

FEATURES

- **Superior Frequency Response**
- **Conservative Components for Continuous Duty**
- **Full Metering — including reflected power and modulation**
- **Small Size for Desk Top Operation**
- **All Parts Accessible for Easy Service**
- **Air Cooled for Long Tube Life**
- **FCC Type Accepted**

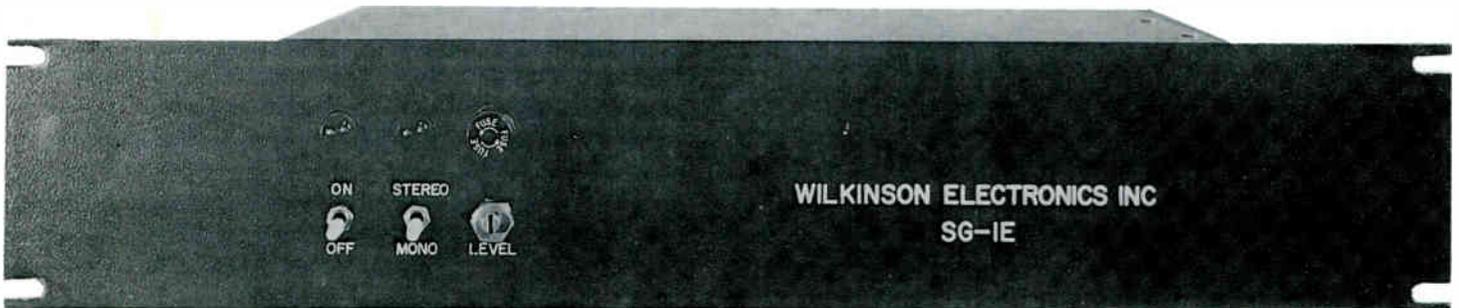


The FM-10E is a conservatively rated 10 watt FM Broadcast Transmitter primarily designed for low power educational stations. It is housed in a single table-top cabinet 21½ inches wide by 15 inches deep and all components are readily accessible through front, top or rear doors. The unit is fully metered including output power, plate voltage, plate current, modulation level as well as all exciter stages. The front and rear doors are interlocked for safety and good engineering practice. The exciter is mounted on chassis slides and will extend through the rear door for service. With the top door open, all stages of the exciter may be tuned and circuit conditions of each stage may be measured with the built-in multimeter. When this chassis is extended, the solid state power supply is completely accessible. A quiet muffin fan in the rear door assures cool operation to extend the life of all components.

The heart of the FM-10E is the FM-10D FM Exciter which produces an extremely low noise FM signal with superior frequency response. This exciter is a crystal controlled phase modulated unit, and thus FM drift cannot occur even when it is modulated at frequencies as low as 30 Hz. Modulation is obtained by the pulse timing process which is one of the most linear and therefore distortionless methods of producing FM. The center carrier frequency is independent of the modulation process, thus the stability is the same as that of the crystal. Distortion is less than .5% from 50 to 15,000 Hz, and FM noise is below -65 db. The output of the exciter, which is the PA of the transmitter, incorporates a 6146 tube which operates well below its maximum rating. A harmonic filter succeeds the PA thus suppressing all harmonics at least -80 db.

The FM-10E is tuned and tested to customer frequency at the factory and is delivered ready for service with the proper installation of antenna and insertion of audio to the input.

SG 1-E STEREO GENERATOR



GENERAL

The Wilkinson Electronics SG 1-E Stereo Generator is a high-quality device designed to generate the complete composite Stereo Signal for modulation of any FCC Type-Accepted Transmitter designed for stereophonic operation using the composite system. Transmitters designed to accept both L-R and L+R signals through separate channels cannot be operated with this stereophonic generator. Specifically, any Direct-FM Transmitter, Type-Accepted to date can be used with this generator.

Provisions are made for remote controlling the Stereo/Mono function so that the operator can switch to the Stereo or Monophonic mode from the operating position.

The audio input levels on both the left and right channels are approximately +10dbm for 100% modulation of the transmitter. The pilot level is not adjustable and is used as the reference for setting the output level. (The output level control is adjusted for 10% pilot modulation of the transmitter). This eliminates the possibility of "crossing" controls and thus makes sure that the generator is always operated at the levels that give the best signal-to-noise ratio and cross-talk characteristics.

In the monophonic mode, provisions are made to select one or both of the channels. This option allows the customer to select any channel or combination of channels for monophonic operation. Normally, the broadcaster would require that only one channel be driven during monophonic operation and the units are shipped with that specification. However, there is an internal adjustment that allows the customer to alter the gain of the unit in the monophonic mode so that 100% modulation is obtained with both of the channels driven.

FEATURES

- * 60 db separation — 50 Hz-7500 Hz
- * 55 db separation — 7500 Hz-10000 Hz
- * 50 db separation — 10 KHz 15 KHz
- * FM Noise - 75 db — Cross Talk - 60 db
- * Comes Complete With Power Supply
- * Requires Only 3½" Rack Space
- * Only One Front Panel Adjustment
- * Remote Stereo On/Off Function

As shipped, this unit is completely adjusted so that as a unit its characteristics fall within the published specifications. It may be necessary to adjust certain controls after installation is completed since most transmitters affect the composite stereo signal somewhat.

There are two widely-used methods of generating the composite stereo signal as required by the FCC for Stereophonic Broadcasting. The first is the so-called MATRIX method and the second is the SWITCHING or FILTER method.

The SG 1-E uses the FILTER method. Both systems have in common the fact that they generate a spectrum of signals ranging from 50 Hz to 53 KHz and these signals modulate the transmitter to produce a stereophonic signal. The only difference is the method in which these components are generated.

The characteristics of the FCC adopted system are as follows:

The frequencies ranging from 50 Hz to 15 KHz are considered the Main Channel and consist of RIGHT and LEFT channel audio signals added together.

The frequencies ranging from 23 KHz to 53 KHz are considered the sub channel and consist of a pair of sidebands,

generated at 38 KHz, containing intelligence corresponding to the difference in modulation between the LEFT and RIGHT channels.

An additional sine wave signal is transmitted at 19 KHz, 20 db below that level corresponding to 100% modulation. It is used to synchronize the receiver during demodulation of this signal. The second-harmonic of this 19 KHz is used for the generation of the subchannel signal.

For simplicity, the 19 KHz signal is called the PILOT. The 23 to 53 KHz sidebands are called the L-R signal, and the 50 Hz to 15 KHz signal is called the L+R signal. The L-R signal results from the amplitude modulation of 38 KHz, the second harmonic of the 19 KHz pilot. The Carrier itself is suppressed at least 40 db below that amplitude corresponding to 100% Modulation as required by the Commission's rules.

Two very important characteristics of this system are that if both the LEFT and RIGHT channels are modulated with the same signal, exactly in phase, all of the modulation will be in the MAIN or L+R Channel.

Conversely, if both the LEFT and RIGHT channels are modu-

lated with the same signal, but exactly 180° out of phase, all of the modulation will be in the SUB or L-R Channel.

The only difference between transmitting a LEFT only or a RIGHT only signal is in the phase relationship that exists between the resultant L-R sidebands and the PILOT signal.

It can be shown that if we switch back and forth between the two channels, that is alternately transmit LEFT and then RIGHT channels, switching at a 38 KHz rate, the resulting signal is very much like that required by the FCC - but not quite. Although this signal could be used for Stereo Transmission in a closed system, it occupies far too much spectrum space to be allowed for FM Broadcasting. It is only necessary, however, to modify this signal by passing it through a filter to remove the wide-band components and then to add just the right amount of L+R signal to result in exactly the right kind of signal for FM Stereo Broadcasting. Specifically, the filter removes all of the switching components and their sidebands beyond approximately 53 KHz, effectively changing the "square wave" switching to "sine wave" switching. A PILOT signal is then added to synchronize the receiver demodulators. In this case, it is obtained by dividing the 38 KHz switching signal by two and filtering out the harmonics.

SPECIFICATIONS

Separation 60 db or better 50 to 7.5 KHz
55 db or better 7.5 to 10 KHz
50 db or better 10 to 15 KHz
Harmonic Distortion less than 0.5% 50 Hz to 15 KHz
FM Noise Level -75 db or better
Stereo Noise (incidental AM of 19 or 38 KHz components)
..... -65 db or better (No FCC specification)
Crosstalk (Sub to Main) -60 db 50 Hz to 15 KHz
Crosstalk (Main to Sub) -60 db 50 Hz to 15 KHz
38 KHz Suppression -50 db or better
76 KHz Suppression (crosstalk to SCA) -60 db or better
Frequency Response Within +0.25 and -0.5 db of 75
Micro second curve 50 Hz to 15 KHz
Input Approx. +10 dbm at 1 KHz for 100% Modulation
500 - 600 ohms balanced

Output 3V P/P Max (adjustable) less than 1 Kilohm
Power Requirements 95 to 135VAC 50/60 Hz
0.035 KVA
Voltage Stability - Will maintain Specifications while operating from a power line fluctuating plus or minus 5 volts at a 2 Hz or longer rate.
Ambient temperature -15 to +55 deg. C.
Mounting - Standard 19" Rack mount, 19 x 3-15/32 x 11-1/2
Remote Control ... Remote Stereo ON/OFF Function with indicator. 24VDC Internally supplied.

Height - 3-15/32
Weight - 16 lbs.
Finish - Black Textured Vinyl



FEATURES

- * Frequency Response $\pm 1/4$ DB 15 Hz - 350 KHz
- * FM Noise Level - 75 DB below 100% Mod.
- * Harmonic Distortion - 0.3%
- * Type Modulation - Direct FM
- * Power Output - Adjustable to 18 Watts
- * Modulation Capability - 200%
- * Stability 1 part in 100000
- * Requires No Oven and Is Not Susceptible to Rumble and Microphonics

GENERAL

The FME 10 is a Direct-FM exciter capable of both monophonic and stereophonic operation. During monophonic operation two SCA Subcarriers can be used; during Stereophonic operation only one SCA Subcarrier can be transmitted although there are no characteristics inherent in the design of this exciter prohibiting the transmission of more than one subcarrier during this kind of operation.

This unit mounts in a standard 19 inch relay rack or in the transmitter proper. The exciter occupies 7 inches of vertical panel space.

CIRCUIT DESCRIPTION

This exciter consists of two basic sections. The first is the Direct-FM Oscillator and Automatic Frequency Control section, and the second is the Multiplier and power amplifier section. The two sections are contained in separate housings to eliminate interaction between the two systems. The power supplies and control circuits are contained in the mainframe of the exciter.

OSCILLATOR SECTION

The heart of the exciter is a stable free-running oscillator circuit using Q1 as the active element. The oscillator operates at approximately $1/4$ of the operating frequency of the exciter. The oscillator is designed to have very low circuit capacitance, both distributed and lumped. Most of the capacity used to tune the oscillator to the correct operating frequency is supplied by two voltage-variable capacitors, C4 and C5, called varicaps. They are essentially reverse-biased silicon diodes, specifically designed for this service. The important property of these diodes is that their capacity varies with applied voltage.

It can be seen that if the voltage on the diodes varies, the



operating frequency of the exciter will vary. Several voltages are applied to the diodes. The first, a bias voltage is applied from the "AFC Zero" control. This voltage is used to establish the average capacity of the oscillator circuit to a point where its operating frequency will be very near the correct frequency of operation. The second voltage, applied from the AFC Circuit, adds to or subtracts from the voltage already on the diodes to adjust the frequency to exactly the correct operating frequency. The third voltage is an AC signal, obtained by adding together the various audio-frequency inputs of the exciter.

This AC signal will vary the operating frequency of the exciter to produce frequency-modulation of the stabilized carrier. Since the audio-signal is AC Coupled, and the AFC signal is DC Coupled, the center frequency will be constantly adjusted and maintained even during audio modulation. The Modulator is capable of modulating the transmitter more than 150% with less than 1% distortion. The usual distortion at something less than 133% modulation is .25 to .5% which is considerably less than can be obtained by even more complicated means. The high-frequency response of this system extends to more than 5 MHz and the low frequency response to about 5 Hz so there is little or no distortion to a Stereo Signal that contains components to only 53 KHz.

Following the oscillator is a two-stage "gain-stage-pair". This circuit matches the oscillator output to the input of a 50 ohm transmission line feeding the multiplier and amplifier unit in the other subassembly and obtains approximately 45 db of isolation.

AFC SECTION

A continuous AFC correction voltage is fed to the varicaps to keep the transmitter on frequency and is produced in the AFC Section. The first essential device in the AFC Section is the reference oscillator. This is a crystal oscillator that operates exactly 50 KHz lower than one-fourth the correct operating

frequency. This oscillator produces very little power and hence very little crystal heating.

A mixer combines the output of the modulated oscillator with the output of the reference oscillator to produce a frequency corresponding to the difference between the two carriers which is 50 KHz.

Following the mixer is an IC Schmidt Trigger. This produces a uniform pulse every time the input signal (50 KHz) crosses the zero axis in the positive direction. The output pulse is applied to a Monostable Multivibrator. This circuit produces a pulse of uniform width every time the input pulse is applied. This pulse is integrated to produce a DC signal whose amplitude corresponds to the IF frequency.

If the IF Frequency is exactly 50 KHz, the voltage is exactly 2 volts. If the frequency is 100 KHz, the voltage is 4 volts. If the frequency is zero, the voltage is zero. Thus, the voltage at the output of the integrator corresponds to the input frequency in a linear fashion.

This voltage change is amplified about 500 times by the third IC. An offset voltage is applied via the "frequency adjust" potentiometer, to adjust the output of this amplifier to zero when the input voltage is 2 volts. This will cause the output of the amplifier to be zero if the IF frequency is 50 KHz.

In terms of the total system; if the Oscillator frequency were to drift slightly higher than the proper frequency, the IF frequency would also drift higher. This would cause the pulses from the Schmidt Trigger to be applied to the multivibrator at a faster rate. Since the output pulses from the multivibrator are of constant width, if they increase in repetition rate, the average DC component will be higher. (If the repetition rate were equal to twice the pulse-width the DC component would be zero.) After filtering, this increase in frequency causes an increase in voltage which is amplified about 500 times and fed back to the varicaps and results in a decrease of bias, which increases the capacity and hence restores the correct operating frequency. The reverse is true if the oscillator were to drift to a lower frequency. The result of this system is that the AFC Circuit will not let the oscillator drift more than a few Hz, even though it may "want" to drift several hundred KHz. The audio-frequency modulation has no effect upon the operation of this kind of AFC Circuit.

FREQUENCY MULTIPLIER SECTION

From the oscillator and AFC unit the signal is routed to the first and second multiplier circuits. These two stages serve to multiply the input to the final operating frequency and afford about 20 db of power gain.

Following the multipliers is a three-stage radio-frequency amplifier, the power-output capability is in excess of 18 watts. The output transistors are completely protected from short-circuits or open termination and will not be destroyed by mistuning or operating into an improper load. The exciter can be operated for extended periods of time even without a load without causing any deterioration in the output transistors.

POWER SUPPLY

All of the power supplies in this exciter are electronically regulated and they are all similar in design. All of the power supplies are nonadjustable and they should supply a voltage of 15 volts, plus or minus a volt.

SPECIFICATIONS

Frequency	88-108 MHz
Emissions	F9/F3, Part 73
Modulation	Direct FM
Frequency Control	Crystal Control AFC Servo
Stability	± 1 KHz @ 100 MHz
AM Noise	-60 below 100% Modulation
FM Noise	-75 below 100% Modulation
Modulation capability	200% Modulation (± 150 KHz)
Modulation inputs (3)	High Z Composite Stereo High Z SCA (identical channel) 600 ohm MONO (75 us pre-emp)
Modulating Level	Approx. 1V P/P Composite for Stereo Nominal zero dbm for 100% modulation at 1 KHz, Mono. 0.2 V P/P for 20% modulation SCA
Frequency Response	± 0.25 db 15 Hz to 350 KHz composite input. ± 0.25, -0.5 db of 75 us curve 50 Hz to 15 KHz, Mono.
Harmonic Distortion	0.35% harmonics or less for all modulating frequencies, composite. 0.35% harmonics or less, mono input.
Stereo Separation	Determined by Stereo Generator. Phase or amplitude not appreciably affected by the exciter.
Power output	10 Watts, adjustable for FM 10 18 Watts minimum for FME 10
Power input	117 VAC, 50/60 Hz 117 Watts (VA) nominal

Additional Equipment Required for Monophonic Operation:
none

Additional Equipment Required for Stereophonic Operation:
Wilkinson Electronics SG 1-E
Stereophonic Generator or equivalent

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WILKINSON EXCLUSIVE FEATURES

INCORPORATES THE ULTIMATE FME-10 EXCITER
Ultra Stable - So Drift Free It Requires No Oven.

Ultra Fidelity - 5 Hz - 15 Hz 100% Modulation Capability.

Ultra Stereo - 50 - 60 db Separation 30 Hz - 15 Khz.

Ultra Distortionless and Noiseless with Flat Response 30-15000hz.

Solid State 20 Watts Output With Built-In Power Supply.

Ultra Accessible - Built on Slide-Out Drawer With Space For Stereo Generator.

INCORPORATES AN ASSURED POWER AMPLIFIER
Single Non Neutralized 4CX100K Final Amplifier
Assures Absolute Stability and Power Capability.

Vacuum Capacitor Tuning and Loading Eliminates Sliding Contacts And Mechanical Problems To Assure Reliability And Long Life.

Input And Output Reflectometers Assure Ease of Tuning, Maintenance and Accuracy of Adjustment.

Pi Output Circuit and Exclusive Harmonic Filter Assure Freedom of Spurious Emissions and Harmonics.

INCORPORATES POWERFUL PROTECTED POWER SUPPLIES

Uses Self Testing Wilkinson Silicon Rectifiers Voltage Protection 400% Current Protection 800%.

Modern Fiberglass Printed Circuit Control Ladder Conserves Space, Reduces Complexity and Eliminates Unnecessary Wiring.

Solid State Time Delay and Recycling Increases Reliability and Eliminates Expensive Relay Replacement.

Double Duty Plate Transformer and Filter Reactor Always Loaf.

GENERAL MECHANICAL DESCRIPTION

The FM 1000E/FM1000ES FM Broadcast transmitter is housed in a steel cabinet finished in a hard durable Black Vinyl Finish with White enamel trim. Only four square feet of floor space is required. All operating controls are on the front panel and access to the interior of the Power amplifier is thru the door of the PA Cubicle. A sliding drawer directly beneath the PA houses the low voltage power supplies and control ladder circuits. Interlock and overload indicators as well as overload reset controls are on the front panel of this slide-out drawer. All components of these circuits are completely accessible when the drawer is opened.

An additional drawer which houses the exciter and where required, the stereo generator is the next vertical component beneath the control circuit drawer. In addition there are two slide-out components in the exciter itself which facilitate exciter adjustments, but for service or maintenance on the exciter power supply, opening of the main drawer provides complete accessibility.

The right side panel of the FM1000 E is removable and all other components can be reached from this access or from the full rear door.

The Main power supply including plate transformer, and filter circuitry are located on the base of the transmitter with the main circuit breaker on the lower front panel.

FM-1000E, 1000 WATT FM BROADCAST TRANSMITTER



Full and complete metering is provided. To the right of the power amplifier two multimeters measure screen and control grid voltage and current. A third meter measures the incident and reflected power of the exciter output.

The upper meter panel indicates plate current, plate voltage, AC Mains voltage and output power in terms of percentage. The output power meter can be switched to read reflected power from the antenna.

EXCITER FME-10 (See Block Diagram next page)

The FME-10 is a direct FM exciter capable of both monophonic and Stereophonic operation. During monophonic operation two sub-carriers can be used; during stereophonic operation only one sub-carrier can be used.

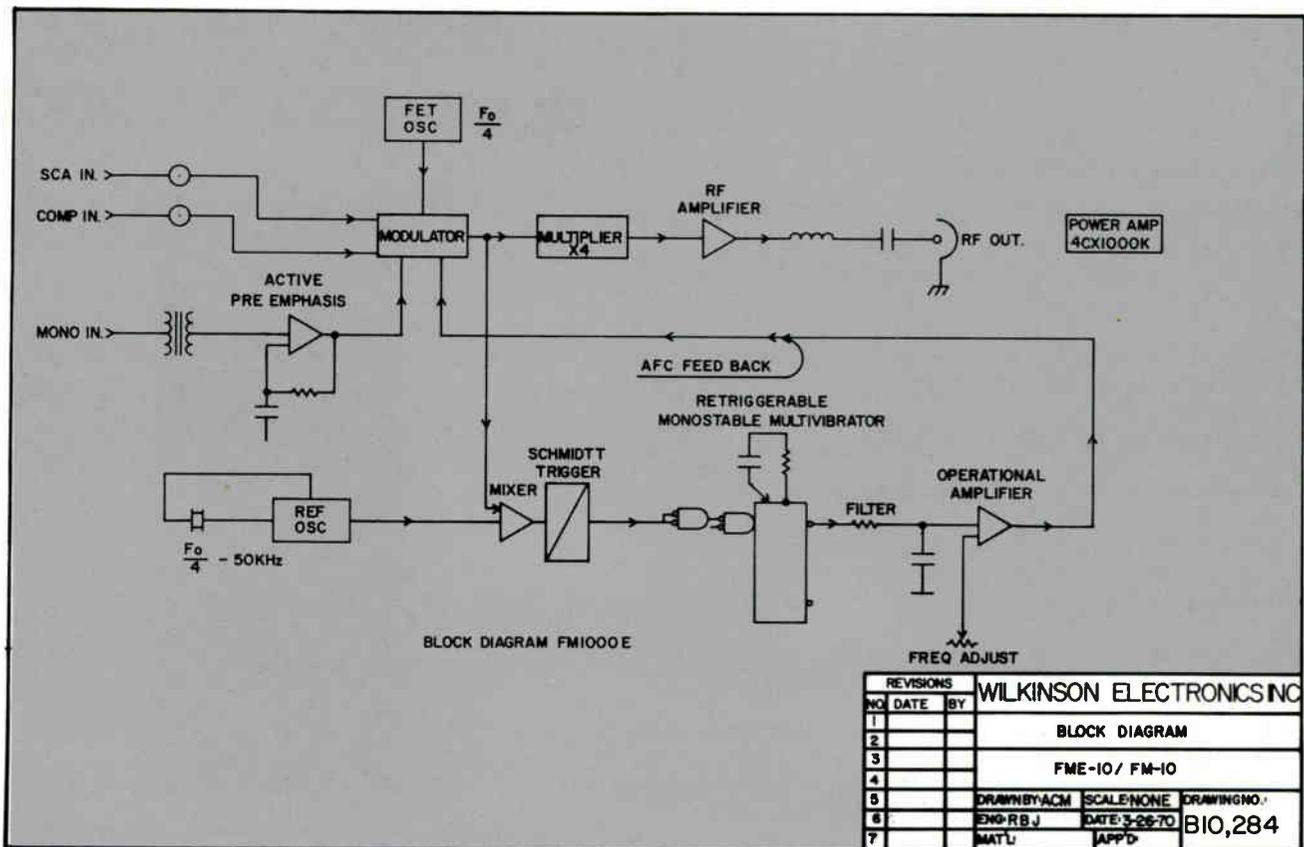
The exciter is comprised of three basic sections, the power supply, a direct FM oscillator and automatic frequency control section, and the multiplier-power amplifier section. The latter two sections are contained in separate housings to eliminate interaction between the two systems. The power supplies and control circuits are contained in the main frame of the exciter.

POWER AMPLIFIER

A single 4CX1000K tube is used as the final RF amplifier. Operating in a grounded cathode configuration. It does not require neutralization because of the internal structure of the screen grid. Capacity tuned pi networks are used in both input and output circuits and both circuits incorporate reflectometers for assurance of correct tuning and safe operations. The inductance in the output is fixed during factory test and variable vacuum capacitors vary tuning and loading of the final.

POWER SUPPLY

A full wave single phase bridge silicon rectifier circuit provides 3000 volts for the 4CX1000 K plate. Separate bridge circuits provide the 500 volt screen supply and 120 volt bias supply.



