AEL Total RF Transmission Systems
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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 Reitman 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) 322-2929  TWX: 510-661-4976
Lee DeForest (1873-1961), an American inventor, pioneered in wireless telegraphy and radio broadcasting. He obtained patents on more than 500 inventions. He patented a vacuum tube called a triode or tetrode, 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.
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 1535 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 to 7500 Hz (± 1.5 dB)
- Low Distortion: 1.5% (typical)
- Low Noise: -55dB (unweighted)

**FEATURES**

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

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 4CX300A 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) 4CX300A'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.

RF OUTPUT CIRCUITRY
(Rear View)

At the top of this RF section is the RF power amplifier and below is the solid state exciter.
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 becomes 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 38"D (overall)
77 1/4"H x 48"W x 38"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 side 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 150°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 = 2.8 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) -35 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.
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 4CX300A class AB1 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)
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 cabinet.
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 4C3000A Tetrodes; the RF driver stage utilizes a single 6121 high performance Tetrode which operates at one half of maximum output capabilities; the modulator stage uses two (2) 4C3000A'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)

RF OUTPUT CIRCUITY
(Rear View)
At the top of this RF section is the RF power amplifier and below is the solid state exciter.

Rear View—with Doors and Air Filters removed.
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 63”W x 30”D (overall)
77 1/4”H x 45”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, front 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.

www.americanradiohistory.com
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:** 200 to 210 VAC 50 to 60 Hz, 3 phase, 4 wires (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:** ±3%.
- **Spurious RF Emission:** (2nd harmonic & higher) — 80 dB.

*Prices and specifications subject to change without notice.*
Model AM-50KD Broadcast Transmitter

FEATURES
- Excellent Fidelity
- Easy Maintenance
- Semi-Automatic Operation
- High Level Modulation
- Solid State Control Circuits
- 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.

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.
TUBES
The RF output stage uses a 4CX3500G Tetrode; the RF driver stage utilizes a single 4-100A high performance Tetrode which operates at one half of maximum output capabilities; the modulator stage uses two (2) 4CX1500A’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 simple 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
- Second Harmonic Trap
- Tuning Control
- Third Harmonic Trap
- Tuning Control
- High Efficiency PA Compartment Blower 1500 CFM
- Oil-Filled Modulation Reactor
AEL AM-50KD
Rear View — Modulator Cabinet
(Doors Removed)

Audio Feedback Ladder Network

Modulator Tube Filament Transformers

High Voltage Shorting Stick

Air Flow Indicator

Solid State Audio Driver Modules on Easy-Access Door

Heavy Duty Oil-Filled Modulation Transformer

Easy Initial Installation With Roller Assisted Access

(Continued on page 18)
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 A8
Frequency Stability ...................................... ±0.5 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) ...................................... ≤5 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 .............................................. 0.8

MECHANICAL
Main Cabinet Size .................................... 64" H x 136" W x 48" D
Transformer Vault ...................................... 48" H x 48" W x 48" D
Weight (approx) ........................................... 11,000 lbs
Operating Temperature .................................. 0 to 65°C
Operating Altitude ....................................... 6,000 ft. max

TUBE COMPLEMENT
1 ea 8121
1 ea 4400C
1 ea 4C3500C
2 ea 4C3500A

Prices and specifications subject to change without notice.
Edwin Howard Armstrong (1890-1954) was 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.
The FM-2.5KE is a completely self-contained 2500W FM Broadcast Transmitter. It operates at any fixed frequency between 88 and 108 kHz in monaural or stereo, and SCA mode.

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

**SUPERION 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 kHertz
- 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.

