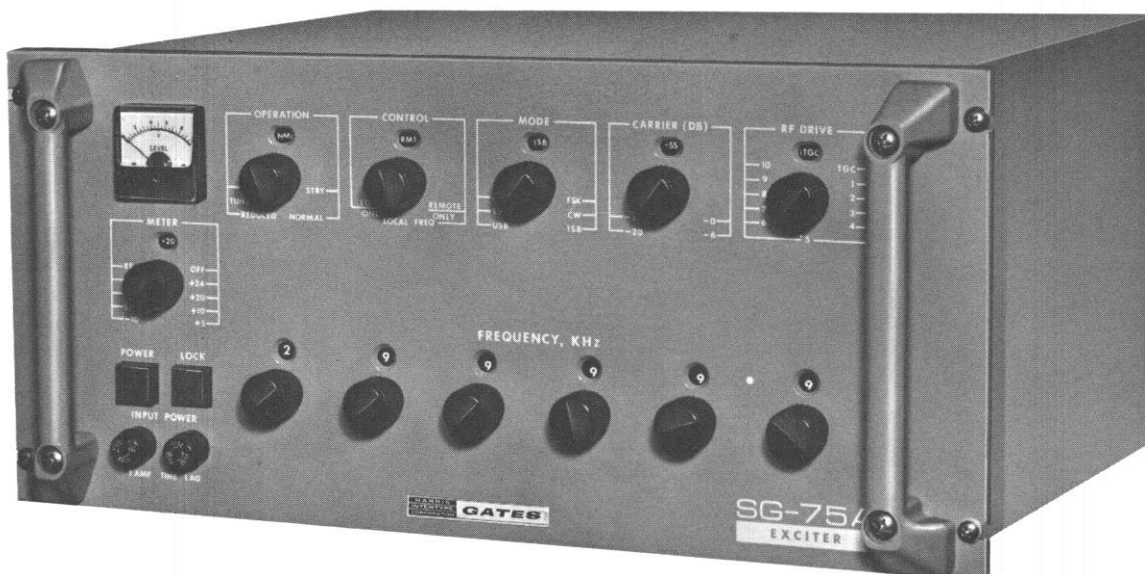


SINGLE SIDEBAND AND COMMUNICATIONS TRANSMITTERS



SG-75A/B Synthesized ISB High Frequency Exciter



Gates SG-75 frequency synthesized independent sideband exciter features total solid state design plus extensive use of integrated circuits. It provides a power output of 100 milliwatts over the 2 to 30 MHz range, and has six separate operating modes. Direct digital frequency adjustments on the front panel permit selection of 280,000 frequencies in 100 Hz increments.

A self-contained wideband frequency shift keyer provides a full carrier shifted in frequency ± 400 to 425 Hz about the center frequency. This eliminates the need for an external keyer or tone oscillator and provides the advantages of direct reading of center frequency.

Automatic gain control is used to control the inputs to balanced modulator stages. Controlled carrier level is provided in the lower, upper and independent sideband modes. This carrier level control is automatically turned off in the FSK mode. Carrier level control is on the front panel along with all normal operating controls. The FSK inputs allow polar, neutral and dry contact keying.

The "B" version of the SG-75 provides selectable carrier insertion compatible with CCIR recommendations.

SPECIFICATIONS

FREQUENCY RANGE: 2 to 29.9999 MHz in 100 Hz steps (280,000 channels).

OPERATING MODES: CW (A_o, A₁), FSK (F₁); AME (A_{3h}); USB, LSB (A_{3a}, i); ISB (A_{3b}).

RATED POWER OUTPUT: 100 mW PEP/CW.

FREQUENCY CONTROL: Digital control of stabilized VFO, synthesized.

OUTPUT IMPEDANCE: 50 ohms nominal.

GAIN CONTROL: Automatic with manual override.

TUNING TIME: 10 seconds.

METHOD OF TUNING: Automatic.

SIGNAL TO NOISE RATIO: In band 50 dB. Out of band 60 dB, exclusive of harmonics.

SIGNAL TO DISTORTION RATIO: 50 dB at rated output. (Distortion products: At rated output, 3rd and higher order products are at least 50 dB below either tone of a standard two-tone test signal).

CARRIER LEVEL: Selectable: SG-75A, 0, -6, -20, -55 dB. SG-75B, 0, -6, -16, -26, -55 dB.

STABILITY: 1×10^{-7} per day (optional 5×10^{-9} per day).

UNWANTED SIDEBAND REJECTION: 60 dB at 500 Hz.

AUDIO INPUT: Two independent 600 ohm channels balanced or unbalanced, -20 to +10 dBm for full RF output with independent AGC amplifiers.

AUDIO FREQUENCY RESPONSE: 250 to 3000 Hz or 250 to 6000 Hz with 3 dB maximum ripple.

FSK CAPABILITY: Wideband FSK built in, adjustable from ± 400 to ± 425 Hz (other shifts optional).

POWER INPUT: 115/230 volts, $\pm 10\%$, 47 to 400 Hz, 50 watts maximum, 2 wire, single phase. All power supplies regulated.

TEMPERATURE: 0° to +50°C.

HUMIDITY: 0 to 95%.

ALTITUDE: Sea level to 10,000 feet.

OUTPUT CONNECTOR: Type BNC.

SIZE: 8 $\frac{3}{4}$ " high, 19" wide, 17" deep.

WEIGHT: 56 lbs. net; domestic pack 75 lbs.; export pack 110 lbs.; Cubage: 6 cubic feet.

OPTIONAL REMOTE CONTROL: Electronic with adapter.

COMPONENTS: All components meet MIL specifications where practicable.

NOTE: The SG-75 exciter operates with Gates 1, 3, or 10 kW linear power amplifiers.

ORDERING INFORMATION

SG-75A synthesized HF ISB exciter.....994-6562-003

SG-75B synthesized HF ISB exciter (CCIR compatible).....994-6562-004

SG-70 ISB High Frequency Exciter



Gates Model SG-70 ISB exciter is equipped to transmit single sideband, independent sideband, compatible AM, CW, MCW, or FSK with adapter. Provisions are incorporated for carrier suppression from -50 dB to 0 dB. A versatile and compact unit designed for accurate and rapid channel change and tune-up, the SG-70 has a self-contained silicon rectifier power supply, and requires only $8\frac{3}{4}$ inches in a standard 19-inch rack for mounting.

The input circuits of the SG-70 include two independent 600 ohm balanced or unbalanced input channels and one high impedance microphone channel. The 600 ohm channels will operate the exciter to full power with a minimum input audio level of -12 dB.

Mode selector switches are provided to switch all inputs to either upper sideband or lower sideband operation.

For the accurate and rapid tuning changes required in HF communications, Gates has designed the SG-70 sideband generator to provide increased utilization through simplified operation. Any one of ten crystal controlled channels may be selected immediately by the turn of a knob. A second selector switch chooses one of 15 frequency bands within the 2-32 MHz range.

Then two final adjustments remain, RF tune and injection tune and the exciter is operational. Exceptional frequency stability is achieved through the use of an oven containing the master solid state transistorized frequency oscillator. The absolute drift never exceeds 8 Hz at any point in the spectrum. The solid state power supply is self-contained. The three generator modules—IF frequency generator, RF section, and Injection generator—are of the plug-in type.

SPECIFICATIONS

FREQUENCY RANGE: 2-32 MHz continuous, band switched.

POWER OUTPUT: 100 milliwatts PEP.

OUTPUT IMPEDANCE: 50 ohms nominal.

OPERATING MODES: USB, LSB, ISB, AME, CW, MCW, FSK with external adapter.

FREQUENCY CONTROL: Temperature controlled crystals, or optional external VFO or synthesizer.

CRYSTAL POSITIONS: 10. Selectable from front panel, with independent trimmer, or synthesizer.

STABILITY: Better than 1 PPM per day.

CARRIER SUPPRESSION: 0 to -50 dB.

SIGNAL TO DISTORTION RATIO: 45 dB @ rated output. (Distortion products: At rated output, 3rd and higher order products are at least 45 dB below either tone of a standard two-tone test signal.)

SIGNAL TO NOISE RATIO: 55 dB.

UNWANTED SIDEBAND REJECTION: 60 dB at 500 Hz.

AUDIO INPUT: Two independent 600 ohm channels balanced or unbalanced. -12 dBm for full RF output. One high impedance microphone channel requiring 1 mV for full PEP.

AUDIO RESPONSE: 250 to 6350 Hz with a 3 dB maximum ripple. Other bandwidths available.

ENVIRONMENTAL: 0° to $+50^{\circ}\text{C}$ operating, or -50° to $+70^{\circ}\text{C}$ non-operating.

POWER CONSUMPTION: 140 watts.

POWER INPUT: 115/230 volts, $\pm 5\%$, 50/60 Hz, 2 wire, single phase.

