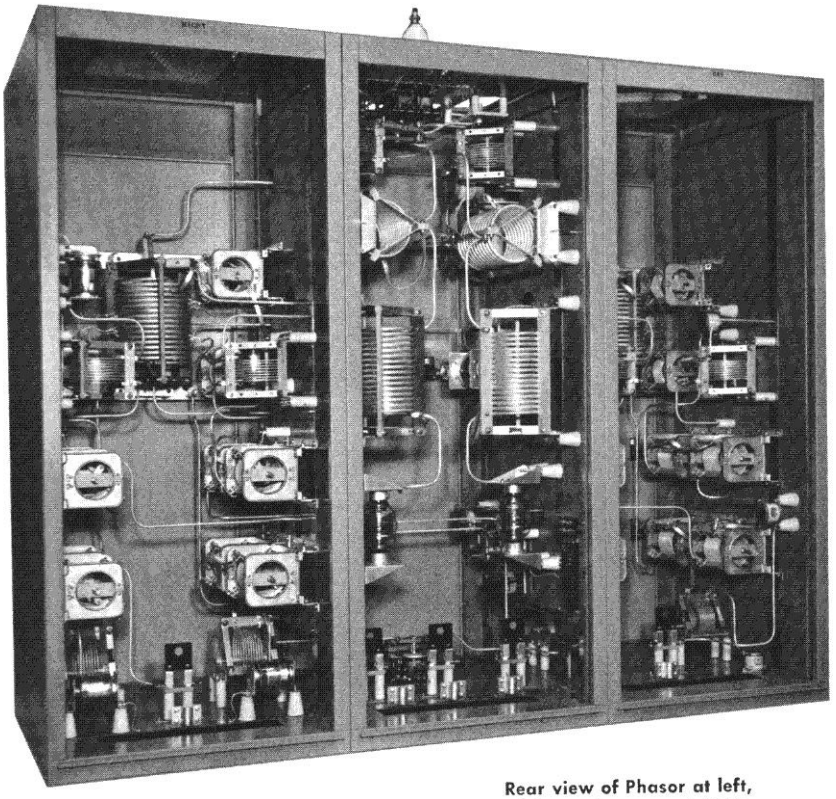
Gates phasing equipment is custom built, utilizing Gates manufactured inductors and other quality components for precise coverage patterns requiring a minimum of adjustment and a maximum of stability. Some of the most complex phasing systems in existence have been built by Gates.

ADVANCED RESEARCH: As the world leader in the design and manufacture of phasing equipment, Gates engages in highly advanced phasor research and development. All Gates phasing systems are computer designed to assure maximum accuracy and most efficient circuitry. Phasor construction is carried out by a group of design and production experts, with years of experience in specialized phasing equipment. This group is under the direction of a registered professional engineer.

CONSTRUCTION: Antenna tuning units are constructed as a panel and shelf type for wall mounting in a doghouse, or in weatherproof metal cabinets. Phasor cabinetry built to your specifications is available, and becomes an integral planning factor in the coordination of design and styling to reflect over-all system compatibility and appearance.

Gates manufactures phasing equipment for any power, for any number of towers; 250 watt to 250 kilowatt tuning units; diplexers for medium wave and for 2-30 MHz short wave; triplexers, rejection filters, and a wide range of radio frequency networks. Each is custom tailored for the particular application, to assure the broadcaster's complete satisfaction.

Antenna Phasing Equipment

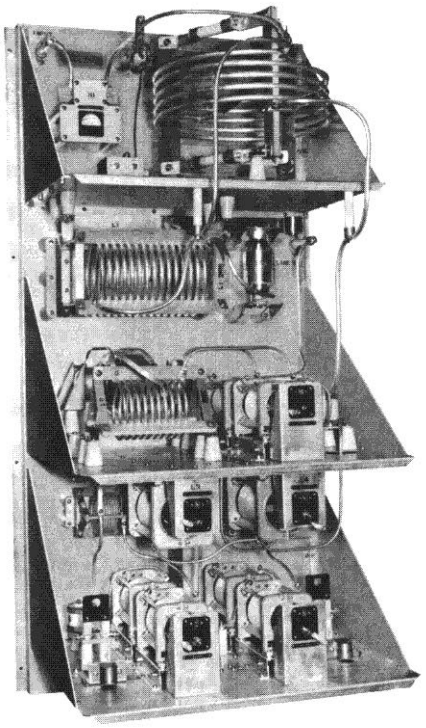


Rear view of Phasor at left, with panels removed. Note the clean mechanical layout.

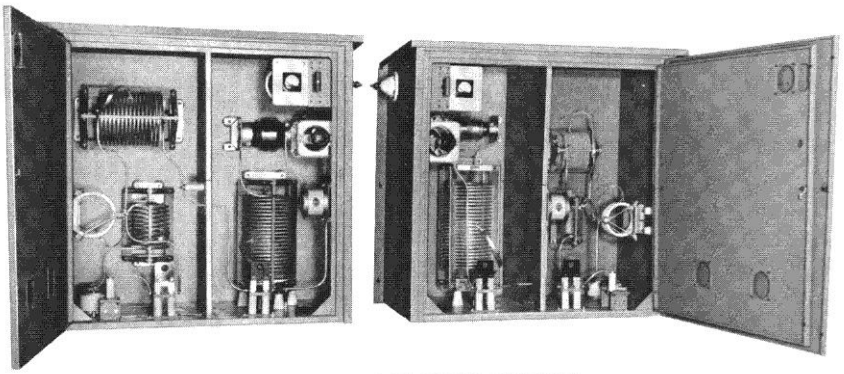
STABILITY AND EFFICIENCY: All directional phasing equipment is designed to the parameters provided by the station's consulting engineer, and work is not initiated until the consultant and customer approve the design. To furnish custom designed phasors suited for specific broadcasting needs, Gates provides detailed specifications for your equipment, so you may determine exactly what you are buying. The full range of adjustment can be precisely determined by computer—before it is delivered. This avoids the possibility of having to replace inadequate components, or make costly field modifications of design to relieve difficult adjustment.