**FEATURES**

- Superior Performance
- Reliability
- Ease of Maintenance
- Automatic Re-Cycling
- Overload Protection
- Power Interrupt
- Auto Restart (Option)
- Mid-Panl 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 prevent 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 Output**: FA, FA
- **RF Load Impedance**: 50 ohms
- **Output Termination**: 1/2" EIA flange
- **Frequency Stability**: ±100 kHz
- **Modulation Capability**: ±1100 kHz
- **Temperature Range**: -30 to 55°C
- **Altitude Above Sea Level**: 10,000 ft. max.
- **Power Loss Requirements**
  - **Voltage**: 220V/240 Vac
  - **Frequency**: 60 Hz
  - **Phase**: Single
  - **Consumption at 250W**: 60 W
  - **Power Factor (Min)**: 0.9
- **Overall Dimensions**: 76" H x 28" W x 26" D
- **Net Weight**: 300 lbs. (approx.)

#### STEREO
- **Audio Input Impedance**: 600 ohms balanced (right and left)
- **Audio Input Level (right and left)**
  - 400 Hz at 100% modulation: ±10 ± 3 dB
- **Audio Frequency Response**
  - (right and left)
  - Standard 75 Microsecond
  - Pre-Emphasis, 52 to 15,000 Hz
- **FM Noise**: ±100 kHz
- **AM Noise**: ±55 kHz
- **Stereo Generation**: ±40 dB
- **Stereo Noise**: ±55 kHz
- **Cross talk**: ±40 dB
- **Mute Delay**: 0.5 to 5 second adjustable
- **FM Noise**: ±100 kHz
- **AM Noise**: ±55 kHz
- **Pre-Emphasis**: ±75 microsecond

#### MONOAURAL
- **Audio Input Impedance**: 600 ohms balanced
- **Audio Input Level**: 400 Hz at 100% modulation: ±10 ± 3 dB
- **Audio Harmonic Distortion**: 10% maximum
- **Audio Frequency Response**
  - Standard 75 microsecond pre-emphasis
  - 50 to 15,000 Hz
- **FM Noise**: (ideally 0% Mod) ±70 dB
- **AM Noise**: (Reference Carrier AM Mod 10%) ±55 dB

**Prices and specifications subject to change without notice.**

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**Simplified Block Diagram AEL FM-2.5KE Transmitter**

[Diagram showing block diagram of the FM-2.5KE Transmitter]

www.americanradiohistory.com
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-15QC Exciter, a complete set of operating tubes and harmonic filter and are factory pre-set and tested to the individual customer's frequency.

**SUPERIOR PERFORMANCE**

The overall frequency stability of these transmitters are typically ±0.01 Hz. (See Exciter page 30). Excellent linearity, maximum 0.5% total harmonic distortion (THD), and ±1.0 dB frequency response result in the faithful reproduction of all musical sound.

This outstanding performance is obtained principally by four factors:

- 0.25% 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 those sophisticated systems is designed into our commercial transmitters.

All critical components are operated at 60% 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 ID 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 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.

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

**FEATURES**

- Superior Performance
- Reliability
- Ease of Maintenance
- Automatic Re-Cycling
- Overload Protection
- Power Interrupt
- Remote Start
- Solid State Metering
- Remote Control Interface
- VSWS Protection (Option)
- Expanded Time Indicator
- Remote Control Power Adjust

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**Simplified Block Diagram: AEL FM-5KE Transmitter**
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 reset.

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 restored to full power immediately upon return of primary power. As long as the interrupt is less than 5 seconds the 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 technician. These include a mid-panel metering system for easy viewing, remote control interface connections are standard. Optional features include VSWR protection.

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**SPECIFICATIONS**

**FM-SKE and FM-10KE with FM-150E Exciter**

**GENERAL**

- **Frequency Range**: 88 to 108 MHz
- **Input power output**: FM-10 2000 to 6000 watts
- **Output power**: FM-10 6000 to 11,000 watts
- **Type of modulation**: F.M.
- **Output impedance**: 50 ohms
- **Output termination**: FM 51/4, FM 15/4
- **Temperature range**: -20 to 100°C
- **Altitude above sea level**: 15,000 ft max.
- **Power line requirements**: 220/240 VAC
- **Frequency**: 50-60 Hz
- **Phase**: 3
- **Power connection**: 4-wire star with grounded neutral
- **Power consumption**: FM-10 1500 W
- **Power factor**: 0.9
- **Overall dimensions**: 20 x 34 x 39 in D
- **Net weight**: FM-8 Approx. 1100 lbs.