SIZE: 19" wide, $8\frac{3}{4}$ " high, 17" deep.

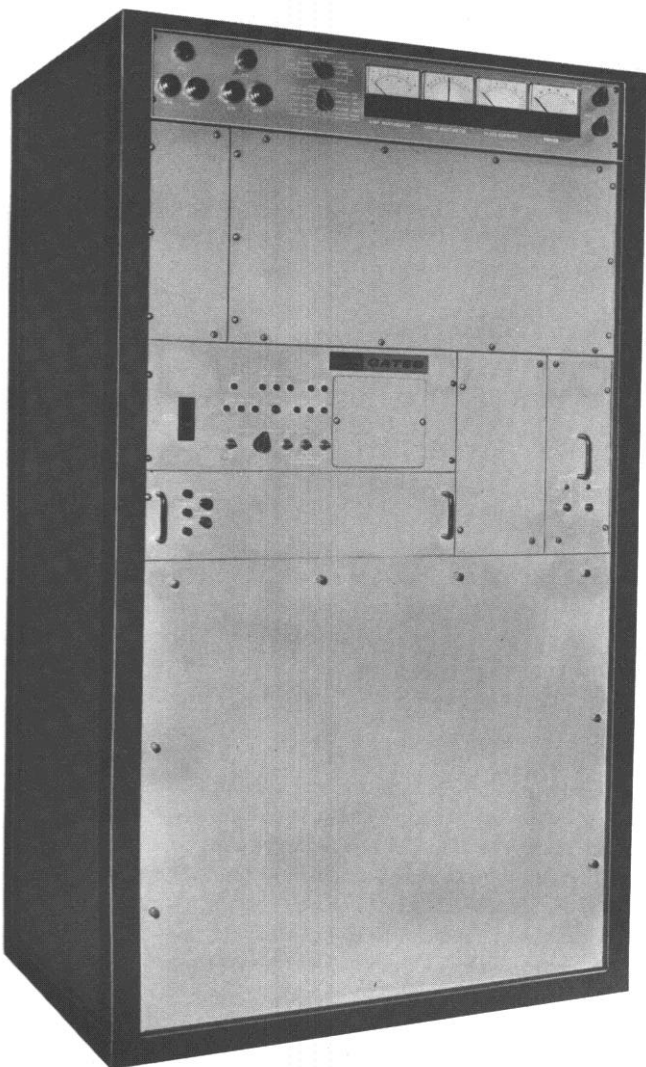
WEIGHT: 56 lbs. net; 90 lbs. export packed. Cubage: 7.5 cubic feet.

NOTE: The SG-70 exciter operates with Gates 1, 3, or 10 kW linear power amplifiers.

ORDERING INFORMATION

SG-70 ISB HF exciter.....994-6411
Complete set of spare tubes.....990-0517

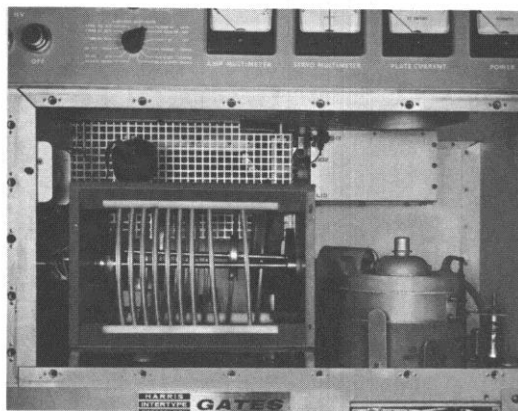
10 kW Automatically Tuned ISB HF Power Amplifier



MODEL ATL-10

Designed for operation in high performance SSB transmitting systems, the Gates ATL-10 linear amplifier requires only 0.1 watt RF drive power to tune automatically from 2-30 MHz in 20 seconds or less. Power output is 10 kW peak envelope or average into an antenna load in any mode requiring linear amplification in a 16 kHz bandwidth. A reliable, simplified tune sequence control governs the automatic tuning circuits with a minimum of control information from the exciter. No band information is required. Prepositioning of the tuning elements is achieved directly from information taken from the input RF frequency, thus making the power amplifier suitable for use with any exciter capable of delivering 100 mW of drive power.

A unique feature of the ATL-10 is the use of DC torque motors to position the tuning elements. These are direct-drive motors



A single 8171/4CX10,000D ceramic tetrode, operating Class AB₁ in a grounded screen configuration, produces the full 10 kW PEP or CW output with maximum stability.

that eliminate much of the mechanical complexity heretofore inherent in automatically tuned equipment. As DC motors are insensitive to power line frequency, the Gates ATL-10 amplifier may be operated from various sources without the need for an optional frequency inverter.

The ATL-10 amplifier, when combined with the Gates SG-75A Exciter, offers full remote control capability. This optional remote control equipment is available to operate both units in a variety of configurations. Combining the SG-75A and ATL-10 produces the advanced STAR-10 sideband transmitter.

RF INPUT: A single type 8233 tube operating Class A in the broad-band input amplifier assures high gain with stability, while maintaining low distortion characteristics. A single type 8321/4CX350A second Class A amplifier also operates completely broad-band. The interstage networks up to and including the input to the driver amplifier are broad-banded and do not require servo tuning.

DRIVER AMPLIFIER: A pair of 8321/4CX350A tubes are operated Class AB₁ to develop satisfactory reserve drive power for the final amplifier grid. Efficiency of this stage is maximized by the use of a parallel tuned matching network to couple into the final amplifier. Approximately 8 dB of RF feedback is applied to the cathode of the driver from the plate circuit of the final amplifier to improve the linearity of these stages.

POWER AMPLIFIER: The final amplifier employs an 8171/4CX10,000D ceramic tetrode operating Class AB₁ in a grounded screen configuration for maximum stability. The grid drive network and plate tank circuits are automatically tuned to resonance by DC control amplifiers and torque motors. The output tuning and loading network is a pi-L filter designed for optimum harmonic rejection and load matching ability. This circuit is capable of matching into a 3:1 VSWR at a full rated power, with optimum loading obtained by the third DC motor and servo system.

10 kW Automatically Tuned ISB HF Power Amplifier-ATL-10

SPECIFICATIONS

FREQUENCY RANGE: 2 to 30 MHz.

OPERATING MODES: Dependent on type of exciter.

RATED POWER OUTPUT: 10 kW PEP or average.

OUTPUT IMPEDANCE: 50 ohms with VSWR up to 3:1.

GAIN CONTROL: Capable of automatic with proper exciter interface.

GAIN VARIATION: 4 dB maximum, 2-30 MHz.

TUNING TIME: 20 seconds maximum.

METHOD OF TUNING: Automatic, remote.

HARMONIC OUTPUT: 2nd, -56 dB below full output, all others 60 dB.

SIGNAL TO NOISE RATIO: 50 dB.

SIGNAL TO DISTORTION RATIO: Capable of 40 dB, 2 to 27.5 MHz; 38 dB, 27.5 to 30 MHz. Distortion products: At rated output, third and higher order distortion products are at least 40 dB below either tone of a standard two-tone test signal 2 to 26 MHz, and at least 36 dB 26 to 30 MHz.)

BANDWIDTH: 25 kHz; 1.5 dB ripple 2 to 4 MHz, 1.0 dB ripple 4 to 30 MHz.

INPUT IMPEDANCE: 50 ohms, 1.5:1 VSWR (maximum).

INPUT CONNECTOR: Type BNC.

RF INPUT POWER: 100 mW maximum for both tune and operate.

POWER INPUT: 200, 210, 220, 230, 240 and 250 volts, $\pm 10\%$, 3 phase, 47-63 Hz, 24 kVA at 0.95 power factor, at 10 kW CW.

TEMPERATURE: 0° to 50°C.

HUMIDITY: 0 to 95%.

ALTITUDE: Sea level to 10,000 feet.

