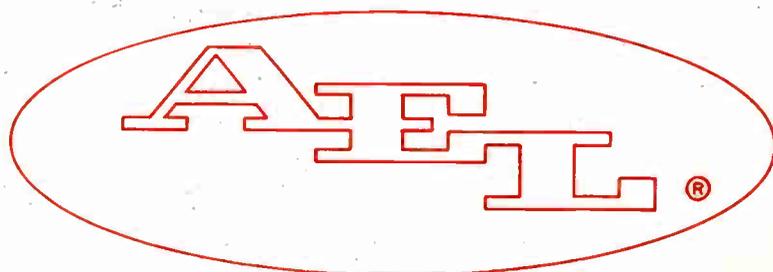


sound of the

70th



WELCOME



**BROADCAST
EQUIPMENT**

to our world of
AM/FM
transmitters



American Electronic Laboratories, Inc., has by far proven its excellence in the design and fabrication of AM and FM transmitters. The AEL team of experienced technicians and engineers work together to produce the best transmitter equipment available today.

The recently developed Vapor cooled transmitter is a new member of the AEL family of high quality broadcast transmitters. Low power stages are transistorized so there are only three tubes. Latest design techniques were carefully reviewed to assure reliable and economic operation. Air cooled version is available in both power levels.

FEATURES

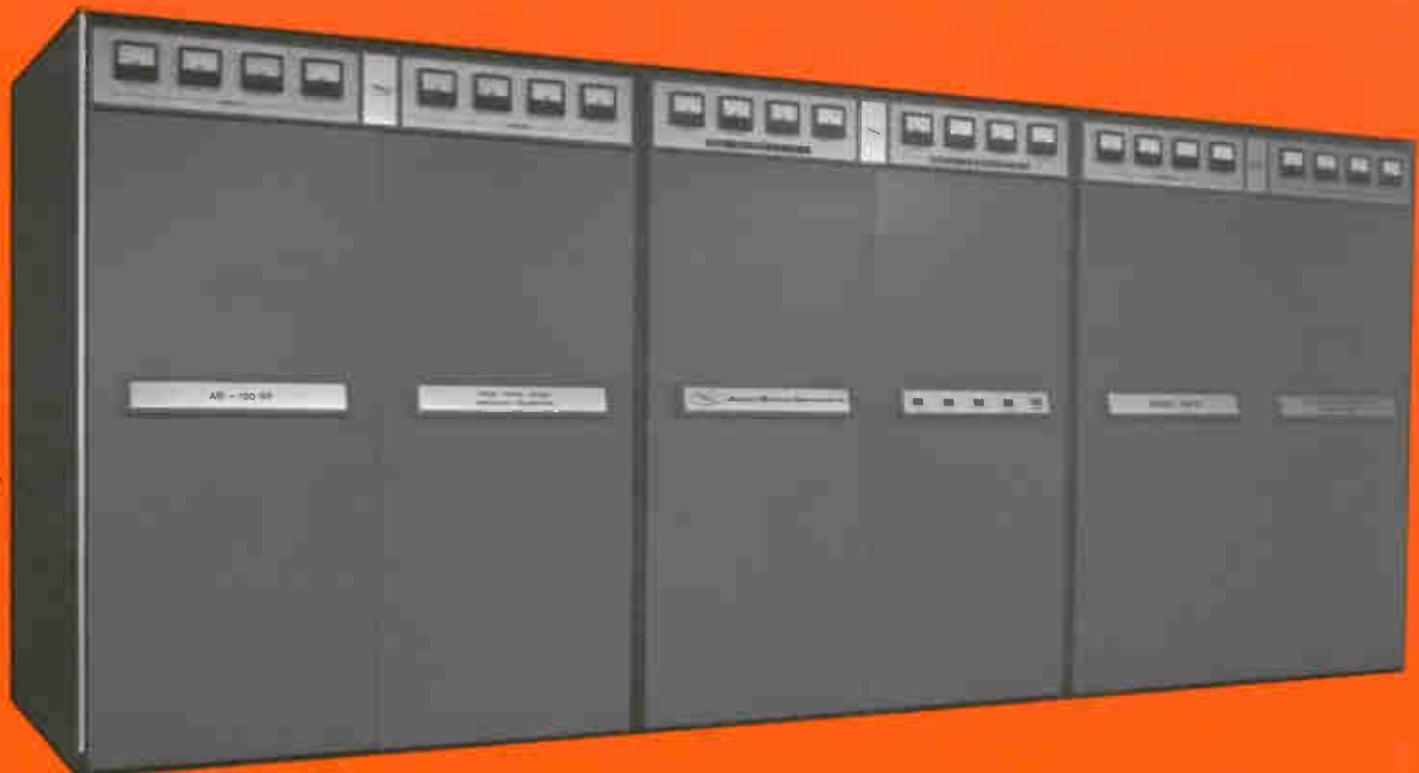
- 27 meters for continuous monitoring
- Vapor cooled Modulator & Final Tubes
- Proven long life tubes
- 4CV 100,000C (100 kw) or 4CV 35,000A (50 kw)
- 4CV-35,000A Modulators (2)
- Shielded components in final configuration
- Transmitter Console
- Solid State Power Supplies

SPECIFICATIONS

- Conventional High Level
- Total 4 tubes
- Sola Regulated
- Power output 110 or 55 kw
- AF Distortion @ 95% Mod. less than 3.0%
40 to 7500 Hz
- AF Response ± 2 db

AM-100/50KB

100,000 watts
50,000 watts
25,000 watts
10,000 watts





AM Broadcast Transmitters

MODEL AM-1KA

1,000 watts
500 watts
250 watts



The AEL AM-1KA transmitter has been designed to offer to radio stations of this size the most complete transmitter of its kind. This transmitter has its PA and Modulator mounted in a separate, shielded enclosure, which also serves as an air plenum.

FEATURES

Built-in Dummy Load • Sola Regulated • Automatic Recycling • Power Cutback Included • Factory Pre-Tuned for Customer's Frequency • Observation Window

SPECIFICATIONS

Power Output Capability 1,250 watts
Type of Emission A-3
Type of Modulation High Level
Output Impedance 40-250 ohms unbalanced
Cabinet Dimensions 70" H x 34" W x 28" D



MODEL AM-5KA

5,000 watts
1,000 watts
500 watts



All components in this AEL transmitter, as in the complete AEL line of transmitters, are easily accessible. There are front and rear doors that permit access to all areas.

FEATURES

Common PA and Modulator Tubes • Five Tube Types • Designed for Remote Control—No Kits Necessary • Seven High-Speed Overload Relays

SPECIFICATIONS

Power Output Capability 6,000 watts
Type of Emission A-3
Type of Modulation High Level
Audio Distortion Less Than 2.5%
40-8,000 Hz ±1 db

The Broadcast Transmitter Division at AEL uses custom production techniques, thereby assuring the broadcaster of the highest quality and latest advances in broadcasting technology.

The equipment designed and manufactured by AEL during the last several years is an indication of how AEL intends to continue to pioneer, as the "State of the Art" expands in our broadcasting industry.

If you require the best in sound, minimum maintenance, and maximum economy, allow AEL to provide all your transmitting and accessory equipment.

Contact AEL now for a quotation on your station requirements.

American Electronic Laboratories Inc.

P. O. Box 552
Lansdale, Pennsylvania 19446
Cable: Amerlab
Tele: (215) 822-2929
Twx: (510) 661-4976

MODEL AM-10KA

10,000 watts
5,000 watts
1,000 watts



This efficient transmitter is manufactured for radio station operating ease. It is designed for remote control, therefore no kits are necessary.

FEATURES

Sola-Regulated • PA and Modulators Are Same Tube Type • One-Button Operation • Six Self-Protecting Circuit Breakers • Five Tube Types

SPECIFICATIONS

Power Output Capability 11,000 watts
Type of Emission A-3
Type of Modulation High Level
Output Impedance 40-240 ohms unbalanced (specify)
Frequency Stability ±5 Hz



AM PHASORS AND COUPLERS TO 50 KW



The AEL antenna and phasing equipment is designed with matching, attractive modern cabinetry. More than a decade of AEL experience in this field assures the broadcaster of complete satisfaction.

FEATURES

Over 200 Installations • Custom Fabrication
Standard Components • Easy Accessibility
Designed for Minimum Maintenance



FM Broadcast Transmitters

MODEL FM-1DB 10 watts



The FM-1DB is especially designed for the college radio station use. AEL offers this quality transmitter priced within the college budget. There is no longer any need to use home made equipment for the campus radio station.

FEATURES

One-Button Operation • Solid State Exceeds FCC requirements • Table Top Cabinet Less Than 1% Distortion • Silicon Power Supply

SPECIFICATIONS

Power Output Capability 10 watts
Frequency Range 86-110 MHz
Audio Response ± 1 db
Weight 50 lbs.
Dimensions 22" W x 23" D x 19" H



**MODEL FM3/5KB 3,000 watts
5,000 watts**



Typical of the AEL transmitter line, vertical panel construction of the FM-3/5KB is utilized for easy accessibility to all components. This transmitter is a new addition to AEL's long line of quality products.

FEATURES

Two Tube Types • 3CX3000A7 PA Grounded Grid • Solid State Direct FM Exciter • Less than 0.5% distortion • One Attractive Cabinet, self-contained.

SPECIFICATIONS

Power Output Capability 3500/5500 watts
Type of Emission F-3
RF Output Impedance 50 ohms, unbalanced
Audio Response ± 1 db
Audio Input Impedance 150/600 ohms

MODEL FM-2.5HB 250 watts



The AEL-2.5 HB transmitter is contained in a compact, single unit that features simplicity and perfect sound. The transmitter contains front and rear doors that permit easy accessibility. It contains a circuit breaker for "back-up" protection.

FEATURES

Less Than 1% Distortion • Automatic Recycling No Neutralization • Only One Tube • Remote Control • Silicon Power Supplies

SPECIFICATIONS

Power Output Capability 300 watts
Type of Emission F-3
Type of Modulation Direct FM
Dimensions 46" H x 23" W x 22" D
Audio Input Impedance 600/150 ohms

**MODEL FM-10KB 10,000 watts
7,500 watts**



The FM-10KB Transmitter uses a 4CX10,000 power tetrode in the power amplifier, and a 4C300Y for a driver. These tubes give the benefit of cleaner sound to the listener and operating simplicity to the broadcaster.

FEATURES

Factory Neutralized • All Tuning and Switching Up Front • One Cabinet—No Vault • Less Than 1% Distortion • Automatic Recycling

SPECIFICATIONS

Power Output Capability 11,000 watts
Type of Emission F-3
Audio Input Impedance 150/600 ohms
Audio Response ± 1 db
Weight, Net 1,400 lbs. (approx.)
Dimensions 76" H x 40" W x 33" D



**FM-20KB 20,000 watts
15,000 watts**



The two tube FM-20 KB offers the modern broadcaster built-in provisions for stereo and SCA. Neutralization is eliminated by the use of grounded grid operation.

FEATURES

Driver Tube—4CX1000K • Power Amplifier Tube 3CX10,000A7 • Filaments Self-Regulated • Solid-State Exciter • Automatic Recycling with Overload Indicators.

SPECIFICATIONS

Power Output Capability 21,000 Watts
Audio Distortion (50-15 KC) 0.5% maximum
Carrier Frequency Stability ± 500 cycles
Power Line Consumption 35 KW
Physical Dimensions 76" H x 55" W x 35" D

MODEL FM-5HB 500 watts



The FM-5HB Transmitter incorporates "State of the Art" circuitry and design parameters that assure the modern broadcaster of excellent reliability and operating simplicity. The Power Amplifier tube is a 4CX300Y.

FEATURES

Sola Filament Transformer • Solid State Exciter Front and Rear Doors • Remote Control • Less Than 1% Distortion • Silicon Power Supplies

SPECIFICATIONS

Power Output Capacity 600 watts
 Type of Emission F-3
 FM Noise -65 db below 100% modulation
 Audio Distortion 50-15,000 Hz Less Than 1%
 Dimensions 46" H x 23" W x 22" D

MODEL #2203 ALL SOLID STATE STEREO GENERATOR



The AEL Model 2203 Stereo Generator has been designed to produce a composite stereo signal that can be fed directly into the audio input of a direct FM Exciter.

FEATURES

Completely Solid State • Distortion—0.5% Maximum • Self-Contained Power Supplies Operates with SCA

SPECIFICATIONS

Audio Input Level +10 ±2 db m
 (Each Channel 400 Hz @ 100%)
 Harmonic Distortion 0.5% Maximum
 (50Hz-15Hz)
 Separation 40 db minimum
 Crosstalk 50 db minimum
 Physical Dimensions 3½" H x 19" W



AM/FM AUTOMATIC TRANSMITTER SWITCHES TO 100 KW

The increase of standby transmitters has created a requirement for a standard line of automatic transmitter switch-over equipment.

AEL has responded by developing three basic models for low, medium and high power installations. Reliable vacuum coaxial relays are provided and used in any common RF connector or flange arrangement.

The automatic transmitter switch will transfer the antenna to the standby or non-operating transmitter in the event of a lack of RF power of a predetermined setting.

The RF switch-over units are fully designed for local or remote control and mechanical control. The flexible design will also permit additional control circuits to actuate the RF switch for faults such as lack of audio, high VSWR, and so on.



MODEL FM-1KB 1,000 watts



The FM-1KB is one of the more popular transmitters in the AEL line. Each unit is factory pre-tested at the customer's frequency. Remote control built-in. Grounded Screen eliminates neutralization.

FEATURES

Long-life 4CX1000K PA • Less Than 1% Distortion • Only One Tube • PA Filament Sola-Regulated • One Button Operation

SPECIFICATIONS

Power Output Capacity 1,300 watts
 Frequency Range 88-108 MHz
 Type of Emission F-3
 Audio Response ±1 db
 Audio Input Impedance 150/600 ohms

MODEL #2202A ALL SOLID STATE DIRECT FM EXCITER



The AEL Model #2202A Direct FM Exciter offers the broadcaster the most advanced FM transmitting capability available today. Completely solid state with an RF output of ten watts, it is now being used in the AEL FM broadcast transmitter line. When used monaurally, the exciter has the unbelievably low harmonic distortion of less than 0.5%.

FEATURES

10 Watts Output • Self-Contained Power Supplies • Completely Solid State • Dimensions—7" H x 19" W.

SPECIFICATIONS

Type of Emission F, F9
 Frequency Range 88-108 MHz
 Output Impedance 50 ohms
 Audio Input Impedance 600 ohms
 Modulation Capability ±100 KC Minimum

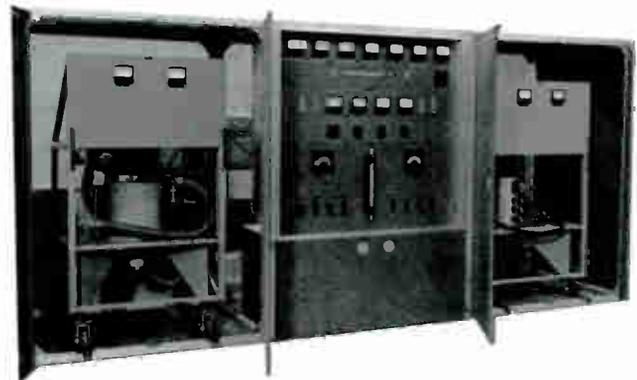
THE BROADCAST TRANSMITTER DIVISION is engaged in the design, development, and production of AM and FM broadcast transmitters, ranging from 10 watts to 50 kilowatts and higher, for both military and high quality commercial requirements.

Custom transmitting equipment has been developed for satellite ground command stations, beacon stations, 50 KW UHF RF devices, vehicular electronic countermeasure applications, high frequency stations, very high frequency applications and standard AM and FM stations.

More recent developments have been in the area of automatic transmitting switching equipment which will reduce down time for those stations that employ standby transmitters.



Satellite Command Transmitter – 100-150 MHz – 5000 Watts Output

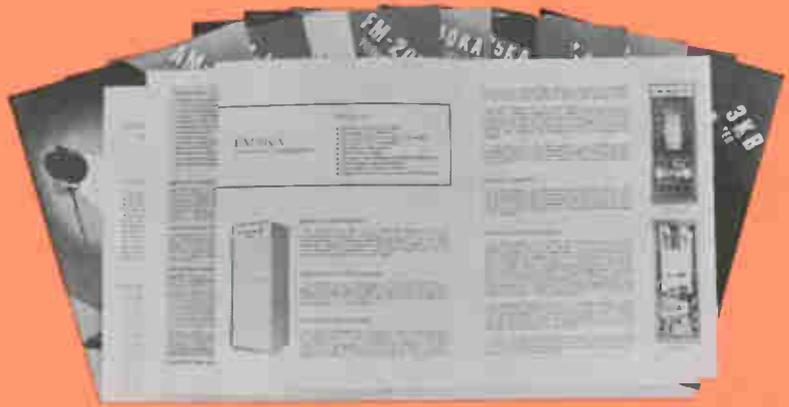


RF Generating Device – UHF 70,000 Watts Output



AN/FRN-25 Beacon Transmitter – Navigational Aid

To obtain these informative brochures, fill out and mail the easy-to-use business reply card below.



LA40KA – 40KW PEP
Linear Amplifier Transmitter
for National Bureau of Standards
WWVH, Hawaii



AMERICAN ELECTRONIC LABORATORIES, INC.
 P. O. BOX 552, LANSDALE, PA. 19446 — (215) 822-2929 • TWX: 510 661-4976

Gentlemen:

I would like some additional information on the following AEL broadcast equipment:

AM TRANSMITTERS

- 1,000/500/250 watts—AM-1KA
- 5,000 watts—AM-5KA
- 10,000 watts—AM-10KA
- 50,000 watts—AM-50KB
- Other: _____
- Other: _____

FM TRANSMITTERS

- 10 watts—FM-1DB
- 250 watts—FM-2.5HB
- 500 watts—FM-5HB
- 1,000 watts—FM-1KB
- 3/5,000 watts—FM-3/5KB
- 10,000 watts—FM-10KB
- 20,000 watts—FM-20KB

Accessory AM Equipment

- Phasors & Tuning Units
(Send Electrical Details)
- FM Isolators
(Send Electrical Details)

Accessory FM Equipment

- Direct FM Exciter—Model 2202A
- Stereo Generator—Model 2203
- ATS Automatic Transmitter
Switcher

Fold Here

Fold Here

My requirement is for:

- New Station
- Future Reference
- Power Increase
- Other: _____
- Replacement

Please forward the above requested information to:

Name _____ Title _____

Company/Station _____

Address _____

City _____ State _____ Zip Code _____

- Consultant
- Engineer
- Management

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 • SEMICONDUCTOR TESTERS • CATV • INSTRUMENTS
 RESEARCH AND DEVELOPMENT

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PENNA. 19446

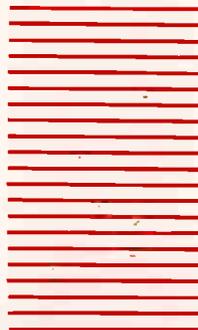
BUSINESS REPLY MAIL

No Postage Stamp Necessary If Mailed In the U.S.A. Postage Will Be Paid By Addressee

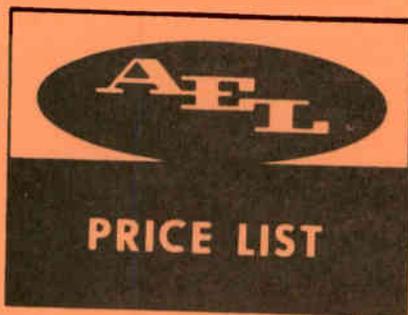
American **E**lectronic **L**aboratories, Inc.

P. O. BOX 552
LANSDALE, PENNSYLVANIA

19446



Prices and specifications
subject to change without
notice



BROADCAST EQUIPMENT

140-220-4.2
May 1972

FM TRANSMITTERS - 88 to 108 MHz

MODEL NUMBER	POWER OUTPUT (watts)	PRICE
FM 2.5HD	50 to 250	\$ 5,750
FM 1KD	250 to 1,000	7,500
FM-2.5KD	500 to 2,500	10,500
FM-5KB	1,000 to 5,000	14,650
FM-12KD	5,000 to 12,000	19,500
FM-25KD	10,000 to 25,000	26,500

ACCESSORY FM EQUIPMENT

2202A	Direct FM Solid State Exciter	2,450
2213	Solid State FM Stereo Generator, with output filter	1,380
SCG-4T	Solid State SCA Generator	695

AM TRANSMITTERS - 535 to 1620 kHz

MODEL NUMBER	POWER OUTPUT (watts)	PRICE
AM-1KC	1,000/500/250	\$ 6,500
AM-5KC	5,000/1,000/500	20,500
AM-10KC	10,000/5,000	22,000

AEL custom manufactured AM Phasors, Tuning Units, RF and Audio Accessory items are available on a request for quotation basis.

All transmitters furnished complete with operating tubes, silicon rectifiers, and crystal(s) at standard 60 cycle AC 120/240 V. Orders must specify Line Voltage and frequency; also Transmitter operating frequency, and antenna impedance.

Prices herein supersede all previously published prices and are domestic U.S. prices f.o.b. Colmar, Pa.

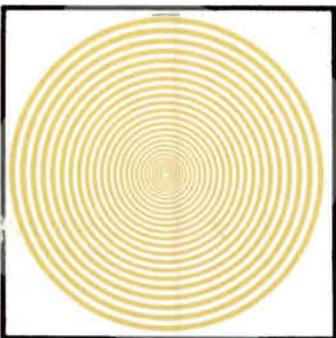
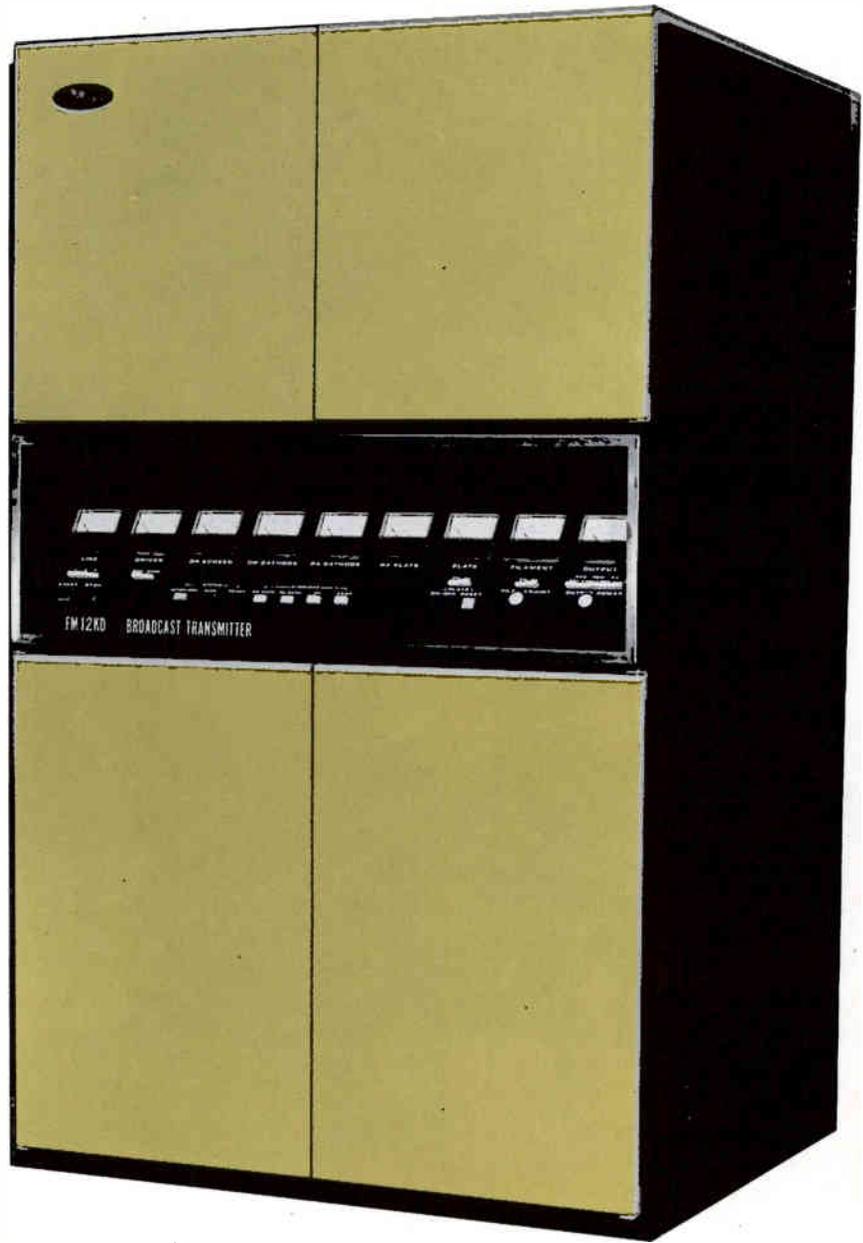
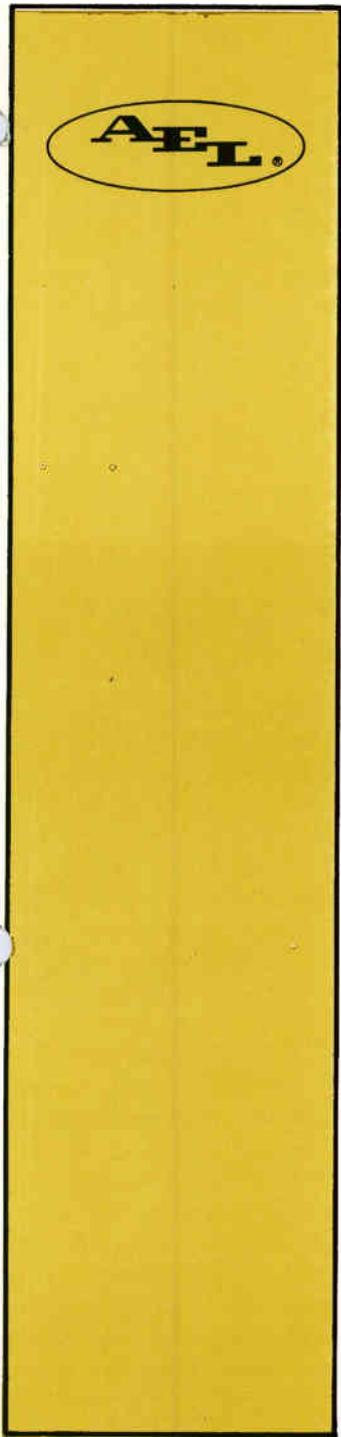
Terms: Net 30 Days. Delivery of stock items is subject to prior sale and prices are subject to change without notice.