The careful design and construction practices maintained by Gates give you more than reasonable assurance of the best possible long term stability and efficiency. This avoids expensive readjustments and reproof of pattern later on.

Gates phasors are constructed to give a safety factor of 1.4 times on RMS current and four times on maximum RMS voltage based on expected operating adjustments.



CUSTOM-BUILT OPEN PANEL PHASOR.



10 kW MEDIUM WAVE DIPLEXER

Numerous diplexers, triplexers, RF filters and custom designed networks are considered normal design and construction activity at Gates. The above illustrates a 10 kW medium wave diplexer that permits two AM transmitters to feed a common vertical radiator.

Common Point Impedance Bridge

An instrument for permanent installation in the common point of a directional antenna system. Permits the common point resistance and reactance to be measured during normal operation without transmitter shutdown. Panel ammeter reads common point current so that direct antenna power can be determined.

The Model CPB-1 and CPB-1A Common Point Impedance Bridges are operating impedance bridges similar to the Model OIB-1, but designed for permanent installation in your phasing equipment at the antenna common point. Instruments have two 4" dials calibrated directly in resistance and reactance. A panel meter is provided for a null detector. The R & X dials are manipulated as a normal bridge while the transmitter is operating at full or reduced power to give a null indication on the panel meter. The value of the common point resistance and reactance can then be read directly from the two dials.

It has been found that many directional antennas have common point impedances which vary from time to time due to seasonal changes in the ground system and minor tuning drift of the antenna parameters. On many occasions it was found from remeasurement of the common point impedance that the station had been transmitting with somewhat less than full power for some time because of these changes. The CPB-1 and CPB-1A permit the station operator to determine the common point impedance at any time, even during normal operating hours. By minor adjustment of the common point resistance control, he can maintain his radiated power at the full license value at all times. He also has a method of detecting changes in his antenna system which affect the common point. This may alert him to equipment faults and prevent citations for antenna misadjustment.

CPB-1 and CPB-1A bridges are normally supplied mounted on a standard 19" x 7" rack panel. A cutout can be made in the antenna phasing equipment for mounting this panel. Both bridges are also available without the rack panel. A drill template is then supplied, permitting the station engineer to mount the bridge in the existing panel of the antenna phasor.

SPECIFICATIONS

FREQUENCY RANGE: 500-1650 kHz.

POWER RATING: CPB-1—5 kW—100% amp. mod. continuous. CPB-1A—50 kW—100% amp. mod. continuous.

RESISTANCE RANGE: 30-100 ohms.

REACTANCE RANGE: ±50 ohms (1000 kHz).

ACCURACY: Resistance ±2% ±1 ohm. Reactance ±5% ±1 ohm. (Provision is made for your consultant to adjust the calibration to agree exactly with your licensed resistance value).

RF SOURCE: Your transmitter operating at normal or reduced power acts as source—no generator is required.

DETECTOR: Tuned internal detector with 25 ua panel meter—no external detector is required.

AMMETER: Panel hole is provided for Weston Model 308, 3½" square ammeter. A meter recessing bracket is supplied for high power applications. A matching meter for your power and resistance can be supplied.

TERMINALS: Screw terminals or standoff insulators at rear of bridge box for connection to tubing, strap, or jumper to coax is provided.

MOUNTING: Standard 7" x 19" engraved gray rack panel—can be supplied without panel for mounting behind your phasor panel (drill template supplied).

DIMENSIONS: Bridge box without panel: Height: 7", Width: 9", Depth: 9¼". Panel dimensions: 7" x 19".

ORDERING INFORMATION

CPB-1 Common Point Impedance Bridge, 5 kW_____700-0055
CPB-1A Common Point Impedance Bridge, 50 kW_____700-0056

Operating Impedance Bridge

- Measures "in circuit" operating impedance—500 kHz to 5 MHz.
- Handles through power up to 10 kW.
- No signal generator or external detector required for measurement under power.
- Can be used with signal generator and receiver as a normal bridge.
- Measures negative impedance loads.
- Ideal for use in adjusting multi-tower directional antennas.
- Based on new principle.

The Model OIB-1 Operating Impedance Bridge measures the operating impedance of the individual radiators, networks, transmission line sections, and common point of directional antenna systems while they are functioning normally and under power. This "operating impedance" cannot be measured by normal impedance bridge methods because the system characteristics are disrupted when the bridge is inserted in the circuit. The OIB-1 thus satisfies a critical requirement long felt by consulting and broadcast station engineers. In addition it has many applications in other fields that cannot be duplicated by any other instrument.

The OIB-1 is inserted directly in series with the transmission line, network, or antenna. The transmitter power is applied and a bridge balance is obtained by manipulating the R and X dials on the face of the bridge. Balance is indicated by a null reading on the meter which is mounted on the front panel of the bridge. Operating resistance and reactance are then read directly from the bridge dials. The VSWR on a transmission line can be read directly from a scale on the meter.

SPECIFICATIONS

FREQUENCY RANGE: 500 kHz to 5 MHz.

THROUGH POWER RATING: 10 kW, carrier only, no modulation with VSWR 3:1.

