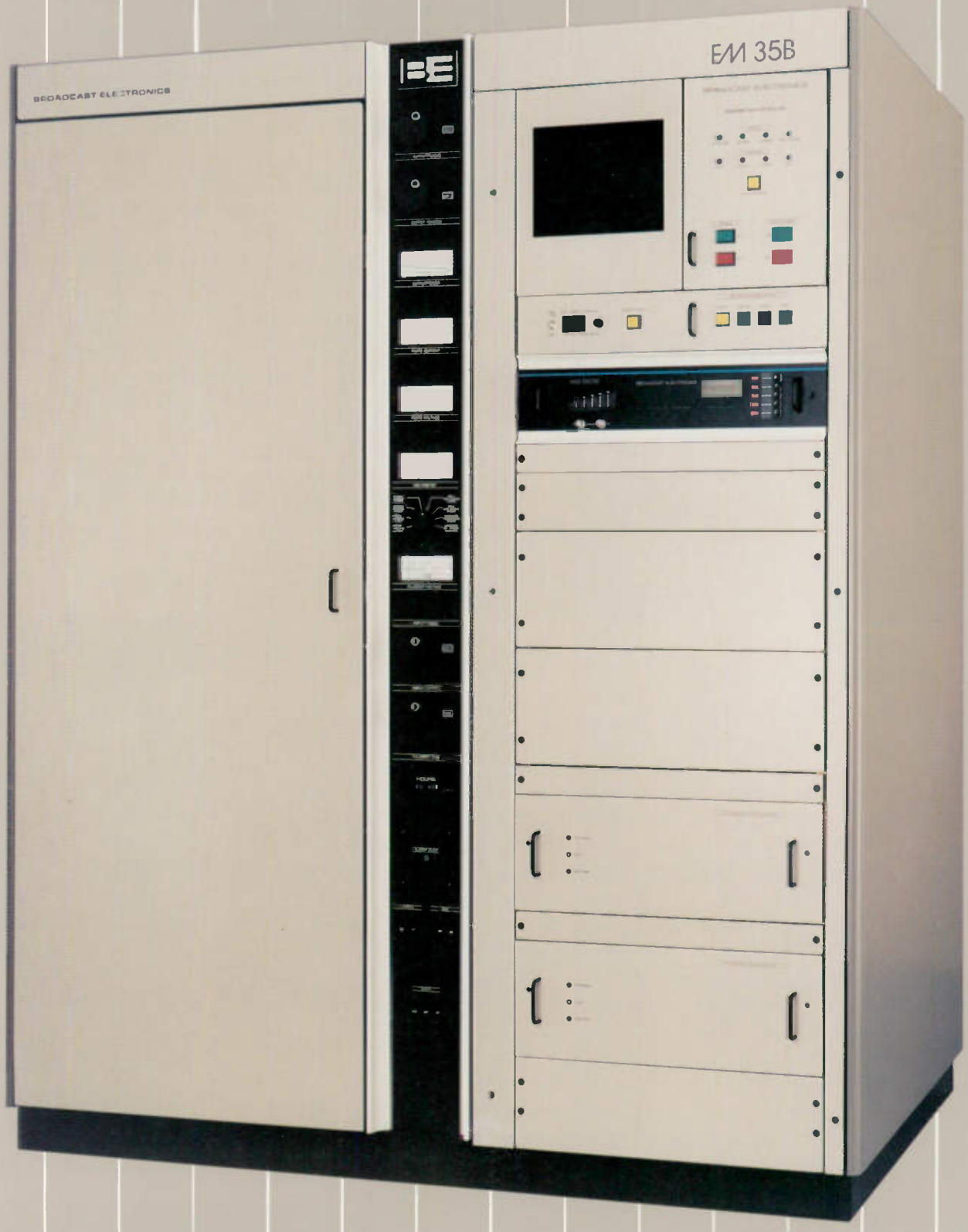
BROADCAST ELECTRONICS INC.

FM Transmitters



PRODUCT
INNOVATION
AND
RELIABILITY

FM Transmitters

Features and Benefits

- New FX-50 Exciter provides audio performance that rivals CD's.
- Single tube high-efficiency design.
- Patented folded half-wave output cavity eliminates plate blocker and sliding contacts.
- Automatic power control maintains constant RF output power.
- Proportional VSWR foldback and exclusive "soft start" reduces power supply stress and allows turn on into high VSWR loads.
- True emergency "by-pass" operation.
- Low noise, high efficiency air cooling system for long tube life.
- Complete remote control interface built-in.
- Extensive metering of PA parameters for ease of tuning and adjustment.
- Optional Microprocessor Video Diagnostic System (MVDS) and MVDS Remote Control available.

Outstanding Performance
Exceptional Reliability
Lower Cost of Ownership

Updated for the 1990's with the same solid and reliable amplifier design, Broadcast Electronics' new "B" Series FM transmitters include the new FX-50 FM Exciter for digital quality transmission. The FX-50 represents an order of magnitude advancement in audio performance over it's industry-standard predecessor the FX-30.

The new "B" Series FM transmitters are designed for the utmost reliability, superior performance and high AC to RF conversion efficiency. A low noise, high efficiency air cooling system used in all models of "B" Series FM transmitters provides positive cabinet pressurization to reduce heat and dust accumulation. All major sub-assemblies including the IPA are manufactured by Broadcast Electronics to insure the highest quality control standards and less expensive replacement parts. It all adds up to the most cost effective FM transmitter on the market today, with the highest level of performance available from today's technology.

The folded half-wave output cavity developed and patented by B/E in 1980.

Folded Half-Wave Output Cavity
The new "B" Series FM transmitters use only a single tube to obtain their rated output power. The patented, folded half-wave cavity design, completely eliminates troublesome and unreliable DC plate blocking capacitors and all sliding RF contacts. Changing the power tube is easy because B/E's broadband screen neutralizing technique eliminates the need to make neutralization readjustment even when the final tube is changed. All PA adjustments are made through smooth operating front panel controls, equipped with counters.

Built-in Precision Envelope Detector
All single tube "B" Series FM transmitters of 1KW and higher power also include a built-in precision envelope detector to make measurement of synchronous AM noise easy and convenient. The only additional equipment required is a readily available oscilloscope or audio voltmeter and an audio oscillator. Adjustment of the transmitter for minimum synchronous AM noise can even be done while on-the-air with program audio.

Automatic Power Control
An automatic power control system (APC) used in all one tube transmitters maintains constant RF output power within 2% of the operator setting, if fluctuations occur in incoming AC line voltage, RF drive level, or antenna impedance. The sophisticated proportional feedback system corrects power variations without overshoot.

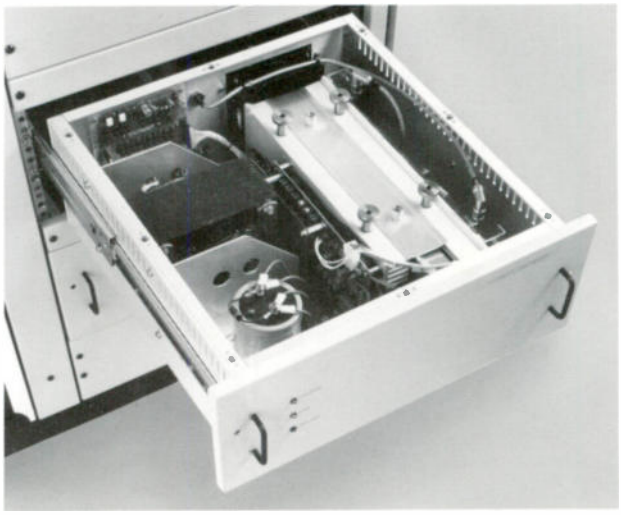
Proportional VSWR Foldback
The first to offer proportional VSWR foldback in FM transmitters, this innovative feature is included in the "B" Series. In cases of gradual changes in load conditions, such as ice build up on the antenna, the proportional VSWR foldback systems protects the PA by automatically reducing output power to a safe operating level.

A "soft start" circuit is used to gradually increase power to allow the transmitter to come up to a safe operating level under high VSWR conditions.

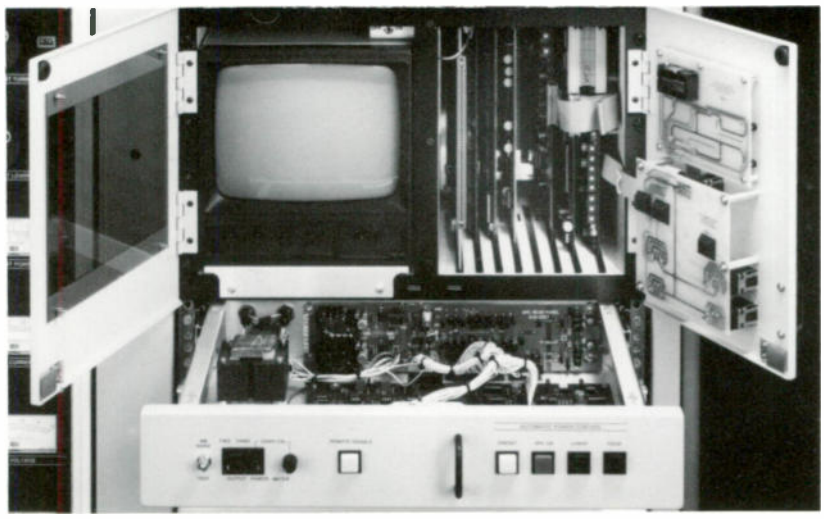
Advanced Transmitter Controller
The standard transmitter controller in the "B" Series FM transmitter features automatic overload recycling and AC Restart, "step start" and provides direct interfacing to all modern remote control systems. The transmitter controller is designed to accommodate BE's exclusive optional MVDS (Microprocessor Video Diagnostic System).

Broadband Solid State IPA
The intermediate power RF amplifier, used in all "B" Series transmitters is a solid state, broadband, 250 watt amplifier. The IPA stage requires no tuning or adjustment and is mounted on slides for easy access. The IPA is equipped with proportional VSWR foldback protection and is open and short circuit protected. In addition, circuits in the IPA Control Regulator protect the RF amplifier from excessive heat, current, and voltage by automatically reducing power to a safe operating level.

In high power "B" Series transmitters two solid state IPA's, operating in parallel, are used to provide RF drive power to the final amplifier. Each IPA drawer contains its own power supply and air cooling system, making it capable of operating as a stand alone 250 watt transmitter. In addition, if one IPA fails, the other continues to operate. The exciter can be fed directly to the operating IPA or the final amplifier. This "flexible patching" capability first offered by Broadcast Electronics in the FM-30 when introduced in 1981, allows bypassing of inoperative stages in order to stay on the air at the highest possible operating power level.



The B/E manufactured 250 watt IPA drawers are self contained with their own power supply and cooling system in an easy access, slide out drawer.



Transmitter Controller (shown with optional MVDS) and modular Automatic Power Control drawer pictured in the B/E FM-10B.

FM Transmitters

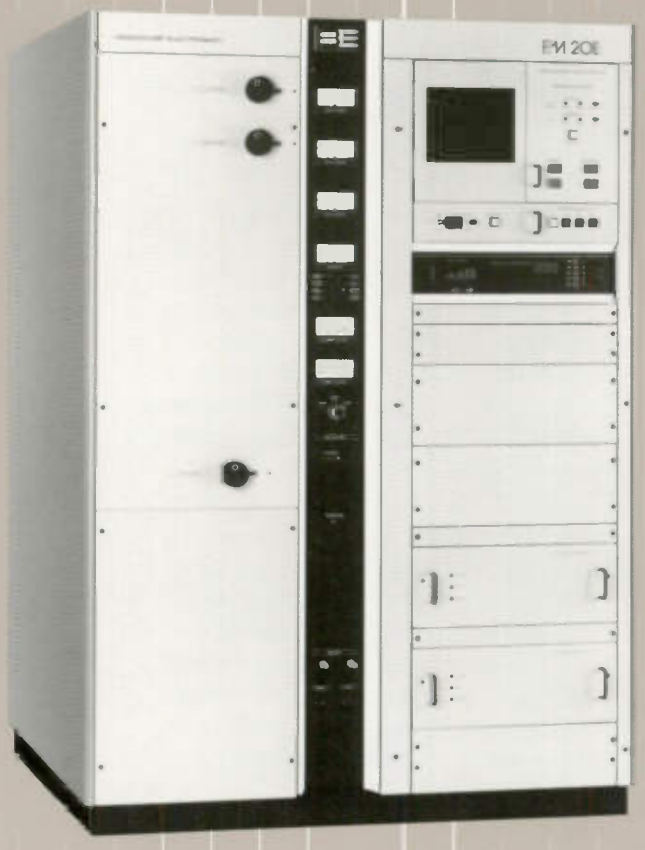
FM-35B, 35 kW FM Transmitter

This ultra quiet model FM-35B Transmitter uses a single high gain Eimac 4CX20000C tetrode tube to produce 10 kW to 38.5 kW of RF power. The 4CX20000C features the highest emission capability and the largest physical size of any tube in the Eimac 20,000 family. This means longer power tube operating life and better overall durability in the FM-35B. In addition, the high plate efficiency of the 4CX20000C tube at the 35 kW output level results in very low power consumption and reduces the overall cost of operation and maintenance. The FM-35B operates from 208/240 volt Delta or WYE, three phase 60 Hz or from a 380/415 volt, 3 phase, 50 Hz power source as specified.

FM-30B, 30 kW FM Transmitter

The FM-30B uses a single high gain Eimac 4CX20,000A tetrode tube to produce 7.5 kW to 30 kW of RF power. This proven tube has been used in 30 kW FM transmitters since 1980. Its reliability, long life and consistent performance has been proven in hundreds of installations worldwide. In addition, the high plate efficiency at the 30 kW output level results in surprisingly low power consumption. This efficiency, combined with the exclusive B/E grid and cavity design, results in long life, reliability, and easy maintenance. Like its predecessor, the FM-30B incorporates an ultra quiet cooling system. Operates from 208/240 volt Delta or WYE, three phase 60 Hz. The transmitter is available for operation from 380/415 volt, 50 Hz, 3 phase power systems when required.

FM Transmitters



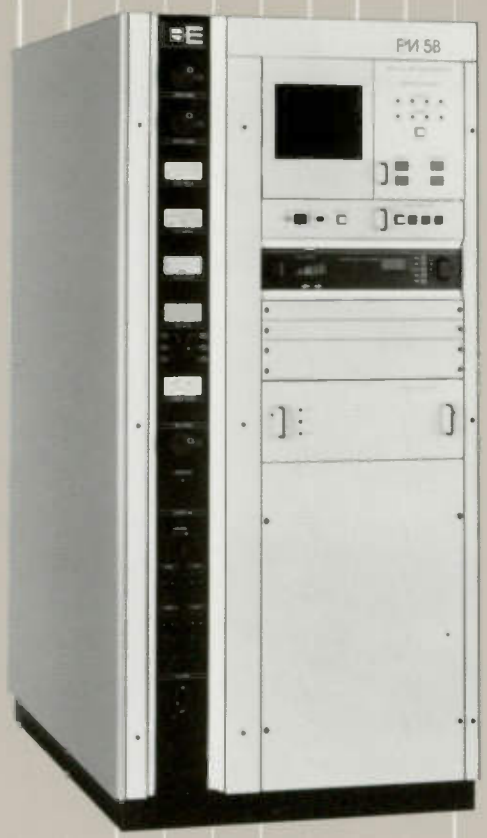
FM-20B, 20 kW FM Transmitter

A single high gain Eimac 4CX12,000A/8989 tetrode tube is used in the FM-20B to produce 7.5 kW to 22 kW of RF power. This innovative single tube design yields a phenomenal 80% PA efficiency to reduce operating costs by lowering power consumption. It also provides higher gain than other tubes used in this power class. Optimum bandwidth is achieved with BE's patented broadband input matching network and a simplified grid circuit design. A hinged meter panel allows easy access and maintenance. As in all "B" Series transmitters, the intermediate stages in the FM-20B are 50 ohm impedance and can be patched and bypassed as necessary for emergency operation capability. Operates from 208/240 volt Delta or WYE, three phase 60 Hz or from a 380/415 volt, 50 Hz, 3 phase power source as specified.

FM-10B, 10 kW FM Transmitter

The Eimac 4CX7500A tetrode, was pioneered in a 10 kW FM broadcast transmitter by Broadcast Electronics. The tube is so well suited to 10 kW FM service that is has become the new industry standard. RF output power is 4950 watts to 11 kW. High plate efficiency when used with B/E's patented cavity, broadband input circuit, and IPA designs, results in low power consumption and long life. Operates from 208/240 volt Delta or WYE, three phase 60 Hz. A 50 Hz power supply configuration is also available.

FM Transmitters



FM-5B, 5 kW FM Transmitter

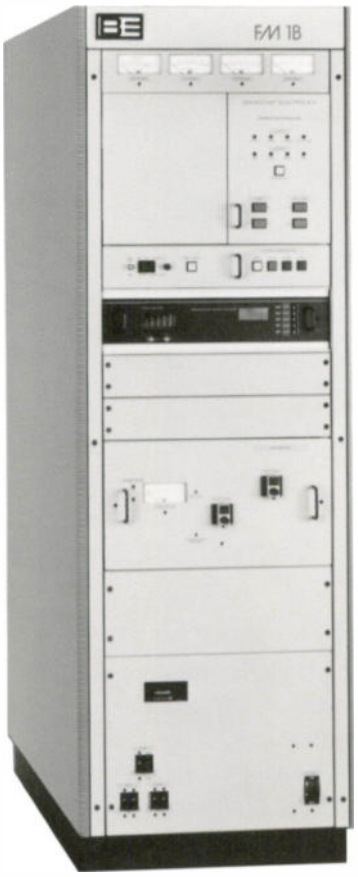
Broadcast Electronics pioneered the use of the Eimac 4CX3500A for 5kW broadcast service. This tube was developed by Eimac to meet the high performance requirements of Broadcast Electronics and has now become an industry standard. The single Eimac 4CX3500A tetrode provides 2500 watts to 5500 watts of RF power in the FM-5B and has lower operating and replacement costs than other tetrodes with similar power capability. The final power amplifier utilizes BE's patented folded half-wave cavity and broadband input matching circuit. The entire transmitter is contained in a single low profile cabinet with easy access to all components. Operates from 208/240 volt Delta or WYE, three phase 50/60 Hz or 208/240 volt single phase 50/60 Hz.

FM-3.5B, 3.5 kW FM Transmitter

Using the same Eimac 4CX3500A tetrode used in the FM-5B, the FM3.5B is very conservatively rated, providing 1500 watts to 3800 watts of RF power. The final power amplifier utilizes BE's patented folded half-wave cavity and broadband input matching circuit. Indeed, like the rest of the "B" line, the FM-3.5B is designed for the greatest reliability and overall low cost of operation. Operates from 208/240 volt single phase 50/60 Hz.

FM-1.5B, 1.5 kW FM Transmitter

Designed for operation from 500 to 1650 watts, the FM-1.5B uses a single Eimac 3CX1500A7/8877 triode to provide more than 1.5 kW of RF power. Operating in a high gain configuration, the tube is conservatively operated at less than one half of its rated plate dissipation. Operates from 208/240 volt single phase 50/60 Hz. The FM-1.5B and larger transmitters use the B/E manufactured IPA's with their self-contained power supply and cooling system.



FM-1B, 1 kW FM Transmitter

The FM-1B uses the same Eimac 3CX1500A7/8877 triode used in the FM-1.5B to produce more than 1 kW of power and is designed for applications requiring 250 to 1100 watts of RF power. The PA is driven directly by the exciter. Operates from 208/240 volt single phase 50/60 Hz. The FM-1B and larger transmitters use the same controller and companion automatic power control and the new revolutionary FM exciter, the 50 watt FX-50, for outstanding audio performance.

FM-300B - FM-250B - FM-100B, Very Low Power FM Transmitters

The "B" Series also includes three models of 100% solid state low power FM transmitters: the FM-100B, FM-250B, and FM-300B.

The FM-300B delivers 90 watts to 400 watts of RF power by combining dual solid state wide band power amplifiers driven by the FX-50 exciter. The FM-250B transmitter delivers 90 watts to 250 watts of RF power through a single solid state power amplifier driven by the FX-50 exciter and the FM-100B using the same configuration provides a very conservatively rated 50 watts to 125 watts of RF power.

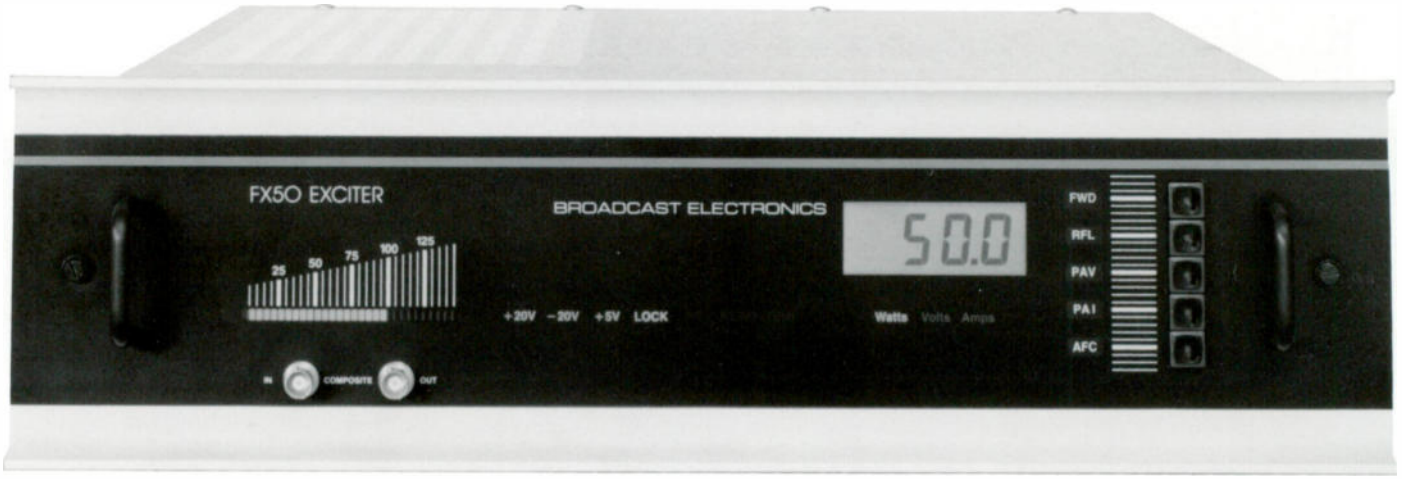
A built-in low pass filter insures harmonic free operation. Compact and self-contained, all three models share the "B" Series' pull out drawer construction for easy maintenance. Operates from 194/266 volt single phase 50/60 Hz.

FM-300B M/A - FM-250B M/A - FM-100B M/A, Main/Alternate Main FM Transmitters

In addition to single transmitter low power units BE also manufactures Main/Alternate Main FM transmitters. The model FM-250B M/A is shown at the left.

The M/A is composed of two all solid state transmitters and is designed to be a fully redundant main/alternate main configuration for continuous operation on one specific frequency in the FM broadcast band. The system consists of either two complete FM-300B, FM-250B, or FM-100B transmitters in a single cabinet. The built-in 500 watt test load allows for testing of the alternate transmitter. Operates from 194/266 volt single phase 50/60 Hz.

FM Exciter and Accessories



Digital Quality Transmission With New FX-50 Exciter

THD and IMD 0.003%, 93 dB S/N, 50 Watts

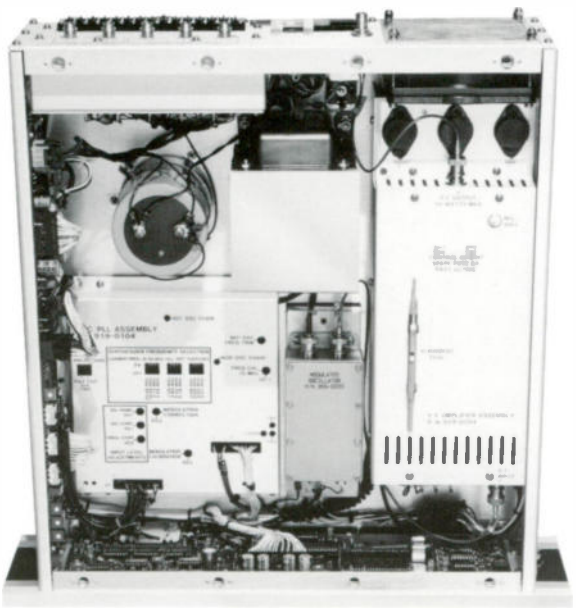
The FX-50 represents an order of magnitude advancement in audio performance over it's industry-standard predecessor the FX-30. This new FX-50 design is already field proven. On air in continuous use since the summer of 1988 assures the benefits of the new technology without taking any chances on performance or reliability. Performance specifications feature a dynamic range that rivals CD players with harmonic and intermodulation distortion so low that they are almost unmeasurable. For the FX-50 the typical FM signal-to-noise ratio is 93 dB and THD and IMD are typically 0.003%! Transient Intermodulation Distortion is less than 0.01%.

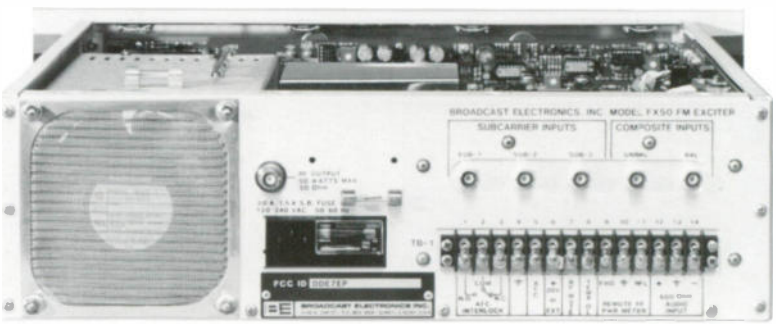
Advanced Linear Modulated Oscillator

A key feature of the FX-30 is the exclusive computer-designed linear modulated oscillator. Its unique resonator with hyper abrupt tuning diodes provides lower distortion, extremely flat response and excellent signal to noise performance. The dual speed phase locked loop synthesizer contributes to the superb transient and low frequency response. It also allows the FX-50 to achieve lock from a cold start in less than five seconds with full modulation capability from less than 0.1 Hz to more than 150 kHz.

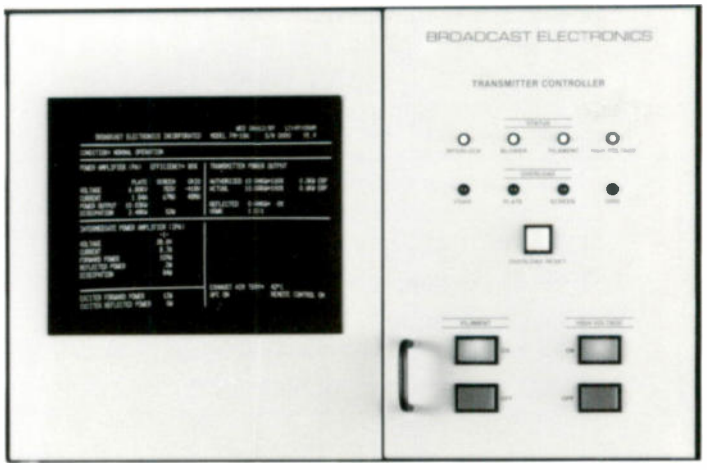
High Power MOSFET Amplifier

Using the latest solid state technology, the FX-50's broadband RF power amplifier uses a 60 watt MOSFET for higher power output and improved amplifier reliability. Monitoring of important operating parameters is displayed by a combination of a digital LCD multimeter and LED annunciator panel. In addition, the multimeter may be used as a high impedance voltmeter for point-by-point measurements within the exciter using the built-in test probe.





Rear View FX-50 Exciter



Microprocessor Video Diagnostic System (MVDS)

The optional Microprocessor Video Diagnostic System adds a new dimension of operational monitoring and control to any "B" series FM transmitter. MVDS provides a visual display of all critical transmitter parameters in either a tabular chart or bar graph form for easy transmitter analysis and adjustment. In addition, the MVDS can print "hard-copy" logs on demand, or automatically at regular intervals on an inexpensive computer printer (not supplied).

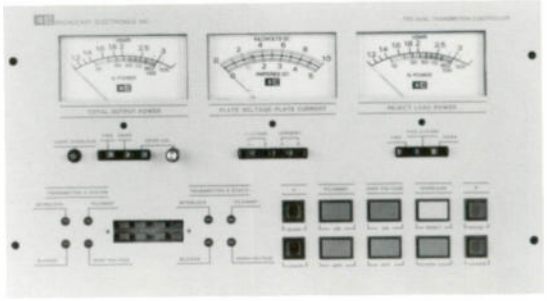
MVDS's plain english diagnostics will display the nature and the location of any malfunction. The MVDS is available for use with all one tube low power and high power BE FM transmitters. An optional MVDS Transmitter Remote Control package is also available.

FS-30 Digital Stereo Generator

The optional FS-30's digital modulator and digital pilot generator offer absolute pilot phase stability without adjustment or PLL. Troublesome distortion products are eliminated for a virtually perfect baseband that is an order of magnitude better than previous standards. Stereo separation is 60 dB. FM noise is 85 dB below 100% modulation. THD and IMD are 0.03% or less, and the field proven FS-30 was the first to specify TIM of 0.1% or less.

FC-30 SCA Generator

The optional FC-30 SCA Generator guarantees low FM noise and high operational stability. Distortion is minimized with it's modulated oscillator and the use of an output low pass filter rather than a distortion producing bandpass filter. Quality features include a DC coupled data input, internal data/audio low pass filter, extensive RFI filtering, LED peak modulation indicator, and convenient front panel test jack. The controlled subcarrier decay muting of the FC-30 eliminates squelch noise in today's SCA receivers.



Transmitter Accessories

Broadcast Electronics also manufactures accessory automatic and dual transmitter controllers for dual-combined or main alternate operations. These include:

FD-2, Dual Transmitter Controller—completely monitors and controls two combined Broadcast Electronics FM transmitters from one convenient panel. The FD-2 can raise and lower the output power of two transmitters together or separately. Complete output monitoring is included with combined output VSWR protection for both transmitters. Independent phase adjustment is provided to eliminate tuning compromises, simplify adjustment and provide stable operation.

FW-30 Automatic Exciter Switcher—offers the ultimate in transmitter system redundancy. It continuously monitors the status of the on-air FM exciter and will quickly switch to the hot-standby unit if a failure is detected.

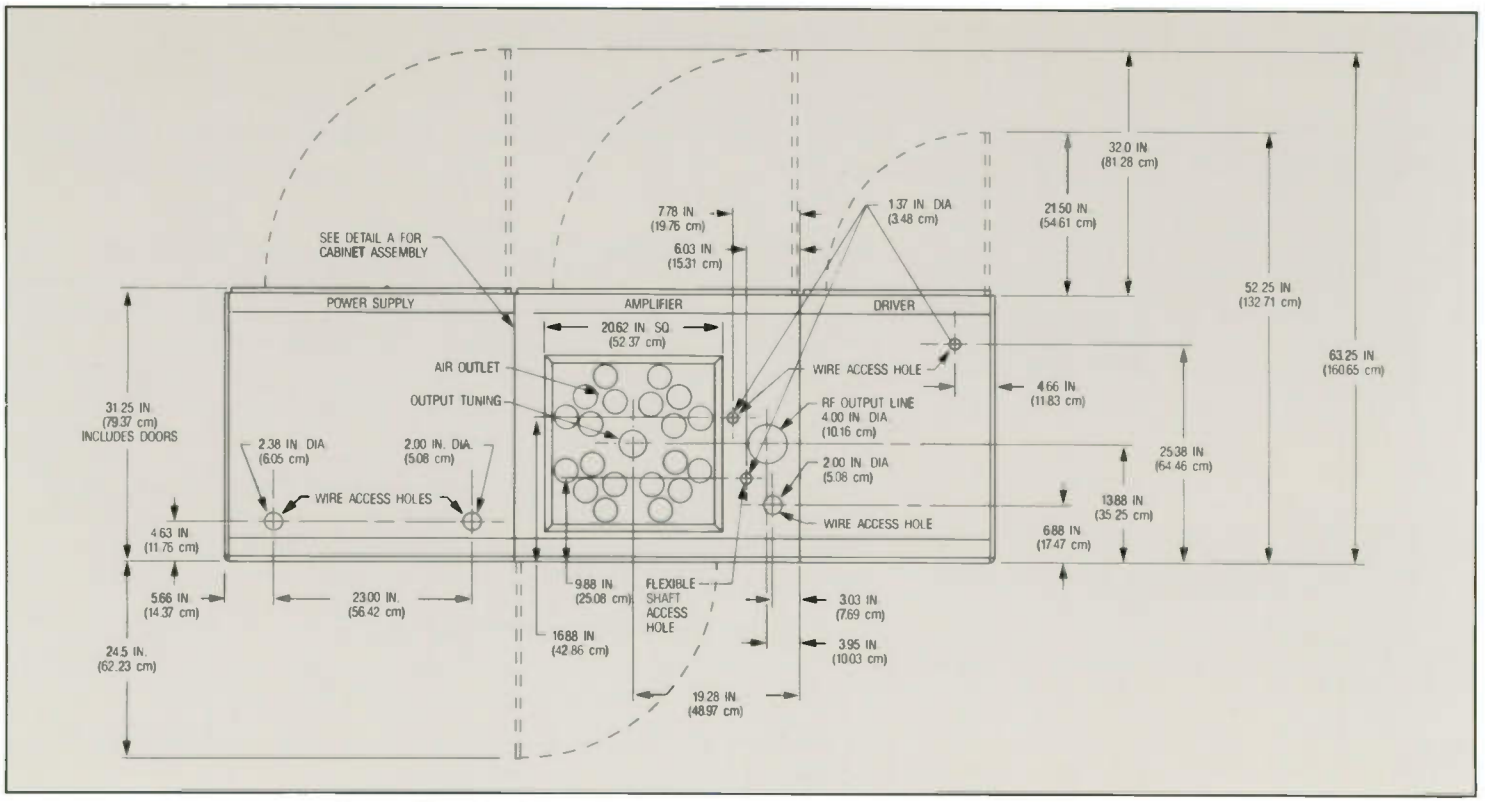
FO-2 Transmitter Output Switcher—when used with the FD-2 Dual Transmitter Controller, provides automatic or manual RF output switching through the use of motorized coaxial switches (not supplied).

FA-2 Transmitter Output Switcher—is stand-alone version of the FO-2 for Main/Alternate Transmitter installations.