AMERICAN ELECTRONIC LABORATORIES, INC.

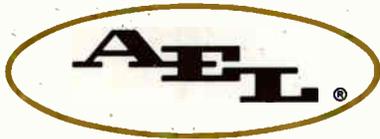
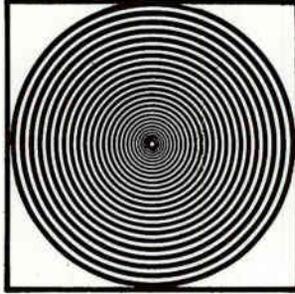
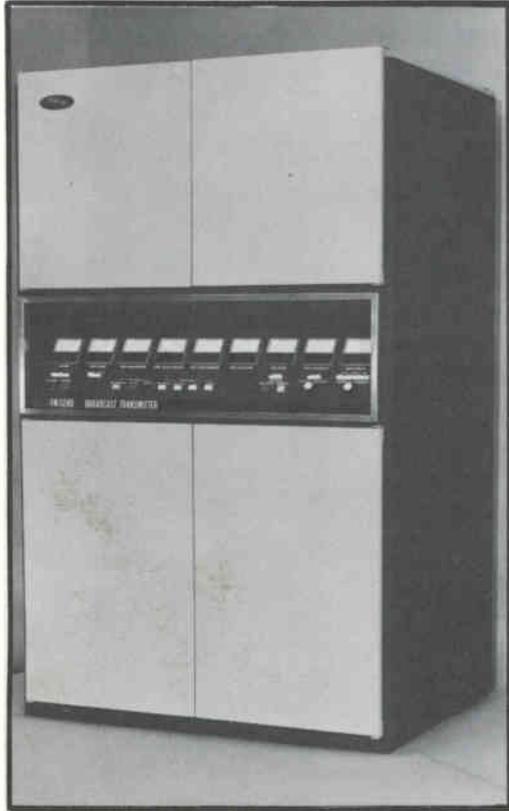
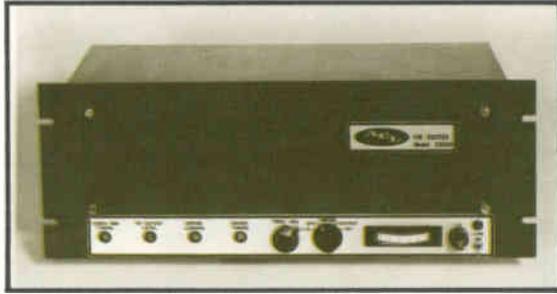
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FM-12 KD

American **E**lectronic **L**aboratories, Inc.



exciter

The AEL Model 2202A Exciter, nucleus of the FM-12KD Transmitter is a totally solid state unit employing Direct Carrier Frequency Modulation. The exciter's capabilities allow exceptional performance over a broad flat response with negligible phase shift for good stereo separation, extremely low distortion and noise. The environmentally controlled AFC and FMO circuitry provides long term frequency stability. This compact, self contained exciter including regulated power supplier, is built with the highest quality components to provide **SOUND FIDELITY OF THE SEVENTIES.**

solid state

Exclusive of the driver (IPA) and power amplifier (PA) tubes the entire FM-12KD is a solid state transmitter. The 2202A supplies 10 watts of RF power to the IPA which in turn delivers drive to the final tube. The power amplifier operates in a grounded grid configuration with zero bias, and the cathode circuitry is broadbanded requiring no field tuning adjustment. Reliable silicon rectifiers are used in the high voltage power supply and are very conservatively rated to provide long, dependable service.

features

- TWO TUBE DESIGN - 12 Kw OUTPUT
- SOLID STATE EXCITER AND POWER SUPPLIES
- SOLID STATE CONTROL CIRCUITRY
- AUTOMATIC RECYCLING
- MID-CABINET METERING
- COMPLETELY SELF-CONTAINED
- NO NEUTRALIZATION OF FINAL TUBE
- CIRCUIT BREAKER PROTECTION
- REMOTE CONTROL PROVISIONS
- POSITIVE CABINET AIR PRESSURE

FM-12KD

operation

The final tube is a 3CX10,000A7 operated in a grounded grid configuration assuring low harmonic radiation and stable amplifier operation. The shielded enclosure reduces the possibility of RF and AF interaction and the rugged design of the PA stage with conservative operating parameters provides the broadcaster many years of maintenance-free operation. The application of positive forced air cabinet and tube cooling techniques increases the possibility of long tube life and decreases dust accumulation between maintenance periods.

driver

The driver (IPA) section of the FM-12KD is a ceramic 4CX1000K power tetrode mounted in its own shielded enclosure, and requires a low input power from the exciter to achieve adequate drive power to the PA.

control circuitry

Solid state control circuitry reduces the number of relays as an advanced technology design. In the event of an overload, fast acting circuit protection networks identify the circuit failure and allow the FM-12KD to recycle twice. A third overload within one minute will shut down the transmitter until the fault is cleared. Door and air flow interlock switches and primary voltage circuit breakers serve a dual function of circuitry and personnel protection.

high standards

AEL Model FM-12KD FM Broadcast transmitter exhibits the high standards of engineering design maintained by the American Electronic Laboratories, Inc. and its subsidiaries based on years of

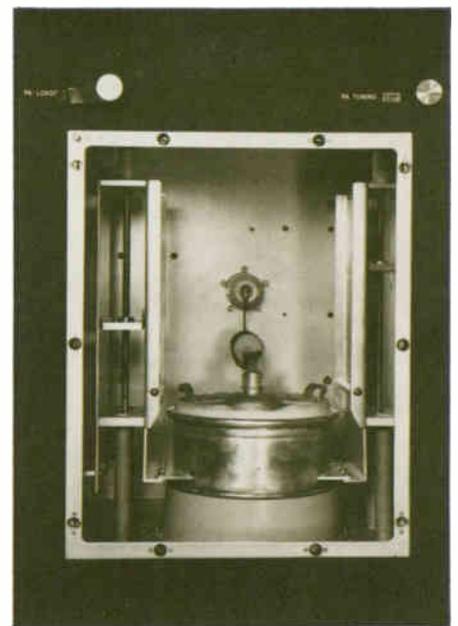
experience. These standards are observed throughout the stages of component selection, production, assembly procedures, testing and shipping.

metering & control

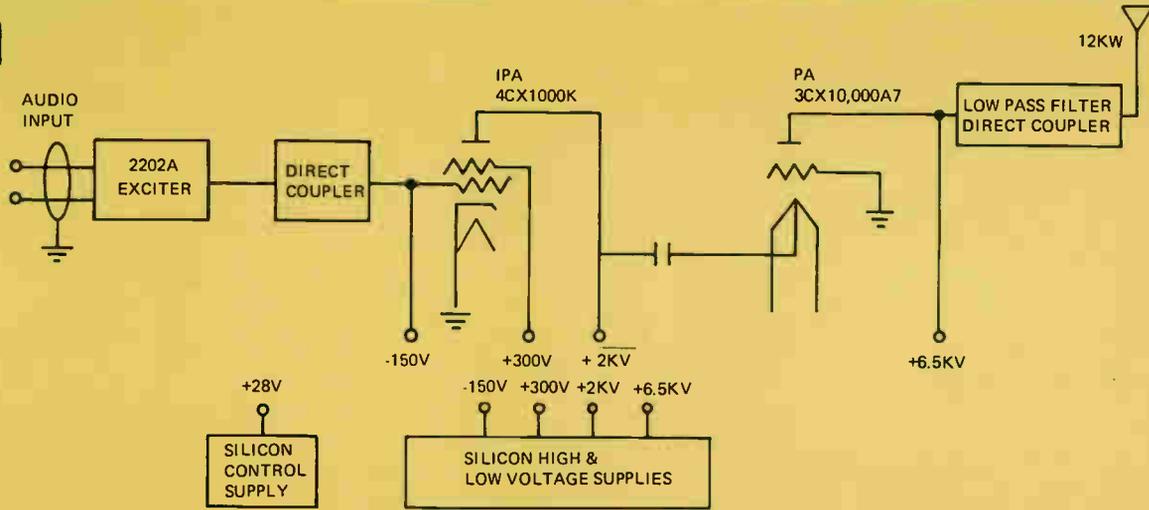
The hinged mid-cabinet meter and control panel completes the designed accessibility of the FM-12KD. All important voltages and currents are monitored by eleven aluminum cased meters, nine of which are mounted on the mid-cabinet panel. The lamp indicators showing the status of the various circuits aid in the prompt investigation of an overload condition. Remote control readings and functions are conveniently provided as parallel circuitry to the main transmitter metering and control. Superior Engineering Design makes the AEL Advanced Equipment Line truly the unit for the **SOUND FIDELITY FOR THE SEVENTIES.**



Sound Fidelity of the Seventies . . .



Diagram



DIRECT ALL CORRESPONDENCE TO:



American **E**lectronic **L**aboratories, Inc.

P.O. Box 552, Lansdale, Pa. 19446 • (215) 822-2929 TWX: 510-661-4976

SPECIFICATIONS

Frequency Range	88 to 108 MHz
Rated Power Output	5,000 to 12,000 watts
Type of Emission	F3, F9
RF Load Impedance	50 ohms
Output Termination	3-1/8" EIA flange
Frequency Stability	± 1000 cycles
Modulation Capability	± 100 MHz
Temperature Range	0-50°C
Altitude Above Sea Level	7,500 ft. max.
Power Line Requirements	
Voltage	208/240 VAC
Frequency	60 cycle
Phase	3
Consumption at 25 KW	22 KW
Power Factor	0.9
Overall Dimensions (less filter)	76" H x 40" W x 33" D
Net Weight	1800 lbs. (approx.)

Monaural

Audio Input Impedance	600 ohms balanced
Audio Input Level	
At 400 Hz at 100% Modulation	+10 ± 2 dBm
Audio Harmonic Distortion	
50 to 15,000 Cycles	0.5% maximum
Audio Frequency Response	± 1 dB
Standard 75 microsecond pre-emphasis	
50 to 15,000 Cycles	
FM Noise at 400 Hz at 100% Mod.	-65 dB
AM Noise-Reference Carrier AM	
Modulation 100%	-55 dB

General

Stereo

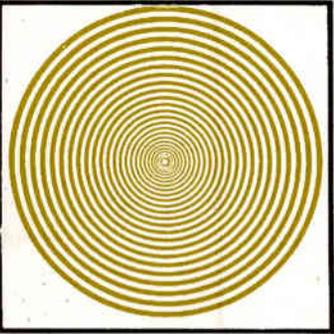
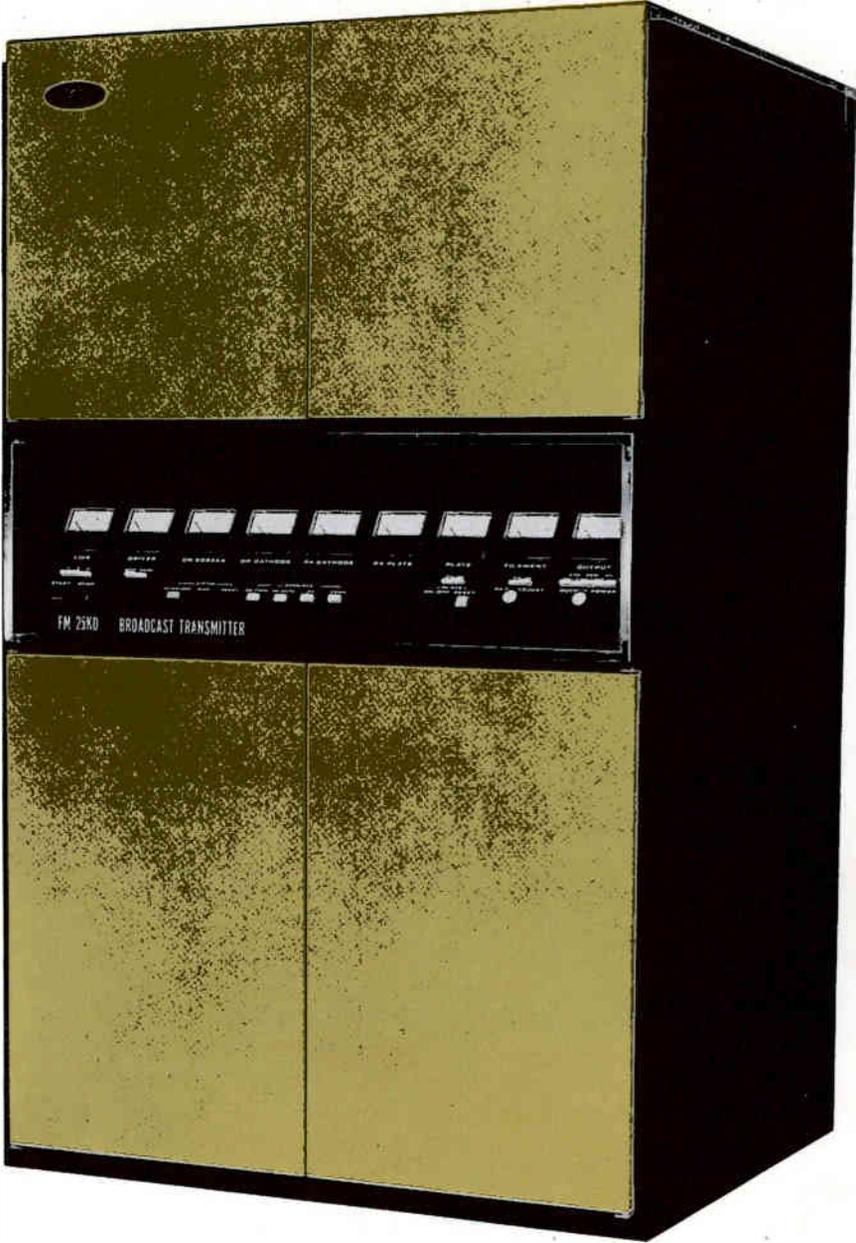
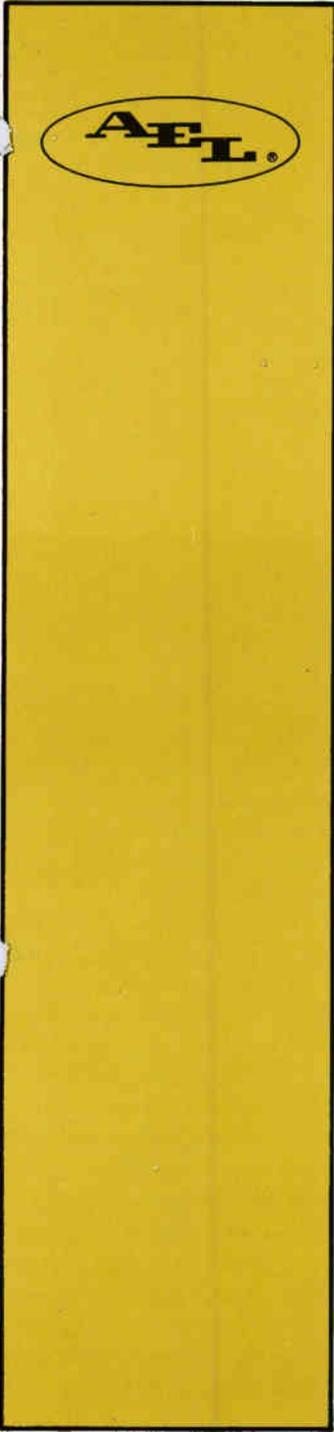
Audio Input Impedance	600 ohms balanced (right and left)
Audio Input Level (right and left)	
At 400 Hz at 100% Modulation	+10 ± 2 dBm
Audio Frequency Response	± 1 dB (right and left)
Standard 75 Microsecond	
Pre-Emphasis, 50-15,000 Cycles	
FM Noise (left or right)	-65 dB
Reference 400 Hz at 100% Mod.	
AM Noise (left or right)	-55 dB
Reference Carrier AM Mod. 100%	
Stereo Separation	
100-15,000 Cycles40 dB min.
50-100 Cycles35 dB min.
Stereo Pilot Stability	19 KHz ± 1 Hz
Cross-talk (L + R to	
L-R, L-R to L+R Ref. 100% Mod.)	-45 dB min.

SCA

Frequency Range	30 to 75 KHz
Frequency Stability	± 400 Hz
Audio Input Impedance	600 ohms
Audio Input Level	-15 dBm to +10 dBm adjustable
Muting Delay	0.5 to 5 second adjustable
FM Noise	65 dB
AM Noise	55 dB
Pre-Emphasis75 microsecond*

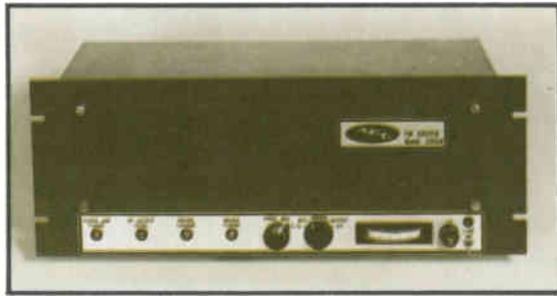
*Standard; otherwise specify

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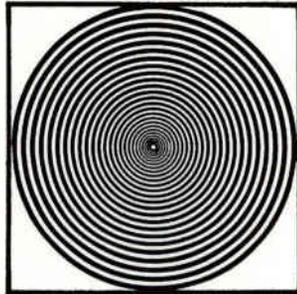
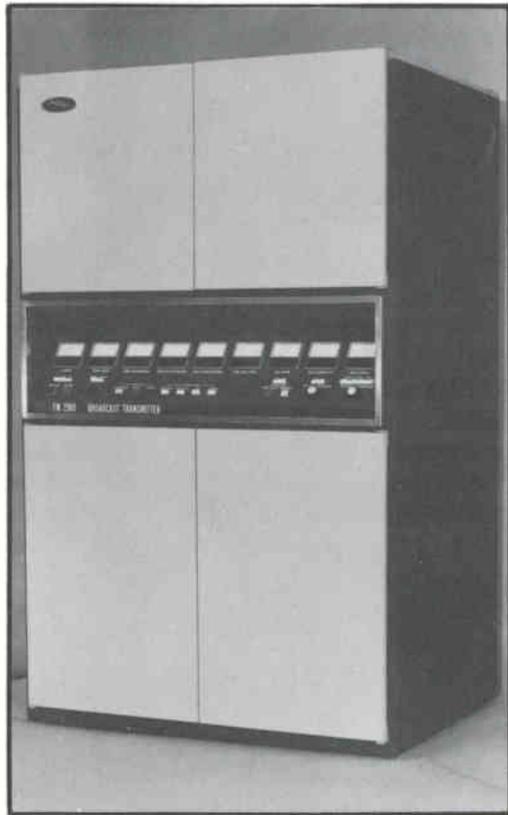
FM-25KD

American **E**lectronic **L**aboratories, Inc.



exciter

The AEL Model 2202A FM Exciter, nucleus of the FM-25KD Transmitter is a totally solid state unit employing Direct Carrier Frequency Modulation. The exciter's capabilities allows exceptional performance over a broad flat response with negligible phase shift for good stereo separation, extremely low distortion and noise. The environmentally controlled AFC and FMO circuitry provides long term frequency stability. This compact, self contained exciter including regulated power supplies, is built with the highest quality components to provide **SOUND FIDELITY OF THE SEVENTIES.**



solid state

Exclusive of the driver (IPA) and power amplifier (PA) tubes the entire FM-25KD is a solid state transmitter. The 2202A supplies 10 watts of RF power to the IPA which in turn delivers drive to the final tube. The power amplifier operates in a grounded grid configuration with zero bias, and the cathode circuitry is broadbanded requiring no field tuning adjustment. Reliable silicon rectifiers are used in the high voltage power supply and are very conservatively rated to provide long, dependable service.



features

- TWO TUBE DESIGN - 25 KW OUTPUT
- HIGH VSWR PROTECTION
- SOLID STATE EXCITER AND POWER SUPPLIES
- SOLID STATE CONTROL CIRCUITRY
- AUTOMATIC POWER OUTPUT CONTROL
- FILAMENT VOLTAGE CONTROL
- AUTOMATIC RECYCLING
- MID-CABINET METERING
- COMPLETELY SELF-CONTAINED
- NO NEUTRALIZATION OF FINAL TUBE
- CIRCUIT BREAKER PROTECTION
- REMOTE CONTROL PROVISIONS
- POSITIVE CABINET AIR PRESSURE



FM-25KD

operation

The final tube is a 3CX15,000A7 operated in a grounded grid configuration assuring low harmonic radiation and stable amplifier operation. The shielded enclosure reduces the possibility of RF and AF interaction and the rugged design of the PA stage with conservative operating parameters provides the broadcaster many years of maintenance-free operation. The application of positive forced air cabinet and tube cooling techniques increases the possibility of long tube life and decreases dust accumulation between maintenance periods.

driver

The driver (IPA) section of the FM-25KD is a ceramic 4CX1000K power tetrode mounted in its own shielded enclosure, and requires a low input power from the exciter to achieve adequate drive power to the PA.

control circuitry

Solid state control circuitry reduces the number of relays as an advanced technology design. In the event of an overload, fast acting circuit protection networks identify the circuit failure and allow the FM-25KD to recycle twice. A third overload within one minute will shut down the transmitter until the fault is cleared. Door and air flow interlock switches and primary voltage circuit breakers serve a dual function of circuitry and personnel protection.

high standards

AEL Model FM-25KD FM Broadcast transmitter exhibits the high standards of engineering design maintained by the American Electronic Laboratories, Inc. and its subsidiaries based on years of

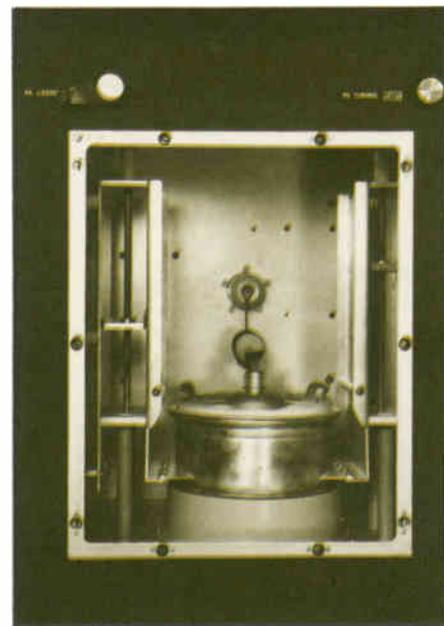
experience. These standards are observed throughout the stages of component selection, production, assembly procedures, testing and shipping.

metering & control

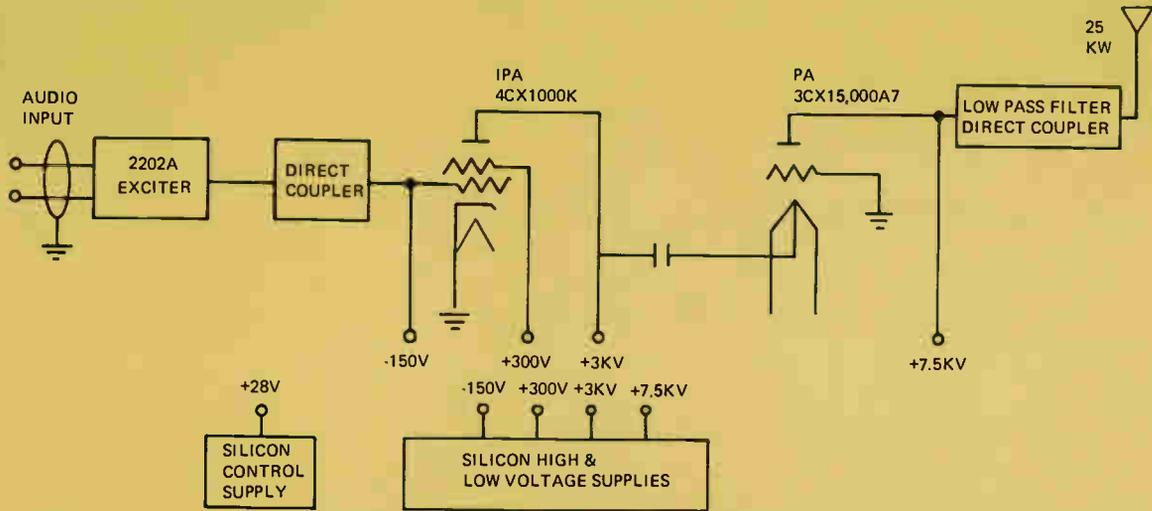
The hinged mid-cabinet meter and control panel completes the designed accessibility of the FM-25KD. All important voltages and currents are monitored by eleven aluminum cased meters, nine of which are mounted on the mid cabinet panel. The lamp indicators showing the status of the various circuits aid in the prompt investigation of an overload condition. Remote control readings and functions are conveniently provided as parallel circuitry to the main transmitter metering and control. Automatic power output, automatic filament and VSWR metering and control make the AEL Advanced Equipment Line truly the unit for the **SOUND FIDELITY FOR THE SEVENTIES.**



Sound Fidelity of the Seventies . . .