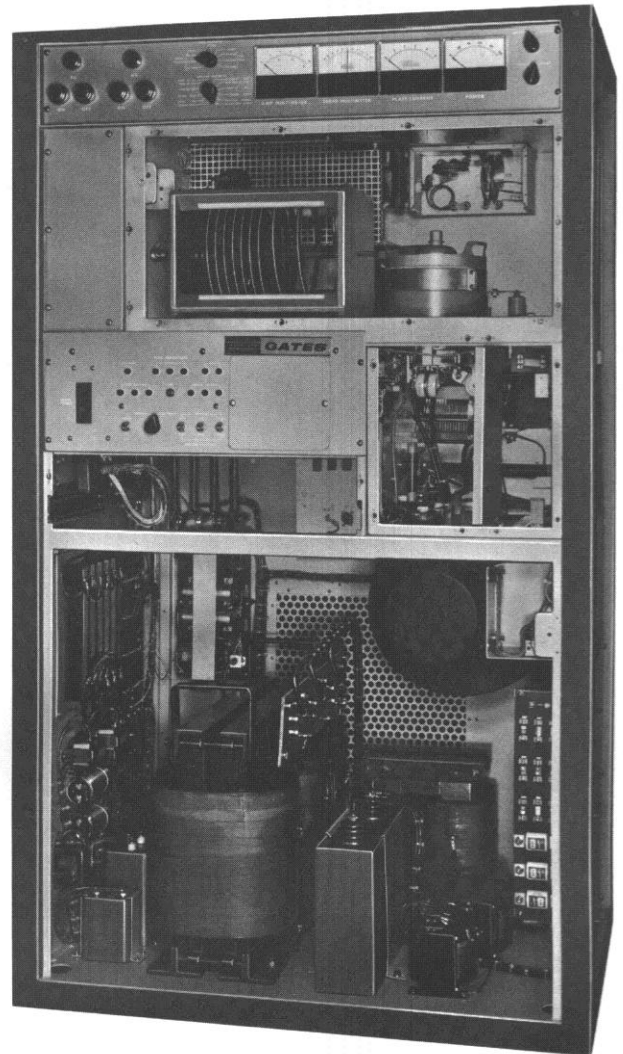
OUTPUT CONNECTOR: 1½" EIA flange.

REMOTE CONTROL: Optional.

COMPONENTS: All components meet MIL specifications where practicable.

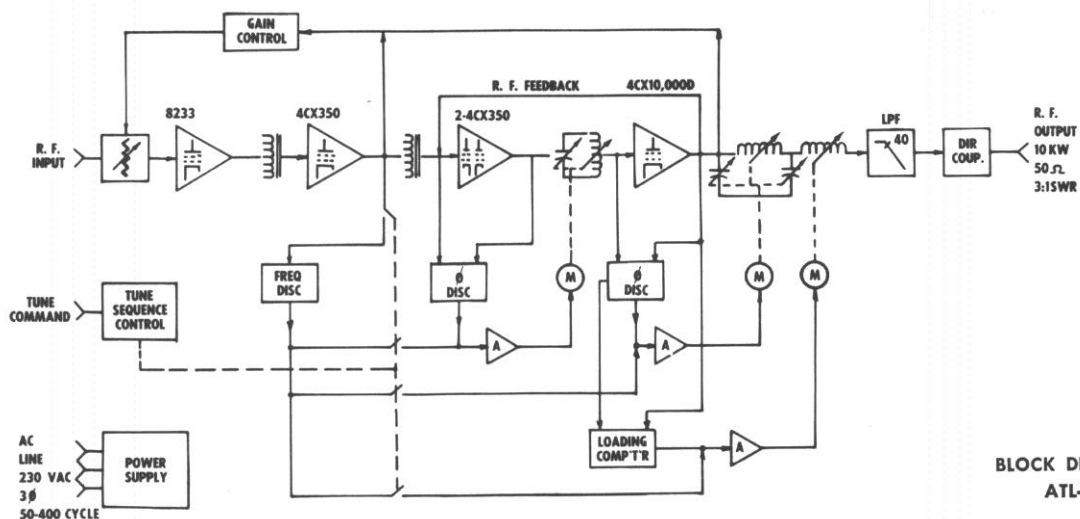
SIZE: 69" high, 40" wide, 27" deep.

WEIGHT: 1300 lbs. net. Domestic pack, 1545 lbs. Export pack, 1700 lbs. Cu-bage: 88.7 cubic feet.



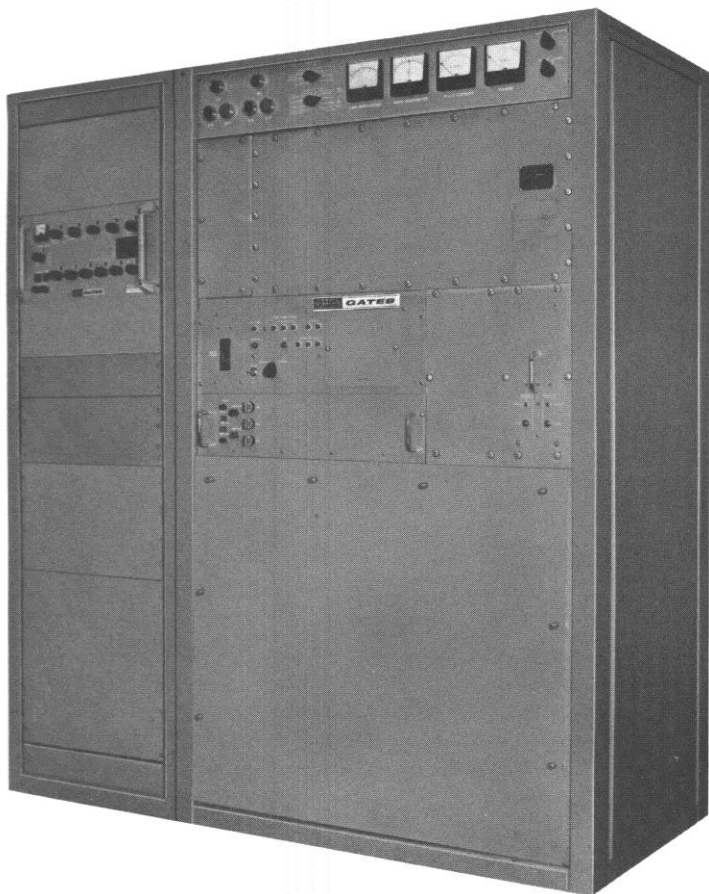
ORDERING INFORMATION

ATL-10 10,000 watt automatically tuned ISB HF power amplifier, complete with cabinet.....994-6506
100% spare tube kit.....990-0574



BLOCK DIAGRAM
ATL-10

10 kW Automatically Tuned ISB HF Transmitter



MODEL STAR-10

Totally modern in design, the STAR-10 is a complete 10 kW transmitter for HF communication service. It incorporates a synthesized exciter that generates a total of 280,000 discrete frequencies, spaced every 100 Hz in the 2-30 MHz band; and a linear power amplifier (ATL-10) which provides a full 10 kW on single tone, as well as 10 kW PEP.

An optional remote control system provides selection of ten preset channels. A second optional system provides remote selection of the full 280,000 discrete frequencies available from the exciter.

The STAR-10 can be retuned, and mode or power level changed in less than 25 seconds, from the time the remote control is actuated to the time the final loads.

All components are solid state except LPA tubes. Integrated circuits are used to control digital tuning of the synthesizer. Signal circuits of the exciter, plus the servo control circuit of the LPA, are discrete components.

LOW DISTORTION: Third order distortion products are at least 40 dB below either tone of a two-tone test at rated power output up to 27.5 MHz.

TUNING: Automatic frequency change is accomplished through a sequential control which is activated by a specific "Tune" command and a new reference frequency. The three DC servo motors are operated in closed loop proportional control servo systems to accomplish the actual adjustment. Tuning time is normally 20 seconds or less.

SENSORS AND DETECTORS: The change in frequency is sensed by a frequency discriminator which is coupled to the output of the second broad-band amplifier. This develops an analog signal from which coarse positioning of the tuning and loading components is accomplished. The output of both the driver and the final are sampled by phase detectors and compared with their input signals for a precise determination of resonance. This provides fine tuning adjustments for the plate tank circuit of the driver and final. Final amplifier loading is controlled by sensing the voltage gain of the output stage.

DC SERVO SYSTEMS: The input to the servo system is an operational amplifier with a feedback loop to shape the system response to an error signal. This method of response shaping reduces the system cost and complexity by replacing the tachometer generator with minor electrical components. The servo power amplifier is a direct coupled solid state DC proportional amplifier with a transistor bridge output which provides high efficiency and dynamic braking.

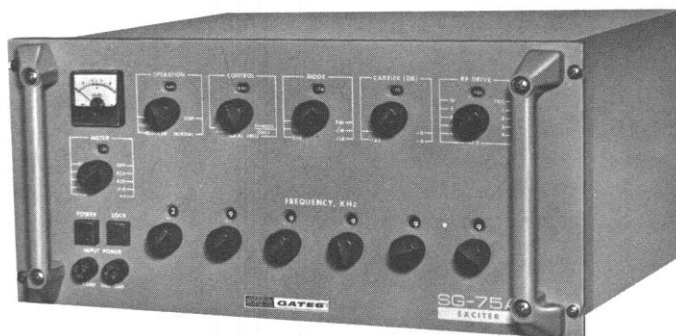
Use of direct-drive DC torque motors provide system stability due to the high torque to inertia ratio (Ta/Ja). Because the motors are directly coupled to the shafts there is no dead zone caused by gear backlash. Since there are no gears involved, and the motors turn at a relatively slow speed, no slip clutch is required.