**MONOARIAL**

- **Audio input impedance**: 600 ohms balanced
- **Audio input level**: +10 ± 2 dbm
- **Output drive level**: (10-1500 KHz)
- **Audio harmonic distortion**: 0.5% max.
- **(50-1500 KHz)**
- **Audio frequency response**: ±1 dB
- **(75 microsecond pre-emphasis, 50-15,000 KHz)**
- **FM Noise**: 70 db (Ref. 1000 Hz @ 100% modulation)
- **AM Noise**: 50 db (Ref. 1000 Hz @ 100% modulation)
- **Stereo separation**: ±500 Hz
- **Intermodulation distortion**: Up to 0.2% (500 KHz, FM, and AM)

**STEREOPHONIC**

- **Audio input impedance**: 600 ohms balanced
- **Audio input level**: ±10 ± 2 dbm
- **Audio frequency response**: ±0.5 dB
- **(Right and Left Channels identified)**
- **(Right and Left Channels identified)**
- **(Right and Left Channels identified)**
- **(50-15,000 KHz)**
- **FM Noise**: 63 db (Ref. 1000 Hz @ 100% modulation)
- **Stereo separation**: ±500 Hz
- **Stereo pld stability**: ±1 kHz ± 1 Hz
- **Cross talk**: 0 dB (Right into Left) -40 dB
- **(L to R) into (L + R) -45 dB
- **Composite Input level for 100% modulation**: ±10 db

**SCA**

- **Sub-carrier frequency range**: 33 / 75 kHz
- **Sub-carrier frequency stability**: ±200 Hz
- **Audio input impedance**: 500 ohms balanced
- **Audio input level**: ±15 ± 2 dbm (variable)
- **Ringing delay**: 7.5 ± 0.5 seconds (variable)
- **S/N ratio**: 43 db
- **Pre-emphasis**: ±50 microsecond standard

Prices and specifications subject to change without notice.
FEATURES
- Superior Performance
- Reliability
- Ease of Maintenance
- Automatic Re-Cycling
- Overload Protection
- Power Interrupt
- Auto Restart
- Mid-Panel Metering
- Remote Control Interface
- ISWM 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.

SUPERIOR PERFORMANCE
This overall frequency stability of the FM-15KE is typically ± 35 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 first 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.

Model FM-15KE Broadcast Transmitter

The pressurized cabinet reduces dust 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 field 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.

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FM-15QE Exciter

AUTO RESTART—Power Intertupt

If the primary power to the transmitter is interrupted for less than 5 seconds, the transmitter automatically shuts down. The unit is automatically returned to full power immediately upon return of primary power. As long as the interruption is less than 5 seconds, the 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 initiated after which normal operation of the transmitter resumes. This 3-minute delay is required to protect the sensitive high power tubes.

SPECIFICATIONS FM-15KE with FM-15QE Exciter

GENERAL

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>88 to 108 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Power Output</td>
<td>5,000 to 15,000 watts</td>
</tr>
<tr>
<td>Type of Operation</td>
<td>F3, F9</td>
</tr>
<tr>
<td>RF Load Impedance</td>
<td>50 ohms</td>
</tr>
<tr>
<td>Output Power</td>
<td>3,000 W</td>
</tr>
<tr>
<td>Frequency Stability</td>
<td>± 10 kHz</td>
</tr>
<tr>
<td>Modulation Capacity</td>
<td>8:100 kHz</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-10 to 55°C</td>
</tr>
<tr>
<td>Altitude Above Sea Level</td>
<td>10,000 ft. max.</td>
</tr>
<tr>
<td>Power Line Requirements</td>
<td>208/230 VAC, 30 Hz</td>
</tr>
<tr>
<td>Primary</td>
<td>230 VAC</td>
</tr>
<tr>
<td>Consumption at 15 kW</td>
<td>25 kW</td>
</tr>
<tr>
<td>Power Filter</td>
<td>0.5</td>
</tr>
<tr>
<td>Overall Weight (less filters)</td>
<td>70 lbs</td>
</tr>
<tr>
<td>Net Weight</td>
<td>80 lbs</td>
</tr>
</tbody>
</table>