Diagram



DIRECT ALL CORRESPONDENCE TO:

AMERICAN ELECTRONIC LABORATORIES, INC.

P.O. Box 552, Lansdale, Pa. 19446 • (215) 822-2929 TWX: 510-661-4976

SPECIFICATIONS

Frequency Range	88 to 108 MHz
Rated Power Output	12,000 to 25,000 watts
Type of Emission	F3, F9
RF Load Impedance	50 ohms
Output Termination	3-1/8" EIA flange
Frequency Stability	± 1000 cycles
Modulation Capability	± 100 KHz
Temperature Range	0-50°C
Altitude Above Sea Level	7,500 ft. max.
Power Line Requirements	
Voltage	208/240 VAC
Frequency	60 cycle
Phase	3
Consumption at 25 KW	39 KW
Power Factor	0.9
Overall Dimensions (less filter)	76" H x 48" W x 33" D
Net Weight	2200 lbs. (approx.)

General

Stereo

Audio Input Impedance	600 ohms balanced (right and left)
Audio Input Level (right and left) At 400 Hz at 100% Modulation	$+10 \pm 2$ dBm
Audio Frequency Response	± 1 dB (right and left)
Standard	75 Microsecond
Pre-Emphasis	50-15,000 Cycles
FM Noise (left and right)	-65 dB Reference 400 Hz at 100% Mod.
AM Noise (left or right)	-55 dB Reference Carrier AM Mod. 100%
Stereo Separation	
100-15,000 Cycles	40 dB min.
50-100 Cycles	35 dB min.
Stereo Pilot Stability	19 KHz ± 1 Hz
Cross-talk (L + R to L-R, L-R to L+R Ref. 100% Mod.)	-45 dB min.

Monaural

Audio Input Impedance	600 ohms balanced
Audio Input Level At 400 Hz at 100% Modulation	$+10 \pm 2$ dBm
Audio Harmonic Distortion 50 to 15,000 Cycles	0.5% maximum
Audio Frequency Response	± 1 dB
Standard 75 microsecond pre-emphasis 50 to 15,000 Cycles	
FM Noise at 400 Hz at 100% Mod.	-65 dB
AM Noise-Reference Carrier AM Modulation 100%	-55 dB

SCA

Frequency Range	30 to 75 KHz
Frequency Stability	± 400 Hz
Audio Input Impedance	600 ohms
Audio Input Level	-15 dBm to ± 10 dBm adjustable
Muting Delay	0.5 to 5 second adjustable
FM Noise	65 dB
AM Noise	55 dB
Pre-Emphasis	75 microsecond*

*Standard; otherwise specify

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AEL Total RF Transmission Systems



The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This not only helps in tracking expenses but also ensures compliance with tax regulations. The document further outlines the process of reconciling bank statements with the company's ledger to identify any discrepancies.

In the second section, the focus is on budgeting and financial forecasting. It provides a detailed breakdown of the company's budget for the upcoming fiscal year, categorized by department and project. The document also includes a risk assessment of various financial scenarios, highlighting potential challenges and opportunities. This section is crucial for strategic planning and resource allocation.

The third part of the document addresses the issue of financial reporting and transparency. It details the company's commitment to providing timely and accurate reports to stakeholders. The document also discusses the implementation of internal controls to prevent fraud and ensure the integrity of financial data. This section is essential for building trust and maintaining a strong financial reputation.

Finally, the document concludes with a summary of key findings and recommendations. It reiterates the importance of continuous monitoring and improvement of financial processes. The document also provides contact information for the finance department for any queries or concerns. This final section serves as a call to action for all employees to adhere to the financial policies and procedures outlined in the document.

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AMERICAN ELECTRONIC LABORATORIES, Inc.



A QUARTER CENTURY OF TECHNOLOGICAL GROWTH

American Electronic Laboratories, Inc. was founded in 1950 by two engineers on the staff of the Moore School of Electrical Engineering at the University of Pennsylvania . . . Dr. Leon Reibman and Conrad J. Fowler.

The modern plant, with the state-of-the-art equipment and facilities, is located on a 55-acre tract in historic Montgomery County, Pennsylvania

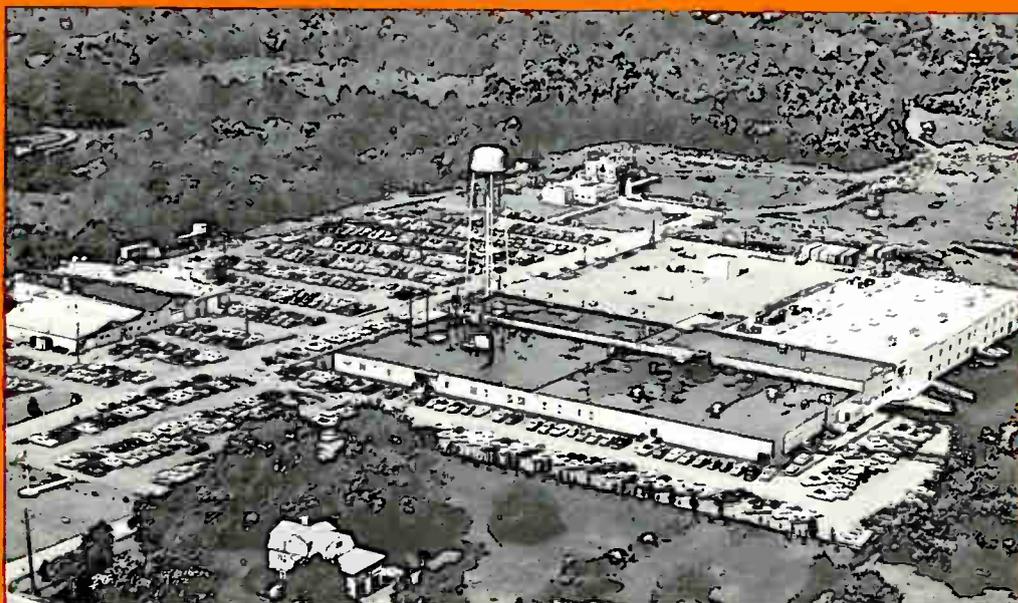
The AEL Broadcast Division is part of a responsive and efficient organization, geared to meet the challenges of scientific research, design, development, manufacturing and service.

Throughout the free world numerous customers have benefited from the success of AEL's innovative endeavors: the Department of Defense, the National Aeronautics & Space Administration, many industrial organizations . . . and especially commercial broadcasters.

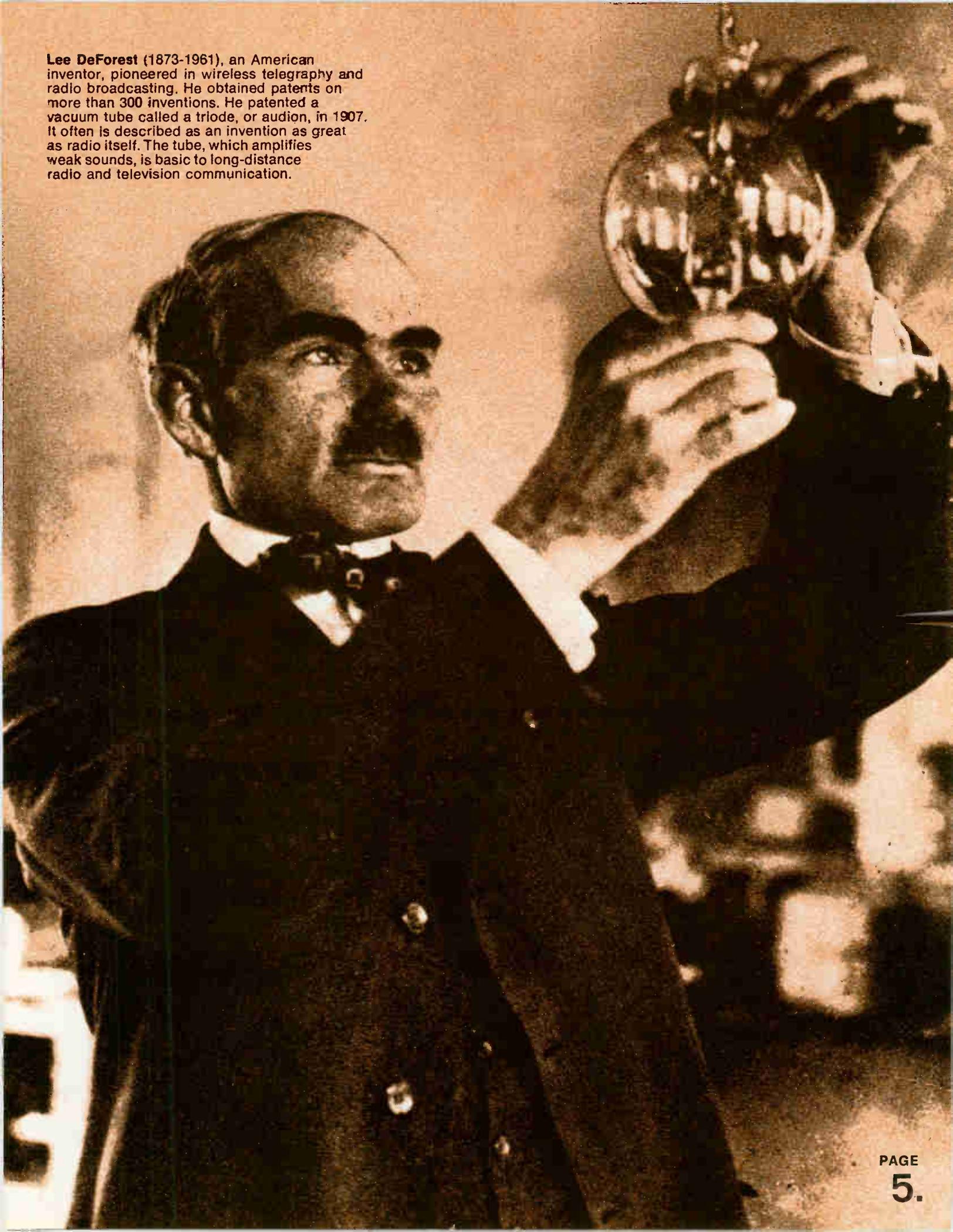
The requirements of the broadcaster are served throughout the United States, as well as internationally, with marketing representatives dedicated to serve management and the broadcast engineer.

For additional information, contact the Broadcast Marketing Manager at our headquarters in Colmar, PA.

American Electronic Laboratories, Inc.
P.O. Box 552, Lansdale, PA 19446
(215) 822-2929 TWX: 510-661-4976



Lee DeForest (1873-1961), an American inventor, pioneered in wireless telegraphy and radio broadcasting. He obtained patents on more than 300 inventions. He patented a vacuum tube called a triode, or audion, in 1907. It often is described as an invention as great as radio itself. The tube, which amplifies weak sounds, is basic to long-distance radio and television communication.



5,000W



FEATURES

- Excellent Fidelity
- Easy Maintenance
- Semi-Automatic Operation
- High Level Modulation
- Solid State Control Circuitry
- 125% Modulation Capability
- Central Control Panel

The Model AM-5KD is a completely self-contained 5,000 Watt AM transmitter. It is FCC Type Accepted for service in the 535 to 1605 kHz broadcast band.

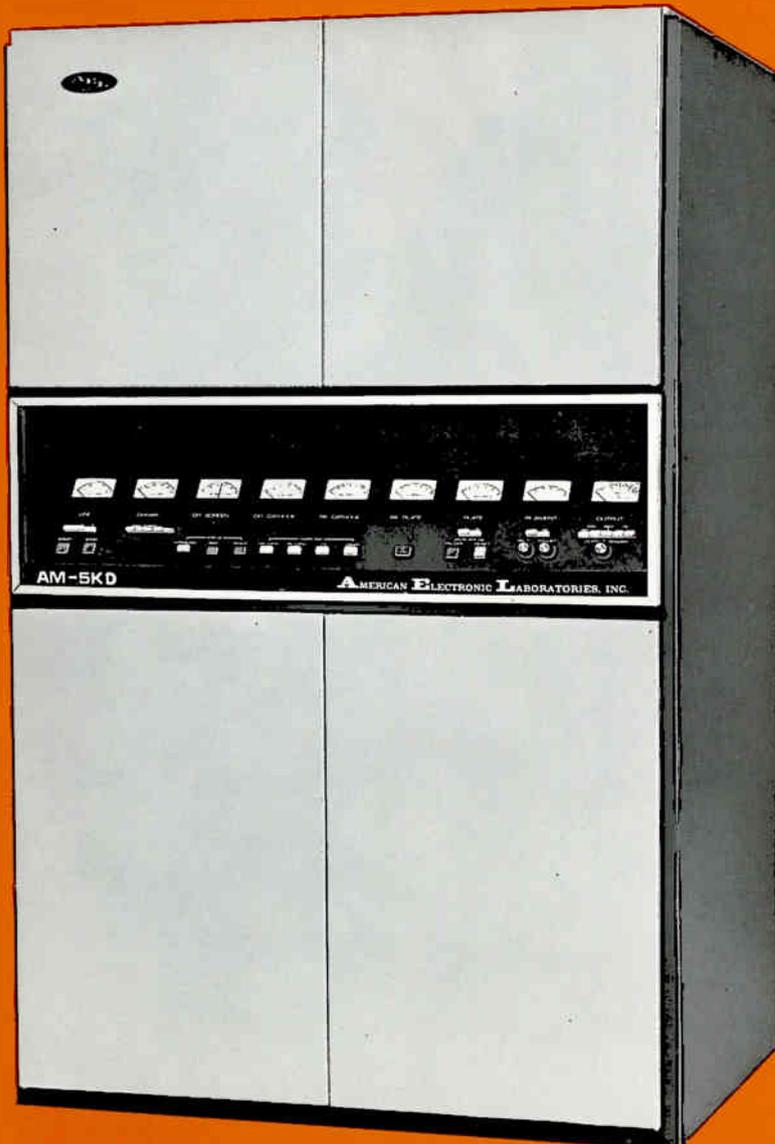
This transmitter was designed for the professional AM broadcaster and features all solid state control circuits, excellent audio fidelity, and semi-automatic start-up features.

FIDELITY

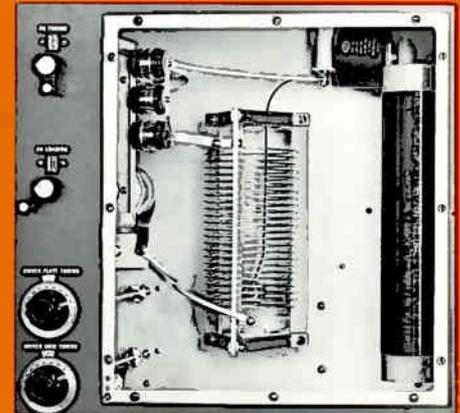
The low level audio section of the AM-5KD is completely solid state. The program input line drives a dual 100 Watt solid state preamplifier whose output provides grid drive to a pair of low distortion 4CX3000A class AB-1 modulators. Negative feedback is used around the complete audio section to reduce distortion and assure high fidelity performance. The overall performance of this transmitter that is of particular interest to the broadcast engineer includes:

- Frequency Response 50 — 7500 Hz (± 1.5 dB)
- Low Distortion 1.5% (typical)
- Low Noise -55dB (unweighted)

Model AM-5KD Broadcast Transmitter



RF OUTPUT CIRCUITRY (Front View)



RF choke and plate tank coil. Notice the convenient PA and driver tuning controls.



EASY MAINTENANCE

The transmitter is housed in a single self-contained modern cabinet including the AEL Center Line Control Panel concept. This places all metering, control, and indicator functions at the normal reading level position for easy operation while making tuning or operation adjustments.

The meter panel is front-end hinged for easy access to all control and logic circuits.

All High Power circuits and components are located in the rear of the cabinets.

The entire chassis maintains a positive cabinet air pressure which prevents intrusion of dust and dirt; this feature significantly increases the life of the high-voltage components and reduces the need for maintenance.

TUBES

The RF output stage uses one (1) high gain, high reliability 4CX3000A Tetrode; the RF driver stage utilizes a single 8121 high performance Tetrode which operates at one third of maximum output capabilities; the modulator stage uses two (2) 4CX3000A's operating class AB1.

There are only two tube types (4 tubes total in this 5,000W transmitter).

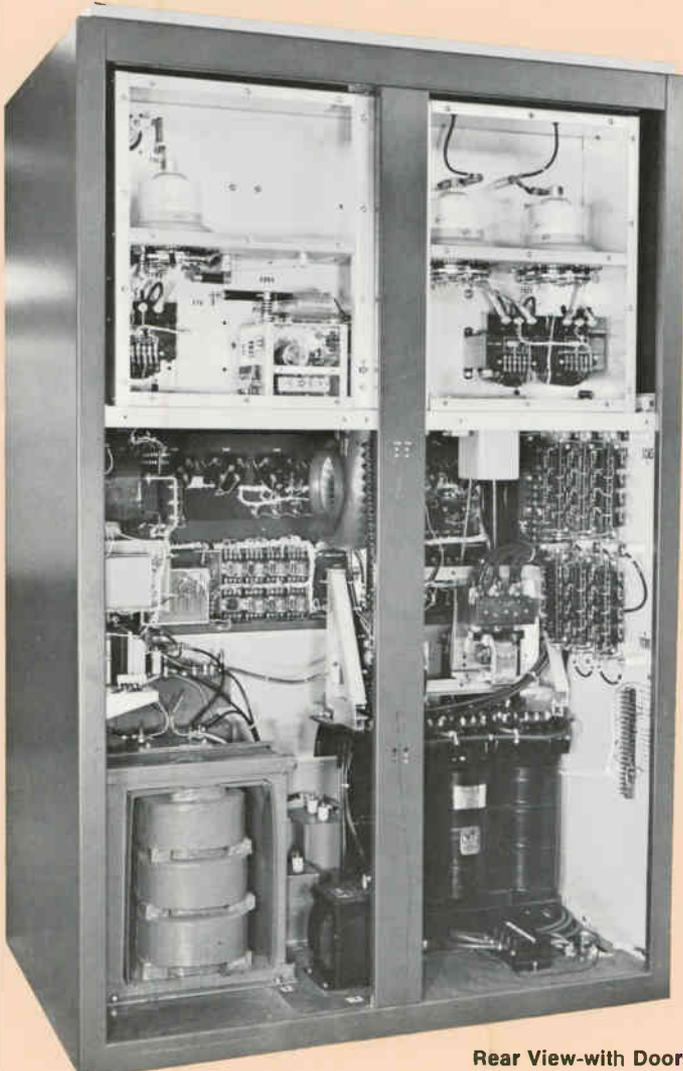
SEMI-AUTOMATIC OPERATION

This transmitter has several semi-automatic controls that are of interest to the broadcaster. These include automatic re-start, automatic re-cycle, and power cut-back; all control functions are accomplished by solid state logic circuits; each operates from a 24 Vdc regulated power supply. The interlock and sequence relays are also operated from this low voltage source for safety and convenience. Push button start/stop operation is used. Operating and fault status lights are placed in the center-mounted control panel.

AUTOMATIC RE-CYCLING—Overload Protection

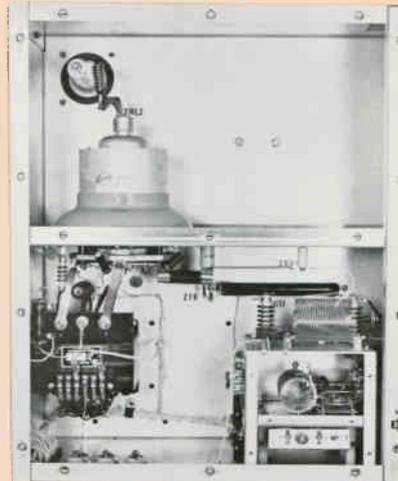
Any abnormal condition that might cause an overload condition in the Driver Tube, the Power Amplifier Tube, or the high voltage section of the amplifier immediately initiates a 1 second shut down. The plate voltage is removed automatically from these tubes to protect them from permanent damage. It is automatically returned after this one second interval; after three consecutive shut downs the plate voltage can be restored only by a manual re-set.