INSERTION EFFECT: Equal to 9" of 150-ohm line.

FUNCTIONS: Direct reading in R, −400 to +400 ohms. Direct reading in X, −300 to +300 ohms. Measures VSWR, Z_0=0 to 400 ohms. Indicates relative forward and reflected power.

ACCURACY: R and X, ±2% ±1 ohm. Dials individually calibrated and engraved.

RF SOURCE: Transmitter, transmission line, etc., or signal generator with adapting connector.

DETECTOR: Internal for high power source. Connector on front panel for external detector when used with signal generator. Amplifier for internal detector available as factory installed option if high sensitivity is desired.

TERMINALS: Input and output are large UHF receptacles (UG-357/U). 12" input and output clip leads are supplied as standard with bridge. 18" leads optional at no extra cost when specified with order. External detector connection is BNC.

ACCESSORIES: Aluminum polyurethane-lined transport case.

DIMENSIONS: 12½" x 9½" x 5¼" deep.

WEIGHT: 10 lbs.

ORDERING INFORMATION

Model OIB-1 Operating Impedance Bridge. Specify whether 12" or 18" leads are desired **700-0063**

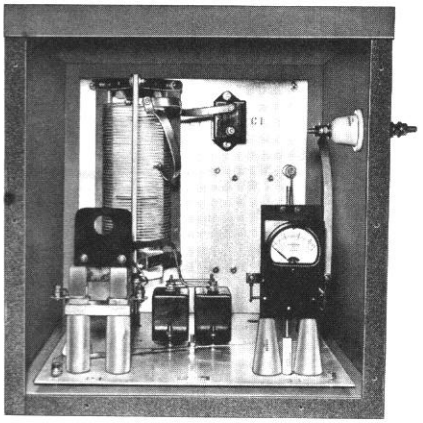
D. C. Amplifier. Used to increase sensitivity of Bridge for use with power sources as low as 25 watts **700-0064**

TC-1 Transport Case. For OIB-1 ..... **700-0065**

HARRIS INTERTYPE CORPORATION GATES

AM Antenna Couplers

WEATHERPROOF SERIES—FED ANTENNA COUPLER, 1250 WATTS



Recommended for broadcast transmitter powers of 1,000, 500 and 250 watts, 100% modulated. Heavy edgewound micalex insulated silver plated coil has generous inductance for a full Tee network along with fixed mica capacitors supplied. Extra room is provided to install either diode or thermocouple remote metering equipment. Heavy duty meter shorting switch eliminates antenna meter from the circuit when not in use for lightning protection. Meter is observed through plexiglass porthole.

Front door of cabinet has been removed for illustrative purposes.

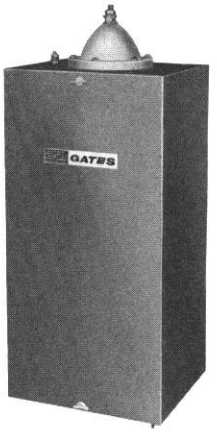
SPECIFICATIONS

CARRIER POWER: Up to 1250 watts AM.
FREQUENCY: 525-1700 kHz as ordered.
LINE IMPEDANCE: 40-230 ohms as ordered.
TO MATCH: Series-fed tower of from 70° to 95° electrical length.
CIRCUIT: Full Tee Network.
WEIGHT: 98 lbs.
SIZE: 20" high, 20¼" wide, 18¾" deep.

ORDERING INFORMATION

Antenna Coupler with antenna meter_994-3494
NOTE: When ordering, state transmission line impedance, frequency, tower height, and tower measurements, if known. For remote meters, see below. Couplers to match unusual loads such as short or tall towers, shunt feed, etc., are available on special order at extra cost.

SERIES AND SHUNT FED COUPLERS



Both series and shunt fed models are constructed in a non-weatherproof cabinet with slip-off front door and large lead in bowl at top. Coil is micalex insulated edgewound silver plated and capacitors are supplied to tune to buyer's specific frequency. Size: 21" high, 10" wide, 9" deep. Usually mounted in small dog house at base of tower. Rating 1250 watts, 100% modulated.

*SERIES FEED MODEL: Provides full Tee network inductance with capacitors to match wide range of input and output impedances. State frequency line impedance, and tower height when ordering. _____994-5178

*SHUNT FEED MODEL: Includes inductor and capacitors to tune out reactance in shunt fed antenna coupling. If tower measurements are known, these are always especially helpful. State line impedance and frequency__994-5179

*NOTE: METER NOT INCLUDED.

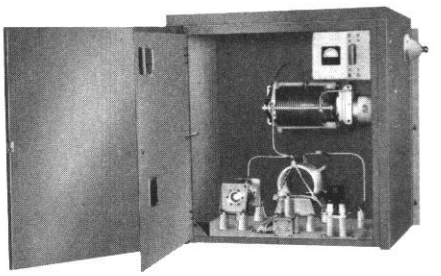
ISOLATION COIL

This isolation coil is quickly made to customer's order by carrying all basic materials in stock. The same type of coaxial cable is used in winding the coil as is used for sampling line. If the customer used Heliax sampling line, then the isolation coil would be wound with Heliax coaxial cable. Nominal inductance 85 uH. Available in weatherproof or open model. Sizes (weatherproof model), 20" wide, 12½" high and 18½" deep. (Open model), 16" wide, 10" high and 16" deep. When ordering, please state type or make of sampling line or preferred coaxial cable for coil construction. Resonating capacitor is not included.