RF INPUT: A unique light sensitive resistor and DC amplifier circuit in the input stage provides superior gain control while minimizing effects of distortion normally associated with less well isolated control circuits. A single type 8321/4CX350A, a second Class A amplifier, also operates completely broadband. The interstage networks up to and including the input to the driver amplifier are broad-banded and therefore do not require servo tuning.

DRIVER AND FINAL AMPLIFIER: A pair of 8321/4CX350A's, followed by an 8171/4CX10,000D are operated Class AB₁ in a grounded screen configuration for maximum stability. The grid drive network and plate tank circuits are automatically tuned to resonance by DC control amplifiers and torque motors. The output tuning and loading network is a pi-L filter designed for optimum harmonic rejection and load matching ability. This circuit is capable of matching into a 3:1 VSWR at a full rated power, with optimum loading obtained by the third DC motor and servo system.

RF PROTECTIVE DEVICES: All stages of the amplifier are protected against overloading and/or overdriving. The driver input is protected by grid leak biasing. An anode dissipation limiter is utilized to protect the PA from excessive dissipation.

10 kW Automatically Tuned ISB HF Transmitter—Star-10

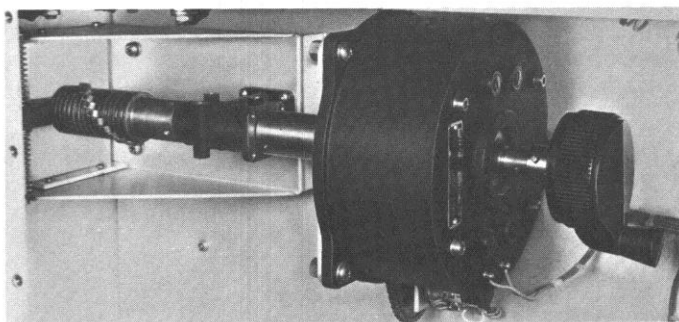


The SG-75A solid state synthesized exciter features front panel selection of 280,000 frequencies in the 2 to 30 MHz range. It operates in the ISB, LSB, USB, AME, CW and FSK modes.

The PA tube and plate supply are protected from current overload by a fast acting relay. A reflected power detector is used to unkey the amplifier and trigger an "excessive SWR" alarm. This protects the final stage against the effects of an SWR which exceeds 3:1.

ENCLOSURE: The entire ATL-10 linear amplifier is contained in a single enclosure measuring 40" wide, 69" high and 27" deep. The power supply is designed for immediate access from the front to all components. The servo control drawer is removable from the front panel and can be serviced while the amplifier is operating. The driver amplifier is also removable as a module for bench servicing. The final grid compartment as well as the final amplifier compartment are enclosed in air tight, RF tight enclosures, in which the cover panels may be removed for direct access.

COOLING: The air for cooling the ATL-10 amplifier is normally brought in through a filtered intake at the front or back of the cabinet. A blower forces the air up through the driver plenum, and into the power amplifier compartment. The majority of the air flows directly through the 8171/4CX-10,000D. The remainder of the air is used to circulate through the PA compartment. All air is exhausted horizontally at the top rear of the cabinet. The ATL-10A has a front air intake, and the ATL-10B has a rear air intake—otherwise the two amplifiers are identical.



High torque DC servo motors direct coupled to PA circuits assure tuning accuracy. Reliability is enhanced through Gates design using fewer components.

SPECIFICATIONS

FREQUENCY RANGE: 29.9999 MHz in 100 Hz steps (280,000 frequencies).

OPERATING MODES AND RATED POWER OUTPUT:

CW (A0, A1)	10 kW (av.)
FSK (F1)	10 kW (av.)
AME (A3h)	10 kW PEP
USB, LSB (A3a, i)	10 kW PEP
ISB (A3b)	10 kW PEP

FREQUENCY CONTROL: Digital control of stabilized VFO, synthesized.

OUTPUT IMPEDANCE: 50 ohms with VSWR up to 3:1.

GAIN CONTROL: Automatic with manual override.

LOAD CONTROL: Peak power control.

TUNING TIME: 25 seconds maximum.

METHOD OF TUNING: Automatic, remote.

HARMONIC OUTPUT: 2nd, 56 dB below full output. All others, 60 dB.

SIGNAL TO NOISE RATIO: 50 dB.

SIGNAL TO DISTORTION RATIO: 40 dB. (Distortion products: At rated output at least 40 dB below either tone of a standard two-tone test signal up to 26 MHz and 36 dB 26 to 30 MHz).

CARRIER LEVEL: Selectable: 0, -6, -20, -55 dB, or 0, -6, -16, -26, -55 dB.

CARRIER COMPRESSION: 1 dB maximum.

STABILITY: 1×10^{-7} per day (optional 5×10^{-9} per day).

UNWANTED SIDEBAND REJECTION: 60 dB at 500 Hz.

AUDIO INPUT: Two independent 600 ohm channels balanced or unbalanced, with independent AGC, -20 to +10 dBm for full RF output.

AUDIO FREQUENCY RESPONSE: 250 to 3000 Hz or 250 to 6000 Hz, with 3 dB maximum ripple.

FSK CAPABILITY: Wideband FSK built in, adjustable from ± 400 to ± 425 Hz (other shifts optional).

POWER INPUT: 200, 210, 220, 230, 240, 250 volts, $\pm 10\%$, 3 phase, 47-63 Hz, 24 kVA at 0.95 power factor at 10 kW CW.

TEMPERATURE: 0° to $+50^\circ\text{C}$.

HUMIDITY: 0 to 95%.

ALTITUDE: Sea level to 10,000 feet.

OUTPUT CONNECTOR: $1\frac{1}{2}$ " EIA flange.

OPTIONAL REMOTE CONTROL: Frequency, operating mode, carrier level, power output, plate on/off and keying.

COMPONENTS: All components meet MIL specifications where practicable.

SIZE: Amplifier, 69" high, 40" wide, 27" deep. Exciter, $8\frac{3}{4}$ " high, 19" wide, 17" deep. (Exciter rack optional.)

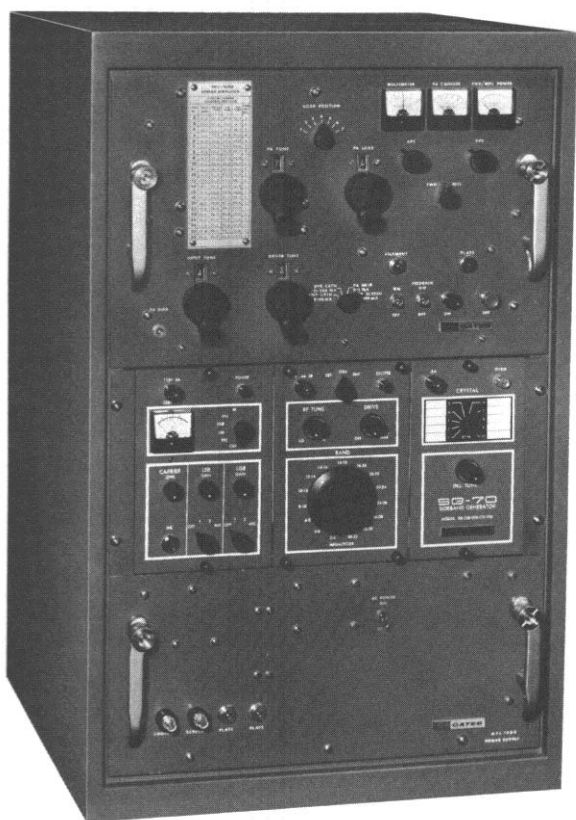
WEIGHT: Amplifier; net 1300 lbs., domestic pack 1545 lbs., export pack 1700 lbs. Cubage: 88.7 cubic feet. Exciter: net 56 lbs., domestic pack 75 lbs., export pack 110 lbs. Cubage: 6 cubic feet.

ORDERING INFORMATION

STAR-10 ISB HF Transmitter, with tubes and silicon rectifiers	994-6566
100% tube kit	990-0574
Model CA-10 remote adapter for STAR-10. Permits selection of any one of ten preset frequencies by remote control	994-6567A
Model CA-280K remote adapter for STAR-10. Permits selection of 280,000 frequencies by remote control	994-6567B

1000 Watt ISB HF Transmitter

MODEL ST-1A



A continuous duty sideband transmitter, the ST-1A is conservatively rated at 1000 watts CW as well as PEP. Powers up to 1500 watts (50% overload) may be handled on an intermittent basis without damage to the equipment. The ST-1A is continuously tunable over the entire 2 to 32 MHz range. All tuning can be accomplished in less than two minutes by means of convenient front panel controls.