(Continued on page 8)



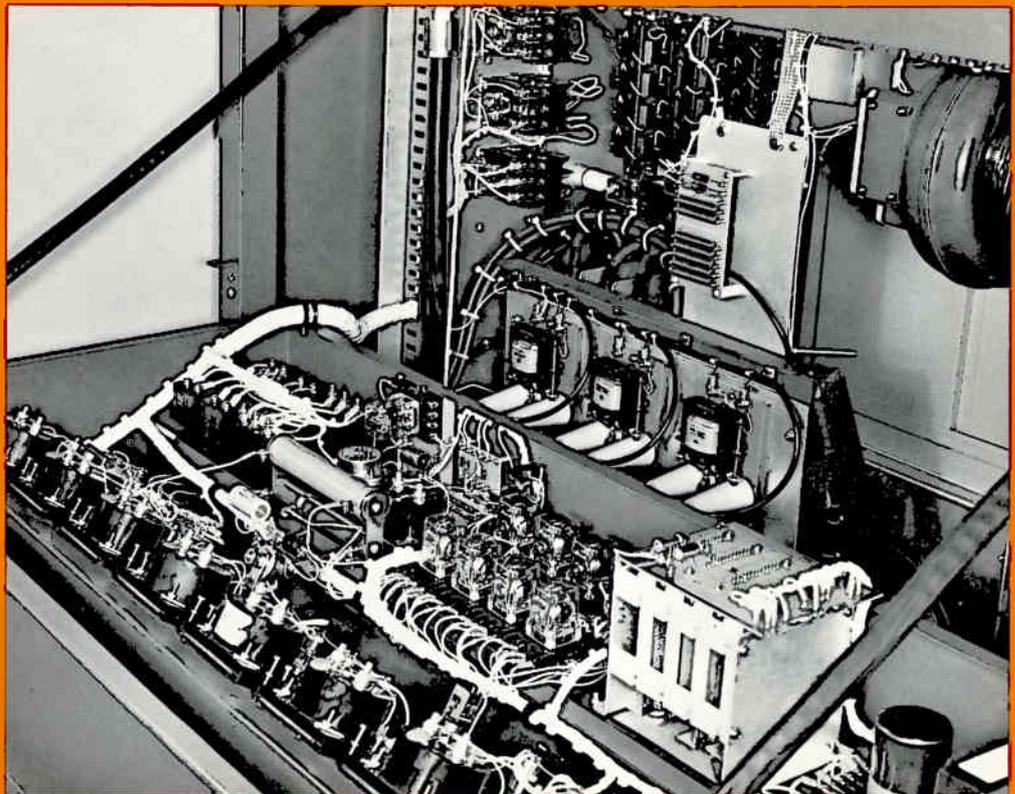
Rear View-with Doors and Air Filters removed.

**RF OUTPUT CIRCUITRY
(Rear View)**



At the top of this RF section is the RF power amplifier and below is the solid state exciter.

5,000W



AEL Design Meter Panel Hinged For Quick Access



Model AM-5KD Broadcast Transmitter

AUTO RESTART—Power Interrupt

If the primary power to the transmitter is interrupted for less than 5 seconds the transmitter automatically shuts down; this protects sensitive tubes and circuits. It is automatically returned to full power immediately upon return of primary power. As long as the interrupt is less than 5 seconds this sequence will continue indefinitely. If primary power to the transmitter is interrupted for more than 5 seconds the transmitter is automatically shut down. When full power is restored, a 3 minute restart cycle is automatically instituted after which normal operation of the transmitter resumes. This 3 minute delay is required to protect the sensitive high power tubes.

SELF-CHECK CIRCUITS

In order to assist the broadcast engineer in routine maintenance procedures, and overload Status Board is incorporated in this transmitter. This provides a visual indication whenever one of the following circuits become overloaded:

- High Voltage Supply
- Final Amplifier Driver
- Modulator
- Low Voltage Supply

REMOTE CONTROL

Terminals for connecting remote control and remote metering functions are built into the transmitter, permitting interface with any conventional remote control system.

POWER CUT-BACK

A single button control with automatic built-in sequencing controls the cut-back from 5,000 Watts to 1,000 or 500 Watts.

MECHANICAL/ENVIRONMENTAL

SIZE: 77-1/4"H x 48"W x 36"D (overall)
77-1/4"H x 48"W x 33"D (trim and doors removed)

WEIGHT: 2360 lbs. (approx.)

FLOOR LOADING: 215 lbs./sq. ft. (approx.)

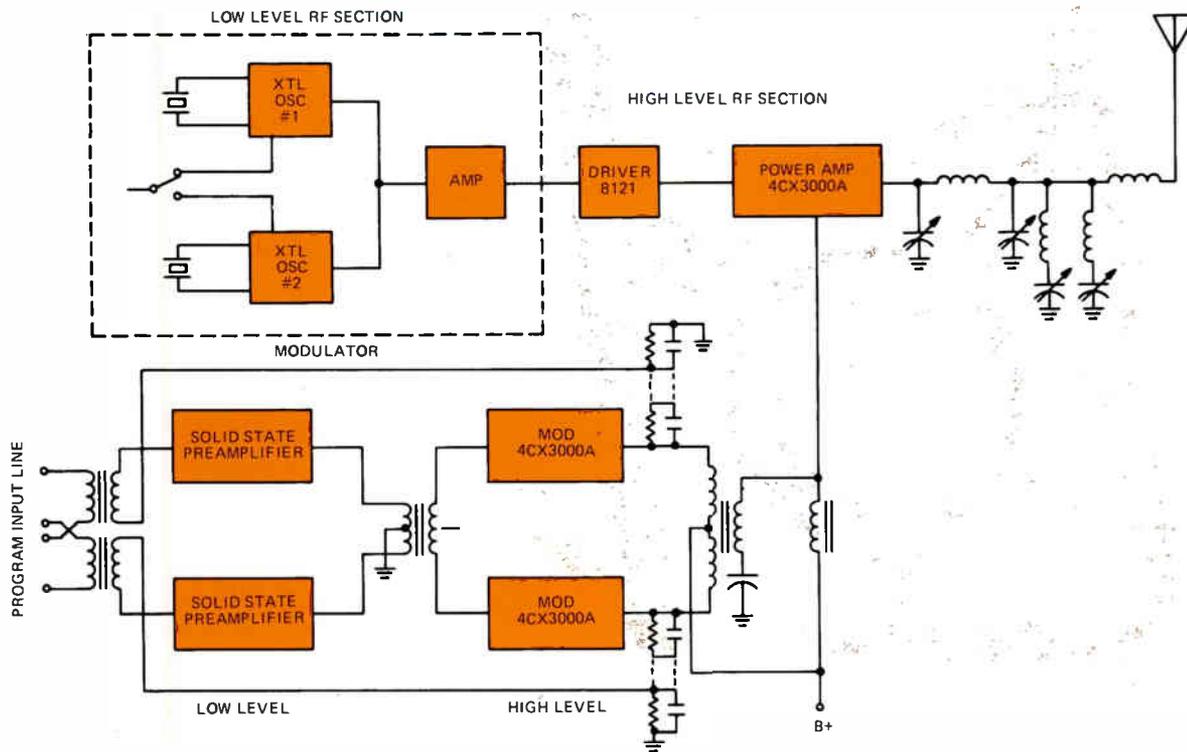
CABINET STYLE: Enclosed single steel cabinet; access through front doors and quickly removable panels, swing-down centrally located meter and control panel, rear doors.

OPERATING AMBIENT TEMPERATURE RANGE:
20°F to 113°F.

STORAGE TEMPERATURE RANGE:
—20°F to 120°F.

PROTECTIVE FUNCTIONS

Extra circuit protection is provided by both multiple circuit breakers and fuses. All access doors and hatches are provided with interlocks for protection of personnel. A high voltage shorting stick is provided with each transmitter.



Simplified Block Diagram, AEL AM-5KD Transmitter

SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

Frequency Range:	535 to 1605 kHz.
Frequency Stability:	±5 Hz.
Audio Frequency Input Impedance:	150/600 ohms balanced.
Audio Frequency Input Level:	+10 dBm ±2 dB for 100% modulation.
Audio Frequency Response:	± 1 dB 50 Hz to 8 kHz.
Audio Frequency Distortion:	Less than 2.5% 50 Hz to 8 kHz at 95% modulation.
Noise Unweighted	(referenced 100% modulation at 400 Hz): -55 dB.
Power Output Capability:	5.5 kW.
Modulation:	High level plate modulation.
Type of Emission:	A3
Output Impedance:	50 ohms unbalanced standard; other impedances available on special order.
Carrier Shift	(100% modulation): Less than 3%.
Monitor Output:	5 V to RMS into 50/75 ohms.
Line Voltage:	208 to 240 Vac 60 Hz, 3 phase, 4 wire (others available on special order).
Power Consumption:	0% modulation — 11 kW. 30% modulation — 12 kW. 100% modulation — 14 kW.
Power Factor:	90%
Voltage Variation and Regulation:	±5%.
Spurious RF Emission	(2nd harmonic & higher): -80 dB.

Prices and specifications subject to change without notice

10,000W



FEATURES

- Excellent Fidelity
- Easy Maintenance
- Semi-Automatic Operation
- High Level Modulation
- Solid State Control Circuitry
- 125% Modulation Capability
- Central Control Panel

The Model AM-10KD is a completely self-contained 10,000 Watt AM transmitter. It is FCC Type Accepted for service in the 535 to 1605 kHz broadcast band.

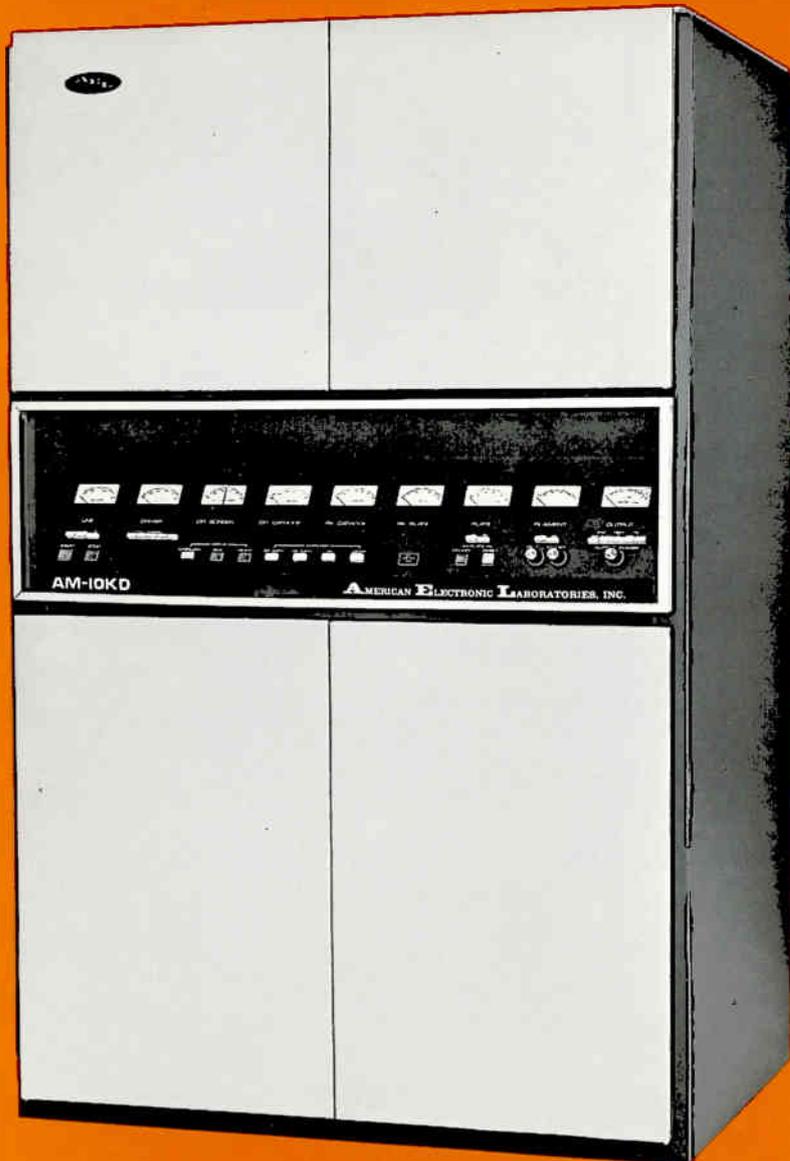
This transmitter was designed for the professional AM broadcaster and features all solid state control circuits, excellent audio fidelity, and semi-automatic start-up features.

FIDELITY

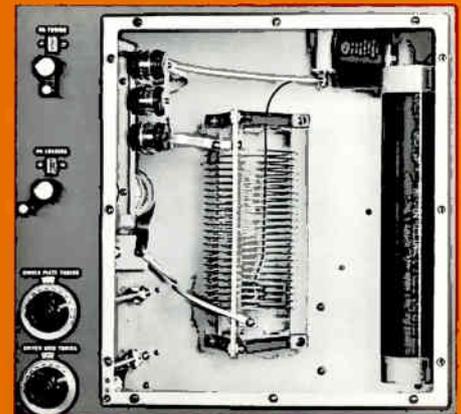
The low level audio section of the AM-10KD is completely solid state. The program input line drives a dual 100 Watt solid state preamplifier whose output provides grid drive to a pair of low distortion 4CX3000A class AB-1 modulators. Negative feedback is used around the complete audio section to reduce distortion and assure high fidelity performance. The overall performance of this transmitter that is of particular interest to the broadcast engineer includes:

- Frequency Response 50 — 7500 Hz (± 1.5 dB)
- Low Distortion 1.5% (typical)
- Low Noise -55 dB (unweighted)

Model AM-10KD Broadcast Transmitter



RF OUTPUT CIRCUITRY (Front View)



RF choke and plate tank coil. Notice the convenient PA and driver tuning controls.



EASY MAINTENANCE

The transmitter is housed in a single self-contained modern cabinet including the AEL Center Line Control Panel concept. This places all metering, control, and indicator functions at the normal reading level position for easy operation while making tuning or operation adjustments.

The meter panel is front-end hinged for easy access to all control and logic circuits.

All High Power circuits and components are located in the rear of the cabinets.

The entire chassis maintains a positive cabinet air pressure which prevents intrusion of dust and dirt; this feature significantly increases the life of the high-voltage components and reduces the need for maintenance.

TUBES

The RF output stage uses two (2) high gain, high reliability 4CX3000A Tetrodes; the RF driver stage utilizes a single 8121 high performance Tetrode which operates at one half of maximum output capabilities; the modulator stage uses two (2) 4CX3000A's operating class AB1.

There are only two-tube types (5 tubes total) in this 10,000 W transmitter.

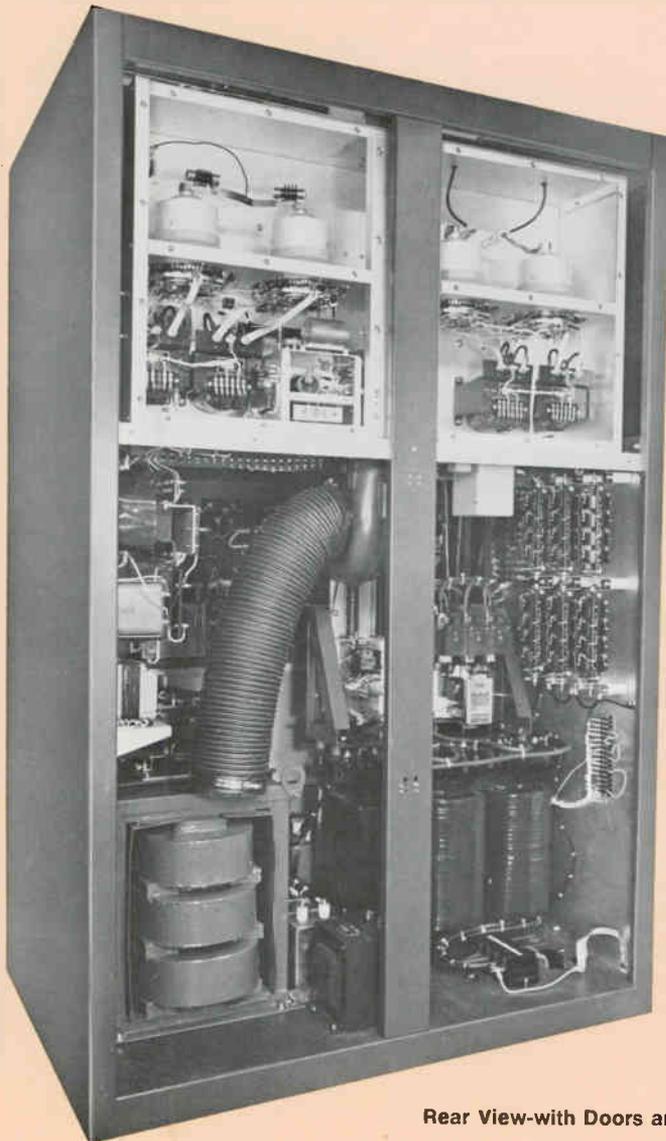
SEMI-AUTOMATIC OPERATION

This transmitter has several semi-automatic controls that are of interest to the broadcaster. These include automatic re-start, automatic re-cycle, and power cut-back; all control functions are accomplished by solid state logic circuits; each operates from a 24 Vdc regulated power supply. The interlock and sequence relays are also operated from this low voltage source for safety and convenience. Push button start/stop operation is used. Operating and fault status lights are placed in the center-mounted control panel.

AUTOMATIC RECYCLING—Overload Protection

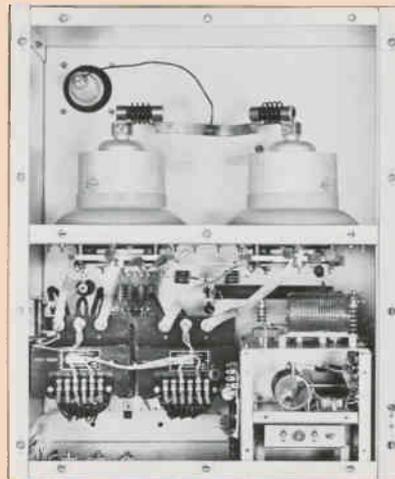
Any abnormal condition that might cause an overload condition in the Driver Tube, the Power Amplifier Tube, or the high voltage section of the amplifier immediately initiates a 1 second shut down. The plate voltage is removed automatically from these tubes to protect them from permanent damage. It is automatically returned after this one second interval; after three consecutive shut downs the plate voltage can be restored only by a manual re-set.

(Continued on page 12)



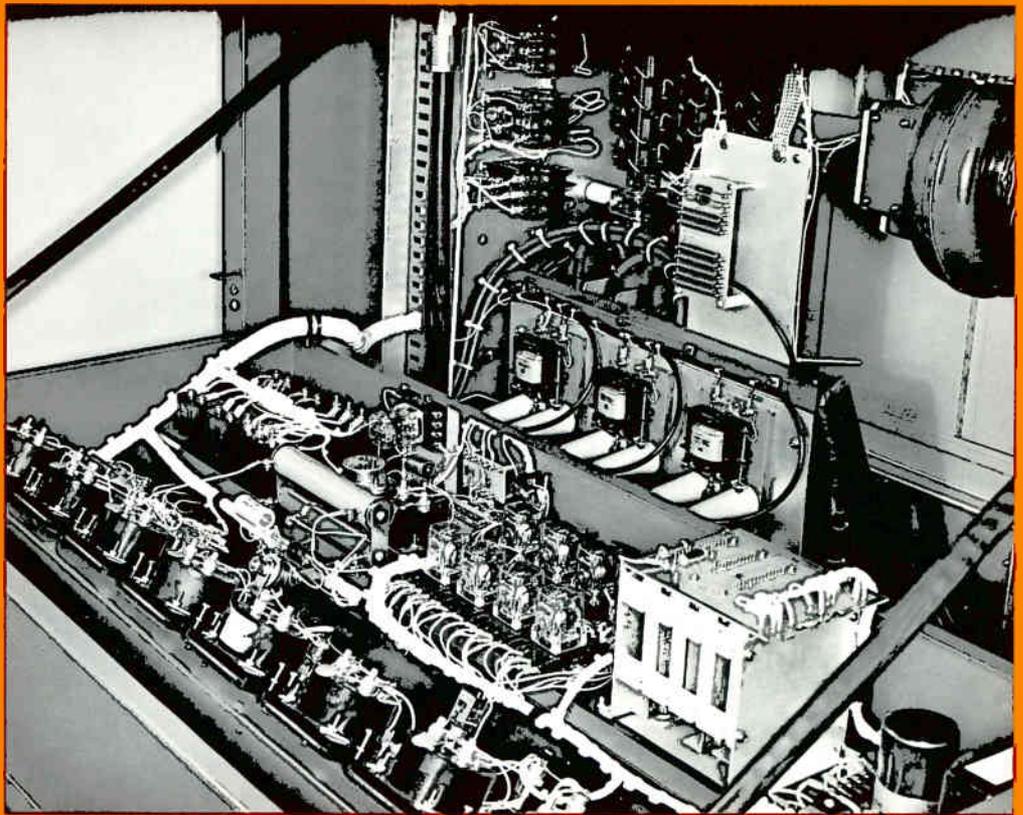
Rear View-with Doors and Air Filters removed.

**RF OUTPUT CIRCUITRY
(Rear View)**



At the top of this RF section is the RF power amplifier and below is the solid state exciter.

10,000W



AEL Design Meter Panel Hinged For Quick Access

Model AM-10KD Broadcast Transmitter

AUTO RESTART—Power Interrupt

If the primary power to the transmitter is interrupted for less than 5 seconds the transmitter automatically shuts down; this protects sensitive tubes and circuits. It is automatically returned to full power immediately upon return of primary power. As long as the interrupt is less than 5 seconds this sequence will continue indefinitely. If primary power to the transmitter is interrupted for more than 5 seconds the transmitter is automatically shut down. When full power is restored, a 3 minute restart cycle is automatically instituted after which normal operation of the transmitter resumes. This 3 minute delay is required to protect the sensitive high power tubes.

SELF CHECK CIRCUITS

In order to assist the broadcast engineer in routine maintenance procedures, an overload Status Board is incorporated in this transmitter. This provides a visual indication whenever one of the following circuits become overloaded:

- High Voltage Supply
- Final Amplifier Driver
- Modulator
- Low Voltage Supply

REMOTE CONTROL

Terminals for connecting remote control and remote metering functions are built into the transmitter, permitting interface with any conventional remote control system.

POWER CUT-BACK

A single button control with automatic built-in sequencing controls the cut-back from 10,000 Watts to 5,000 or 1,000 Watts.

MECHANICAL/ENVIRONMENTAL

SIZE: 77-1/4"H x 48"W x 36"D (overall)
77-1/4"H x 48"W x 33"D (trim and doors removed)

WEIGHT: 2360 lbs. (approx.)

FLOOR LOADING: 215 lbs./sq. ft. (approx.)

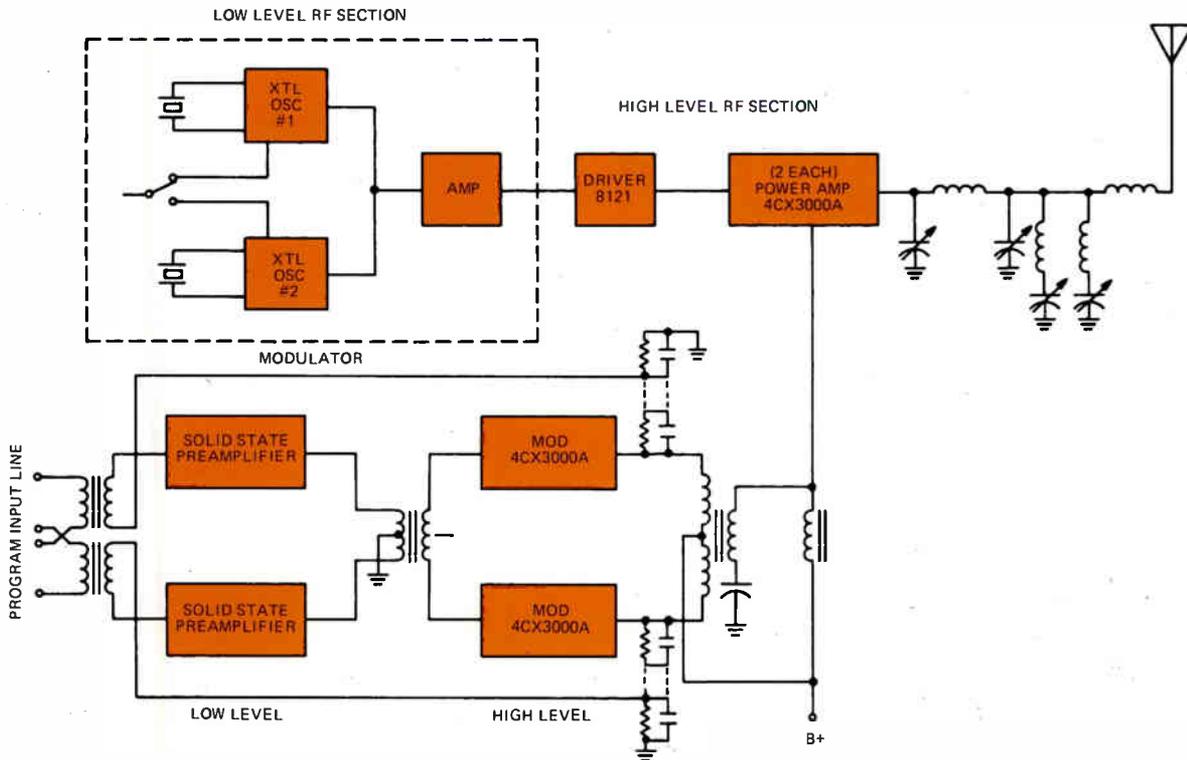
CABINET STYLE: Enclosed single steel cabinet; access through front doors and quickly removable panels, swing-down centrally located meter and control panel, rear doors.