ORDERING INFORMATION

Weatherproof isolation unit_____994-3073
Open unit coil only, less cabinet_____994-4561

WEATHERPROOF 5-10 KW ANTENNA COUPLING UNITS



Housed in aluminum cabinet with double front doors. Porthole for meter reading and heavy duty meter shorting switch operates with doors closed. Large micalex insulated silver plated coils combined with capacitors of generous voltage and current ratings to assure a lifetime of service under extreme heat or cold. A large antenna lead in bowl is provided. Mounting is with metal flanges on the back of the tuning unit for attachment to wooden poles set in ground or for mounting on wall.

SPECIFICATIONS

CARRIER POWER: M-5309A 5,000 watts AM.
M-5309B 10,000 watts AM.
FREQUENCY: 525-1,700 kHz as ordered.
LINE IMPEDANCE: 40-230 ohms as ordered.
TO MATCH: Series fed tower of from 70° to 95° electrical length.
CIRCUIT: Full Tee Network.
WEIGHT: Approximately 200 lbs.
SIZE: 38" high, 37" wide, 21½" deep.

ORDERING INFORMATION

Antenna Coupling Unit, 5 kW_____994-5309A
Antenna Coupling Unit, 10 kW_____994-5309B
NOTE: When ordering, state carrier frequency, transmission line impedance, power, tower height and tower measurements, if known. Couplers to match unusual loads such as short or tall towers, shunt feed, etc., are available on special order, at extra cost.

R. F. ANTENNA METERS

Internal thermocouple standard scale. Weston Model 308, three-inch square case. Other ranges not listed below are available with many carried in stock. Also expanded scale meters in inventory.

ORDERING INFORMATION

Meter, 0-3 R. F. amperes_____634-0206
Meter, 0-6 R. F. amperes_____634-0238
Meter, 0-8 R. F. amperes_____634-0209
Meter, 0-10 R. F. amperes_____634-0210

DIODE TYPE REMOTE METER EQUIPMENT

For remote indication of RF current. Consists of a carefully constructed pickup loop attached through a short coaxial cable to a solid state rectifier assembly. RF current is measured without breaking the main lead. No AC power is required. May be used with any good 1 MA DC meter. Power range: 250 watts to 50,000 watts. Frequency range: 540 kHz to 1600 kHz.

ORDERING INFORMATION

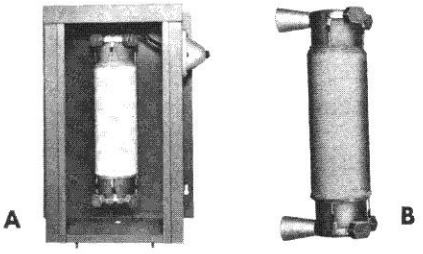
Diode remote meter unit, less meter_____994-6112
Meter 3" sq. case, scale 0-3 R. F. amperes_____632-0418
Meter 3" sq. case, scale 0-5 R F. amperes_____632-0419
Meter 3" sq. case, scale 0-8 R. F. amperes_____632-0420
Meter 3" sq. case, scale 0-10 R. F. amperes_____632-0421
Meter 4" sq. case, scale 0-3 R. F. amperes_____632-0424
Meter 4" sq. case, scale 0-8 R. F. amperes_____632-0426
Meter 4" sq. case, scale 0-10 R. F. amperes_____632-0361
Meter 4" sq. case, scale 0.15 R. F. amperes_____632-0428

NOTE: Other meter scale ranges available at extra cost. Above for use with diode remote unit, not thermocouple.

HARRIS INTERTYPE CORPORATION **GATES**

AM Antenna Coupling Accessories

SOLENOID TOWER CHOKES



(20 AMP AC RATING)

Most popular of all tower light isolation chokes. Available in 2 or 3 section and in open type, or weatherproof as illustrated. Wound on heavy triple X tubing with mica-by-pass condensers on each circuit end. Inductance approximately 350 uH. 3" stand-off insulators are part of coil. (Weatherproof type), 24" high, 17¾" wide, 10¼" deep. Illustration to left shows weatherproof unit with front cover removed.

ORDERING INFORMATION

Tower Choke, 2 wire, weatherproof, Fig. A **994-3937**
Tower Choke, 3 wire, weatherproof, Fig. A **994-3938**
Tower Choke, 2 wire, open type, Fig. B **994-3935**
Tower Choke, 3 wire, open type, Fig. B **994-3936**

RADIO FREQUENCY CONTACTOR

A heavy duty solenoid operated RF contactor for most switching applications through 50 kW power. Available in either SPDT or DPDT types and in two voltage ratings. Will operate on 115/230 volts AC, latching type. Will handle up to 25 amperes RF per contact.

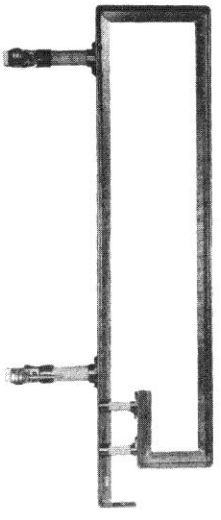
ORDERING INFORMATION

Contactor SPDT insulated 17 kV peak voltage **570-0001**
Contactor DPDT insulated 17 kV peak voltage **570-0002**
Contactor SPDT insulated 22 kV peak voltage **570-0003**
Contactor DPDT insulated 22 kV peak voltage **570-0004**

LARGE INVENTORY OF METERS

In the manufacture of transmitting and audio equipment for broadcasting, communications and defense, Gates is required to carry thousands of meters in inventory. Whether AC, DC, or RF, or microammeter, milliammeter or ammeter, it is very likely the meter you need in emergency or expansion is quickly available. Give us desired case size, range and type of movement and we will serve you speedily. Many meters are also carried at our Houston, Texas branch.