Designed for operation on any one of 10 crystal controlled channels, with all tuning accomplished by only seven front panel controls and one band switch. The ST-1A will transmit USB, LSB, ISB, AME, CW, MCW and FSK with adapter. Third order distortion products are at least 35 dB below the level one tone of a two-tone test. At maximum power, each of the two independent sidebands has a full 6 kHz capability. Easy access to all components is assured with modular and tilt-over slide out construction used in the compact ST-1A. Maximum attention has been given to efficient cooling for the entire transmitter.

Exceptional frequency stability has been achieved by using a crystal oven containing a transistorized master frequency oscillator. Generator stability of two parts in 10^{-7} is approached at 32 MHz. Data and teletype tone transmission is possible since absolute drift never exceeds 8 Hz at any point in the operating spectrum.

A directional coupler and meter are provided in the ST-1A as standard equipment for power indications. Gates directional watt meter uses two separate circuits to measure forward and reflected RF power in the 50 ohm transmission line.

SPECIFICATIONS

FREQUENCY RANGE: 2-32 MHz continuous, band switched.

POWER OUTPUT: 1000 watts PEP, 1000 watts CW, continuous.

OUTPUT IMPEDANCE: 50 ohms; will match a VSWR up to 2:1.

OPERATING MODES: USB, LSB, ISB, AME, CW, MCW, FSK with external adapter.

FREQUENCY CONTROL: Temperature controlled crystals, or optional external VFO or synthesizer.

CRYSTAL POSITIONS: 10. Selectable from front panel, with independent trimmer, or synthesizer.

STABILITY: Better than 1 PPM per day.

CARRIER SUPPRESSION: 0 to -50 dB.

SIGNAL TO DISTORTION RATIO: 35 dB. (Distortion products: At rated output, 3rd and higher order products are at least 35 dB below either tone of a standard two-tone test signal.)

SIGNAL TO NOISE RATIO: 50 dB.

UNWANTED SIDEBAND REJECTION: 60 dB at 500 Hz.

HARMONICS: Second harmonic, at least 40 dB down; all higher order harmonics, at least 50 dB down.

AUDIO INPUT: Two independent 600 ohm channels balanced or unbalanced. -12 dBm for full RF output. One high impedance mic channel requiring 1 mV for full PEP.

AUDIO RESPONSE: 250 to 6350 Hz with 3 dB maximum ripple. Other bandwidths available.

AUTOMATIC LOAD CONTROL: Provided to limit distortion during high-drive peaks or load changes.

ENVIRONMENTAL: 0° to +50°C operating, or -50° to +70° C non-operating.

POWER CONSUMPTION: Key down CW 3.45 kw, @ approximately 90% power factor.

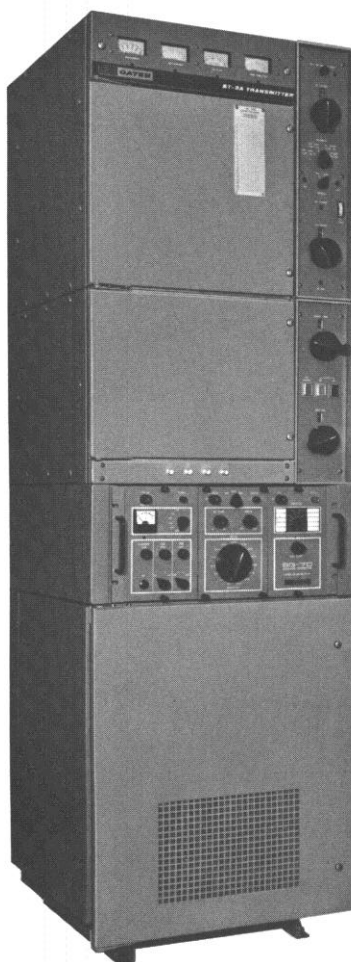
POWER INPUT: 115/230 volts, single phase, 3 wire, 50/60 Hz.

SIZE: Over-all with optional cabinet: 21" wide, 33½" high, 23½" deep. Amplifier: 12¾" high, standard 19" rack mount. Power supply: 8¾" high, standard 19" rack mount. Exciter: 8¾" high, standard 19" rack mount.

WEIGHT: 375 lbs. net. Domestic packed: 500 lbs. Export packed: 600 lbs. Cubage: 14 cubic feet.

ORDERING INFORMATION

ST-1A ISB HF communications transmitter with tubes and silicon rectifiers, less cabinet	994-6418
Complete set of spare tubes	990-0519
Optional ST-1A transmitter cabinet	952-5967



MODEL ST-3A

Gates offers an ISB transmitter with unexcelled performance for high frequency communications service in either fixed station or transportable operation. Conservatively rated at 3000 watts average as well as 3000 watts PEP, the ST-3A transmitter provides SSB, ISB, AME, CW, MCW, and FSK modes of operation.

The ST-3A is a complete transmitter consisting of the SG-70 ISB Exciter, power amplifier and solid state power supply, all in one extremely accessible cabinet.

Designed for operation on any one of 10 crystal controlled frequencies, all tuning is accomplished by only six front panel controls and one channel selector covering the 2 to 30 MHz frequency range.

Mode switches select operation on upper, lower or both sidebands. At maximum power, each of the two independent sidebands has a full 6 kHz capability. Flat crystal filter response provides the capability of effectively multiplexing four 3 kHz channels for voice and teletype communications. Third order distortion products are at least 40 dB below the level of one tone of a two tone test.

The ST-3A transmitter has been designed to provide accurate and rapid tuning. A compact and efficient turret tuner is used to switch each of the 10 crystal controlled positions into one of the 15 frequency bands. This permits tuning the transmitter to a pre-logged frequency, usually within one minute, and at widest extremes, no more than two minutes.

SPECIFICATIONS

FREQUENCY RANGE: 2-30 MHz continuous, band switched.

POWER OUTPUT: 3000 watts PEP, 3000 watts CW, continuous.

OUTPUT IMPEDANCE: 50 ohms; will match a VSWR up to 3:1.

OPERATING MODES: USB, LSB, ISB, AME, CW, MCW, and FSK with external adapter.

FREQUENCY CONTROL: Temperature controlled crystals or optional external VFO or synthesizer.

CRYSTAL POSITIONS: 10; selectable from front panel, with independent trimmer, or synthesizer.

STABILITY: Better than 1 PPM per day.

CARRIER SUPPRESSION: 0 to -50 dB.

SIGNAL TO DISTORTION RATIO: 40 dB. (Distortion Products: At rated output, 3rd and higher order distortion products are at least 40 dB below either tone of a standard two-tone test signal.)

SIGNAL TO NOISE RATIO: 50 dB.

UNWANTED SIDEBAND REJECTION: 60 dB at 500 Hz.

HARMONICS: Second harmonic, at least 50 dB down; all higher order harmonics, at least 60 dB down. Optional filter available.

AUDIO INPUT: Two independent 600 ohm channels balanced or unbalanced. -12 dBm for full RF output. One high impedance mic channel requiring 1 mV for full PEP.

AUDIO RESPONSE: 250 to 6350 Hz with 3 dB maximum ripple. Other bandwidths available.

AUTOMATIC LOAD CONTROL: Provided to limit distortion during high drive peaks or load changes.

ENVIRONMENTAL: 0° to +50°C operating, or -50° to +70°C non-operating.

POWER CONSUMPTION: Key down CW 7.5 kW, @ approx. 90% Power Factor.

POWER INPUT: 208/230/240 volts $\pm 5\%$ 50/60 Hz, 3-phase 3 or 4 wire, plus 115/230 volts, 2 wire.

SIZE: 22" Wide, 72" High, 24" Deep.

WEIGHT: 800 lbs. net. Domestic packed: 925 lbs. Export packed: 975 lbs. Cubage: 41 cubic feet.

ORDERING INFORMATION

ST-3A 3 kW ISB Transmitter with tubes, silicon rectifiers, less crystals	994-6492
ST-3A (same as above) with 78 dB factory installed harmonic filter	994-6492B
Spare tube kit for above	990-0520
HFT-5K 5 kW balun to match 50 ohms to 600 ohms	478-0246
Roll out base for ST-3A transmitter	994-6477

1000 Watt HF Linear Amplifier

MODEL HFL-1000



Gates HFL-1000 Linear Amplifier at 1000 watts PEP or 1000 watts CW is the smallest, completely self-contained amplifier in its power class. It features 90° tilt type slide mounting for the amplifier and a slide-out power supply which provides complete front panel servicing. Air intake is at the rear of the unit. The amplifier exhaust is on top, and the power supply exhaust is in the rear. The amplifier is designed to operate between 2.0 and 32 MHz and is capable of any type emission not exceeding its power and bandwidth capabilities. The final amplifier is operated class AB₁ at all times.

Ample metering is employed in the HFL-1000 linear amplifier to facilitate tuning and maintenance. A directional coupler with meter is provided as standard equipment for measuring forward or reflected power. The amplifier can be tuned and loaded to full rated output on any operating frequency, using only front panel controls. Tuning is continuous over the entire range without changing components. No air capacitors are used for tuning or loading. Loading is accomplished with band switched ceramic capacitors and a variable vacuum capacitor. Silicon rectifiers are used in all power supplies.