FM Transmitters

Installation And Shipping

MODEL	TYPE NOTIFIED POWER RANGE	FCC IDENTIFIER	SIZE
FM-35B	10 to 38.5 kW	DDE7EPTX-FM35B	Main Cabinet 56.37″W × 31.25″D × 69.81″H HV Power Supply 34.31″W × 31.25″D × 69.81″H
FM-30B	7.5 to 30 kW	DDE7EPTX-FM30B	Main Cabinet 56.37″W × 31.25″D × 69.81″H HV Power Supply 34.31″W × 31.25″D × 69.81″H
FM-20B	7.5 to 22 kW	DDE7EPTX-FM20B	Main Cabinet 50.37″W × 31.25″D × 69.81″H HV Power Supply 28.31″W × 31.25″D × 69.81″H
FM-10B	4.95 to 11 kW	DDE7EPTX-FM10B	Main Cabinet 34.31″W × 37.25″D × 69.81″H HV Power Supply 23.31″W × 37.25″D × 69.81″H
FM-5B	2.5 to 5.5 kW	DDE7EPTX-FM5B	Main Cabinet 34.31″W × 37.25″D × 69.81″H
FM-5BS	2.5 to 5.5 kW	DDE7EPTX-FM5BS	Main Cabinet 34.31″W × 37.25″D × 69.81″H
FM-3.5B	1.5 to 3.8 kW	DDE7EPTX-FM3.5B	Main Cabinet 34.31″W × 37.22″D × 69.81″H
FM-1.5B	500 to 1.65 kW	DDE7EPTX-FM1.5B	Main Cabinet 23.31″W × 31.25″D × 69.81″H
FM-1B	250 to 1100 W	DDE7EPTX-FM1B	Main Cabinet 23.31″W × 31.25″D × 69.81″H
FM-300B	90 to 400 W	DDE7EPTX-FM300B	Main Cabinet 23.31″W × 31.25″D × 50.56″H
FM-250B	90 to 250 W	DDE7EPTX-FM250B	Main Cabinet 23.31″W × 31.25″D × 36.56″H
FM-100B	50 to 125 W	DDE7EPTX-FM100B	Main Cabinet 23.31″W × 31.25″D × 36.56″H
FX-50	3 to 50 W	DDE7EPTX-FX50	Rack Mount - 19″W × 17.7″D × 5.25″H
FS-30			Rack Mount - 19″W × 16.5″D × 3.5″H
FC-30			Rack Mount - 19″W × 9″D × 1.75″H

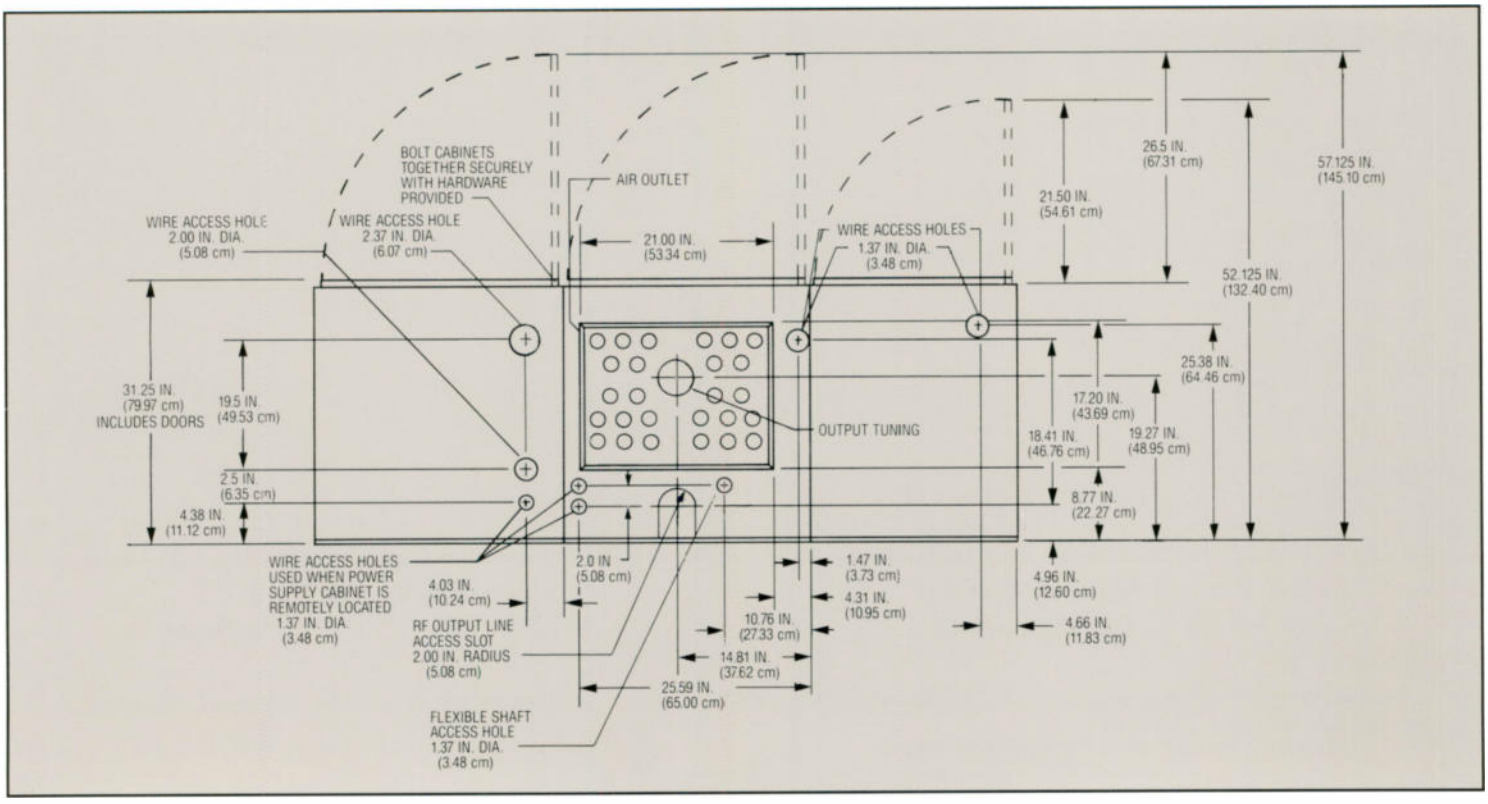


Floor Plan for FM 30B, 30 kW and FM 35B, 35 kW Transmitters

Information

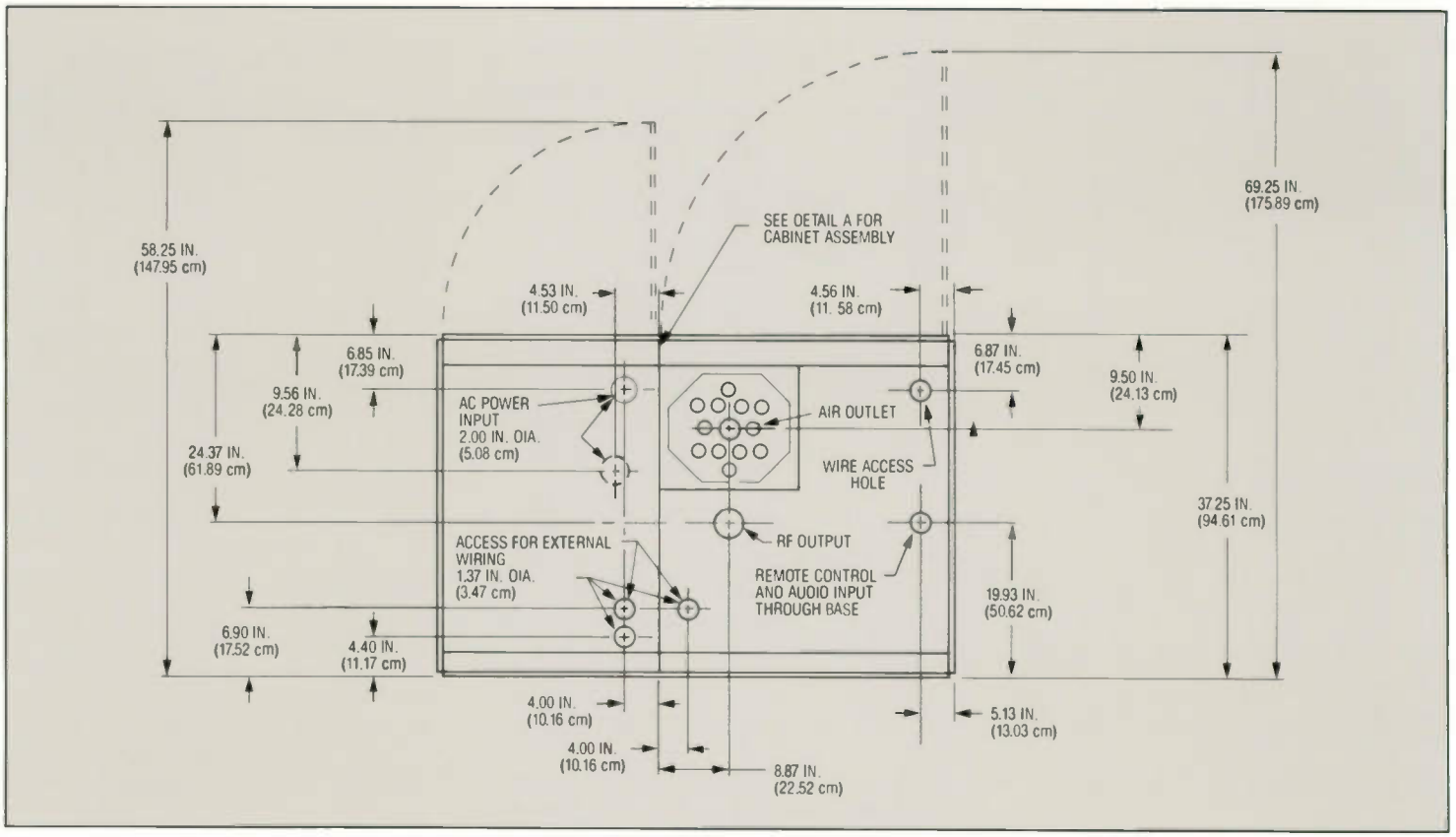
NET WEIGHT	RF OUTPUT*	AC INPUT**	AC POWER CONSUMPTION
Main Cabinet 1500 lbs HV Power Supply 1850 lbs	3-1/8" EIA	196 to 252 VAC, 50/60 Hz, three phase	51 kW (0.94 pf)
Main Cabinet 1500 lbs HV Power Supply 1750 lbs	3-1/8" EIA	196 to 252 VAC, 50/60 Hz, three phase	44 kW (0.94 pf)
Main Cabinet 1200 lbs HV Power Supply 1500 lbs	3-1/8" EIA	196 to 252 VAC, 50/60 Hz, three phase	30 kW (0.97 pf)
Main Cabinet 800 lbs HV Power Supply 1000 lbs	3-1/8" EIA	196 to 252 VAC, 50/60 Hz, three phase	15.8 kW (0.94 pf)
Main Cabinet 1000 lbs	1-5/8" EIA	196 to 252 VAC, 50/60 Hz, three phase	8.3 kW (0.92 pf)
Main Cabinet 1100 lbs	1-5/8" EIA	196 to 252 VAC, 50/60 Hz, single phase	9.6 kW (0.98 pf)
Main Cabinet 1050 lbs	1-5/8" EIA	196 to 252 VAC, 50/60 Hz, single phase	6.5 kW (0.92 pf)
Main Cabinet 800 lbs	7/8" EIA	196 to 252 VAC, 50/60 Hz, single phase	3 kW (0.9 pf)
Main Cabinet 760 lbs	7/8" EIA	196 to 252 VAC, 50/60 Hz, single phase	2.2 kW (0.99 pf)
Main Cabinet 275 lbs	Type "N"	196 to 266 VAC, 50/60 Hz, single phase	1200 watts
Main Cabinet 225 lbs	Type "N"	196 to 266 VAC, 50/60 Hz, single phase	830 watts
Main Cabinet 225 lbs	Type "N"	196 to 266 VAC, 50/60 Hz, single phase	524 watts
38 lbs	BNC	97 to 133 VAC or 194 to 266 VAC, 50/60 Hz.	200 watts
17 lbs	BNC	97 to 133 VAC or 194 to 266 VAC, 50/60 Hz.	24 watts
4.5 lbs	BNC	97 to 133 VAC or 194 to 266 VAC, 50/60 Hz.	7 watts

*Female **Other Voltages and Frequencies available upon request.

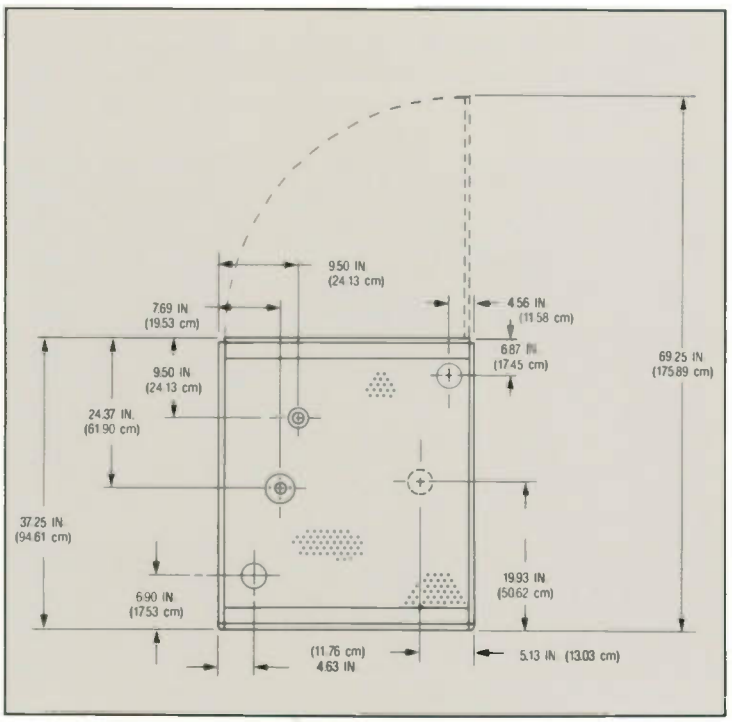


Floor Plan for FM 20B, 20 kW Transmitter

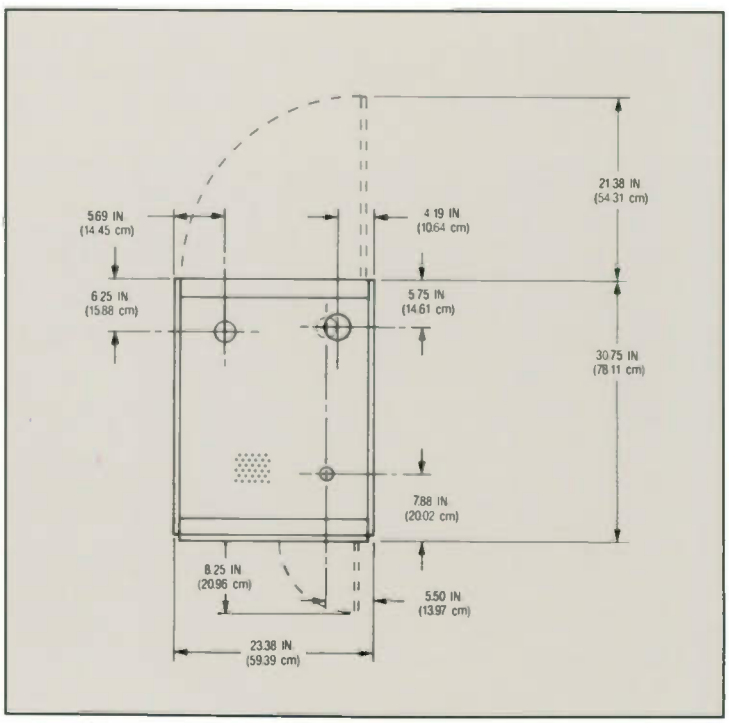
FM Transmitters



Floor Plan for FM 10B, 10 kW Transmitter



Floor Plan for FM 3.5B, 3.5 kW and FM 5B, 5 kW Transmitters



Floor Plan for FM 1B, 1 kW and FM 1.5B, 1.5 kW Transmitters

Please contact Bill Harland or Russ Erickson at (217) 224-9600 for a detailed brochure on any model of interest.

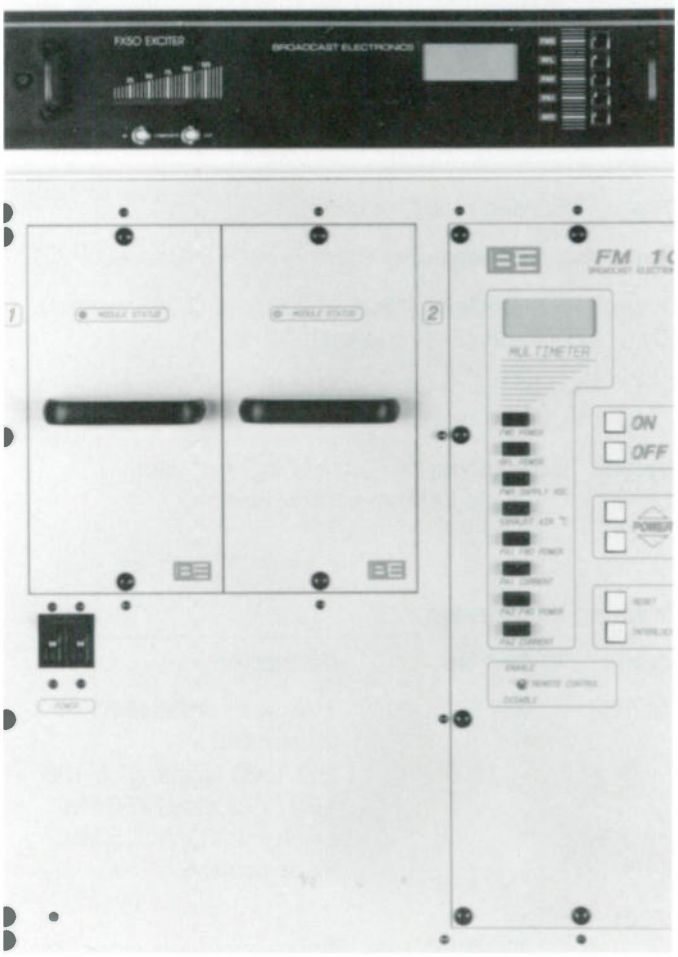
BROADCAST ELECTRONICS INC.

4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305-3606 U.S.A., PHONE (217) 224-9600, TELEX 250142, FAX (217) 224-9607

BROADCAST ELECTRONICS

FM1C

1 kW Solid State FM Stereo Transmitter



Broadcast Electronics' FM-1C is the first of the next generation of solid state FM transmitters. It employs B/E's industry acclaimed FX50 Exciter, delivering unmatched audio performance and offering a dynamic range rivaling that of a CD player. A dual configuration is available for the ultimate in reliability.

Features/Benefits

- Broadband FX50 Exciter incorporates a digitally programmed synthesizer and displays operational parameters on a digital LCD multimeter and LED status panel.
- Reliable, Solid State Design.
- Replaceable, pleated air filter.
- 2 RF power modules provide for soft failure.
- Broadband design means no tuning adjustments.
- Internal Low Pass filter.
- Reliable CMOS Controller.
- Compact and easy to install, rack mounted.
- RF Power Modules are self protected.
- Integral Reject Load.
- Two Year Warranty.
- Meets IEC-215 Safety Requirements.
- Optional unity power factor correction available to meet IEC 555-2.

®
BROADCAST ELECTRONICS INC.
4100 N. 24th St.
P.O. Box 3606
Quincy, IL 62305-3606

FM1C SPECIFICATIONS

Power Output: 1000 watts to 250 watts capability.

RF Output Load Impedance: 50 ohms.

Output Connector: "N" type.

Load VSWR: 1.2:1 without output matching. Open and short circuit protected.

Harmonic and Spurious Suppression: Meets or exceeds FCC, DOC and CCIR requirements when preceded by external NRSC compatible audio low pass filter(s).

Frequency Range: 87.5 MHz to 108 MHz, tuned to specific operating frequency. Exciter programmable in 10 kHz steps.

Frequency Stability: +300 Hz, 0 to 50° C.

Type of Modulation: Direct frequency modulation of carrier frequency.

Modulation Capability: Greater than +350 kHz.

Pre-emphasis: FCC 75 uS, CCIR 50 uS (where specified), 25 uS (Dolby) or flat response, selectable.

Asynchronous AM Signal to Noise Ratio: 55 dB below reference carrier with 100% AM modulation at 400 Hz, 75 uS de-emphasis (no FM modulation present).

Synchronous AM Signal to Noise Ratio: 50 dB below 1 kW reference carrier at 100% AM modulation at 400 Hz, 75 uS de-emphasis (with FM modulation +75 kHz at 400 Hz).

Audio Input Impedance: 600 ohms.

Audio Input Level (Mono): +10 dBm for +75 kHz deviation at 400 Hz.

Audio Input Level (Stereo): +10 dBm for 100% modulation at 400 Hz.

Audio Frequency Response (Mono): +0.5 dB, from 30 Hz to 15 kHz, selectable flat, 25, 50, 75 uS pre-emphasis.

Audio Frequency Response (Stereo): +0.5 dB, from 30 Hz to 15 kHz, 75 uS pre-emphasis (flat, 25, or 50, uS pre-emphasis selectable).

SMPTE Intermodulation Distortion (Mono): Less than 0.02% from 60 Hz to 7 kHz, 4:1 ratio.

SMPTE Intermodulation Distortion (Stereo): Less than 0.05% from 60 Hz to 7 kHz, 4:1 ratio.

Stereo Separation: 50 dB or better, 30 Hz to 15 kHz.

Noise (Mono): 85 dB below +75 kHz deviation at 400 Hz measured in a 20 Hz to 30 kHz bandwidth with 75 uS de-emphasis.

Noise (Stereo): -82 dB or better below 100% modulation at 400 Hz with 75 uS de-emphasis.

AC Input Voltage: 196 to 252 VAC, 50/60 Hz, single phase.

Overall Efficiency: 45% or better.

Operating Temperature: +32 to +122° F (0 to +50° C).

Operating Altitude (AMSL): 10,000 feet (3048 meters), 60 Hz; 7,500 feet (2286 meters), 50 Hz.

Size: 19 in (48.3 cm) wide x 22 in (55.9 cm) deep x 21 in (53.3 cm) high.

Weight: 103 lb (45 kg); 170 lb (77 kg) packed. (Does not include FX50 exciter weight)

Ordering Information

Model	Part No.	Decription
FM-1C	909-1001-204	1 kw solid state FM transmitter, 250-1000 watts, 87.5-108 MHz. Includes FX50 FM Exciter, 220 VAC, 50/60 Hz operation
*Rack Option		
	809-2200	Single rack, less sides, 35 rack unit
	809-2201	Side panel and trim set

*Other rack options are available.

Specifications subject to change without notice.

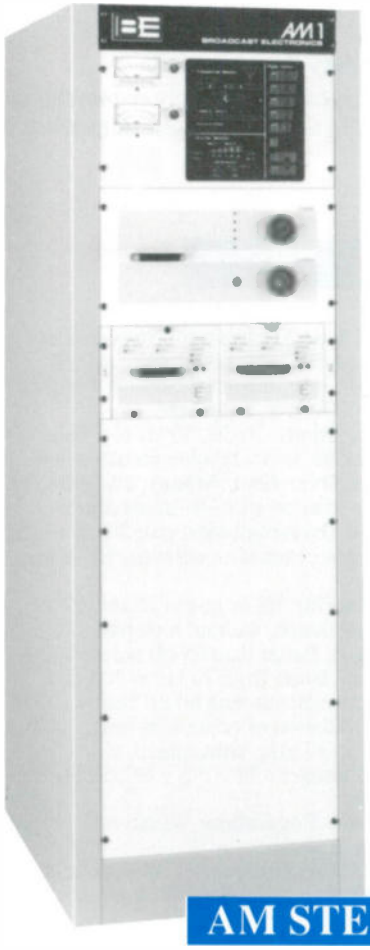
Broadcast Electronics... Recognized Leader in Radio Broadcast Technology.

BROADCAST ELECTRONICS INC.
4100 N. 24th St., P.O. Box 3606, Quincy, IL 62305-3606
Phone: (217) 224-9600, Telex: 250142, Fax: (217) 224-9607

Printed in U. S. A.

BROADCAST ELECTRONICS INC.

AM1 ONE KILOWATT SOLID STATE AM TRANSMITTER



Features/Benefits

- C-QUAM™ AM Stereo built-in, AM Stereo at no additional cost.
- High efficiency Class E (patented) operated power modules; plus high efficiency switching power supply provide for low power consumption and cool operation.
- Five (5) separate power levels accommodate any AM station license's requirement.
- Hot pluggable power modules provide rugged reliability and withstand abuse.
- "Star" Combiner network provides for uninterrupted operation, with minimal power reduction, without the use of dummy modules.
- Exclusive VSWR detection and foldback circuit reduces listener annoying carrier interruptions from nearby weather disturbances.
- Built-in output matching network.
- Rugged single cabinet construction.
- Meets or exceeds IEC-215 safety requirements.

AM STEREO AT NO EXTRA COST

The AM-1 is the first C-QUAM™ AM Stereo transmitter. Until now, AM Stereo required the purchase of a C-QUAM exciter, costing more than $5,000 and an expensive installation service call. The AM-1 includes the AM Stereo Exciter built-in, eliminating the need for a field installation by specially trained personnel.

The AM-1 includes two (2) sets of antenna equalization, which can be switched by remote control and includes remote switching of mono/stereo modes.

Class E (patented) Power Modules

The AM-1's unique Class E mode of operation provides high efficiency and low electric power bills. The 100% solid state design, utilizes power MOSFET's housed in two identical power modules. The Class E power modules are so rugged and reliable, they can even be removed while the transmitter is operating. This "hot pluggable" module design is unique to the AM-1.

"Star" Combining Network

The "Star" combiner used in the AM-1 offers the benefit of allowing continued operation, at reduced power, without the substitution of "dummy" or "bypass" power modules. In the event of a power module failure or even if it's just removed for any reason at all, the AM-1 continues to operate without carrier interruption.

Switching Power Supply

The high efficiency switch mode power supply of the AM-1 provides for lower power consumption than is possible with other designs. This also allows power switching to lower output levels to be accomplished by reducing the power supply's DC voltage level, rather than by adjusting the modulator's duty cycle. This means that the AM-1's audio specifications do not degrade as dramatically during reduced power operation, as other AM transmitters. The power supply also provides for "soft start" to reduce stress on the power module active devices.

The AM-1's power supply design also accommodates either 50 Hz or 60 Hz AC power without component changes.

Controller

The AM-1 Controller is a low power consumption CMOS design that directly interfaces to all popular remote control systems. The controller provides all the metering required for tuning the transmitter into the antenna system and also includes an LED status and RF flow chart to allow an operator to quickly identify problems.

The controller includes an exclusive VSWR and lightning detector which prevents the AM-1's foldback circuit from being activated by nearby weather disturbances, while still properly protecting the transmitter against direct lightning strikes. The AM-1 has provisions for five (5) operating power levels and includes antenna conflict monitoring to protect the antenna and phasing system.

Meets IEC Safety Requirements

The AM-1 meets all the safety requirements of IEC-215 and is housed in a rugged, single, attractively styled, 23" wide cabinet.

AM1 Specifications

Power Output: 1100 watts to 100 watts capability. Five (5) Preset Power levels available by local or remote control.
RF Output Load Impedance: 50 ohms, unbalanced. Matching network to optimize VSWR of 1.5:1 at any phase angle at carrier frequency.
Output Connector: Clamp and Lug type, accommodates 1/2 inch or 7/8 inch transmission line.
Load VSWR: 1.5:1 at full carrier power, high VSWR at lower output power. Open and short circuit protected.
Harmonic And Spurious Suppression: Meets or exceeds FCC, DOC, and CCIR requirements, when preceded by external NRSC compatible audio low pass filter(s).
Carrier Frequency Range: 522 kHz to 1705 kHz. Supplied on one frequency (synthesized), as ordered. Accommodates 9 kHz or 10 kHz channel spacing (9 kHz requires an optional crystal).
Carrier Frequency Stability: +/-5ppm, 0 to 50 degrees, C.
Carrier Shift: Less than 2% at 95% negative modulation at 1 kHz.
Type Of Modulation: Pulse Width Modulation of envelope with integrated C-QUAM™ AM Stereo.
Modulation Capability: Greater than 125% peak positive capability.
Audio Input Level: +10 dBm, +/-1 dB, L=R (or mono) to produce 100% envelope modulation. Other input levels can be accommodated.
Audio Input Impedance: 600 ohms. Inputs are balanced, transformerless, and resistive with passive RFI filtering. Other impedances can be accommodated.
Audio Frequency Response (Mono): +/-1 dB, from 20 Hz to 10 kHz at 80% negative modulation, with HF Boost. +0 dB, -3 dB from 20 Hz to 10 kHz at 80% negative modulation, without HF Boost.
Audio Harmonic Distortion (Mono): Less than 1.0% at 90% modulation, 20 Hz to 10 kHz, at rated power.
Audio Harmonic Distortion (Stereo): Less than 2.0% at 50% single channel modulation, 50 Hz to 10 kHz, at rated power.
Incidental Phase Modulation (Stereo): Less than 1.6 degrees (0.028 radians) average, at 95% negative L+R envelope modulation at 1 kHz or 35 dB below 100%, L-R, C-QUAM.
Stereo Separation: -30 dB, 50 Hz to 5 kHz; -25 dB, 5 kHz to 10 kHz; into a 50 ohm resistive load.
Squarewave Overshoot (Mono): 3% or less at 400 Hz, 90% modulation with HF Boost disabled.
Squarewave Overshoot (Stereo): 3% or less at 400 Hz, 50% single channel modulation, HF Boost disabled.
Squarewave Tilt: 3% or less at 20 Hz, 90% negative modulation, without high pass filter.
Noise (Mono): Better than 65 dB below 100% negative modulation from 20 Hz to 30 kHz.
Noise (Stereo): Better than 60 dB below 100% negative modulation of either Left or Right channel from 20 Hz to 30 kHz, unweighted.
AC Input Voltage: 196 - 252 VAC, 50/60 Hz, single phase.
Output Power Regulation: Within plus or minus 2% of operator setting.
AC Power Consumption: 1.37 Kw, no modulation of One Kw carrier. 2.05 Kw, 100% modulation of One Kw carrier.
Overall Efficiency: 73% or better, AC Line to RF Output.
Cooling: Low velocity air, with disposable filters.
Operating Temperature: 0 to 50 degrees, C.
Operating Altitude (AMSL): 10,000 feet, 60 Hz; 7,500 feet, 50 Hz. 3,048 meters, 60 Hz; 2,286 meters, 50 Hz.
Size: 23.31 in. wide x 32.00 in. deep x 69.81 in. high. 59.21 cm wide x 81.28 cm deep x 177.32 cm high.
Weight: 400 lbs; 525 lbs, packed. 181 kg; 238 kg, packed.

All specifications measured with AS-10 modulation monitor while transmitting at 1 Kw into a 50 ohm resistive load.

Broadcast Electronics...
Recognized Leader in Radio Broadcast Technology.

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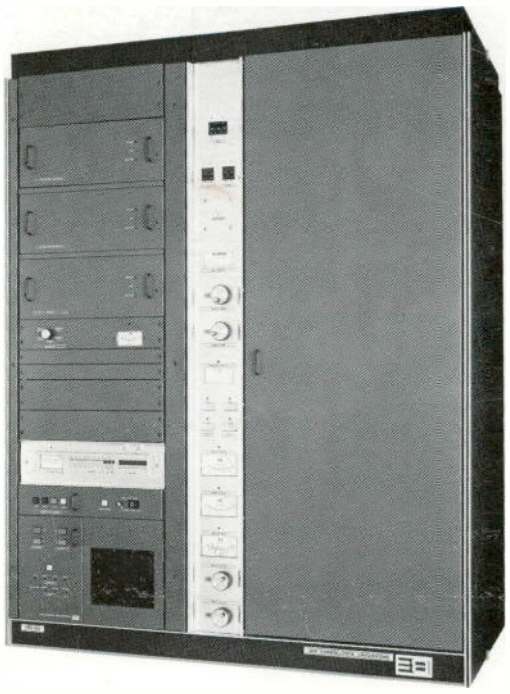
4100 N. 24th St., P.O. Box 3606, Quincy, IL 62305-3606 USA
Phone: (217) 224-9600, Telex: 250142, Fax: (217) 224-9607



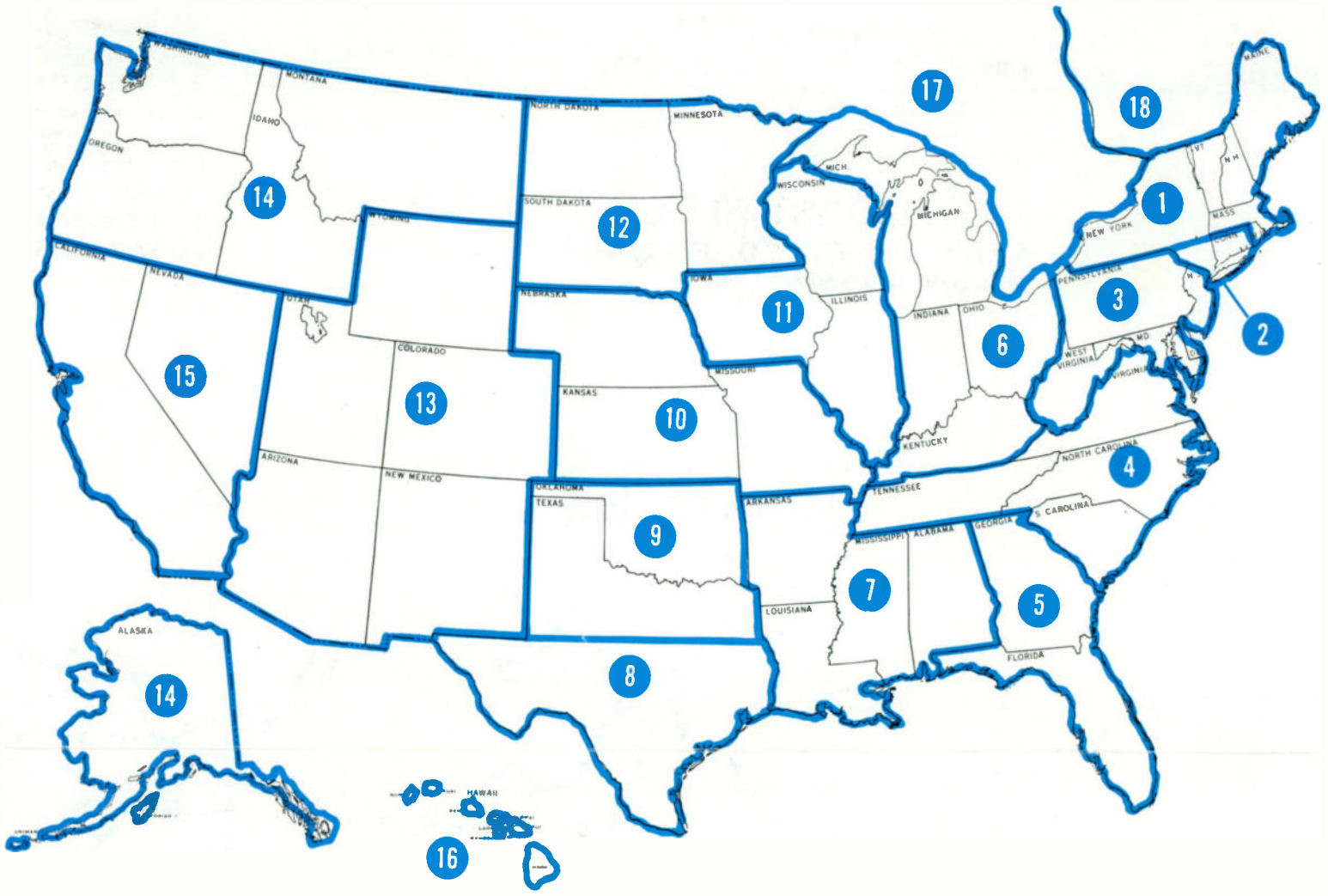
Model FM-35A
The world's premier
35kW FM Transmitter

BROADCAST ELECTRONICS INC.
4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305–3606 U.S.A.

From 100 watts

to 70 kW...