STEREO

<table>
<thead>
<tr>
<th>Audio Input Impedance</th>
<th>600 ohms balanced (right and left)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio Input Level (right and left)</td>
<td>-12 ± 2 dB</td>
</tr>
<tr>
<td>Audio Frequency Response</td>
<td>± 0.5 dB</td>
</tr>
<tr>
<td>Modulation Stability</td>
<td>± 0.5 dB</td>
</tr>
<tr>
<td>S/N Ratio</td>
<td>75 dB</td>
</tr>
<tr>
<td>Pre-Emphasis</td>
<td>25 dB</td>
</tr>
<tr>
<td>S/N Ratio (Reference Carrier Mod, 100%)</td>
<td>75 dB</td>
</tr>
</tbody>
</table>

MONOaurAL

<table>
<thead>
<tr>
<th>Audio Input Impedance</th>
<th>600 ohms balanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio Input Level</td>
<td>400 mV at 0.9 mV</td>
</tr>
<tr>
<td>Audio Harmonic Distortion</td>
<td>± 0.5 dB</td>
</tr>
<tr>
<td>Audio Frequency Response</td>
<td>± 1 dB</td>
</tr>
<tr>
<td>Standard 75 microsecond pre-emphasis</td>
<td></td>
</tr>
<tr>
<td>CC to 15,000 Hz</td>
<td>0.5 dB</td>
</tr>
<tr>
<td>FM Balance (flat)</td>
<td>0.5 dB</td>
</tr>
<tr>
<td>All Tone (Reference Carrier KHz)</td>
<td>12 dB</td>
</tr>
<tr>
<td>Modulation (KHz)</td>
<td>12 dB</td>
</tr>
</tbody>
</table>

SCA

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>30 to 75 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Stability</td>
<td>± 0.5 dB</td>
</tr>
<tr>
<td>Audio Input Impedance</td>
<td>600 ohms</td>
</tr>
<tr>
<td>Audio Level (left and right)</td>
<td>-12 dB</td>
</tr>
<tr>
<td>Modulation Stability</td>
<td>± 0.5 dB</td>
</tr>
<tr>
<td>S/N Ratio</td>
<td>75 dB</td>
</tr>
<tr>
<td>Pre-Emphasis</td>
<td>25 dB</td>
</tr>
<tr>
<td>S/N Ratio (Reference Carrier Mod, 100%)</td>
<td>75 dB</td>
</tr>
</tbody>
</table>

Prices and specifications subject to change without notice.

Simplified Block Diagram AEL FM-15KE Transmitter

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FEATURES

- Superior Performance
- Reliability
- Ease of Maintenance
- Automatic Re-Cycling
- Overload Protection
- Power Intercept
- Auto Restart
- Mid-Panel Metering
- Remote Control Interface
- 132W Protection
- Elevated Tone 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 preset 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 95). 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 microwaved RF systems. The same technology and reliability used in those 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 dust and dirt 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 practical and most are mounted in easily reached plug-in modules. Twenty-four hour parts and technical assistance is available from AEL.

AUTOMATIC RE-CYLING—
Overload Protection

Any abnormal condition that might cause an overloaded 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 the one second interval. After three consecutive shut downs the plate voltage can be restored only by a manual reset.
**FM-20E Exciter**

**AUTO RESTART—Power Intermittent**

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 6 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 re-start cycle is automatically initiated 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 technician. These include a mid-panel metering system for easy reading, remote control interface connections, VSWR protection, an elapsed time indicator, automatic level controls, and a remote control power adjust system are standard items.