The amplifier and power supply may be mounted in any standard 19" relay rack, or in an optional cabinet. The amplifier and power supply are manufactured for a wide range of temperature and humidity conditions and can be operated at altitudes up to 10,000 feet above sea level on a continuous basis.

SPECIFICATIONS

FREQUENCY RANGE: 2-32 MHz.

POWER OUTPUT: 1000 watts PEP, 1000 watts CW, continuous.

OUTPUT IMPEDANCE: 50 ohms; will match a VSWR up to 2:1.

OUTPUT CONNECTOR: Type UHF.

RF INPUT POWER: Less than 100 milliwatts driving power to obtain full rated output.

INPUT IMPEDANCE: 50 ohms, nominal.

INPUT CONNECTOR: Type BNC.

BANDWIDTH: 16 kHz or more to the 1 dB point.

HARMONICS: Second harmonic, at least 40 dB down; all higher order harmonics, at least 50 dB down.

SIGNAL TO DISTORTION RATIO: Capable of 35 dB. (Distortion products: At rated output, 3rd and higher order distortion products are at least 35 dB below either tone of a standard two-tone test signal.)

TUNING: Only four tuning controls, all on front panel and 1 band switch.

TUNING TIME: Maximum time required to change frequency between any two previously logged operating frequencies—two minutes.

AUTOMATIC LOAD CONTROL: Provided to limit distortion during high drive peaks or load changes.

POWER SUPPLY: Solid state.

DUTY CYCLE: Continuous at full rated output throughout the full environmental range specified.

ENVIRONMENTAL: 0° to +50°C; 0 to 95% humidity from sea level to 10,000 feet.

POWER INPUT: 115/230 volts, single phase, 3 wire, 50/60 Hz.

POWER CONSUMPTION: Key down CW 3.31 kW @ approximately 90% power factor.

SIZE: Amplifier, 12¼" high x 19" wide. Power supply, 8¾" high x 19" wide.

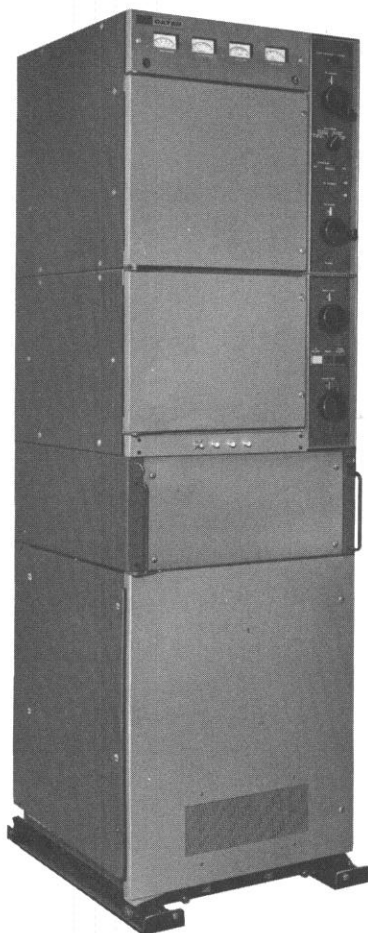
WEIGHT: 280 lbs. net; 350 lbs. export packed. Cubage: 8 cubic feet.

ORDERING INFORMATION

HFL-1000 1 kW linear amplifier with tubes and silicon rectifiers, less cabinet.....	994-6161
Cabinet for HFL-1000.....	952-5894
100% spare tube kit.....	990-0447

3000 Watt HF Linear Amplifier

MODEL HFL-3000



The Gates HFL-3000 linear amplifier is rated at 3000 watts CW/PEP, and is designed to operate between 2 and 30 MHz. It features continuously variable tuning over the entire range and may be excited by any suitable generating equipment delivering 100 mW of power into 50 ohms. Any type of emission not exceeding the amplifier power output or bandwidth ratings is possible.

Important where compactness is desired, such as in multi-transmitter operations or portable installation, the total size of the 3000 watt unit, including self-contained power supply, is only 72" high, 22" wide, and 24" deep. Designed for operation at altitudes up to 10,000 feet on a continuous basis.

The power amplifier operates class AB₁ for all modes of emission. A 4CX3000A power tetrode is used as the final amplifier of the HFL-3000. The amplifier may be quickly tuned and loaded to full rated output at any operating frequency between 2-30 MHz by front panel controls. RF feedback is employed. A directional coupler and meter are provided as standard equipment for measuring either forward or reflected power.

The Gates HFL-3000 RF linear amplifier may be remote controlled through its normal start-stop functions up to nominal distances of several hundred feet.

SPECIFICATIONS

FREQUENCY RANGE: 2-30 MHz.

POWER OUTPUT: 3000 watts PEP, 3000 watts CW, continuous.

OUTPUT IMPEDANCE: 50 ohms; will match a VSWR up to 3:1.

OUTPUT CONNECTOR: Type LC.

RF INPUT POWER: Less than 100 milliwatts driving power to obtain full rated output.

INPUT IMPEDANCE: 50 ohms, nominal.

INPUT CONNECTOR: Type BNC.

BANDWIDTH: 16 kHz or more to the 1 dB point.

HARMONICS: Second harmonic, at least 50 dB down; all higher order harmonics, at least 60 dB down. Optional 78 dB filter available.

SIGNAL TO DISTORTION RATIO: Capable of 40 dB. (Distortion products: At rated output, 3rd and higher order distortion products are at least 40 dB below either tone of a standard two-tone test signal.)

SIGNAL TO NOISE RATIO: 50 dB.

TUNING: Only four tuning controls, all on front panel.

TUNING TIME: Maximum time required to change frequency between any two previously logged operating frequencies—two minutes.

AUTOMATIC LOAD CONTROL: Provided to limit distortion during high drive peaks or load changes.

DUTY CYCLE: Continuous at full rated output throughout the full environmental range specified.

ENVIRONMENTAL: 0° to +50°C; 0 to 95% humidity from sea level to 10,000 feet.

POWER INPUT: 208/230/240 volts $\pm 5\%$, 50/60 Hz, 3-phase, 3 or 4 wire, plus 115/230 volts, 2 wire.

POWER CONSUMPTION: Key down CW 7.45 kW @ approximately 90% power factor.

SIZE: 22" wide, 24" deep, 72" high.

WEIGHT: 660 lbs. net; 930 lbs. export packed. Cubage: 61.4 cubic feet.

ORDERING INFORMATION

HFL-3000 3 kW linear amplifier complete with tubes, silicon rectifiers, less roll out base	994-6466A
HFL-3000 with optional filter	994-6466B
Roll out base for HFL-3000	994-6477
Spare tube kit	990-0531

Transmitter Control



TYPICAL SPECIFICATIONS

Transmitter control consoles are designed for use with any medium wave or short wave transmitter to provide a convenient and centralized "control center" to operate the transmitter. Gates can design and build consoles for high powered 50 kW or 100 kW transmitters, or for any special application.

AUDIO INPUTS: Three 600 ohm channels provided with line isolation transformers.

OUTPUT: 600 ohms.

MASTER GAIN: Balanced 30 steps, 1.5 dB per step.

VU METER: 4" square case with range control.

MODULATION METER: 4" square case illuminated.

PUSHBUTTONS: Four pairs provided for transmitter start-stop functions.

PILOT LIGHTS: Indicate transmitter filament and plate on.

FINISH: Medium hand rubbed gloss gray with escutcheons in black.

EXTENDED CONTROL AND METERING PANELS

Gates extended control and metering panels are designed to extend basic transmitter meter readings and control functions of a Gates transmitter from a room housing the transmitter to another room in the building. Interconnection over a reasonable distance between the panel and transmitter can be accomplished through the use of a multi-conductor cable. All units are standard 19-inch width for convenient rack mounting.