HEAVY DUTY SAMPLING LOOP



This is a very rugged fixed non-shielded RF sampling loop. It is heavily galvanized after welding, and is fitted with large steatite insulators and heavy duty tower leg clamps for easy and positive mounting. Complete with type "N" jack. For 50 to 70 ohm sampling line.

ORDERING INFORMATION

Heavy duty sampling loop **994-6126**

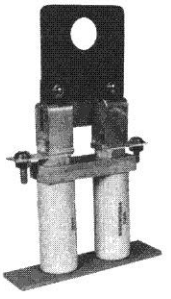
ROTATING PHASE SAMPLING LOOPS

This model is especially applicable where high current ratios are to be sampled. May be rotated so that phase monitor amplitude values are nearly equal. Electrostatically shielded and insulated from tower. May be used with or without isolation coil at base of tower. Coil is single loop, heavily insulated from base frame. Matches either 50 or 70 ohm line. Size: 48" wide, 32" high.

ORDERING INFORMATION

Rotating Sampling Loop **994-3283**

METER JACK AND SHORTING BAR-MOUNTING PLUG

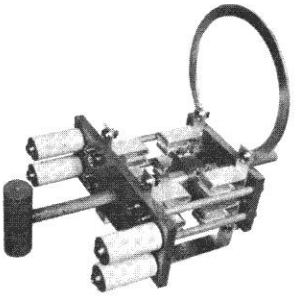


A great convenience to allow RF current measurements to be made by simply plugging in a meter. Will accommodate most 3" or 4" meters. A "must" in critical RF circuit areas in phasors, couplers, etc. Rating up to 50 kW on a 50 ohm line.

ORDERING INFORMATION

Meter jack and shorting bar **994-3280**
Meter mounting plug **994-3281**

METER SHORTING SWITCH



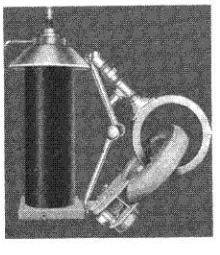
A heavy duty, make-before-break meter shorting switch of the plunger or push type. Heavy bronze tempered spring grips on both sides assure accuracy and durability.

ORDERING INFORMATION

Meter Shorting Switch, rating 40 amperes **994-6527**
Meter Shorting Switch, rating 15 amperes **994-3493**

AUSTIN RING TYPE TOWER CHOKE

Ring type tower choke is a transformer with clear air space between primary and secondary, and minimum antenna shunting effects. Independent of frequency. All models are for 115/230 volt primary and 115 volt secondary. Base insulator in photo for illustration purposes only.



ORDERING INFORMATION

CAP-KVA	MFG. STYLE	LBS.	ATTACHMENTS	ORDER NO.
1-1.75	Side Bracket	81	none	710-0051
1-1.75	Side Bracket	85	lightning gap	710-0052
1-1.75	Pedestal	82	none	710-0053
1-1.75	Pedestal	86	lightning gap	710-0054
2-3	Side Bracket	188	none	710-0055
2-3	Side Bracket	201	lightning gap	710-0031
2-3	Pedestal	182	none	710-0056
2-3	Pedestal	200	lightning gap	710-0057

HARRIS INTERTYPE CORPORATION **GATES**

AM Modulation Monitor

MODEL M-6659

Gates' AM Modulation Monitor is an FCC type-accepted solid-state instrument designed to meet or exceed all requirements for measuring modulation percentages of broadcast and short-wave stations in the frequency range 540 kHz to 30 MHz. It will provide the accurate and dependable monitoring required by the FCC, and is suitable for proof-of-performance measurements.

CONTROLS: Three functional controls are located on the front panel, and mounted in-line for easy adjustment: (1) carrier-level setting, (2) a range selector control covering negative peak percentages, and (3) a modulation meter switch for choosing either negative or positive peaks. Switches and terminal connections are mounted on the rear of the chassis.

MONITOR ACCURACY: Gates monitors are factory calibrated by precision instruments and need no further adjustment. The monitor's solid-state circuits are not affected by ageing and the resulting change in circuit constants that normally affect calibration accuracy.

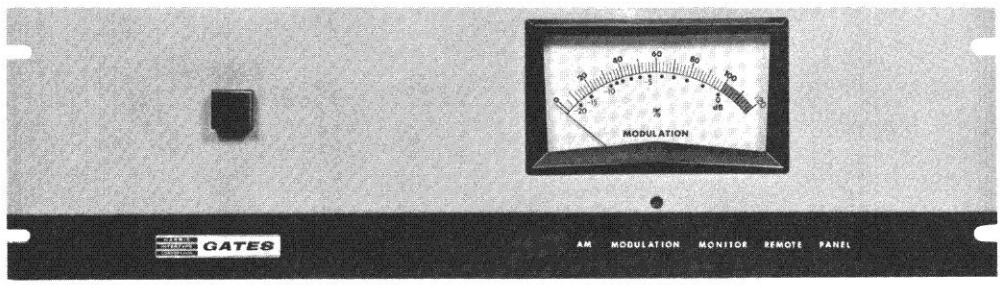
MODULATION METER: Correct positive or negative peak indications, even on program bursts as short as 40 to 90 milliseconds, assure true peak measurement regardless of the wave forms encountered.

OVER-MODULATION FLASHER: Operation of the flasher light is adjusted by the calibrated negative-peak control, and has the same superior accuracy as the meter.

AUDIO OUTPUTS: Proof-of-performance measurements can be taken from the monitor's high-fidelity output with absolute assurance that readings of transmitter performance are accurate. A 600-ohm audio output is also provided to supply aural monitoring in the control room.