OPERATING AMBIENT TEMPERATURE RANGE:
20°F to 113°F.

STORAGE TEMPERATURE RANGE:
—20°F to 120°F.

PROTECTIVE FUNCTIONS

Extra circuit protection is provided by both multiple circuit breakers and fuses. All access doors and hatches are provided with interlocks for protection of personnel. A high voltage shorting stick is provided with each transmitter.



Simplified Block Diagram AEL AM-10KD Transmitter

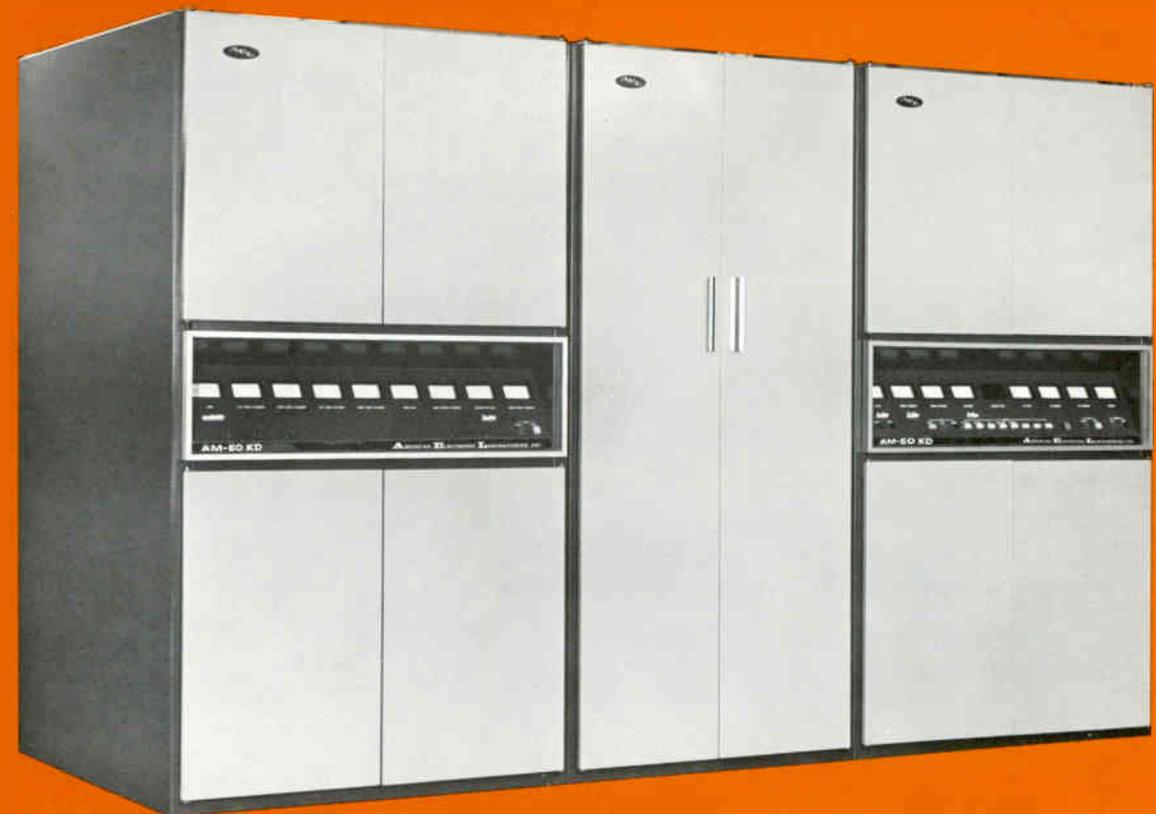
SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

Frequency Range:	535 to 1605 kHz.
Frequency Stability:	± 5 Hz.
Audio Frequency Input Impedance:	150/600 ohms balanced.
Audio Frequency Input Level:	+ 10 dBm ± 2 dB for 100% modulation.
Audio Frequency Response:	± 1 dB 50 Hz to 8 kHz.
Audio Frequency Distortion:	Less than 2.5% 50 Hz to 8 kHz at 95% modulation.
Noise Unweighted	(referenced 100% modulation at 400 Hz): -55 dB.
Power Output Capability:	11.5 kW.
Modulation:	High level plate modulation.
Type of Emission:	A3
Output Impedance:	50 ohms unbalanced standard; other impedances available on special order.
Carrier Shift	(100% modulation): Less than 3%.
Monitor Output:	5-10 V RMS into 50/75 ohms.
Line Voltage:	208 to 240 Vac 60 Hz, 3 phase, 4 wire (others available on special order).
Power Consumption:	0% modulation — 10 kW. 30% modulation — 22 kW. 100% modulation — 31 kW.
Power Factor:	90%
Voltage Variation and Regulation:	± 5%.
Spurious RF Emission	(2nd harmonic & higher): - 80 dB.

Prices and specifications subject to change without notice

50,000W



Model AM-50KD Broadcast Transmitter

FEATURES

- Excellent Fidelity
- Easy Maintenance
- Semi-Automatic Operation
- High Level Modulation
- Solid State Control Circuitry
- 125% Modulation Capability
- Central Control Panels

The Model AM-50KD is a high level modulated 50,000 Watt AM transmitter. It is FCC Type Accepted for service in the 535 to 1605 kHz broadcast band.



Easy Access Drop-Down Meter and Control Panel

This transmitter was designed for the professional AM broadcaster and features all solid state control circuits, excellent audio fidelity, and semi-automatic start-up features.

FIDELITY

The low level audio section of the AM-50KD is completely solid state. The program input line drives a dual 100 Watt solid state preamplifier whose output provides grid drive to a pair of low distortion 4CX15000A class AB-1 modulators. Negative feedback is used around the complete audio section to reduce distortion and assure high fidelity performance. The overall performance of this transmitter that is of particular interest to the audio engineer includes:

- Frequency Response 50 — 7500 Hz (± 2 dB)
- Low Distortion 1.5% (typical)
- Low Noise -55 dB (unweighted)

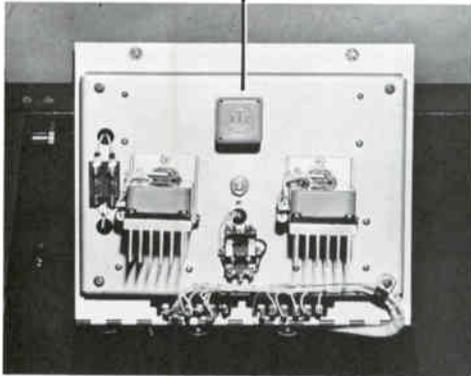
EASY MAINTENANCE

This air cooled transmitter is housed in a three section modern cabinet with a separate Power Vault and includes the AEL Center Line Control Panel concept. This places all metering, control, and indicator functions at the normal reading level position for easy operation while making tuning or operation adjustments.

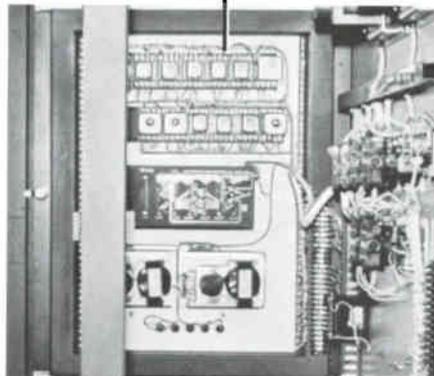
The meter panels are front-end hinged for easy access to all control and logic circuits.

All High Power circuits and components are located in the rear of the cabinets.

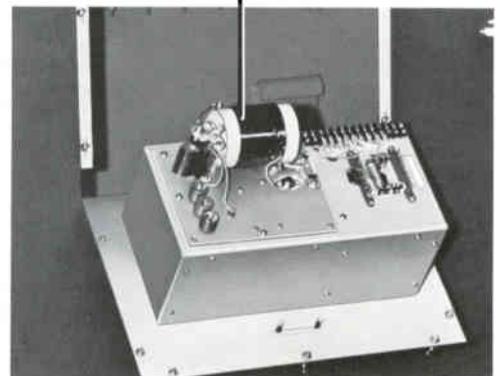
All necessary chassis sections maintain a positive cabinet air pressure which prevents intrusion of dust and dirt; this feature significantly increases the life of the high-voltage components and reduces the need for maintenance.



Solid State Audio Amplifier



Solid State Control Circuitry



Exciter

TUBES

The RF output stage uses one (1) high gain, high reliability 4CX35000C Tetrode; the RF driver stage utilizes a single 4-400A high performance Tetrode which operates at one half of maximum output capabilities; the modulator stage uses two (2) 4CX15000A's operating class AB1.

SEMI-AUTOMATIC OPERATION

This transmitter has several semi-automatic controls that are of interest to the broadcaster. These include automatic re-start, automatic re-cycle, and power cut-back features; all are accomplished by solid state logic circuits. All operate from 24 Vdc regulated power supplies. The interlock and sequence relays are also operated from this low voltage source for safety and convenience. Push button start/stop operation is used. Operating and fault status lights are placed in the center-mounted control panels. Solid state VSWR protection is a standard feature.

AUTOMATIC RECYCLING—Overload Protection

Any abnormal condition that might cause an overload condition in the Driver Tube, the Power Amplifier Tube, or the high voltage section of the amplifier immediately initiates a 1 second shut down. The plate voltage is removed automatically from these tubes to protect them from permanent damage. It is automatically returned after this one second interval; after three consecutive shut downs the plate voltage can be restored only by a manual re-set.

AUTO RESTART—Power Interrupt

If the primary power to the transmitter is interrupted for less than 5 seconds the transmitter automatically shuts down; this protects sensitive tubes and circuits. It is automatically returned to full power immediately upon return of primary power. As long as the interrupt is less than 5 seconds this sequence will continue indefinitely. If primary power to the transmitter is interrupted for more than 5 seconds the transmitter is automatically shut down. When full power is restored, a 3 minute restart cycle is automatically instituted after which normal operation of the transmitter resumes. This 3 minute delay is required to protect the sensitive high power tubes.

SELF-CHECK CIRCUITS

In order to assist the broadcast engineer in routine maintenance procedures, we have incorporated an overload Status Board in this transmitter. This provides a visual indication whenever one of the following circuits become overloaded:

- High Voltage Supply
- Final Amplifier Driver
- Modulator
- Low Voltage Supply

REMOTE CONTROL

Terminals for connecting remote control and remote metering functions are built into the transmitter, permitting interface with any conventional remote control system.

POWER CUT-BACK

A single button control with automatic built-in sequencing controls the cut-back from 50,000 Watts to 25,000 or 10,000 Watts.

(Continued on page 16)

AEL AM-50KD
Rear View — Driver and PA Cabinet
(Doors Removed)

View With Interlocked
Hatch Cover Removed

Heavy Duty Plate
Tank Coil

Oil-Filled
Modulation
Reactor

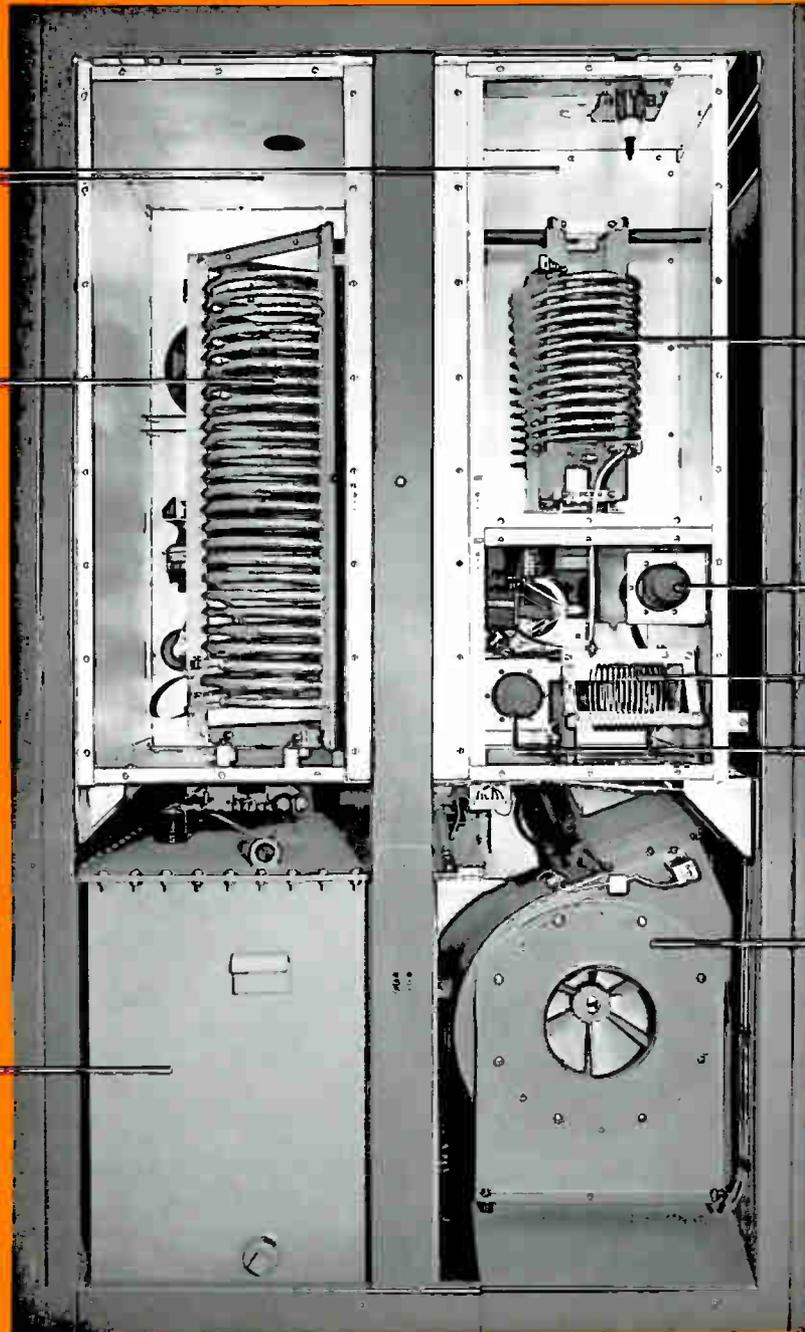
Second Harmonic Trap

Tuning Control

Third Harmonic Trap

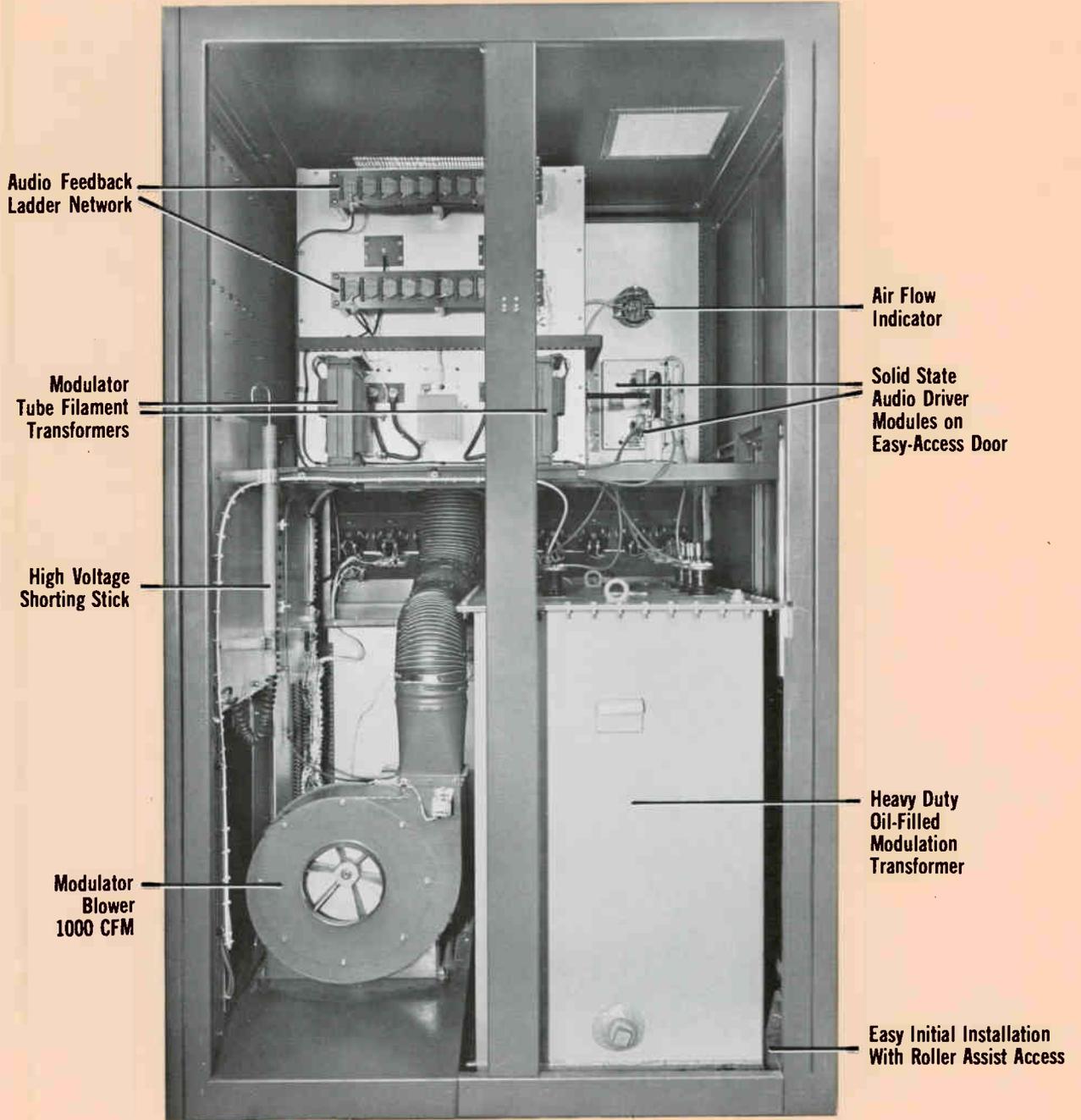
Tuning Control

High Efficiency
PA Compartment
Blower 1500 CFM





AEL AM-50KD
Rear View — Modulator Cabinet
(Doors Removed)

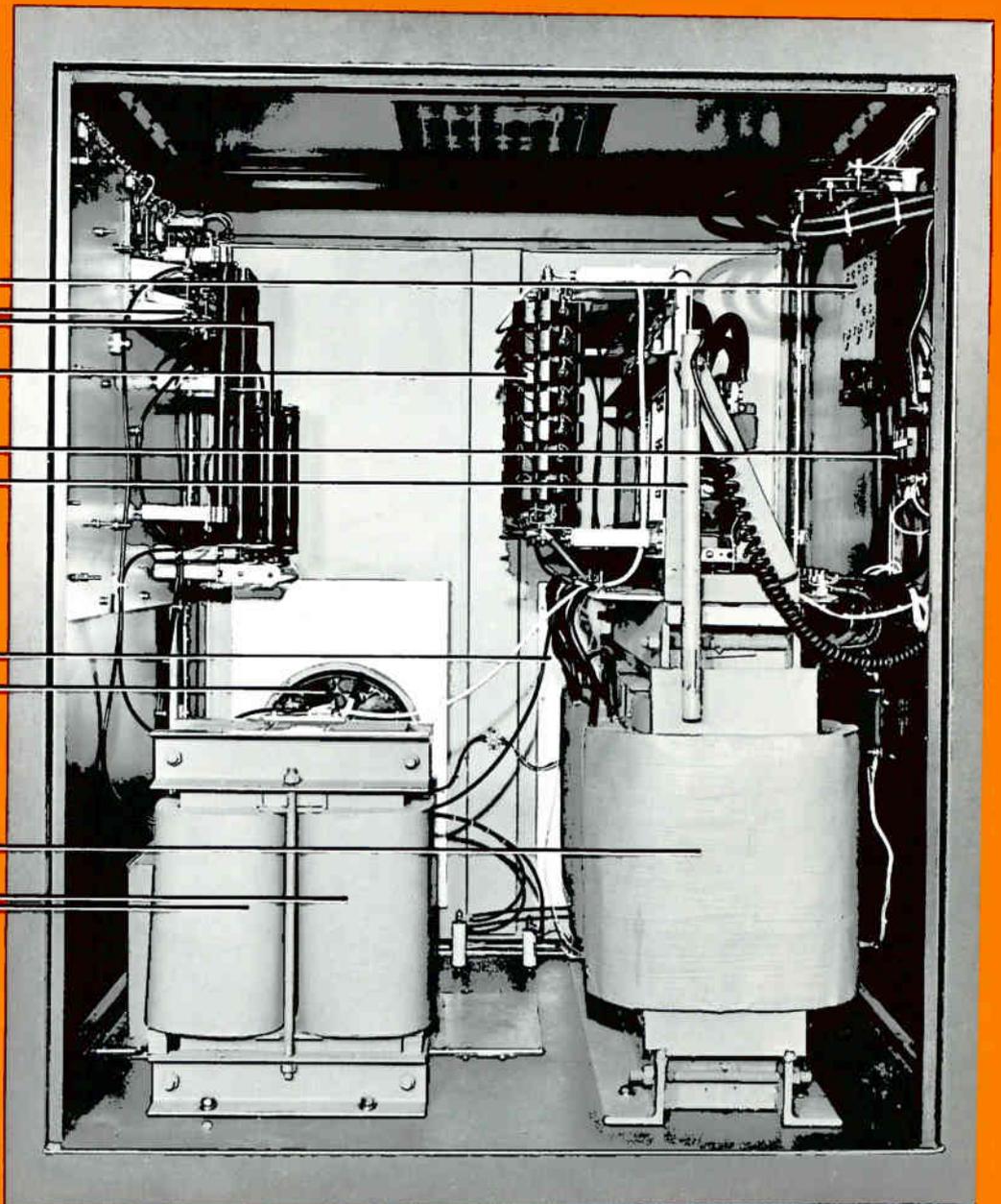


AEL AM-50KD
Front View — High Voltage Power Vault
(Door Removed)

Main Circuit Breaker
High Voltage Step-Start Control
High Voltage Three-Phase
Bridge Rectifier Stacks
Low Voltage Circuit Breaker
High Voltage Shorting Stick