Contact Your Broadcast Electronics Representative For Your RF Equipment Needs



REPRESENTATIVES FOR BROADCAST ELECTRONICS FM TRANSMITTERS

1 Northeast Broadcast Lab
BILL BINGHAM
CRISS ONAN
10373 Saratoga Rd.
P.O. Box 1176
South Glens Falls, NY 12801
Telephone: (518) 793-2181
Territory: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, New York except NYC area and Long Island

2 Broadcast Electronics
BILL HARLAND
4100 N. 24th St.
Quincy, IL 62305
Telephone: (217) 224-9600
Territory: Connecticut, New York City/ Long Island

3 Radio Systems
BILL WOHL
OAN BRAVERMAN
5113 W. Chester Pike
P.O. Box 356
Edgemont, PA 19028
Telephone: (215) 356-4700
Territory: Pennsylvania, New Jersey, Delaware, Maryland, West Virginia, District of Columbia

4 SCMS, Inc.
BOB CAUTHEN
10201 Rodney Blvd.
Pineville, NC 28134
Telephone: (704) 889-4509

SCMS, Inc.
ANDY BOOTH
4214 Jolar Way
Virginia Beach, VA 23452
Telephone: (804) 495-7149
Territory: Virginia, North Carolina, Tennessee, South Carolina

5 RF Specialties of Florida
BILL TURNEY
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Niceville, FL 32578
Telephone: (904) 678-8943
Territory: Florida, Georgia

6 Audio Broadcast Group
DAVE VELDSMA
DAVE HOWLAND
2342 Division Ave. South
Grand Rapids, MI 49507
Telephone: (616) 452-1596
Territory: Michigan, Ohio, Indiana, Kentucky

7 Audiomedia Associates
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4657 Michoud Blvd.
P.O. Box 29264
New Orleans, LA 70189
Telephone: (504) 586-0140
Territory: Mississippi, Arkansas, Alabama, Louisiana

8 Giesler Broadcast
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DAN GIESLER
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Houston, TX 77074
Telephone: (713) 774-3314
Territory: South Texas

9 RF Specialties of Texas
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TIM HAWKS
P.O. Box 8316
Amarillo, TX 79114
Telephone: (806) 372-4518
Territory: North Texas, Oklahoma

10 RF Specialties of Nebraska
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Bellevue, NE 68005
Telephone: (402) 734-5521
Territory: Nebraska, Kansas, Missouri

11 Windcomm
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Racine, WI 53402
Telephone: (414) 639-4576
Territory: Illinois, Iowa, Wisconsin

12 TDM Engineering
MIKE TROJE
9800 69th Ave. No.
No. 205
Maple Grove, MN 55369
Telephone: (612) 533-4038
Territory: North Dakota, South Dakota, Minnesota

13 Roberts Broadcast Equipment
DAN ROBERTS
2301 Belmont Rd.
Casper, WY 82604
Telephone: (307) 235-1800
Territory: Wyoming, Utah, Colorado, Arizona, New Mexico

14 RF Specialties of Washington
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BOB ARNOLO
11721 15th Avenue, NE
Seattle, WA 98125
Telephone: (206) 363-7730
Territory: Washington, Montana, Idaho, Oregon, Alaska

15 RF Specialties of California
SAM LANE
3463 State Street
Suite 229
Santa Barbara, CA 93105
Telephone: (805) 682-9429
Territory: California, Nevada

16 Caughill-Palitz
BOB PALITZ
CLAYTON CAUGHILL
1750 Kalakaua Ave.
Suite 3-120
Honolulu, HI 96826
Telephone: (808) 941-3618
Territory: Hawaii and U.S. Pacific Possessions

17 Comad Communications
WILF RICE
EMIL ADAMYK
1435 Bonhill Rd.
Unit 34
Mississauga, Ontario L5T 1M1
Telephone: (416) 676-9171
Territory: All Canada Except Quebec

18 Marketing Marc Vallée Ltd.
MARC VALLÉE
GILLES PARE
Marketing Marc Vallée
1063 St-Lambert
St-Sauver-des-Monts
Quebec J0R 1R0
Telephone: (514) 227-5110
Territory: Quebec only

Please send me complete information on the following Transmitting Equipment:

- ☐ FM Exciter Model FX-30
- ☐ FM Stereo Generator Model FS-30
- ☐ SCA Generator Model FC-30
- ☐ 100 Watt Solid State FM Transmitter
- ☐ 250 Watt Solid State FM Transmitter
- ☐ 300 Watt Solid State FM Transmitter
- ☐ 1.5KW FM Transmitter Model FM-1.5A
- ☐ 3.5KW FM Transmitter Model FM-3.5A
- ☐ 5KW FM Transmitter Model FM-5A
- ☐ 10KW FM Transmitter Model FM-10A
- ☐ 30KW FM Transmitter Model FM-30A
- ☐ 35KW FM Transmitter Model FM-35A
- ☐ 60KW/70KW FM Transmitter Model FM-60A/FM-70A
- ☐ Dual Combined or Main/Alternate Main FM Transmitter System
- ☐ Microprocessor Video Diagnostic System (MVDS) for FM Transmitters
- ☐ AM Stereo Exciter, C-QUAM System
- ☐ AM Stereo Modulation Monitor
- ☐ TV Stereo Generator (MTS)
- ☐ FM Antenna ☐ Number Bays_____
- ☐ Other Equipment (Specify)_____

I'm interested in price and delivery. Please send me a quotation on the following:

_____FM Transmitter (Specify power)_____kW. ____FM Antenna (Specify number of bays)_____

NAME_____TITLE_____

STATION_____PHONE_____

STREET ADDRESS_____

CITY_____STATE_____ZIP_____

REPMAIL 5.6K 287

BROADCAST ELECTRONICS INC.

4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305-3606 U.S.A., TELEX 250142, CABLE: BROADCAST, PHONE (217) 224-9600

HIGH POWER FM
PRODUCT CATALOG

Solutions for Tomorrow's Radio

TABLE OF CONTENTS

BROADCAST ELECTRONICS... SOLUTIONS FOR TOMORROW'S RADIO

Broadcast Electronics' High Power FM

As the only major manufacturer devoted exclusively to engineering better radio, it's no wonder that Broadcast Electronics has led the industry in the introduction of AM and FM transmitters and advanced technologies.

Broadcast Electronics' High Power FM transmitters carry on the standards for high power transmission equipment originally set by our FM-30. Broadcast Electronics has built more advanced, useful technology into this enhanced line of high power transmitters. Each model still provides the superior audio quality, cost-efficiency, reliability, and long life broadcasters have come to expect from Broadcast Electronics. As part of the RF Product Line these superior transmitters are just part of Broadcast Electronics' total solution for tomorrow's radio.

Broadcast Electronics' Advantages

Folded Half-Wave Cavity—
This patented cavity eliminates troublesome and unreliable DC plate blocking capacitors and all sliding RF contacts.

True Proportional VSWR Foldback—
Allows operation into 3-to-1 VSWR.

Advanced Controller Design—
Monitors virtually all operating parameters of the transmitter and facilitates remote monitoring and full connectivity.

Standard filiment voltage regulator for longer tube life

Extensive Metering of PA Parameters—
Eases tuning and adjustment which allows for more efficient operation as proper operating parameters can be monitored and maintained.

Built-In Remote Control Interface—
Easy interface for convenient use of all current remote control systems.

Updated RF Drive—
Latest MOSFET technology in IPAs at 20 kW & above, and high power exciters eliminate the need for an IPA below 20 kW.

Optional RTDS—
Remote Transmitter Diagnostic System allows interactive diagnostics without a trip to the transmitter shack.

BROADCAST ELECTRONICS HIGH POWER FM T-SERIES

FM-5T

FM-10T

FM-20T

FM-30T

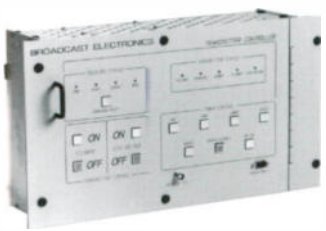
FM-35T

BROADCAST ELECTRONICS HIGH POWER FM TECHNOLOGY

Advanced Transmitter Controller

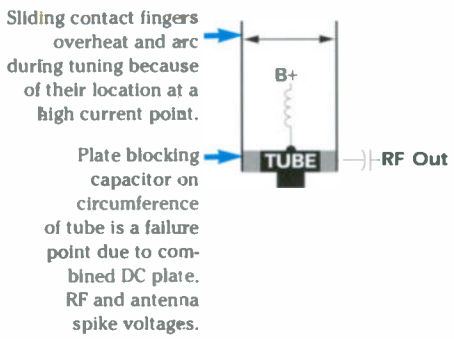
At the heart of the new T-Series high power transmitters is a new, enhanced controller. Capable of monitoring all transmitter functions, this new controller offers the operator more information than any other controller on the market. And every monitoring function is housed inside a single, compact, reliable assembly. All internal components are accessible from the front panel.

The new T-Series Controller features three serial ports for direct communication connections, and is designed to accept future technical

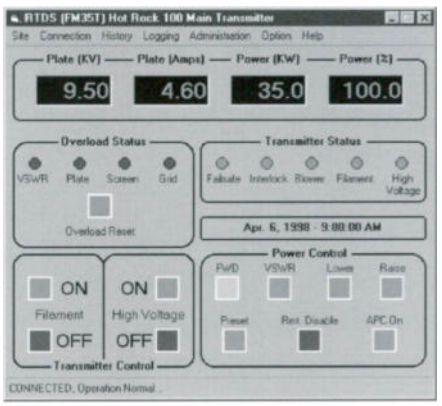


improvements via simple software changes rather than replacement of the whole controller unit.

CONVENTIONAL 1/4 WAVE CAVITY

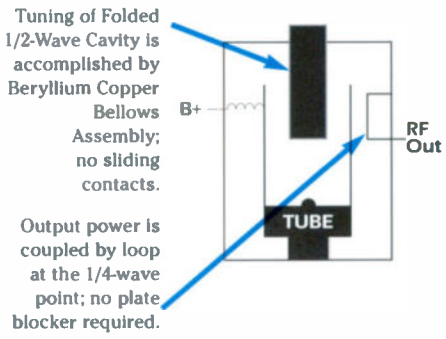


Remote Transmitter Diagnostic System (RTDS)



The new Remote Transmitter Diagnostic System (RTDS) has reached a new level of transmitter monitoring technology with its multi-level security features which protect the stations and transmitters; the ability to record snapshots before, at and after an overload and multiple transmitter access from a single connection. The RTDS is an option available for all T-series transmitters, and an upgrade kit is available to make all A and B series tube transmitters compatible as well.

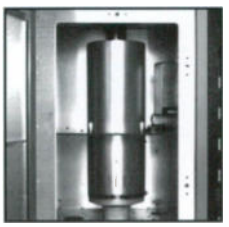
BROADCAST ELECTRONICS FOLDED HALF WAVE CAVITY



True Proportional Variable Standing Wave Ratio (VSWR) Foldback

Broadcast Electronics is the first company to offer proportional VSWR foldback in FM transmitters. In cases of gradual changes in load conditions, such as ice build-up on the antenna, the Broadcast Electronics' design protects the power amplifier by automatically reducing power to a safe operating level. A "soft start" circuit then gradually increases power to allow the transmitter to resume a safe optimum operating level under high VSWR conditions.

Folded Half Wave Output Cavity



The new T-Series High Power Transmitters achieve their rated output power with a single tube. Our patented Folded Half-Wave Cavity design eliminates troublesome and unreliable DC plate blocking capacitors and all sliding RF contacts. Changing the power tube is simple; Broadcast Electronics' broadband screen-neutralizing technique eliminates the need to readjust neutralization. All PA adjustments are made with numerically calibrated front panel controls.

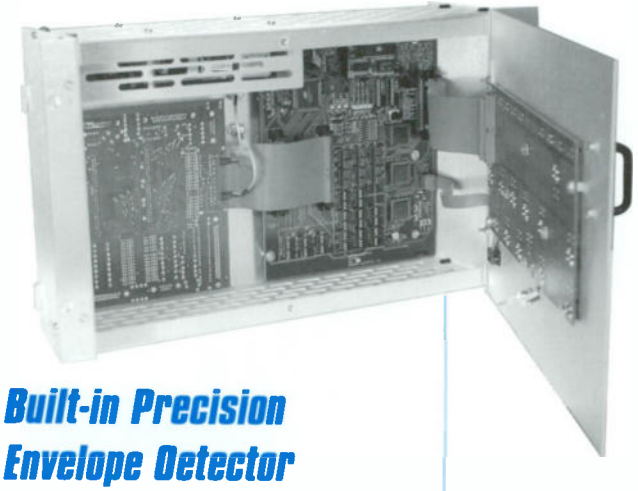
HIGH POWER FM TECHNOLOGY

FX-50 Exciter

All Broadcast Electronics high power FM transmitters come equipped with FX-50 Exciter technology. Featuring unmatched audio quality, the FX-50 has been engineered to outperform any other FM Exciter available today. The FX-50 can operate as a stand alone transmitter or as a replacement exciter and has easily become the standard for FM audio performance.

FM-250C Exciter

Based on the industry standard FX-50, the FM-250C provides unsurpassed audio performance while eliminating the need for an intermediate power amplifier. This reduces the overall complexity of the 5 & 10kW T-Series while improving the mean time between failure to the best in the industry.



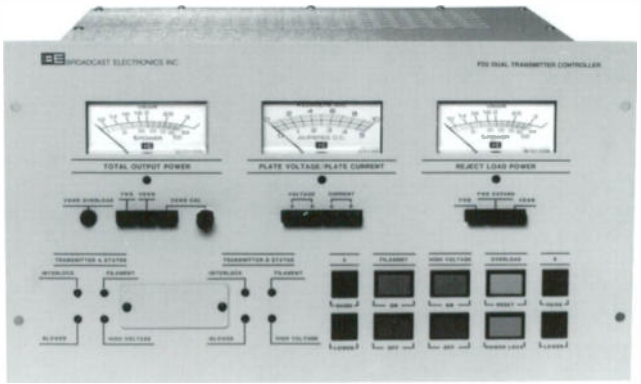
Built-in Precision Envelope Detector

All single tube Broadcast Electronics transmitters contain a built-in precision envelope detector to facilitate measurement of synchronous AM noise. Adjustment of the transmitter for minimum synchronous AM noise can be performed even while program audio is on the air.

NEW Solid State IPA

In keeping with Broadcast Electronics' goal of including the latest technologies in our RF products, we have taken the FM RF amplifier from the extremely successful Solid State series and created the new 500 watt MOSFET based IPA. This technology update takes advantage of years of field experience with thousands of modules and hundreds of thousands of hours of trouble-free operation.

TRANSMISSION SYSTEMS ACCESSORIES

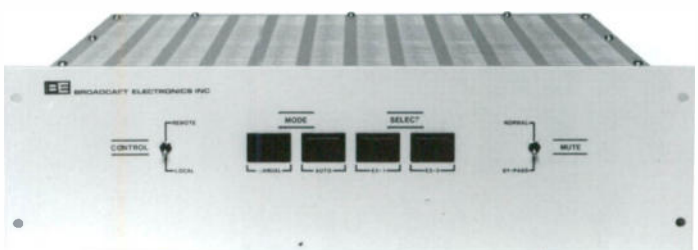


Predator Digital Transmitter/Exciter

Broadcast Electronics' engineers were the first to develop the right kind of digital technology for a low power transmitter/exciter—modular, expandable, convertible, digital quality, and priced thousands less. All at power levels designed to fit any need - 50 or 250 watts. The Predator accepts AES/EBU, left and right, or composite inputs, can be upgraded in the field and is equipped with a full remote control interface.

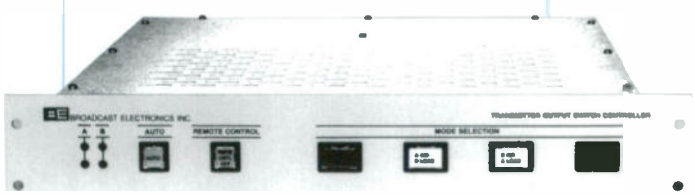
FD-2 Dual Transmitter Controller

Monitors and controls two combined Broadcast Electronics' FM transmitters from one panel. The FD-2 can raise and lower output power of the two transmitters together or separately and its complete output monitoring is included with combined output VSWR protection for both transmitters.



FW-30 Automatic Exciter Switch

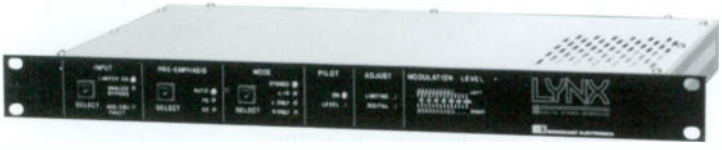
The FW-30 delivers total transmitter redundancy. Continuously monitors the status of the on-air FM exciter and switches to hot-standby unit if failure is detected.



FO-2 Transmitter Output Switcher

When used in conjunction with the FD-2, the FO-2 provides auto or manual RF output switching through the use of motorized coaxial switches (not supplied).

TRANSMISSION SYSTEM ACCESSORIES



LYNX Digital Stereo Generator

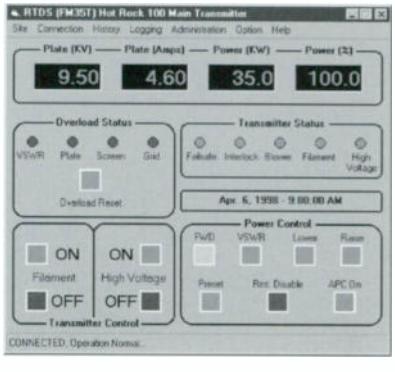
A new state-of-the-art stereo generator with encoding features that make it as easy to use in conventional analog applications as it is in digital transmission systems. The LYNX executes encoding in DSP for superior performance and excellent long term stability, accepts analog or AES/EBU digital inputs, automatic switching of pre-emphasis and de-emphasis to accommodate different transmission schemes.

FC-30 SCA Generator

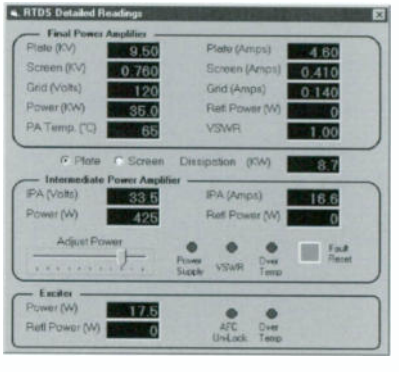
The FC-30 delivers low FM noise and high operational stability. Distortion is minimized through its modulated oscillator and the use of an output low pass filter instead of bandpass filters. The FC-30 also features DC-coupled data input, internal data/audio low pass filter, extensive RFI filtering, LED peak modulation indicator, and a convenient front panel test jack. Additionally, the FC-30's controlled subcarrier decay muting eliminates squelch noise in SCA receivers.

REMOTE TRANSMITTER DIAGNOSTIC SYSTEM (RTDS)

The new Remote Transmitter Diagnostic System (RTDS) offers unprecedented flexibility and access when monitoring transmitters.



By providing more useful diagnostic information than any other remote control system available, RTDS allows you to conveniently monitor your transmitters' performance without making a trip to the transmitter shack. This system is currently compatible with all Broadcast Electronics' T-series transmitters, and an upgrade kit is available to make all A and B series tube transmitters compatible as well.



TRANSMISSION SYSTEMS SPECIFICATIONS

High Power FM Transmitters - ALL

General

Frequency Range: 87.5 to 108 MHz, tuned to specific operating frequency. Exciter programmable in 10kHz steps.
RF Output Impedance: 50 ohms (others on special request).
VSWR: 1.8:1 maximum. (Will operate into higher VSWR with automatic power reduction.)
Frequency Stability: +/-300 Hz, 0 to 50° C.
Type of Modulation: Direct frequency modulation of carrier frequency.
Modulation Capability: Greater than +/-350 kHz.
Modulation Indication: Peak reading, color coded, LED display with baseband overmodulation indicator.
Exciter: Solid state, 50 watt output, model FX-50; incorporating a digitally programmed synthesizer. (10kHz increments).
Pre-Emphasis: FCC 75µS, CCIR 50µS (where specified), 25µS (Dolby), or flat response, selectable.
Asynchronous AM S/N Ratio: 55dB below equivalent reference carrier with 100% AM modulation at 400Hz, 75µS de-emphasis. (No FM modulation present.)
RF Harmonics: Suppression meets all FCC/DOC requirements and CCIR recommendations. Power Supply Rectifiers Silicon
Altitude: 10,000 ft. at 60Hz (3048M), 7500 ft. at 50Hz (2286M).
Ambient Temperature Range: -10° C to +50° C.

Monaural Operation

Audio Input Impedance: 600 ohms balanced, resistive, adaptable to other impedances, 60dB common mode suppression.
Audio Input Level: +10dBm nominal for +/- 75kHz deviation @ 400Hz.
Audio Frequency Response: +/- 0.5dB, 30Hz to 15kHz, selectable flat, 25, 50, 75 microsecond pre-emphasis.
Total Harmonic Distortion + Noise: 0.02% or less at 400 Hz.
CCIF Intermodulation Distortion: 0.02% or less, 15kHz/14kHz, 1:1 ratio.
Transient Intermodulation Distortion: 0.02% or less, sine wave/ square wave.

Wideband Composite Operation

Composite Inputs: 3 total, (1) unbalanced and (1) balanced plus front panel test. All connectors BNC.
Balanced Composite Input Impedance: 10K ohm or 50 ohm, nominal, resistive, selectable.
Unbalanced Composite Input Impedance: 10K ohm, nominal, resistive.
Composite Input Level: 3.5V p-p nominal, for +/- 75kHz deviation.
Composite Total Harmonic Distortion + Noise: 0.02% or less at 400Hz.
Composite CCIF Intermodulation Distortion: 0.02% or less, 15kHz/14kHz, 1:1 ratio.
Composite Transient Intermodulation Distortion: 0.02% or less, sine wave/square wave.
Composite Amplitude Response: +/- 0.05 dB, 30 Hz to 53 kHz.
Composite Phase Response: +/- .25° from linear phase, 30 Hz to 53kHz.
Composite Group Delay Variation: +/-10 nanoseconds, 30Hz to 100kHz.
Composite Slew Rate: 9 V/microsecond (symmetrical).

Subcarrier Inputs: (3) total, unbalanced, BNC connectors.
Subcarrier Input Impedance: 100K ohm, nominal, resistive.
Subcarrier Input Level: 3.5 V p-p, nominal, for +/- 7.5kHz deviation.
Subcarrier Amplitude Response: +/- 0.2dB, 40kHz to 100kHz.

Stereo Operation

Modulation Type: Digitally synthesized stereo, digitally synthesized pilot. No pilot phase adjustment required.
Audio Input Impedance: 600 ohms balanced, resistive, floating (adaptable to other impedances).
Audio Input Level: +10 dBm, +/- 1 dBm, for 100% modulation @ 400 Hz (adaptable to other input levels).
Audio Input Filters: 15kHz LPF with delay equalization for minimum overshoot.
Frequency Response: +/- 0.5dB, 30-15,000 Hz, 75 µS pre-emphasis (flat, 25 or 50 µS pre-emphasis selectable).
Total Harmonic Distortion + Noise: 0.05% or less @ 400Hz.
CCIF Intermodulation Distortion: 0.05% or less, 15kHz/14kHz; 1:1 ratio.
Transient Intermodulation Distortion: 0.05% or less, sine wave/ square wave.
Stereo Separation: 50dB or better; 30-15,000Hz (sine wave).
Dynamic Stereo Separation: 50dB or better; 30-15,000Hz (normal program content).
Linear Crosstalk: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30-15,000Hz, 45dB minimum below 100% modulation.
Non-Linear Crosstalk: Main to Sub/Sub to Main due to distortion products. 70dB minimum below 100% modulation.
38 kHz Subcarrier Suppression: 80dB minimum below 100% modulation.
Pilot Stability: +/- 0.5Hz, 0° to 50° C.
Modes: Stereo, Mono L+R, Mono (L) and Mono (R) remote controlled.

SCA Operation

Modulation: Direct FM
Subcarrier Frequency: 67kHz (39 to 95 kHz to order).
Subcarrier Frequency Stability: +/- 0.5% (330Hz @ 67kHz), 0 to 50° C.
Subcarrier Harmonic Content: Less than 0.3%.
Subcarrier Envelope Decay: Greater than 100 msec from 90% to 10% subcarrier levels.
Modulation Capability: +/- 20% of subcarrier frequency.
Audio Input Impedance: 600 ohm balanced, resistive.
Data Input Impedance: 75 ohm unbalanced, resistive, DC coupled.
Input Levels: (Audio) adjustable +10 dBm to -10dBm for +/- 6kHz deviation @ 400Hz. (Data) adjustable 1.0 to 4.0 V p-p for +/- 6kHz deviation (DC coupled).
Pre-Emphasis: (Audio) 150 microseconds standard 75 µS with internal jumper (Data) no pre-emphasis.
Frequency Response: (Audio) +/- 0.5dB, 10-10,000Hz, exclusive of audio low pass filter. (Data) +/- 0.5dB, DC-10,000Hz.
Audio Low Pass Filter: Sixth order, -3dB @ 4.3 kHz, standard (resistor changes for other values).
Data Low Pass Filter: Same as AF filter or may be bypassed.
Total Harmonic Distortion: Less than 0.5% throughout AF pass band.

SMPTE Intermodulation Distortion: Less than 0.5%, 60Hz/7kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed).
Crosstalk, SCA to Stereo: -60dB or better below 100% modulation of left or right. 75 µS de-emphasis.
Crosstalk, Stereo to SCA: -50dB or better below +/- 6kHz deviation of SCA using 150 µS de-emphasis and FS-30 stereo generator.
Crosstalk, SCA to SCA: -50dB or better below +/- 6kHz deviation of either SCA using 150 µS de-emphasis.
FM Noise: 62dB below +/- 6kHz deviation at 400Hz (150µS de-emphasis).
Auto Muting Level: Adjustable from 10 to 30dB below program level.
Auto Muting Delay: Adjustable, 0.5 to 10.0 seconds.

FM5T Transmitter

General
Power Output: 5kW (2.5kW to 5.5kW).
Output Connector: 1 5/8 inch EIA.
Synchronous AM S/N Ratio: 40dB below equivalent 5kW reference carrier with 100% AM modulation at 1kHz, no de-emphasis. (FM modulation +/- 75kHz at 1kHz).
Tube Complement: (1) 4CX3500A

Electrical/Mechanical
Primary Power Consumption: Typically 8.3kW (at .92 pf) at 5kW RF output.
Overall Efficiency: Typically 60% (AC line input to RF output).
Size: (Transmitter) 34.5"W x 37.25"D x 70"H (87.63W x 94.61D x 177.8H cm).
Weight & Cubage: (Transmitter) 1000 lbs. (455 kg); packed 1200 lbs. (545 kg) 60 cu. ft. (2 cu. meters).

Monaural Operation
SMPTE Intermodulation Distortion: 0.05% or less, 60Hz/7kHz, 4:1 ratio.
FM S/N Ratio: 82dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.

Wideband Composite Operation
FM S/N Ratio: 82dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.
Composite SMPTE Intermodulation Distortion: 0.05% or less, 60Hz/7kHz, 1:1 ratio.

Stereo Operation
SMPTE Intermodulation Distortion: 0.05% or less, 60Hz/7kHz, 4:1 ratio.
FM S/N Ratio: 78dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.
FM-5T system performance is specified using model FX-50 Exciter, FS-30 Stereo Generator, and FC-30 SCA Generator, where applicable, measured at rated transmitter power of 5kW into a 50 ohm resistive load.

FM10T Transmitter

General
Power Output: 10kW (4.5kW to 11kW).
Output Connector: 1 5/8 inch EIA coupling standard. 3 1/8 in EIA flange optional.
Synchronous AM S/N Ratio: 45dB below equivalent 10kW reference carrier with 100% AM modulation at 1kHz, no de-emphasis. (FM modulation +/- 75kHz at 1kHz).
Tube Complement: (1) 4CX7500A

Electrical/Mechanical
Primary Power Consumption: Typically 15.8kW (at .98 pf) at 10kW RF output.
Overall Efficiency: Typically 63% (AC line input to RF output).
Size: (Transmitter) 33.7"W x 37.2"D x 69.8"H (85.6W x 94.6D x 177.3H cm). (Power Supply) 22.7"W x 37.2"D x 69.6"H (57.6W x 94.6D x 177.3H cm).
Weight & Cubage: (Transmitter) 800 lbs. (363 kg); 53 cu. ft. (1.5 cu. meters); (HV Power Supply) 1000 lbs. (453.6 kg) 36 cu. ft. (1.01 cu. meters).

Monaural Operation
SMPTE Intermodulation Distortion: 0.05% or less, 60Hz/7kHz, 4:1 ratio.
FM S/N Ratio: 85dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.

Wideband Composite Operation
FM S/N Ratio: 85dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.
Composite SMPTE Intermodulation Distortion: 0.05% or less, 60Hz/7kHz, 1:1 ratio.

Stereo Operation
SMPTE Intermodulation Distortion: 0.08% or less, 60Hz/7kHz, 4:1 ratio.
FM S/N Ratio: 80dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.
FM-10T system performance is specified using model FX-50 Exciter, FS-30 Stereo Generator, and FC-30 SCA Generator, where applicable, measured at rated transmitter power of 10kW into a 50 ohm resistive load.

FM20T Transmitter

General
Power Output: 20kW (7.5kW to 22kW).
PA Efficiency: 80% typical.
Output Connector: 3 1/8 inch EIA flange.
Synchronous AM S/N Ratio: 50dB below equivalent 20kW reference carrier with 100% AM modulation at 1kHz, no de-emphasis. (FM modulation +/- 75kHz at 1kHz).
Tube Complement: (1) 8989/4CX12,000A

Electrical/Mechanical
Primary Power Consumption: 30kW (at .97 pf) at 20kW RF output.
Overall Efficiency: Typically 67% (AC line input to RF output).
Size: (Transmitter) 50.5"W x 31.5"D x 70"H (128.3W x 80D x 177.8H cm). (Power Supply) 28.5"W x 31.5"D x 70"H (72.4W x 80D x 177.8H cm).
Weight & Cubage: (Transmitter) 1200 lbs. (545 kg); packed 1450 lbs. (660 kg); 75 cu. ft. (2.1 cu. meters). (HV Power Supply) 1500 lbs. (681 kg); packed 1750 lbs. (795 kg); 45 cu. ft. (1.3 cu. meters).

Monaural Operation
SMPTE Intermodulation Distortion: 0.02% or less, 60Hz/7kHz, 4:1 ratio.
FM S/N Ratio: 85dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.

Wideband Composite Operation
FM S/N Ratio: 85dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.
Composite SMPTE Intermodulation Distortion: 0.02% or less, 60Hz/7kHz, 1:1 ratio.

Stereo Operation
SMPTE Intermodulation Distortion: 0.05% or less, 60Hz/7kHz, 4:1 ratio.
FM S/N Ratio: 80dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.
FM-20T system performance is specified using model FX-50 Exciter, FS-30 Stereo Generator, and FC-30 SCA Generator, where applicable, measured at rated transmitter power of 20kW into a 50 ohm resistive load.

FM30T Transmitter

General
Power Output: 30kW (7.5kW to 30kW).
Output Connector: 3 1/8 inch EIA flange.
Synchronous AM S/N Ratio: 50dB below equivalent 30kW reference carrier with 100% AM modulation at 1kHz, no de-emphasis. (FM modulation +/- 75kHz at 1kHz).
Tube Complement: (1) 8990/4CX20000A.

Electrical/Mechanical
Primary Power Consumption: Typically 44kW (at .94 pf) at 30kW RF output.
Overall Efficiency: Typically 68% (AC line input to RF output).
Size: (Transmitter) 56.5"W x 31.5"D x 70"H (143.5W x 80D x 177.8H cm). (Power Supply) 34.5"W x 31.5"D x 70"H (87.6W x 80D x 177.8H cm).
Weight & Cubage: (Transmitter) 1500 lbs. (682 kg); packed 1750 lbs. (795 kg); 72 cu. ft. (2 cu. meters). (HV Power Supply) 1750 lbs. (794 kg); packed 1800 lbs. (816 kg); 44 cu. ft. (1.25 cu. meters).
Sound Level: 61dB (A-weighted), 48dB (SIL), (Ref. 0dB = .0002 microbar) at one meter front center.

Monaural Operation
SMPTE Intermodulation Distortion: 0.02% or less, 60Hz/7kHz, 4:1 ratio.
FM S/N Ratio: 85dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.

Wideband Composite Operation
FM S/N Ratio: 85dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.
Composite SMPTE Intermodulation Distortion: 0.02% or less, 60Hz/7kHz, 1:1 ratio.

Stereo Operation
SMPTE Intermodulation Distortion: 0.05% or less, 60Hz/7kHz, 4:1 ratio.
FM S/N Ratio: 80dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.
FM-30T system performance is specified using model FX-50 Exciter, FS-30 Stereo Generator, and FC-30 SCA Generator, where applicable, measured at rated transmitter power of 30kW into a 50 ohm resistive load.

FM35T Transmitter

General
Power Output: 35kW (10kW to 38.5kW).
Output Connector: 3 1/8 inch EIA flange.
Synchronous AM S/N Ratio: 50dB below equivalent 35kW reference carrier with 100% AM modulation at 1kHz, no de-emphasis. (FM modulation +/- 75kHz at 1kHz).
Tube Complement: (1) 4CX20000C.

Electrical/Mechanical
Primary Power Consumption: Typically 51kW (at .94 pf) at 35kW RF output.
Overall Efficiency: Typically 68% (AC line input to RF output).
Size: (Transmitter) 56.5"W x 31.5"D x 70"H (143.5W x 80D x 177.8H cm). (Power Supply) 34.5"W x 31.5"D x 70"H (87.6W x 80D x 177.8H cm).
Weight & Cubage: (Transmitter) 1500 lbs. (682 kg); packed 1750 lbs. (795 kg); 72 cu. ft. (2 cu. meters). (HV Power Supply) 1750 lbs. (794 kg); packed 1800 lbs. (816 kg); 44 cu. ft. (1.25 cu. meters).
Sound Level: 61dB (A-weighted), 48dB (SIL), (Ref. 0dB = .0002 microbar) at one meter front center.

Monaural Operation
SMPTE Intermodulation Distortion: 0.02% or less, 60Hz/7kHz, 4:1 ratio.
FM S/N Ratio: 85dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.

Wideband Composite Operation
FM S/N Ratio: 85dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.
Composite SMPTE Intermodulation Distortion: 0.02% or less, 60Hz/7kHz, 1:1 ratio.

Stereo Operation
SMPTE Intermodulation Distortion: 0.05% or less, 60Hz/7kHz, 4:1 ratio.
FM S/N Ratio: 80dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 30kHz bandwidth with 75µS de-emphasis.
FM-35T system performance is specified using model FX-50 Exciter, FS-30 Stereo Generator, and FC-30 SCA Generator, where applicable, measured at rated transmitter power of 35kW into a 50 ohm resistive load.

250 WATT FM EXCITER/TRANSMITTER

General

Power Output: 25 to 250 W continuously variable (N type connector) open and short circuit protected.
R.F. Output Impedance: 50 ohms.
R.F. Harmonic and Spurious Suppression: Meets all FCC and DOC requirements and CCIR recommendations for a 250-watt transmitter.
Frequency Stability: ±300Hz, +32°F to +122°F (0°C to +50°C).
Modulation Type: Direct FM at the carrier frequency.
Modulation Capability: ±350 kHz.
Asynchronous AM S/N Ratio: 80dB minimum below equivalent reference carrier with 100% amplitude modulation at 400Hz and 75µS de-emphasis (no FM modulation present).
Synchronous AM S/N Ratio: 60dB minimum below equivalent 50W reference carrier with 100% AM modulation at 1kHz, no de-emphasis (FM modulation +/- 75kHz and 1kHz).
Remote Metering: Buffered Forward and Reflected power outputs.
Front Panel Test Connections: Composite input and composite output.
Audio/Control Connections: 14 position barrier strip and (5) BNC connectors. Control connections are AFC Interlock (normally open/normally closed relay contacts), AFC indication (open collector and closure), +20V or remote power control (switch selectable), RF mute, Temperature overload (+18V at 15ma), buffered FWD and RFL meter samples, and two ground connections. All inputs/outputs RFI suppressed.
RF Mute Control: +3V to +40V DC or GND closure, switch selectable. Ima maximum.
AC Input Power: 97 to 133 VAC or 194 to 266 VAC, 50/60 Hz, 230 w maximum.
Ambient Temperature Range: ±32°F to +122°F (0°C to +50°C).
Altitude: 15,000 feet (4,572 m) AMSL.
Dimensions: 17.70"W x 5.25"H x 19.00"D (44.96 x 13.33 x 48.26 cm).
Net Weight: 53 lbs. (23.85 kg) unpacked.

Wideband Composite Operation

Composite Inputs: 3 total, (1) unbalanced, (1) balanced, plus (1) front panel test provision (BNC connectors).
Composite Input Impedance:
Unbalanced: 10 k ohm, nominal, resistive.
Balanced: 10 k ohm or 50 ohm, programmable, jumper selected.
Composite Input Level: 3.5V p-p nominal, for ±75 kHz deviation.
Composite FM S/N Ratio: 85dB below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 200kHz bandwidth with 75µS de-emphasis.
Composite Harmonic Distortion: 0.01% or less @ 400Hz.
Composite Intermodulation Distortion: 0.005% or less (0.003% typical).
Composite CCIF IMD: 0.005% or less (all products greater than -86dB below 100% modulation. Twin tone, 15 kHz/14 kHz, 1:1 pair).
Composite Transient IMD: 0.01% or less (square wave/sine wave).
Composite Amplitude Response: +/- 0.025dB, 30Hz to 53kHz.
Composite Phase Response: +/- 0.1degree from linear phase, 30Hz to 53kHz.
Composite Group Delay Variation: +/- 5 nanoseconds, 30Hz to 100kHz.
Subcarrier Inputs: 3 total, unbalanced, BNC connectors.
Subcarrier Input Impedance: 100 k ohm nominal, resistive.
Subcarrier Input Level: 3.5 V p-p nominal for ±7.5 kHz deviation (10% injection).
Subcarrier Amplitude Response: ±0.2 dB, 40 kHz to 100 kHz -3dB at 7,500 Hz.
Stereophonic Separation: 60dB, 30Hz to 5kHz, 52dB, 5 to 15kHz (measured using BE FS30 Stereo Generator).

Stereo Operation

Total Harmonic Distortion Plus Noise [THD+N]: 0.03% or less at ±75 kHz deviation, 400 Hz, using 75µS de-emphasis.
Intermodulation Distortion: 0.03% or less, 60 Hz/7 kHz, 4:1 ratio.
CCIF Intermodulation Distortion: 0.01% or less (all products greater than -80dB below 100% modulation. Left or right channel modulated 100%, twin tone, 15 kHz/14 kHz, 1:1 pair).
Stereo Separation: 52 dB; 30 Hz to 15,000 Hz 60dB; 30 Hz to 5000 Hz.
Spurious and Sideband Suppression: 80dB minimum below 100% modulation to 95 kHz, 75dB minimum beyond 95 kHz.
FM Signal to Noise Ratio: -82dB minimum below left or right channel, 100% modulation, 400 Hz, with 75µS de-emphasis.