REMOTE OPERATION: Modulation readings by meter and flasher at a distant location are obtainable with a Gates optional remote meter panel. Separate output circuits provide (1) a ballistically correct signal for a remote meter and (2) a remote flasher, connected by two loops with a length of up to 2,000 ft. of #22 or larger wire.

AM Modulation Monitor–M-6659



REMOTE METER AND FLASHER PANEL

SPECIFICATIONS

FREQUENCY RANGE: 540 kHz to 30.0 MHz.

RF INPUT: For 50/75 ohm line at 6 to 20 volts.

MODULATION INDICATION:

METER: 0% to 100% on negative peaks.
0% to 120% on positive peaks.

FLASHER: 50% to 100% in 5% steps on negative peaks. Flashes when negative modulation is within 2% of dial setting.

ACCURACY: Meter is ±2% of full scale at 1000 Hz. Flasher is ±2% at 1000 Hz.

RESPONSE TIME:

METER: Responds to within 90% of correct reading with a single 65 (±25) millisecond pulse of modulation. Needle returns to 10% of reading in 650 (±150) milliseconds after signal is removed.

FLASHER: Responds to less than one millisecond pulse of modulation and remains on for about 0.5 second.

AUDIO MONITOR OUTPUT:

FREQUENCY RESPONSE: ±0.5 dB from 20 Hz to 20 kHz.

DISTORTION: Less than 0.3% with 600-ohm load at 100% modulation.

OUTPUT VOLTAGE: At 100% modulation, output is 0.55 volts into a 600-ohm load, approximately −10 dBm average.

OUTPUT IMPEDANCE: 600 ohms, unbalanced.

FIDELITY MEASURING OUTPUT:

FREQUENCY RESPONSE: ±0.5 dB, 20 Hz to 20 kHz.

DISTORTION: Less than 0.3%.

OUTPUT VOLTAGE: At 100% modulation, output is 4.4 volts with a load resistance greater than 100,000 ohms.

OUTPUT IMPEDANCE: 4000 ohms, unbalanced.

NOISE: 70 dB below nominal outputs of both monitoring and fidelity outputs.

REMOTE OUTPUT: For meter and flasher indications at another location, use Gates remote meter panel: 994-6687.

PHYSICAL & MECHANICAL DIMENSIONS:

SIZE: 19" long x 7" high x 6" deep. Will mount in a standard relay rack.

WEIGHT: Domestic, 12 lbs. Export, 21 lbs. Cubage, 3. cu. ft.

POWER SOURCE: 105-125 volts, 50/60 Hz., 10 watts.

SERVICE CONDITIONS:

AMBIENT TEMPERATURE RANGE: −4° to 125° F. (−20° to 52° C.).

AMBIENT HUMIDITY RANGE: 0% to 95% relative humidity.

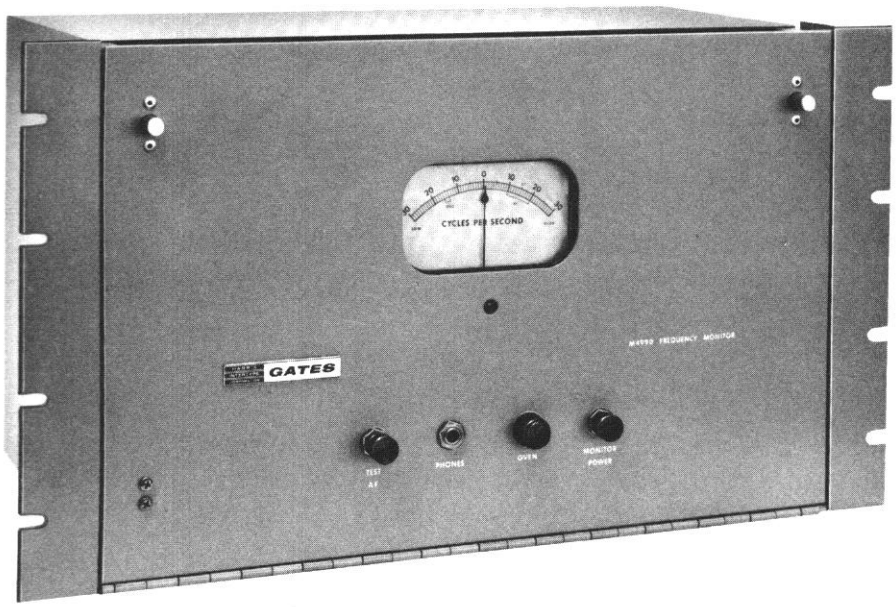
ALTITUDE: Sea level to 7500 feet.

ORDERING INFORMATION

Solid-State AM Modulation Monitor	**994-6659**
Remote Meter Panel	**994-6687**

HARRIS INTERTYPE CORPORATION GATES

AM Frequency Monitor



MODEL M-4990

The major requirements of a broadcast frequency monitor are reliability, and extreme accuracy in indication of the carrier frequency. Progressive engineering has provided both in Gates FCC type approved M-4990 Frequency Monitor.

Significant improvements include an amplified intermediate frequency that is limited prior to the discriminator circuit. As a result, heavy modulation or a wide change in RF input level will have essentially no effect on the accuracy of the frequency meter reading. The precision vacuum type crystal easily meets FCC stability requirements, and is mounted in a temperature controlled chamber, along with oscillator components. This results in one-half part per million frequency accuracy. Another engineering improvement is the greatly simplified balanced discriminator circuit. The older and often troublesome meter reactance box has been discarded.