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

Type of Emission F3 F9
 Frequency Range 88 to 108 mhz
 Rated Power Output 1000 watts
 RF Output Impedance (7/8" EIA Flange) 50 ohms
 Audio Input Impedance 600 ohms
 Audio Input Level 0 ±2 dbm
 Amplitude vs. Frequency .. ±1 db from 50 to 15000 hz
 Carrier Frequency Stability ±1000 hz
 Modulation Capability 150 khz
 Audio Frequency Distortion..... .5% Max. 50 - 15 khz
 FM Noise Below ±75 kc 75 db
 AM Noise RMS 60 db below carrier
 Harmonic Attenuation at least 70 db
 (Ratio of any single harmonic to carrier)

ELECTRICAL SPECIFICATIONS

Power Line Requirements
 Voltage 115 and 230 volts, 50 or 60 cycles, 1 phase
 Slow Line Variations ±5%
 Rapid Line Variations ±3%
 Regulation 3%
 Power Consumption 2100 watts (approx.)
 Power Factor (approx.) 90%

MECHANICAL SPECIFICATIONS

Transmitter Overall Dimensions
 Width 28 1/4"
 Height 76"
 Depth 27"
 Net Weight 1000 lbs. (approx.)
 Maximum Altitude 7500 feet
 Ambient Temperature 0°C min. +45°C max.

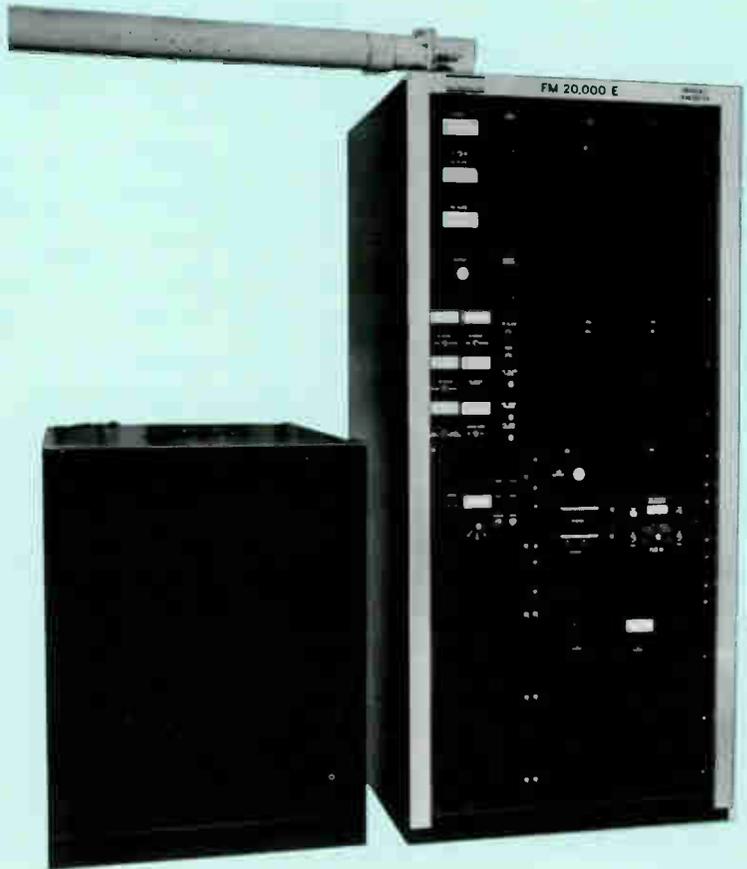
TUBE COMPLEMENT

1-4CX1000K

WILKINSON ELECTRONICS, INC.

WILKINSON ELECTRONICS, INC.

FM-20,000E 25/20 KW FM TRANSMITTER



WILKINSON EXCLUSIVE FEATURES

INCORPORATES THE ULTIMATE FME-10 EXCITER

- STABLE - SO DRIFT FREE IT REQUIRES NO OVEN
- FIDELITY - 25 Hz - 15 KHz 100% MODULATION CAPABILITY
- DISTORTIONLESS AND NOISELESS WITH RESPONSE 30-15,000 Hz WITH PRE-EMPHASIS

INCORPORATES AN ASSURED POWER AMPLIFIER

- SINGLE TETRODE 4CX15,000A FINAL AMPLIFIER. ASSURES ABSOLUTE STABILITY AND POWER CAPABILITY
- VACUUM CAPACITOR TUNING AND LOADING ELIMINATES SLIDING CONTACTS AND MECHANICAL PROBLEMS TO ASSURE RELIABILITY AND LONG LIFE
- INPUT AND OUTPUT REFLECTOMETERS ASSURE EASE OF TUNING, MAINTENANCE AND ACCURACY OF ADJUSTMENT

- THE EXCLUSIVE OUTPUT CIRCUIT AND HARMONIC FILTER ASSURE FREEDOM OF SPURIOUS EMISSIONS AND HARMONICS

INCORPORATES PROTECTED POWER SUPPLIES

- USES SELF-TESTING WILKINSON SILICON RECTIFIERS. VOLTAGE PROTECTION 300% CURRENT PROTECTION 300%
- MODERN FIBERGLASS PRINTED CIRCUIT CONTROL LADDER CONSERVES SPACE, REDUCES COMPLEXITY, AND ELIMINATES UNNECESSARY WIRING
- SOLID STATE TIME DELAY AND RECYCLING INCREASES RELIABILITY AND ELIMINATES EXPENSIVE RELAY REPLACEMENT
- DOUBLE DUTY PLATE TRANSFORMER AND FILTER REACTOR ALWAYS LOAF
- DESIGNED FOR REMOTE CONTROL

FM-20,000E 25/20 KW FM TRANSMITTER

GENERAL MECHANICAL DESCRIPTION

The FM-20,000E 25/20 KW broadcast transmitter consists of a single steel cabinet finished in a hard, durable black vinyl finish with brushed aluminum trim and a medium sized power supply vault. The major difference between the 25 KW version and the 20 KW version is the KVA rating of the power supply. Access to the equipment may be had by opening the rear interlocked door or by opening the front interlocked doors. All operating controls are on the front panel, and access to the exterior of the power amplifier is through the door of the PA cubicle. The IPA is directly beneath the PA shelf, and access to it is reached by opening the pressurized door.

The exciter and, where required, the stereo generator is the next vertical component beneath the IPA cubicle. There are two slide-out compartments in the exciter itself which facilitate exciter adjustments. In addition, the entire exciter can be pulled out for complete accessibility.

The low voltage power supplies are located on the base of the transmitter and are completely accessible through doors on the front and rear panels.

The main power supply including plate transformer is located in the power supply vault and is connected by a wiring harness to the transmitter. The main circuit breaker is mounted on the power vault.

An external harmonic filter, elbow and directional coupler are mounted on top of the transmitter cabinet.

Full and complete metering is provided by eleven separate meters to meter all vital circuits. The PA meter panel swings out for complete accessibility.

ELECTRICAL DESCRIPTION

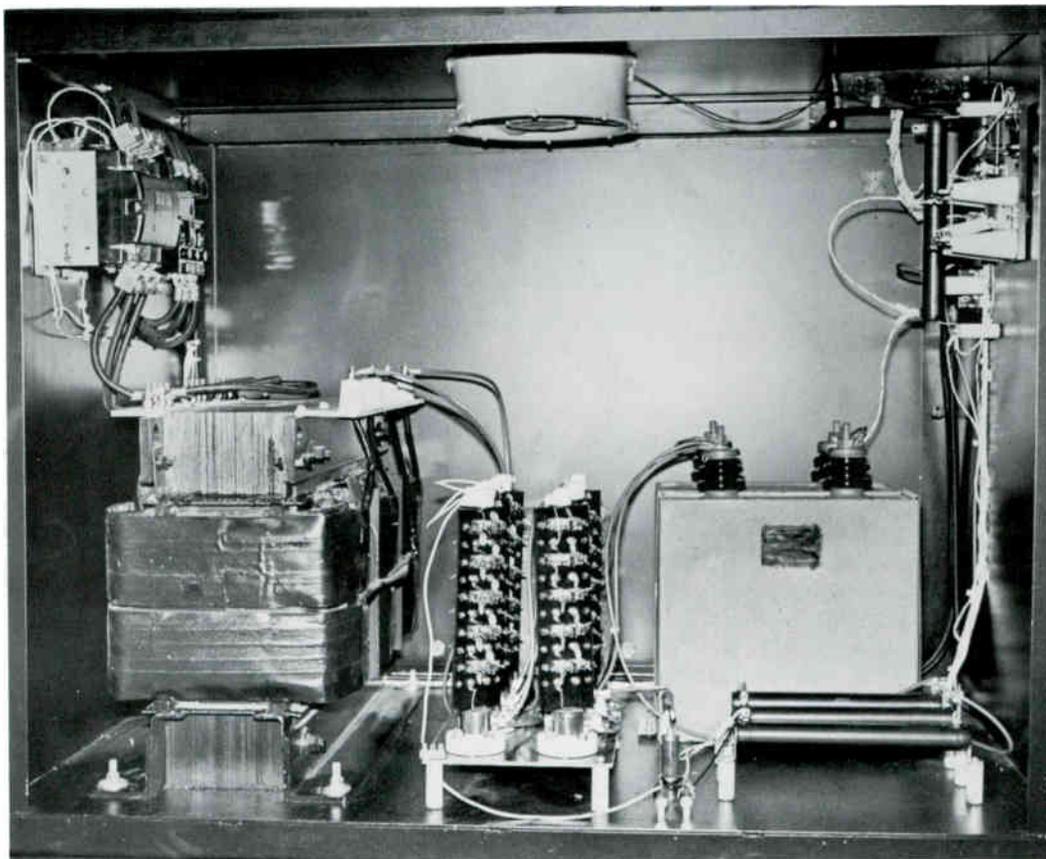
Exciter FME-10 — The FME-10 is a direct FM all solid state exciter capable of both monophonic and stereophonic operation. During monophonic operation two subcarriers can be used; during stereophonic operation only one subcarrier can be used.

The exciter is comprised of three basic sections: the power supply, a direct FM oscillator and automatic frequency control section, and the multiplier-power amplifier section. The latter two sections are contained in separate housings to eliminate interaction between the two systems. The power supplies and control circuits are contained in the main frame of the exciter. Up to 18 watts of drive power is available from this exciter and a power output meter and reflectometer is incorporated between the exciter and the IPA to indicate the exciter power output or reflected power.

IPA — The immediate power amplifier of the FM-20,000E transmitter is a 4CX250B tetrode. It is operated as a class "C" RF amplifier and is capable of delivering the 250 watts required for driving the final stage of the transmitter. It is tuned and loaded by variable capacitors in a series-series circuit to eliminate any mechanical sliding contacts; tuning is by vacuum capacitor.

PA — The final power amplifier tube is a 4CX15,000A tetrode-operated grounded cathode with a grid drive. Output tuning and loading are accomplished through the medium of fixed inductive coupling and variable vacuum capacitors, eliminating the need for mechanical sliding contacts. This circuit is extremely stable. Power output is varied through the use of a rheostat which controls the screen voltage, and power can be

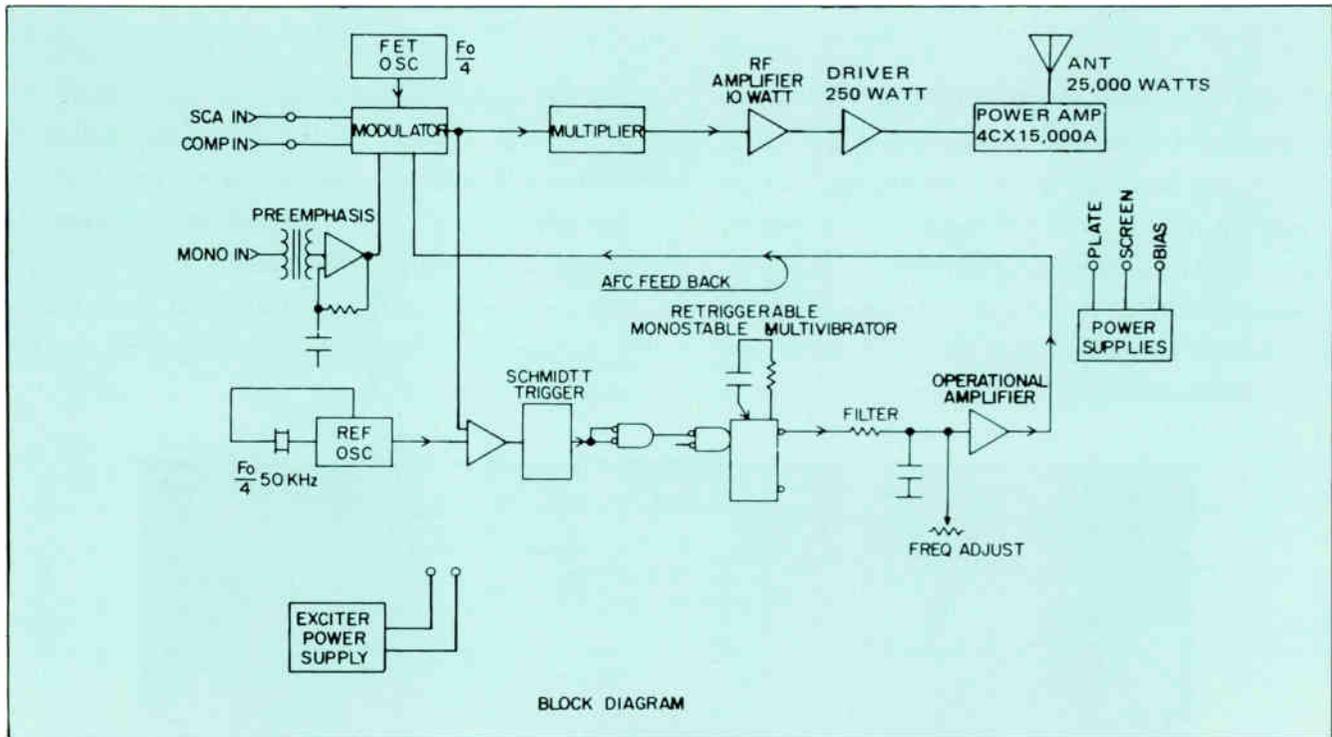
reduced by approximately 65% by this method. The 4CX15,000A is easily neutralized by the use of the exclusive Wilkinson adjustable screen ring and such neutralization is only required when tubes are changed. The 4CX15,000A tube is a very conservatively rated tube for this service, and it is not unusual to achieve up to four years of operating life out of a single tube.



POWER SUPPLY VAULT

POWER SUPPLY — All power supplies within the FM-20,000E transmitter use the exclusive Wilkinson self-testing silicon rectifiers. These are plug-in units and each diode has a neon indicator in shunt with it which is lit by the back voltage on the diode. If the diode should leak, the indicator is extinguished, thus the entire unit is self-testing. A window in the vault permits viewing of the diodes.

CONTROL CIRCUIT — The control ladder and time delay circuits of the FM-20,000E transmitter are incorporated on high quality fiberglass printed circuit boards to reduce complexity, eliminate unnecessary wiring, and conserve space. Solid state time delay and recycling eliminates expensive relay replacement.



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

Type of Emission F3/F9
 Frequency Range 88 to 108 mc/s
 Rated Power Output 25,000 watts/20,000 watts
 Efficiency Factor (Plate) 70%
 RF Output Impedance 50 ohms (3-1/8 EIA Flange)
 Audio Input Impedance 600 ohms
 Audio Input Level +10, (± 2) dbm
 Amplitude vs. Frequency Response
 Within 1 db 50 Hz to 15,000 KHz
 (75 microsecond pre-emphasis)
 Carrier Frequency Stability ± 1000 cycles
 Modulation Capability:
 Main Channel ± 150 KHz deviation
 Sub-Channel ± 150 KHz deviation
 FM Noise, below 75 KHz Deviation -65 db
 AM Noise, RMS -55 db
 Audio Frequency Distortion . 0.5% T.H.D. 50 Hz - 75 KHz

ELECTRICAL SPECIFICATIONS

Power Line Requirements

Line Voltage 240/220/208 V, 3-Phase, 50/60 cycles
 Slow Line Variations 5% Maximum
 Regulation 5%
 Power Consumption.. 40,000/32,000 Watts approximately
 Power Factor Approximately .9

MECHANICAL SPECIFICATIONS

Transmitter Overall Dimensions

Width 34-1/4"
 Height 76"
 Depth 27'38"
 Weight approx. 2000 lbs.
 Maximum Altitude 10,000 feet
 Ambient Temperature 45°C max. -20°C min.

Power Supply Vault

Width 30-1/4"
 Height 39-1/4"
 Depth 48-1/4"

TUBE COMPLEMENT

1 - 4CX250B
 1 - 4CX15,000A

WILKINSON
ELECTRONICS, INC.

7th ST. & CHESTNUT AVE. • CHESTER (TRAINER), PA. 19013 • TELEPHONE (215) 497-5100

FM-20,000 20 KW FM BROADCAST TRANSMITTER

FEATURES

- Self Testing Silicon Rectifiers
- Carefully Tested on Frequency
- Oversized Components
- Technically Exceeds FCC Requirements
- Smallest Space Requirements
- Complete Accessibility
- Operational Simplicity
- Twenty KW Plus — Output Capability
- Stereo Perfect with the SGLD
- Conservative Read-View Power Supply
- Operates with Remote Control
- Tuned by Vacuum Capacitor

GENERAL DESCRIPTION

The FM-20,000D consists of a single cabinet and an external power supply vault. Although the cabinet is only 34½" wide by 27" deep, full utilization of all cabinet space provides ample cubic area and full accessibility to all components.

All tuning and operating controls are on the front panel of the transmitter. After initial adjustments and tuning are completed, only the plate and filament push buttons on the front door are used for normal operation.

The small front door opens to expose the exciter and the power and control panel. The exciter may be tuned or adjusted from the front and swings out for complete accessibility to all rear chassis components of the power and control panel are readily reached.

Removing the kick plate at the bottom of the transmitter completely exposes other components. The power amplifier tube and all tuning circuits in the PA cubical may be serviced by opening a panel on the rear of the PA box.

ELECTRICAL DESCRIPTION

Control—The control circuit of the FM-20,000D has been designed for remote control. Although all the major circuits are protected by circuit breakers, actual application of line filament and plate voltages is accomplished by contactors. Facilities within the cabinet permit independent operation of the contactors. In general, the engineer need only operate the front door controls. Automatic recycling is also included.

Exciter—The FM exciter of the FM-20,000D broadcast transmitter is crystal-controlled. A frequency stability of .001% is assured by utilizing vacuum crystals, and an excellent frequency response with distortion of less than 1% is achieved by utilizing conventional pulse-shaping and phase-modulating circuits.



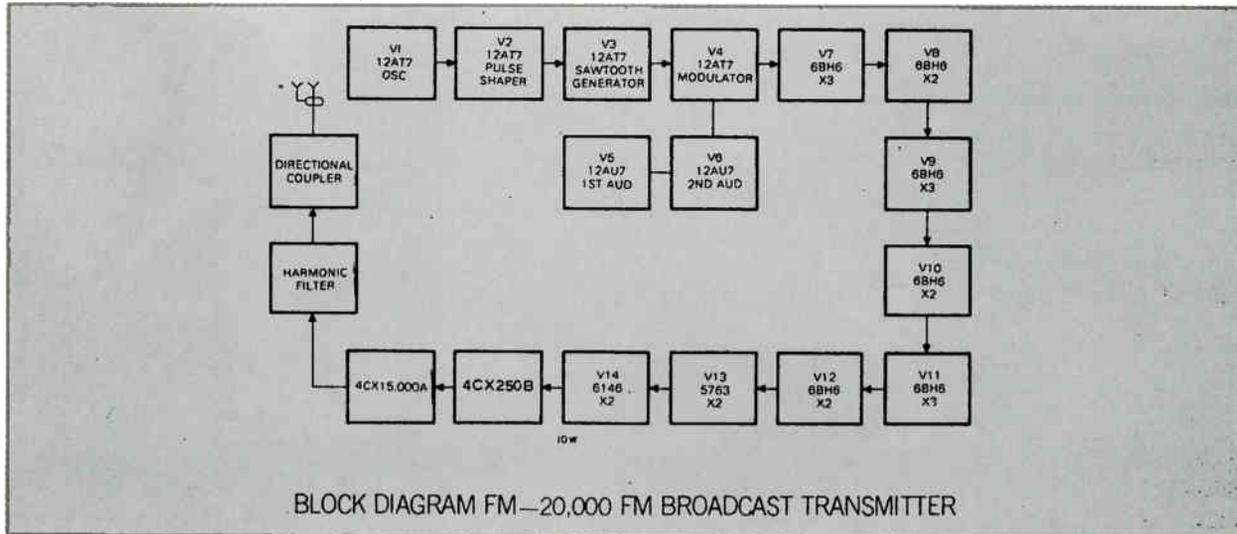
The RF frequency multipliers are driven to saturation reducing the AM hum to a negligible value. It should be noted that no RF stage operates as an on-frequency amplifier. This eliminates the problems of neutralization and assures freedom from parasitics and secures continuity of programming. All circuits of the exciter can be tuned from the front by simply adjusting the coils for a peak reading indication on their respective stages. A front panel meter is provided for analyzing this tuning. After the initial adjustment, it is very unlikely that any retuning will be required. The output of the exciter is approximately ten watts at the carrier frequency of the transmitter.

IPA—The intermediate power amplifier of the FM-20,000D is a 4CX300Y tetrode. It is operated as a Class C RF amplifier and is capable of delivering much more than the 250 watts required for driving the final stage of the transmitter.

PA—The final power amplifier utilizes a single 4CX15,000A tetrode. This proven tube delivers excellent stability with the proven circuitry increased more than 24KW to the output tuning circuitry of the transmitter. In VHF tuning circuitry incorporates a motor driven vacuum capacitor in addition to a motor driven shunt inductants to assure ease of output tuning.

Power Supply—All power supplies within the FM-20,000D use long line, self-testing silicon rectifiers. The main power supply for the high voltage is housed in a 40" by 30" x 30" cubical which may be mounted in any indoor location. The top of the power supply cabinet is a hinged door incorporating a plexiglas window through which the main silicon stacks are completely visible. Each diode in the power supply is

shunted by a neon indicator. If the reverse leakage of the diode exceeds 50 micro amperes, the lamp is extinguished and it is evident that a diode has failed. Thus by inspecting occasionally the power supply, the complete stacks of the power supply of the silicon rectifiers are determined. The power supply is extremely conservative, providing 300% safety factor in both voltage and current.



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

Type of Emission	FM
Frequency Range	88 to 108 mc
Rated Power Output	20,000 watts
RF Output Impedance (1-5/8" fitting)	50 ohms
Audio Input Impedance	600 ohms
Audio Input Level	+10 ± 2 dbm
Amplitude vs. Frequency	±1 db from 50 to 15,000 cycles with 75 uS pre-emphasis
Carrier Frequency Stability	+1000 cycles
Modulation Capability	±75 kc
Audio Frequency Distortion	1.0% max. 50-100 cycles .5% max. 100-7500 cycles 1.0% max. 7500-15,000 cycles
FM Noise Below ±75 kc	65 db
AM Noise, RMS	55 db below carrier
Harmonic Attenuation	at least 80 db (Ratio of any single harmonic to carrier)

ELECTRICAL SPECIFICATIONS

Power Line Requirements:	
Voltage	230 volts, 50 or 60 cycles, 3 phase
Slow Line Variations	5% Max.
Rapid Line Variations	3% Max.
Regulation	3% Max.
Power Consumption	28,000 watts
Power Factor	90%
Efficiency, Power Amplifier	75.6%

MECHANICAL SPECIFICATIONS

	Transmitter	Power Supply
Dimensions:		
Width	34 1/4"	40
Height	76"	30
Depth	27"	30
Net Weight (approx.)	1000 lbs.	700
Maximum Altitude	7500 ft.	
Ambient Temperature	0° C. min. to 45° C. max.	

TUBE COMPLEMENT

Type Number	Quantity
0D3	2
12AT7	4
12AX7	1
12AU7	1
6BH6	6
5763	1
6146	1
4CX250B	1
4CX15,000A	1

WILKINSON
ELECTRONICS, INC.

FM-10,000E 10KW FM BROADCAST TRANSMITTER

WILKINSON EXCLUSIVE FEATURES

- Incorporates the best exciter in the world
- Single cabinet construction – requires only 9 sq. ft.
- Vacuum capacitor PA tuning and loading
- IPA input and PA output reflectometers assure ease of tuning
- Self-testing Wilkinson silicon rectifiers used throughout
- Designed for remote control
- Modern fiberglass printed circuit control ladder
- Solid state time delay and recycling

GENERAL MECHANICAL DESCRIPTION

The FM-10,000E/FM-10,000ES FM broadcast transmitter is housed in a single steel cabinet finished in a hard durable black vinyl finish with white enamel trim. Only nine square feet of floor space is required. All operating controls are on the front panel and access to the interior of the power amplifier is through the door of the PA cubicle. The IPA is directly beneath the PA shelf and access to it is reached by opening the pressurized door which also provides access to the input circuitry of the PA.