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**SPECIFICATIONS FM-25KE with FM-20E Exciter**

**GENERAL**

- **Frequency Range:** 88 to 108 MHz
- **Total Power Output:** 3,000 to 36,000 watts
- **Type of Emission:** F3, F4
- **DC Input Power:** 600 watts
- **Output Termination:** 30 MHz band
- **Modulation Quality:** ±100 kHz
- **Temperature Range:** -10 to 52°C
- **Altitude Above Sea Level:** 10,000 ft. max.
- **Power Line Requirements:** 230 VAC
- **Power Consumption:** 25 kW
- **Weight:** 210 lb. (minimum)

**STEREO**

- **Audio Input Impedance:** 600 ohms balanced
- **Audio Input Level (right and left):** +10 ±2 dBm
- **RF Input:** 1000 µV, Modulation: +10 dBm
- **Audio Frequency Response:** ±1 dB
- **Standard 100 Microsecond**
- **PH Mode:** 50 to 15,000 Hz
- **PH Noise:** 55 dB
- **Reference Carrier AM Mod. 100%**
- **Sensitivity:** 50 to 15,000 Hz
- **Stress Test:** 10 kHz to 1 MHz

**MONOURAL**

- **Audio Input Impedance:** 600 ohms balanced
- **Audio Input Level:** 400 µV, Modulation: +10 ±2 dBm
- **Audio Harmonic Distortion:** 0.5% maximum
- **Audio Frequency Response:** ±1 dB
- **Standard 100 Microsecond**
- **PH Mode:** 50 to 15,000 Hz
- **FM Range:** 88 to 108 MHz
- **RF Input:** 1000 µV, Modulation: +10 dBm
- **Audio Noise:** 70 dB
- **Reference Carrier AM:** 100% Modulation: 55 dB
- **Sensitivity:** 50 to 15,000 Hz

**SCA**

- **Frequency Range:** 30 to 75 kHz
- **Frequency Stability:** ±50 Hz
- **Audio Input Impedance:** 600 ohms
- **Audio Input Level:** +15 dBm
- **Milling Delay:** 0.5 to 5 second adjustable
- **PH Noise:** 63 dB
- **Reference Carrier AM:** 100% Modulation: 55 dB
- **Sensitivity:** 70 microsecond

*Prices and specifications subject to change without notice.*

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**Simplified Block Diagram AEL FM-25KE Transmitter**

![Simplified Block Diagram AEL FM-25KE Transmitter](image)
The FM-25/25KE 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 50kW.

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 3-1/2", hybrid combiner is normally supplied for external mounting depending on individual station layouts. A larger combiner for use with 4-1/2" 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-25E 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 10 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-Panell Metering
- Remote Control Interface
- VSWR Protection
- Delayed Time Indicator
- Remote Control Power Adjust

SUPERIOR PERFORMANCE

The overall frequency stability of the Model FM-25/25KE is typically ±200 Hz (See FM-25E Exciter, page 36). Excellent linearity, 0.05% 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:
- 0.05% 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 cabinets 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 initiated 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.

(Continued on page 32)
AEL FM-25/25KE Custom Control Cabinet

Front View—Door Removed

Rear View—Door Removed

- Individual Power and Total Power Output Meters
- Controls and Status Indication of Coax Switching
- Control System Transmitters "A" and "B"
- Dual Buffer Amplifier for Transmitters "A" and "B"
- AEL FM-20E Exciter
- AEL FM-20E/26 Stereo Generator
- Rear View Individual Power and Total Power Output Meters
- Remote Control Function Connection Panel
- Rear View Coax Switching Control Relays
- Rear View Dual Buffer Amplifier Assembly
- Regulated 24Vdc Control Circuit Power Supply