LYNX SPECIFICATIONS

Digital Input Stereo Operation

Frequency Response: ±.1 dB, 20-15,000 Hz, 75µS, flat, or 50µS pre-emphasis
Total Harmonic Distortion: 0.02% or less at 400 Hz.
SMPTE Intermodulation Distortion: 0.02%, 60 Hz/7 kHz; 4:1 ratio.
Stereo Separation: -75dB or better from 20 to 15,000 Hz (Sine Wave). -80dB or better typical at 1 kHz.
FM Noise: -85dB or better below left or right channel, 100% modulation @ 400Hz, 75µS de-emphasis.
Operating Temperature Range: 0° to 50°C. (Functional to -20°C).
Maximum Altitude: 15,000 feet (4,572 M).

Analog Input Stereo Operation

Frequency Response: ±0.5 dB, 20-15,000 Hz, 75µS, flat, or 50µS pre-emphasis
Total Harmonic Distortion: 0.02% or less at 400 Hz.
SMPTE Intermodulation Distortion: 0.02%, 60 Hz/7 kHz; 4:1 ratio.
Stereo Separation: -72dB or better from 20 to 15,000 Hz (Sine Wave). -80dB or better typical at 1 kHz.
FM Noise: -85dB or better below left or right channel, 100% modulation @ 400Hz, 75µS de-emphasis.
Operating Temperature Range: 0° to 50°C. (Functional to -20°C)
Maximum Altitude: 15,000 feet (4,572 M).

PREDATOR SPECIFICATIONS

GENERAL

Power Output: 50 Watt Module: 5 to 50 Watts, continuously variable. Type "N" female connector.
250 Watt Module: 25 to 250 Watts, continuously variable. Type "N" female connector.
RF Output Impedance: 50 ohms.
RF Harmonic and Spurious Suppression: Meets or exceeds all FCC, DOC, and CCIR standards (low pass filter included for transmitter).
Frequency Stability: ±300 Hz, +32°F to +122°F (0°C to +50°C). ±100 Hz optional. Can be locked to an external 10 MHz reference source such as GPS (global positioning system).
Modulation Type: FM, generated digitally using a 32-bit numerically controlled oscillator.
Modulation Capability: ±399 kHz maximum.
Asynchronous AM S/N Ratio: 80dB below an equivalent reference carrier with 100% amplitude modulation @ 400 Hz and 75 µS de-emphasis (no FM modulation present).
Synchronous AM S/N Ratio: 60dB below an equivalent reference carrier with 100% amplitude modulation @ 1 kHz (FM modulation: ±75 kHz @ 400 Hz).
Pre-emphasis: Analog Interface Module: FCC 75µS, CCIR 50µS, Dolby 25µS, or flat response, selectable.
Digital Stereo Generator Module: FCC 75µS, CCIR 50µS, or flat response, selectable.
Overall Efficiency: Greater than 20%.
AC Input Power Requirements: 100 to 240 VAC, 50/60 Hz, single phase.
Ambient Operating Temperature Range: +32°F to +122°F (0°C to +50°C).
Humidity: 95% Maximum, Non-condensing.
Altitude: 50 Hz: 0 to 7500 ft. (2286 m) Above Sea Level.
60 Hz: 0 to 10,000 ft. (3048 m) Above Sea Level.
Dimensions (H X W X D): 7" X 19" X 16" (17.78cm X 48.3cm X 40.64cm).
Weight: 26 lbs. (11.8 kg) unpacked.

WIDEBAND COMPOSITE OPERATION

Analog Interface Module

Composite Input: Balanced BNC connector.
Composite Input Impedance: 10 k ohm or 50 ohm, nominal, resistive, selectable.
Composite Input Level: 3.5 Vp-p nominal, for ±75 kHz deviation.
Composite FM Signal-to-Noise Ratio: 93dB (96dB typical) below ±75 kHz deviation @ 400 Hz measured within a 20 Hz to 80 kHz bandwidth with 75µS de-emphasis and DIN "A" weighting.
Composite Harmonic Distortion plus Noise: 0.005% or less @ 400 Hz.
Composite SMPTE Intermodulation Distortion: 0.005% or less, 60 Hz/7 kHz 1:1 ratio.
Composite CCIF Intermodulation Distortion: 0.005% or less, 15 kHz/14 kHz 1:1 ratio.
Composite Amplitude Response: ±0.025 dB, 30 Hz to 53 kHz.
Composite Phase Response: ±0.1° from linear phase, 30 Hz to 100 kHz.
Composite Group Delay Variation: ±40 nanoseconds, 30 Hz to 100 kHz.
Stereo Separation: 65dB or better from 30 Hz to 15 kHz (sine wave).

STEREO PERFORMANCE

Digital Stereo Generator Module

Digital Audio Input: Format: AES/EBU.
Connectors: Two (2) total, one (1) XLR and one (1) Toshiba optical.
Impedance: 110 ohms, resistive.
Level: -2 dBfs nominal for 100% modulation.
Data Rate: Any in range of 32 to 56 kHz (32, 44.1, or 48 kHz typical output rates for AES/EBU devices).
Frequency Response: ±0.5 dB, 20 Hz to 15 kHz, 75µS pre-emphasis (Flat or 50µS pre-emphasis selectable).
Total Harmonic Distortion: 0.03% or less from 30 Hz to 15 kHz.
Intermodulation Distortion: 0.03%, 60 Hz/7 kHz 4:1 ratio.
Stereo Separation: 70dB or better from 20 Hz to 15 kHz(Sine Wave).
Linear Crosstalk: Main to Sub (L+R to L-R), 20 Hz to 15 kHz, 70dB minimum below 100% modulation.
Sub to Main, 20 Hz to 15 kHz, 50dB minimum below 100% modulation.
FM Noise: 85dB or better below 100% modulation @ 400 Hz measured within a 20 Hz to 22 kHz bandwidth with 75µS de-emphasis and DIN "A" weighting.
Pilot Stability: ±0.3 Hz, +32°F to +122°F (0°C to +50°C).
Dynamic Stereo Separation: 60dB or better from 20 Hz to 15 kHz (normal program content).
38 kHz Suppression: 80dB minimum below 100% modulation.
57 kHz, 76 kHz, and 95 kHz Suppression: 80dB minimum below 100% modulation.
Spurious and Sideband Suppression (beyond 95 kHz): 75dB minimum below 100% modulation.
Modes of Operation: Stereo, Mono L+R, Mono L, and Mono R. Remote control accessible.

MONAURAL OPERATION

Analog Interface Module

Audio Input Impedance: 10 k ohm or 600 ohm selectable, balanced, resistive, 60dB common mode suppression.
Audio Input Level: +10 dBm nominal for ±75 kHz deviation @ 400 Hz, adaptable to other levels.
Audio Frequency Response: ±0.5 dB, 30 Hz to 15 kHz, selectable flat, 25µS, 50µS, or 75µS pre-emphasis.
Harmonic Distortion plus Noise: 0.03% or less @ 400 Hz.
SMPTE Intermodulation Distortion: 0.03% or less, 60 Hz to 7 kHz 4:1 ratio.
CCIF Intermodulation Distortion: 0.03% or less, 15 kHz/14 kHz 1:1 ratio.
FM Signal-to-Noise Ratio: 93dB (96dB typical) below ±75 kHz deviation @ 400 Hz measured in a 20 Hz to 80 kHz bandwidth with 75µS de-emphasis and DIN "A" weighting.

SCA (RBDS/RDS) OPERATION

Analog Interface or Digital Stereo Generator Modules

Input: 3 total, BNC connectors. Two (2) SCA Inputs, one (1) RBDS/RDS Input. SCA Input 2 configurable for SCA or wideband audio input.
Input Impedance: 10 k ohm, unbalanced.
Input Level: 3.5 Vp-p nominal for 10% deviation.
SCA Amplitude Response: ±0.2 dB, 40 to 100 kHz.

FX-50 SPECIFICATIONS

General

Power Output: 3 to 50 W continuously variable (BNC connector) open and short circuit protected.
R.F. Output Impedance: 50 ohms.
R.F. Harmonic and Spurious Suppression: Meets all FCC and DOC requirements and CCIR recommendations for a 50-watt transmitter with optional low pass filter.
Frequency Stability: ±300Hz, +32°F to +122°F (0°C to +50°C).
Modulation Type: Direct FM at the carrier frequency.
Modulation Capability: ±350 kHz.
Asynchronous AM S/N Ratio: 80dB minimum below equivalent reference carrier with 100% amplitude modulation at 400Hz and 75µS de-emphasis (no FM modulation present).
Synchronous AM S/N Ratio: 60dB minimum below equivalent 50W reference carrier with 100% AM modulation at 1kHz, no de-emphasis (FM modulation +/- 75kHz and 1kHz).
Remote Metering: Buffered Forward and Reflected power outputs.
Front Panel Test Connections: Composite input and composite output.
Audio/Control Connections: 14 position barrier strip and (5) BNC connectors. Control connections are AFC Interlock (normally open/normally closed relay contacts), AFC indication (open collector and closure), +20V or remote power control (switch selectable), RF mute, Temperature overload (+18V at 15ma), buffered FWD and RFL meter samples, and two ground connections. All inputs/outputs RFI suppressed.
RF Mute Control: +3V to +40V DC or GND closure, switch selectable. Ima maximum.
AC Input Power: 97 to 133 VAC or 194 to 266 VAC, 50/60 Hz, 230 w maximum.
Ambient Temperature Range: +32°F to +122°F (0°C to +50°C).
Altitude: 15,000 feet (4,572 m) AMSL.
Dimensions: 17.70"W x 5.25"H x 19.00"D (44.96 x 13.33 x 48.26 cm).
Net Weight: 38 lbs. (17.1 kg), packed 46 lbs. (20.7 kg).

Wideband Composite Operation

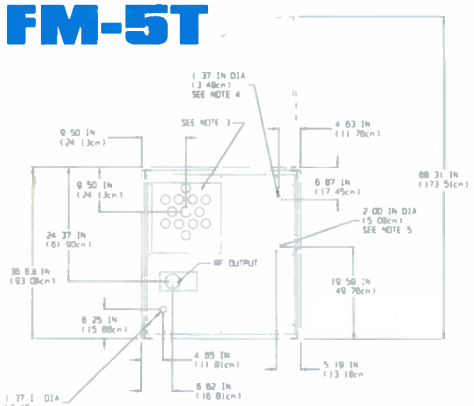
Composite Inputs: 3 total, (1) unbalanced, (1) balanced, plus (1) front panel test provision (BNC connectors).
Composite Input Impedance:
Unbalanced: 10 k ohm, nominal, resistive.
Balanced: 10 k ohm or 50 ohm, programmable, jumper selected.
Composite Input Level: 3.5V p-p nominal, for ±75 kHz deviation.
Composite FM S/N Ratio: 90dB (94dB typical) below +/- 75kHz deviation at 400Hz, measured in a 20Hz to 200kHz bandwidth with 75µS de-emphasis, 94dB (96dB typical) with DIN "A" weighting.
Composite Harmonic Distortion: 0.003% or less.
Composite Intermodulation Distortion: 0.005% or less (0.003% typical).
Composite CCIF IMD: 0.005% or less (all products greater than -86dB below 100% modulation. Twin tone, 15 kHz/14 kHz, 1:1 pair).
Composite Transient IMD: 0.01% or less (square wave/sine wave).
Composite Amplitude Response: +/- 0.025dB, 30Hz to 53kHz.
Composite Phase Response: +/- 0.1 degree from linear phase, 30Hz to 53kHz.
Composite Group Delay Variation: +/- 5 nanoseconds, 30Hz to 100kHz.
Subcarrier Inputs: 3 total, unbalanced, BNC connectors.
Subcarrier Input Impedance: 100 K ohm nominal, resistive.
Subcarrier Input Level: 3.5 V p-p nominal for ±7.5 kHz deviation (10% injection).
Subcarrier Amplitude Response: ±0.2 dB, 40 kHz to 100 kHz -3dB at 7,500 Hz.
Stereophonic Separation: 60dB, 30Hz to 5kHz, 52dB, 5 to 15kHz (measured using BE FS30 Stereo Generator).

Stereo Operation

Total Harmonic Distortion Plus Noise (THD+N): 0.03% or less at ±75 kHz deviation, 400 Hz, using 75µS de-emphasis.
Intermodulation Distortion: 0.03% or less, 60 Hz/7 kHz, 4:1 ratio.
CCIF Intermodulation Distortion: 0.01% or less (all products greater than -80dB below 100% modulation. Left or right channel modulated 100%, twin tone, 15 kHz/14 kHz, 1:1 pair).
Stereo Separation: 60dB; 30 Hz to 5000 Hz. 52 dB; 30 Hz to 15,000 Hz
Spurious and Sideband Suppression: 80dB minimum below 100% modulation to 95 kHz, 75dB minimum beyond 95 kHz.
FM Signal to Noise Ratio: -82dB minimum below left or right channel, 100% modulation, 400 Hz, with 75µS de-emphasis.

BROADCAST ELECTRONIC FLOOR PLANS

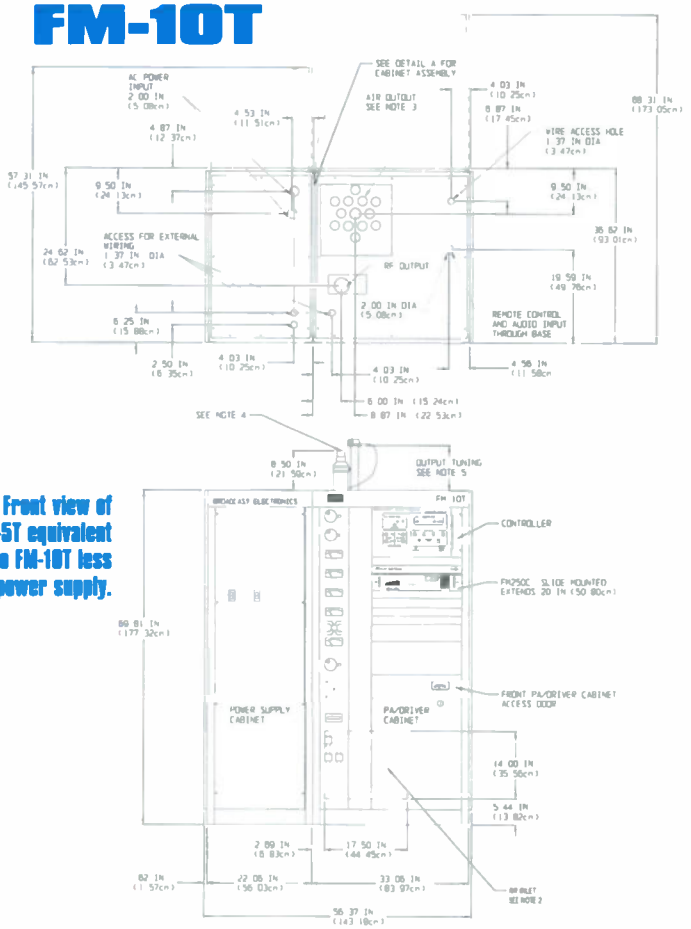
FM-5T



FM-5T NOTES:

1. TUNING LINE HEIGHT (DETERMINED BY TRANSMITTER FREQUENCY: MAXIMUM: 11 INCHES (27.94 CM), FREQUENCY: 108 MHZ. MINIMUM: I INCH (2.54 CM), FREQUENCY: 87.5 MHZ.
2. AIR INLET, FILTER REQUIRED (BE P/N 407-0062). LOCATION: REAR OF PA/DRIVER CABINET
   DIMENSIONS:
   WIDTH: 17.5 INCHES (44.5 CM),
   HEIGHT: 14 INCHES (35.6 CM).
3. AIR OUTLET: LOCATION: TOP OF PA/DRIVER CABINET
   DESCRIPTION: 15 INCH (38.1 CM) SQUARE EXHAUST AREA CENTERED AROUND OUTPUT TUNING LINE.
4. ACCESS FOR A.C. POWER THROUGH 1 3/8" (3.47 CM) DIA. HOLE IN TOP COVER IN REAR. GROUND STRAP ENTRY POINT IN LOWER RIGHT CORNER.
5. ACCESS FOR REMOTE CONTROL AND AUDIO CONNECTIONS THROUGH 2" (5.08 CM) DIA. HOLE IN BASEPLATE OR THROUGH EITHER 1 3/8" (3.47 CM) DIA. HOLE TOP COVER.
6. RF OUTPUT CONNECTION: 1.625 INCH (4.13 CM) EIA 50 OHM COUPLING, 1.625 FEMALE EIA FLANGE, OR 1.625 MALE EIA FLANGE.
7. FLOOR: 121 POUNDS PER SQUARE FOOT (MAX.)
8. HEAT DISSIPATION (5KW OUTPUT) FM-5T-3.5KW (11,995 BTU/H). FM-5TS-4.6KW (15,700 BTU/H).
9. COOLING AIR REQUIREMENTS: 800 CUBIC FEET PER MINUTE (22.6M3/MIN).
10. AC INPUT:
    THREE PHASE: 196-252 VAC, 3 WIRE, 3 PHASE AT 40 AMPERES PER PHASE MAXIMUM LINE CURRENT, 60 HZ WITH 909-5000-215 (50 HZ WITH 909-5000-315), 909-5000-385 REQUIRES 340-436 PHASE TO PHASE VAC, 50HZ, 4 WIRE, 3 PHASE AT 40 AMPERES PER PHASE MAXIMUM LINE CURRENT. FUSED DISCONNECT SWITCH RECOMMENDED. FOR PROPER SIZING OF FUSES REFER TO NATIONAL ELECTRICAL CODE OR LOCAL CODES.
    SINGLE PHASE: 196-252 VAC, 60 HZ, SINGLE PHASE AT 55 AMPERES MAXIMUM. FUSED DISCONNECT SWITCH RECOMMENDED. FOR PROPER SIZING OF FUSES REFER TO NATIONAL ELECTRICAL CODE OR LOCAL CODES.
11. POWER CONSUMPTION: 8.3KW FOR A 5KW RF POWER OUTPUT, 0.92 POWER FACTOR

FM-10T

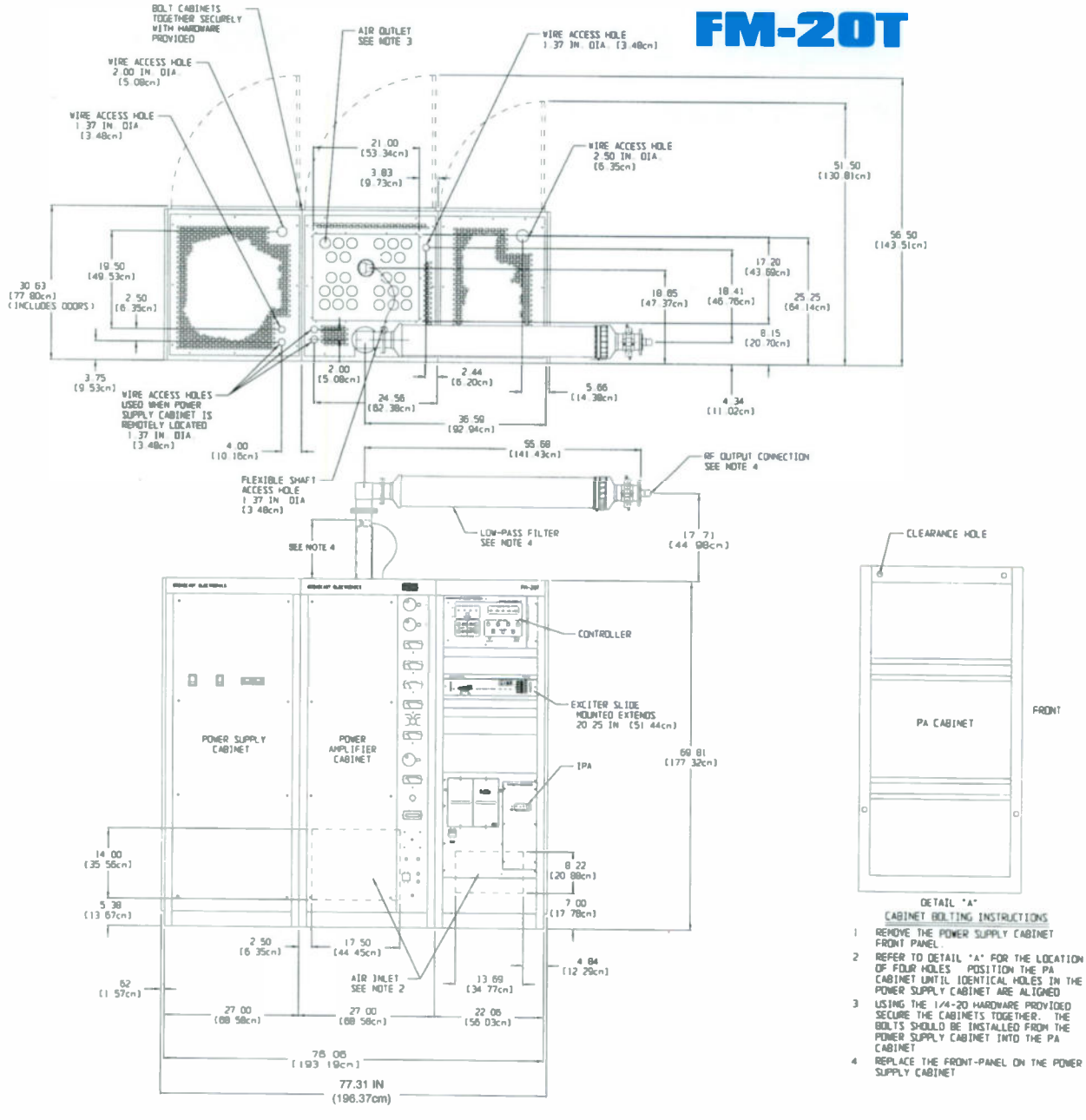


Front view of FM-5T equivalent to FM-10T less power supply.

FM-10T NOTES:

1. POWER SUPPLY CABINET MAY BE LOCATED FROM PA/DRIVER CABINET IF DESIRED. 30 FEET (9.14m) STANDARD.
2. AIR INLET, FILTER REQUIRED (BE P/N 407-0062).
   LOCATION: REAR OF PA/DRIVER CABINET
   DIMENSIONS:
   WIDTH: 17.5 INCHES (44.5cm).
   HEIGHT: 14 INCHES (35.6cm).
3. AIR OUTLET: LOCATION: TOP OF PA/DRIVER CABINET
   DESCRIPTION: 15 INCH (38.1cm) SQUARE EXHAUST AREA CENTERED AROUND OUTPUT TUNING LINE.
4. RF OUTPUT CONNECTION: 1.625 INCH EIA 50 OHM COUPLING, 1.625 FEMALE FLANGE, OR 1.625 MALE FLANGE STANDARD. 3.125 INCH EIA 50 OHM MALE FIELD FLANGE OPTIONAL. SEE VIEW "B"
5. TUNING LINE HEIGHT (DETERMINED BY TRANSMITTER FREQUENCY: MAXIMUM: 11 INCHES (27.94cm), FREQUENCY: 108 MHZ. MINIMUM: I INCH (2.54cm), FREQUENCY: 87.5 MHZ.
6. FLOOR: 180 POUNDS PER SQUARE FOOT (MAX.)
7. COOLING AIR REQUIREMENTS: 800 CUBIC FEET PER MINUTE (22.6m3/MIN).
8. AC INPUT: FM-10T-196 TO 252 VAC 50/60 HZ OR 341 TO 435 VAC 50 HZ, THREE-PHASE CLOSED-DELTA OR WYE, 65 AMPERES MAXIMUM. FM-10TS-196 TO 252 VAC 50/60 HZ SINGLE PHASE, 120 AMPERES MAXIMUM.
9. HEAT DISSIPATION (10KW OUTPUT): 7KW (25,000 BTU/H).
10. POWER CONSUMPTION: 15.8 KW FOR A 10 KW RF POWER OUTPUT, 0.94 POWER FACTOR.
11. PRIMARY AC FUSED SERVICE DISCONNECT
    THREE PHASE FUSE SIZE: 100A
    WIRE SIZE: NO. 1 COPPER THHN OR EQUIVALENT
    SINGLE PHASE FUSE SIZE: 175A
    WIRE SIZE: 3/0 COPPER THHN OR EQUIVALENT
    FUSED DISCONNECT SWITCH RECOMMENDED.
    REFER TO THE NATIONAL ELECTRIC CODE OR LOCAL CODES FOR PROPER FUSE SIZES.

FM-20T

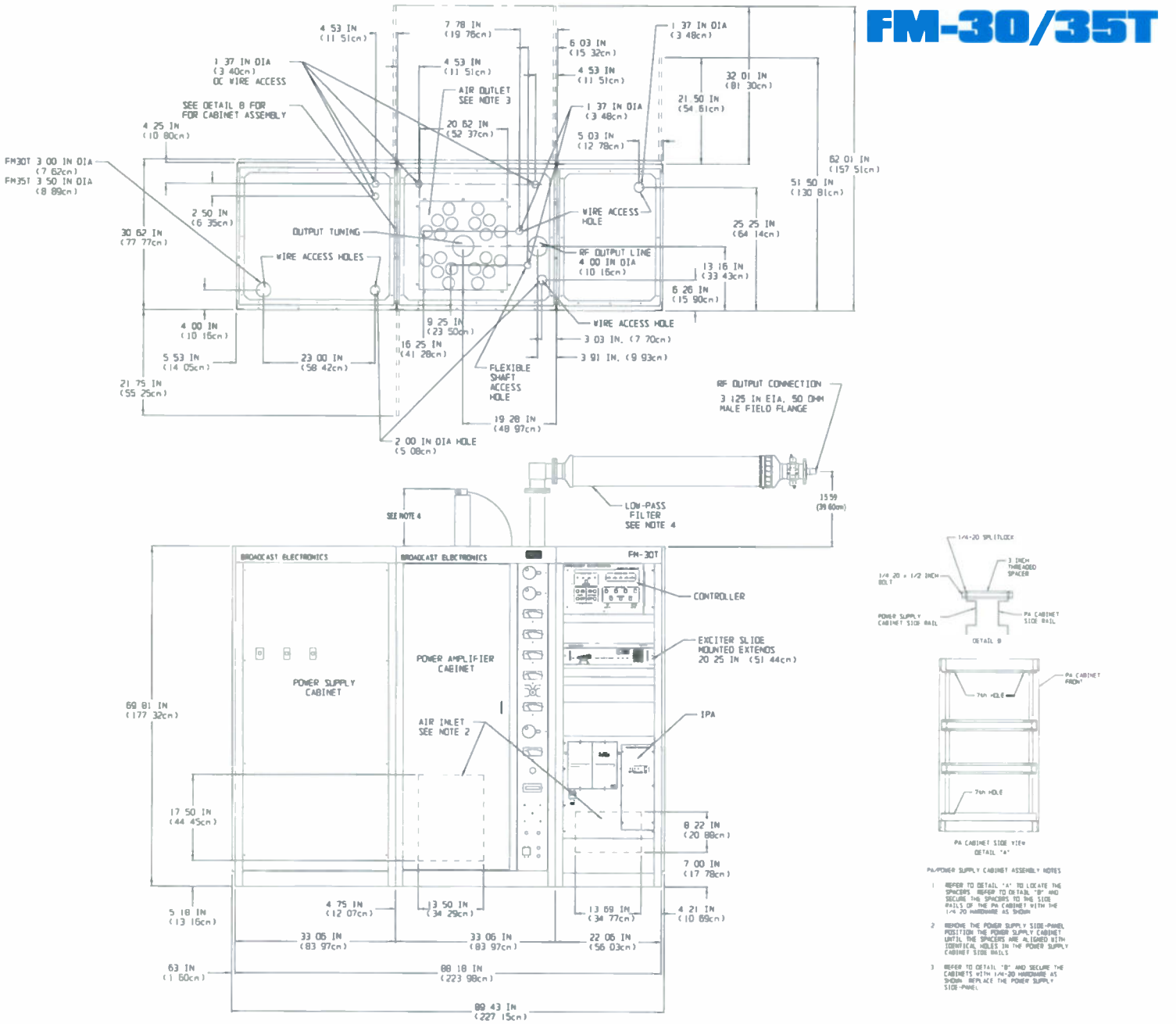


CABINET BOLTING INSTRUCTIONS

1. REMOVE THE POWER SUPPLY CABINET FRONT PANEL.
2. REFER TO DETAIL "A" FOR THE LOCATION OF FOUR HOLES. POSITION THE PA CABINET UNTIL IDENTICAL HOLES IN THE POWER SUPPLY CABINET ARE ALIGNED.
3. USING THE 1/4-20 HARDWARE PROVIDED SECURE THE CABINETS TOGETHER. THE BOLTS SHOULD BE INSTALLED FROM THE POWER SUPPLY CABINET INTO THE PA CABINET.
4. REPLACE THE FRONT-PANEL ON THE POWER SUPPLY CABINET.

FM-20T NOTES:

1. POWER SUPPLY CABINET MAY BE LOCATED REMOTELY FROM THE PA/DRIVER CABINET IF DESIRED. 30 FEET (9.14 M) STANDARD.
2. AIR INLET:
   1. LOCATION: PA CABINET REAR-PANEL
      DIMENSIONS:
      WIDTH: 17.5 INCHES (44.45 CM)
      HEIGHT: 14.0 INCHES (35.56 CM)
      FILTER: 16 INCHES X 20 INCHES X 1 INCH NOMINAL.
      BEI P/N 407-0062.
   2. LOCATION: DRIVER CABINET REAR PANEL
      DIMENSIONS:
      WIDTH: 13.69 INCHES (34.77 CM)
      HEIGHT: 8.22 INCHES (20.88 CM)
      FILTER: 16 INCHES X 20 INCHES X 1 INCH NOMINAL. BEI P/N 407-0062.
3. AIR OUTLET: DESCRIPTION: 17 INCHES (43.18 CM) X 20.75 INCHES (52.71 CM) EXHAUST AREA CENTERED AROUND OUTPUT TUNING LINE.
4. RF OUTPUT ASSEMBLY: CONNECTION: 3.125 INCH EIA 50 OHM MALE FIELD FLANGE. LOW-PASS FILTER (BEI P/N 339-0022):
   DIMENSIONS:
   LENGTH: 52.12 INCHES (132.38 CM)
   DIAMETER: 6.13 INCHES (15.57 CM)
   MOUNTING: MECHANICAL SUPPORT REQUIRED EXTERNAL TO TRANSMITTER.
   WEIGHT: 65 POUNDS (29.48 KG)
   TUNING LINE HEIGHT (DETERMINED BY TRANSMITTER FREQUENCY):
   MAXIMUM: 17.0 INCHES (43.18 CM) @ 108 MHZ
   MINIMUM: 5.0 INCHES (12.7 CM) @ 88 MHZ
5. CUBAGE: PA/DRIVER CABINET:
   64 CUBIC FEET (1.8 m^3)
   POWER SUPPLY CABINET:
   36 CUBIC FEET (1.0m^3)
6. WEIGHT: PA/DRIVER CABINET:
   1200 POUNDS (545 kg)
   POWER SUPPLY CABINET:
   1500 POUNDS (681 kg)
7. COOLING AIR REQUIREMENTS:
   PA CABINET: 810 CUBIC FEET PER MINUTE (23M3/MIN)
   DRIVER CABINET: 500 CUBIC FEET PER MINUTE (14.2M3/MIN)
   POWER SUPPLY CABINET: NATURAL CONVECTION
8. AC INPUT REQUIREMENTS:
   196V TO 252V AC 50/60 HZ OR 339V TO 437 AC 50 HZ, THREE-PHASE CLOSED-DELTA OR WYE, 200 AMPERES PER PHASE MAXIMUM. FUSED DISCONNECT RECOMMENDED.
9. HEAT DISSIPATION:
   20 KW OUTPUT: 16KW (54,725 BTU/H)
10. POWER CONSUMPTION:
    30.0 KW FOR A 20 KW OUTPUT, 0.97 POWER FACTOR.



FM-30/35T NOTES:

1. POWER SUPPLY CABINET MAY BE LOCATED REMOTELY FROM THE PA/DRIVER CABINET IF DESIRED. 30 FEET (9.14 M) STANDARD.
2. AIR INLET:
   1. LOCATION: PA CABINET REAR-PANEL
      DIMENSIONS:
      WIDTH: 13.5 INCHES (34.29 CM)
      HEIGHT: 17.5 INCHES (44.45 CM)
      FILTER: 16 INCHES X 20 INCHES X 1 INCH NOMINAL.
      BEI P/N 407-0062.
   2. LOCATION: DRIVER CABINET REAR-PANEL
      DIMENSIONS:
      WIDTH: 13.69 INCHES (34.77 CM)
      HEIGHT: 8.22 INCHES (20.88 CM)
      FILTER: 16 INCHES X 20 INCHES X 1 INCH NOMINAL. BEI P/N 407-0062.
3. AIR OUTLET:
   DESCRIPTION: 20.62 INCHES (52.37 CM) SQUARE EXHAUST AREA CENTERED AROUND OUTPUT TUNING LINE.
4. RF OUTPUT ASSEMBLY: CONNECTION: 3.125 INCH EIA 50 OHM MALE FIELD FLANGE. LOW-PASS FILTER (BEI P/N 339-0022).
   DIMENSIONS:
   LENGTH: 52.12 INCHES (132.38 CM)
   DIAMETER: 6.13 INCHES (15.57 CM)
   MOUNTING: MECHANICAL SUPPORT REQUIRED EXTERNAL TO TRANSMITTER.
   WEIGHT: 65 POUNDS (29.48 KG)
   TUNING LINE HEIGHT (DETERMINED BY TRANSMITTER FREQUENCY):
   MAXIMUM: 15.5 INCHES (39.37 CM) @ 108 ,MHZ
   MINIMUM: 4.5 INCHES (11.3 CM) @88 MHZ
5. CUBAGE: PA/DRIVER CABINET: 72 CUBIC FEET (2 m^3)
   POWER SUPPLY CABINET: 44 CUBIC FEET (1.25m^3)
6. WEIGHT: PA/DRIVER CABINET: 1500 POUNDS (682 kg)
   POWER SUPPLY CABINET: 1750 POUNDS (794 kg)
7. COOLING AIR REQUIREMENTS:
   PA CABINET: 1200 CUBIC FEET PER MINUTE (34M3/MIN)
   DRIVER CABINET: 500 CUBIC FEET PER MINUTE (14.2M3/MIN)
   POWER SUPPLY CABINET: NATURAL CONVECTION.
8. AC INPUT REQUIREMENTS: FM-30T 196V TO 252V AC 50/60 HZ OR 339V TO 437 AC 50 HZ, THREE-PHASE CLOSED-DELTA OR WYE, 250 AMPERES PER PHASE MAXIMUM. FUSED DISCONNECT RECOMMENDED.
   FM-35T: 196V TO 252V AC 50/60 HZ OR 339V TO 437 AC 50HZ, THREE-PHASE CLOSED-DELTA OR WYE, 300 AMPERES PER PHASE MAXIMUM. FUSED DISCONNECT RECOMMENDED.
9. HEAT DISSIPATION:
   FM30T (30 KW OUTPUT): 14KW (48,000 BTU/H)
   FM35T (35 KW OUTPUT): 16KW (55,000 BTU/H)
10. POWER CONSUMPTION:
    FM30T: 44.0 KW FOR A 30 KW OUTPUT, 0.94 POWER FACTOR
    FM35T: 51.0 KW FOR A 35 KW OUTPUT, 0.94 POWER FACTOR.