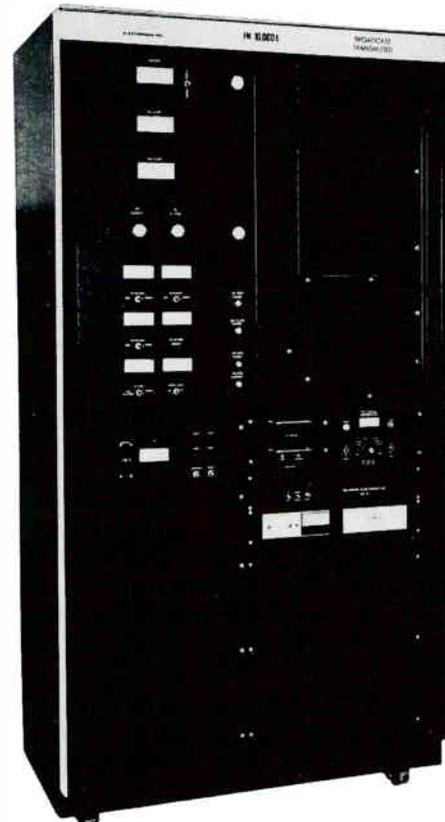
The exciter is mounted directly beneath the power amplifier on slides so that it is readily accessible for service.

ELECTRICAL DESCRIPTION

Exciter FME-10—The FME-10 is a direct FM all solid state exciter capable of both monophonic and stereophonic operation. During monophonic operation two subcarriers can be used; during stereophonic operation only one subcarrier can be used.

The exciter is comprised of three basic sections: the power supply, a direct FM oscillator and automatic frequency control section, and the multiplier-power amplifier section. The latter two sections are contained in separate housings to eliminate interaction between the two systems. The power supplies and control circuits are contained in the main frame of the exciter. Up to 18 watts of drive power is available from this exciter and a power output meter and reflectometer is incorporated between the exciter and the IPA to indicate the exciter power output or reflected power.

IPA—The intermediate power amplifier of the FM-10,000E is a 4CX250B tetrode. It is operated as a class "C" RF amplifier and is capable of delivering much more than the 100 watts required for driving the final stage of the trans-



mitter. It is tuned and loaded by variable capacitors in a series-series circuit to eliminate any mechanical sliding contacts.

PA—The final power amplifier tube is a 4CX10,000D tetrode operated grounded cathode with grid drive. Output tuning and loading are accomplished through the medium of fixed inductive coupling and variable vacuum capacitors, eliminating the need for plate blocking capacitors and mechanical sliding contacts. This circuit is extremely stable. Power output is varied through the use of a rheostat which controls the screen voltage and power can be reduced by approximately 65% by this method. The 4CX10,000D is easily neutralized by the use of the exclusive Wilkinson adjustable screen ring and such neutralization is only required when tubes are changed. The 4CX10,000D tube is a very conservatively rated tube for this service and it is not unusual to achieve up to four years of operating life out of a single tube.

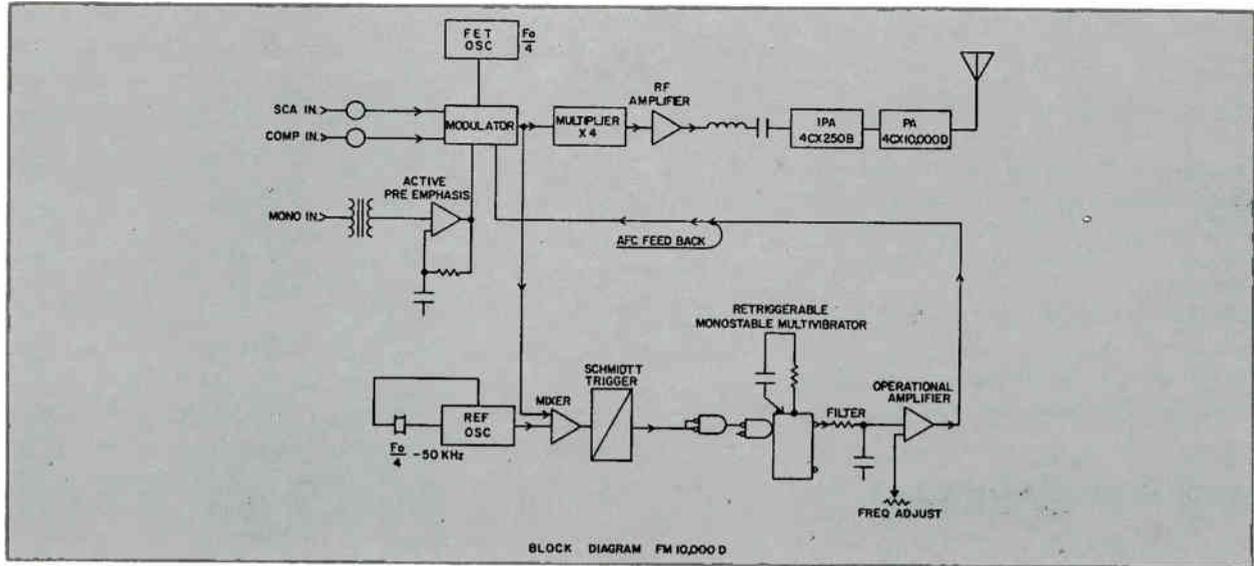
POWER SUPPLY—All power supplies within the FM-10,000E use the exclusive Wilkinson self-testing silicon rectifiers. These are plug-in units and each diode has a neon

indicator in shunt with it which is lit by the back voltage on the diode. If the diode should leak, the indicator is extinguished, thus the entire unit is self-testing.

CONTROL CIRCUIT—The control ladder and time delay circuits of the FM-10,000E are incorporated on high quality fiberglass printed circuit boards to reduce complexity,

eliminate unnecessary wiring and conserve space. Solid state time delay and recycling eliminates expensive relay replacement.

METERING—Full and complete metering is provided by ten separate meters to meter all vital circuits.



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

Type of Emission	F3 F9
Frequency Range	88 to 108 mhz
Rated Power Output	10000 watts
RF Output Impedance (EIA Flange)	50 ohms
Audio Input Impedance	600 ohms
Audio Input Level	0 ±2 dbm
Amplitude vs. Frequency	±1 db from 50 to 15000 hz
Carrier Frequency Stability	±1000 hz
Modulation Capability	150 khz
Audio Frequency Distortion5% Max. 50 - 15 khz
FM Noise Below ±75kc	75 db
AM Noise RMS	60db below carrier
Harmonic Attenuation	at least 70 db
(Ratio of any single harmonic to carrier)	

ELECTRICAL SPECIFICATIONS

Power Line Requirements

Voltage	115 and 230 volts, 50 or 60 cycles, 1 phase
Slow Line Variations	±5%
Rapid Line Variations	±3%
Regulation	3%
Power Consumption	2100 watts (approx.)
Power Factor (approx.)	90%

MECHANICAL SPECIFICATIONS

Transmitter Overall Dimensions

Width	34"
Height	76"
Depth	38"
Net Weight	1200 lbs. (approx.)
Maximum Altitude	7500 feet
Ambient Temperature	0°C min. +45°C max.

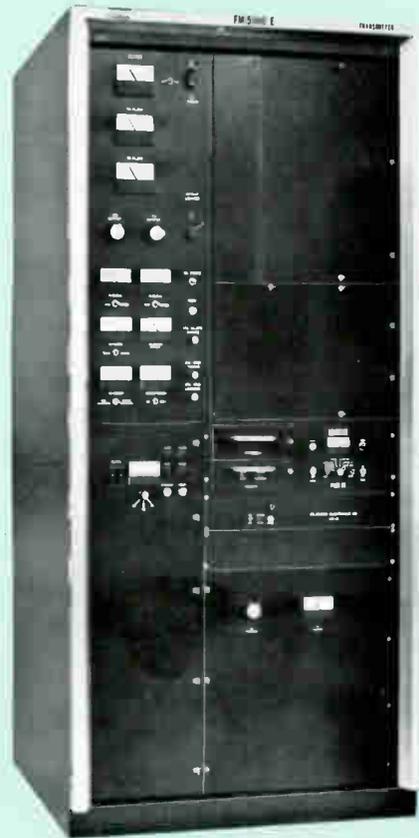
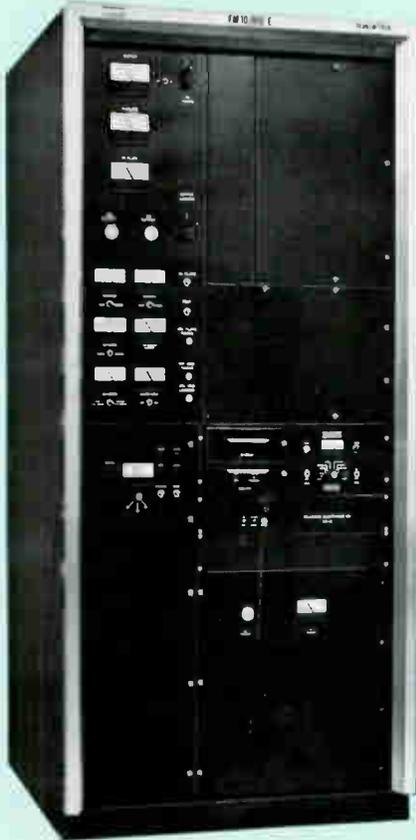
TUBE COMPLEMENT

1-4CX250B
1-4CX10000D

WILKINSON
ELECTRONICS, INC.

WILKINSON
ELECTRONICS, INC.

FM 10,000E / 7,500E / 5,000E
10 KW – 7.5 KW – 5 KW
FM BROADCAST TRANSMITTERS



FEATURES

INCORPORATES THE ULTIMATE FME-10 EXCITER

- **STABLE – SO DRIFT FREE IT REQUIRES NO OVEN**
- **FIDELITY – 25 Hz – 15 KHz 100% MODULATION CAPABILITY**
- **DISTORTIONLESS AND NOISELESS WITH RESPONSE 30-15,000 Hz WITH PRE-EMPHASIS**

INCORPORATES AN ASSURED POWER AMPLIFIER

- **SINGLE TETRODE FINAL AMPLIFIER. ASSURES ABSOLUTE STABILITY AND POWER CAPABILITY**
- **VACUUM CAPACITOR TUNING AND LOADING ELIMINATES SLIDING CONTACTS AND MECHANICAL PROBLEMS TO ASSURE RELIABILITY AND LONG LIFE**

- **INPUT AND OUTPUT REFLECTOMETERS ASSURE EASE OF TUNING, MAINTENANCE AND ACCURACY OF ADJUSTMENT**
- **THE EXCLUSIVE OUTPUT CIRCUIT AND HARMONIC FILTER ASSURE FREEDOM OF SPURIOUS EMISSIONS AND HARMONICS**

INCORPORATES PROTECTED POWER SUPPLIES

- **USES SELF-TESTING WILKINSON SILICON RECTIFIERS. VOLTAGE PROTECTION 300% CURRENT PROTECTION 300%**
- **MODERN FIBERGLASS PRINTED CIRCUIT CONTROL LADDER CONSERVES SPACE, REDUCES COMPLEXITY, AND ELIMINATES UNNECESSARY WIRING**
- **SOLID STATE TIME DELAY AND RECYCLING INCREASES RELIABILITY AND ELIMINATES EXPENSIVE RELAY REPLACEMENT**
- **DESIGNED FOR REMOTE CONTROL**

GENERAL MECHANICAL DESCRIPTION

The Wilkinson Electronics FM-10,000E/7,500E/5,000E FM broadcast transmitter is designed for high fidelity FM broadcasting on any frequency between 88-108 MHz with a power output of 10,000, 7,500, and 5,000 watts. The major difference between the FM-10,000E, 7,500E and 5,000E is the KVA rating of the power supply and the final tube.

The transmitter employs the Wilkinson Electronics Model FME-10 Exciter. This incorporates a subcarrier modulator and can be used with the Wilkinson Electronics stereo generator to provide for various applications of FM multiplex, such as background and stereophonic sound broadcasting. Incorporating simplified circuitry and improved mechanical layout, the FM-10,000E/7,500E/5,000E is a compact, medium power transmitter designed to provide long, trouble-free service with maximum operational ease and efficiency.

Air-cooled tubes are employed in all stages of the transmitter which consists of the FM Exciter unit, 250 watt driver and 5,000, 7,500 or 10,000 watt power amplifier. The Exciter utilizes all solid state design.

The FM-10,000E/7,500E/5,000E is conservatively designed for unattended operation. Functions such as starting and stopping of the transmitter, resetting overload relays, metering of all power amplifier circuits and monitoring power output can be performed at a remote location as well as at the transmitter by the addition of available remote control accessories.

The transmitter is housed in a single steel cabinet finished in a hard durable black vinyl finish with brushed aluminum trim. Only nine square feet of floor space is required.

PA and plate circuitry, as well as mechanical layout of the transmitter, are arranged to permit maximum accessibility. Vertical chassis-type construction is employed, with surface mounting of components and exposed wiring for easy and speedy tracing of circuits during servicing.

Safety for operating personnel has been given special consideration in the design of this transmitter. All access doors to compartments containing high voltages are equipped with automatic interlock switches. When these doors are opened all rectifiers are immediately de-energized.

Forced air cooling for the IPA and final power amplifier tube is provided by a blower located

at the back of the PA cabinet. An air pressure interlock switch removes plate, screen and filament voltage if the air pressure drops below a prescribed level.

Access to the equipment may be had by opening the rear interlocked door or by opening the front interlocked doors. All operating controls are on the front panel and access to the interior of the power amplifier is through the door of the PA cubicle. The IPA is directly beneath the PA shelf and access to it is reached by opening the pressurized door.

The Exciter and, where required, the stereo generator is the next vertical component beneath the IPA cubicle. There are two slide-out compartments in the exciter itself which facilitate exciter adjustments. In addition, the entire exciter can be pulled out for complete accessibility.

The transmitter power supplies are located in the base of the transmitter and are completely accessible through doors on the front and rear panels. The control circuit breaker is located on the front panel. The main circuit breaker is mounted on the wall.

An external harmonic filter, elbow, and directional coupler are mounted on top of the transmitter cabinet.

Full and complete metering is provided by twelve separate meters to meter all vital circuits.

ELECTRICAL DESCRIPTION

Exciter FME-10 — The FME-10 is a direct FM all solid state exciter capable of both monophonic and stereophonic operation. During monophonic operation two subcarriers can be used; during stereophonic operation only one subcarrier can be used.

The exciter is comprised of three basic sections: the power supply; a direct FM oscillator and automatic frequency control section; and the multiplier-power amplifier section. The latter two sections are contained in separate housings to eliminate interaction between the two systems. The power supplies and control circuits are contained in the main frame of the exciter. Up to 18 watts of drive power is available from this exciter and a power output meter and reflectometer is incorporated between the exciter and the IPA to indicate the exciter power output or reflected power.

IPA — The intermediate power amplifier of the FM-10,000E/7,500E/5,000E is a 4CX250B

tetrode. It is operated as a class "C" RF amplifier and is capable of delivering the 250 watts required for driving the final stage of the transmitter. It is tuned and loaded by variable capacitors, in a series-series circuit to eliminate any mechanical sliding contacts; tuning is by vacuum capacitor.

PA — The final power amplifier tube in the FM-10,000E is a 4CX10,000D. The final power amplifier tube in the FM-7,500E and FM-5,000E is a 4CX5000A. This final tube is operated grounded cathode with grid drive. Output tuning and loading are accomplished by the means of fixed inductive reactance and variable vacuum capacitors, eliminating the need for mechanical sliding contacts. This circuit is extremely stable. Power output is varied through the use of a rheostat which controls the PA screen voltage, and power can be reduced by approximately 65 percent by this method.

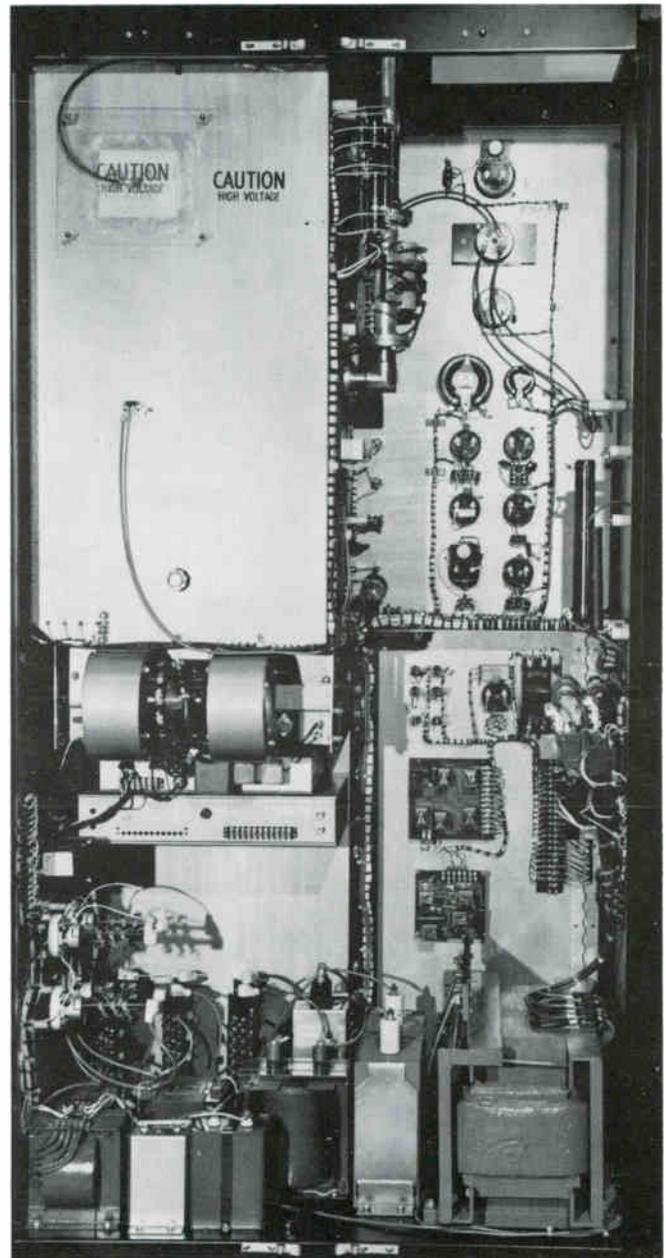
The 4CX10,000D and 4CX5000A are easily neutralized by the use of the exclusive Wilkinson adjustable screen ring, and such neutralization is only required when tubes are changed and requires about two minutes' time.

POWER SUPPLY

All power supplies within the FM-10,000E/7,500E/5,000E use the exclusive Wilkinson self-testing silicon rectifiers. These are plug-in units, and each diode has a neon indicator in shunt with it which is lit by the back voltage on the diodes. If the diode should leak, the indicator is extinguished, thus the entire unit is self testing.

CONTROL CIRCUIT

The control ladder and time delay circuits of the FM-10,000E/7,500E/5,000E are incorporated on high quality fiberglass printed circuit boards to reduce complexity, eliminate unnecessary wiring, and conserve space. Solid state time delay and recycling eliminates expensive relay replacement.



REAR VIEW OF TRANSMITTER
DOOR OPEN

WILKINSON

ELECTRONICS, INC.

WILKINSON EXCLUSIVE FEATURES

INCORPORATES THE ULTIMATE FME-10 EXCITER

- Stable - So Drift Free It Requires No Oven.
- Fidelity - 25 Hz - 15 KHz 100% Modulation Capability.
- Distortionless and Noiseless with Response 30-15000 Hz with Pre-emphasis.
- Solid State 10 Watts Output with Built-In Power Supply.

INCORPORATES AN ASSURED POWER AMPLIFIER

- Single Pentode 5CX1500A Final Amplifier. Assures Absolute Stability and Power Capability.
- Vacuum Capacitor Tuning And Loading Eliminates Sliding Contacts and Mechanical Problems to Assure Reliability and Long Life.
- Input and Output Reflectometers Assure Ease of Tuning, Maintenance and Accuracy of Adjustment.
- The Output Circuit and Exclusive Harmonic Filter Assure Freedom of Spurious Emissions and Harmonics.

INCORPORATES PROTECTED POWER SUPPLIES

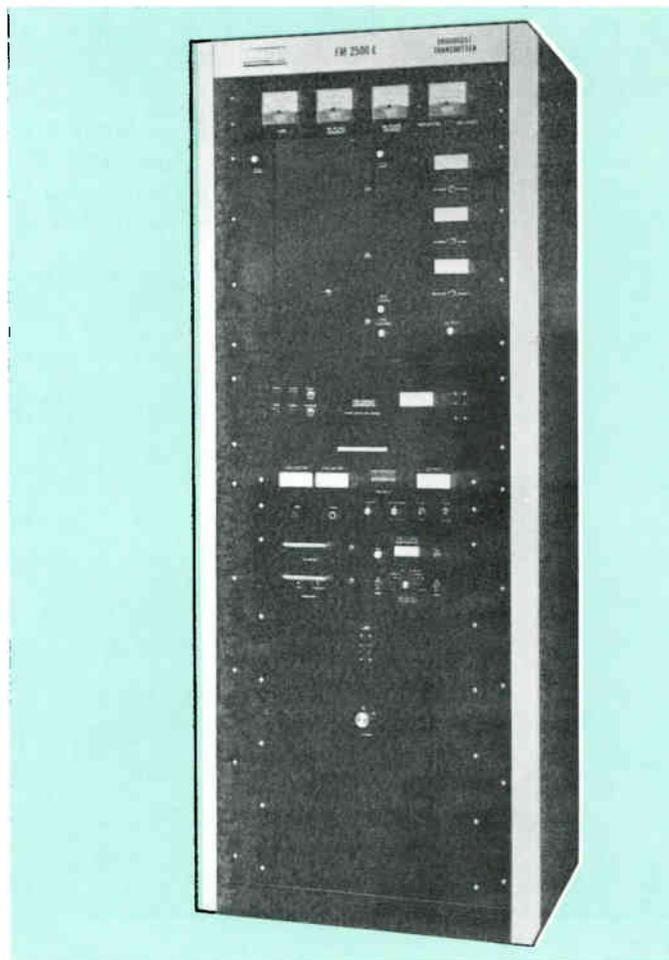
- Uses Self Testing Wilkinson Silicon Rectifiers Voltage Protection 400% Current Protection 800%
- Modern Fiberglass Printed Circuit Control Ladder Conserves Space, Reduces Complexity and Eliminates Unnecessary Wiring.
- Solid State Time Delay and Recycling Increases Reliability and Eliminates Expensive Relay Replacement.
- Double Duty Plate Transformer and Filter Reactor Always Loaf.
- FCC Type Accepted to 2800 Watts.

GENERAL MECHANICAL DESCRIPTION

The FM2500E broadcast transmitter is housed in a steel cabinet finished in a hard durable Black Vinyl Finish with Brushed Aluminum Trim. Only four square feet of floor space is required. All operating controls are on the front panel and access to the interior of the power amplifier is thru the door of the PA cubicle. A sliding drawer directly beneath the PA houses the low voltage power supplies and control ladder circuits. Interlock and overload indicators as well as overload reset controls are on the front panel of this slide-out drawer. All components of these circuits are completely accessible when the drawer is opened.

The exciter and where required, the stereo generator is the next vertical component beneath the control circuit drawer. There are two slide-out compartments in the exciter itself which facilitate exciter adjustments, but for service or maintenance on the exciter power supply, opening of the rear provides complete accessibility:

FM2500E 2.5KW FM TRANSMITTER



All components can be reached from this access or from the full rear door.

The Main power supply including plate transformer, and filter circuitry are located on the base of the transmitter with the main circuit breaker on the lower front panel.

Full and complete metering is provided. To the right of the power amplifier two multimeters measure screen and control grid voltage and current. A third meter measures the incident and reflected power of the exciter output.

The upper meter panel indicates plate current, plate voltage, AC Mains voltage and output power in terms of percentage. Full metering for the IPA stage is incorporated in the 65 watt section. The output power meter can be switched to read reflected power from the antenna.

EXCITER FME-10 and IPA

The FME-10 is a direct FM exciter capable of both monophonic and stereophonic operation. During monophonic operation two sub-carriers can be used; during stereophonic operation only one sub-carrier can be used.

The exciter is comprised of three basic sections, the power supply, a direct FM oscillator and automatic frequency control section, and the multiplier-power amplifier section. The latter two sections are

contained in separate housings to eliminate interaction between the two systems. The power supplies and control circuits are contained in the main frame of the exciter. The exciter drives the IPA, which is a Motorola 2N6166, which supplies 65 watts of drive for the final tube. This is more than adequate for this service.