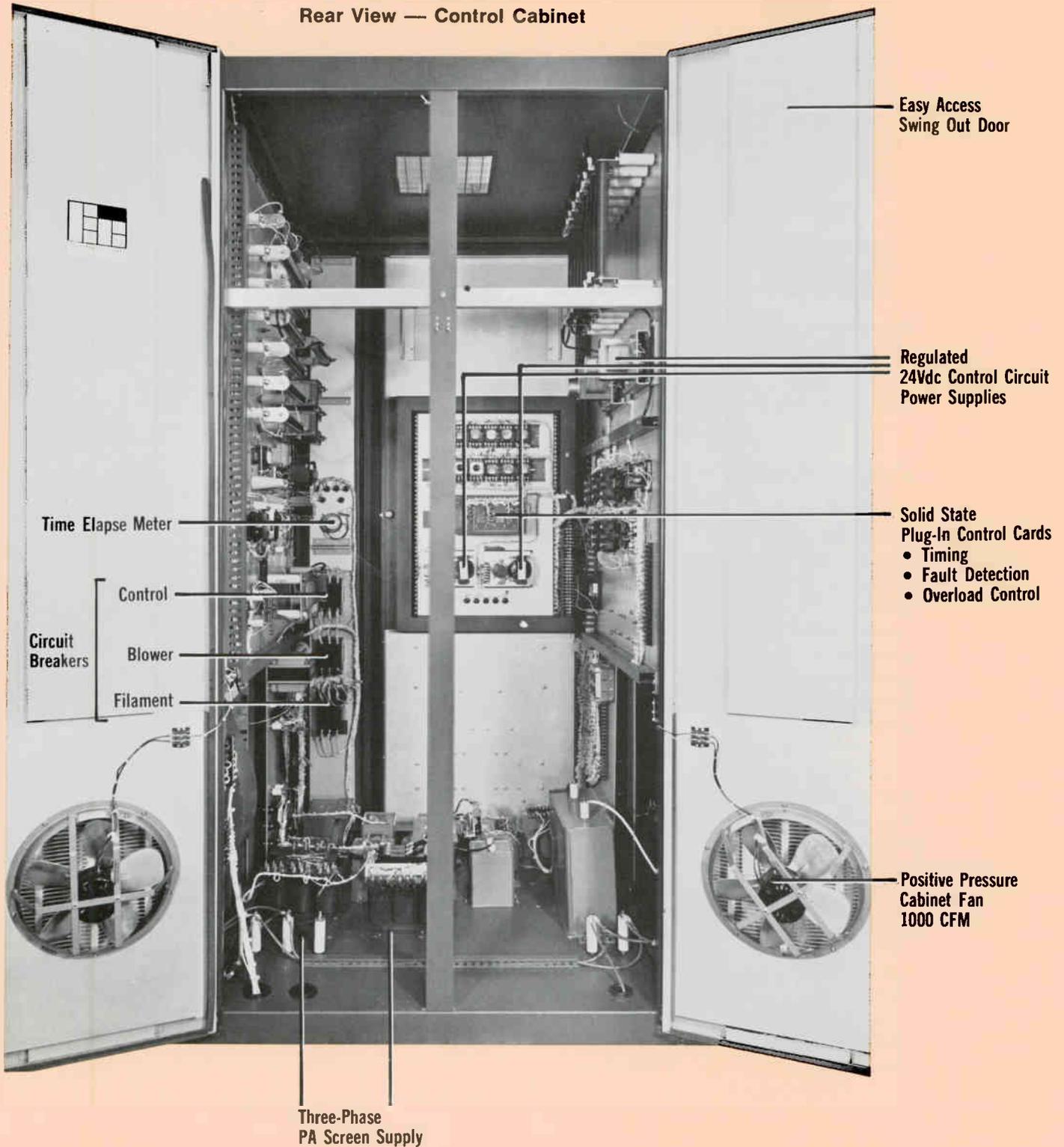
Positive Pressure
Cabinet Fans
1000 CFM Each

High Voltage
Plate Transformer
High Voltage
Power Supply
Filter Choke





AEL AM-50KD
Rear View — Control Cabinet



Easy Access
Swing Out Door

Regulated
24Vdc Control Circuit
Power Supplies

Solid State
Plug-In Control Cards
• Timing
• Fault Detection
• Overload Control

Time Elapse Meter

Circuit
Breakers

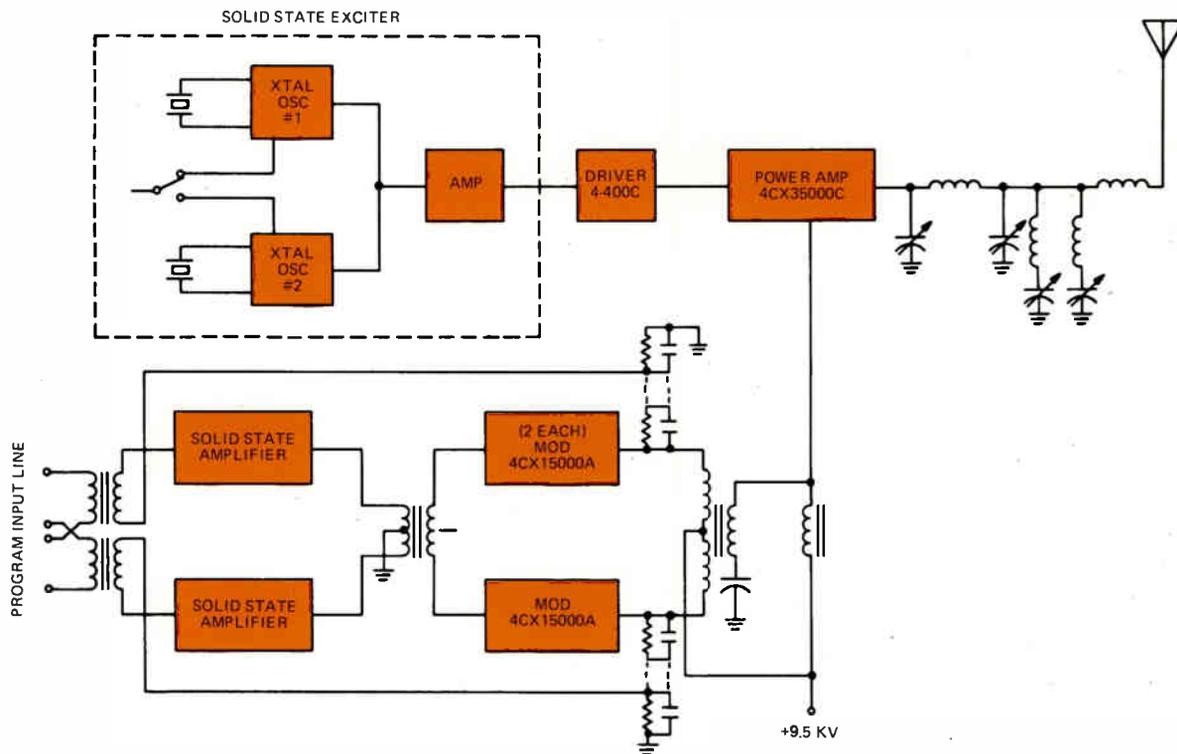
Control

Blower

Filament

Positive Pressure
Cabinet Fan
1000 CFM

Three-Phase
PA Screen Supply



Simplified Block Diagram, AEL AM-50KD Transmitter

SPECIFICATIONS

ELECTRICAL

Power Output	55 kW max
Frequency Range	530-1640 kHz
Emission	A3
Modulation	High level Class AB ₁
Frequency Stability	±5 Hz
Carrier Shift at 100% Mod	3% max
Output Impedance	50-230 ohms
Audio Response	50-10,000 Hz; ±2dB
Audio Distortion	50-7500 Hz, 3% max
Noise (ref 100% mod)	-55 dB max
Spurious Outputs	-80 dB max
Power Line Requirement	380/460 Vac, 3 phase, 60 Hz
Power Consumption (approx)	
0% Modulation	99 kW
30% Modulation	112 kW
100% Modulation	150 kW
Power Factor	0.9

MECHANICAL

Main Cabinet Size	84" H x 136" W x 48" D
Transformer Vault	48" H x 48" W x 48" D
Weight (approx)	13,000 lbs
Operating Temperature	0 to 45°C
Operating Altitude	6,000 ft. max

TUBE COMPLEMENT

- 1 ea 8121
- 1 ea 4-400C
- 1 ea 4CX35000C
- 2 ea 4CX15000A

Prices and specifications subject to change without notice.

A black and white photograph of Edwin Howard Armstrong. He is standing outdoors, wearing a dark suit, a white shirt, a dark tie, and a dark hat. He is holding a large, dark, circular object, possibly a speaker or a component of a radio, in front of him. To his right is a large, dark, rectangular object, likely a radio receiver, which has several circular dials or knobs on its front panel. The background is a light-colored, textured surface, possibly a wall or a large piece of paper.

Edwin Howard Armstrong (1890-1954)
an electrical engineer who made
important contributions to radio
communication. The invention for which
he is most widely known, frequency
modulation, was made in 1933. This is
a system of broadcast without
static. Armstrong developed the
superheterodyne circuit which became
widely used in radio receivers. He
invented superregeneration in 1920,
used then by police forces and in
military radio.

2,500W



The FM-2.5KE is a completely self-contained 2500W FM Broadcast Transmitter. It operates at any fixed frequency between 88 and 108 MHz in monaural or stereo, and SCA mode.

It is supplied with a complete set of operating tubes and harmonic filter and is factory pre-tuned and tested to the individual customer's frequency.

SUPERIOR PERFORMANCE

The overall frequency stability of the FM-2.5KE is typically maximum ± 300 Hz (See Exciter, page 38). Excellent linearity, 0.5% total harmonic distortion (THD), and ± 1.0 dB frequency response result in the faithful reproduction of all natural sound.

This outstanding performance is obtained principally by four factors:

- 0.35% IM distortion
- FM noise of -70 dB
- Bandwidth of 250 kHz
- Less than 4° phase shift

RELIABILITY

AEL is a major supplier of militarized RF systems. The same technology and reliability used in these sophisticated systems is designed into our commercial transmitters.

All critical components are operated at 50% below their manufacturer's suggested ratings. The grounded grid final amplifier stage eliminates the need for the usual screen voltage supply, the bias voltage supply, and all tuned input circuits. The conservatively rated IPA uses a 4X150A tube input which operates at only half of the rated power of 250 watts.

The pressurized cabinet reduces dirt and dust intrusion. This significantly increases the operating life of all major high voltage components.

All transmitters are operated at Station TPO and frequencies for a minimum of 100 hours at AEL before shipment to the customer.

EASE OF MAINTENANCE

The estimated mean-time-to repair of the FM-2.5KE is less than 30 minutes.

All doors and panels are easily removed to give immediate access to all major sub-assemblies. Standard components are used wherever possible and most are mounted in easily reached plug-in modules.

Twenty-four hour parts and technical assistance is available from AEL.



Model FM-2.5KE Broadcast Transmitter

FEATURES

- Superior Performance
- Reliability
- Ease of Maintenance
- Automatic Re-Cycling
 - Overload Protection
 - Power Interrupt
 - Auto Restart (Option)
- Mid-Panel Metering
- Remote Control Interface
- VSWR Protection (Option)
- Elapsed Time Indicator (Option)
- Remote Control Power Adjust (Option)

AUTOMATIC RE-CYCLING—Overload Protection

Any abnormal condition that might cause an overload condition in the Driver Tube, the Power Amplifier Tube, or the high voltage section of the amplifier immediately initiates a 1 second shut down. The plate voltage is removed automatically from these tubes to protect them from permanent damage. It is automatically returned after this one second interval; after three consecutive shut downs the plate voltage can be restored only by a manual re-set.

AUTO RESTART—Power Interrupt

If the primary power to the transmitter is interrupted for less than 5 seconds the transmitter automatically shuts down; this protects sensitive tubes and circuits. It is automatically returned to full power immediately upon return of primary power. As long as the interrupt is less than 5 seconds this sequence will continue indefinitely. If primary power to the transmitter is interrupted for more than 5 seconds the transmitter is automatically shut down. When full power is restored, a 3 minute restart cycle is automatically instituted after which normal operation of the transmitter resumes. This 3 minute delay is required to protect the sensitive high power tubes.

MISCELLANEOUS

The Model FM-2.5KE contains many other features of interest to the professional broadcast engineer and technicians. These include a mid-panel metering system for easy viewing. Remote control interface connections are standard. Optional features include VSWR protection, an elapsed time indicator, Automatic level controls, and a remote control power adjust system.



FM-15QE Exciter



SPECIFICATIONS Model FM-2.5KE

GENERAL

Frequency Range 88 to 108 MHz
 Rated Power Output 500 to 2500 watts
 Type of Emission F3, F9
 RF Load Impedance 50 ohms
 Output Termination 1 5/8" EIA flange
 Frequency Stability ±300 Hz
 Modulation Capability ±100 kHz
 Temperature Range -10 to 55°C
 Altitude Above Sea Level 10,000 ft. max.
Power Line Requirements
 Voltage 200/240 Vac
 Frequency 60 Hz
 Phase single
 Consumption at 2500W 6 kW
 Power Factor (Max) 0.9
 Overall Dimensions 76" H x 28" W x 26" D
 Net Weight 800 lbs. (approx.)

MONAURAL

Audio Input Impedance 600 ohms balanced
 Audio Input Level
 400 Hz at 100% Modulation +10 ±2 dBm
 Audio Harmonic Distortion
 50 to 15,000 Hz 0.5% maximum
 Audio Frequency Response ±1 dB
 Standard 75 microsecond pre-emphasis
 50 to 15,000 Hz
 FM Noise (Ref 400 Hz at 100% Mod) -70 dB
 AM Noise (Reference Carrier AM
 Modulation 100%) -55 dB

STEREO

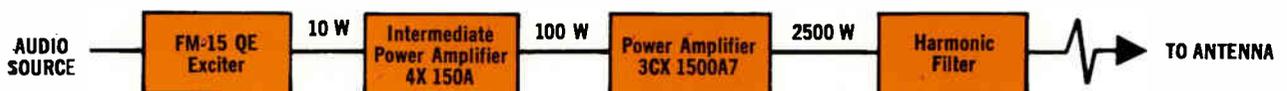
Audio Input Impedance 600 ohms balanced
 (right and left)
 Audio Input Level (right and left)
 400 Hz at 100% Modulation +10 ±2 dBm
 Audio Frequency Response ±1 dB
 (right and left)
 Standard 75 Microsecond
 Pre-Emphasis, 50 to 15,000 Hz
 FM Noise -63 dB
 (Reference 400 Hz at 100% Mod)
 AM Noise -55 dB
 (Reference Carrier AM Mod. 100%)
 Stereo Separation
 50 to 15,000 Hz 40 dB min.
 Stereo Pilot Stability 19 kHz ±1 Hz
 Cross-talk
 (L + R to L-R, L-R to L + R) -46 dB max.

SCA

Frequency Range 30 to 75 kHz
 Frequency Stability ±400 Hz
 Audio Input Impedance 600 ohms
 Audio Input Level -15 dBm to 10 dBm
 adjustable
 Muting Delay 0.5 to 5 second adjustable
 FM Noise -63 dB
 AM Noise -55 dB
 Pre-Emphasis 75 microsecond*

*Standard; otherwise specify

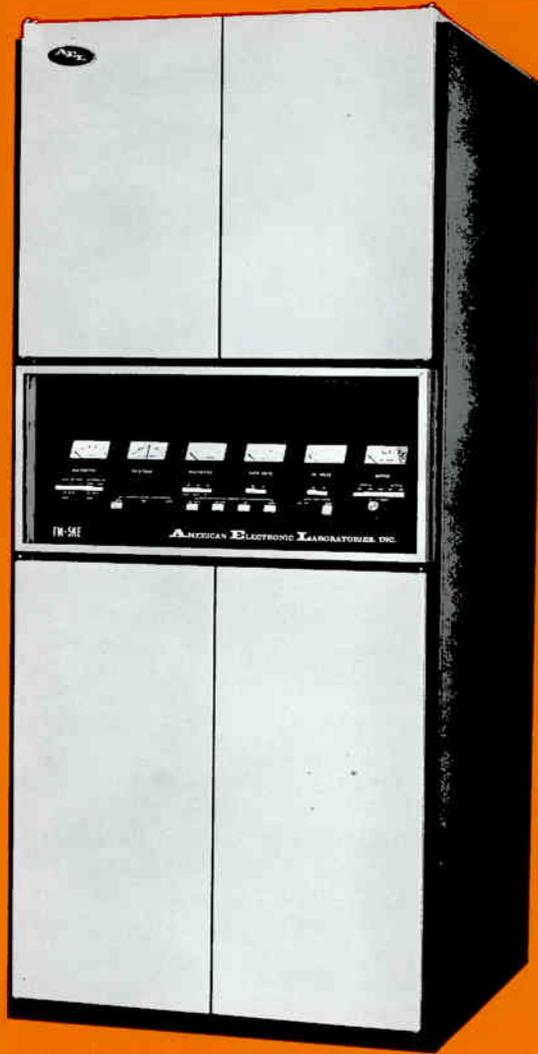
Prices and specifications subject to change without notice.



Simplified Block Diagram AEL FM-2.5KE Transmitter

10,000W

5,000W



The FM-5KE and FM-10KE are completely self-contained Broadcast Transmitters that operate at 5000W and 10000W respectively. They operate at any fixed frequency between 88 and 108 MHz in monaural or stereo, and SCA mode.

They are supplied with an AEL FM-15QE Exciter, a complete set of operating tubes and harmonic filter and are factory pretuned and tested to the individual customer's frequency.

SUPERIOR PERFORMANCE

The overall frequency stability of these transmitters are typically ± 300 Hz (See Exciter page 38). Excellent linearity, maximum 0.5% total harmonic distortion (THD), and ± 1.0 dB frequency response result in the faithful reproduction of all natural sound.

This outstanding performance is obtained principally by four factors:

- 0.35% IM distortion
- FM noise of -70 dB
- Bandwidth of 250 kHz
- Less than 4° phase shift

RELIABILITY

AEL is a major supplier of militarized RF systems. The same technology and reliability used in these sophisticated systems is designed into our commercial transmitters.

All critical components are operated at 50% below their manufacturer's suggested ratings. The grounded grid final amplifier stage eliminates the need for the usual screen voltage supply, the bias voltage supply and all tuned input circuits.

The pressurized cabinet reduces dirt and dust intrusion. This significantly increases the operating life of all major high voltage components.

All transmitters are operated at Station TPO and frequencies for a minimum of 100 hours at AEL before shipment to the customer.

Model FM-5KE & FM-10KE Broadcast Transmitters

FEATURES

- Superior Performance
- Reliability
- Ease of Maintenance
- Automatic Re-Cycling
 - Overload Protection
 - Power Interrupt
 - Auto Restart
- Mid-Panel Metering
- Remote Control Interface
- VSWR Protection (Option)
- Elapsed Time Indicator
- Remote Control Power Adjust

EASE OF MAINTENANCE

The estimated mean-time-to-repair of these transmitters is less than one hour.

All doors and panels are easily removed to give immediate access to all major sub-assemblies. Standard components are used wherever possible and most are mounted in easily reached plug-in modules.

Twenty-four hour parts and technical assistance is available from AEL.



Simplified Block Diagram AEL FM-5KE Transmitter



SPECIFICATIONS

FM-5KE and FM-10KE with FM-15QE Exciter

GENERAL

Frequency Range	88 to 108 MHz
Rated power output	FM-5 3000 to 6000 watts FM-10 6000 to 11,000 watts
Type of emission	F3, F9
RF load impedance	50 ohms
Output termination	FM-5 1 5/8" FM-10 3 1/8"
Temperature range	-10 to 55°C
Altitude above sea level	10,000 ft max
Power line requirements:	
Voltage	180/260 Vac
Frequency	50-60 Hz
Phase	3
Power connection	4-wire. Star with grounded neutral
Power consumption	FM-5 9kW FM-10 18kW
Power factor	0.9
Overall dimensions	76" H x 34" W x 35" D
Net weight	FM-5 Approx. 1100 Lbs. FM-10 Approx. 1500 Lbs.

AUTOMATIC RE-CYCLING—Overload Protection

Any abnormal condition that might cause an overload condition in the Driver Tube, the Power Amplifier Tube, or the high voltage section of the amplifier immediately initiates a 1 second shut down. The plate voltage is removed automatically from these tubes to protect them from permanent damage. It is automatically returned after this one second interval; after three consecutive shut downs the plate voltage can be restored only by a manual re-set.

AUTO RESTART—Power Interrupt

If the primary power to the transmitter is interrupted for less than 5 seconds the transmitter automatically shuts down; this protects sensitive tubes and circuits. It is automatically returned to full power immediately upon return of primary power. As long as the interrupt is less than 5 seconds this sequence will continue indefinitely. If primary power to the transmitter is interrupted for more than 5 seconds the transmitter is automatically shut down. When full power is restored a 3-minute restart cycle is automatically instituted after which normal operation of the transmitter resumes. This three-minute delay is required to protect the sensitive high power tubes.

MISCELLANEOUS

These transmitters contain many other features of interest to the professional broadcast engineer and technicians. These include a mid-panel metering system for easy viewing. Remote control interface connections are standard. Optional features include VSWR protection.

MONAURAL

Audio input impedance	600 ohms balanced
Audio input level (400 Hz @ 100% modulation)	+10 ±2 dBm
Audio harmonic distortion (50-15,000 Hz)	0.5% max.
Audio frequency response (75 microsecond pre-emphasis, 50-15,000 Hz)	±1 dB
FM Noise (Ref. 400 Hz @ 100% modulation)	-70 dB
AM Noise (Ref. carrier AM modulation 100%)	-55 dB
Frequency stability	±500 Hz
Intermodulation distortion (S.M.P.T.E.)	Typical 0.25%

STEREOPHONIC

Audio input impedance (Right and left channels identical)	600 ohms balanced
Audio input level (Right and left channels identical)— 400 Hz @ 100% modulation)	+10 ±2 dBm
Audio frequency response (Right and left channels identical— 75 microsecond pre-emphasis, 50-15,000 Hz)	±0.5 dB
FM noise (Ref. 400 Hz @ 100% modulation)	-63 dB
Stereo separation 50-15,000 Hz	-40 dB
Stereo pilot stability	19 kHz ±1 Hz
Cross talk (L+R) into (L-R)	-46 dB
(L-R) into (L+R)	-46 dB
Composite input level for 100% modulation	4 Vpp

SCA

Sub-carrier frequency range	30 - 75 kHz
Sub-carrier frequency stability	±400 Hz
Audio input impedance	600 ohms balanced
Audio input level	-15 dBm to -10 dBm (adjustable)
Muting delay	0.5 to 5 seconds (adjustable)
S/N ratio	-63 dB
Pre-emphasis	75 microsecond standard (otherwise specify)

Prices and specifications subject to change without notice



Simplified Block Diagram AEL FM-10KE Transmitter

15,000W



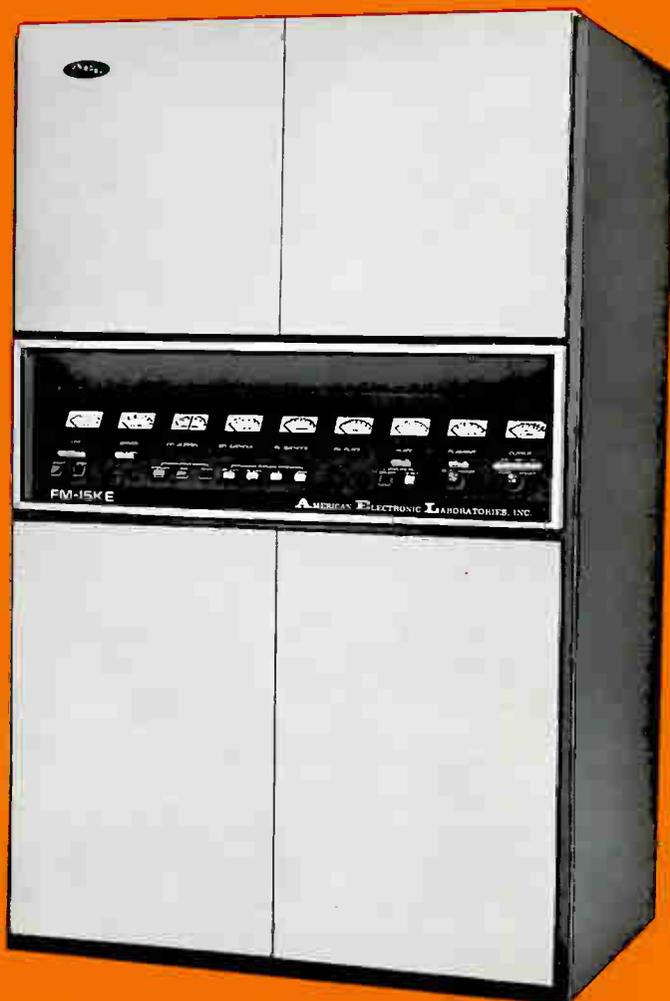
FEATURES

- Superior Performance
- Reliability
- Ease of Maintenance
- Automatic Re-Cycling
 - Overload Protection
 - Power Interrupt
 - Auto Restart
- Mid-Panel Metering
- Remote Control Interface
- VSWR Protection (Option)
- Elapsed Time Indicator
- Remote Control Power Adjust

The FM-15KE is a completely self-contained 15,000W FM Broadcast Transmitter. It operates at any fixed frequency between 88 and 108 MHz in monaural or stereo, and SCA mode.