MAIN/ALTERNATE Configuration

NOTES

1 POWER SUPPLY CABINETS MAY BE LOCATED REMOTELY FROM PA/DRIVER CABINET IF DESIRED 30 FEET (9 14M) STANDARD

2 AIR INLET, FILTER REQUIRED (BE P/N 407-0052)
LOCATION: REAR OF PA/DRIVER CABINET
DIMENSIONS
WIDTH 17.5 INCHES (44 5 CM)
HEIGHT: 14 INCHES (35 6 CM)

3 AIR OUTLET
LOCATION TOP OF PA/DRIVER CABINET
DESCRIPTION 15 INCH (38 1 CM) SQUARE
EXHAUST AREA CENTERED AROUND
OUTPUT TUNING LINE

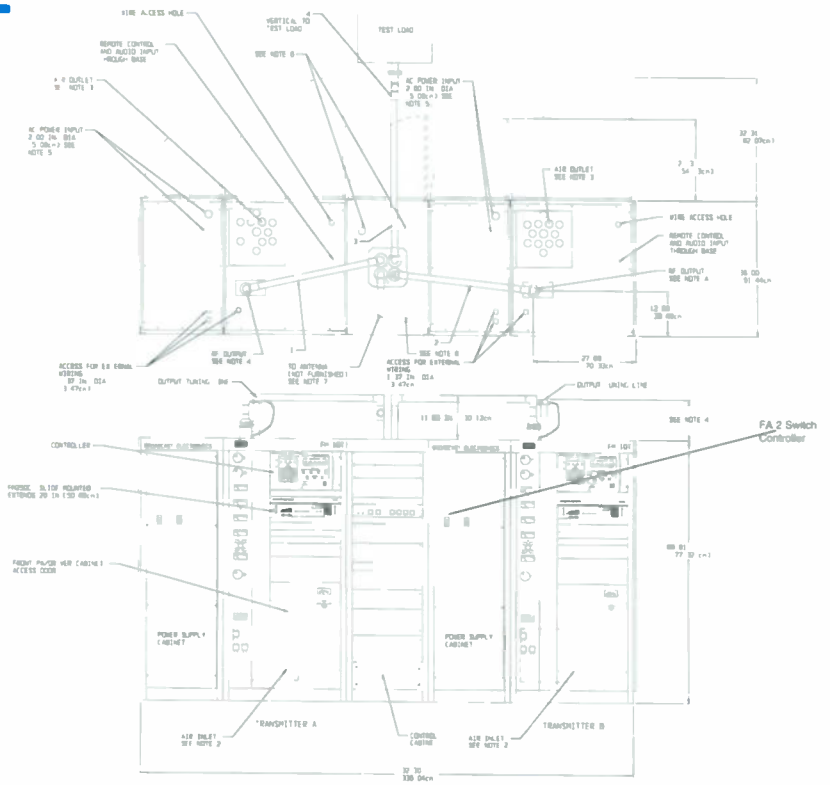
4 RF OUTPUT ASSEMBLY
CONNECTION 1.625 INCH EIA 50 OHM
MALE FIELD FLANGE

TUNING LINE HEIGHT (DETERMINED BY TRANSMITTER FREQUENCY)
MAXIMUM 11 INCHES (27 94 CM), FREQUENCY 108 MHz
MINIMUM 1 INCH (2 54 CM), FREQUENCY 87 5 MHz

5 ACCESS FOR A C POWER THRU TOP OR BOTTOM OF CABINET

6 ACCESS FOR REMOTE CONTROL AND AUDIO CONNECTIONS THROUGH TOP OR BOTTOM OF CABINET.

7 OUTPUT CONNECTOR, 1 625 IN



Dual/Combined Configuration

NOTES

1 POWER SUPPLY CABINETS MAY BE LOCATED REMOTELY FROM PA/DRIVER CABINET IF DESIRED. 30 FEET (9 14M) STANDARD

2 AIR INLET, FILTER REQUIRED (BE P/N 407-0082)
LOCATION: REAR OF PA/DRIVER CABINET.
DIMENSIONS
WIDTH. 17 5 INCHES (44.5 CM)
HEIGHT 14 INCHES (35 6 CM)

3 AIR OUTLET
LOCATION TOP OF PA/DRIVER CABINET
DESCRIPTION 15 INCH (38 1 CM) SQUARE
EXHAUST AREA CENTERED AROUND
OUTPUT TUNING LINE

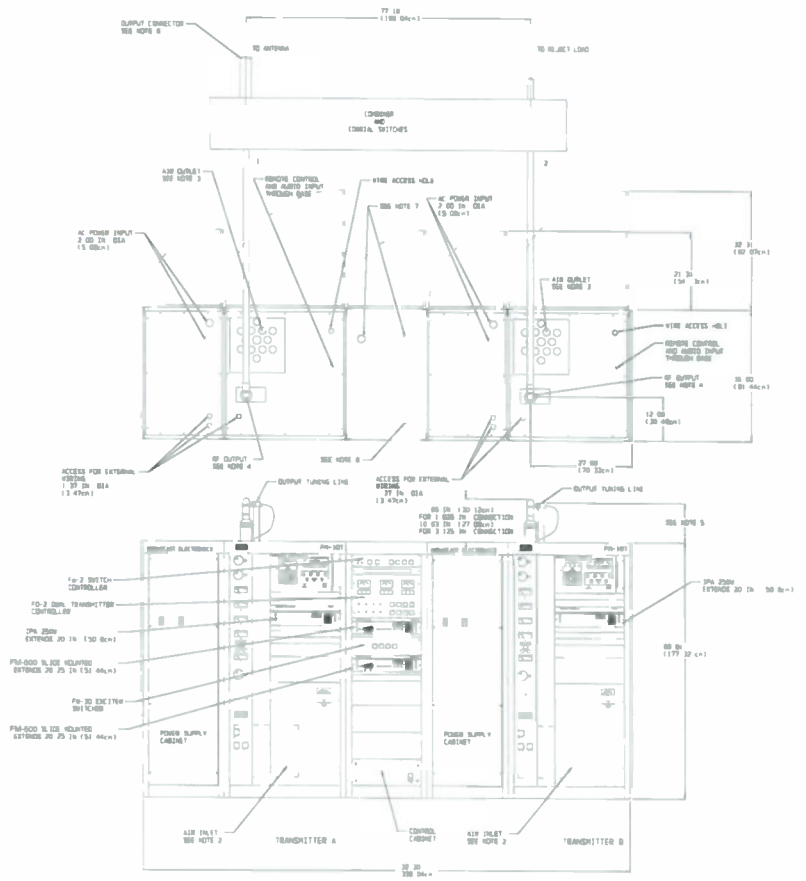
4 RF OUTPUT ASSEMBLY
CONNECTION: 1 625 INCH EIA 50 OHM
MALE FIELD FLANGE STANDARD
3 125 INCH EIA 50 OHM MALE
FIELD FLANGE OPTIONAL.

5 TUNING LINE HEIGHT (DETERMINED BY TRANSMITTER FREQUENCY)
MAXIMUM 11 INCHES (27 94 CM), FREQUENCY 108 MHz
MINIMUM. 1 INCH (2 54 CM), FREQUENCY 87.5 MHz

6 ACCESS FOR A C. POWER THRU BASE PLATE, SEE DRAWING
GROUND STRAP ENTRY POINT IN LOWER LEFT CORNER

7 ACCESS FOR REMOTE CONTROL AND AUDIO CONNECTIONS THROUGH TOP OR BOTTOM OF CABINET

8 OUTPUT CONNECTOR, 3-1/8 IN



BROADCAST ELECTRONICS— SOLUTIONS FOR TOMORROW'S RADIO

Operating in today's radio industry calls for cost effective solutions for your equipment requirements.

For years, Broadcast Electronics has been leading the broadcast industry in technology, product development and service. In fact, no other company today provides such a full range of radio broadcasting solutions.

The RF PRODUCTS LINE carries a wide range of AM and FM radio transmission systems, accessories, studio products, and remote equipment.

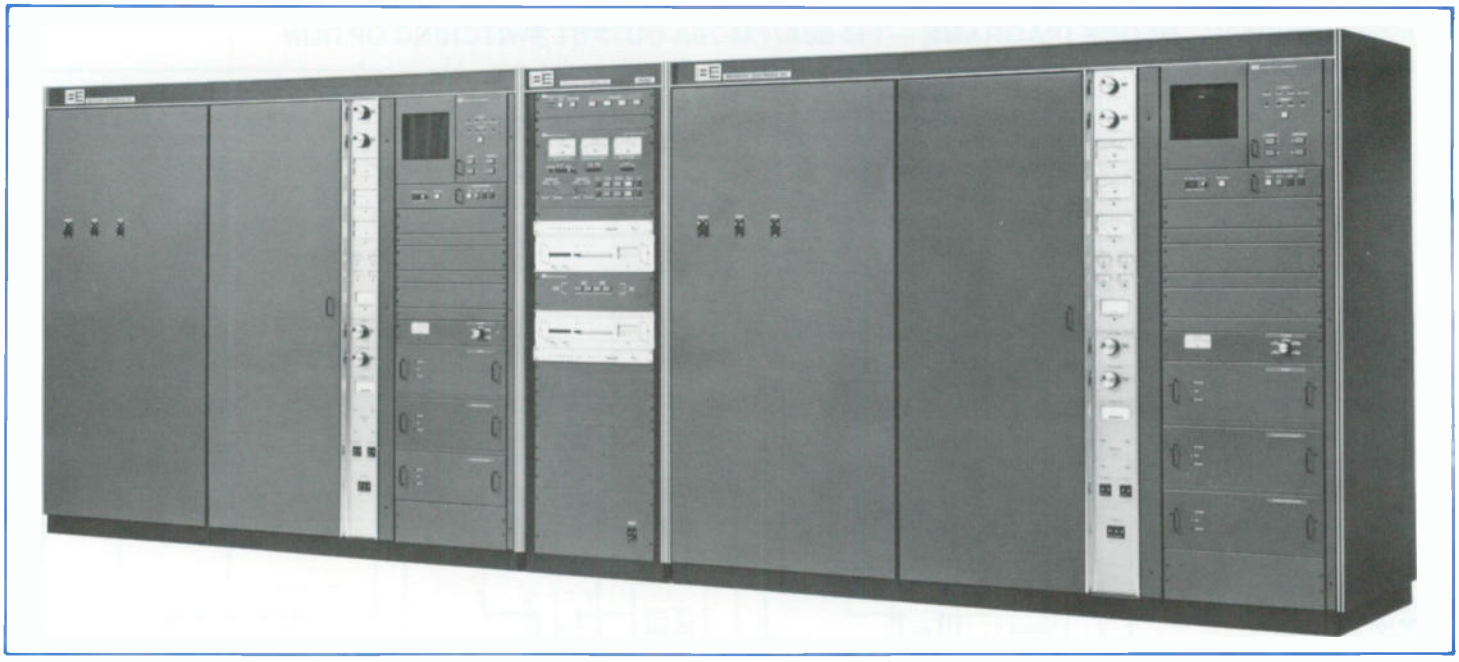
Included in this division is the MARTI line of industry leading remote pickup systems, telephone codecs, studio-transmitter links, FM exciters, accessories, and other wireless remote communication systems.

The STUDIO SYSTEMS division produces AudioVAULT®, the best selling digital audio storage and control system for radio. Additionally, a complete line of studio furniture and the AudioPOINT routing switch are included in this division.

Broadcast Electronics' PROGRAMMING division is the leading U.S. provider of music formats, syndicated dayparts, libraries, and consulting services, offering comprehensive resources and programming solutions for radio.

For more information on any of our products, contact your Broadcast Electronics representative, call us direct at (217) 224-9600, or visit our homepage at www.bdcast.com.

FM-70A, 'Dual-35', 70 kW FM Transmitter
FM-60A, 'Dual-30', 60 kW FM Transmitter



FEATURES

- *Folded half-wave output cavity (no plate blocking capacitors or sliding contacts)
- Twenty-nine meters including eight multi-function meters
- Automatic proportional VSWR foldback
- Optional Microprocessor Video Diagnostic System. (MVDS)
- Synthesized, transparent FX-30 exciter
- Advanced transmitter controller

*Patented

ADVANCED RELIABILITY TRANSMITTERS

The FM-60A and FM-70A from Broadcast Electronics offer the ultimate in high level output capability in a dependable, dual transmitter system.

The 60,000 watt FM-60A is comprised of two FM-30A transmitters. The FM-70A system delivers 70,000 watts from two combined FM-35A transmitters. As shown in Figure 1, both the FM-60A and FM-70A utilize a single FX-30 synthesized exciter. The output of the FX-30 is fed into a hybrid splitter which supplies equal RF drive to the solid-state IPA stages. A phase shifter is provided to allow independent control of phase balance without the need to re-tune the transmitters.

The RF outputs from the twin FM-30A (FM-60A system) or FM-35A (FM-70A system) transmitters are summed in a hybrid combiner to deliver the total output, less combiner losses. The hybrid combiner includes a reject load which dissipates any energy resulting from an imbalance in the system. Consequently, should either transmitter malfunction, transmission will still continue uninterrupted at a reduced power level through the combiner.

EXCITER SWITCHING OPTION

Where complete redundancy of equipment is desired, a dual exciter option is available. (See Figure 2) By utilizing the optional FW-30 Exciter Switcher, two FX-30 exciters can be switched manually or automatically. In automatic operation, the FW-30 monitors the output of the on-air exciter and maintains the backup on "hot stand-by". If the FW-30 detects a failure in the on-air unit, it will automatically switch to the backup exciter.

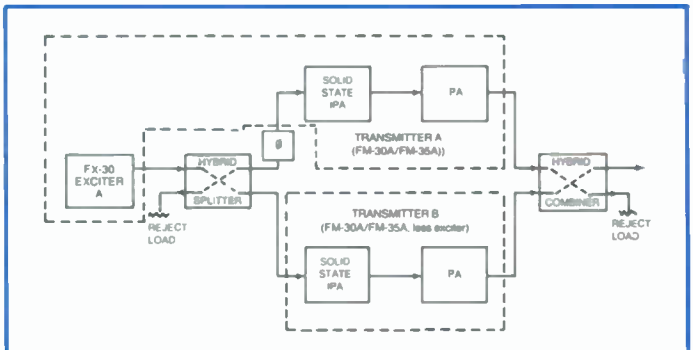


FIGURE 1 - BLOCK DIAGRAM, FM-60A/FM-70A

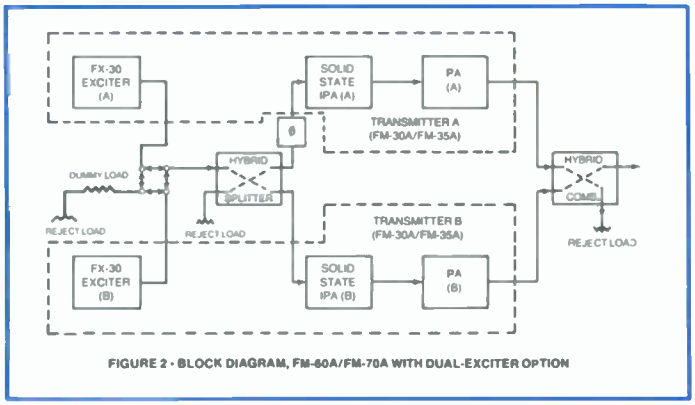
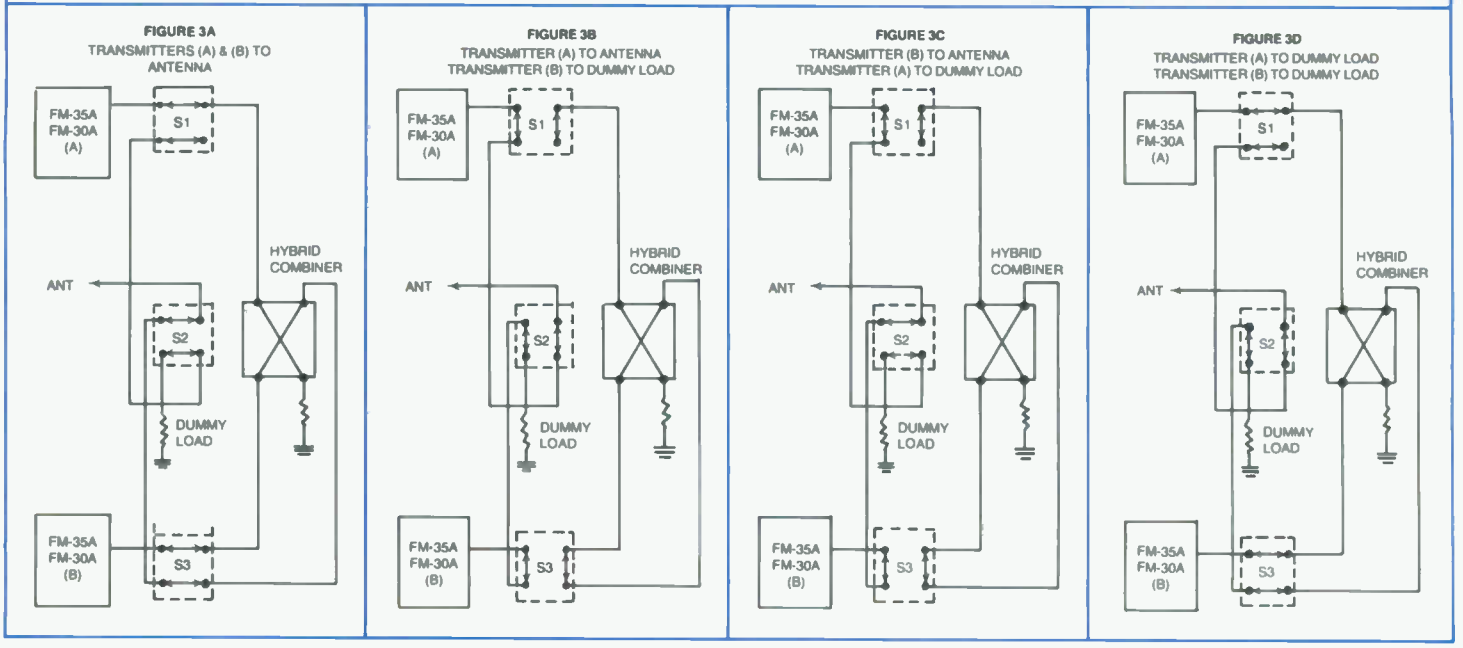


FIGURE 2 - BLOCK DIAGRAM, FM-60A/FM-70A WITH DUAL-EXCITER OPTION

BLOCK DIAGRAMS — FM-60A/FM-70A OUTPUT SWITCHING OPTION



OUTPUT SWITCHING OPTION

An automatic/manual output switching option is also available. (See Figures 3A through 3D) By using the optional FO-2 Automatic Output Switcher with the appropriate coaxial switches (not supplied), rapid transmitter switching can be accomplished manually or automatically. The FO-2 offers four operating modes:

1. Transmitters A+B to Air
2. Transmitters A+B to Load
3. Transmitter A to Air, B to Load
4. Transmitter B to Air, A to Load

If automatic operation is selected, the FO-2 will monitor the outputs of both transmitters continuously. If it detects a failure, the FO-2 automatically switches the defective unit to the dummy load and places the remaining transmitter directly on-line to the antenna. By using the FO-2 switcher to bypass the combiner, the full power capability of the remaining transmitter is available for output.

POWER AMPLIFIER DESIGN

Both the FM-30A transmitters used in the FM-60A system, and the FM-35A transmitters in the FM-70A system employ a state-of-the-art power amplifier section. At the heart of this advanced PA design is the patented folded half-wave cavity. This unique innovation completely eliminates troublesome plate blocking capacitors and sliding contacts. The result is exceptional reliability and lower maintenance costs.

The FM-30A transmitters utilize a single Eimac 8990/4CX20,000A tetrode to provide 30 kW output. The 4CX20,000A has a field proven record of long life and high output efficiency in the FM-30A's.

The FM-35A transmitters feature a single Eimac 4CX20,000C. This rugged tetrode offers the largest filament and anode to be found in **any** 35 kW FM transmitter.

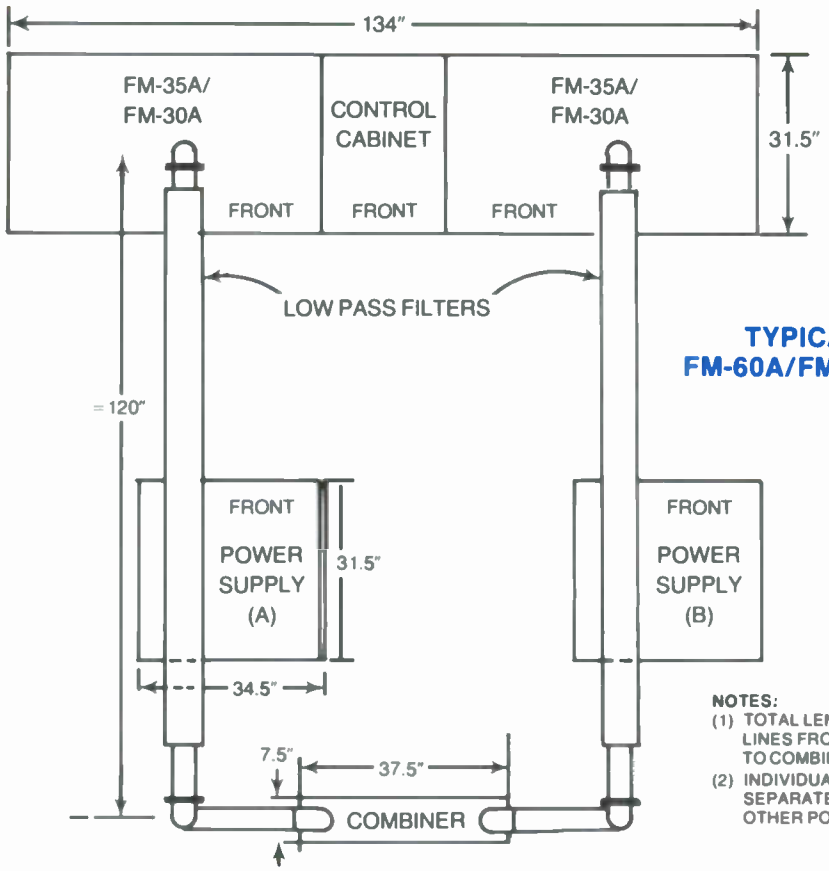
BROADBAND SOLID-STATE DRIVER/IPA

Both the FM-30A and FM-35A transmitters include an advanced Driver/IPA system.

A solid-state Power FET pre-driver stage in each transmitter is used to boost the output of the FX-30 to approximately 60 watts. A hybrid splitter network feeds two identical solid-state IPA modules, the outputs of which are combined in phase, to produce the drive level necessary to power the PA stage. Each of the IPA/Driver assemblies are self-contained and accessible through front access, slide-out drawers. LED indicators display forward power, VSWR, and overtemperature conditions. This updated IPA is broadband, requires no output tuning over the entire FM band, and features excellent stability under all operating conditions.

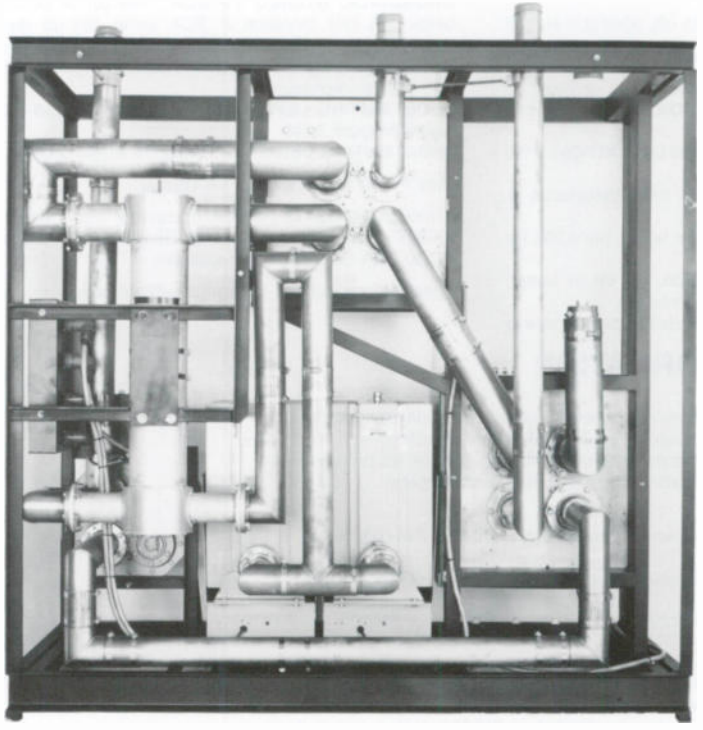
OPTIONAL MICROPROCESSOR VIDEO DIAGNOSTIC SYSTEM (MVDS)

The FM-60A and FM-70A both contain the provision to add the optional Microprocessor Video Diagnostic System (MVDS). MVDS provides diagnostic system analysis to the sub-system level and redundant, automatic transmitter control. It converts multiple meter readings to easy-to-read bar-graph or tabular video displays. MVDS also offers hard copy logging capability as well as remote monitoring via modem, telco lines, or SCA. Keyboard entry is utilized with password control. See the MVDS brochure for more details.



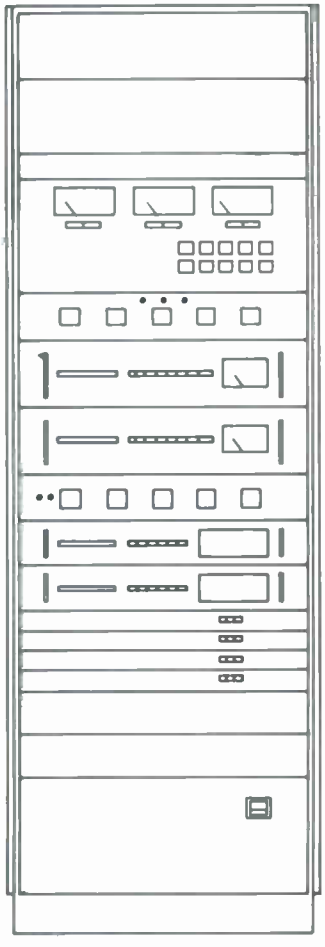
TYPICAL FLOOR PLAN FM-60A/FM-70A INSTALLATION

NOTES:
(1) TOTAL LENGTH OF TRANSMISSION LINES FROM FM-30A/FM-35A (A) & (B) TO COMBINER INPUTS MUST BE EQUAL.
(2) INDIVIDUAL CABINETS MAY BE SEPARATED AND LOCATED IN OTHER POSITIONS.



Output Switching Option - As shown in Figures 3A through 3D, utilizing coaxial relay switching for uninterrupted service during routine maintenance or single-transmitter malfunction.

FM-60A/FM-70A CONTROL CABINET LAYOUT



*Optional

FM-60A/FM-70A TECHNICAL SPECIFICATIONS

GENERAL

POWER OUTPUT: FM-60A 15-60 kW including combiner losses; FM-70A 20-70 kW including combiner losses.
FREQUENCY RANGE: 87.5 to 108 MHz., tuned to specific operating frequency. Exciter programmable in 10 kHz. steps.
RF OUTPUT IMPEDANCE: 50 ohms (others on special request)
OUTPUT CONNECTOR: 6⅛ inch EIA flange
VSWR: 1.8:1 maximum. (will operate into higher VSWR with automatic power reduction).
FREQUENCY STABILITY: ±300 Hz., 0 to 50 Degrees C.
TYPE OF MODULATION: Direct frequency modulation of carrier frequency.
MODULATION CAPABILITY: Greater than ±200 kHz.
MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.
EXCITER: Solid state, 30 watt output, model FX-30; incorporating a digitally programmed synthesizer. (10 kHz. increments)
PRE-EMPHASIS: FCC 75 uS, CCIR 50 uS (where specified) or 25 uS (Dolby)
ASYNCHRONOUS AM S/N RATIO: 55 dB below reference carrier with 100% AM modulation @ 400 Hz., 75 uS de-emphasis. (no FM modulation present)
SYNCHRONOUS AM S/N RATIO: 45 dB below reference carrier with 100% AM modulation @ 400 Hz., 75 uS de-emphasis. (FM modulation ±75 kHz. @ 400 Hz.)
TUBE COMPLEMENT: FM-60A (2) 8990/4CX20,000A; FM-70A (2) 4CX20,000C
RF HARMONICS: Suppression meets all FCC/DOC requirements and CCIR recommendations.
POWER SUPPLY RECTIFIERS: Silicon

ELECTRICAL/MECHANICAL

AC INPUT POWER: 208 V WYE/240 V Delta, 60 Hz, three phase. (Taps for 196 to 252 V. Other voltages and line frequencies are available upon request.)
POWER CONSUMPTION: (FM-60A) 105 kW @ 60 kW output, 0.9 pf; (FM-70A) 118 kW @ 70 kW output, 0.9 pf
SIZE: Transmitters (2) 56.5″ W × 31.5″ D × 70″ H (143.5 W × 80 D × 177.8 H cm); Power Supplies (2) 34.5″ W × 31.5″ D × 70″ H (87.6 W × 80 D × 177.8 H cm)
WEIGHT & CUBAGE: Transmitters (2) 1500 lbs. (682 Kg); packed 1750 lbs. (795 Kg) 72 cu. ft. (2 cu. meters); HV Power Supplies (2) 1750 lbs (794 Kg); packed 1800 lbs (816 Kg) 44 cu. ft. (1.25 cu. meters)
ALTITUDE: 10,000 feet @ 60 Hz (3048 m), 7500 ft. @ 50 Hz (2286 M)
AMBIENT TEMPERATURE RANGE: −10 degrees C to +50 degrees C.
FINISH: B/E blue with anodized aluminum control center panel and anodized aluminum trim.

*MONAURAL OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode supression
AUDIO INPUT LEVEL: +10 dBm nominal for ±75 kHz. deviation @ 400 Hz.
AUDIO FREQUENCY RESPONSE: ±0.5 dB, 30 Hz. to 15 kHz., selectable flat, 25, 50, 75 microsecond pre-emphasis
HARMONIC DISTORTION: 0.08% or less (.04% typical)
INTERMODULATION DISTORTION: 0.08% or less, 60 Hz./7 kHz., 4:1 ratio
TRANSIENT IMD: 0.1% or less (square wave/sine wave)
FM S/N RATIO: 72 dB below ±75 kHz. deviation @ 400 Hz. (75 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 uS de-emphasis

*WIDEBAND COMPOSITE OPERATION

COMPOSITE INPUTS: 3 total, (1) unbalanced and (1) balanced plus front panel test. All connectors BNC.
COMPOSITE INPUT IMPEDANCE: 10K ohm, nominal, resistive
COMPOSITE INPUT LEVEL: 3.5 V p-p nominal, for ±75 kHz. deviation
COMPOSITE FM S/N RATIO: 72 dB below ±75 kHz deviation @ 400 Hz. (75 dB typical) Measured in a 30 Hz. to 100 kHz. bandwidth with 75 uS de-emphasis
COMPOSITE HARMONIC DISTORTION: 0.08% or less (.04% typical)
COMPOSITE INTERMODULATION DISTORTION: 0.08% or less (.04% typical)
COMPOSITE TRANSIENT IMD: 0.1% or less (square wave/sine wave)
COMPOSITE AMPLITUDE RESPONSE: ±0.1 dB, 30 Hz to 100 kHz
COMPOSITE PHASE RESPONSE: ±0.5 degrees from linear phase, 30 Hz to 53 kHz
COMPOSITE GROUP DELAY: 390 nanoseconds, ±25 nanoseconds 30 Hz to 53 kHz
COMPOSITE SLEW RATE: 12V/microsecond (symmetrical)

*STEREO OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, floating. (Adaptable to other impedances)
AUDIO INPUT LEVEL: +10 dBm, ±1 dBm, for 100% modulation @ 400 Hz. (Adaptable to other input levels)
AUDIO INPUT FILTER: 15 kHz LPF with delay equalization for minimum overshoot
FREQUENCY RESPONSE: ±0.5 dB, 30-15,000 Hz, 75 uS pre-emphasis (flat, 25 or 50 uS pre-emphasis selectable)
TOTAL HARMONIC DISTORTION: 0.08% or less
INTERMODULATION DISTORTION: 0.08%, 60 Hz/7 kHz; 4:1 ratio
TRANSIENT INTERMODULATION DISTORTION: 0.1% (square wave/sine wave)
FM NOISE: 72 dB or better below 100% modulation @ 400 Hz, 75 uS de-emphasis
STEREO SEPARATION: 45 dB or better; 30-15,000 Hz (sine wave)
DYNAMIC STEREO SEPARATION: 40 dB or better; 30-15,000 Hz (normal program content)
LINEAR CROSSTALK: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30-15,000 Hz, 45 dB minimum below 100% modulation.
NON-LINEAR CROSSTALK: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation
PILOT STABILITY: ±0.5 Hz, 0 to 50 degrees C.
MODES: Stere, Mono L+R, Mono (L) and Mono (R) remote controlled. (See FS-30 data sheet for full details)

*STEREO OPERATION

MODULATION: Direct FM
SUBCARRIER FREQUENCY: 67 kHz (39 to 95 kHz to order)
SUBCARRIER FREQUENCY STABILITY: ±0.5% (330 Hz @ 67 kHz), 0 to 50 degrees C.
SUBCARRIER HARMONIC CONTENT: Less than 0.3%
SUBCARRIER ENVELOPE DECAY: Greater than 100 msec. from 90% to 10% subcarrier levels.
MODULATION CAPABILITY: ±20% of subcarrier frequency
AUDIO INPUT IMPEDANCE: 600 ohm balanced, resistive
DATA INPUT IMPEDANCE: 75 ohn unbalanced, resistive, DC couples
INPUT LEVELS: (Audio) adjustable +10 dBm to −10 dBm for ±6 kHz deviation @ 400 Hz. (Data) adjustable 1.0 to 4.0 V p-p for ±6 kHz deviation - DC coupled
PRE-EMPHASIS: (Audio) 150 microseconds standard (75 uS with internal jumper) (Data) no pre-emphasis
FREQUENCY RESPONSE: (Audio) ±0.5 dB, 10-10,000 Hz, exclusive of audio low pass filter. (Data) ±0.5 dB, DC-10,000 Hz.
AUDIO LOW PASS FILTER: Sixth order, −3 dB @ 4.3 kHz, standard (resistor changes for other values)
DATA LOW PASS FILTER: Same as AF filter or may be bypassed.
TOTAL HARMONIC DISTORTION: Less than 0.5% throughout AF pass band
INTERMODULATION DISTORTION: Less than 0.5%, 60 Hz/7 kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed) Typically 0.1%
CROSSTALK, SCA TO STEREO: −60 dB or better below 100% modulation of left or right. 75 uS de-emphasis.
CROSSTALK, STEREO TO SCA: −50 dB or better below ±6 kHz deviation of SCA using 150 uS de-emphasis and FS-30 stereo generator
FM NOISE: 72 dB below ±6 kHz deviation @ 400 Hz (150 uS de-emphasis)
AUDIO MUTING LEVEL: Adjustable from 10 to 30 dB below program level
AUDIO MUTING DELAY: Adjustable, 0.5 to 10.0 seconds

(See FC-30 data sheet for full details)

*Through FM-30A or FM-35A Transmitter using model FX-30 Exciter, model FS-30 Stereo Generator, and model FC-30 SCA Generator as applicable.

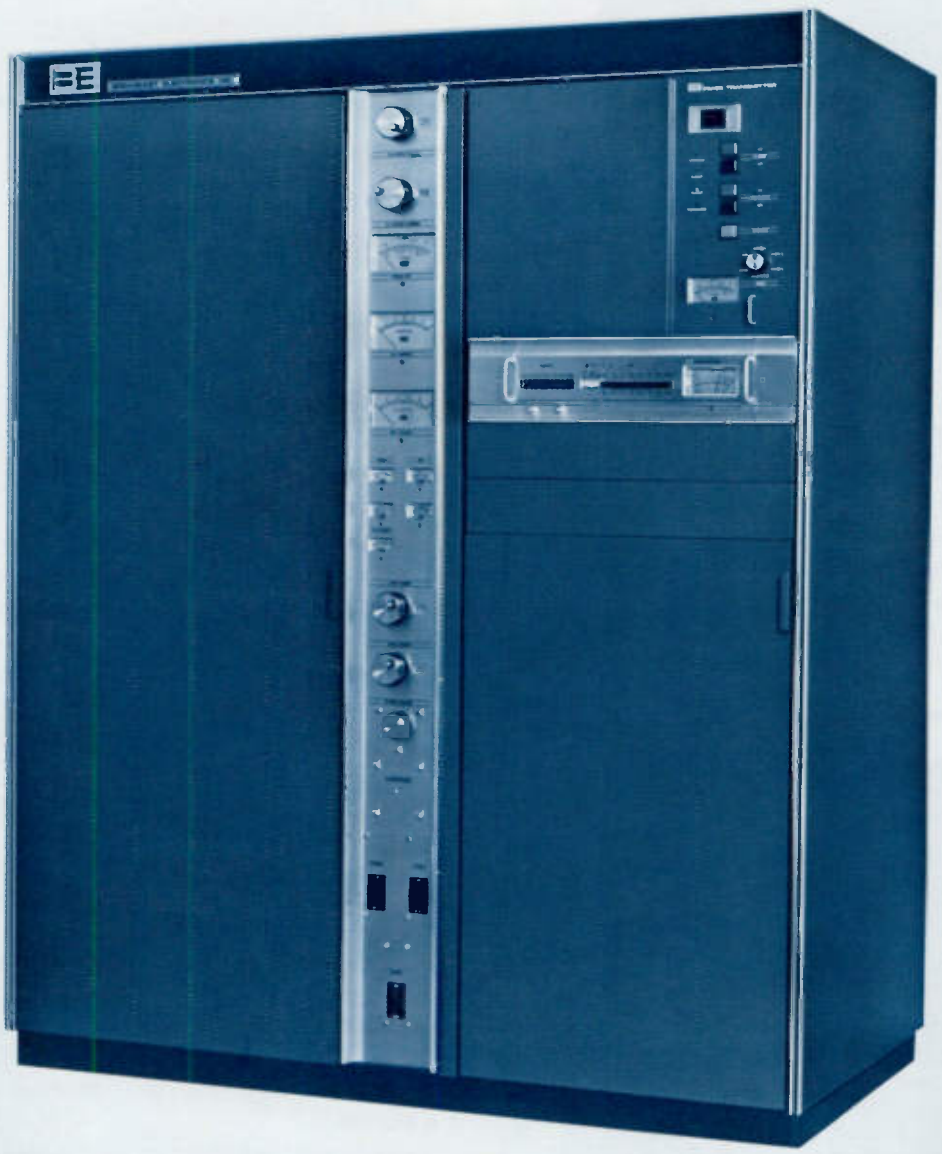
Specifications subject to change without notice.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-60A	909-2030-200	FM-60A 60,000 watt FM transmitter system with two FM-30A transmitters, one FX-30 exciter, control cabinet, hybrid splitter, and combiner.
FM-70A	909-2035-200	FM-70A 70,000 watt FM transmitter system with two FM-35A transmitters, one FX-30 exciter, control cabinet, hybrid splitter, and combiner.
(Factory installed options)		
MVDS	909-0091-001	Optional Microprocessor Video Diagnostic System for the FM-60A or FM-70A. (two required)
FO-2	909-0117	Optional Transmitter Output Switcher for use with the FM-60A or FM-70A systems.
FW-30	909-0120	Optional FW-30 Exciter Switcher for use with the FM-60A or FM-70A systems.
FX-30	909-0009	Extra FX-30 exciter for use in dual-exciter FM-60A or FM-70A systems
	909-0112	Filament voltage regulator (60 Hz), factory installed in either the FM-30A's or the FM-35A's. (two required)
	909-0113	Three phase AC voltmeter option for FM-30A or FM-35A, factory installed. (two required)

BROADCAST ELECTRONICS INC
4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305-3606 U.S.A., TELEX: 250142, CABLE: BROADCAST, PHONE (217) 224-9600

FM-30
30 KW, Single Tube
FM Transmitter



BROADCAST
ELECTRONICS INC

FM-30, One Tube 15-30KW FM Transmitter

FEATURES

- **World's most powerful one-tube FM transmitter**
- ***Folded half-wave output cavity — no plate blocking capacitor or sliding contacts**
- **Microprocessor control provides 127 status indications**
- **Twelve meters including 4 multi-function meters**
- **Synthesized FX-30 exciter with extremely low distortion**
- **Conservative 30 kW output**
- **High efficiency for low operating cost**
- **Elegant styling**

* Patent Pending

THE NEW FM-30 TRANSMITTER — Totally new, the 30 kW Model FM-30 is the most advanced transmitter since the advent of FM broadcasting.