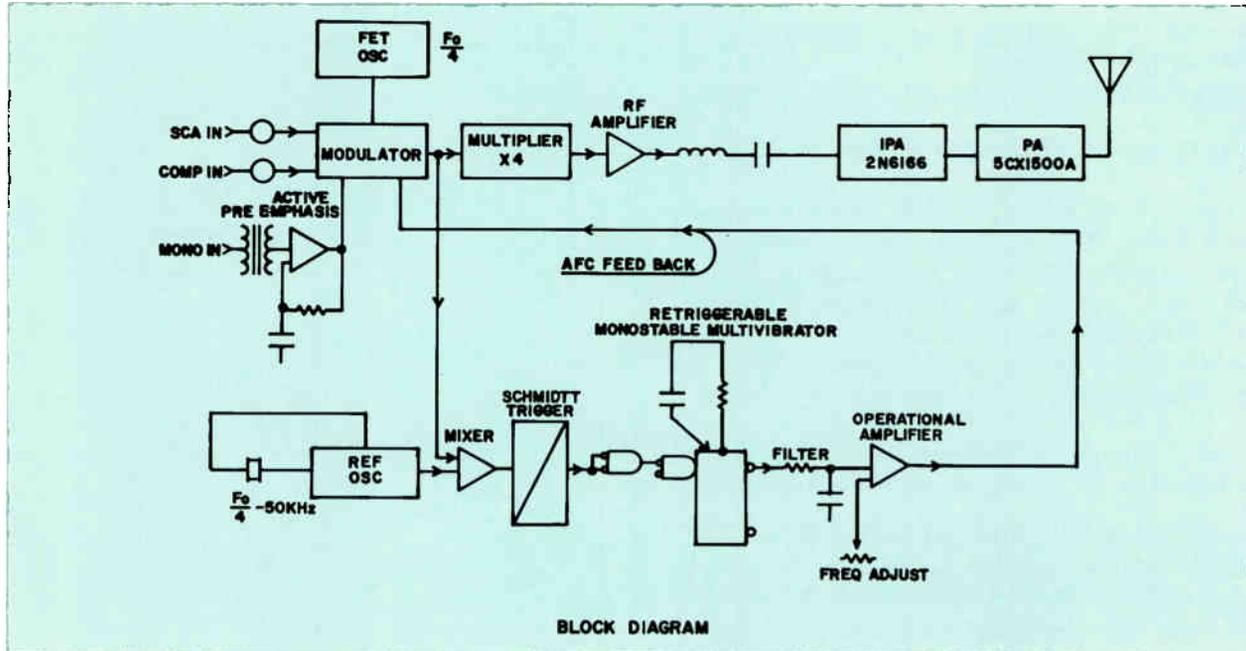
POWER AMPLIFIER

A single 5CX1500A tube capable of 3000 watts is used as the final RF amplifier. Operating in a grounded cathode configuration. It does not require neutralization because of the internal structure of the

screen grid. Capacity tuned networks are used in both input and output circuits and both circuits incorporate reflectometers for assurance of correct tuning and safe operations. The inductance in the output is fixed during factory test and variable vacuum capacitors vary tuning and loading of the final.

POWER SUPPLY

A full wave single phase bridge silicon rectifier provides 4500 volts for the 5CX1500A plate. Separate bridge circuits provide the 500 volt screen supply and 120 volt bias supply.



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

Type of Emission F3 F9
 Frequency Range 88 to 108 MHz
 Rated Power Output 2800 watts
 RF Output Impedance (7/8" EIA Flange) ... 50 ohms
 Audio Input Impedance 600 ohms
 Audio Input Level 10 ±2 dbm
 Amplitude vs. Frequency +1/4 to 1/2 db of 75
 microsec. curve 30 Hz to 15 KHz
 Carrier Frequency Stability ±1000 Hz
 Modulation Capability ±150 KHz
 Audio Frequency Distortion... 1/2% Max. 50 - 15 KHz
 FM Noise Below ±75 kc -65 db
 AM Noise RMS 55 db below carrier
 Harmonic Attenuation at least 73 db

ELECTRICAL SPECIFICATIONS

Power Line Requirements
 Voltage 208 or 230 volts, 50 or 60 cycles, 1 phase

Slow Line Variations ±5%
 Rapid Line Variations ±3%
 Regulation 3%
 Power Consumption 4250 watts (approx.)
 Power Factor (approx.) 90%

MECHANICAL SPECIFICATIONS

Transmitter Overall Dimensions

Width 28 1/4"
 Height 76"
 Depth 27"
 Net Weight 1200 lbs. (approx.)
 Maximum Altitude 7500 feet
 Ambient Temperature -30°F min. +120°F max.

TUBE COMPLEMENT

1-5CX1500A



WILKINSON ELECTRONICS, INC.

FME 10 EXCITER

FEATURES

- * Frequency Response $\pm 1/4$ DB 15 Hz - 350 KHz
- * FM Noise Level - 65 DB below 100% Mod.
- * Harmonic Distortion - 0.5%
- * Type Modulation - Direct FM
- * Power Output - 10 Watts
- * Modulation Capability - 200%
- * Stability 1 part in 100000
- * Requires No Oven and Is Not Susceptible to Rumble and Microphonics



GENERAL

The FME 10 is a Direct-FM exciter capable of both monophonic and stereophonic operation. During monophonic operation two SCA Subcarriers can be used; during Stereophonic operation only one SCA Subcarrier can be transmitted although there are no characteristics inherent in the design of this exciter prohibiting the transmission of more than one subcarrier during this kind of operation.

This unit mounts in a standard 19 inch relay rack or in the transmitter proper. The exciter occupies 7 inches of vertical panel space.

CIRCUIT DESCRIPTION

This exciter consists of two basic sections. The first is the Direct-FM Oscillator and Automatic Frequency Control section, and the second is the Multiplier and power amplifier section. The two sections are contained in separate housings to eliminate interaction between the two systems. The power supplies and control circuits are contained in the mainframe of the exciter.

OSCILLATOR SECTION

The heart of the exciter is a stable free-running oscillator circuit using Q1 as the active element. The oscillator operates at approximately $1/4$ of the operating frequency of the exciter. The oscillator is designed to have very low circuit capacitance, both distributed and lumped. Most of the capacity used to tune the oscillator to the correct operating frequency is supplied by two voltage-variable capacitors, C4 and C5, called varicaps. They are essentially reverse-biased silicon diodes, specifically designed for this service. The important property of these diodes is that their capacity varies with applied voltage.

It can be seen that if the voltage on the diodes varies, the

operating frequency of the exciter will vary. Several voltages are applied to the diodes. The first, a bias voltage is applied from the "AFC Zero" control. This voltage is used to establish the average capacity of the oscillator circuit to a point where its operating frequency will be very near the correct frequency of operation. The second voltage, applied from the AFC Circuit, adds to or subtracts from the voltage already on the diodes to adjust the frequency to exactly the correct operating frequency. The third voltage is an AC signal, obtained by adding together the various audio-frequency inputs of the exciter.

This AC signal will vary the operating frequency of the exciter to produce frequency-modulation of the stabilized carrier. Since the audio-signal is AC Coupled, and the AFC signal is DC Coupled, the center frequency will be constantly adjusted and maintained even during audio modulation. The Modulator is capable of modulating the transmitter more than 150% with less than 1% distortion. The usual distortion at something less than 133% modulation is 0.5% which is considerably less than can be obtained by even more complicated means. The high-frequency response of this system extends to more than 5 MHz and the low frequency response to about 5 Hz so there is little or no distortion to a Stereo Signal that contains components to only 53 KHz.

Following the oscillator is a two-stage "gain-stage-pair". This circuit matches the oscillator output to the input of a 50 ohm transmission line feeding the multiplier and amplifier unit in the other subassembly and obtains approximately 45 db of isolation.

AFC SECTION

A continuous AFC correction voltage is fed to the varicaps to keep the transmitter on frequency and is produced in the AFC Section. The first essential device in the AFC Section is the reference oscillator. This is a crystal oscillator that operates exactly 50 KHz lower than one-fourth the correct operating

frequency. This oscillator produces very little power and hence very little crystal heating.

A mixer combines the output of the modulated oscillator with the output of the reference oscillator to produce a frequency corresponding to the difference between the two carriers which is 50 KHz.

Following the mixer is an IC Schmidt Trigger. This produces a uniform pulse every time the input signal (50 KHz) crosses the zero axis in the positive direction. The output pulse is applied to a Monostable Multivibrator. This circuit produces a pulse of uniform width every time the input pulse is applied. This pulse is integrated to produce a DC signal whose amplitude corresponds to the IF frequency.

If the IF Frequency is exactly 50 KHz, the voltage is exactly 2 volts. If the frequency is 100 KHz, the voltage is 4 volts. If the frequency is zero, the voltage is zero. Thus, the voltage at the output of the integrator corresponds to the input frequency in a linear fashion.

This voltage change is amplified about 500 times by the third IC. An offset voltage is applied via the "frequency adjust" potentiometer, to adjust the output of this amplifier to zero when the input voltage is 2 volts. This will cause the output of the amplifier to be zero if the IF frequency is 50 KHz.

In terms of the total system; if the Oscillator frequency were to drift slightly higher than the proper frequency, the IF frequency would also drift higher. This would cause the pulses from the Schmidt Trigger to be applied to the multivibrator at a faster rate. Since the output pulses from the multivibrator are of constant width, if they increase in repetition rate, the average DC component will be higher. (If the repetition rate were equal to twice the pulse-width the DC component would be zero.) After filtering, this increase in frequency causes an increase in voltage which is amplified about 500 times and fed back to the varicaps and results in a decrease of bias, which increases the capacity and hence restores the correct operating frequency. The reverse is true if the oscillator were to drift to a lower frequency. The result of this system is that the AFC Circuit will not let the oscillator drift more than a few Hz, even though it may "want" to drift several hundred KHz. The audio-frequency modulation has no effect upon the operation of this kind of AFC Circuit.

FREQUENCY MULTIPLIER SECTION

From the oscillator and AFC unit the signal is routed to the first and second multiplier circuits. These two stages serve to multiply the input to the final operating frequency and afford about 20 db of power gain.

Following the multipliers is a three-stage radio-frequency amplifier, the power-output capability is in excess of 18 watts. The output transistors are completely protected from short-circuits or open termination and will not be destroyed by mistuning or operating into an improper load. The exciter can be operated for extended periods of time even without a load without causing any deterioration in the output transistors.

POWER SUPPLY

All of the power supplies in this exciter are electronically regulated and they are all similar in design. All of the power supplies are nonadjustable and they should supply a voltage of 15 volts, plus or minus a volt.

SPECIFICATIONS

Frequency	88-108 MHz
Emissions	F9/F3, Part 73
Modulation	Direct FM
Frequency Control	Crystal Control AFC Servo
Stability	±1 KHz @ 100 MHz
AM Noise	-60 below 100% Modulation
FM Noise	-65 below 100% Modulation
Modulation capability	200% Modulation (± 150 KHz)
Modulation inputs (3)	High Z Composite Stereo High Z SCA (identical channel) 600 ohm MONO (75 us pre-emp)
Modulating Level	Approx. 1V P/P Composite for Stereo +10 db for 100% modulation at 1 KHz, Mono. 0.2 V P/P for 20% modulation SCA
Frequency Response	±0.25 db 15 Hz to 350 KHz composite input. ±0.25, -0.5 db of 75 us curve 50 Hz to 15 KHz, Mono.
Harmonic Distortion	0.5% harmonics or less for all modulating frequencies, composite. 0.5% harmonics or less, mono input.
Stereo Separation	Determined by Stereo Generator. Phase or amplitude not appreciably affected by the exciter.
Power output	10 Watts, adjustable for FM 10 10 Watts minimum for FME 10
Power input	117 VAC, 50/60 Hz 117 Watts (VA) nominal

Additional Equipment Required for Monophonic Operation:
none

Additional Equipment Required for Stereophonic Operation:
Wilkinson Electronics SG 1-E
Stereophonic Generator or equivalent



WILKINSON ELECTRONICS, INC.

WILKINSON EXCLUSIVE FEATURES

INCORPORATES THE ULTIMATE FME-10 EXCITER
Stable - So Drift Free It Requires No Oven.

Fidelity - 25 Hz - 15 KHz 100% Modulation Capability.
Distortionless and Noiseless with Response 30-15000hz
with Pre-emphasis.

Solid State 10 Watts Output With Built-In Power Supply.
Ultra Accessible - Built on Slide-Out Drawer With Space
For Stereo Generator.

INCORPORATES AN ASSURED POWER AMPLIFIER
Single Non Neutralized 4CX1000K Final Amplifier.
Assures Absolute Stability and Power Capability.

Vacuum Capacitor Tuning and Loading Eliminates Sliding
Contacts And Mechanical Problems To Assure Re-
liability And Long Life.

Input And Output Reflectometers Assure Ease of Tuning.
Maintenance and Accuracy of Adjustment.

The Output Circuit and Exclusive Harmonic Filter Assure
Freedom of Spurious Emissions and Harmonics.

INCORPORATES PROTECTED POWER SUPPLIES
Uses Self Testing Wilkinson Silicon Rectifiers Voltage
Protection 400% Current Protection 800%.

Modern Fiberglass Printed Circuit Control Ladder Con-
serves Space, Reduces Complexity and Eliminates
Unnecessary Wiring.

Solid State Time Delay and Recycling Increases Reliability
and Eliminates Expensive Relay Replacement.

Double Duty Plate Transformer and Filter Reactor Always
Loaf.

GENERAL MECHANICAL DESCRIPTION

The FM 1000E/FM1000ES FM Broadcast trans-
mitter is housed in a steel cabinet finished in a hard
durable Black Vinyl Finish with White enamel trim.
Only four square feet of floor space is required. All
operating controls are on the front panel and access to the
interior of the Power amplifier is thru the door of the PA
Cubicle. A sliding drawer directly beneath the PA houses
the low voltage power supplies and control ladder circuits.
Interlock and overload indicators as well as overload reset
controls are on the front panel of this slide-out drawer.
All components of these circuits are completely access-
ible when the drawer is opened.

An additional drawer which houses the exciter and
where required, the stereo generator is the next vertical
component beneath the control circuit drawer. In addition
there are two slide-out compartments in the exciter itself
which facilitate exciter adjustments, but for service or
maintenance on the exciter power supply, opening of the
main drawer provides complete accessibility.

The right side panel of the FM1000 E is removable
and all other components can be reached from this access
or from the full rear door.

The Main power supply including plate transformer,
and filter circuitry are located on the base of the trans-
mitter with the main circuit breaker on the lower front
panel.

Full and complete metering is provided. To the
right of the power amplifier two multimeters measure
screen and control grid voltage and current. A third
meter measures the incident and reflected power of the
exciter output.

FM-1000E, 1000 WATT FM BROADCAST TRANSMITTER



The upper meter panel indicates plate current, plate
voltage, AC Mains voltage and output power in terms of
percentage. The output power meter can be switched to
read reflected power from the antenna.

EXCITER FME-10 (See Block Diagram next page)

The FME-10 is a direct FM exciter capable of both
monophonic and Stereophonic operation. During mono-
phonic operation two sub-carriers can be used; during
stereophonic operation only one sub-carrier can be used.

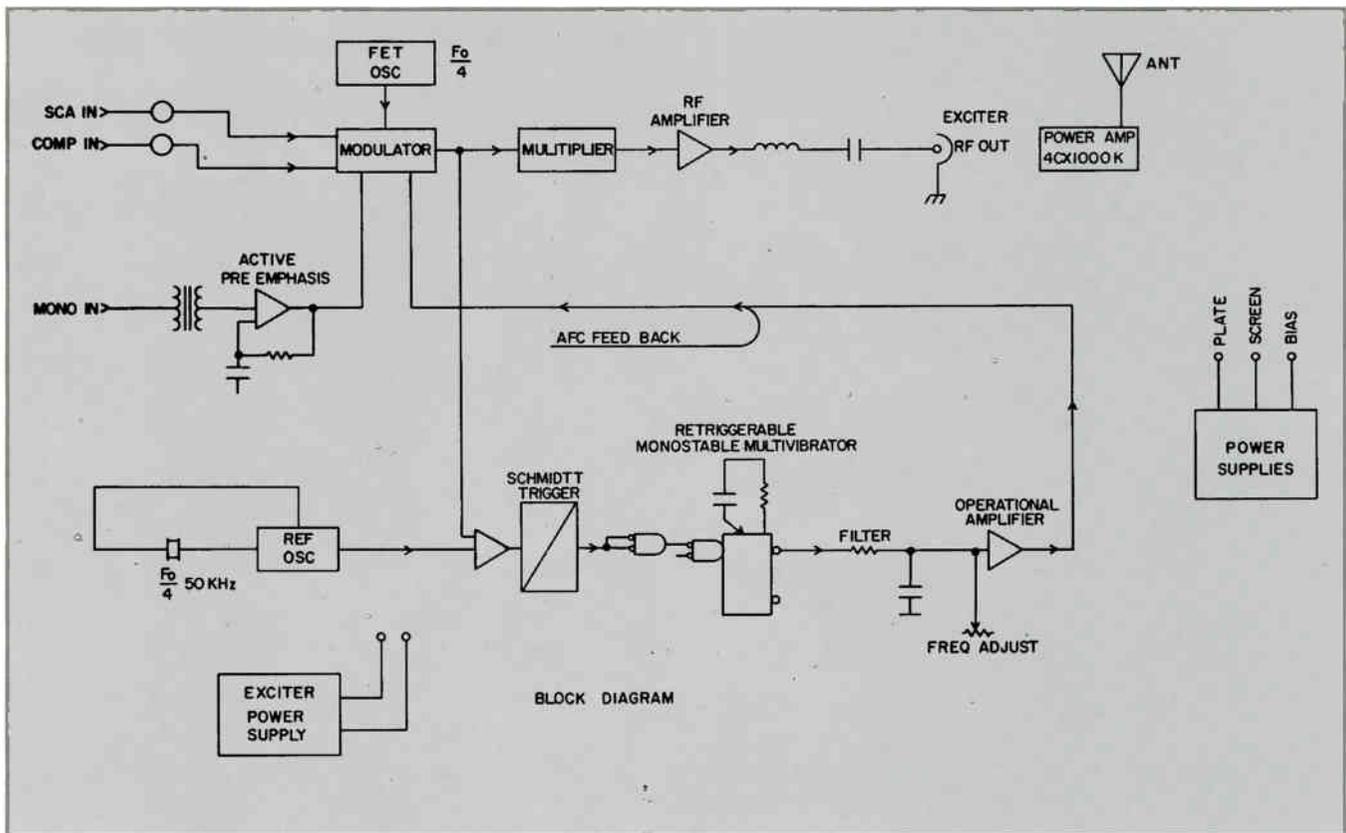
The exciter is comprised of three basic sections, the
power supply, a direct FM oscillator and automatic fre-
quency control section, and the multiplier-power amplifier
section. The latter two sections are contained in separate
housings to eliminate interaction between the two systems.
The power supplies and control circuits are contained in
the main frame of the exciter.

POWER AMPLIFIER

A single 4CX1000K tube is used as the final RF
amplifier. Operating in a grounded cathode configuration.
It does not require neutralization because of the internal
structure of the screen grid. Capacity tuned networks are
used in both input and output circuits and both circuits
incorporate reflectometers for assurance of correct tuning
and safe operations. The inductance in the output is fixed
during factory test and variable vacuum capacitors vary
tuning and loading of the final.

POWER SUPPLY

A full wave single phase bridge silicon rectifier circuit
provides 3000 volts for the 4CX1000 K plate. Separate
bridge circuits provide the 500 volt screen supply and 120
volt bias supply.



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

Type of Emission	F3 F9
Frequency Range	88 to 108 mhz
Rated Power Output	1000 watts
RF Output Impedance (7/8" EIA Flange).....	50 ohms
Audio Input Impedance	600 ohms
Audio Input Level	0 ±2 dbm
Amplitude vs. Frequency	
+¼ to ½ db of 75 microsec. curve	30 hz to 15 khz
Carrier Frequency Stability	±1000 hz
Modulation Capability	±150 khz
Audio Frequency Distortion5% Max. 50 – 15 khz
FM Noise Below ±75 kc	70 db
AM Noise RMS	60 db below carrier
Harmonic Attenuation	at least 73 db

ELECTRICAL SPECIFICATIONS

Power Line Requirements	
Voltage	208 or 230 volts, 50 or 60 cycles, 1 phase
Slow Line Variations	±5%
Rapid Line Variations	±3%
Regulation	3%
Power Consumption	2560 watts (approx.)
Power Factor (approx.)	90%

MECHANICAL SPECIFICATIONS

Transmitter Overall Dimensions	
Width	28 1/4"
Height	76"
Depth	27"
Net Weight	1000 lbs. (approx.)
Maximum Altitude	7500 feet
Ambient Temperature	-30°F min. +120°F max.

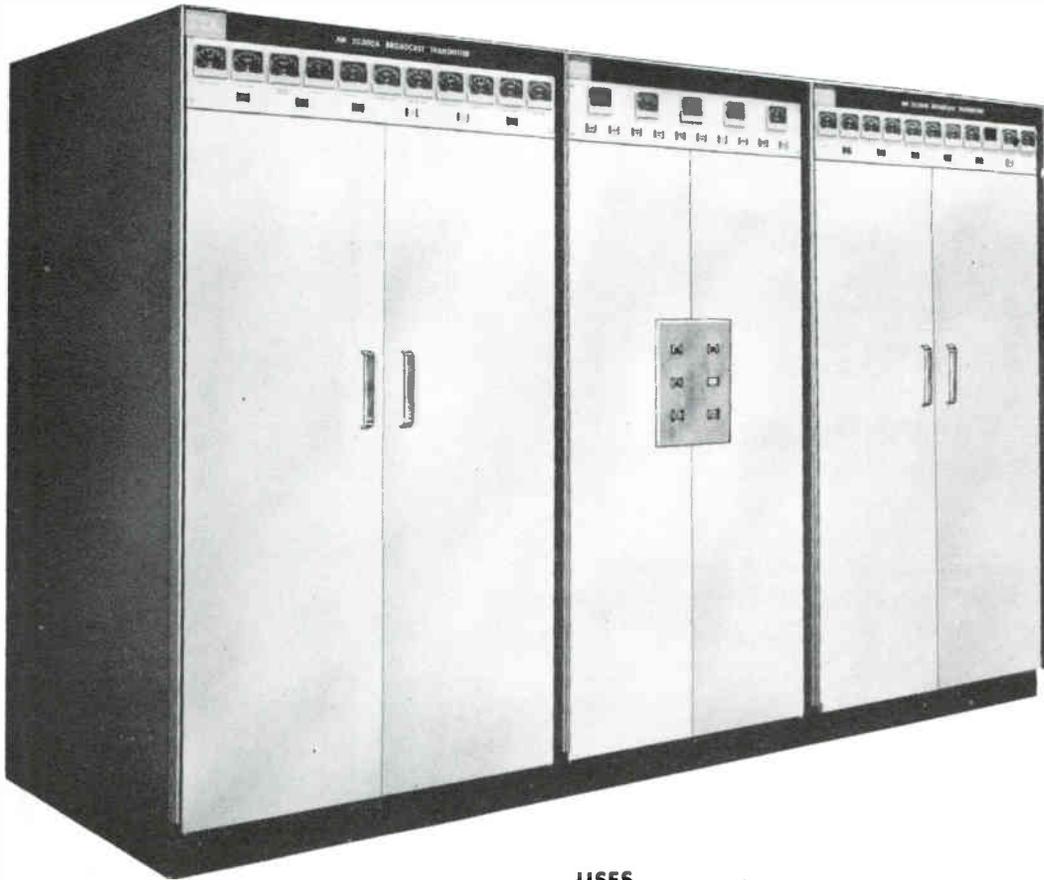
TUBE COMPLEMENT

1-4CX1000K

WILKINSON
ELECTRONICS, INC.