It is supplied with an AEL FM-15QE Exciter, a complete set of operating tubes and harmonic filter and is factory pre-tuned and tested to the individual customer's frequency.

Model FM-15KE Broadcast Transmitter



SUPERIOR PERFORMANCE

The overall frequency stability of the FM-15KE is typically ± 300 Hz (See Exciter, page 38). Excellent linearity, 0.5% total harmonic distortion (THD), and ± 1.0 dB frequency response result in the faithful reproduction of all natural sound.

This outstanding performance is obtained principally by four factors:

- 0.35% IM distortion
- FM noise of -70 dB
- Bandwidth of 250 kHz
- Less than 4° phase shift

RELIABILITY

AEL is a major supplier of militarized RF systems. The same technology and reliability used in these sophisticated systems is designed into our commercial transmitters.

All critical components are operated at 50% below their manufacturer's suggested ratings. The grounded grid final amplifier stage eliminates the need for the usual screen voltage supply, the bias voltage supply and all tuned input circuits. The conservatively rated IPA uses a 4CX1000A tube input which operates at only half of the rated power of 1600 watts.

The pressurized cabinet reduces dirt and dust intrusion. This significantly increases the operating life of all major high voltage components.

All transmitters are operated at Station TPO and frequencies for a minimum of 100 hours at AEL before shipment to the customer.

EASE OF MAINTENANCE

The estimated mean-time-to-repair of the FM-15KE is less than 1 hour.

All doors and panels are easily removed to give immediate access to all major sub-assemblies. Standard components are used wherever possible and most are mounted in easily reached plug-in modules.

Twenty-four hour parts and technical assistance is available from AEL.

AUTOMATIC RE-CYCLING— Overload Protection

Any abnormal condition that might cause an overload condition in the Driver Tube, the Power Amplifier Tube, or the high voltage section of the amplifier immediately initiates a 1 second shut down. The plate voltage is removed automatically from these tubes to protect them from permanent damage. It is automatically returned after this one second interval; after three consecutive shut downs the plate voltage can be restored only by a manual re-set.



FM-15QE Exciter

AUTO RESTART—Power Interrupt

If the primary power to the transmitter is interrupted for less than 5 seconds the transmitter automatically shuts down; this protects sensitive tubes and circuits. It is automatically returned to full power immediately upon return of primary power. As long as the interrupt is less than 5 seconds this sequence will continue indefinitely. If primary power to the transmitter is interrupted for more than 5 seconds the transmitter is automatically shut down. When full power is restored a 3-minute restart cycle is automatically instituted after which normal operation of the transmitter resumes. This 3-minute delay is required to protect the sensitive high power tubes.

MISCELLANEOUS

The Model FM-15KE contains many other features of interest to the professional broadcast engineer and technicians. These include a mid-panel metering system for easy viewing. Remote control interface connections are standard. Optional features include VSWR protection.

SPECIFICATIONS FM-15KE with FM-15QE Exciter

GENERAL

Frequency Range	88 to 108 MHz
Rated Power Output	5,000 to 15,000 watts
Type of Emission	F3, F9
RF Load Impedance	50 ohms
Output Termination	3 1/8" EIA flange
Frequency Stability	±300 Hz
Modulation Capability	±100 kHz
Temperature Range	-10 to 55°C
Altitude Above Sea Level	10,000 ft. max.
Power Line Requirements	
Voltage	208/240 Vac
Frequency	60 Hz
Phase	3
Consumption at 15 kW	25 kW
Power Factor	0.9
Overall Dimensions (less filter)	76"Hx48"Wx35"D*
Net Weight	1800 lbs. (approx.)

STEREO

Audio Input Impedance	600 ohms balanced (right and left)
Audio Input Level (right and left)	400 Hz at 100% Modulation +10 ±2 dBm
Audio Frequency Response	±1 dB (right and left)
	Standard 75 Microsecond Pre-Emphasis, 50 to 15,000 Hz
FM Noise	-63 dB (Reference 400 Hz at 100% Mod.)
AM Noise	-55 dB (Reference Carrier AM Mod. 100%)
Stereo Separation	50 to 15,000 Hz 40 dB min.
Stereo Pilot Stability	19 kHz ±1 Hz
Cross-talk (L + R to L-R, L-R to L + R)	-46 dB max.

MONAURAL

Audio Input Impedance	600 ohms balanced
Audio Input Level	400 Hz at 100% Modulation +10 ±2 dBm
Audio Harmonic Distortion	50 to 15,000 Hz 0.5% maximum
Audio Frequency Response	±1 dB (Standard 75 microsecond pre-emphasis 50 to 15,000 Hz)
FM Noise (Ref 400 Hz at 100% Mod)	-70 dB
AM Noise (Reference Carrier AM Modulation 100%)	-55 dB

SCA

Frequency Range	30 to 75 kHz
Frequency Stability	±400 Hz
Audio Input Impedance	600 ohms
Audio Input Level	-15 dBm to +10 dBm adjustable
Muting Delay	0.5 to 5 second adjustable
FM Noise	-63 dB
AM Noise	-55 dB
Pre-Emphasis	.75 microsecond**
	*33"D without trim **Standard; otherwise specify

Prices and specifications subject to change without notice.



Simplified Block Diagram AEL FM-15KE Transmitter

25,000W

FEATURES

- Superior Performance
- Reliability
- Ease of Maintenance
- Automatic Re-Cycling
 - Overload Protection
 - Power Interrupt
 - Auto Restart
- Mid-Panel Metering
- Remote Control Interface
- VSWR Protection
- Elapsed Time Indicator
- Remote Control Power Adjust

The FM-25KE is a completely self-contained 25,000W FM Broadcast Transmitter. It operates at any fixed frequency between 88 and 108 MHz in monaural or stereo, and SCA mode.

It is supplied with a complete set of operating tubes, FM-20E Exciter, and harmonic filter and is factory pre-tuned and tested to the individual customer's frequency.

SUPERIOR PERFORMANCE

The overall frequency stability of the FM-25KE is typically ± 200 Hz (See Exciter, page 36). Excellent linearity, 0.5% total harmonic distortion (THD), and ± 1.0 dB frequency response result in the faithful reproduction of all natural sound.

This outstanding performance is obtained principally by four factors:

- 0.35% IM distortion
- FM noise of -70 dB
- Bandwidth of 250 kHz
- Less than 1° phase shift

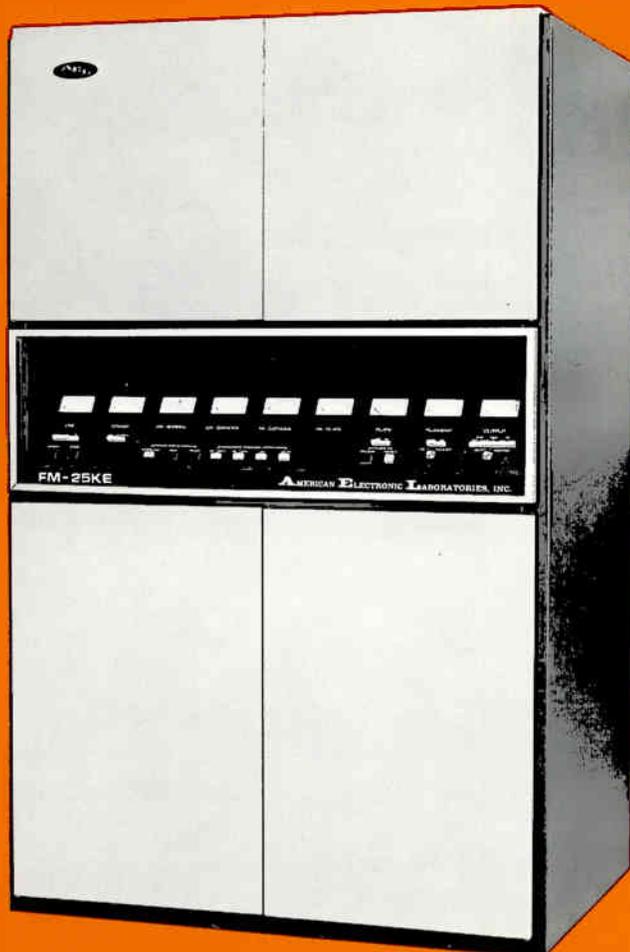
RELIABILITY

AEL is a major supplier of militarized RF systems. The same technology and reliability used in these sophisticated systems is designed into our commercial transmitters.

All critical components are operated at 50% below their manufacturer's suggested ratings. The grounded grid final amplifier stage eliminates the need for the usual screen voltage supply, the bias voltage supply and all tuned input circuits.



Model FM-25KE Broadcast Transmitter



The pressurized cabinet reduces dirt and dust intrusion. This significantly increases the operating life of all major high voltage components.

All transmitters are operated at Station TPO and frequencies for a minimum of 100 hours at AEL before shipment to the customer.

EASE OF MAINTENANCE

The estimated mean-time-to-repair of the FM-25KE is less than 1 hour.

All doors and panels are easily removed to give immediate access to all major sub-assemblies. Standard components are used wherever possible and most are mounted in easily reached plug-in modules.

Twenty-four hour parts and technical assistance is available from AEL.

AUTOMATIC RE-CYCLING— Overload Protection

Any abnormal condition that might cause an overload condition in the Driver Tube, the Power Amplifier Tube, or the high voltage section of the amplifier immediately initiates a 1 second shut down. The plate voltage is removed automatically from these tubes to protect them from permanent damage. It is automatically returned after this one second interval; after three consecutive shut downs the plate voltage can be restored only by a manual re-set.



FM-20E Exciter

AUTO RESTART—Power Interrupt

If the primary power to the transmitter is interrupted for *less* than 5 seconds the transmitter automatically shuts down; this protects sensitive tubes and circuits. It is automatically returned to full power immediately upon return of primary power. As long as the interrupt is less than 5 seconds this sequence will continue indefinitely. If primary power to the transmitter is interrupted for *more* than 5 seconds the transmitter is automatically shut down. When power is returned a 3 minute restart cycle is automatically instituted after which normal operation of the transmitter resumes. This delay is required to protect the sensitive high power tubes.

MISCELLANEOUS

The Model FM-25KE contains many other features of interest to the professional broadcast engineer and technicians. These include a mid-panel metering system for easy viewing. Remote control interface connections, VSWR protection, an elapsed time indicator, automatic level controls, and a remote control power adjust system are standard items.

SPECIFICATIONS FM-25KE with FM-20E Exciter

GENERAL

Frequency Range	88 to 108 MHz
Rated Power Output	3,000 to 25,000 watts
Type of Emission	F3, F9
RF Load Impedance	50 ohms
Output Termination	3/8" EIA flange
Frequency Stability	± 300 Hz
Modulation Capability	± 100 kHz
Temperature Range	-10 to 55°C
Altitude Above Sea Level	10,000 ft. max.
Power Line Requirements	
Voltage	208/240 Vac
Frequency	60 Hz
Phase	3
Consumption at 25 kW	39 kW
Power Factor	0.9
Overall Dimensions (less filter)	76"Hx48"Wx35"D*
Net Weight	2200 lbs. (approx.)

STEREO

Audio Input Impedance	600 ohms balanced (right and left)
Audio Input Level (right and left)	400 Hz at 100% Modulation ... +10 ± 2 dBm
Audio Frequency Response (right and left)	± 1 dB
Standard 75 Microsecond Pre-Emphasis, 50 to 15,000 Hz	
FM Noise	-63 db (Reference 400 Hz at 100% Mod.)
AM Noise	-55 dB (Reference Carrier AM Mod. 100%)
Stereo Separation	
50 to 15,000 Hz	40 dB min.
Stereo Pilot Stability	19 kHz ± 1 Hz
Cross-talk (L + R to L - R, L - R to L + R)	-46dB max.

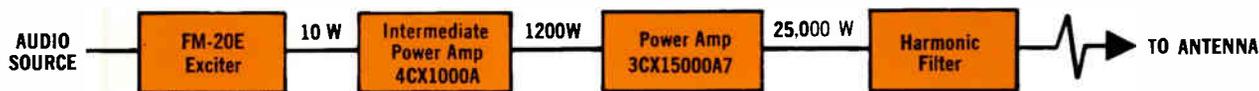
MONAURAL

Audio Input Impedance	600 ohms balanced
Audio Input Level	400 Hz at 100% Modulation ... +10 ± 2 dBm
Audio Harmonic Distortion	
50 to 15,000 Hz	0.5% maximum
Audio Frequency Response	± 1 dB
Standard 75 microsecond pre-emphasis	
50 to 15,000 Hz	
FM Noise (Ref 400 Hz at 100% Mod)	-70 dB
AM Noise (Reference Carrier AM Modulation 100%)	-55 dB

SCA

Frequency Range	30 to 75 kHz
Frequency Stability	± 400 Hz
Audio Input Impedance	600 ohms
Audio Input Level	-15 dBm to +10 dBm adjustable
Muting Delay	0.5 to 5 second adjustable
FM Noise	-63 dB
AM Noise	-55 dB
Pre-Emphasis	75 microsecond**
*33"D without trim	**Standard; otherwise specify

Prices and specifications subject to change without notice.



Simplified Block Diagram AEL FM-25KE Transmitter

40,000W/50,000W



The FM25/25KE is a completely self-contained 40,000 or 50,000W FM Broadcast Transmitter. It operates at any fixed frequency between 88 and 108 MHz in monaural or stereo, and SCA mode.

It is supplied with a complete set of operating tubes and harmonic filter and is factory pre-tuned and tested to the individual customer's frequency.

The AEL FM-25/25KE is designed for very high power broadcasting service and provides a high degree of redundancy and reliability. This transmitter consists basically of two AEL FM-25KE 25kW FM transmitters whose outputs are connected through a hybrid combiner for a total output capability of up to 50 kW.

The basic configuration comprises two standard FM-25KE transmitters and a control and interface cabinet placed between the two transmitter units. A standard 40 kW 3-1/8" hybrid combiner is normally supplied for external mounting depending on individual station layouts. A larger combiner for use with 6-1/8" line is also available for power level requirements over 40 kW. Additionally, various patching and switching functions can be provided to suit individual station requirements.

A true 90° hybrid combiner accepts the output of both transmitters, adds the two outputs together and delivers the combined output to the antenna. In the event one of the transmitter units shuts down, the remaining transmitter continues to deliver power through the combiner to the antenna. In this case, however, the combiner operates as a power divider with half the power going to the antenna and half being dissipated in a

reject load connected to the combiner. A high degree of isolation is maintained between the transmitters so that service may be performed on the off unit.

A single width matching rack cabinet between the two transmitter units provides metering and control functions for the system as well as a common interface for connection to remote control and monitoring requirements. The exciter, buffer and phasing controls are also in the control cabinet. Meters for all important combiner functions and individual transmitter start, stop and plate voltage control are provided.

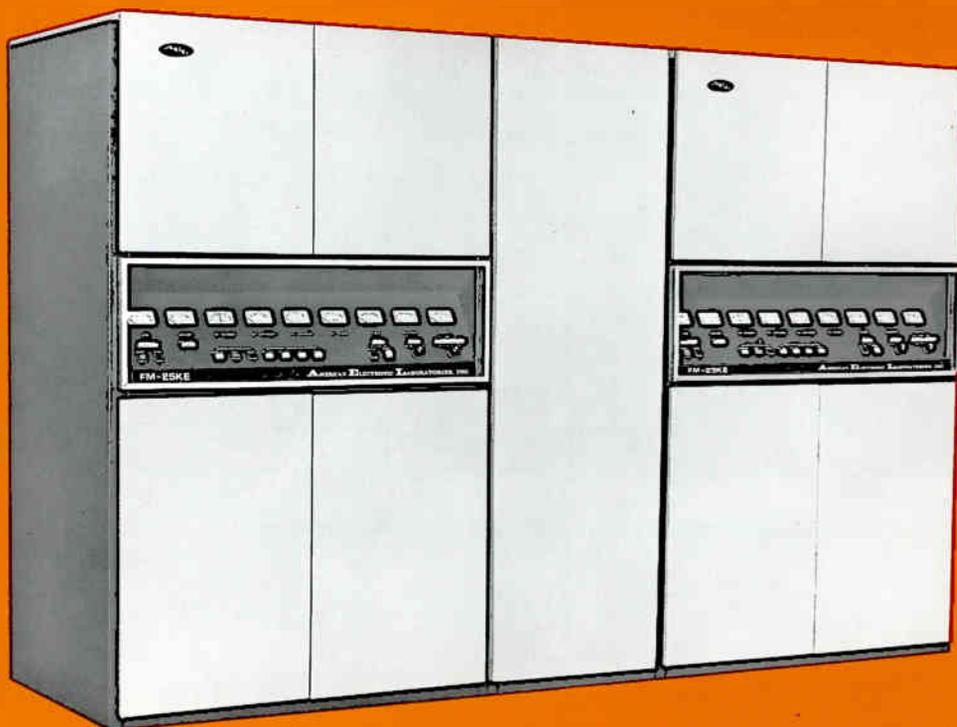
A single FM-20E Exciter provides drive to a solid state dual buffer amplifier, the outputs of which provide excitation to the individual 25 kW amplifiers. (See page 36).

Each 25 kW amplifier is connected through its individual harmonic filter to the inputs of the hybrid combiner.

The standard 40 kW output level requires that each 25 kW amplifier operate at only 20 kW, thus providing sufficient reserve and conservative operation.

Each 25 kW amplifier retains all of its individual metering and remote control functions. In addition, in the control cabinet, meters are provided for reading total forward power and reflected power in the antenna system, power in the reject load, power in a dummy load (optional) if used, and power from each transmitter. Also provided are parallel control functions for turning each amplifier on and off and control of plate voltage.

Model FM-25/25KE Broadcast Transmitter





FEATURES

- Superior Performance
- Reliability
- Ease of Maintenance
- Automatic Re-Cycling
 - Overload Protection
 - Power Interrupt
 - Auto Restart
- Mid-Panel Metering
- Remote Control Interface
- VSWR Protection
- Elapsed Time Indicator
- Remote Control Power Adjust

SUPERIOR PERFORMANCE

The overall frequency stability of the Model FM-25/25KE is typically ± 200 Hz (See FM-20E Exciter, page 36). Excellent linearity, 0.5% total harmonic distortion (THD), and ± 1.0 dB frequency response result in the faithful reproduction of all natural sound.

This outstanding performance is obtained principally by four factors:

- 0.35% IM distortion
- FM noise of -70 dB
- Bandwidth of 250 kHz
- Less than 1° phase shift

RELIABILITY

AEL is a major supplier of militarized RF systems. The same technology and reliability used in these sophisticated systems is designed into our commercial transmitters.

All critical components are operated at 50% below their manufacturer's suggested ratings. The grounded grid final amplifier stage eliminates the need for the usual screen voltage supply, the bias voltage supply and all tuned input circuits.

The pressurized cabinet reduces dirt and dust intrusion. This significantly increases the operating life of all major high voltage components.

All transmitters are operated at Station TPO and frequencies for a minimum of 100 hours at AEL before shipment to the customer.

EASE OF MAINTENANCE

The estimated mean-time-to repair of the Model FM-25/25KE is less than 1 hour.

All doors and panels are easily removed to give immediate access to all major sub-assemblies. Standard components are used wherever possible and most are mounted in easily reached plug-in modules.

Twenty-four hour parts and technical assistance is available from AEL.

AUTOMATIC RE-CYCLING—Overload Protection

Any abnormal condition that might cause an overload condition in the Driver Tube, the Power Amplifier Tube, or the high voltage section of the amplifier immediately initiates a 1 second shut down. The plate voltage is removed automatically from these tubes to protect them from permanent damage. It is automatically returned after this one second interval; after three consecutive shut downs the plate voltage can be restored only by a manual re-set.

AUTO RESTART—Power Interrupt

If the primary power to the transmitter is interrupted for less than 5 seconds the transmitter automatically shuts down; this protects sensitive tubes and circuits. It is automatically returned to full power immediately upon return of primary power. As long as the interrupt is less than 5 seconds this sequence will continue indefinitely. If primary power to the transmitter is interrupted for more than 5 seconds the transmitter is automatically shut down. When power is returned a 3 minute restart cycle is automatically instituted after which normal operation of the transmitter resumes. This delay is required to protect the sensitive high power tubes.

MISCELLANEOUS

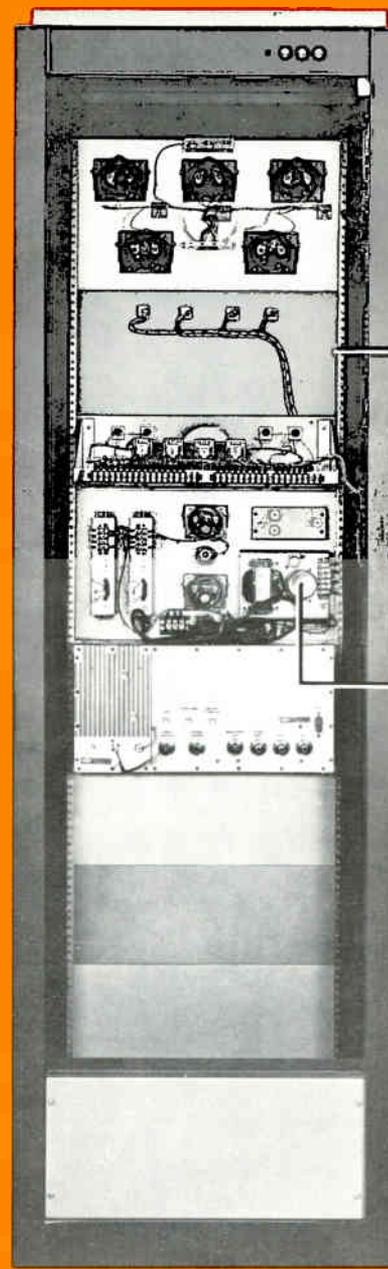
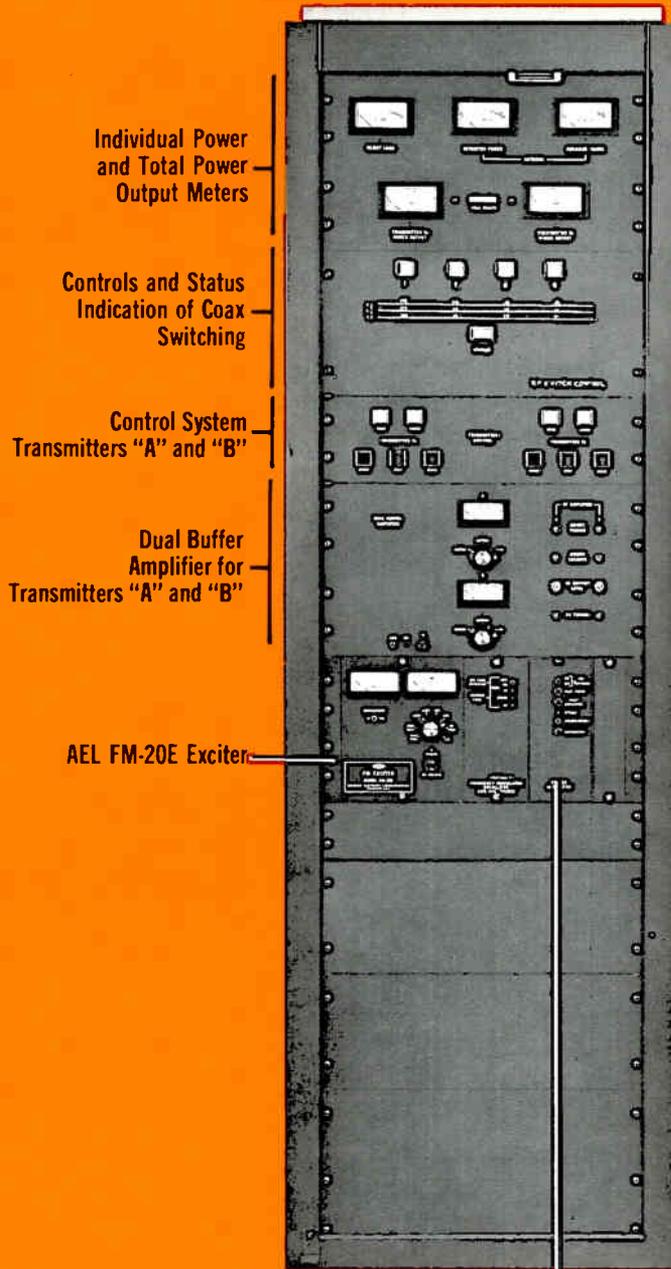
The Model FM-25/25KE contains many other features of interest to the professional broadcast engineer and technicians. These include a mid-panel metering system for easy viewing. Remote control interface connections, VSWR protection, an elapsed time indicator, automatic level controls, and remote control power adjust system are standard items.