The single-tube FM-30 incorporates a unique *folded half-wave cavity power amplifier design, digitally programmed FX-30 ultra-linear exciter and, for the first time in a broadcast transmitter, a microprocessor based control system. With these innovative engineering advances, Broadcast Electronics has produced a transmitter for the optimum in FM performance, reliability, diagnostic capability, and efficiency.

The Power Amplifier in the FM-30 transmitter employs a half-wavelength folded tank circuit, which eliminates the plate blocking capacitor and all sliding contacts.

INNOVATIVE POWER AMPLIFIER DESIGN — Broadcast Electronics' experienced engineering group has created the first truly unique power amplifier design since the beginning of FM broadcasting. The new high power cavity employs a *half-wavelength folded tank circuit. This new cavity design eliminates the plate blocking capacitor and all sliding contacts. The result is much higher reliability, higher efficiency and lower maintenance costs.

The high gain amplifier has inherent second harmonic suppression with less power lost at the fundamental frequency, yielding higher PA efficiency. For the first time, it is possible to efficiently produce more than 30 kW of output power with a solid-state driver.

All PA tuning and loading adjustments are conveniently located front panel controls. The harmonic filter/directional couplers are located external to the transmitter.

EFFICIENT SINGLE TUBE DESIGN — The FM-30 uses a single, efficient, high gain Eimac 8990/4CX20000A tetrode to provide 30 kW power output on any frequency between 87.5 and 108 MHz. The tetrode operates in a high-gain, grid-driven configuration.

Plate efficiency of the final amplifier approaches 80% at 30 kW output, resulting in comparatively low power

FM-30, One Tube 15-30KW FM Transmitter

AUTOMATIC AC RESTART — In the event of a momentary AC power failure, full operation is resumed immediately. If the A.C. power is lost for a more prolonged period, the transmitter automatically goes through the regular filament warm-up period before high voltage is applied.

HIGH VOLTAGE POWER SUPPLY — All HV power supply components of the FM-30 are contained in a separate transmitter-matching cabinet. The HV power supply cabinet may be located next to the power amplifier cabinet, or located separately almost anywhere in the transmitter building.

The plate transformer has taps for both 208 V or 240 V and each input has a multi-tap for +12 V, 0 V, and -12 V. Thus, the transmitter can accommodate six different AC inputs from 196 V to 252 V.

A separate screen supply is located in the PA cabinet.

CONTROL CENTER — The convenient vertical "Control Center" is centrally located between the exciter/driver cabinet and the power amplifier. This operational control assembly houses the PA tuning controls and all PA meters. These meters can be easily removed from the front of the transmitter.

EXTENSIVE METERING — The FM-30 provides more metering and diagnostic indications than any other FM transmitter.

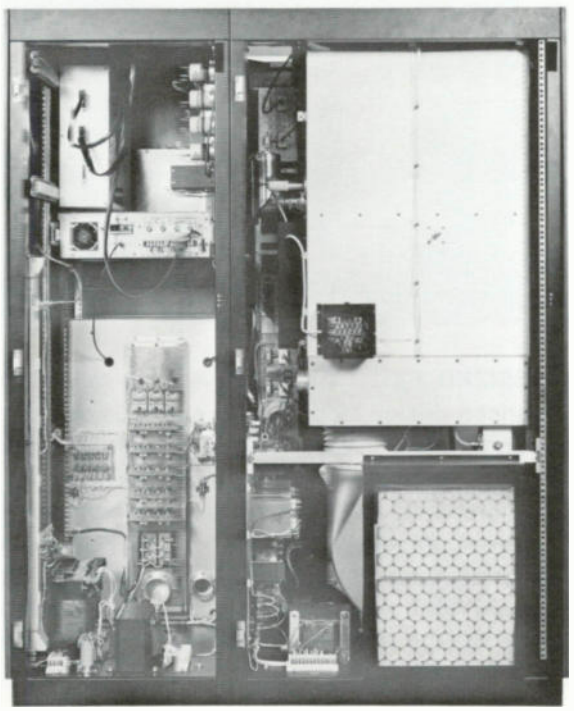
The power amplifier alone has 8 meters located in the vertical "Control Center" panel. All amplifier tuning controls are also conveniently arranged in the "Control Center".

Three individual multi-function meters are used in the IPA stage, and the FX-30 exciter has its own built-in metering. There are a total of 12 meters, including 4 multi-functional meters, giving the FM-30 Transmitter extensive metering capability.

REMOTE CONTROL — The FM-30 transmitter is designed so that all necessary operating functions can be remote controlled. The control logic circuitry used in the transmitter can interface directly with most modern remote control and ATS systems.

COMPACT SIZE — The entire FM-30 transmitter, excluding the HV power supply, is contained in two low-profile cabinets only 5'10" tall (177. 8 cm) for easy access to components. Only 12½ square feet of floor space are required.

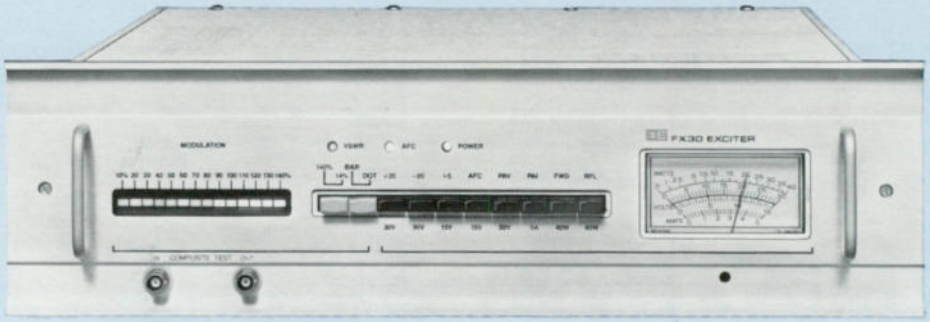
ELEGANT STYLING — The elegant styling of the FM-30 complements its outstanding electrical design. Housed in an attractive BE blue cabinet with anodized aluminum "Control Center" and exciter, the FM-30 will enhance the appearance of any broadcast station environment.



Rear view of FM-30 transmitter, with doors removed.

All transmitter control and status functions in the FM-30 transmitter are performed by a built-in microprocessor controller (upper right part of photo). The advanced design Model FX-30 exciter is in the lower portion of the photo. Both units slide out for easy access.

The Model FX-30 Synthesized FM Exciter



SYNTHESIZED FX-30 EXCITER — Also totally new, the advanced-design Model FX-30 exciter is capable of more than 30 watts output. A digitally programmed frequency synthesizer permits field frequency changes in 10 KHz increments without requiring new crystals. The temperature compensated reference oscillator allows immediate on-frequency operation of the exciter without temperature controlled oven warm up. The reference frequency can be directly compared to worldwide frequency standards.

The FX-30 has extremely low distortion, with THD or IMD less than 0.08%, and it is the first FM exciter to specify Transient Intermodulation Distortion (TIM) at less than 0.1%.

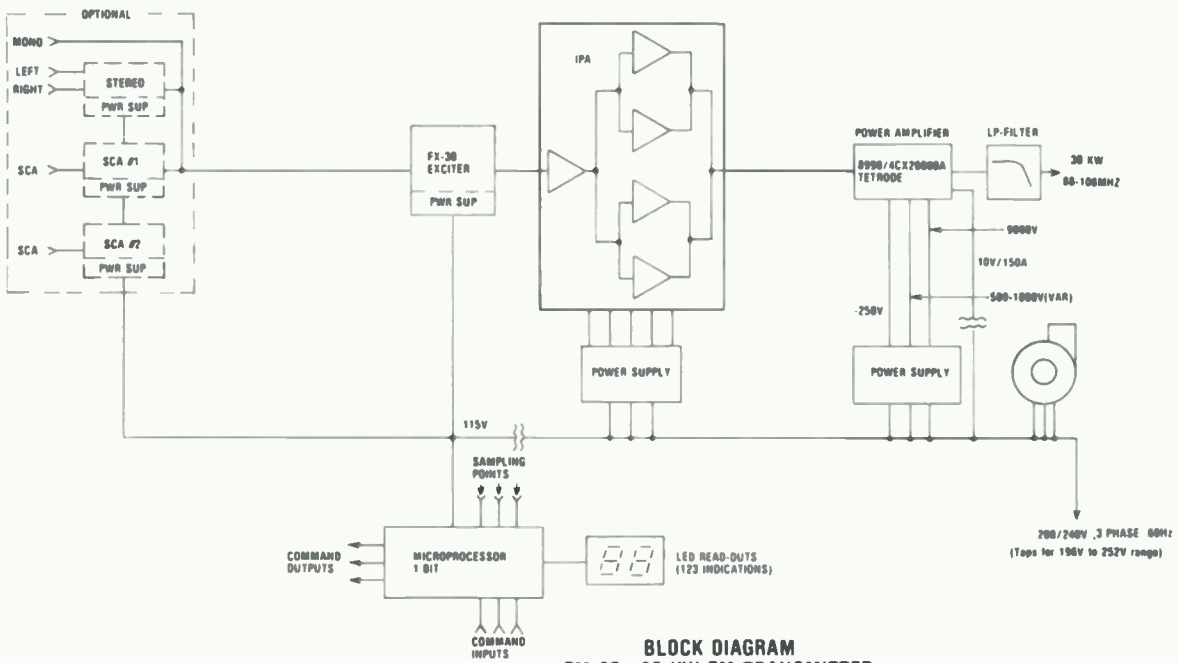
The ultra linear modulated oscillator provides minimum intermodulation of base band frequency components providing superior stereo and SCA performance.

The solid-state FX-30 exciter is completely broad band and requires no tuning adjustments for a conservative 30 watt output. Although capable of over 30 watts output, less than 20 watts are required to drive the IPA in the FM-30 transmitter.

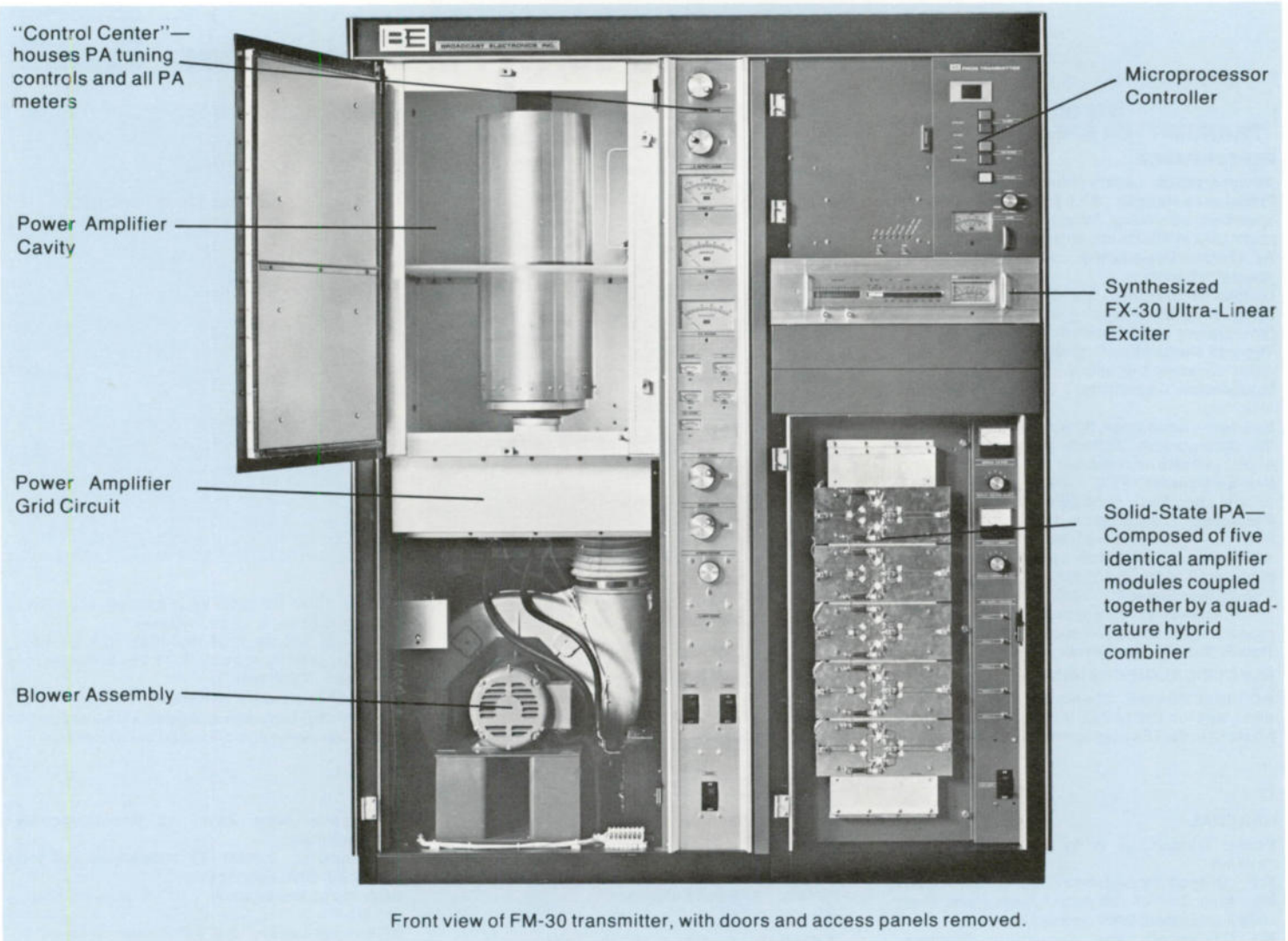
Dual speed phase lock loop circuitry permits very fast lock up of the carrier frequency and greatly improved low frequency response. Automatic control circuits eliminate adjustments after initial setup. The exciter output is automatically stabilized and fully protected.

The FX-30 is mounted on a slide out assembly making all components accessible for easy servicing and fits a standard 19" EIA width rack occupying only 5¼" of vertical rack space.

The FX-30 accepts multiple wideband composite inputs as well as a 600 ohm balanced input. When used for wideband, stereo or monaural operation, the new Broadcast Electronics FX-30 exciter produces a distinctively clean and superb FM sound.



BLOCK DIAGRAM
FM-30 30 KW FM TRANSMITTER



Front view of FM-30 transmitter, with doors and access panels removed.

consumption. The FM-30 single tube design provides savings in both operating and maintenance costs.

A completely new grid input circuit optimizes the impedance transformation between the solid-state driver and the power tube grid. This novel design takes advantage of the true power gain capability of the Eimac 8990/4CX20000A tetrode. Installation and removal of the power tube, from the front of the transmitter, is a quick, simple procedure in the FM-30.

SOLID-STATE IPA — The solid-state IPA assembly in the FM-30 transmitter is composed of 5 identical amplifier modules (one used as a driver for the other four) coupled together by a quadrature hybrid combiner/splitter.

Failure of any one of the four output IPA modules will cause only a 15 percent power reduction, and in the event of two modules failing only a 35 percent transmitter power reduction will result.

Since all five modules in the IPA are identical, only one type of spare module is necessary, thus reducing maintenance costs. In addition, any one of the four amplifier modules could be used to replace the pre-driver module should the need ever arise.

A conventional quadrature hybrid combiner/splitter is used in the IPA of the FM-30, because of the proven overall simplicity and reliability of this arrangement.

MICROPROCESSOR CONTROL/DIAGNOSTICS — All transmitter control and status functions in the FM-30 are performed by a built-in microprocessor controller. This microprocessor controller is the "brain" that monitors the transmitter operating parameters and then determines what control actions are necessary.

By its continuous scanning action, the microprocessor controller provides 127 different status indications, including 123 codes on two large seven segment LED displays. An additional 4 status indications appear on individual LED's. This gives the transmitter operator more diagnostic information than ever available before, for use in troubleshooting and day-to-day transmitter operation. The system is so simple that no "computer" experience is necessary to operate the FM-30.

Five push buttons used for the transmitter "ON/OFF" sequence operate in conjunction with 4 separate LED indicators.

Two-step recycling overload protection is also provided in the FM-30.

FM-30, One Tube 15-30KW FM Transmitter

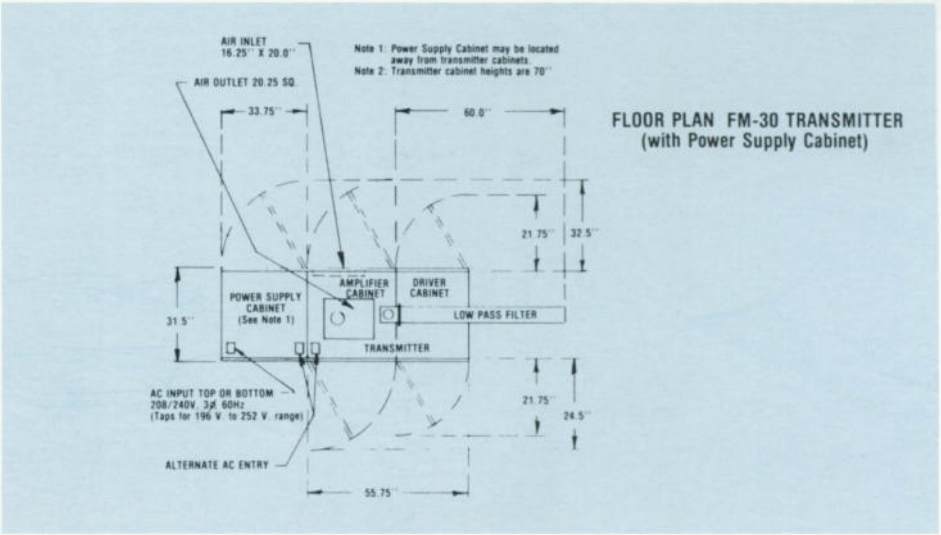
FM-30 TRANSMITTER SPECIFICATIONS

PERFORMANCE

Power Output: 30kW (from 15kW to 30kW)
Frequency Range: 87.5 to 108 MHz, tuned to specified operating frequency. Exciter programmable in 10kHz increments
RF Output Impedance: 50 ohms (others on special request)
Output Connector: 3⅛" EIA flange
Frequency Stability: ± 300 Hz, 0° to 50° C, temperature compensated crystal oscillator
Type of Modulation: Direct frequency modulation of carrier frequency
Modulation Capability: Greater than ± 200 kHz
Exciter: Solid state, 30 watt output, Model FX-30; incorporates digitally programmed synthesizer (10 kHz increments)
Pre-Emphasis: FCC 75uS, CCIR 50uS (where specified), or 25 uS (Dolby)
FM Noise: 72 dB below 100% modulation, @ 400 Hz, ± 75 kHz deviation
AM Noise: 55dB below a reference carrier AM modulated 100% @ 400 Hz, 75 uS de-emphasis
Tube Complement: 8990/4CX20000A (1)
RF Harmonics: Suppression meets all FCC requirements and CCIR recommendations
Power Supply Rectifiers: Silicon

ELECTRICAL/MECHANICAL

AC Input Power: 208/240V, 60Hz, three phase (taps for 196 to 252 V range) (Available for 50 Hz to order) Exciter operates from 97 V to 133 V, 50/60 Hz or 194 V to 266 V, 50/60 Hz
Power Consumption: 50kW
Size: Transmitter (excluding HV supply) 56.5" W (143.5 cm) × 70" H (177.8 cm) × 31.5" D (80.0 cm). HV power supply cabinet-34.5" W (87.6 cm) × 70" H (177.8 cm) × 31.5" D (80.0 cm).
Weight & Cubage: Transmitter (excluding HV supply) 1500 lbs.(682 kg.); packed 1750 lbs. (795 kg.); 72 cu. ft. (2 cu. meters).
HV Power Supply 1200 lbs. (545 kg.); packed 1250 lbs. (568 kg.); 44 cu. ft. (1.25 cu. meters).
Altitude: 7500 feet
Ambient Temperature Range: -10° C to +50°C
Finish: BE blue with anodized aluminum control center panel and anodized aluminum trim



FLOOR PLAN FM-30 TRANSMITTER
(with Power Supply Cabinet)

FX-30 EXCITER SPECIFICATIONS

GENERAL

Power Output: 3 W to 30 W continuously variable
R.F. Output Impedance: 50 ohms, VSWR less than 2:1 for full output, (open and short circuit protected) BNC connector
R.F. Harmonic and Supurious Suppression: (Conducted) at least 58 dB below rated output
Frequency Range: 87 MHz to 109 MHz digitally programmable in 10 kHz increments
Frequency Stability: ±300 Hz, 0° to 50° C, TCXO
Modulation Type: Direct FM at the carrier frequency
Modulation Capability: ±200 kHz
Modulation Indication: Peak reading, color coded, LED display with baseband overmodulation indicator
Asynchronous AM S/N Ratio: 70 dB below reference carrier with 100% AM modulation @400 Hz, 75 microsecond de-emphasis. (no FM modulation present)
Synchronous AM S/N Ratio: 50 dB below reference carrier with 100% AM modulation @400 Hz, 75 microsecond de-emphasis. (FM modulation ±75 kHz @400 Hz)
Multimeter: 8 function diagnostic aid
Test Metering: Internal high input impedence multimeter with probe, for point by point measurements
Front Panel Composite Test Jacks: Composite input and composite output
Audio/Control Connections: 14 position barrier strip and (4) BNC connectors
AC Input Power: 97 to 133 VAC or 194 to 266 VAC, 50/60 Hz, 200 W max
Ambient Temperature Range: 0° C to 50° C (operational to -20° C)
Cabinet Size: 17.70" (44.96 cm) wide × 5.25" (13.33 cm) high × 19.00" (48.26 cm) deep. Standard 19" (48.26 cm) rack mounting with slide out feature for easy access
Net Weight: 36 lbs. (16.3 kg); packed 42 lbs. (19.1 kg)
Finish: Anodized aluminum

WIDEBAND COMPOSITE OPERATION

Composite Inputs: 3 total, (1) unbalanced and (1) balanced plus front panel test. BNC connectors
Composite Input Impedance: 10 k ohm, nominal, resistive
Composite Input Level: 3.5 V P-P nominal, for ±75 kHz deviation
Composite FM S/N Ratio: 72 dB below ±75 kHz deviation @400 Hz (78 dB typical). Measured in a 30 Hz to 100 kHz bandwidth with 75 microsecond de-emphasis
Composite Harmonic Distortion: 0.08% or less (.04% typical)
Composite Intermodulation Distortion: 0.08% or less (.04% typical)
Composite Transient IMD: 0.1% or less (square wave/sinewave)
Composite Amplitude Response: ±0.1 dB 30 Hz to 100 kHz
Composite Phase Response: ±0.5° from linear phase 30 Hz to 53 kHz
Composite Group Delay: 390 nanoseconds ±25 nanoseconds 30 Hz to 53 kHz
Composite Slew Rate: 12 V/microsecond (symmetrical)
SCA Inputs: 2 total (1) unbalanced and (1) balanced, BNC connectors
SCA Input Impedance: 100 K ohm, nominal, resistive
SCA Input Level: 3.5 V P-P nominal for ±7.5 kHz deviation
SCA Amplitude Response: ±0.5 dB, 40 kHz to 100 kHz

MONAURAL OPERATION

Audio Input Impedance: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode supression
Audio Input Level: ±10 dBm nominal for ±75 kHz deviation @400 Hz
Audio Frequency Response: ±0.5 dB 30 Hz to 15 kHz, selectable flat, 25, 50 or 75 microsecond pre-emphasis
Harmonic Distortion: 0.08% or less 30 Hz to 15 kHz
Intermodulation Distortion: 0.08% or less, 60 Hz/7 kHz 4:1 ratio
Transient IMD: 0.1% or less (square wave/sine wave)
FM S/N Ratio: 72 dB below ±75 kHz deviation @400 Hz (78 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 microsecond de-emphasis

Specifications subject to change without notice.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-30	909-0001-1	FM-30, 30kW FM transmitter, with remote HV power supply
FM-30	909-0001	FM-30, 30kW FM transmitter, with HV power supply cabinet adjacent to PA and IPA/Exciter cabinets.
8990/4CX20000A	243-0001	Spare tube, for FM-30

BROADCAST ELECTRONICS INC.
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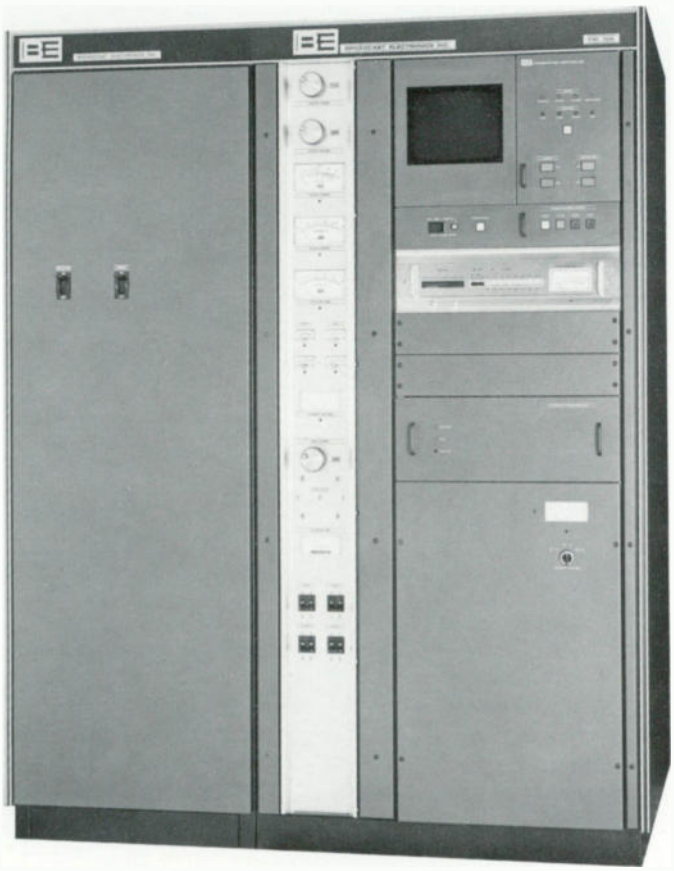
BROADCAST ELECTRONICS INC

FM-10A

10 KW Single Tube Transmitter

The Optimum in Performance, Reliability and Efficiency.

FM-10A, ONE TUBE 10 KW FM TRANSMITTER



FEATURES

- Single Tube Transmitter
- *Folded half-wave output cavity — no plate blocking capacitors or sliding contacts
- *Broadband input matching network
- Advanced digital control system
- Optional microprocessor video diagnostic system (MVDS)
- Synthesized FX-30 Exciter
- Solid state broadband IPA
- Automatic power control (APC) with proportional VSWR foldback
- High overall efficiency for low operating cost
- Extensive metering (10 meters)

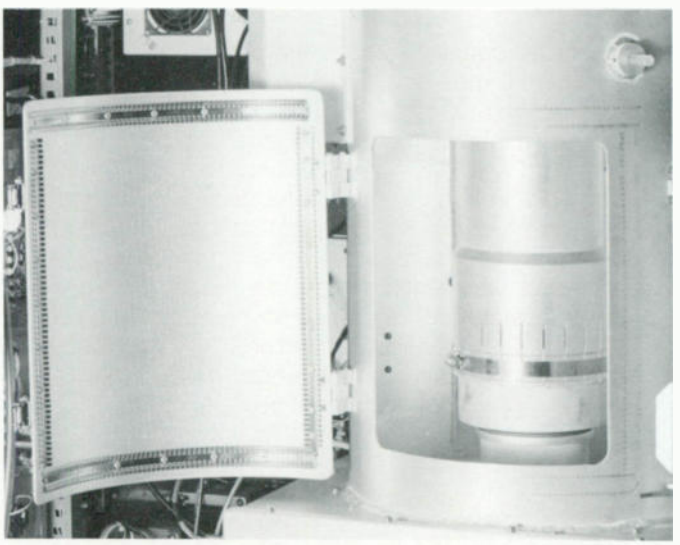
*patented

GENERAL DESCRIPTION — The FM-10A is a unique single tube 10,000 watt FM broadcast transmitter incorporating an innovative folded half-wave cavity power amplifier, broadband solid state intermediate power amplifier (IPA), ultra-linear synthesized exciter, and a second generation digital control system. The primary RF amplifier assembly is housed in a low profile cabinet only five feet, eight inches high (177.3 cm) with easy access to all components. The PA plate voltage power supply is contained in a matching enclosure only twenty-three inches wide and thirty-seven inches deep. (57.6 cm. × 94.6 cm.) When the power supply is mounted adjacent to the transmitter, the entire assembly is only fifty-six inches wide. (143 cm.)

SINGLE TUBE DESIGN — Reliability is the most important factor in the FM-10A transmitter. The single tube design offers a high level of transmitter dependability despite such adverse conditions as lightning, output mismatch or operator error. Solid state devices are rarely forgiving, but the FM-10A output tube can tolerate repeated abuse without damage. This durability is enhanced through the use of a highly reliable PA cavity and automatic protection circuitry.

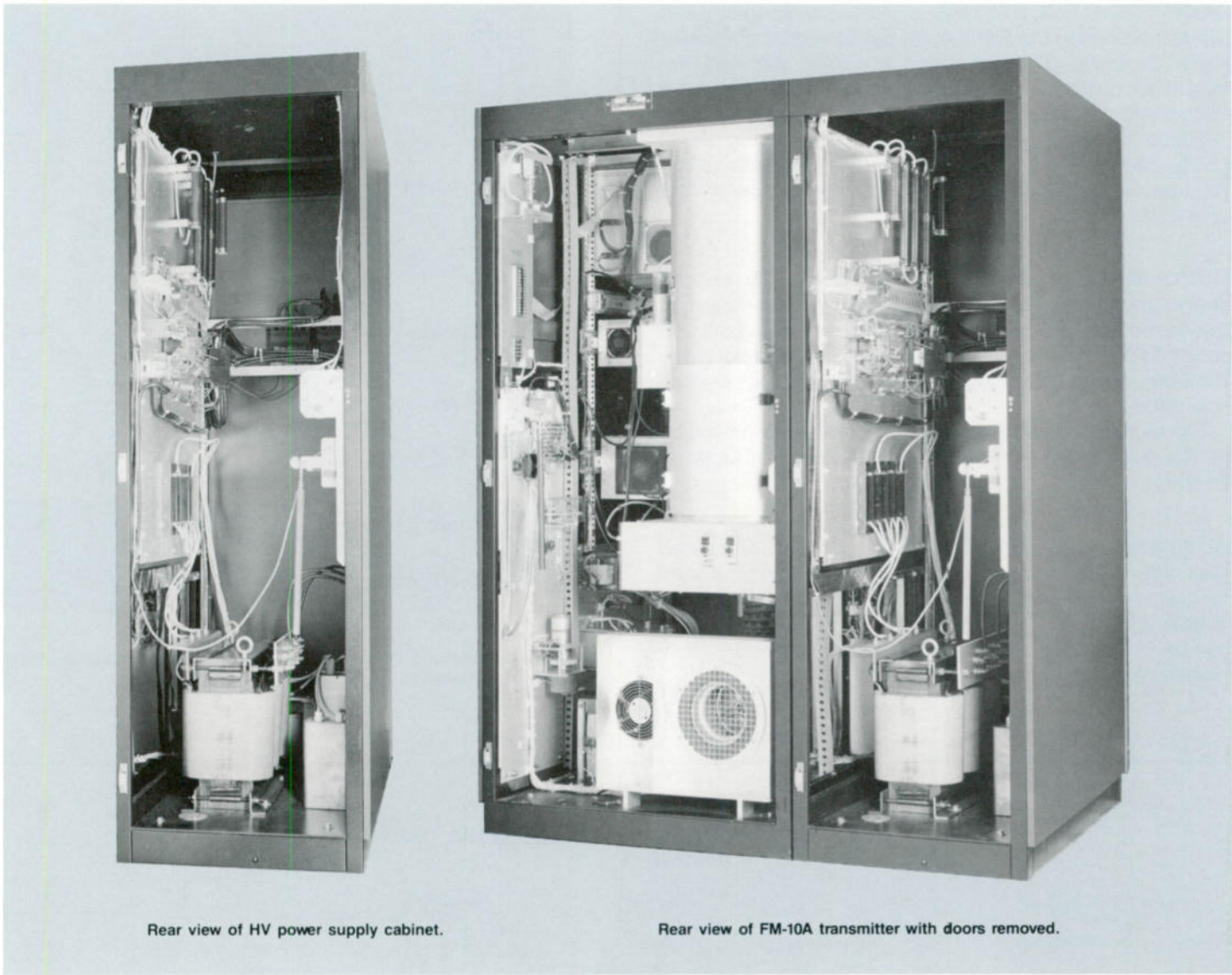
The FM-10A utilizes a single Eimac 4CX7500A tetrode to produce over 10 kW of RF power on any 10 kHz frequency increment between 87.5 and 108 MHz. It operates in a grounded cathode configuration with grid drive provided by a solid state broadband IPA. Installation or removal of the power tube is accomplished quickly and easily from the rear of the transmitter.

INNOVATIVE POWER AMPLIFIER — Broadcast Electronics' new computer optimized coaxial cavity employs a patented folded half-wave tank circuit. This unique output circuit design eliminates the high voltage blocking capacitor and high current sliding contacts found in conventional cavities. The result is exceptional reliability with reduced maintenance costs.



Computer optimized coaxial cavity employs B/E's patented folded half wave tank circuit, which eliminates the plate blocking capacitor and all sliding contacts in the output circuit.

FM-10A, ONE TUBE 10 KW FM TRANSMITTER



Rear view of HV power supply cabinet.

Rear view of FM-10A transmitter with doors removed.

The welded coaxial construction of the cavity improves efficiency and markedly reduces leakage radiation. A patented second harmonic suppressor is integrated within the cavity to minimize harmonic energy at the source. This yields higher PA efficiency without wasting fundamental frequency power. In addition, a separate distributed coaxial low pass filter (with directional couplers) is located external to the transmitter to insure compliance with FCC and DOC regulations as well as CCIR recommendations.

All PA adjustments have smooth operating vernier front panel controls with counters. Improved lightning immunity is obtained through the use of grounded bellows output tuning and grounded loop antenna coupling.

SIMPLIFIED INPUT CIRCUIT — The patented PA input circuit provides excellent impedance matching between the IPA and the power tube grid over the entire FM band. This broadband circuit maximizes bandwidth and stability while eliminating the input loading control. Only a single grid tuning control is adjusted for maximum drive. In fact, the entire transmitter can be easily tuned from one frequency to another across the entire FM band within a short period of time. No changes in frequency determining components are required.

SOLID STATE IPA — A high efficiency solid state IPA assembly in the FM-10A is contained in a slide-out drawer for convenience in maintenance.

The broadband amplifier and regulator modules are easily removed—no de-soldering is necessary.