50,000 WATT AM BROADCAST TRANSMITTER

MODEL AM-50,000A



FEATURES

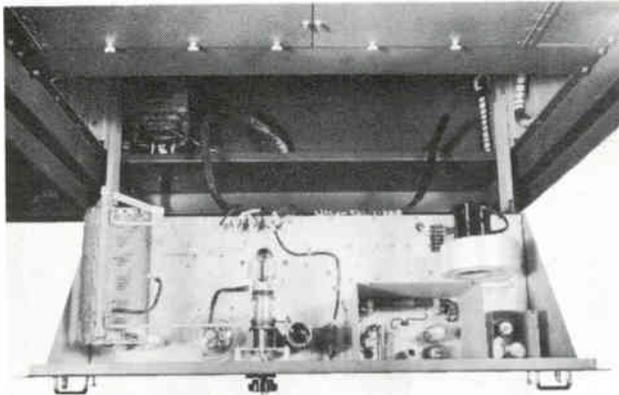
- ★ New Tetrode
- ★ Silicon Rectifiers in all Power Supplies
- ★ Only 11 Tubes—6 Tube Types
- ★ Compact—Only 76 sq. ft. Including Transformers
- ★ Proven High Level Modulation
- ★ Full Accessibility to All Components
- ★ High Speed Overload Protection
- ★ Automatic Recycling for Continuity of Service
- ★ Excellent Response—Low Distortion
- ★ Electrostatic Shielding of All Tank Circuits
- ★ Power Cutback Provisions
- ★ Remote Control Operation

USES

The AM-50000A is the most advanced 50 kw AM transmitter ever designed for AM broadcast service. It covers the standard broadcast band from 535 to 1640 kc. A high efficiency power amplifier circuit permits full 25 kw output with minimum power consumption. Conventional high level modulation is used to produce undistorted modulation together with simplicity of operation. Remote control provisions are built in for even greater operating convenience.

This compact 50 kw transmitter requires only 63 square feet of floor space, including the transformer vault. Power transformers, contactors, and circuit breakers are located in the separate vault. Meters measuring all circuit parameters are conveniently located along the top of the cabinets. For ease of operation, all operating controls are on the front panels of the transmitter. Motor driven tuning controls are used. Panel counters indicate control settings.

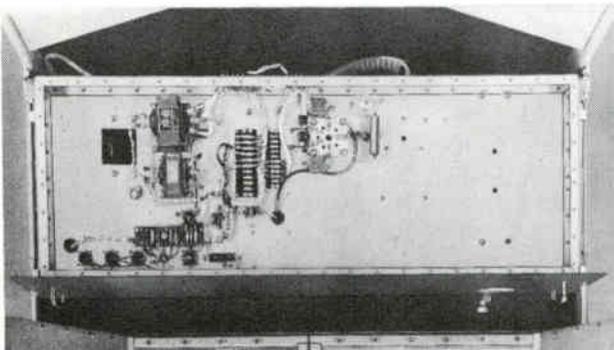
WILKINSON
ELECTRONICS, INC.



PA DRIVER

PA DRIVER

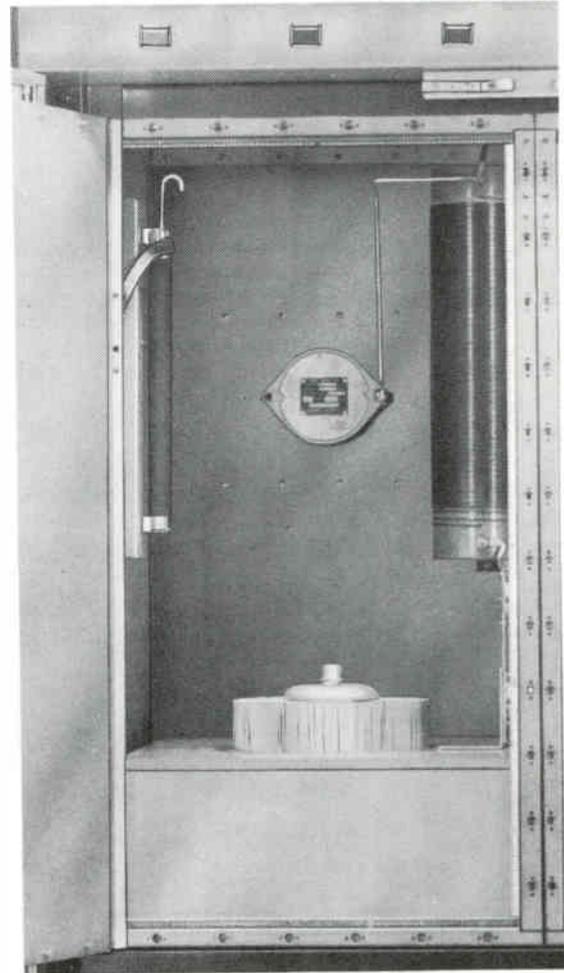
The output tube of the exciter is a 4-400A tube which provides more than adequate drive for the 4CX35000A power amplifier.



EXCITER, BOTTOM VIEW

STABLE EXCITER

A vacuum crystal oscillator circuit is used to generate the RF carrier. Provisions exist for switching between either of the two crystals in the oscillator circuit. A single 12BY7A tube is used in the oscillator circuit followed by a 6146 buffer stage. The output tube of the exciter is a 4-400A tube which provides more than adequate drive for the 4CX35000A power amplifier.



POWER AMPLIFIER

HIGH EFFICIENCY POWER AMPLIFIER

Plate efficiencies in the order of 80 percent are achieved with the power amplifier circuit. One lightweight 4CX35000C PA tube is used to provide an output in excess of 50 kw. The tube weighs only 45 pounds making it easy for one man to change. Tube hoists and dollies have been eliminated to permit rapid tube change. Saving in operating costs combined with low tube costs make the AM-50000A a truly economical 50 kw transmitter. High level modulation of the power amplifier produces a true high fidelity AM signal.

HIGH FIDELITY MODULATOR

Two 4CX15000C ceramic tetrodes provide the audio power required to 100 percent modulate the AM-50000A transmitter. High level modulation is used, because it offers greatest simplicity of operation. The techniques used are familiar to all levels of operating personnel.

High level modulation offers the added advantage of providing higher undistorted modulation capability. Since all modulation takes place in the power amplifier, very little modulation distortion is introduced. Unlike low level modulation systems there is no RF amplification of the modulated signal; therefore, less distortion is introduced.

Driving the modern 4CX15000C modulator tubes are a pair of 6146 tubes which in turn are driven by a pair of 12BY7A. The entire modulator is housed in a single 48" w x 51" d x 86" h cabinet. Modulation transformer and reactor are located in the bottom of the modulator and PA cabinets respectively.

SILICON RECTIFIERS

All high and low voltage power supplies in the 50 kw transmitter use silicon rectifiers. Medium and low voltage power supplies use banks of silicon units that are fully surge protected. With proper care these silicon rectifiers should last the life of the equipment. Silicons also minimize heat generation and eliminate filament power consumption common to mercury vapor tubes.

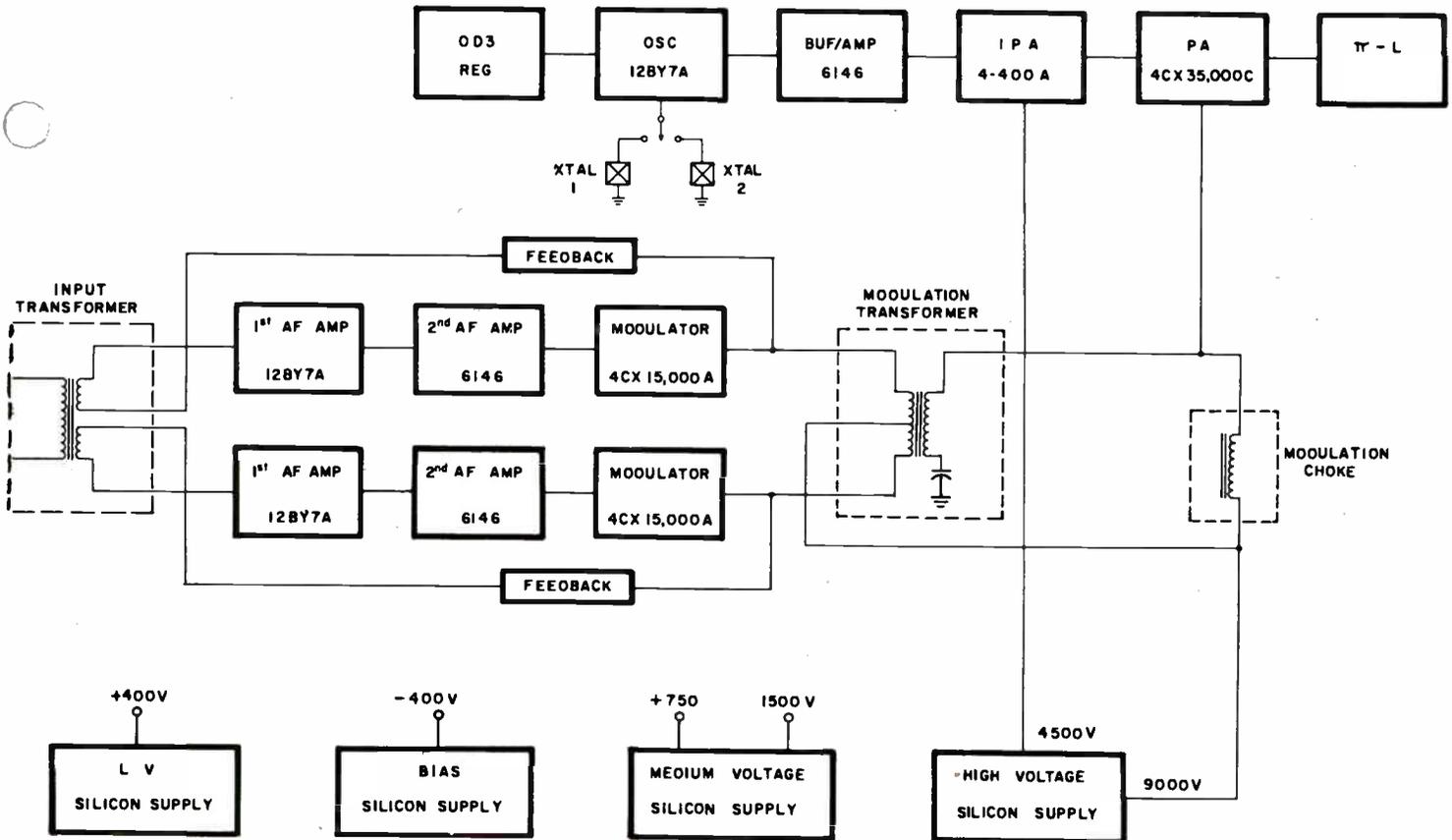
HIGH SPEED OVERLOAD PROTECTION

Each major circuit of the transmitter is fully protected against overloads. Circuit breakers and contactors automatically remove high voltage in the event of an overload. High speed relays are used in the interlocks to protect personnel. The blower motor is also interlocked and if it should fail all plate and filament voltages are immediately removed.

Circuit breakers and contactors for the plate supply are housed in the separate transformer vault along with the normal line protection breakers. This location eliminates the necessity of using high current wires in the cabinets of the equipment. High current, primary wires are time consuming in installation at the power levels required for 50 kw power output.

COMPLETE ACCESSIBILITY

Throughout this 50 kw transmitter vertical panel construction is used for maximum accessibility. All control circuits are terminated at the rear of the transmitter to make maintenance and servicing easier. The vertical construction also permits free circulation of air for cooler operation and longer component life. Access to tubes is through the interlocked front doors; components at the rear are easily reached by removing the interlocked rear panels.



BLOCK DIAGRAM AM-50,000A AM BROADCAST TRANSMITTER

WILKINSON ELECTRONICS, INC.

AM2500B 2.5 KW AM BROADCAST TRANSMITTER

FEATURES

- Solid State Modulator Driver
- Solid State Exciter
- Only One Tube Type - (4) 4-1000A
- Variable Vacuum Capacitor Tuning
- Motorized Variable Capacitor Loading
- Low Distortion, High Level Modulation
- Accessible Drawer Construction
- Solid State Timing Circuits
- Self-Testing Silicon Power Supplies
- Automatic Recycle
- Simplified PA Tuning - Only two controls
- Double Duty Plate & Modulation Transformers
- Pretuned at Customer's Frequency
- Power Cutback (optional)
- Designed for Remote Control
- Ample, Roomy Cabinet for Ease of Service
- Completely Metered
- Uses Standard Parts with Original Maker Numbers

GENERAL DESCRIPTION

The Wilkinson Electronics AM-2500B is a heavy duty 2.5 KW broadcast transmitter contained in a single cabinet requiring only 9 square feet of floor space.

All tuning and operating controls are on the front panel of the transmitter. After initial adjustments and tuning are completed, only the plate and filament push buttons are used for normal operations.

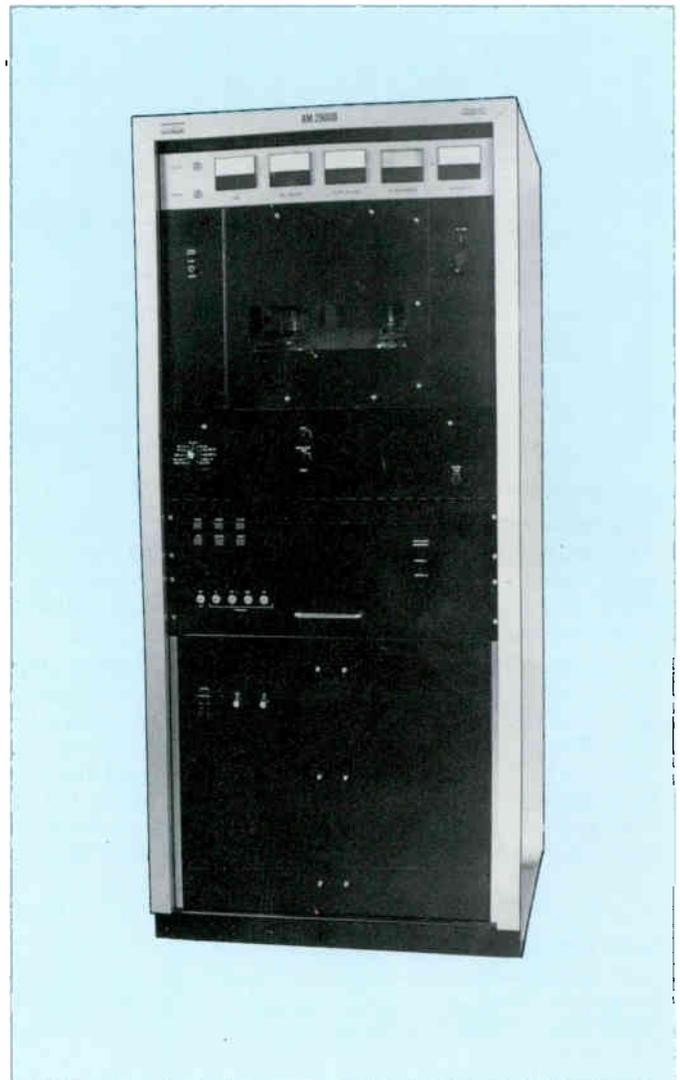
The low voltage supplies, control ladder, and timing circuits, as well as the RF exciter, are housed in the middle drawer which can slide out for ease of maintenance, cleaning, and servicing.

The solid state modulator driver is located on the shelf beneath the modulator final. The modulator finals and the RF finals, each incorporating (2) 4-1000A tetrodes, are located in the main air-cooled compartment, and operation of these tubes is visible through the Lexan plastic window.

The high voltage power supply is located on the base of the cabinet along with the modulation transformer and modulator reactor. Full access to these compartments can be achieved through the interlocked front panel doors or the interlocked rear door.

The meter panel is hinged and swings out for easy service.

RF Exciter - The solid state RF exciter and driver consist of a very well regulated two-stage crystal oscillator at 2 or 4 times the transmitter output frequency. This is followed by a buffer which in turn drives an integrated divider circuit. This circuit divides either by 2 or 4 for an output frequency be-



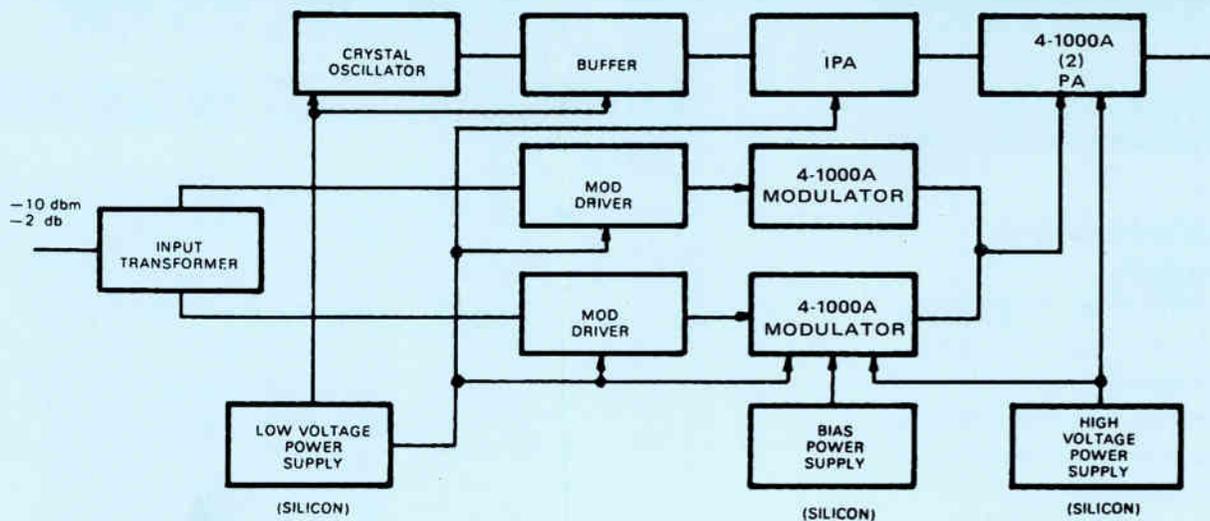
tween 540 KHz and 1600 KHz, thus dividing any crystal error by 2 or 4 and obtaining the desired frequency stability without the use of vacuum crystals or ovens.

Following the divider, a pre-driver is incorporated to drive the IPA transistor. The buffer and dividers, as well as the pre-driver are broadband circuits, thus no tuning is required of the circuits. The output of the pre-driver as well as the IPA are tuned for maximum efficiency of the IPA stage.

RF Power Amplifier - Two (2) 4-1000A tetrode tubes operating in parallel serve as the final power amplifier stage of the AM-2500B transmitter. The plate circuit is tuned and matched to the required output impedance by a Pi-L output circuit. The plate tuning is accomplished by use of a variable vacuum capacitor. The load control is a motor-driven air variable connected to the junction of the Pi-L network.

Solid State Modulator Driver - Two (2) high voltage transistors are used as a starved collector current circuit to obtain the required grid voltage swing for the final modulator tubes. Feedback is obtained from the modulation transformer and is applied to the center taps of the audio input transformer to obtain excellent response and distortion characteristics.

(Over)



BLOCK DIAGRAM AM2500B

BROADCAST TRANSMITTER

(Electrical Description cont'd.)

Two (2) 4-1000A tubes are used in class AB1 to modulate the RF carrier. These tubes are metered separately to allow each static current balance. This modulator stage is capable of 125% of positive carrier modulation, since it has double the capacity required.

Power Supplies - The exclusive Wilkinson self-testing plug-in silicon rectifier stacks are used in all of the power supplies of the AM-2500B. Each of these plug-in units are repairable as they are not encapsulated. Across each diode is a neon lamp which is lit by the back voltage across it. Should the diode short, there is no longer back voltage across it, so the neon lamp goes out indicating that a diode should be replaced. High speed overload protection circuitry is incorporated to protect

the complete transmitter and automatic recycling will automatically return the transmitter to the air after a period of one (1) second. If the fault condition continues, the transmitter is automatically turned off and requires a manual reset. This assures complete protection.

Operation - Operation of the AM-2500B is extremely simple. The main circuit breaker is located on the lower left front door. The Start Switch (which operates the blower and control ladder) as well as the plate and power switches are located on the slide-out drawer. The power amplifier tuning controls (PA tuning and PA loading) are located respectively on the right and left side of the power amplifier cubicle.

SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

Type of Emission	A3
Frequency Range	535-7000 KHz
Rated Power Output	2500 watts
Efficiency Factor	70%
RF Output Impedance	30-250 ohms
Audio Input Impedance	150/600 ohms
Audio Input Level	+10 +2 dbm
AF Response	±1 db 50-5000 cps
	±2 db 40-10,000 cps
AF Distortion	Less than 3% 50 Hz to 7500 Hz
Carrier Shift (0-100% modulation).....	Less than 3%
Noise	-55 db

ELECTRICAL POWER LINE REQUIREMENTS

Line Voltage	230 volt three phase 50/60 Hz
Regulation	5% Maximum
Power Consumption:	
(0% modulation)	5000 watts (approx.)

(100% modulation).....	7500 watts (approx.)
(average program modulation)	6000 watts (approx.)
Power Factor	90%

MECHANICAL DIMENSIONS

Width	34"
Height	77"
Depth	38"
Shipping Weight	1400 lbs.
Altitude Range	0-10,000 ft.
Ambient Temperature	-10° C to +50° C

TUBE COMPLEMENT

Power Amplifier.....	(2) 4-1000A
Modulator	(2) 4-1000A

TRANSISTOR COMPLEMENT

2N4124	2N3878	MC850P
2N3053	2N3439	40318



WILKINSON ELECTRONICS, INC.

AM 5000B-5KW AM TRANSMITTER



AM 10000B-10KW AM TRANSMITTER



FEATURES

- SOLID STATE EXCITER
- SOLID STATE CONTROL CIRCUITRY
- SHIPPED COMPLETELY TUNED AND TESTED
- SINGLE CABINET DESIGN 40" X 42" X 82"
- VACUUM CAPACITOR TUNING PA AND IPA
- SUPERB FREQUENCY RESPONSE $\pm \frac{1}{2}$ db
- DESIGNED FOR REMOTE CONTROL
- SELF TESTING SOLID STATE POWER SUPPLIES
- SOLID STATE MODULATOR DRIVER
- SUPERIOR ACCESSABILITY
- COOL CONSERVATIVE COMPONENTS
- NINE METERS MEASURE 22 FUNCTIONS
- LOW NOISE -60 db OR BETTER
- EXCEEDS ALL FCC SPECIFICATIONS
- ECONOMICAL AND EASY TO INSTALL
- EASY MAINTENANCE

GENERAL DESCRIPTION

The WILKINSON AM 5000B and AM 10000B are high level plate modulated AM Transmitters with output power of 5 KW and 10 KW respectively. Each will operate at any specific frequency between 540 KHz to 7.2 MHz.

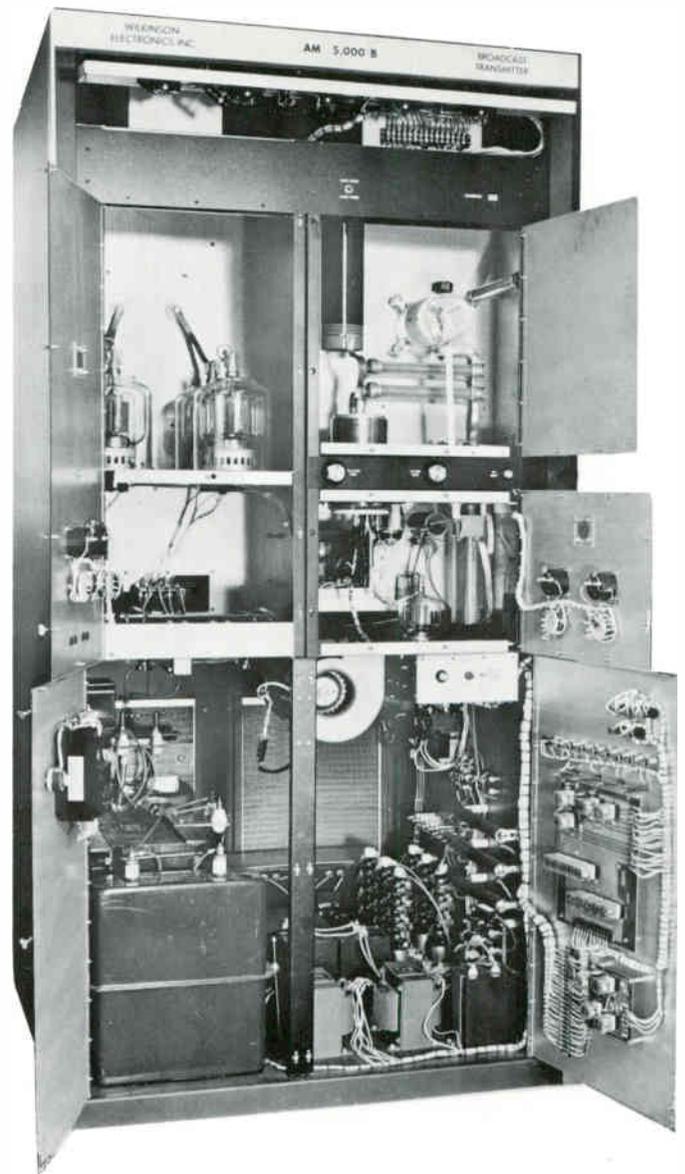
These two transmitters are identical except for the R. F. Power Amplifier, Modulation transformer, Power transformers, and Modulation and Filter reactors. All components except for the wall mounted main breaker are housed in a single cabinet 40" w x 42" d x 82" h. Only 16 square feet of floor space is required.