For remote control operation, the M-4990 Frequency Monitor may be operated as an off-the-air monitor, or over telephone lines when used with the Gates M-5631 Extension Meter Panel.

Frequency is direct reading. The same meter, by switching, also indicates; (a) carrier level, and (b) oscillator current. Controls include: AF level for correct input signal; phone jack for 1,000 Hz tone; power switch and OVEN ON pilot light.

SPECIFICATIONS

FREQUENCY RANGE: 540-1600 kHz (as ordered).

METER: Reads direct 30-0-30 Hz above and below carrier frequency.

OSCILLATOR AND STABILITY: Electron coupled, 1,000 Hz below assigned frequency. Accuracy of ±0.5 parts per million. Over-all monitor stability, ±2.0 parts per million.

INPUT: 50/70 ohms. Will operate on input as low as 5 mV. When direct connected, will accommodate input voltages from 5 to 50 volts. The input signal may be either modulated or unmodulated.

POWER INPUT: 105/125 volts, 50/60 Hz, 85 watts.

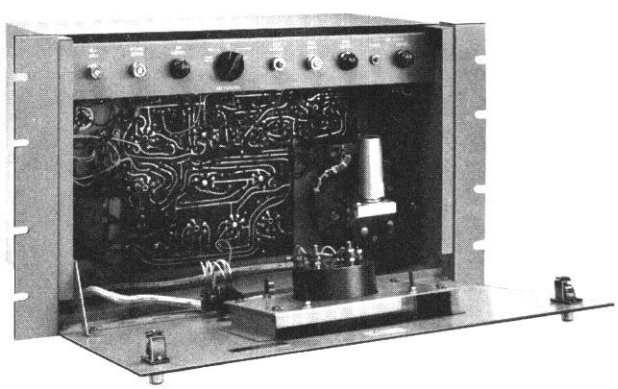
TUBES: (5) 6AU6, (3) 6AQ5, (2) 6AL5 and (1 each) 12BY7A, 6C4, 12AT7, 6X4, OB2 and 13-4 ballast tube.

FCC APPROVAL: No. 3-102.

MECHANICAL: 19" x 10½" x 10½" deep. Weight packed (domestic) 53 lbs., (export) 77 lbs. Cubage: 4. Finish: beige-gray.

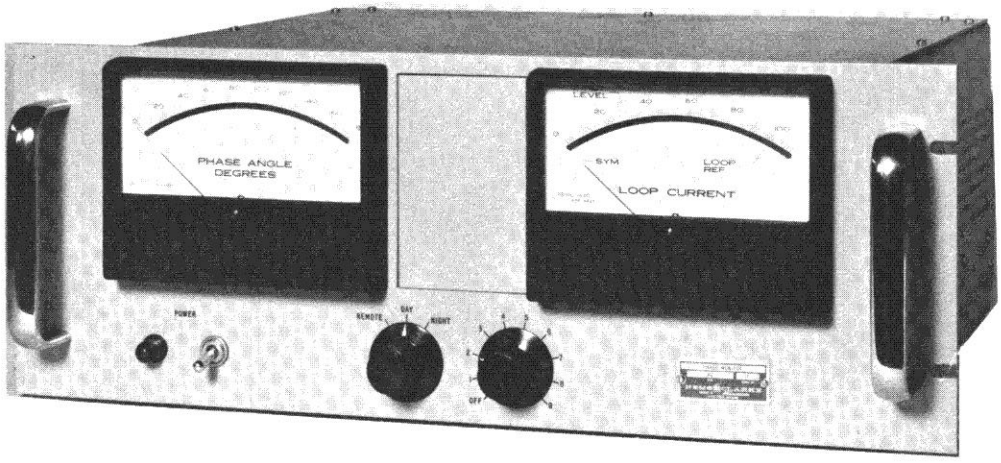
ORDERING INFORMATION

Frequency Monitor with tubes	994-4990
Remote Control Extension Meter (see Page 71)	994-5631
Spare 100% tube kit for monitor	990-0281



Front panel hinges down for easy maintenance and operating adjustments. Note the circular temperature-controlled oven containing all oscillator components and the precision vacuum type crystal. A slip-on dust cover protects tubes and terminations.

HARRIS INTERTYPE CORPORATION **GATES**



PHASE MONITOR

A completely solid state AM phase monitor for directional systems up to 9 towers. Phase readings are not affected by modulation, and are accurate to ±1°. Silicon transistors and taut-band meters assure greatest reliability.
The Model 112 phase monitor is easy to operate, easy to read, and it is fully adaptable to remote control operation.

SPECIFICATIONS

FREQUENCY RANGE: 540-1600 kHz.
ACCURACY: ±1°. Phase resolution: 0.5°.
INPUT IMPEDANCE: 50 or 75 ohms.
NUMBER OF INPUTS: Up to 9.
INPUT LEVEL: 1.5 to 20 volts RMS.
POWER REQUIRED: 115/230 VAC, 15 watts. 50/60 Hz.
SIZE: 19" W x 7" H x 14" D.
WEIGHT: 20 lbs.

ORDERING INFORMATION

Model 112 Phase Monitor (State number of towers) **731-020X**

FIELD INTENSITY METER

The battery operated Model 120E field intensity meter is universally used to measure field strength in the 540-1600 kHz broadcast band. Accuracy of measurement is assured by a calibration method that compensates for variations in tube characteristics and for voltage variations in the self-contained battery power supply. The 120E is a necessary item for initial and periodic directional antenna measurement and proof of performance.