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

80KW Dummy Load (Phantom Antenna)

90° 40KW Hybrid Combiner

3½" Motor-Driven Coaxial Switches

3½" Coax to Reject Load

Forward and Reflected Power Directional Coupler For Transmitter "A"

25KW Harmonic Filter to Transmitter "A"

30° 40KW Hybrid Combiner

25KW Harmonic Filter to Transmitter "B"

3½" Coax to Reject Load

80KW Dummy Load (Phantom Antenna)

FM-25/25KE 40KW Combiner

(Continued on page 34)
SPECIFICATIONS FM-25/25KE

ELECTRICAL

Frequency Range
68 to 108 MHz

Load Impedance
50 ohms; VSWR 1.5:1 max

Output Termination
3 1/2" or 6 1/2" EIA flange

Modulation Capability
±100 kHz

Audio Input Impedance
600 ohms balanced

Audio Input Level
-10 ± 2 dBu for 1000%, peak at 435 Hz

Audio Response
±1 dB, 50 to 3000 Hz

Audio Distortion
0.5% max, 50 to 500 Hz

FM Noise
-70 dB max

Power Line
208/204 Vac, 3 phase, 60 Hz

Power Factor
99

MECHANICAL

Overall Dimensions (excluding cabinets)
19"H x 17"W x 34"D

Net Weight
400 lbs (approx)

Operating Altitude
10,000 ft max

Operating Temperature
0° to 45° C

TUBE COMPLEMENT

2 ea 4CX100A
2 ea 30X1500A

Pricing and specifications subject to change without notice.

Basic System Block Diagram AEL FM-25/25KE

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The AFL Model FM-20E FM Exciter, nucleus of the AEL FM-25XE 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 AGC and FMO circuitry provides long term frequency stability. The modular construction of the AEL FM-20E permits the integration of a single rack mounted unit with the Power Supply and Metering Module, the Frequency Modulated Oscillator, the Monotone 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**: ±3° 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 the 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 excitors 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

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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.

MONORAL MODULE
The Monoral Module of the FM-20E exciter provides the necessary circuitry for driving the FM0 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 kHz
Power Output: 5.2 watts (cont. variable)
Load Impedance: 50 ohms
AFC: PhaseLocked Loop
Type of Modulation: Direct IV
Modulation Capability: ± 100 Hz minimum
Alpha: 0.606 (fast)
Temperature Range: -10 to 55°C
Overall Dimensions: 8 1/8" x 10" x 9 1/8" deep
Net Weight:
Standard module: 2.5 lbs.
Stereo module: 7.0 lbs.
SCA module: 5.0 lbs.

MONORAL OPERATION
Input Impedance: 350 ohms balanced
Input Level: 0 dBm ± 3 dB for 100% modulation
Frequency Response: 30 to 15,000 Hz ± 0.5 dB
Pre-Emphasis: Standard 75 µs with provision
to adjust
FM Noise: better than -70 dB
AC Noise: -55 dB
Distortion: 0.01% max. (I.M. & T.H.D)

STEREO OPERATION
Input Impedance: 600 ohms balanced
Input Level: 6 dBm ± 5 dB
Stereo Response: 50 to 15,000 Hz ± 1 dB
Stereo Pre-Emphasis: 75 µs with standard with provision
to adjust
Distortion: 0.01% max. (I.M. & T.H.D)
PD Noise: -51 dB
Stereo Pilot Stability: ± 1 Hz
Stereo Depression: ± 18 db 50-15,000 Hz

SCA SUB-CARRIER
Frequency Range: 30-1500 Hz
Frequency Stability: ± 100 Hz
Input Impedance: 50 ohms balanced
Input Level: -30 to +10 dBm adjustable
Mixing Ratio: C 5.5 seconds adjustable
FM Noise: -63 dB
Cross Talk: -45 dB

Prices and specifications subject to change without notice.