Ease of maintenance and accessibility are keynote features of these transmitters. The transmitter opens completely from both front and rear by means of interlocked doors providing instant access to all components. The solid state RF exciter and IPA are mounted on a hinged chassis suspended from the Power Amplifier bottom shelf and swings down for complete access. The meter panel swings up for cleaning and testing and ample access space beneath horizontal shelves makes servicing easy.

These transmitters are extremely quiet due to oversized filters and the use of two dual low noise high compression blowers.

ELECTRICAL DESCRIPTION

Power Supplies, Control and Metering. All power supplies in these transmitters incorporate controlled avalanche silicon rectifier stacks manufactured by Wilkinson Electronics. These rectifiers are self testing since a neon indicator is placed across each diode to exhibit any failure. The lamp is lit by reverse voltage and is extinguished should any diode fail. Each stack is easily removed for cleaning or repair since it is mounted in a plug-in socket. These stacks provide a capability of 18 amperes DC continuously whereas the



**IMMEDIATE FRONT ACCESS
MAINTENANCE IS EASY**

required current does not exceed 5 amperes in the 10 KW or 2.5 amperes in the 5 KW. The surge current rating of these rectifiers is 600 amperes. The voltage rating incorporates 300% safety margin.

Filter capacitors, reactors and transformers are very conservatively rated and should virtually last forever. Solid State timing and control circuitry provide simple sure safety and reliability. Nine meters measure 22 transmitter parameters.

RF EXCITER AND IPA

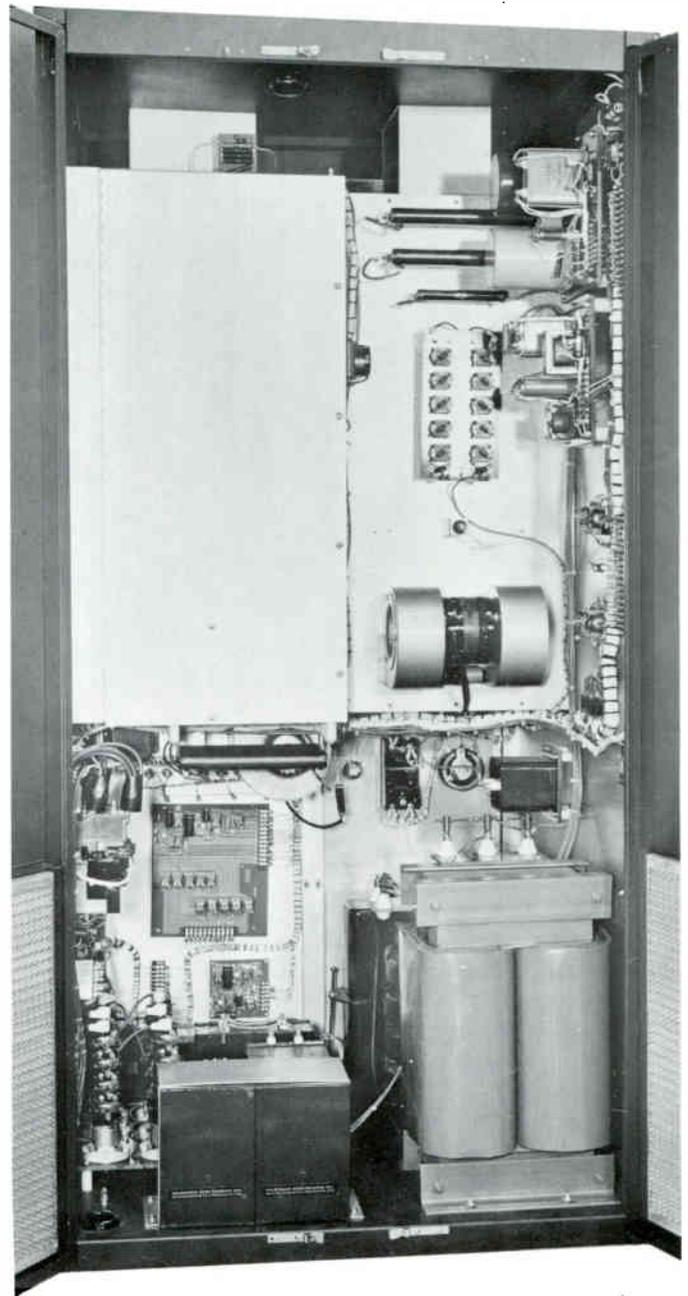
The RF exciter and intermediate power amplifier are built on an individual chassis which also incorporates the exciter power supply. The heart of this solid state exciter is a stable crystal controlled oscillator which operates at 2 or 4 times the transmitter output frequency. It is followed by a buffer amplifier used to drive one or two frequency dividers for division by 2 or 4. Such division serves further to improve stability since any frequency error would also be divided. Following the divider are two amplifier stages which provide sufficient voltage gain (600 Volts P-P) to drive the high gain tetrode IPA tube which is a 4-400. The output plate tank of the IPA is the grid tank coil of the Power Amplifier and is tuned by a vacuum variable capacitor.

POWER AMPLIFIER

The AM 5000B incorporates a 3CX2500F3 triode whereas the AM 10000B employs a 3CX10000A3 triode. The output circuit is a Pi L network and is vacuum capacitor tuned. Motor controlled output loading is incorporated where remote control is desired. Heavy duty coils and vacuum capacitors assure cool reliable operation and conservatively rated tubes warrant long life.

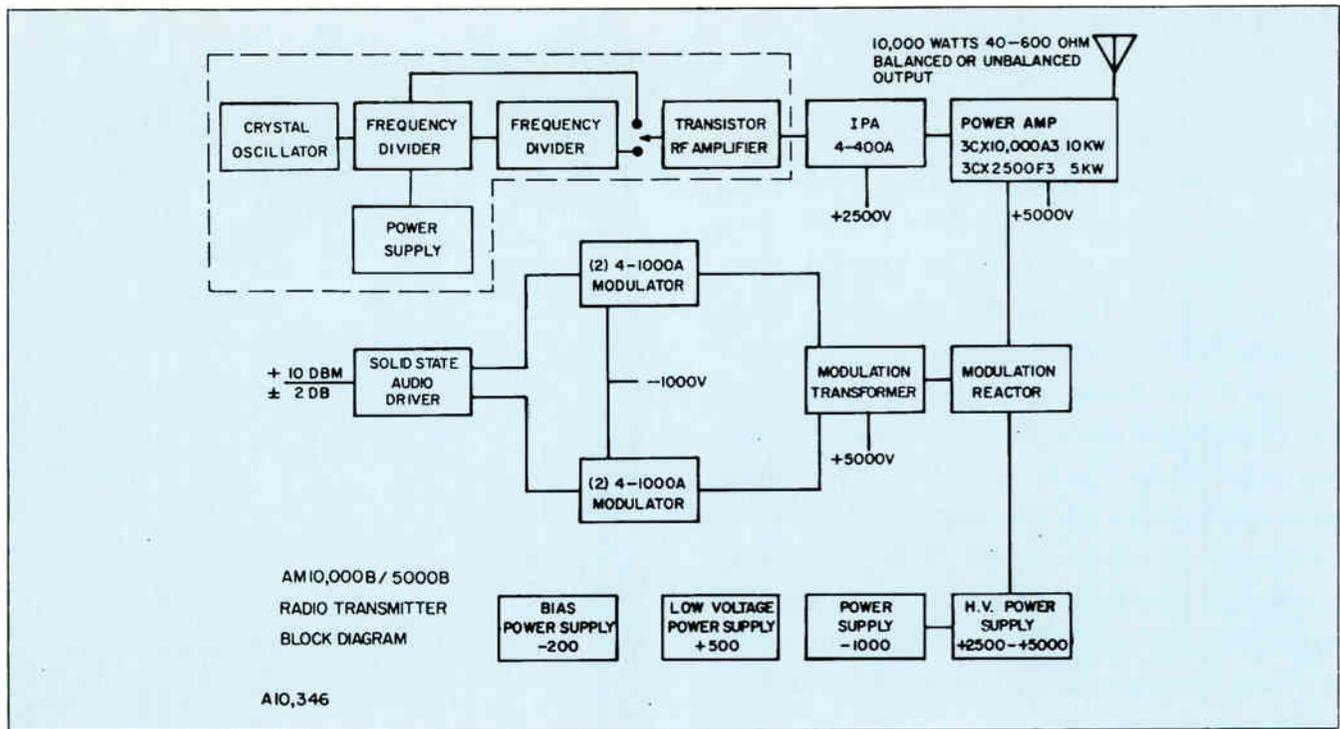
MODULATOR

The modulator driver employs two dual transistor stages of audio amplification to drive the modulator final. This stage consists of two pair of 4-1000A tetrodes operating in parallel push pull class AB 1 Service, to provide up to 7900 watts of audio power for high level modulation. Since the audio power



IMMEDIATE REAR ACCESS SERVICE IS EASY

required for 100% modulation is only 6250 watts in the 10KW and 3250 watts in the 5KW, the modulator is extremely conservative. These tubes are economical and cost little to replace in comparison with other tubes used in this service.



TECHNICAL SUMMARY

ELECTRICAL CHARACTERISTICS

Type of Emission	A3
Frequency Range	540KHZ—7.2MHZ
Efficiency Factor	80% Nominal
RF Output Impedance	Unbal—40—250 ohms Bal 300—600 ohms
Audio Input Impedance	150/600 ohms
Audio Input Level	+10 ±2 dbm
AF Response	+1 db 50 to 7500 Cycles
AF Distortion	3% at 95% modulation
Carrier Shift	Less than 3%
Noise	Less than 60 db

ELECTRICAL POWER LINE REQUIREMENTS

Line Voltage	208/230 volt 3 phase 50/60 cycles
Regulation	5% maximum
Power Consumption	0% modulation — 19 KW (AM 10000 B) 11 KW for AM 5000 B 100% modulation — 31 KW 16 KW for AM 5000 B Average modulation — 23 KW 12 KW for AM 5000 B

MECHANICAL DIMENSIONS

Height	82"
Width	40"
Depth	42"
Net Weight	2900 lbs. 5KW 3500 10KW
Altitude Range	0 — 10000 feet
Ambient Operating Temperature:	

Minimum — -10° C (50° F)
Maximum — +45° C (113° F)

TUBE COMPLEMENT

Quantity	Tube Types	Function
1	4-400A	Driver
1	3CX10000A3 (10KW)	Power Amplifier
4	4-1000A	Modulator
1	3CX2500F3 (5KW)	Power Amplifier

WILKINSON
ELECTRONICS, INC.

WILKINSON ELECTRONICS, INC.

WILKINSON EXCLUSIVE FEATURES

INCORPORATES THE ULTIMATE FME-10 EXCITER
Stable - So Drift Free It Requires No Oven.

Fidelity - 25 Hz - 15 KHz 100% Modulation Capability.
Distortionless and Noiseless with Response 30-15000hz
with Pre-emphasis.

Solid State 10 Watts Output With Built-In Power Supply.
Ultra Accessible - Built on Slide-Out Drawer With Space
For Stereo Generator.

INCORPORATES AN ASSURED POWER AMPLIFIER
Single Non Neutralized 5CX1500A Final Amplifier.
Assures Absolute Stability and Power Capability.

Vacuum Capacitor Tuning and Loading Eliminates Sliding
Contacts And Mechanical Problems To Assure Re-
liability And Long Life.

Input And Output Reflectometers Assure Ease of Tuning.
Maintenance and Accuracy of Adjustment.

The Output Circuit and Exclusive Harmonic Filter Assure
Freedom of Spurious Emissions and Harmonics.

INCORPORATES PROTECTED POWER SUPPLIES
Uses Self Testing Wilkinson Silicon Rectifiers Voltage
Protection 400% Current Protection 800%.

Modern Fiberglass Printed Circuit Control Ladder Con-
serves Space, Reduces Complexity and Eliminates
Unnecessary Wiring.

Solid State Time Delay and Recycling Increases Reliability
and Eliminates Expensive Relay Replacement.

Double Duty Plate Transformer and Filter Reactor Always
Loaf.

GENERAL MECHANICAL DESCRIPTION

The FM-1500E FM Broadcast transmitter is housed in a steel cabinet finished in a hard durable Black Vinyl Finish with Brushed Aluminum trim. Only four square feet of floor space is required. All operating controls are on the front panel and access to the interior of the Power amplifier is thru the door of the PA Cubicle. A sliding drawer directly beneath the PA houses the low voltage power supplies and control ladder circuits. Interlock and overload indicators as well as overload reset controls are on the front panel of this slide-out drawer. All components of these circuits are completely accessible when the drawer is opened.

An additional drawer which houses the exciter and where required, the stereo generator is the next vertical component beneath the control circuit drawer. In addition there are two slide-out compartments in the exciter itself which facilitate exciter adjustments, but for service or maintenance on the exciter power supply, opening of the main drawer provides complete accessibility.

The right side panel of the FM1500 E is removable and all other components can be reached from this access or from the full rear door.

The Main power supply including plate transformer, and filter circuitry are located on the base of the transmitter with the main circuit breaker on the lower front panel.

Full and complete metering is provided. To the right of the power amplifier two multimeters measure screen and control grid voltage and current. A third meter measures the incident and reflected power of the exciter output.

FM-1500E, 1500 WATT FM BROADCAST TRANSMITTER



The upper meter panel indicates plate current, plate voltage, AC Mains voltage and output power in terms of percentage. The output power meter can be switched to read reflected power from the antenna.

EXCITER FME-10 (See Block Diagram next page)

The FME-10 is a direct FM exciter capable of both monophonic and Stereophonic operation. During monophonic operation two sub-carriers can be used; during stereophonic operation only one sub-carrier can be used.

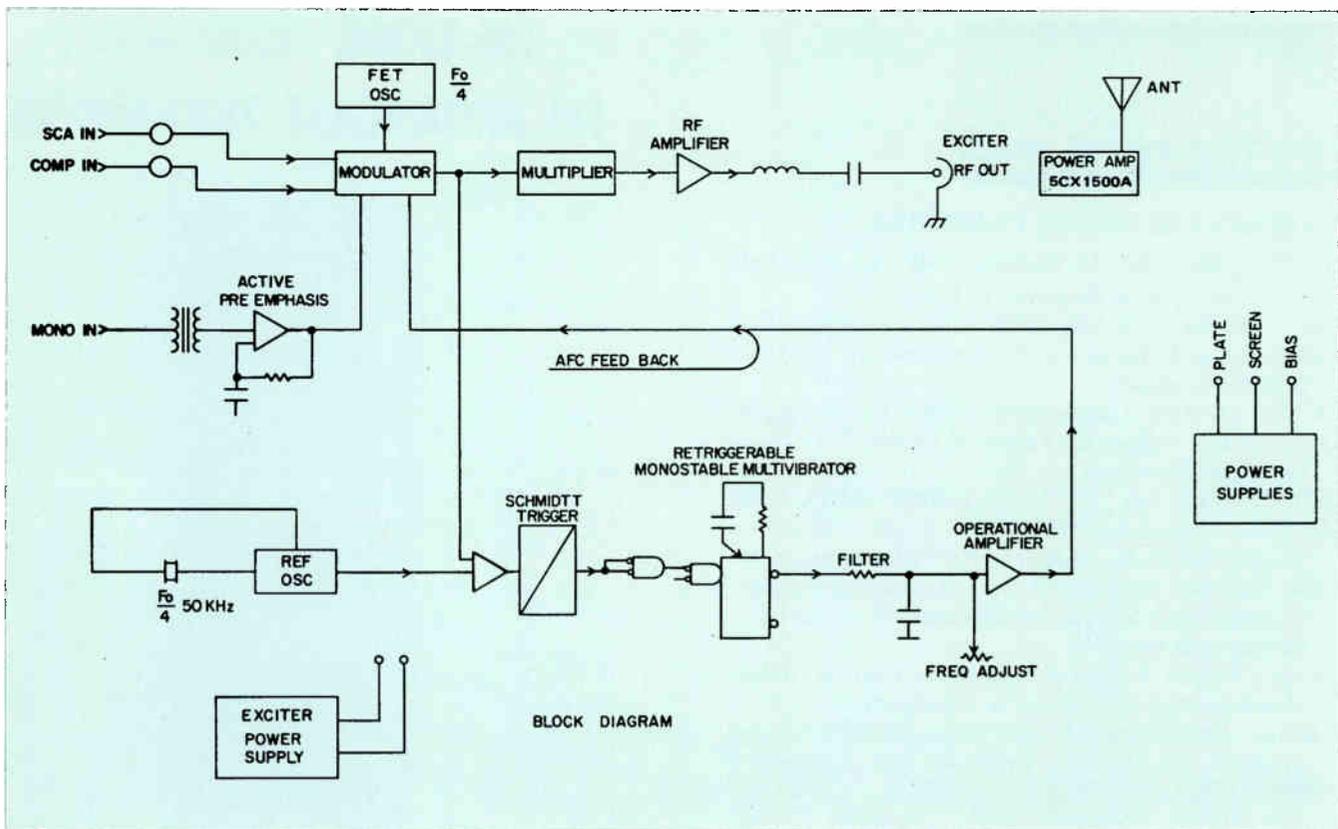
The exciter is comprised of three basic sections, the power supply, a direct FM oscillator and automatic frequency control section, and the multiplier-power amplifier section. The latter two sections are contained in separate housings to eliminate interaction between the two systems. The power supplies and control circuits are contained in the main frame of the exciter.

POWER AMPLIFIER

A single 5CX1500A tube is used as the final RF amplifier. Operating in a grounded cathode configuration. It does not require neutralization because of the internal structure of the screen grid. Capacity tuned networks are used in both input and output circuits and both circuits incorporate reflectometers for assurance of correct tuning and safe operations. The inductance in the output is fixed during factory test and variable vacuum capacitors vary tuning and loading of the final.

POWER SUPPLY

A full wave single phase bridge silicon rectifier circuit provides 4500 volts for the 5CX1500A plate. Separate bridge circuits provide the 500 volt screen supply and 120 volt bias supply.



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

Type of Emission	F3 F9
Frequency Range	88 to 108 mhz
Rated Power Output	1500 watts
RF Output Impedance (7/8" EIA Flange).....	50 ohms
Audio Input Impedance	600 ohms
Audio Input Level	0 ±2 dbm
Amplitude vs. Frequency	
+¼ to ½ db of 75 microsec. curve	30 hz to 15 khz
Carrier Frequency Stability	±1000 hz
Modulation Capability	±150 khz
Audio Frequency Distortion5% Max. 50 - 15 khz
FM Noise Below ±75 kc	70 db
AM Noise RMS	60 db below carrier
Harmonic Attenuation	at least 73 db

ELECTRICAL SPECIFICATIONS

Power Line Requirements

Voltage	208 or 230 volts, 50 or 60 cycles, 1 phase
Slow Line Variations	±5%
Rapid Line Variations	±3%
Regulation	3%
Power Consumption	3000 3000 watts (approx.)
Power Factor (approx.)	90%

MECHANICAL SPECIFICATIONS

Transmitter Overall Dimensions

Width	28 1/4"
Height	76"
Depth	27"
Net Weight	1000 lbs. (approx.)
Maximum Altitude	7500 feet
Ambient Temperature	-30°F min. +120°F max.

TUBE COMPLEMENT

1-5CX1500A

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LINE SURGE PROTECTORS

<u>MODEL</u>	<u>DESCRIPTION</u>	<u>UNIT PRICE</u>
SLA-1	110 Volt Single Phase	140.00
SLA-2	220 Volt Single Phase	250.00
SLA-3	220 Volt Three Phase	350.00
SLA-4	440 Volt Three Phase	425.00

MONITOR AND MEASURING EQUIPMENT

TAMF-1A	AM Frequency Monitor Analog	795.00
RMP-3A	Remote Meter Panel for the TAMF-1A	110.00
TAMF-1D	AM Frequency Monitor Digital	995.00
TAMM-1A	AM Modulation Monitor	550.00
RMP-2A	Remote Meter Panel for the TAMM-1A	175.00
TRF-1A	Transistorized RF Amplifier	425.00
TRF-1AGC	Transistorized RF Amplifier with AGC	475.00
AFM-1A	Air Flow Monitor	89.50
4-N-1	Portable Field Meter	1095.00
9343	Broadband Transformer for 4-N-1	75.00

FM ACCESSORIES

FM-10D	FM Exciter (tube type)	995.00
FME-10	FM Exciter Solid State with Power Supply	1695.00
SG-1D	Stereo Generator (tube type)	1295.00
SG-1E	Stereo Generator Solid State	1495.00
HF-1	1 kw Harmonic Filter, 88-108 MHz	195.00
HF-3	3 kw Harmonic Filter, 88-108 MHz	295.00
SCG-1	Subcarrier Generator, 67 KHz or 41 KHz	495.00

AUDIO CONSOLES

TAC-1C	Transistorized single channel console, eight mixers, six low level inputs, sixteen high level inputs	1995.00
TAP-1A	Additional preamplifier for TAC-1C	95.00
TACS-2B	Transistorized dual channel stereo console with twelve low level inputs, thirty-six high level inputs, also available as dual channel monaural	3350.00
TSC-4	Transistorized dual channel stereo console with two preamplifiers, for 6 microphone inputs, five high level stereo mixers for 9 stereo inputs	1895.00

FM TRANSMITTERS

<u>MODEL</u>	<u>DESCRIPTION</u>	<u>UNIT PRICE</u>
FM-10E	10W FM Transmitter complete with tubes and crystal	1295.00
FM-20E	18W FM Transmitter all solid state with crystal and harmonic filter	1895.00
FM-50A/ FML-30A	50W FM Transmitter complete with tubes and crystal	1895.00
FM-250E	250W FM Transmitter complete with tubes, crystal and harmonic filter	3500.00
FM-1000E	1 kw FM Transmitter complete with crystal and harmonic filter, with solid state exciter, monaural (one tube)	5850.00
FM-1000ES	Stereo version of FM-1000E solid state	7345.00
FM-2500E	2.5 kw FM Transmitter complete with tubes, crystal and harmonic filter, with solid state exciter, monaural (two tubes)	7950.00
FM-2500ES	Stereo version of FM-2500E with solid state stereo generator	9445.00
FM-5000E	5 kw FM Transmitter complete with operating tubes, crystal & harmonic filter, with solid state exciter, monaural (two tubes)	10995.00
FM-5000ES	Stereo version of FM-5000E with solid state generator	12490.00
FM-7500E	7.5 kw FM Transmitter complete with operating tubes, crystal and harmonic filter, with solid state exciter, monaural	11900.00
FM-7500ES	Stereo version of FM-7500E	13395.00
FM-10000E	10 kw FM Transmitter complete with operating tubes, crystal & harmonic filter, with solid state exciter, monaural	13995.00
FM-10000ES	Stereo version of FM-10000E	15290.00
FM-20000E	20 kw FM Transmitter complete with operating tubes, crystal & harmonic filter, with solid state exciter, monaural	18500.00
FM-20000ES	Stereo version of FM-20000E	19995.00

WILKINSON

ELECTRONICS, INC.

FM-250E 250 WATT FM BROADCAST TRANSMITTER

WILKINSON EXCLUSIVE FEATURES

INCORPORATES THE ULTIMATE FME-10 EXCITER

- Stable - So Drift Free It Requires No Oven.
- Fidelity - 25 Hz - 15 KHz 100% Modulation Capability.
- Distortionless and Noiseless with Response 30-15,000 Hz with Pre-emphasis.
- Solid State 10 Watts Output With Built-In Power Supply.
- Ultra Accessible-Built on Slide-Out Drawer With Space For Stereo Generator.

INCORPORATES AN ASSURED POWER AMPLIFIER

- Single Non Neutralized 4CX250B Final Amplifier. Assures Absolute Stability and Power Capability.
- Variable Capacitor Tuning and Loading Eliminates Sliding Contacts and Mechanical Problems To Assure Reliability And Long Life.
- Input and Output Reflectometers Assure Ease of Tuning. Maintenance and Accuracy of Adjustment.
- The Output Circuit and Exclusive Harmonic Filter Assure Freedom of Spurious Emissions and Harmonics.