SPECIFICATIONS

FREQUENCY RANGE: 540-1600 kHz.
MEASUREMENT RANGE: 10 microvolts to 10 volts per meter.
ACCURACY: 2%.
OUTPUT INDICATOR: Direct reading. Provision for recorder.
TUBES: (4) 1T4, (2) 1R5, plus two IN34A diodes.
BATTERIES: (5) 1.5 volt flashlight type, (2) midget 67½ volt "B".
Note: These standard type universally available batteries are not supplied, but may be purchased locally.
SIZE: 9" high, 13" wide, 5¾" deep.
WEIGHT: 12½ pounds.

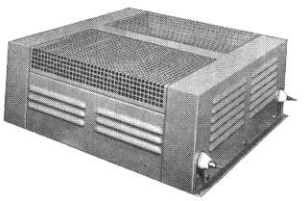
ORDERING INFORMATION

Model 120E Field Intensity Meter (less batteries) **700-0001**

Dummy Antennas

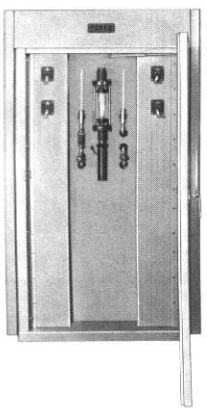
The dummy antenna is perhaps the most needed test device in a broadcasting station. Principal use is tune-up and test without the signal being on the air. For daytime stations, this means routine work may be done after station sign off instead of after 1 a.m. The dummy antenna is most valuable in the event of a transmitting system malfunction. At this time the first problem is always locating the source of the trouble. An open transmission line, a short in the coupler or phasor, a short in a tower light, etc., will usually react by operating the overload relay in the transmitter. By attaching the dummy antenna, the trouble spot is quickly isolated as either in the transmitter or elsewhere in the system.

5 KW AIR COOLED DUMMY ANTENNA



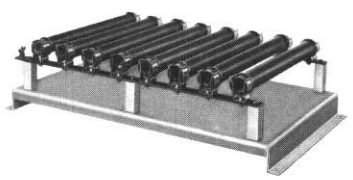
For use with standard broadcast transmitters in the 5 kW power range for tune-up and efficiency tests. Essentially non-reactive. Handles 5000 watts 100% sine wave modulated. For operation between 200 kHz and 2000 kHz. 27½" x 26" x 10¼" high. Available in 50 ohm (Model DU-551) and 70 ohm (Model DU-570).

50 KW WATER COOLED DUMMY ANTENNA



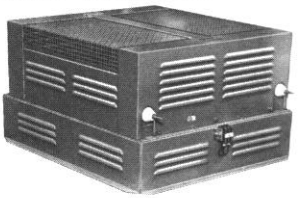
The Gates 50 kW water cooled dummy antenna is available either for medium wave or short wave application. The medium wave unit is essentially non-reactive in the 200-2000 kHz band, and does not usually require a matching network. Both models will easily handle a full 50 kW 100% modulated when provided with suitable water flow. Water of reasonable purity can be used; normal required flow is approximately 15 gallons per minute. Dual thermometers and flow meter are provided for precise power measurement by the calorimetric method. Available in medium wave type with 50, 70, 150, 300 or 600 ohms input impedance as ordered. The high frequency model for operations between 2-30 MHz is available only for 300 or 600 ohms. Size: 78" high, 42" wide, 48½" deep.

1 KW AIR COOLED DUMMY ANTENNA



This unit may be used for any medium wave transmitter at a maximum power rating of 1 kW, 100% modulated. Consists of non-inductive resistors heavily banded together to arrive at correct load resistance. For 200 kHz to 2000 kHz. 20¼" x 12⅝" x 5" high. Available in 50 ohm and 70 ohm models.

10 KW AIR COOLED DUMMY ANTENNA



An air cooled 10,000 watt dummy antenna that will permit 100% sine wave modulation for long periods of time. Essentially non-reactive, it can be used at full rating between 200 kHz and 2000 kHz. Resistance, 50 ohms. This air cooled dummy antenna eliminates need for water connections and is a practical device for tune-up and measurement. 29⅝" x 26" x 16⅜" high. Model M-6107.

100 KW WATER COOLED DUMMY ANTENNA

Designed for high power application, the Model WDL-1000A water cooled dummy load will dissipate a generous 100 kW AM at any frequency up to 30 MHz. Operating impedance is 300 ohms balanced. Other impedances available on special order. This model employs its own captive water system and an external heat exchanger. Water required for cooling need only be reasonably clean and free from mineral content. Heat is dissipated in an external heat exchanger of the water-to-air type. Approximately 150 gallons of water fill the system.

Size, of the dummy load only, is approximately 4' wide, 5' high, 4' deep. Total weight, including heat exchanger, is 3850 pounds packed for shipment. Operates on 230 volts AC, single phase.

ORDERING INFORMATION

DU-551 Dummy Antenna, 5 kW, 50 ohms	994-3968-001
DU-570 Dummy Antenna, 5 kW, 70 ohms	994-3968-002
M-6107 Dummy Antenna, 10 kW, 50 ohms	994-6107
M-5497 Dummy Antenna, 50 kW, medium wave (see Note 1)	994-5497-001
M-5497A Dummy Antenna, 50 kW, high frequency (see Note 1)	994-5497-002
Dummy Antenna, 100 kW, high frequency (see Note 2)	WDL-1000A
DU-151 Dummy Antenna, 1 kW, 50 ohms	994-4354
DU-170 Dummy Antenna, 1 kW, 70 ohms	994-3483

NOTES: (1) Be sure to state resistance, such as 50 ohms. (2) Give power line frequency when ordering, such as 50 or 60 Hz, etc.