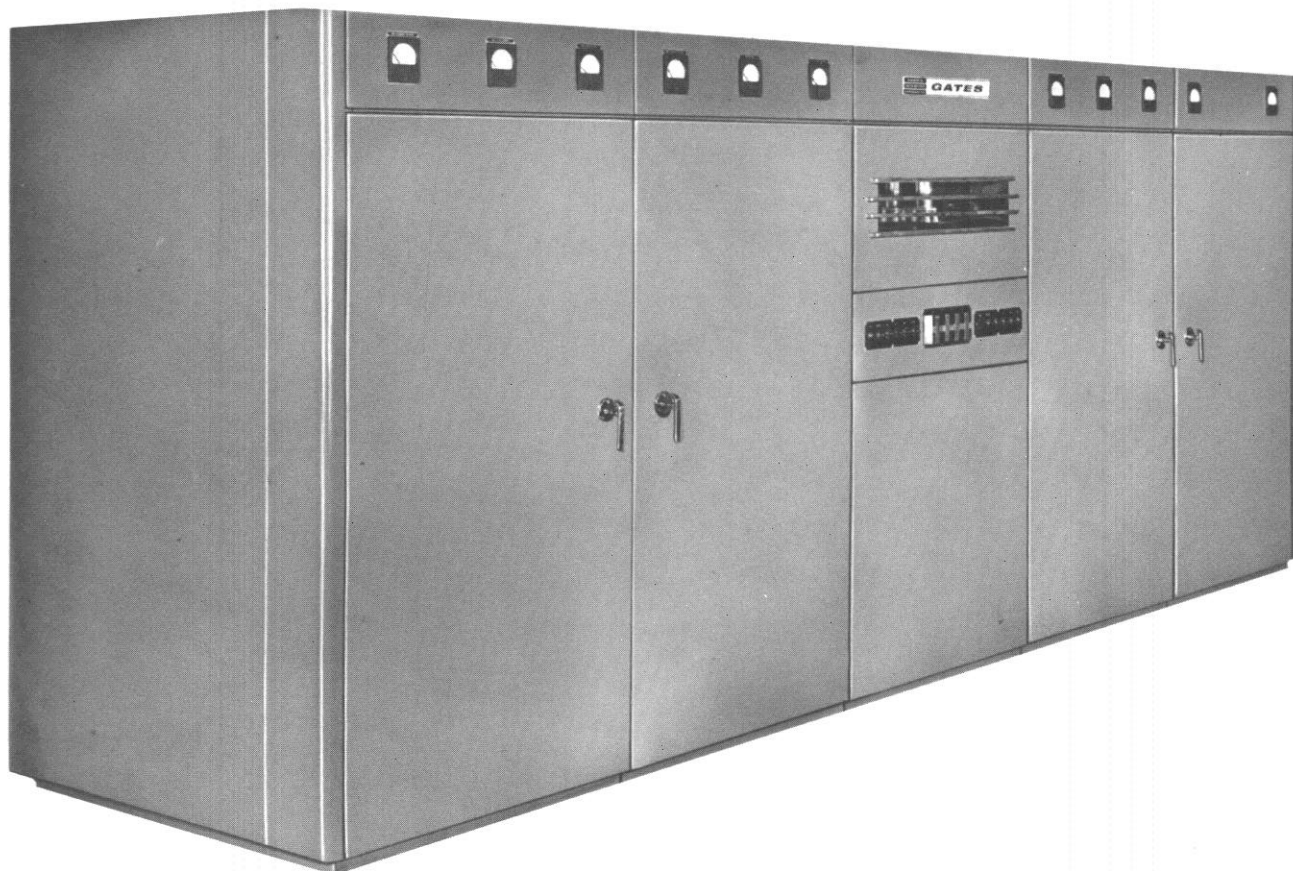
Metering is accomplished by three easy-to-read 4-inch meters. Plate voltage and plate current indications appear on separate meters. The third meter is used for indicating RF Amperes for an AM transmitter or RF output in kW for an FM transmitter. As remote meter sampling kits are included as standard items in current Gates transmitters, metering is

easily accomplished. For AM transmitters the Gates M-6112 diode units should be added for indication of RF Amperes. The M-6112 is described on page 71.

Control of transmitter filament and plate is facilitated through switches located below the meters. To comply with FCC regulations an additional switch is provided to activate a power raise/lower function. For some AM transmitters a motor-rheostat assembly is required—these units are described on page 71.

Ample space is provided on the panel so that a station can add additional switching or control functions, such as a stereo on-off switch.

20,000 Watt HF Broadcast Transmitter



MODEL HF-20B

This remarkable transmitter, field proven in over 16 different countries, represents the ultimate in 20 kW high frequency transmitter performance. It is designed for continuous 24-hour-a-day operation in all parts of the world, including areas with tropical climates.

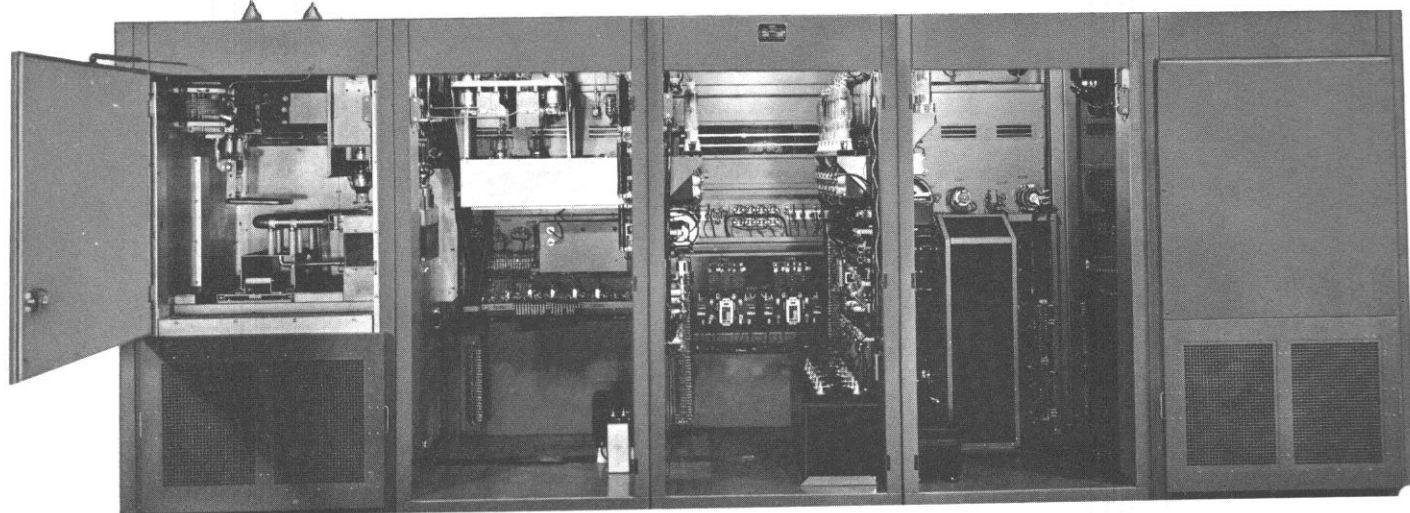
Air cooled and employing high level plate modulation, the HF-20B is tunable over the entire frequency spectrum between 4 and 22 MHz.

FAST TUNING: Once the frequency band is selected, transmitter tune-up can be made within one minute from front panel controls. Except for the final tank coil, all circuits are continuously variable and front panel tuned between 4 MHz and 22 MHz. Changing of the final tank coil, which sets on a sliding carriage in the PA tank frame assembly, is speedily accomplished. Five coils are supplied for full 4-22 MHz coverage. Counter type controls read to 1/10 turn to permit accurate logging of all tuned circuits and quick return to any previously employed frequency.

RADIO FREQUENCY AND AUDIO SECTIONS: A two-stage radio frequency exciter unit incorporates switching positions for four crystals and input provisions for an external VFO or frequency shift keyer. The 6146 straight amplifier or doubler stage is followed by two type 4-250A tubes which provide an abundance of RF drive to the final amplifier. Four 3X2500F3 triodes operate push-pull parallel in the power output stage. A superb audio system consisting of four stages, all push-pull, is employed in the HF-20B. Four type 3X3000F1 triodes operating push-pull are used as Class B modulators.

OUTPUT COUPLING: To accommodate a wide variety of transmission lines, a balanced matching output network is incorporated, using series variable coils and parallel variable vacuum capacitors designed to match 300 to 800 ohm resistive balanced lines (500 ohms, with VSWR 1.7 to 1). Both variable coils and capacitors have counter type tuning controls for accurate logging. (A 50 ohm unbalanced output is also available on special order).

20,000 Watt HF Broadcast Transmitter—HF-20B



Rear view of the HF-20B.

POWER SUPPLIES: Five major power supplies deliver plate and bias voltages to the HF-20B transmitter. To assure greater reliability and better regulation, separate high voltage supplies are used for the modulator and power amplifier.

RELAYS AND PROTECTION: Magnetic AC contactors are inserted in all main primary lines. All major tubes are protected by individual supervisory overload relays. Protection devices included for door interlock and air failure.

MODEL HF-20BX: Identical to the HF-20B transmitter described herein, but has 400 word per minute keyer added. This model may be used for broadcasting, voice communications, telegraph, or with optional frequency shift keyer.

MODEL HF-20CX: The audio frequency response is for voice only in this model; otherwise it is the same as the HF-20BX, including keyer and provision for FSK. Audio response is rated 200-3,500 Hz ± 3 db.

SPECIFICATIONS

CARRIER POWER OUTPUT: 4-18 MHz, 20,000 watts. 18-22 MHz, 16,000 watts modulated (A3). Full 20 kW output 4-22 MHz telegraph.