INCORPORATES PROTECTED POWER SUPPLIES

- Uses Self Testing Wilkinson Silicon Rectifiers Voltage Protection 400% Current Protection 800%.
- Modern Fiberglass Printed Circuit Control Ladder Conserves Space, Reduces Complexity and Eliminates Unnecessary Wiring.
- Solid State Time Delay and Recycling Increases Reliability and Eliminates Expensive Relay Replacement.
- Double Duty Plate Transformer and Filter Reactor Always Loaf.
- FCC Type Accepted to 275 Watts.

GENERAL MECHANICAL DESCRIPTION

The FM 250E FM Broadcast transmitter is housed in a steel cabinet finished in a hard durable Grey Hammertone Enamel Finish. Only four square feet of floor space is required. All operating controls are on the front panel and access to the interior of the Power amplifier is through the door of the PA Cubicle. A sliding drawer directly beneath the PA houses the low voltage power supplies and control ladder circuits. Interlock and overload indicators as well as overload reset controls are on the front panel of this slide-out drawer. All components of these circuits are completely accessible when the drawer is opened.



An additional drawer which houses the exciter and where required, the stereo generator is the next vertical component beneath the control circuit drawer. In addition there are two slide-out compartments in the exciter itself which facilitates exciter adjustments, but for service or maintenance on the exciter power supply, opening of the main drawer provides complete accessibility.

Full and complete metering is provided. To the right of the power amplifier two multimeters measure screen and control grid voltage and current. A third meter measures the incident and reflected power of the exciter output.

The metal panel indicates plate current, plate voltage, AC Mains voltage and output power in terms of percentage. The output power meter can be switched to read reflected power from the antenna.

EXCITER FME-10 (See Block Diagram next page)

The FME-10 is a direct FM exciter capable of both monophonic and stereophonic operation. During monophonic operation two sub-carriers can be used; during stereophonic operation only one sub-carrier can be used.

The exciter is comprised of three basic sections, the power supply, a direct FM oscillator and automatic frequency control section, and the multiplier-power amplifier section. The latter two sections are contained in separate housings to eliminate interaction between the two systems. The power supplies and control circuits are contained in the main frame of the exciter.

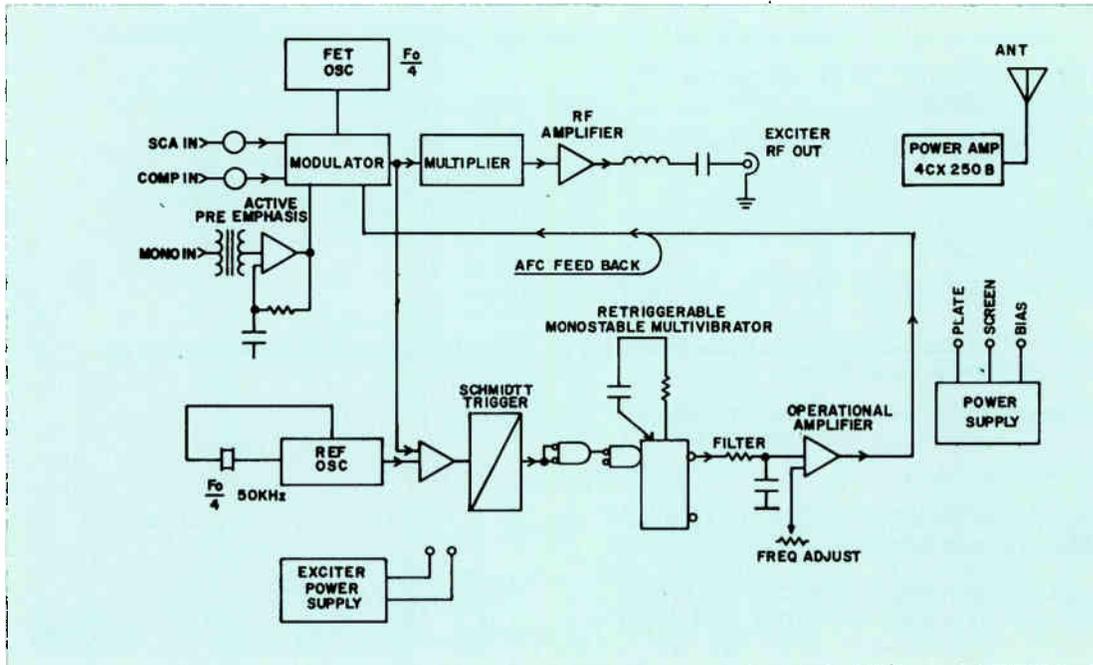
POWER AMPLIFIER

A single 4CX250B tube is used as the final RF amplifier, operating in a grounded cathode con-

figuration. Capacity tuned networks are used in both input and output circuits and both circuits incorporate reflectometers for assurance of correct tuning and safe operations. The inductance in the output is fixed during factory test and variable vacuum capacitors vary tuning and loading of the final.

POWER SUPPLY

A full wave single phase bridge silicon rectifier circuit provides 2000 volts for the 4CX250B plate. Separate bridge circuits provide the 300 volt screen supply and 120 volt bias supply.



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

Type of Emission F3 F9
 Frequency Range 88 to 108 MHz
 Rated Power Output 250 watts
 RF Output Impedance (TYPE N FEMALE).. 50 ohms
 Audio Input Impedance 600 ohms
 Audio Input Level 10 ± 2 dbm
 Amplitude vs. Frequency
 ... +¼ to ½ db of 75 microsec. curve 30 Hz to 15 KHz
 Carrier Frequency Stability ± 1000 Hz
 Modulation Capability ± 150 KHz
 Audio Frequency Distortion ... ½% Max. 50-15 KHz
 FM Noise Below ± 75 kc 70 db
 AM Noise RMS 60 db below carrier
 Harmonic Attenuation at least 73 db

ELECTRICAL SPECIFICATIONS

Power Line Requirements

Voltage 208 or 230 volts, 50 or 60 cycles, 1 phase
 Slow Line Variations ± 5%

Rapid Line Variations ± 3%
 Regulation 3%
 Power Consumption 650 watts (approx.)
 Power Factor (approx.) 90%

MECHANICAL SPECIFICATIONS

Transmitter Overall Dimensions

Width 28 1/4"
 Height 52"
 Depth 27"
 Net Weight 300 lbs. (approx.)
 Maximum Altitude 10,000 feet
 Ambient Temperature -30°F min. +120°F max.

TUBE COMPLEMENT

1-4CX250B

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FEATURES:

- Frequency Response $\pm 1/4$ DB 25 Hz - 350 KHz
- FM Noise Level - 65 DB below 100% Mod.
- Harmonic Distortion - 0.35%
- Type Modulation - Direct FM
- Power Output - 10 Watts
- Modulation Capability - 200%
- Stability 1 part in 100,000
- Requires No Oven and Is Not Susceptible to Rumble and Microphonics
- FCC Type Accepted

FM-10 Transmitter



GENERAL

The FM-10 is a Direct-FM transmitter capable of both monophonic and stereophonic operation. During monophonic operation, two SCA Subcarriers can be used; during Stereophonic operation, only one SCA Subcarrier can be transmitted although there are no characteristics inherent in the design of this exciter prohibiting the transmission of more than one subcarrier during this kind of operation.

The FM-10 transmitter consists of the FME-10 exciter and a metering panel mounted in a standard 19 inch case, 14½ inches in height.

CIRCUIT DESCRIPTION

The FME-10 exciter consists of two basic sections. The first is the Direct-FM Oscillator and Automatic Frequency Control section, and the second is the Multiplier and Power Amplifier section. The two sections are contained in separate housings to eliminate interaction between the two systems. The power supplies and control circuits are contained in the mainframe of the exciter.

OSCILLATOR SECTION

The heart of the exciter is a stable free-running oscillator circuit. The oscillator operates at approximately $1/4$ of the operating frequency of the exciter. The oscillator is designed to have very low circuit capacitance, both distributed and lumped. Most of the capacity used to tune the oscillator to the correct operating frequency is supplied by two voltage-variable capacitors called Varicaps. They are essentially reverse-biased silicon diodes, specifically designed for this service. The important property of these diodes is that their capacity varies with applied voltage. If the voltage on the diodes varies, the operating frequency of the exciter will vary.

Several voltages are applied to the diodes. The first, a bias voltage, is used to establish the average capacity of the oscillator circuit to a point where its operating frequency will be very near the correct frequency of operation. The second voltage, applied from the AFC Circuit, adds to or subtracts from the voltage already

on the diodes to adjust the frequency to exactly the correct operating frequency. The third voltage is an AC signal, obtained by adding together the various audio-frequency inputs of the exciter.

This AC signal will vary the operating frequency of the exciter to produce frequency-modulation of the stabilized carrier. Since the audio-signal is AC Coupled, and the AFC signal is DC Coupled, the center frequency will be constantly adjusted and maintained even during audio modulation. The Modulator is capable of modulating the transmitter more than 150% with less than 1% distortion. The usual distortion at something less than 133% modulation is between .25 to .5%, which is considerably less than can be obtained by even more complicated means. The high-frequency response of this system extends to more than 5 MHz and the low-frequency response to about 5 Hz so there is little or no distortion to a Stereo Signal that contains components to only 53 KHz.

Following the oscillator is a two-stage "gain-stage-pair". This circuit matches the oscillator output to the input of a 50 ohm transmission line feeding the multiplier and amplifier unit in the other sub-assembly and obtains approximately 45 db of isolation between the oscillator and the rest of the transmitter.

AFC SECTION

A continuous AFC correction voltage is fed to the varicaps to keep the transmitter on frequency and is produced in the AFC Section. The first essential device in the AFC Section is the reference oscillator. This is a crystal oscillator that operates exactly 50 KHz lower than one-fourth the correct operating frequency. This oscillator is designed to produce very little power and hence very little crystal heating.

A mixer combines the output of the modulated oscillator with the output of the reference oscillator to produce a frequency corresponding to the difference between the two carriers which is 50 KHz.

Following the mixer is an IC Schmidt Trigger. This produces a uniform pulse every time the input signal (50 KHz) crosses the zero axis in the positive direction. The output pulse is applied to a Monostable

Multivibrator. This circuit produces a pulse of uniform width every time the input pulse is applied. This pulse is integrated to produce a DC signal whose amplitude corresponds to the IF frequency.

If the IF Frequency is exactly 50 KHz, the voltage is exactly 2 volts. If the frequency is 100 KHz, the voltage is 4 volts. If the frequency is zero, the voltage is zero. Thus, the voltage at the output of the integrator corresponds to the input frequency in a linear fashion.

This voltage change is amplified about 500 times by the third IC. An offset voltage is applied via the "frequency adjust" potentiometer, to adjust the output of this amplifier to zero when the input voltage is 2 volts. This will cause the output of the amplifier to be zero if the IF frequency is 50 KHz.

In terms of the total system, if the Oscillator frequency were to drift slightly higher than the proper frequency, the IF frequency would also drift higher. This would cause the pulses from the Schmidt Trigger to be applied to the monostable multivibrator at a faster rate. Since the output pulses from the multivibrator are of constant width, if they increase in repetition rate, the average DC component will be higher. (If the repetition rate were equal to twice the pulse-width, the DC component would be zero.) After filtering, this increase in frequency causes an increase in voltage which is amplified about 500 times and fed back to the varicaps and results in a decrease of bias, which increases the capacity and hence restores the correct operating frequency. The reverse is true if the oscillator were to drift to a lower frequency. The result of this system is that the AFC Circuit will not let the oscillator drift more than a few Hz, even though it may "want" to drift several hundred KHz. The audio-frequency modulation has no effect upon the operation of this kind of AFC Circuit.

FREQUENCY MULTIPLIER SECTION

From the oscillator and AFC unit the signal is routed to the first and second multiplier circuits. These two stages serve to multiply the input to the final operating frequency and afford about 20 db of power gain. A single stage amplifier is used to obtain power gain and isolation between the multipliers and the RF amplifier section.

Following the multipliers is a three-stage, radio-frequency amplifier. The power-output capability is in excess of 10 watts. The output transistors are completely protected from short-circuits or open termination and will not be destroyed by mistuning or operating into an improper load. The exciter can be operated for extended periods of time even without a load without causing any deterioration in the output transistors.

POWER AMPLIFIER

The power amplifier section uses a single transistor (PT9780) operating in Class C. The RF drive from the

exciter is connected through a directional coupler to the input circuits of the power amplifier. The directional coupler is used to measure V.S.W.R. between the exciter and power amplifier, and is metered by the output power meter on the front panel. The output circuits are connected to the antenna through a bandpass-type harmonic filter.

POWER SUPPLY

All of the power supplies in this exciter are electronically regulated and they are all similar in design. All of the power supplies are nonadjustable and they should supply a voltage of 15 volts, plus or minus a volt.

SPECIFICATIONS

Frequency	88-108 MHz
Emissions	F9/F3, Part 73
Modulation	Direct FM
Frequency Control	Crystal Control AFC Servo
Stability	± 1 KHz at 100 MHz
AM Noise	60 db below 100% Modulation
FM Noise	65 db below 100% Modulation
Modulation Capability	200% Modulation (± 150 KHz)
Modulation Inputs (3)	High Z Composite Stereo High Z SCA (identical channel) 600 ohm MONO (75 us pre-emp)
Modulating Level	Approx. 1 V P/P Composite for Stereo + 10 db for 100% modulation at 1 KHz, Mono. 0.2 V P/P for 20% modulation SCA
Frequency Response	± 0.25 db 15 Hz to 350 KHz composite input +0.25, -0.5 db of 75 us curve 50 Hz to 15 KHz, Mono.
Harmonic Distortion	0.35% harmonics or less for all modulating frequencies, composite 0.35% harmonics or less, mono input
Stereo Separation	Determined by Stereo Generator Phase or amplitude not appreciably affected by the exciter
Power Output	10 Watts, adjustable for FM-10
Power Input	117 VAC, 50/60 Hz 117 Watts (VA) nominal
Output Connector	Type N Female
Width	20½ inches
Height	14½ inches
Depth	18¾ inches
Weight	55 lbs.

Additional Equipment Required for Monophonic Operation: None.

Additional Equipment Required for Stereophonic Operation:

Wilkinson Electronics SG-1.E
Stereophonic Generator or equivalent

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SG 1-E STEREO GENERATOR



GENERAL

The Wilkinson Electronics SG 1-E Stereo Generator is a high-quality device designed to generate the complete composite Stereo Signal for modulation of any FCC Type-Accepted Transmitter designed for stereophonic operation using the composite system. Transmitters designed to accept both L-R and L+R signals through separate channels cannot be operated with this stereophonic generator. Specifically, any Direct-FM Transmitter, Type-Accepted to date can be used with this generator.

Provisions are made for remote controlling the Stereo/Mono function so that the operator can switch to the Stereo or Monophonic mode from the operating position.

The audio input levels on both the left and right channels are approximately +10dbm for 100% modulation of the transmitter. The pilot level is not adjustable and is used as the reference for setting the output level. (The output level control is adjusted for 10% pilot modulation of the transmitter). This eliminates the possibility of "crossing" controls and thus makes sure that the generator is always operated at the levels that give the best signal-to-noise ratio and cross-talk characteristics.

In the monophonic mode, provisions are made to select one or both of the channels. This option allows the customer to select any channel or combination of channels for monophonic operation. Normally, the broadcaster would require that only one channel be driven during monophonic operation and the units are shipped with that specification. However, there is an internal adjustment that allows the customer to alter the gain of the unit in the monophonic mode so that 100% modulation is obtained with both of the channels driven.

FEATURES

- * 60 db separation – 50 Hz-7500 Hz
- * 55 db separation – 7500 Hz-10000 Hz
- * 50 db separation – 10 KHz 15 KHz
- * FM Noise - 75 db – Cross Talk - 50 db
- * Comes Complete With Power Supply
- * Requires Only 3½" Rack Space
- * Only One Front Panel Adjustment
- * Remote Stereo On/Off Function

As shipped, this unit is completely adjusted so that as a unit its characteristics fall within the published specifications. It may be necessary to adjust certain controls after installation is completed since most transmitters affect the composite stereo signal somewhat.

There are two widely-used methods of generating the composite stereo signal as required by the FCC for Stereophonic Broadcasting. The first is the so-called MATRIX method and the second is the SWITCHING or FILTER method.

The SG 1-E uses the FILTER method. Both systems have in common the fact that they generate a spectrum of signals ranging from 50 Hz to 53 KHz and these signals modulate the transmitter to produce a stereophonic signal. The only difference is the method in which these components are generated.

The characteristics of the FCC adopted system are as follows:

The frequencies ranging from 50 Hz to 15 KHz are considered the Main Channel and consist of RIGHT and LEFT channel audio signals added together.

The frequencies ranging from 23 KHz to 53 KHz are considered the sub channel and consist of a pair of sidebands,

generated at 38 KHz, containing intelligence corresponding to the difference in modulation between the LEFT and RIGHT channels.

An additional sine wave signal is transmitted at 19 KHz, 20 db below that level corresponding to 100% modulation. It is used to synchronize the receiver during demodulation of this signal. The second-harmonic of this 19 KHz is used for the generation of the subchannel signal.

For simplicity, the 19 KHz signal is called the PILOT. The 23 to 53 KHz sidebands are called the L-R signal, and the 50 Hz to 15 KHz signal is called the L+R signal. The L-R signal results from the amplitude modulation of 38 KHz, the second harmonic of the 19 KHz pilot. The Carrier itself is suppressed at least 40 db below that amplitude corresponding to 100% Modulation as required by the Commission's rules.

Two very important characteristics of this system are that if both the LEFT and RIGHT channels are modulated with the same signal, exactly in phase, all of the modulation will be in the MAIN or L+R Channel.

Conversely, if both the LEFT and RIGHT channels are modu-

lated with the same signal, but exactly 180° out of phase, all of the modulation will be in the SUB or L-R Channel.

The only difference between transmitting a LEFT only or a RIGHT only signal is in the phase relationship that exists between the resultant L-R sidebands and the PILOT signal.

It can be shown that if we switch back and forth between the two channels, that is alternately transmit LEFT and then RIGHT channels, switching at a 38 KHz rate, the resulting signal is very much like that required by the FCC - but not quite. Although this signal could be used for Stereo Transmission in a closed system, it occupies far too much spectrum space to be allowed for FM Broadcasting. It is only necessary, however, to modify this signal by passing it through a filter to remove the wide-band components and then to add just the right amount of L+R signal to result in exactly the right kind of signal for FM Stereo Broadcasting. Specifically, the filter removes all of the switching components and their sidebands beyond approximately 53 KHz, effectively changing the "square wave" switching to "sine wave" switching. A PILOT signal is then added to synchronize the receiver demodulators. In this case, it is obtained by dividing the 38 KHz switching signal by two and filtering out the harmonics.

SPECIFICATIONS

Separation 60 db or better 50 to 7.5 KHz
55 db or better 7.5 to 10 KHz
50 db or better 10 to 15 KHz
Harmonic Distortion less than 0.5% 50 Hz to 15 KHz
FM Noise Level -75 db or better
Stereo Noise (incidental AM of 19 or 38 KHz components)
..... -65 db or better (No FCC specification)
Crosstalk (Sub to Main) -50 db 50 Hz to 15 KHz
Crosstalk (Main to Sub) -50 db 50 Hz to 15 KHz
38 KHz Suppression -50 db or better
76 KHz Suppression (crosstalk to SCA) -60 db or better
Frequency Response Within +0.25 and -0.5 db of 75
Micro second curve 50 Hz to 15 KHz
Input Approx. +10 dbm at 1 KHz for 100% Modulation
500 - 600 ohms balanced

Output 3V P/P Max (adjustable) less than 1 Kilohm
Power Requirements 95 to 135VAC 50/60 Hz
0.035 KVA
Voltage Stability - Will maintain Specifications while operating from a power line fluctuating plus or minus 5 volts at a 2 Hz or longer rate.
Ambient temperature -15 to +55 deg. C.
Mounting - Standard 19" Rack mount, 19 x 3-15/32 x 11-1/2
Remote Control Remote Stereo ON/OFF Function with indicator. 24VDC Internally supplied.
Separation and Crosstalk Measured with an Oscilloscope
Height - 3-15/32
Weight - 16 lbs.
Finish - Black Textured Vinyl

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AM-1000A 1000 WATT AM BROADCAST TRANSMITTER

FEATURES

- Meets All FCC Specifications
- Low Distortion High Level Modulation
- Simplified Tuning—Only two Controls
- All Parts Accessible
- Designed for Remote Control
- Provisions for Power Cutback
- Pretuned at Customer's Frequency
- Only 3 Tube Types
- Built-in Load
- Automatic Recycling
- Installation supervision available
- "Meets 30-30-105 Test"

MECHANICAL DESCRIPTION

The WE AM-1000A is contained in a single, medium sized, modern cabinet. Access to the tuning and power adjustments is had by opening the front door. After the initial adjustments are made by the station engineer no re-adjustment is generally required. Thus, the only operation controls normally used will be the front door filament and plate push buttons.

A rear, interlocked, filtered door is used to gain access to the back of the equipment.

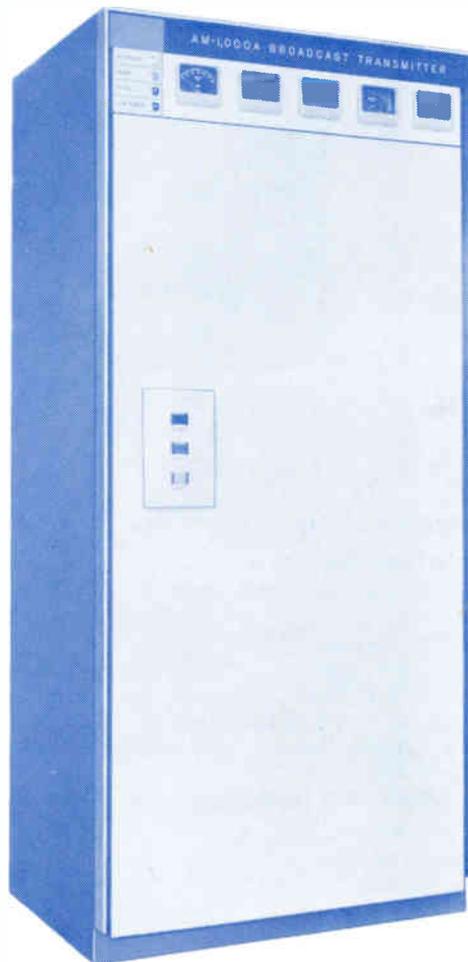
ELECTRICAL DESCRIPTION

RF Circuitry—Referring to the block diagram of the AM-1000A, it can be seen that the RF circuitry consists of a conventional crystal oscillator, buffer, a 6146 driver, and two 4-400A tetrodes operated in parallel but as class C amplifiers.

Modulator Circuitry—The AM-1000A utilizes a conventional balanced modulator which can very easily achieve the high standards of frequency response and distortion required for a broadcast transmitter. All components are conservatively rated.

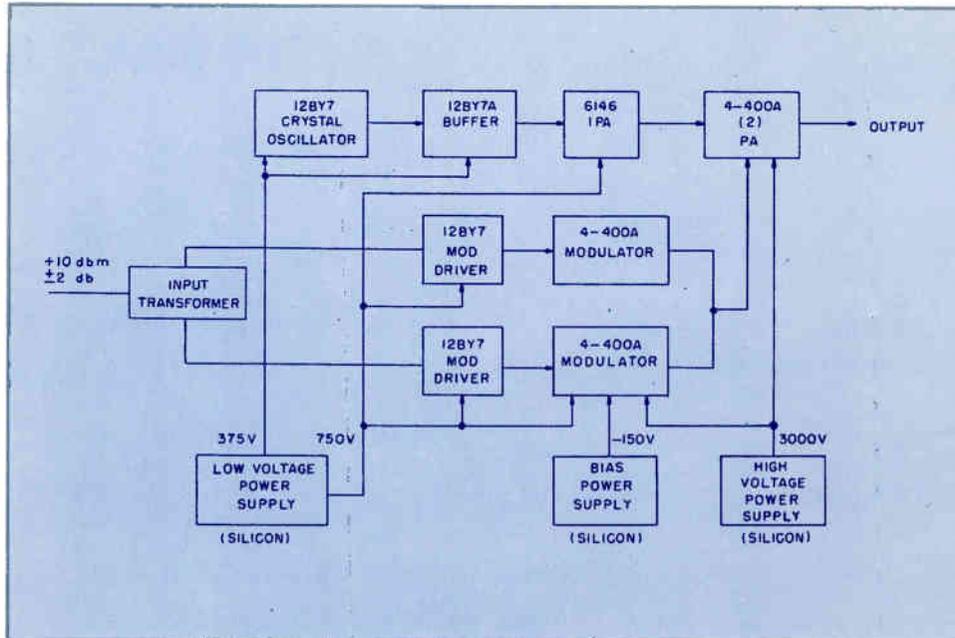
Power Supplies—All power supplies within the AM-1000A utilize trouble free silicon rectifiers. All filament transformers and bias supply are fed from an automatic voltage regulator. This latter item assures excellent tube life even under the condition of 15% variation in line voltage.