Both RF output transistors are automatically protected against output mismatch. The self-contained IPA unit can be operated directly into an antenna as a low power transmitter during emergencies. The IPA power supply operates from 97 to 133 VAC, or 194 to 266 VAC.

Operational aids for the IPA include three front panel status indicators and buffered rear panel metering outputs.

FM-10A, ONE TUBE 10 KW FM TRANSMITTER

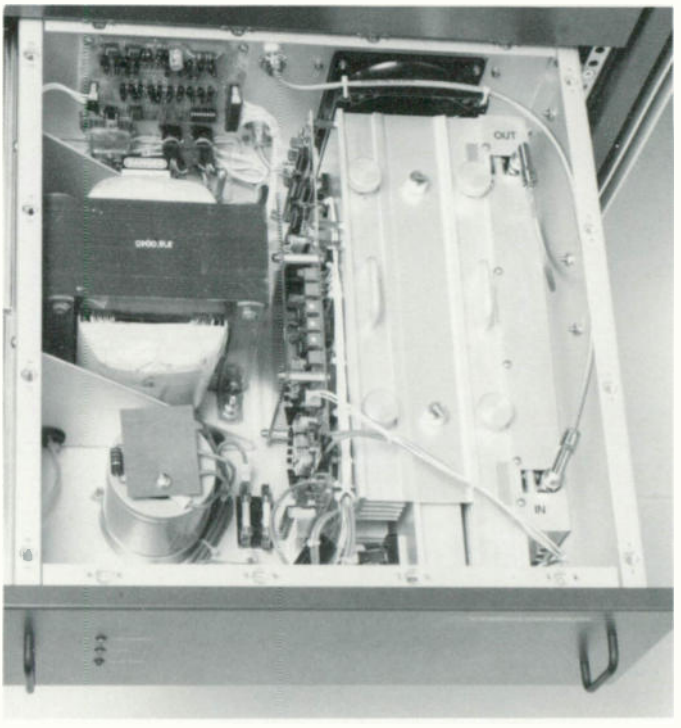
DIGITAL CONTROL SYSTEM — All transmitter control and status functions in the FM-10A are performed by a modular digital controller. This advanced controller monitors the transmitter operating parameters and determines what control actions are necessary.

Status indicators (a total of eight) appear on individual LED's. This gives the transmitter operator more information for use in troubleshooting and day-to-day transmitter operation.

MODULAR CONTROL SYSTEM DESIGN — A modular design approach with ribbon cables and a card edge bus makes removal of the controller assembly board quick and easy. CMOS logic was chosen because of its superior noise immunity. All remote control inputs and outputs are optically isolated.

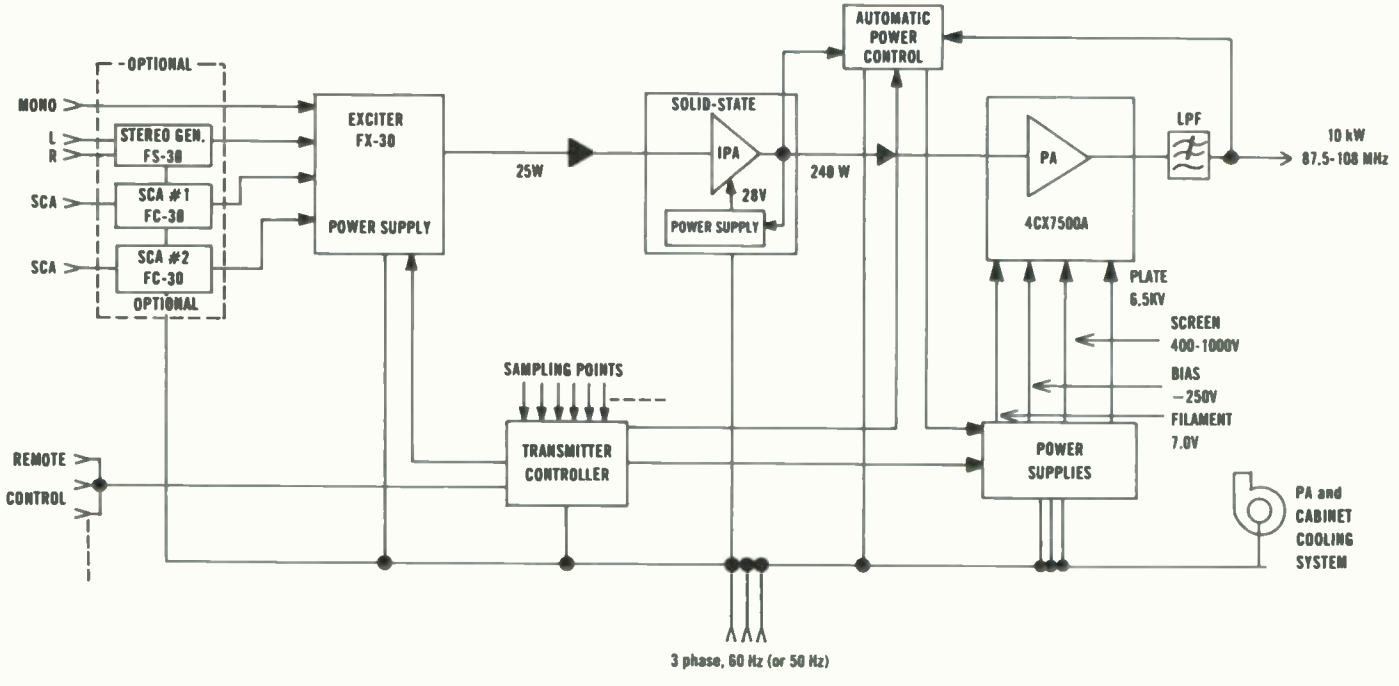
The modular design also accommodates plug-in circuitry for the optional Microprocessor Video Diagnostic System. (MVDS)

AUTOMATIC POWER CONTROL — An advanced automatic power control (APC) system maintains constant RF output power with limited fluctuations in primary AC line voltage or changes in RF drive level. The regulated set point can be changed by remote control and is retained in non-volatile digital memory.



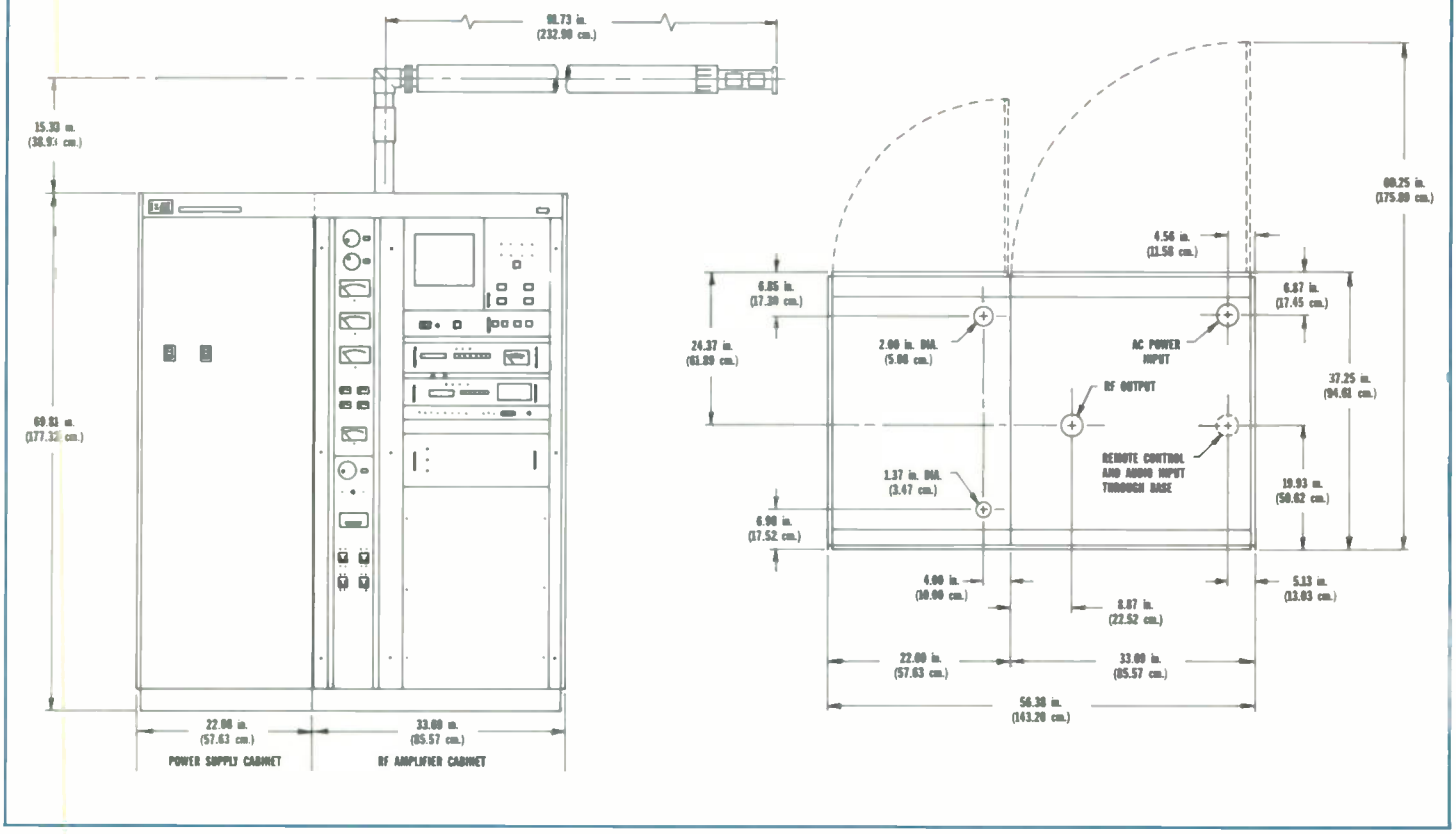
Slide out solid state IPA assembly includes power supply and can be used as emergency transmitter.

BLOCK DIAGRAM B/E MODEL FM-10A TRANSMITTER



FM-10A, ONE TUBE 10 KW FM TRANSMITTER

FLOOR PLAN B/E FM-10A TRANSMITTER (with Power Supply Cabinet)



An external signal can be used to switch the FM-10A into a separate "Preset Power" mode for reduced power during an emergency, or increased power for other special applications.

A proportional VSWR foldback system protects the PA from overloads by automatically reducing output power to a safe operating level if the antenna system presents a mismatch, such as during icing conditions. Full power is automatically restored when the antenna impedance returns to normal.

Each time the transmitter is activated, a "soft start" circuit automatically raises the power from zero to the normal operating level. At turn-on, this feature allows the transmitter to assume a safe operating level under high VSWR conditions without overloading.

AUTOMATIC AC RESTART — In the event of a momentary AC power failure, full operation is resumed immediately. If the AC power is lost for a more prolonged period, the transmitter will automatically go through the regular filament warm-up period before high voltage is applied.

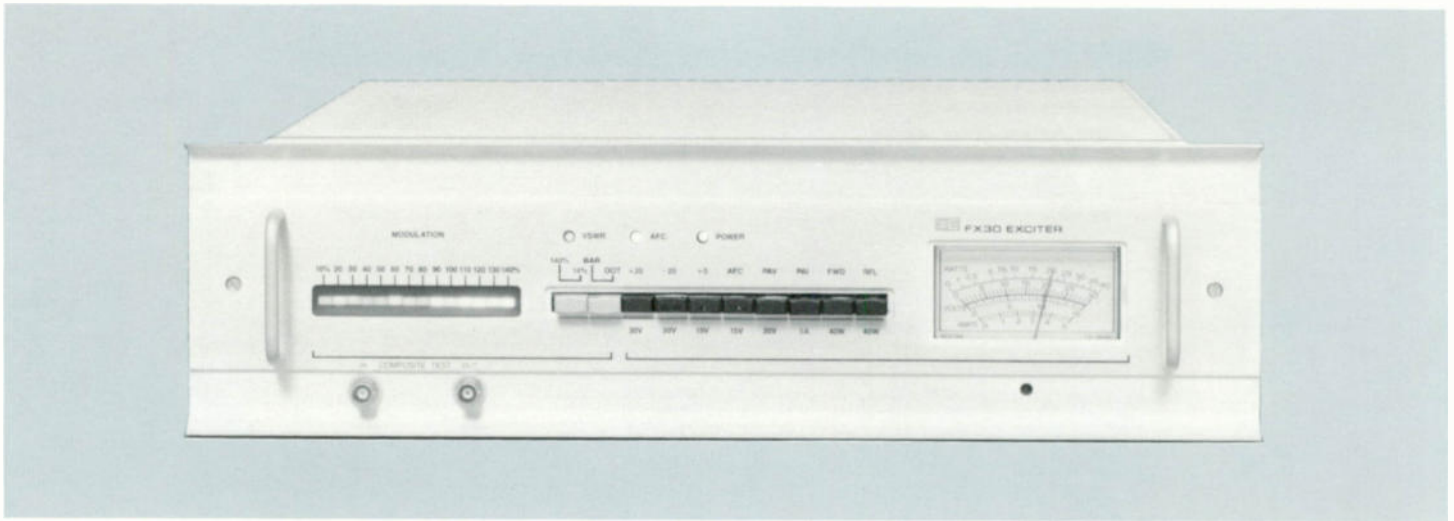
POWER SUPPLY — The HV plate supply for the FM-10A transmitter is contained in a separate matching cabinet. This power supply cabinet is normally mounted adjacent to the power amplifier, or it can be located separately within the transmitter building. The FM-10A is designed to operate from a 208/240V, 50 or 60 Hz, three phase power system, or 380V, four wire WYE system if specified at time of order. The plate transformer has multiple taps to accommodate a wide range of AC inputs. A step-start system is utilized to minimize peak in-rush currents.

EXTENSIVE INDEPENDENT METERING — Independent metering permits observation of all important PA parameters simultaneously. Three large 4.5 inch (11.43 cm.) meters, one 3.5 inch (8.9 cm.) meter, and four 1.5 inch (3.8 cm.) meters are located on the vertical control center. An elapsed time indicator and an "iron vane" true RMS filament voltmeter are included.

The PA output power meter is conveniently located adjacent to the output loading and tuning controls. The FX-30 exciter has its own built-in metering.

REMOTE CONTROL — The B/E FM-10A transmitter is designed so that all operating modes can be remotely controlled by momentary contact closures. The transmitter controller can interface directly with modem control and ATS systems.

FM-10A, ONE TUBE 10 KW FM TRANSMITTER

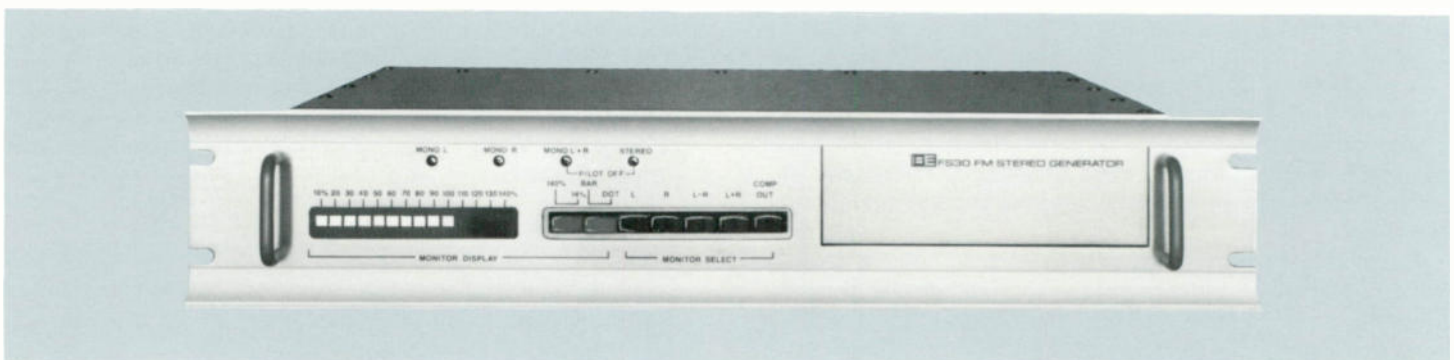


SYNTHESIZED FX-30 EXCITER — The B/E FM-10A transmitter features the FX-30 exciter. The FX-30 is digitally synthesized, programmable in 10 kHz steps. A dual speed phase lock loop and stable 10 MHz TCXO reference oscillator allows immediate on-frequency operation.

The ultra-linear modulated oscillator provides minimum intermodulation of the baseband stereo and SCA carriers. Harmonic and intermodulation distortion are typically less than 0.05%, and Transient Intermodulation Distortion (TIM) is less than 0.1%.

POWER AMPLIFIER 30 WATTS — The FX-30's RF power amplifier is fully VSWR protected, even up to its 30 watt output rating. Automatic power control eliminates periodic adjustments. The broadband power amplifier has no tuning adjustments.

The FX-30 is mounted as a slide out assembly, with an easy to remove top cover allowing accessibility of all components. Full front panel metering, and internal diagnostic LED's give operating status at a glance. Five audio and composite inuts are provided on the rear panel.



OPTIONAL STEREO/SCA GENERATOR — The FM-10A transmitter has additional rack space so that the FS-30 Stereo Generator and the FC-30 SCA Generator may be mounted directly below the FX-30 Exciter. These two B/E units are available as optional equipment.

DIGITAL DESIGN — In the FS-30 Stereo Generator, a digital modulator and pilot generator offer absolute pilot phase stability without adjustment and eliminates troublesome distortion products. The result is a virtually perfect baseband that is an order of magnitude better than previous standards.

OTHER FEATURES — The FS-30 Stereo Generator includes linear, delay equalized audio low pass filters for minimum overshoot without the use of clippers or other nonlinear devices. Also standard in the FS-30 are front panel LED peak reading modulation status display, RFI protection and remote control capability.

FM-10A, ONE TUBE 10 KW FM TRANSMITTER

ULTIMATE CONTROL: MICROPROCESSOR VIDEO DIAGNOSTIC SYSTEM (MVDS) — (optional on the FM-10A)

Features:

- Calculates efficiency and dissipation
- Converts multiple meter readings to bar-graph or tabular display
- Reverse video indicates violations of preset limits
- Automatically displays the location and nature of a malfunction
- Bar-graph display of PA/IPA parameters
- Auto back-up of main controller timers, logic circuits, and transmitter control circuits
- Automatic logging output capability
- Remote monitoring via modem, telco lines, or SCA

Broadcast Electronics' Microprocessor Video Diagnostic System (MVDS) is available as an add-on to the FM-10A. The Microprocessor Video Diagnostic System (MVDS) provides an extraordinary degree of transmitter monitoring and control. It can increase overall reliability and significantly improve operating ease and efficiency.

VERSATILE KEYBOARD PROGRAMMING — The keyboard is outfitted with a plug-in cable which mates with a connector at the rear of the controller chassis. The keyboard allows the customer to set time, select the desired CRT screen display, set or re-program the limits of the monitored parameters, and activate various system options.

Three distinct display screens are keyboard selectable . . .

Normal Display: The normal display includes date and time; plate screen, and grid voltages and currents; calculated plate efficiency; exciter/IPA forward and reflected power; IPA voltage/current; transmitter power output; and calculated ERP. Parameters that exceed preset limits are displayed in reverse video. A condition/diagnosis line displays the condition of the transmitter and the diagnosis for that condition. It also displays the times and causes of carrier interruptions.

Linear Bar-Graph Display: The bar-graph display is especially useful for "peaking" or "nulling" various parameters during transmitter set-up as well as for tuning for optimum overall performance. It continuously and simultaneously provides both linear bar-graph and digital displays of PA forward/reflected powers; calculated plate efficiency; plate, screen, and grid currents; and IPA forward/reflected power. The transmitter can be easily tuned for peak PA efficiency by using the calculated efficiency bar-graph.

The optional MVDS keyboard and video monitor.

Customer Configuration Display: The customer configuration screen allows the user to establish and customize system options and "min/max" limits for the monitored parameters. Access is by entry of an eight character password. This prevents system changes by unauthorized persons. If a user-entered limit is greater than the factory limit, the entry will not be accepted. The screen cursor will not move until a revised, acceptable value has been entered.

LOGGING BY PRINTER — The normal display screen information may be logged on an inexpensive home computer printer. Logging may be initiated by simple keyboard command or may be programmed to occur automatically at periodic intervals. (The normal display screens may be viewed remotely through the use of modems and hardware, telephone line, or SCA subcarrier interconnection.) Should an overload condition occur while an operator is not present, the "anticipatory logging" feature of the MVDS will capture vital diagnostic data milliseconds before the outage takes place. This data will be sent to the printer at the next available opportunity after normal transmitter operation is resumed.

REMOTE VIDEO MONITORING — The bar-graph display screen video information may be fed over coaxial cable to local video monitors over a distance of up to one thousand feet.

IMPROVED ON-AIR RELIABILITY — The addition of the MVDS to the FM-10A provides not only the diagnostic system functions, but also redundant, automatic transmitter control which enhances the overall on-air reliability. When the MVDS is selected for operation, it takes total control of the transmitter. It monitors the transmitter front panel switches and is in complete control. If it is disabled in any way, control automatically reverts to the primary transmitter controller without any interruption in transmission.

FM-10A, ONE TUBE 10 KW FM TRANSMITTER

TECHNICAL SPECIFICATIONS

GENERAL

POWER OUTPUT: 10 kW (4.5 kW to 11.0 kW)
FREQUENCY RANGE: 87.5 to 108 MHz, tuned to specific operating frequency. Exciter programmable in 10 kHz steps.
RF OUTPUT IMPEDANCE: 50 ohms (others on special request)
OUTPUT CONNECTOR: 3⅛ inch EIA flange. (1⅝ inch EIA on request)
VSWR: 1.8:1 maximum. (will operate into higher VSWR with automatic power reduction).
FREQUENCY STABILITY: ±300 Hz, 0° to 50°C.
TYPE OF MODULATION: Direct frequency modulation of carrier frequency.
MODULATION CAPABILITY: Greater than ±200 kHz.
MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.
EXCITER: Solid state, 30 watt output, model FX-30; incorporating a digitally programmed synthesizer. (10 kHz increments)
PRE-EMPHASIS: FCC 75 uS, CCIR 50 uS (where specified) or 25 uS (Dolby)
ASYNCHRONOUS AM S/N RATIO: 55 dB below reference carrier with 100% AM modulation @ 400 Hz, 75 uS de-emphasis. (no FM modulation present)
SYNCHRONOUS AM S/N RATIO: 45 dB below 10 kW reference carrier with 100% AM modulation @ 400 Hz, 75 uS de-emphasis. (FM modulation ±75 kHz @ 400 Hz)
TUBE COMPLEMENT: (1) 4CX7500A
RF HARMONICS: Suppression meets all FCC/DOC requirements and CCIR recommendations.
POWER SUPPLY RECTIFIERS: Silicon

ELECTRICAL/MECHANICAL

AC INPUT POWER: 208 V WYE/240 V Delta, 380 V four wire WYE, 50 or 60 Hz (as ordered), three phase. (Taps for 196 to 252 V. Other voltages are available upon request.)
POWER CONSUMPTION: 17.2 kW @ 0.9 PF @ 10 kW output.
SIZE & WEIGHT: (Transmitter) 33.7" W × 37.2" D × 69.8" H (85.6 cm. W × 94.6 cm. D × 177.3 cm. H) Weight = 700 lbs. (317.5 kg.)
(Power Supply) 22.7" W × 37.2" D × 69.8" H (57.6 cm. W × 94.6 cm. D × 177.3 cm. H) Weight = 900 lbs. (408.2 kg.)
ALTITUDE: 7500 ft. @ 50 Hz (2286 M) - 10,000 ft. @ 60 Hz (3048 M)
AMBIENT TEMPERATURE RANGE: −10°C to +50°C.
FINISH: B/E blue with anodized aluminum control center panel and anodized aluminum trim.

*MONAURAL OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode suppression.
AUDIO INPUT LEVEL: +10 dBm nominal for ±75 kHz deviation @ 400 Hz.
AUDIO FREQUENCY RESPONSE: ±0.5 dB, 30 Hz to 15 kHz, selectable flat, 25, 50, 75 microsecond pre-emphasis.
HARMONIC DISTORTION: 0.08% or less (.04% typical)
INTERMODULATION DISTORTION: 0.08% or less, 60 Hz/7 kHz, 4:1 ratio
TRANSIENT IMD: 0.1% or less (square wave/sine wave)
FM S/N RATIO: 72 dB below ±75 kHz deviation @ 400 Hz (78 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 uS de-emphasis.

*WIDEBAND COMPOSITE OPERATION

COMPOSITE INPUTS: 3 total, (1) unbalanced and (1) balanced plus front panel test. All connectors BNC.
COMPOSITE INPUT IMPEDANCE: 10K ohm, nominal, resistive.
COMPOSITE INPUT LEVEL: 3.5 V p-p nominal, for ±75 kHz deviation.
COMPOSITE FM S/N RATIO: 72 dB below ±75 kHz deviation @ 400 Hz (78 dB typical). Measured in a 30 Hz to 100 kHz bandwidth with 75 uS de-emphasis.
COMPOSITE HARMONIC DISTORTION: 0.08% or less (.04% typical)
COMPOSITE INTERMODULATION DISTORTION: 0.08% or less (.04% typical)
COMPOSITE TRANSIENT IMD: 0.1% or less (square wave/sine wave)
COMPOSITE AMPLITUDE RESPONSE: ±0.1 dB, 30 Hz to 53 kHz
COMPOSITE PHASE RESPONSE: ±0.5° from linear phase, 30 Hz to 53 kHz
COMPOSITE GROUP DELAY: 390 nanoseconds, ±25 nanoseconds 30 Hz to 53 kHz
COMPOSITE SLEW RATE: 12 V/microsecond (symmetrical)

*STEREO OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, floating. (Adaptable to other impedances)
AUDIO INPUT LEVEL: +10 dBm, ±1 dBm, for 100% modulation @ 400 Hz. (Adaptable to other input levels)
AUDIO INPUT FILTER: 15 kHz LPF with delay equalization for minimum overshoot.
FREQUENCY RESPONSE: ±0.5 dB, 30 - 15,000 Hz, 75 uS pre-emphasis (flat, 25, or 50 uS pre-emphasis selectable)
TOTAL HARMONIC DISTORTION: 0.08% or less
INTERMODULATION DISTORTION: 0.08%, 60 Hz/7 kHz; 4:1 ratio.
TRANSIENT INTERMODULATION DISTORTION: 0.1% (square wave/sine wave)
FM NOISE: 72 dB or better below 100% modulation @ 400 Hz, 75 uS de-emphasis.
STEREO SEPARATION: 45 dB or better; 30 - 15,000 Hz (sine wave)
DYNAMIC STEREO SEPARATION: 40 dB or better; 30 - 15,000 Hz (normal program content)
LINEAR CROSSTALK: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30 - 15,000 Hz, 45 dB minimum below 100% modulation.
NON-LINEAR CROSSTALK: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation.
PILOT STABILITY: ±0.5 Hz, 0° to 50°C.
MODES: Stereo, Mono L+R, Mono (L) and Mono (R) remote controlled. (See FS-30 data sheet for full details)

*SCA OPERATION

MODULATION: Direct FM.
SUBCARRIER FREQUENCY: 67 kHz (39 to 95 kHz to order).
SUBCARRIER FREQUENCY STABILITY: ±0.5% (330 Hz @ 67 kHz), 0° to 50°C.
SUBCARRIER HARMONIC CONTENT: Less than 0.3%.
SUBCARRIER ENVELOPE DECAY: Greater than 100 msec. from 90% to 10% subcarrier levels.
MODULATION CAPABILITY: ±20% of subcarrier frequency
AUDIO INPUT IMPEDANCE: 600 ohm balanced, resistive
DATA INPUT IMPEDANCE: 75 ohm unbalanced, resistive, DC coupled
INPUT LEVELS: (Audio) adjustable +10 dBm to −10 dBm for ±6 kHz deviation @ 400 Hz. (Data) adjustable 1.0 to 4.0 V p-p for ±6 kHz deviation/DC coupled/
PRE-EMPHASIS: (Audio) 150 microseconds standard (75 uS with internal jumper). (Data) no pre-emphasis.
FREQUENCY RESPONSE: (Audio) ±0.5 dB, 10 - 10,000 Hz, exclusive of audio low pass filter. (Data) ±0.5 dB, DC - 10,000 Hz.
AUDIO LOW PASS FILTER: Sixth order, −3 dB @ 4.3 kHz, standard (resistor changes for other values)
DATA LOW PASS FILTER: Same as AF filter or may be bypassed.
TOTAL HARMONIC DISTORTION: Less than 0.5% throughout AF pass band.
INTERMODULATION DISTORTION: Less than 0.5%, 60 Hz/7 kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed) Typically 0.1%
CROSSTALK, SCA TO STEREO: −60 dB or better below 100% modulation of left or right. 75 uS de-emphasis.
CROSSTALK, STEREO TO SCA: −50 dB or better below ±6 kHz deviation of SCA using 150 uS de-emphasis and FS-30 stereo generator.
FM NOISE: 72 dB below ±6 kHz deviation @ 400 Hz (150 uS de-emphasis)
AUTO MUTING LEVEL: Adjustable from 10 to 30 dB below program level.
AUTO MUTING DELAY: Adjustable, 0.5 to 10.0 seconds
(See FC-30 data sheet for full details)

*Through FM-10A Transmitter using model FX-30 Exciter, model FS-30 Stereo Generator, and model FC-30 SCA Generator as applicable.

Specifications subject to change without notice.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-10A	909-1110-200	FM-10A single tube broadcast transmitter for operation on one specified frequency between 87.5 and 108 MHz. 208 V/240 V, 60 Hz 3-wire three phase power source. HV power supply cabinet ATTACHED to PA cabinet. Includes FX-30 Exciter.
FM-10A	909-1110-220	FM-10A single tube broadcast transmitter for operation on one specified frequency between 87.5 and 108 MHz. 208 V/240 V, 60 Hz 3-wire three phase power source with REMOTE HV power supply cabinet. Includes FX-30 Exciter.
FM-10A	909-1110-380	FM-10A single tube broadcast transmitter with HV power supply cabinet attached to PA cabinet for 380/220 V., 50 Hz, 4 wire WYE, 3 phase power source, with provision for safety conductor.
FM-10A	909-1110-381	FM-10A transmitter, same as above except with remote HV power supply cabinet.
MVDS	909-0091-005	Optional Microprocessor Video Diagnostic System, factory installed in FM-10A transmitter. (Must be ordered with transmitter)
	909-0115	Optional filament voltage regulator (60 Hz)
	909-0098	Optional three phase AC voltmeter

BROADCAST ELECTRONICS INC
4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305-3606 U.S.A., TELEX: 250142, CABLE: BROADCAST, PHONE (217) 224-9600

BROADCAST ELECTRONICS INC

FM-5A

5 KW Single Tube Transmitter

The Worlds Most Advanced

The Optimum in Performance, Reliability and Efficiency.

FM-5A, One Tube 5KW FM Transmitter

FEATURES

- One-tube transmitter
- *Folded half-wave output cavity—no plate blocking capacitor or sliding contacts
- Broadband input matching network
- Advanced digital control system
- Optional microprocessor diagnostics
- Synthesized BE FX-30 exciter
- Solid state broadband IPA
- Automatic Power Control with Proportional VSWR Foldback
- High overall efficiency for low operating cost
- Extensive metering, 10 meters

*Patented

GENERAL DESCRIPTION — The one-tube 5000 watt Model FM-5A transmitter incorporates a unique *folded half-wave cavity power amplifier, broadband intermediate power amplifier, digitally programmed FX-30 ultra-linear exciter, and a second generation digital control system. With these innovative engineering advancements, Broadcast Electronics has produced a 5000 watt transmitter for optimum reliability and superb FM performance.

The entire transmitter is contained in a single low profile cabinet only 5'10" high (177.8 cm) with easy access to all components. Only 8.5 sq. feet (0.8m^2) of floor space is needed. The air filter is replaceable while the transmitter is operating without opening any access doors.

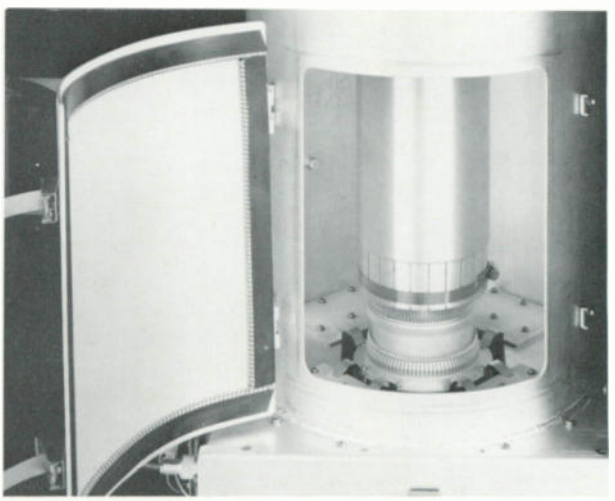
*Patented

SINGLE TUBE DESIGN — Achieving the utmost in reliability was the design philosophy behind the FM-5A. The one tube design provides a transmitter that can remain on the air despite adverse conditions such as lightning, output mismatch or operator error. Unlike solid state devices, an output tube can repeatedly withstand overloads without damage. In the FM-5A the ruggedness of a single tube output stage is enhanced with a highly reliable PA cavity and automatic protective circuitry.

Another advantage of this one tube design is its optimal bandpass characteristics which make it transparent for stereo modulation while it minimizes susceptance to intermodulation at multiple transmitter sites.

BE's FM-5A uses a single Eimac 4CX3500A tetrode to provide over 5KW of RF power on any frequency between 87.5 and 108MHz. The 4CX3500A has lower operating and replacement cost than other tetrodes with similar power capability. It operates in a grounded cathode configuration, being grid-driven by a solid state broadband IPA.

Installation and removal of the power tube, from the rear of the transmitter, is a quick, simple procedure in this compact 5000 watt transmitter.



Computer optimized coaxial cavity employs BE's patented folded half wave tank circuit, which eliminates the plate blocking capacitor and all sliding contacts in the output circuit.

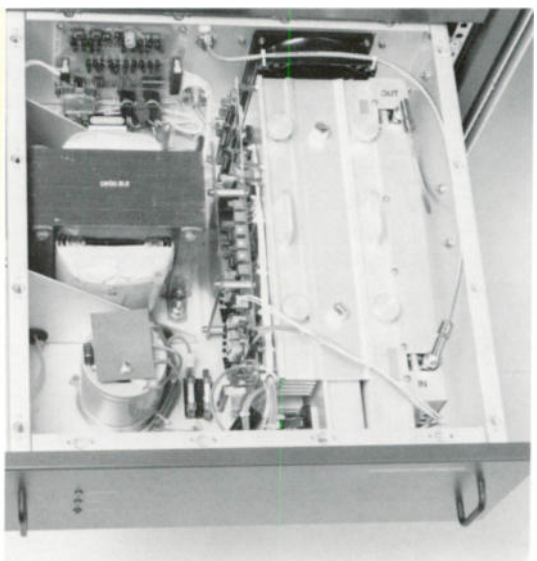
FM-5A, One Tube 5KW FM Transmitter

AUTOMATIC POWER CONTROL — An advanced automatic power control system (APC) maintains constant RF output power regardless of fluctuations in primary AC line voltage or changes in the RF drive level. The regulated set point can be changed by remote control and is retained in a non-volatile digital memory.

An external signal can be used to switch the FM-5A into a separate "Preset Power" mode for minimal power consumption during an emergency.

A proportional VSWR foldback system protects the PA from overloads by automatically reducing output power to a safe operating level if the antenna system presents a mismatch, such as during icing conditions.

Each time the transmitter is activated a "soft-start" circuit automatically raises the power from zero to the nominal operating level. At turn-on, this feature allows the transmitter to assume a safe operating level under high VSWR conditions without overloading.



Slide out solid state IPA assembly includes power supply and can be used as 250 watt transmitter.

AUTOMATIC AC RESTART — In the event of a momentary AC power failure, full operation is resumed immediately. If the AC power is lost for a more prolonged period, the transmitter automatically goes through the regular filament warm-up period before high voltage is applied.

POWER SUPPLY — All power supplies in the FM-5A are self-contained in the transmitter cabinet. The transmitter operates from a 208/240V, 50/60Hz, three phase power system. 380V-Wye operation is optional. Step-start minimizes peak inrush currents.