FREQUENCY RANGE: 4-22 MHz.

RF STABILITY: .003% or better, with JK-09C oven.

OUTPUT IMPEDANCE: 300-800 ohms resistive balanced. (500 ohms, with VSWR 1.7 to 1.) (50 ohms unbalanced, optional).

POWER LINE REQUIREMENTS: 230 volts, 3 phase, 50/60 Hz. Other primary voltages or line frequencies available on special order.

POWER FACTOR: 90% or better.

POWER CONSUMPTION: 0% modulation, 37 kW. Average modulation, 43 kW. 100% modulation (sine wave), 55 kW.

POWER REDUCTION: Low power tune-up switch provided.

AUDIO RESPONSE: ± 1.5 dB, 50-10,000 Hz.

DISTORTION: 3% or less, 100-5000 Hz. 4% or less 50-7500 Hz.

NOISE: 55 dB or better below 100% modulation.

CRYSTAL POSITIONS: Four; input for external VFO or FSK provided.

KEYING: 400 wpm with essential square top wave form, on-off keying. Keyer supplied on Models HF-20BX and HF-20CX only.

TUBES: (RF section) 6AG7 oscillator, 6AG7 buffer, 6146 buffer/doubler, (2) 4-250A RF driver, (4) 3X2500F3 power amplifiers. (Audio section) (2) 6J7 first audio, (2) 807 second audio, (2) 845 audio driver, (4) 3X3000F1 modulators. (Power supplies) (12) 673 HV rectifiers, (4) 8008 LV rectifiers, (2) 866A LV rectifiers. (Keyer) (1) 812 keyer tube.

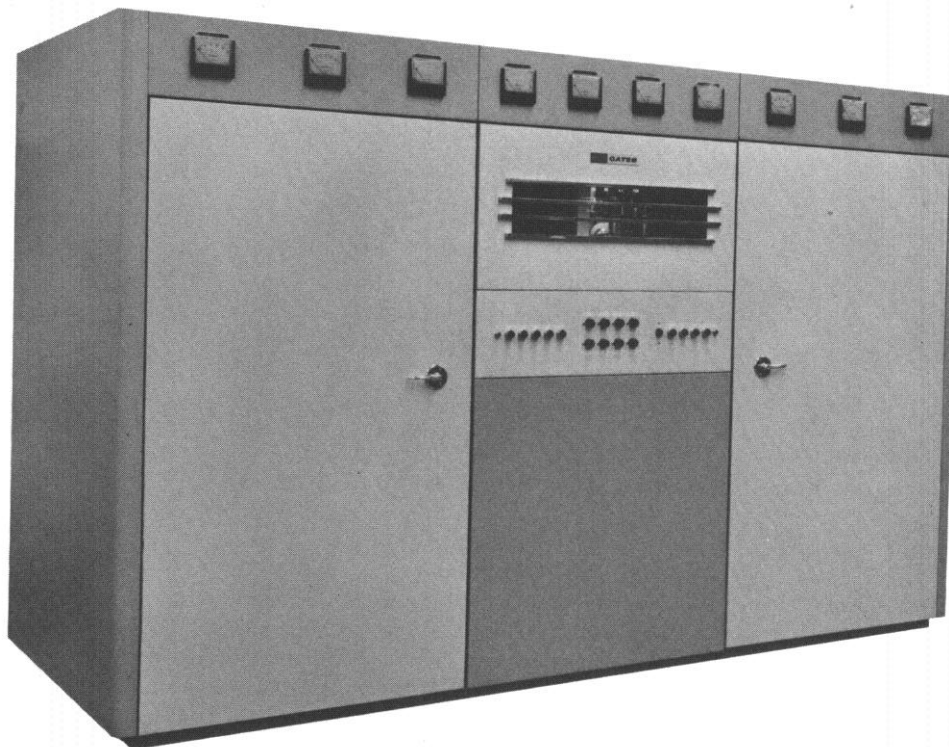
SIZE: HF-20B and HF-20BX, 205" wide, 48½" deep, 78" high. Door swing, 40" front and rear. Floor space for external transformers: 10' x 9'. Largest cabinet size uncrated: 45" wide, 50" deep, 78" high. HF-20CX, 175" wide, 48½" deep, 78" high. Door swing, 40" front and rear. Floor space for external transformers: 5' x 6'.

WEIGHT: (Packed) domestic, 11,000 lbs.; export, 13,900 lbs. Cubage: 1050 cubic feet.

ORDERING INFORMATION

HF-20B, 20 kW broadcast transmitter, 4-22 MHz, with one set of coils, tubes, less crystals	994-4748
HF-20BX, 20 kW broadcast transmitter, with tubes and with keyer added, 4-22 MHz, less crystals	994-4778A
HF-20CX, 20 kW telephone and telegraph transmitter, with tubes and keyer, 4-22 MHz, less crystals	994-4778B
Spare 100% tube kit for HF-20B	990-0139
Spare 100% tube kit for HF-20BX	990-0140
Crystal and holder, .02% accuracy (specify operating frequency)	CR27A/U
Temperature controlled crystal oven holds two CR27A/U crystals for 0.003% accuracy	JK-09C

10,000 Watt High Frequency Broadcast Transmitter



MODEL HF-10B

POWER OUTPUT: 10,000 watts.

FREQUENCY RANGE: 2-22 MHz. (4-30 MHz on special order).

TYPE OF EMISSION: (Model HF-10B) A3. (Models HF-10BX, HF-10CX) A1, A2, A3 and F1 with external frequency shift keyer.

FREQUENCY STABILITY: .003%, with oven.

CARRIER SHIFT: 5% or less at 100% modulation.

RF HARMONICS: Suppression of harmonics meets or exceeds CCIR requirements.

OUTPUT IMPEDANCE: 300 to 800 ohms resistive balanced. (500 ohms with VSWR 1.7 to 1). (50 ohms unbalanced on special order).

POWER LINE REQUIREMENTS: 230 volts, 3 phase, 50 or 60 Hz (as ordered). (Other voltages or line frequencies available on special order.)

POWER FACTOR: 90% or better.

POWER CONSUMPTION: 0% modulation, 21 kW. Average modulation, 23 kW. 100% modulation, 30 kW.

FREQUENCY RESPONSE: (Model HF-10B ± 1.5 dB, 30-10,000 Hz. (Model HF-10CX) ± 3 dB, 150-4000 Hz.

DISTORTION: (Model HF-10B) 3% or less 50 to 7500 Hz. (Model HF-10CX) 10% or less 150-4000 Hz.

AUDIO INPUT: ± 15 dBm ± 2 dB.

NOISE: (Model HF-10B) 60 dB or better below 100% modulation. (Model HF-10CX) 45 dB or better below 100% modulation.

CRYSTAL POSITIONS: 4, front panel selected.

TUBES: (2) 6AG7, (2) 4-250A, (2) 6J7, (4) 845, (4) 3X2500F3, (4) 8008, (6) 673, (3) 807, (Keyer is type 812A).

SIZE: 125" wide, 78" high, 48½" deep. Front door swing, 19"; back door swing 40". Size of largest cubicle uncrated: 45" wide, 50" deep, 78" high. (Space required to accommodate optional external oil-filled magnetic components 8' x 3').

WEIGHT AND CUBAGE:

MODEL DRY COMPONENTS

HF-10B 6600 lbs. domestic packed
6815 lbs. export packed
533 cu. ft.

HF-10CX 6150 lbs. domestic packed
6360 lbs. export packed
523 cu. ft.

OIL-FILLED COMPONENTS

(Optional)

8000 lbs. domestic packed
10,174 lbs. export packed
566 cu. ft.

6950 lbs. domestic packed
9125 lbs. export packed
533 cu. ft.

ALTITUDE: 6000 feet. (Higher on special order.)

ORDERING INFORMATION

HF-10B, 10 kW broadcast transmitter, with tubes, less crystals...994-3787

HF-10BX, 10 kW broadcast transmitter, with tubes, electronic keyer, less crystals...994-3789

HF-10CX, 10 kW communications telephone and telegraph transmitter, with tubes, less crystals...994-3793

HF-10TX, 10 kW communications telegraph transmitter, with tubes, less crystals...994-3795

Spare 100% tube kit for all models...990-0253

Crystal and holder (.02% accuracy) (specify operating frequency)...CR27A/U

Temperature controlled oven, holds two CR27A/U crystals, (.003% accuracy)...JK-09C

NOTES: (1) State line frequency as 50 or 60 Hz. (2) Above models are for 2-22 MHz and with self-contained dry type power components. (3) All models available for 4-30 MHz at slight extra cost. (4) All models available with external oil-filled plate transformer, modulation transformer, and modulation reactor at extra cost. (5) Be sure and state carrier frequency/s, primary voltage and frequency when ordering.