Control Ladder—The control ladder of the AM-1000A provides protection for cooling, pre-heating of the PA stages, application of protective bias and closing of all door interlocks. An automatic recycling circuit is incorporated which will permit the equipment to automatically be restored to operation in the event of a temporary outage. No fuses are used; all the protection is obtained by means of overload relays and circuit breakers.



Power Cutback—The AM-1000A incorporates provisions for reducing its output power by simply throwing a front panel switch. The equipment as designed can be reduced to 250 watts nominal output. However, upon request a different value can be obtained. Provisions are also available for the installation of a kit that will permit conelrad operation. Conelrad and power cutback can be remotely operated.

Additional Features—The AM-1000A has no sliding contacts. In addition, only two tuning controls are required for the complete equipment. The transmitter also includes a 1KW load which will permit the operator to pretune the transmitter before connection to an antenna.



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

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

ELECTRICAL SPECIFICATIONS

RF Voltage (for frequency monitoring) 10V RMS	75 ohms
RF Voltage (for modulation monitoring) 10V RMS	75 ohms
Power Output (nominal)	1000 watts
Power Output Capability	1300 watts
Power Supply	208/240 volts
Line Frequency	60 cycles

Phase	1
Power Consumption:	
(0% modulation)	2550 watts (approx.)
(100% modulation)	3400 watts (approx.)
(average program modulation)	2630 watts (approx.)
Power Factor	90%
Permissible combined line voltage variation and regulation	± 15%

TUBE COMPLEMENT

<i>Quantity</i>	<i>Type</i>
4	12BY7
1	6146
4	4-400A

MECHANICAL SPECIFICATIONS

Height	77"
Width	34"
Depth	24"
Weight (net)	1200 pounds (crated)
Altitude Range	0-6000 ft.
Ambient Operating Temperature:	
(min.)	+ 10°C (50°F)
(max.)	+ 45°C (113°F)

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AM3 3000/1000 WATT AM BROADCAST TRANSMITTER

FEATURES

- Designed for remote control
- Unlimited accessibility
- Recycling automatic
- Automatic standby changeover available
- Built in low voltage regulator
- Low distortion high level modulation
- Exceeds FCC specifications
- Self-testing solid state power supplies
- Conservatively rated
- Oversized components
- Tuned by vacuum capacitor

GENERAL DESCRIPTION

The AM3 is housed in a modern medium sized cabinet which requires only 6 square feet of floor space. A separate vault which may be placed in any convenient indoor location houses the plate transformer.

All tuning and operating controls are on the front panel of the transmitter. After initial adjustments and tuning are completed, only the plate, and filament push buttons on the front door are used for normal operation. The front door opens to expose the exciter, low level audio stages and the power and control panel.

The final modulator and RF amplifier may be visually inspected and serviced through the interlocked, windowed door in the high power compartment. All components in this compartment are readily accessible through this door or by opening the pressure panel beneath it.

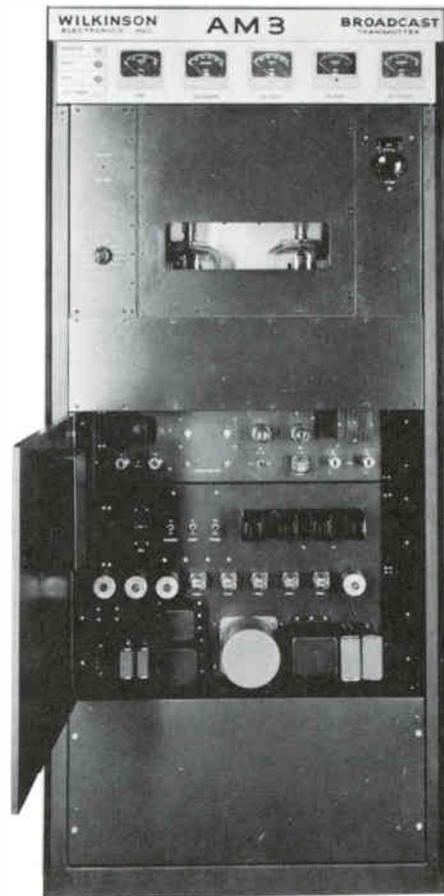
The meter panel is hinged and swings out for easy service and maintenance.

A rear interlocked filtered door opens to exhibit the vertical chassis construction and all other components.

ELECTRICAL DESCRIPTION

RF Circuitry—Referring to the block diagram of the AM3, it can be seen that the RF circuitry consists of a conventional crystal oscillator, buffer, a 6146 driver, and two 4-1000A operated in parallel as Class C. amplifiers.

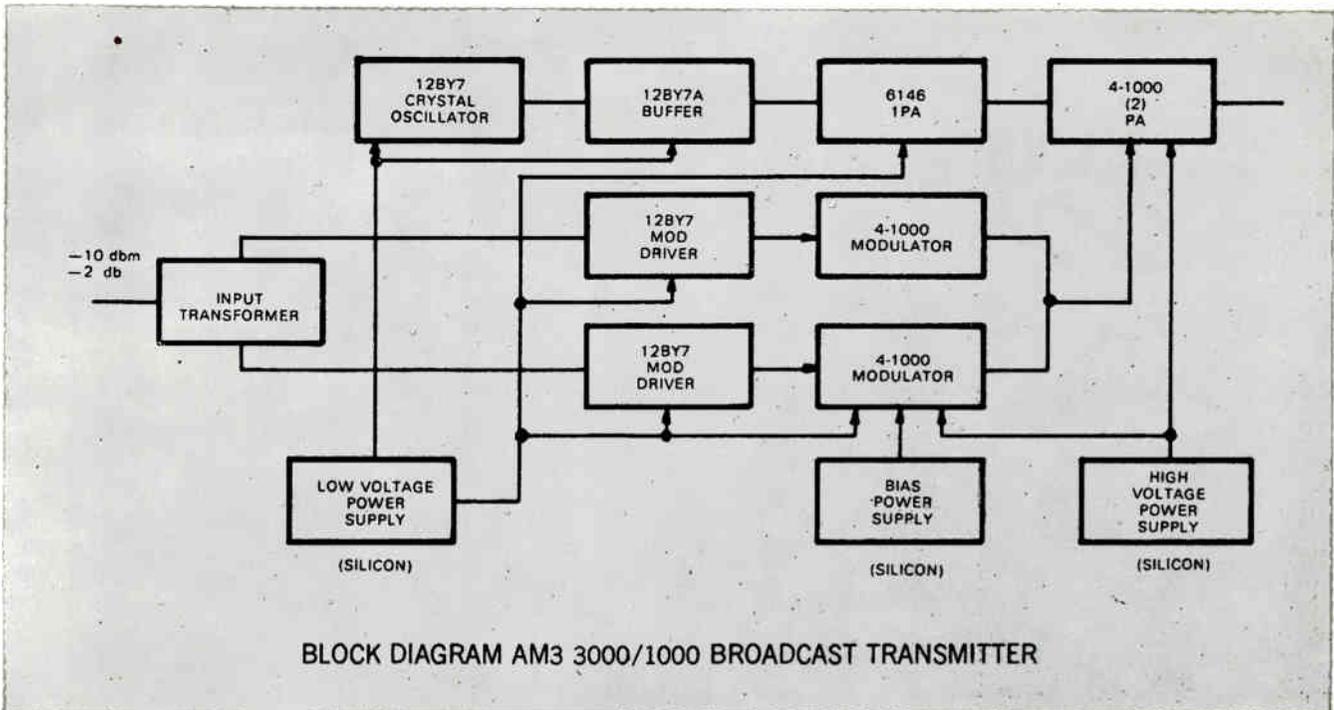
Modulator Circuitry—The AM3 utilizes a conventional balanced modulator which can very easily achieve the high standards of frequency response and distortion required for a broadcast transmitter. Two 4-1000A tetrodes are operated in Class AB1 and readily provide a modulation capability in excess of 120%.



Power Supply—All power supplies in the AM3 utilize Wilkinson self-testing silicon rectifiers. Each diode rectifier is shunted by a neon indicator so that it is automatically known if any diode has failed when the indicator is extinguished. The power supplies for the bias, exciter and control circuitry are fed from an automatic voltage regulator, thus assuring excellent stability and sure protection.

Control Ladder—The control ladder of the AM3 provides protection for cooling, pre-heating of the PA stages, application of protective bias and closing of all door interlocks. An automatic recycling circuit is incorporated which will permit the equipment to be restored to operation automatically in the event of a temporary outage. No fuses are used; all the protection is obtained by means of positive acting overload relays and circuit breakers.

Power Cutback—The AM3 incorporates provisions for reducing its power output by simply throwing a front panel switch. The equipment as designed can be reduced to 1000 watts output. Power cutback can be remotely operated either up or down and an optional accessory carrier — off/audio — off monitor is available for automatically placing the AM3 into operation as a standby transmitter.



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

AF Input Impedance150/600 ohms
 AF Input Level (100% modulation).....+10 ±dbm
 AF Response:
 50-7500 cycles±1 db
 30-10,000 cycles.....±1.5 db
 30-12,000 cycles±3 db
 AF Distortion (95% modulation):
 50-5,000 cycles2%
 40-10,000 cycles3%
 Noise (below 100% modulation)60 db
 Frequency Range.....535-1620 kc
 Frequency Stability±5 cycles
 Type of OutputSingle ended
 Carrier Shift (0-100% modulation).....3%
 Output Impedance40-250 ohms

Power Consumption:

(0% modulation).....7500 watts (approx.)
 (100% modulation).....9600 watts (approx.)
 (average program modulation).....8200 watts (approx.)
 Power Factor90%
 Permissible combined line voltage
 variation and regulation±15%

TUBE COMPLEMENT

Quantity	Type
4	12BY7
1	6146
4	4-1000

MECHANICAL SPECIFICATIONS

	Transmitter	Transformer
Height	77"	16"
Width	34"	26"
Depth	24"	14"
Weight (approx.)	1000 lbs. (crated)	400
Altitude Range	0-6000 ft.	
Ambient Operating Temperature:		
(min.)	+ 10° C (50° F)	
(max.)	+ 45° C (113° F)	

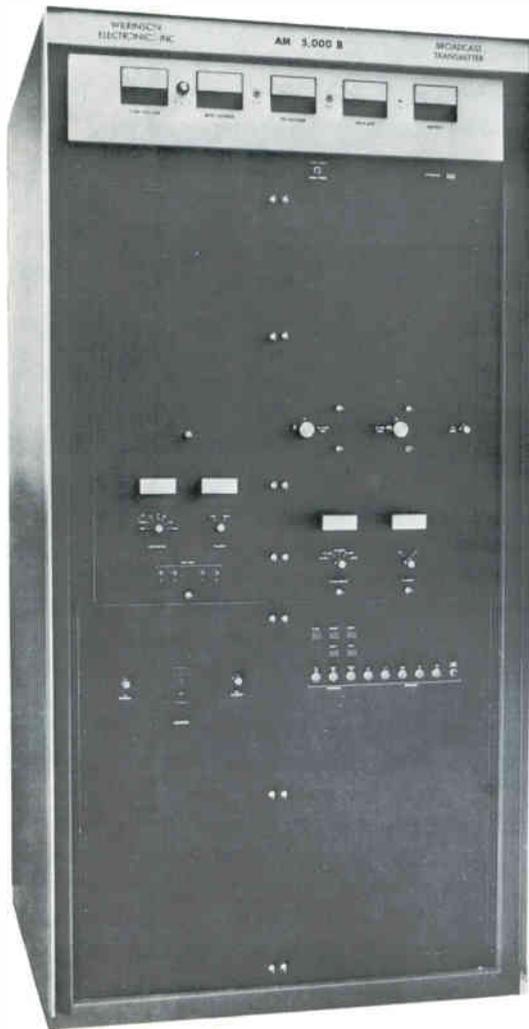
ELECTRICAL SPECIFICATIONS

RF Voltage (for frequency monitoring) 10V RMS 75 ohms
 RF Voltage (for modulation monitoring) 10V RMS 75 ohms
 Power Output (nominal)3000 watts
 Power Output Capability3500 watts
 Power Supply208/240 volts
 Line Frequency.....50/60 cycles
 Phase1

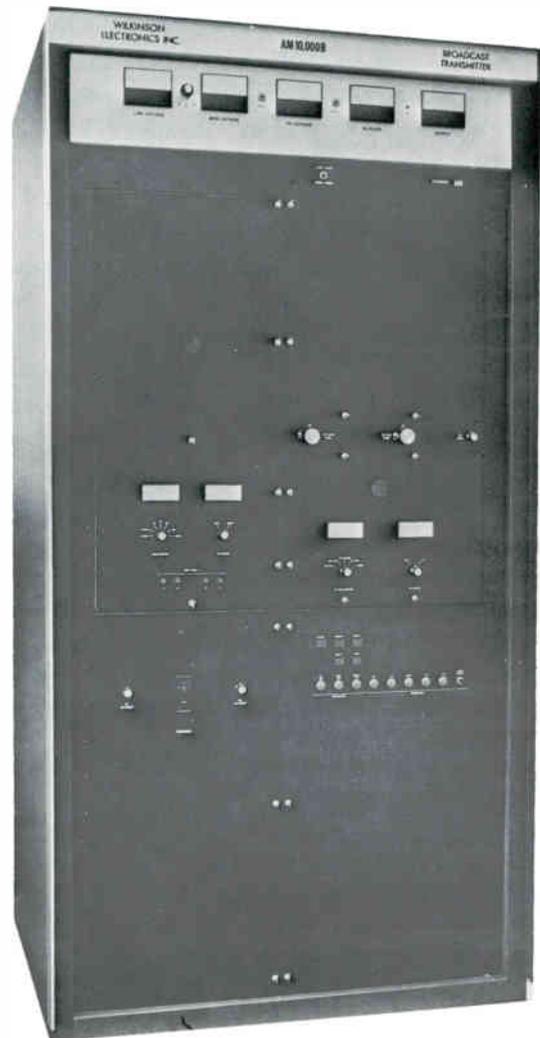
**WILKINSON
ELECTRONICS, INC.**

WILKINSON ELECTRONICS, INC.

AM 5000B-5KW AM TRANSMITTER



AM 10000B-10KW AM TRANSMITTER



FEATURES

- SOLID STATE EXCITER
- SOLID STATE CONTROL CIRCUITRY
- SHIPPED COMPLETELY TUNED AND TESTED
- SINGLE CABINET DESIGN 40" X 42" X 82"
- VACUUM CAPACITOR TUNING PA AND IPA
- SUPERB FREQUENCY RESPONSE $\pm \frac{1}{2}$ db
- DESIGNED FOR REMOTE CONTROL
- SELF TESTING SOLID STATE POWER SUPPLIES

- SOLID STATE MODULATOR DRIVER
- SUPERIOR ACCESSABILITY
- COOL CONSERVATIVE COMPONENTS
- NINE METERS MEASURE 22 FUNCTIONS
- LOW NOISE -60 db OR BETTER
- EXCEEDS ALL FCC SPECIFICATIONS
- ECONOMICAL AND EASY TO INSTALL
- EASY MAINTENANCE

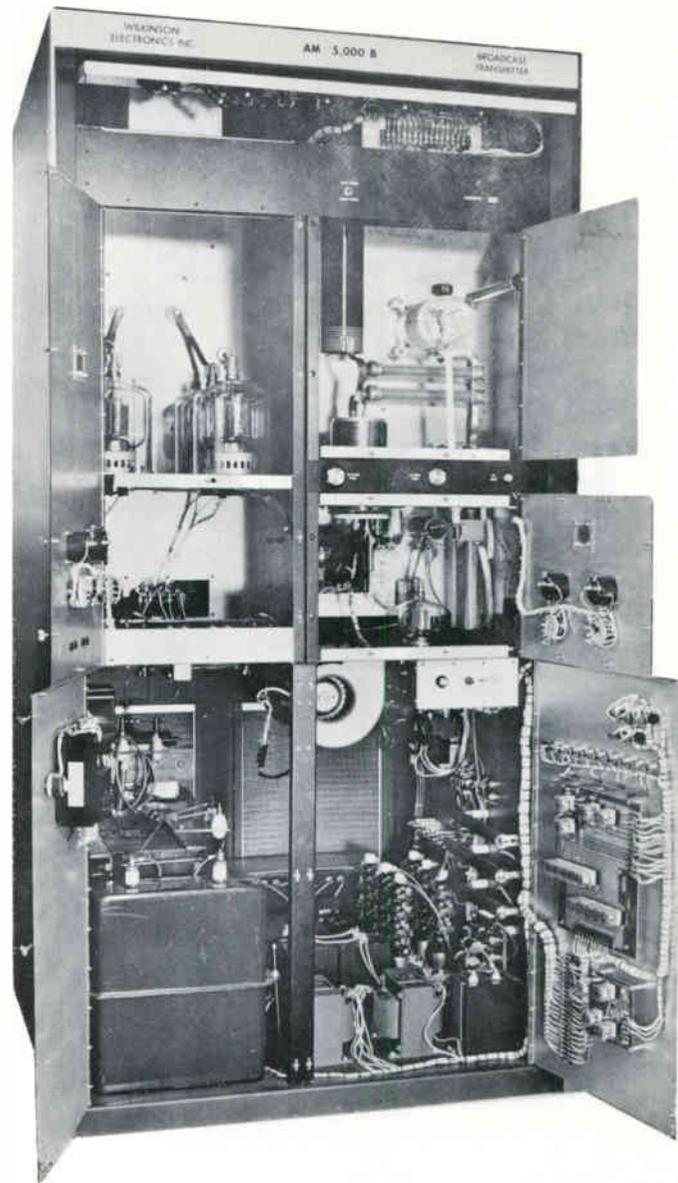
GENERAL DESCRIPTION

The WILKINSON AM 5000B and AM 10000B are high level plate modulated AM Transmitters with output power of 5 KW and 10 KW respectively. Each will operate at any specific frequency between 540 KHz to 7.2 MHz.

These two transmitters are identical except for the R. F. Power Amplifier, Modulation transformer, Power transformers, and Modulation and Filter reactors. All components except for the wall mounted main breaker are housed in a single cabinet 40" w x 42" d x 82" h. Only 16 square feet of floor space is required.

Ease of maintenance and accessibility are keynote features of these transmitters. The transmitter opens completely from both front and rear by means of interlocked doors providing instant access to all components. The solid state RF exciter and IPA are mounted on a hinged chassis suspended from the Power Amplifier bottom shelf and swings down for complete access. The meter panel swings up for cleaning and testing and ample access space beneath horizontal shelves makes servicing easy.

These transmitters are extremely quiet due to oversized filters and the use of two dual low noise high compression blowers.



ELECTRICAL DESCRIPTION

Power Supplies, Control and Metering.

All power supplies in these transmitters incorporate controlled avalanche silicon rectifier stacks manufactured by Wilkinson Electronics. These rectifiers are self testing since a neon indicator is placed across each diode to exhibit any failure. The lamp is lit by reverse voltage and is extinguished should any diode fail. Each stack is easily removed for cleaning or repair since it is mounted in a plug-in socket. These stacks provide a capability of 18 amperes DC continuously whereas the required current does not exceed 5 amperes in the 10 KW or 2.5 amperes in the 5 KW. The surge current rating of these rectifiers is 600 amperes. The voltage rating incorporates 300% safety margin.

Filter capacitors, reactors and transformers are very conservatively rated and should virtually last forever. Solid State timing and control circuitry provide simple sure safety and reliability. Nine meters measure 22 transmitter parameters.

**IMMEDIATE FRONT ACCESS
MAINTENANCE IS EASY**

RF EXCITER AND IPA

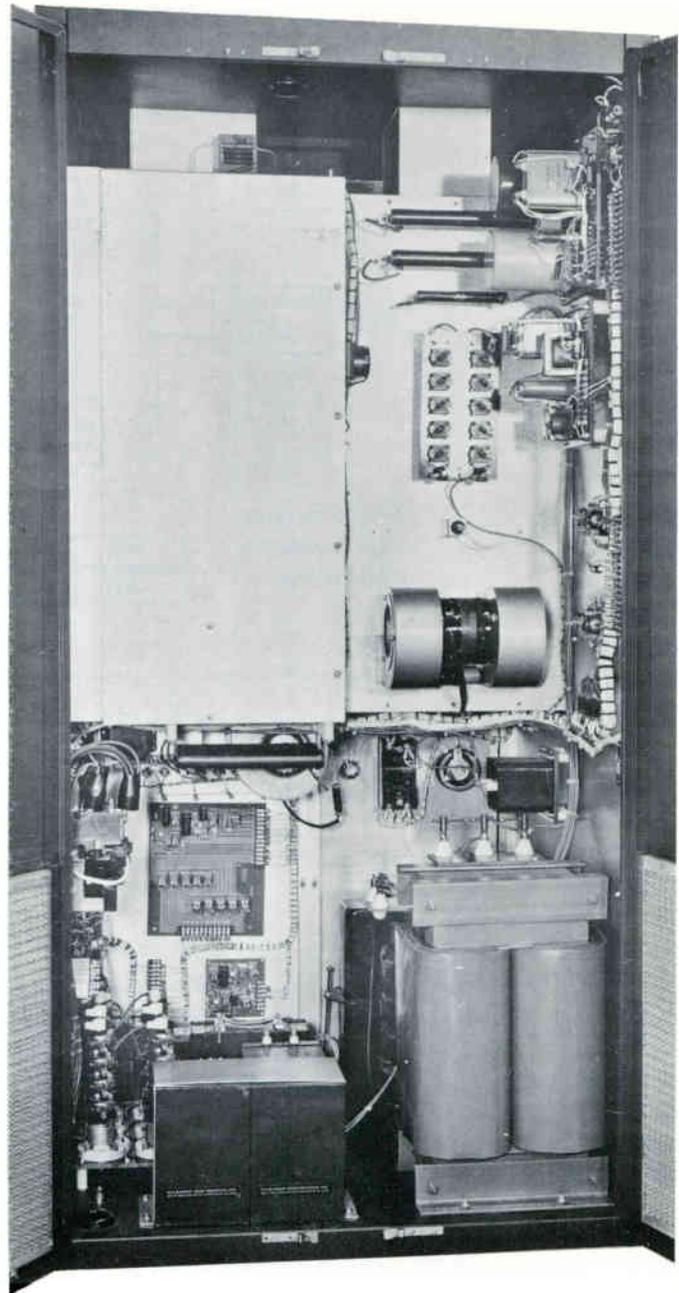
The RF exciter and intermediate power amplifier are built on an individual chassis which also incorporates the exciter power supply. The heart of this solid state exciter is a stable crystal controlled oscillator which operates at 2 or 4 times the transmitter output frequency. It is followed by a buffer amplifier used to drive one or two frequency dividers for division by 2 or 4. Such division serves further to improve stability since any frequency error would also be divided. Following the divider are two amplifier stages which provide sufficient voltage gain (600 Volts P-P) to drive the high gain tetrode IPA tube which is a 4-400. The output plate tank of the IPA is the grid tank coil of the Power Amplifier and is tuned by a vacuum variable capacitor.

POWER AMPLIFIER

The AM 5000B incorporates a 3CX2500A3 triode whereas the AM 10000B employs a 3CX10000-A3 triode. The output circuit is a Pi Pi network and is vacuum capacitor tuned. Motor controlled output loading is incorporated where remote control is desired. Heavy duty coils and vacuum capacitors assure cool reliable operation and conservatively rated tubes warrant long life.

MODULATOR

The modulator driver employs two dual transistor stages of audio amplification to drive the modulator final. This stage consists of two pair of 4-1000A tetrodes operating in parallel push pull class AB 1 Service, to provide up to 7900 watts of audio power for high level modulation. Since the audio power required for 100% modulation is only 6250 watts in the 10KW and 3250 watts in the 5KW, the modulator is extremely conservative. These tubes are economical and cost little to replace in comparison with other tubes used in this service.



**IMMEDIATE REAR ACCESS
SERVICE IS EASY**