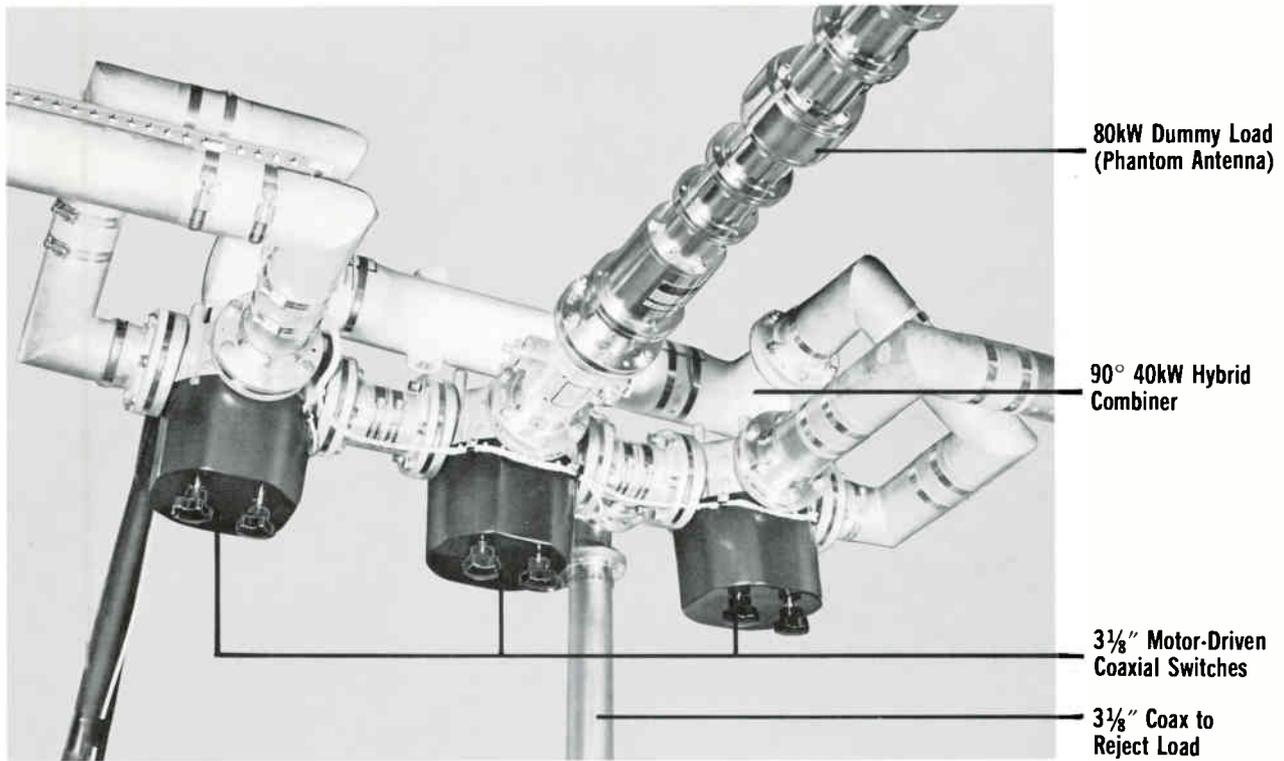
AEL FM-25/25KE Custom Control Cabinet

Front View—Door Removed

Rear View—Door Removed



AEL FM-20E/SG
Stereo Generator



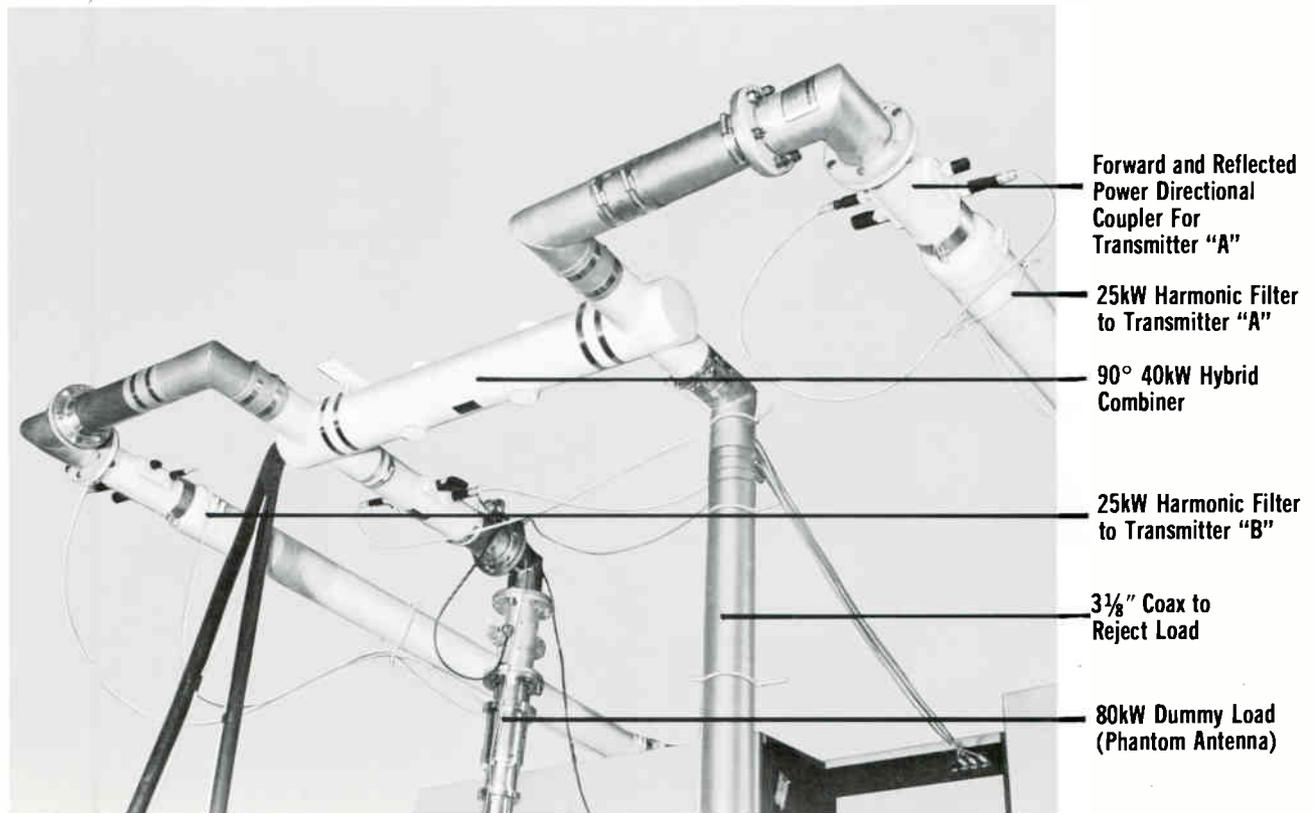
80kW Dummy Load
(Phantom Antenna)

90° 40kW Hybrid
Combiner

3 1/8" Motor-Driven
Coaxial Switches

3 1/8" Coax to
Reject Load

FM-25/25KE 40KW Combiner with Remote Control Coax Switching



Forward and Reflected
Power Directional
Coupler For
Transmitter "A"

25kW Harmonic Filter
to Transmitter "A"

90° 40kW Hybrid
Combiner

25kW Harmonic Filter
to Transmitter "B"

3 1/8" Coax to
Reject Load

80kW Dummy Load
(Phantom Antenna)

FM-25/25KE 40KW Combiner



SPECIFICATIONS FM-25/25KE

ELECTRICAL

Power Output	40 kW max with 3 1/8" line 50 kW max with 6 1/8" line
Frequency Range	88 to 108 MHz
Emission	F3, F9
Load Impedance	50 ohms; VSWR 1.5: 1 max
Output Termination	3 1/8" or 6 1/8" EIA flange
Frequency Stability	± 200 Hz
Modulation Capability	± 100 kHz
Audio Input Impedance	600 ohms balanced
Audio Input Level	10 ± 2 dBm for 100% mod at 400 Hz
Audio Response	± 1 dB, 50-15000 Hz
Audio Distortion	0.5% max, 50-15000 Hz
FM Noise	- 70 dB max
AM Noise	- 55 dB max
Power Line	208/240 Vac, 3 phase; 60 Hz
Power Factor	0.9

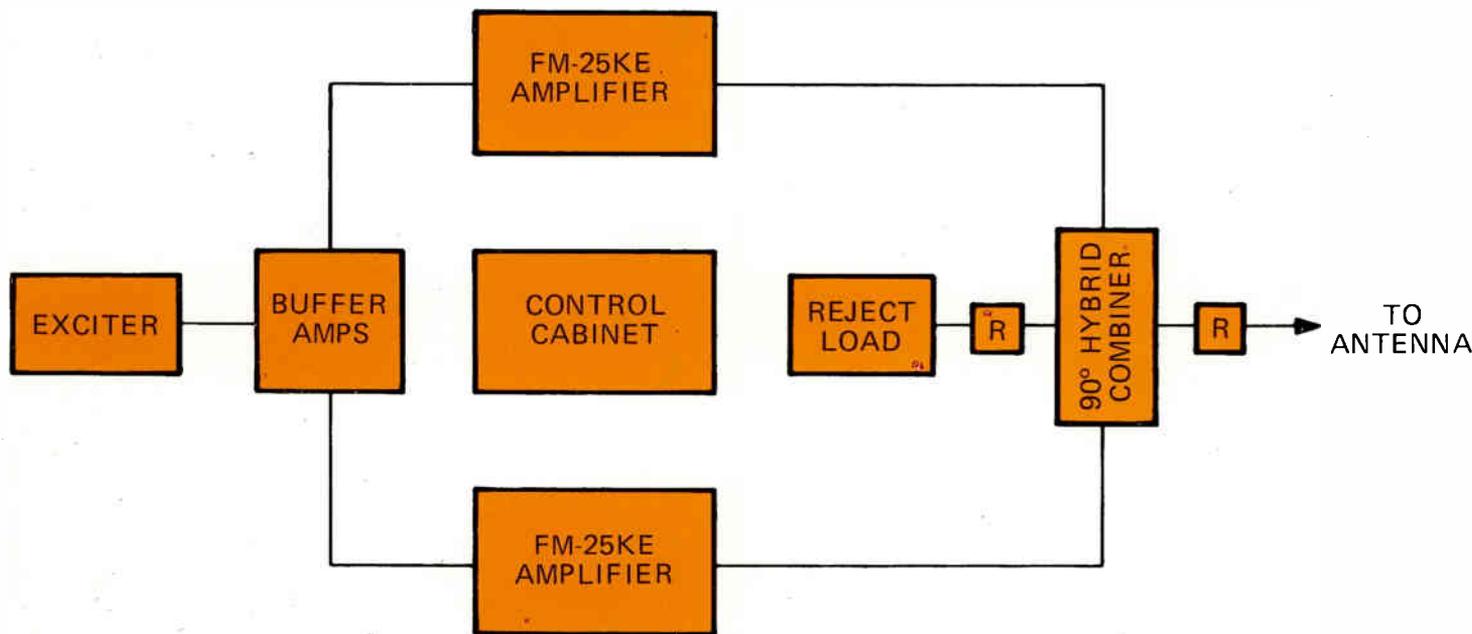
MECHANICAL

Overall Dimensions (main cabinets)	76"H x 120"W x 34"D (less filters and combiner)
Net Weight	4600 lbs (approx)
Operating Altitude	10,000 ft max
Operating Temperature	0° to 45° C

TUBE COMPLEMENT

- 2 ea-4CX1000A
- 2 ea 3CX15000A7

Prices and specifications subject to change without notice.



Basic System Block Diagram AEL FM-25/25KE

A black and white portrait of Guglielmo Marconi, an Italian inventor and electrical engineer. He is shown from the chest up, wearing a dark suit jacket, a white collared shirt, and a dark tie. He has short, dark hair and is looking directly at the camera with a serious expression. In the background, there is a large, complex piece of early 20th-century electrical equipment, likely a radio transmitter or receiver, with various dials, knobs, and wires. The lighting is dramatic, highlighting his face against a dark background.

Guglielmo Marconi (1874-1937) Marconi, an Italian inventor and electrical engineer, won recognition for his work in developing wireless telegraphy, or radio. This led to present-day radio broadcasting. He produced a practical wireless telegraph system in 1895 from basic discoveries that had previously been made in wireless telegraphy. He produced the first transatlantic wireless signal in history on Dec. 12, 1901, and patented the horizontal directional aerial in 1905. Marconi invented the beam system of wireless for long-distance communication.

FM-20E EXCITER



The AEL Model FM-20E FM Exciter, nucleus of the AEL FM-25KE Transmitter, is a totally solid state unit employing Direct Carrier Frequency Modulation. The exciter's capabilities allows exceptional performance over a wide frequency range with negligible phase shift and provides good stereo separation, extremely low distortion and noise.

The AFC and FMO circuitry provides long term frequency stability. The modular construction of the AEL FM-20E permits the integration in a single rack mounted unit the Power Supply and Metering Module, the Frequency Modulated Oscillator, the Monaural Module, the Stereo Generator, and the SCA Generator.

FEATURES

- 25 Watt RF output
- 88 — 108 MHz without tuning
- Superior Audio Performance
- Ease of Maintenance . .
- Military type construction
- Minimum alignment adjustments

SUPERIOR AUDIO PERFORMANCE

This exciter offers superior performance for the professional FM broadcaster. The 25W output provides sufficient reserve power for most installations. Other outstanding performance specifications include:

- Low Intermodulation Distortion
0.35% (typical)
- Frequency Stability
 ± 200 Hz
- Phase Linearity
 $\pm 3^\circ$ at 75kHz deviation

EASE OF MAINTENANCE

All critical circuits are mounted on three readily accessible and replaceable modules. All sensitive circuits located on these boards are measured and displayed on front panel meters. Replacing any one of these plug-in modules will correct most failures that might occur in this exciter. This feature reduces potential down-time to an absolute minimum.

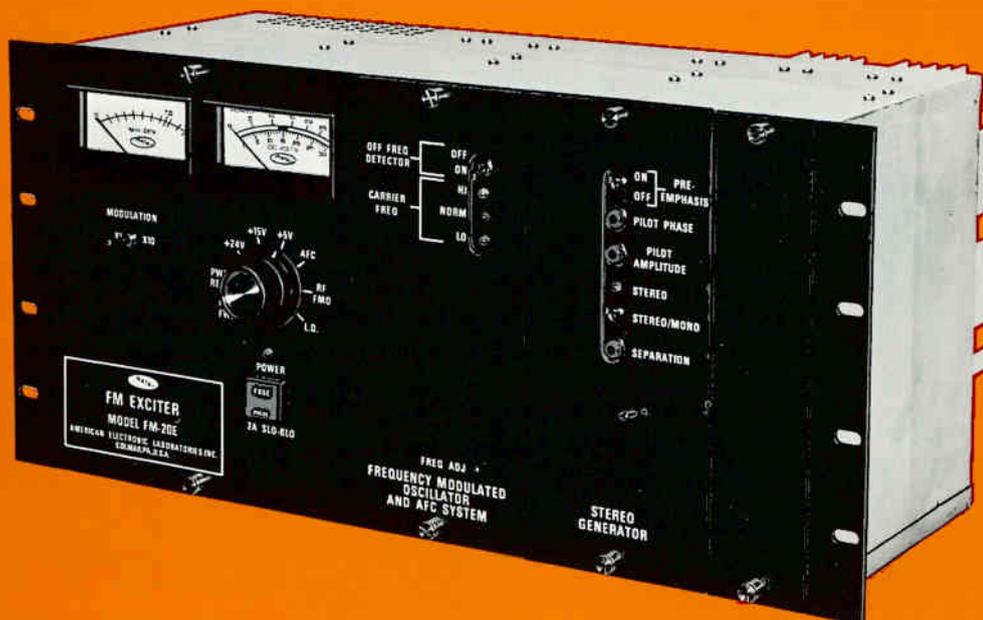
MINIMUM ALIGNMENT ADJUSTMENTS

Most modern exciter designs require from 7 to 14 separate adjustments to maintain frequency stability, distortion, and RF output power. The AEL Model FM-20E exciter requires only 3 alignment adjustments to control these functions. In normal operation, these adjustments will never have to be made unless a component failure occurs.

MILITARY TYPE CONSTRUCTION

These exciters have been designed, manufactured, and tested in conformance to the most rigorous electrical and mechanical requirements. This results in years of trouble-free operation. Only AEL offers these outstanding construction features:

- MIL Spec IC's
- Double-Rail mechanical mountings
- Short circuit-proof power supply
- Heavy gauge steel construction
- PC boards electrically shielded





STEREO GENERATOR

The AEL FM-20E/SG stereo generator exceeds its published specifications by a considerable margin. These specifications are by far more exacting than the minimum FCC requirements.

The AEL FM-20E/SG utilizes an all silicon monolithic design which offers unprecedented reliability and performance. A special digital chain for the sub-channel carrier offers extreme stability of frequency and phase. A similar modulation technique assures a separation in excess of 40 dB at any frequency from 50 Hz to 15,000 Hz.

SCA GENERATOR

The AEL FM-20E/SC Generator provides an SCA carrier for the exciter. A digital monolithic circuitry provides excellent stability, performance and reliability. The standard AEL FM-20E/SC provides a 67 kHz sub-carrier (10% modulation, ± 6.7 kHz); a 41 kHz version is also available upon request.

MONAURAL MODULE

The Monaural Module of the FM-20E exciter provides the necessary circuitry for driving the FMO with a 30-15000 Hz ± .5dB signal. It has an isolation transformer and pre-emphasis and has provision for altering it to any value that may be desired.

SPECIFICATIONS

GENERAL

Frequency Range:	88 to 108 MHz
Power Output	5-20 watts (cont. variable)
Load Impedance	50 ohms
AFC	Phase Locked Loop
Type of Modulation	Direct FM
Modulation Capability	± 100 kHz minimum
Altitude	10,000 feet
Temperature Range	- 10 to 55°C
Overall Dimensions	8½" x 19" x 8½" deep
Net Weight	19" rack—FMO—P.S.—20 lbs. Monaural module —2.5 lbs. Stereo module —7.0 lbs. SCA module —5.0 lbs.
VSWR	Will withstand an open or a short circuited output indefinitely

MONAURAL OPERATION

Input Impedance	150/600 ohms balanced
Input Level	0 dBm to +20 dBm for 100% modulation
Frequency Response	30-15,000 Hz ± 0.5 dB
Pre-Emphasis	Standard 75 µsec with provision to change
FM Noise	better than -70 dB
AM Noise	- 55 dB
Distortion	0.5% max. (I.M.D. & T.H.D)

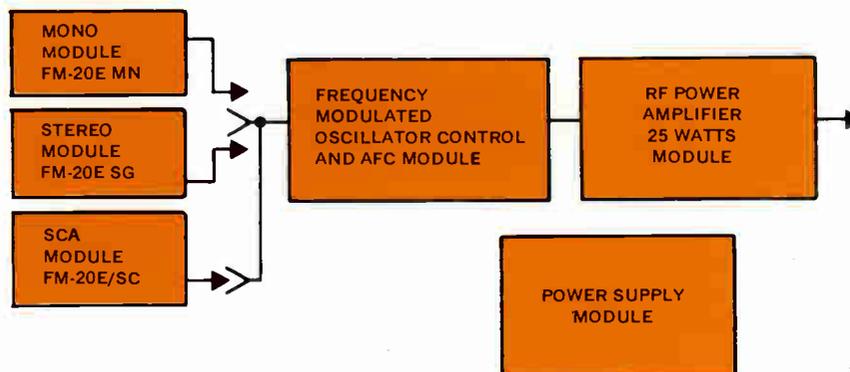
STEREO OPERATION

Input Impedance	600 ohms balanced
Input Level	+10dBm ± 2dB for 100% modulation
Stereo Response	50-15,000 ± 1 dB
Stereo Pre-Emphasis	75 µsec standard with provision to change
Distortion	0.5% max. (I.M.D. & T.H.D)
FM Noise	- 63 dB
Stereo Pilot Stability	± 1 Hz
Stereo Separation	40 dB 50-15,000 Hz

SCA SUB-CHANNEL

Frequency Range	30-100 kHz
Frequency Stability	± 400 Hz
Input Impedance	600 ohms balanced
Input Level	- 15 to + 10 dBm adjustable
Muting Delay	0.5 to 5 seconds adjustable
FM Noise	- 63 dB
Cross-Talk	- 46 dB

Prices and specifications subject to change without notice.



FM-20E Exciter

FM-15QE EXCITER



The AEL Model FM-15QE Exciter, nucleus of the AEL FM-2.5, FM-5, FM-10, and FM-15 transmitters is a totally solid state unit employing phase locked, frequency synthesized techniques and direct carrier frequency modulation. The economically priced exciter allows exceptional performance over a broad flat response with negligible phase shift for good stereo separation, extremely low distortion and noise.

FEATURES

- Flat Response
- Extremely Low Audio Harmonic Distortion
- Excellent Stereo and SCA Capabilities
- All Solid State
- Direct FM on Carrier Frequency
- 15 Watts Output
- Excellent Frequency Stability
- Variable Output (5-15W)



SPECIFICATIONS

Primary Power	105-125/210-250 Vac 50/60 Hz
Power Consumption	Approx. 50 watts max.
Power Output	Adjustable from less than 5 to greater than 15 watts.
Frequency Range	88 MHz to 108 MHz (programmable)
Type of Emission	180F3 or 300F9
Modulation Capability (less than 1% THD)	150 kHz peak
Frequency Stability	±300 Hz (-10°C to +55°C)
Output Impedance	50 ohms
VSWR Protection	Any magnitude or phase
Harmonic and Spurious Suppression	Better than 80 dB

Mono Input	
a. Impedance	600 ohms (balanced)
b. Level	+10dBm for 75 kHz dev. @ 400 Hz
c. Pre-emphasis	75 μsec ± 1 dB (50 μsec optional)
d. Distortion	0.5% max.
Composite Input	
a. Impedance	10k ohms
b. Level	.3 to 4Vpp adj. for 75 kHz deviation
Environmental	-10 to 55°C operating (-15° to 55°C with 30 min. warm up)

Prices and specifications subject to change without notice

STEREO GENERATOR



The AEL FM-15QE/SG is an all solid state design which offers excellent reliability and performance. Separation is in excess of -40 dB at any frequency from 50 Hz to 15,000 Hz.

The composite signal is generated using the time division technique thereby reducing the complexity of the circuit and the number of adjustments.

SPECIFICATIONS

Inputs (Right and Left)

- a. Frequency Range 30 Hz - 15 kHz
- b. Impedance 600 ohms balanced
- c. Level + 10 dBm \pm 1 dB

Frequency Response (30 Hz - 15 kHz)

- a. Flat \pm 0.5 dB
- b. Pre-emphasized 75 μ sec \pm 1 dB

Output (Composite)

- a. Impedance less than 300 ohms
- b. Level 4Vpp

Stereo Separation (30 Hz - 15 kHz) Greater than 40 dB

Crosstalk (30 Hz - 15 kHz)

- a. Main to Sub 46 dB
- b. Sub to Main 46 dB

38 kHz Suppression 55 dB

Noise (below 4Vpp output) - 63 dB

Distortion (Left or Right) 0.5% max. (I.M.D. & T.H.D.)

Pilot Frequency 19 KHz \pm 1 Hz

Power Requirement 105-125 Vac or 210-250
Vac 50/60 Hz

Ambient Temperature - 10 to 55°C

Prices and specifications subject to change without notice



FM-15QE/SG



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