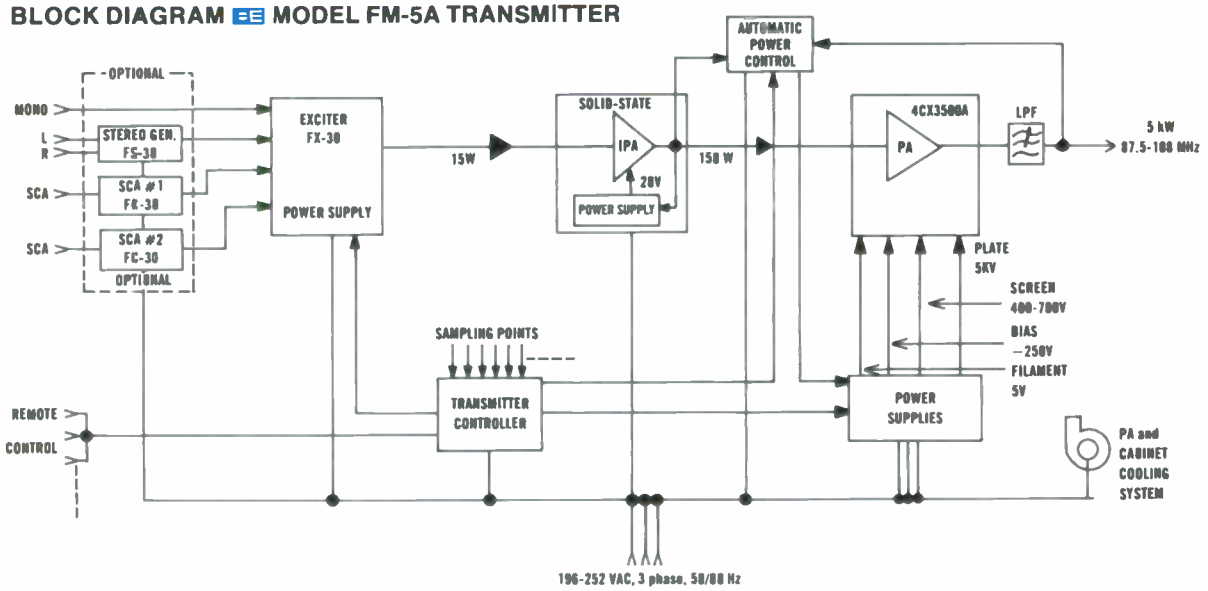
The transmitter can accommodate AC inputs from 196V to 252V. The plate transformer has 5 taps for this wide range of inputs.

EXTENSIVE INDEPENDENT METERING — Independent metering permits observation of all important PA parameters simultaneously. Three large 4.5 inch meters, two 3.5 inch meters and four 1.5 inch meters are located on the vertical control center. An elapsed time indicator and a true RMS filament voltmeter are included.

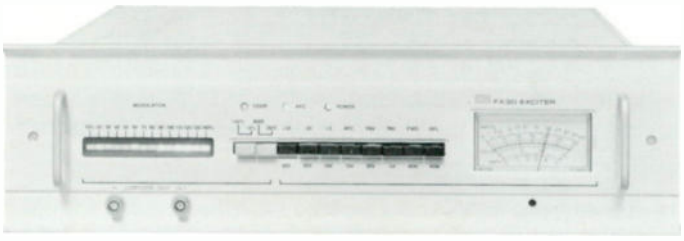
The PA output power meter is conveniently located adjacent to the output loading and output tuning controls. The FX-30 exciter has its own built-in metering.

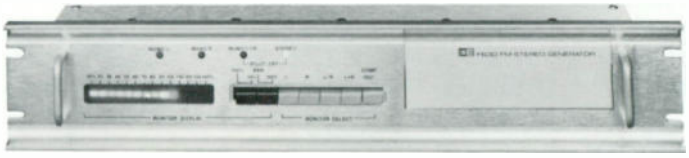
REMOTE CONTROL — The FM-5A transmitter is designed so that all operating modes can be remotely controlled by momentary contact closures. The transmitter controller can interface directly with modern remote control and ATS systems.

BLOCK DIAGRAM BE MODEL FM-5A TRANSMITTER



FM-5A, One Tube 5KW FM Transmitter





SYNTHESIZED FX-30 EXCITER — The FM-5A transmitter features the FX-30 exciter. The FX-30 is digitally synthesized, programmable in 10kHz steps. A dual speed phase lock loop and stable 10MHz reference oscillator allows immediate on-frequency operation.

The ultra-linear modulated oscillator provides minimum intermodulation of the baseband stereo and SCA carriers. Harmonic and intermodulation distortion are less than 0.05%, and Transient Intermodulation Distortion (TIM) is less than 0.1%.

POWER AMPLIFIER 30 WATTS — The FX-30's RF power amplifier is fully VSWR protected, even up to its 30 watt output rating. Automatic power control eliminates periodic adjustments. The broadband power amplifier has as tuning adjustments.

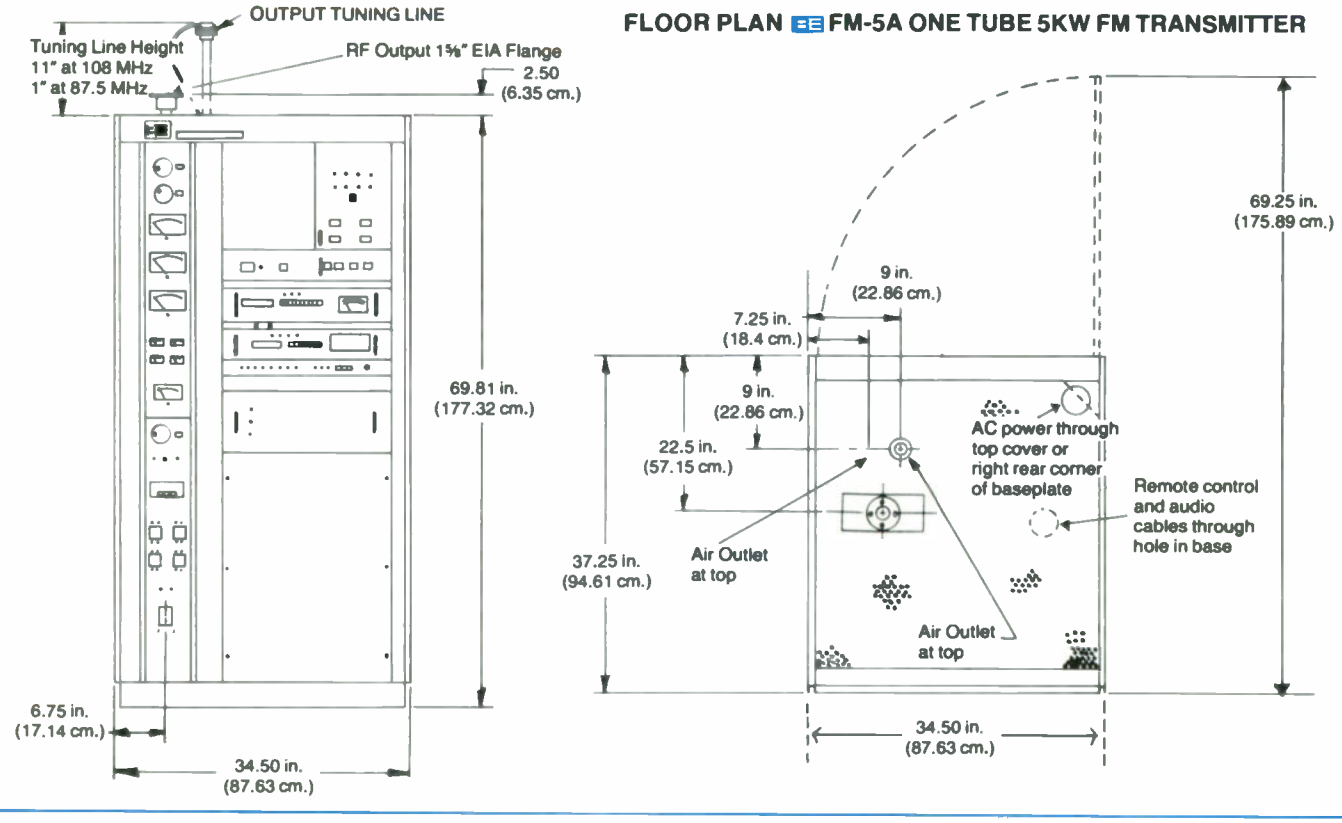
The FX-30 is mounted as a slide out assembly, with an easy to remove top cover allowing accessibility of all components. Full front panel metering, and internal diagnostic LED's give operating status at a glance. Five audio and composite inputs are provided on the rear panel.

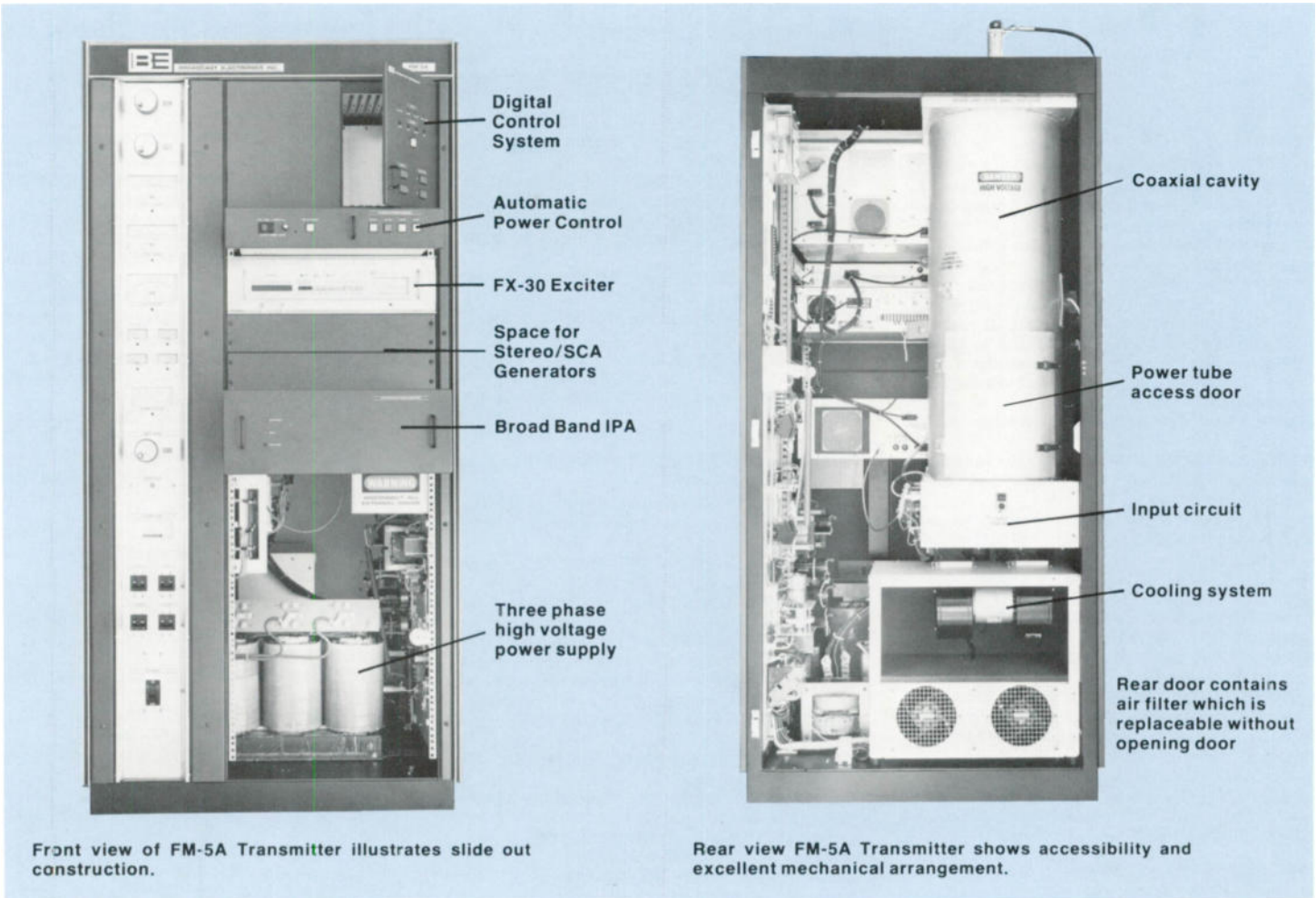
OPTIONAL STEREO/SCA GENERATOR — The FM-5A transmitter has additional rack space so that the FS-30 Stereo Generator and the FC-30 SCA Generator may be mounted directly below the FX-30 Exciter. These two BE units are available as optional equipment.

DIGITAL DESIGN — In the FS-30 Stereo Generator, a digital modulator and pilot generator offer absolute pilot phase stability without adjustment and eliminates troublesome distortion products. The result is a virtually perfect baseband that is an order of magnitude better than previous standards.

OTHER FEATURES — The FS-30 Stereo Generator includes linear, delay equalized audio low pass filters for minimum overshoot without the use of clippers or other non-linear devices. Also standard in the FS-30 are front panel LED peak reading modulation status display, RFI protection and remote control capability.

FLOOR PLAN FM-5A ONE TUBE 5KW FM TRANSMITTER





Front view of FM-5A Transmitter illustrates slide out construction.

Rear view FM-5A Transmitter shows accessibility and excellent mechanical arrangement.

INNOVATIVE POWER AMPLIFIER — 's new computer-optimized coaxial cavity employs a patented folded half-wave tank circuit. This unique design eliminates the high voltage blocking capacitors, high current shorting planes, and sliding contacts of conventional cavities. The result is exceptional reliability with lower maintenance costs.

Welded coaxial construction improves efficiency and reduces leakage radiation. A patented second harmonic suppressor is integral in this cavity, minimizing the generation of harmonic energy at the source. This yields higher PA efficiency without wasting fundamental frequency power. A separate low pass filter with directional couplers is located within the transmitter to insure compliance with FCC and DOC regulations and CCIR recommendations.

All PA adjustments have smooth-operating front panel controls with counters. A grounded bellows tunes the output while a grounded loop couples the antenna. Improved immunity to lightning is accomplished in the FM-5A in this manner.

SIMPLIFIED INPUT CIRCUIT — A new PA input circuit matches the impedance between the IPA and the power tube grid over the entire FM band. This broadband printed circuit assembly maximizes bandwidth and stability, while eliminating the input loading control. A single grid tuning control is adjusted for maximum output. The entire transmitter can be retuned to a different frequency in a short time; no extra frequency determining components are required.

SOLID STATE IPA — A high efficiency solid state IPA assembly in the FM-5A is contained in a slide-out drawer for convenience in maintenance.

The broadband amplifier and regulator modules are easily removed—no de-soldering is necessary.

Both RF output transistors are automatically protected against output mismatch. The self-contained IPA unit can be operated directly into an antenna as a 250 watt transmitter during emergencies. The IPA power supply operates from 97 to 133 VAC, or 194 to 266 VAC.

Operational aids for the IPA include three front panel status indicators and availability of buffered rear panel metering.

DIGITAL CONTROL SYSTEM — All transmitter control and status functions in the FM-5A are performed by a modular digital controller. This advanced controller monitors the transmitter operating parameters and determines what control actions are necessary.

Status indicators (a total of 8) appear on individual LED's. This gives the transmitter operator more information for use in troubleshooting and day-to-day transmitter operation.

MODULAR CONTROL SYSTEM DESIGN — A modular design approach with ribbon cables and a card edge bus makes board removal quick and easy. CMOS logic was chosen because of its superior noise immunity. All remote control inputs and outputs are optically isolated. The modular design accommodates plug-in circuitry for extensive diagnostics.

FM-5A, One Tube 2.5KW to 5.5KW FM Transmitter

TECHNICAL SPECIFICATIONS

GENERAL

POWER OUTPUT: 5kW (from 2.5kW to 5.5kW).
FREQUENCY RANGE: 87.5 to 108 MHz, tuned to specified operating frequency. Exciter programmable in 10kHz increments.
RF OUTPUT IMPEDANCE: 50 ohms (others on special request).
OUTPUT CONNECTOR: 1⅝" EIA flange.
VSWR: 1.8:1 maximum (will operate into higher VSWR with automatic power reduction).
FREQUENCY STABILITY: ±300Hz, 0° to 50°C, temperature compensated crystal oscillator.
TYPE OF MODULATION: Direct frequency modulation of carrier frequency.
MODULATION CAPABILITY: Greater than ±200 kHz.
MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.
EXCITER: Solid state, 30 watt output, Model FX-30; incorporates digitally programmed synthesizer (10kHz increments).
PRE-EMPHASIS: FCC 75uS, CCIR 50uS (where specified), or 25uS (Dolby).
ASYNCHRONOUS AM S/N RATIO: 55dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (no FM modulation present).
SYNCHRONOUS AM S/N RATIO: 40dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (FM modulation ± 75kHz @ 400Hz).
TUBE COMPLEMENT: 4CX3500A (1).
RF HARMONICS: Supression meets all FCC/DOC requirements and CCIR recommendations.
POWER SUPPLY RECTIFIERS: Silicon.

ELECTRICAL/MECHANICAL

AC INPUT POWER: 208V WYE/240V Delta, 50/60Hz, three phase. (Taps for 196 to 252V). (Other voltages are available upon request).
POWER CONSUMPTION: 8.5kW, 0.9PF @ 5kW output.
SIZE/WEIGHT/CUBAGE: 34.5" W (87.63 cm) × 70" H (177.8 cm) × 37.25" D (94.61 cm). Weight 1000 lbs. (455 kg unpacked; 1200 lbs. packed 545 kg.) Cubage: Net 53 cu. ft. (1.5 cu. m.) Packed 60 cu. ft. (2 cu. m.)
ALTITUDE: 7500 ft. @ 50 Hz (2286 M) 10,000 ft. @ 60 Hz (3048 M).
AMBIENT TEMPERATURE RANGE: −10°C to +50°C.
FINISH: BE blue with anodized aluminum control center panel and anodized aluminum trim.

*MONAURAL OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode supression.
AUDIO INPUT LEVEL: +10 dBm nominal for ±75 kHz deviation @ 400 Hz.
AUDIO FREQUENCY RESPONSE: ±0.5 dB, 30 Hz to 15 kHz, selectable flat, 25, 50 or 75 microsecond pre-emphasis.
HARMONIC DISTORTION: 0.08% or less, 30 Hz to 15 kHz.
INTERMODULATION DISTORTION: 0.08% or less, 60 Hz/7 kHz, 4:1 ratio.
TRANSIENT IMD: 0.1% or less (square wave/sine wave).
FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 microsecond de-emphasis.

*WIDEBAND COMPOSITE OPERATION (Thru FM-5A using FX-30)

COMPOSITE INPUTS: 3 total, (1) unbalanced and (1) balanced plus front panel test. BNC connectors.
COMPOSITE INPUT IMPEDANCE: 10 k ohm, nominal, resistive.
COMPOSITE INPUT LEVEL: 3.5 VP-P nominal, for ±75 kHz deviation.
COMPOSITE FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical). Measured in a 30 Hz to 100 kHz bandwidth with 75 microsecond de-emphasis.
COMPOSITE HARMONIC DISTORTION: 0.08% or less (.04% typical).
COMPOSITE INTERMODULATION DISTORTION: 0.08% or less (.04% typical).
COMPOSITE TRANSIENT IMD: 0.1% or less (square wave/sinewave).
COMPOSITE AMPLITUDE RESPONSE: ±0.1 dB, 30 Hz to 53 kHz.
COMPOSITE PHASE RESPONSE: ±0.5° from linear phase, 30 Hz to 53 kHz.
COMPOSITE GROUP DELAY: 390 nanoseconds ±25 nanoseconds, 30 Hz to 53 kHz.
COMPOSITE SLEW RATE: 12 V/microsecond (symmetrical).

*STEREO OPERATION (Thru FM-5A using FS-30 Stereo Generator)

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, floating. (Adaptable to other impedances).
AUDIO INPUT LEVEL: +10 dBm, ±1 dB for 100% modulation @ 400 Hz. (Adaptable to other input levels).
AUDIO INPUT FILTER: 15 kHz LPF with delay equalization for minimum overshoot.
FREQUENCY RESPONSE: ±0.5 dB, 30-15,000 Hz, 75 usec pre-emphasis (flat, 25 or 50 usec pre-emphasis selectable).
TOTAL HARMONIC DISTORTION: 0.08% or less, 30-15,000 Hz.
INTERMODULATION DISTORTION: 0.08%, 60 Hz/7 kHz; 4:1 ratio.
TRANSIENT INTERMODULATION DISTORTION: 0.1% (Square wave/sine wave).
FM NOISE: 72 dB or better below 100% modulation @ 400 Hz, 75 usec de-emphasis.
STEREO SEPARATION: 45 dB or better; 30-15,000 Hz (sine wave).
DYNAMIC STEREO SEPARATION: 40 dB or better; 30-15,000 Hz (normal program content).
LINEAR CROSSTALK: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30-15,000 Hz, 45 dB minimum below 100% modulation.
NON-LINEAR CROSSTALK: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation.
38 kHz SUPPRESSION: 70 dB minimum below 100% modulation.
PILOT STABILITY: ±0.5 Hz, 0° to 50°C.
MODES: Stereo, Mono L+R, Mono (L) and Mono (R) remote controlled (See FS-30 data sheet for full details).

*SCA OPERATION (Thru FM-5A using FC-30 SCA Generator)

MODULATION: Direct FM
SUBCARRIER FREQUENCY: 67 kHz (39 to 95 kHz to order).
SUBCARRIER FREQUENCY STABILITY: ±0.5% (330 Hz @ 67 kHz), 0° - 50°C.
SUBCARRIER HARMONIC CONTENT: Less than 0.3%.
SUBCARRIER ENVELOPE DECAY: Greater than 100 msec. from 90% to 10% subcarrier levels.
MODULATION CAPABILITY: ±20% of subcarrier frequency.
AUDIO INPUT IMPEDANCE: 600 ohm balanced resistive.
DATA INPUT IMPEDANCE: 75 ohm unbalanced resistive DC coupled.
INPUT LEVELS: (Audio) Adjustable, +10 dBm to −10 dBm for ±6 kHz deviation @ 400 Hz. (Data) Adjustable, 1.0 to 4.0 V p-p for ±6 kHz deviation (D.C. coupled).
PREEMPHASIS: (Audio) 150 microseconds standard (75 usec with internal jumper). (Data) no pre-emphasis.
FREQUENCY RESPONSE: (Audio) ±0.5 dB, 10-10,000 Hz, exclusive of audio low-pass filter. (Data) ±0.5 dB, dc-10,000 Hz.
AUDIO LOW-PASS FILTER: Sixth order, −3 dB @ 4.3 kHz, standard (resistor changes for other values).
DATA LOW-PASS FILTER: Same as AF filter or may be bypassed.
TOTAL HARMONIC DISTORTION: Less than 0.5% throughout AF pass band.
INTERMODULATION DISTORTION: Less than 0.5%, 60Hz/7kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed). Typical 0.1%.
CROSSTALK, SCA TO STEREO: −60 dB or better below 100% modulation of left or right. 75 usec de-emphasis.
CROSSTALK, STEREO TO SCA: −50 dB or better below ±6 kHz deviation of SCA using 150 usec de-emphasis and FS-30 stereo generator.
FM NOISE: 72 dB below ±6 kHz deviation @ 400 Hz (150 usec de-emphasis).
AUTO MUTING LEVEL: Adjustable from 10 to 30 dB below program level.
AUTO MUTING DELAY: Adjustable, 0.5 to 10.0 seconds.
(See FC-30 data sheet for full details).

*Through FM-5A Transmitter using Model FX-30 Exciter, FS-30 Stereo Generator and FC-30 SCA Generator as applicable.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-5A	909-5000-200	FM-5A one tube 5kW FM broadcast transmitter for operation on one specified frequency between 87.5MHz and 108MHz and for 208V./240V., 60Hz, 3 wire, three phase power source.
FM-5A	909-5000-300	Same as above except for 208V./240V., 50Hz power source.
FM-5A	909-5000-380	Same as above except for operation from 380V., WYE, 50 Hz, three phase power source.
	243-3500	Spare 4CX3500A power tube for FM-5A.

Specifications subject to change without notice.

BROADCAST ELECTRONICS INC
4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305 U.S.A., TELEX: 25-0142, CABLE: BROADCAST, PHONE: (217) 224-9600

B173 CP 1M 783

BROADCAST ELECTRONICS INC

FM-3.5A

3.5 KW Single Tube Transmitter

The Worlds Most Advanced

The Optimum in Performance, Reliability and Efficiency.

FM-3.5A, One Tube 3500 Watt FM Transmitter

FEATURES

- One-tube transmitter
- *Folded half-wave output cavity—no plate blocking capacitor or sliding contacts
- Broadband input matching network
- Solid state broadband IPA
- Advanced digital control system
- Optional microprocessor diagnostics
- Synthesized BE FX-30 exciter
- Automatic Power Control with Proportional VSWR Foldback
- Extensive metering, 10 meters

*Patented

TOTALLY NEW DESIGN — Through innovative engineering developments BE has introduced a totally new 3500 watt FM broadcast transmitter. The single tube model FM-3.5A incorporates a unique patented folded half-wave cavity power amplifier, digitally programmed FX-30 ultra linear exciter and a second generation digital control system. A new automatic power control system (APC), a simplified input circuit, and a computer optimized coaxial cavity set new standards of dependability. With the FM-3.5A, Broadcast Electronics has produced a transmitter for optimum reliability and superb FM performance.

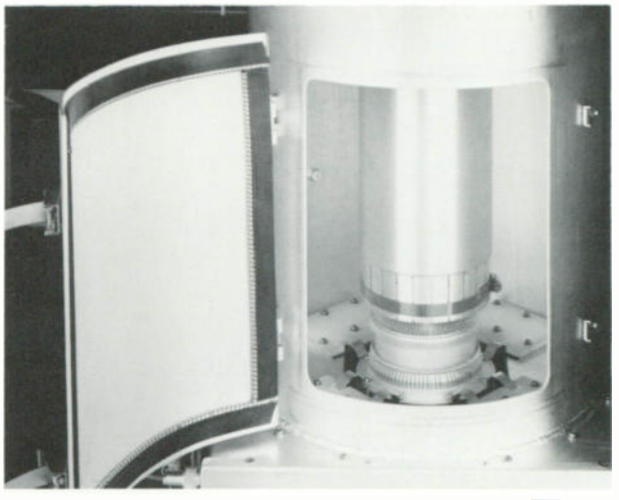
The entire 3500 watt transmitter is contained in a single low profile cabinet only 5'10" high (177.8 cm) with easy access to all components. Only 8.5 sq. feet ($0.8m^2$) of floor space is needed. The air filter is replaceable while the transmitter is operating.

SINGLE TUBE DESIGN — Achieving the utmost in reliability was the design philosophy behind the FM-3.5A. The one tube design provides a transmitter that can remain on the air despite adverse conditions such as lightning, output mismatch or operator error. Unlike solid state devices, an output tube can repeatedly withstand overloads without damage. In the FM-3.5A the ruggedness of a single tube output stage is enhanced with a highly reliable PA cavity and automatic protective circuitry.

Another advantage of this single tube design is its optimal bandpass characteristics which make it transparent for stereo modulation while it minimizes susceptance to intermodulation at multiple transmitter sites.

The totally new FM-3.5A transmitter uses a single Eimac 4CX3500A tetrode to provide over 3500 watts of RF power on any frequency between 87.5 and 108MHz. The 4CX3500A has lower operating and replacement cost than other tetrodes with similar power capability. It operates in a grounded cathode configuration, being grid-driven by a solid state broadband IPA.

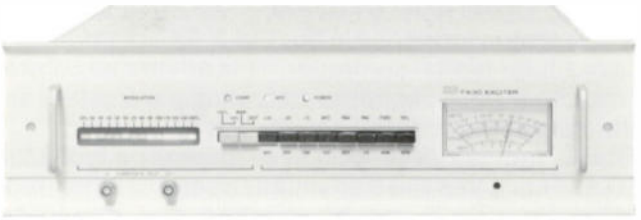
Installation and removal of the power tube, from the rear of the transmitter, is a quick, simple procedure in this compact BE transmitter.



Computer optimized coaxial cavity employs BE's patented folded half wave tank circuit which eliminates the plate blocking capacitor and all sliding contacts in the output circuit.

FM-3.5A, One Tube 3500 Watt FM Transmitter

Close up view of Digital Controller in the Model FM-3.5A Transmitter. A total of eight status indicators appear on individual LED's. The transmitter and controller are pre-wired for optional plug-in diagnostic circuitry.



SYNTHESIZED FX-30 EXCITER — The BE FM-3.5A transmitter features the FX-30 exciter. The FX-30 is digitally synthesized, programmable in 10kHz steps. A dual speed phase lock loop and stable 10MHz reference oscillator allows immediate on-frequency operation.

The ultra-linear modulated oscillator provides minimum intermodulation of the baseband stereo and SCA carriers. Harmonic and intermodulation distortion are less than 0.05%, and Transient Intermodulation Distortion (TIM) is less than 0.1%.

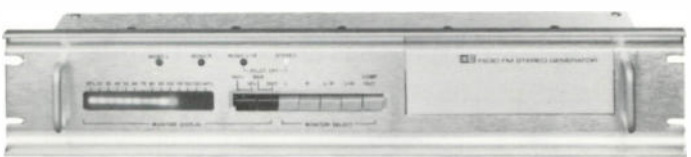
This solid state exciter is completely broadband and requires no tuning adjustments for a conservative 30 watt output.

The FX-30 is mounted on a slide out assembly making all components accessible for easy servicing.

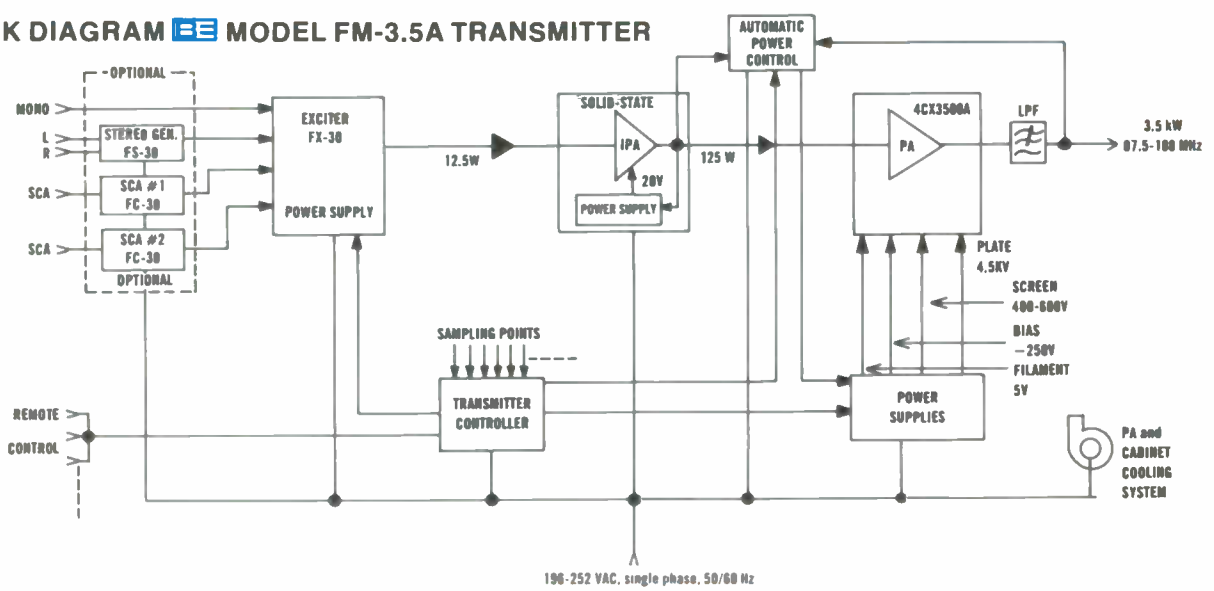
The FX-30 accepts multiple wideband composite inputs as well as a 600 ohm balanced input. When used for wideband, stereo or monaural operation, the new Broadcast Electronics FX-30 exciter produces a distinctively clean and superb FM sound.

Close up view of the Automatic Power Control System (APC). This is one of three slide out modules in the FM-3.5A Transmitter.

OPTIONAL STEREO/SCA GENERATOR — The FM-3.5A transmitter has additional rack space so that the FS-30 Stereo Generator and the FC-30 SCA Generator may be mounted directly below the FX-30 Exciter. These two BE units are available as optional equipment.



BLOCK DIAGRAM BE MODEL FM-3.5A TRANSMITTER



FM-3.5A, One Tube 3500 Watt FM Transmitter

DIGITAL CONTROL SYSTEM — All transmitter control and status functions in the FM-3.5A are performed by a modular digital controller. This advanced controller monitors the transmitter operating parameters and determines what control actions are necessary.

Status indicators (a total of 8) appear on individual LED's. This gives the transmitter operator more information for use in troubleshooting and day-to-day transmitter operation.

MODULAR CONTROL SYSTEM DESIGN — A modular design approach with ribbon cables and a card edge bus makes board removal quick and easy. CMOS logic was chosen because of its superior noise immunity. All remote control inputs and outputs are optically isolated.

The modular design will accommodate plug-in circuitry for extensive diagnostics to be available as a future add-on option.

REMOTE CONTROL — The BE FM-3.5A transmitter is designed so that all operating modes can be remotely controlled by momentary contact closures. The transmitter controller can interface directly with modern remote control and ATS systems.

EXTENSIVE INDEPENDENT METERING — Independent metering permits observation of all important PA parameters simultaneously. Three large 4.5 inch meters, two 3.5 inch meters and four 1.5 inch meters are located on the vertical control center. An elapsed time indicator and a true RMS filament voltmeter are included.

The PA output power meter is conveniently located adjacent to the output loading and output tuning controls. The FX-30 exciter has its own built-in metering.

AUTOMATIC POWER CONTROL — An advanced automatic power control system (APC) maintains constant RF output power regardless of fluctuations in primary AC line voltage or changes in the RF drive level. The regulated set point can be changed by remote control and is retained in a non-volatile digital memory.

An external signal can be used to switch the FM-3.5A into a separate "Preset Power" mode for reduced power during an emergency.

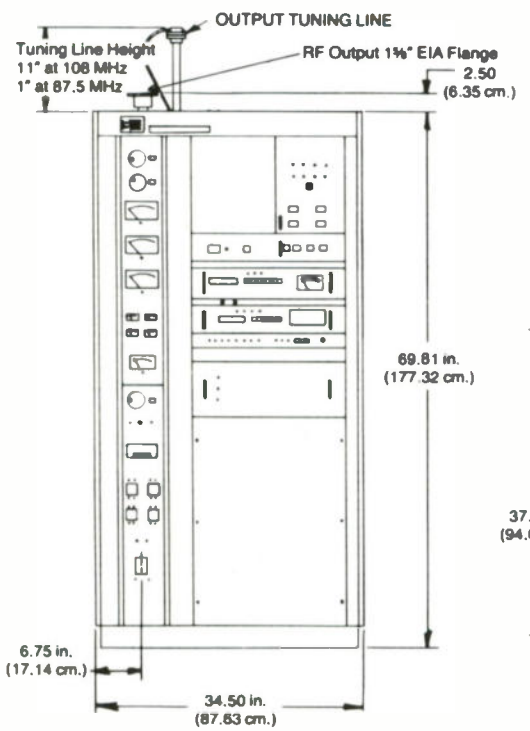
A proportional VSWR foldback system protects the PA from overloads by automatically reducing output power to a safe operating level if the antenna system presents a mismatch, such as during icing conditions.

Each time the transmitter is activated a "soft-start" circuit automatically raises the power from zero to the nominal operating level. At turn-on, this feature allows the transmitter to assume a safe operating level under high VSWR conditions without overloading.

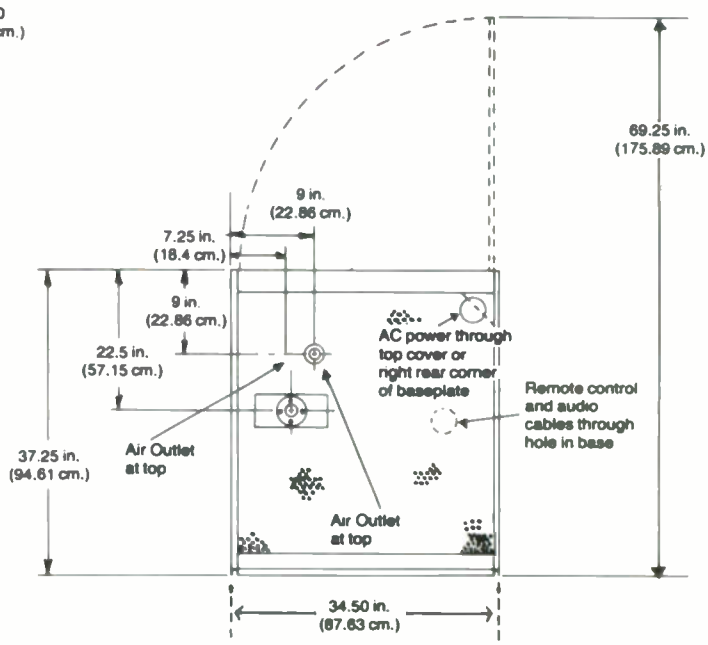
AUTOMATIC AC RESTART — In the event of a momentary AC power failure, full operation is resumed immediately. If the AC power is lost for a more prolonged period, the transmitter automatically goes through the regular filament warm-up period before high voltage is applied.

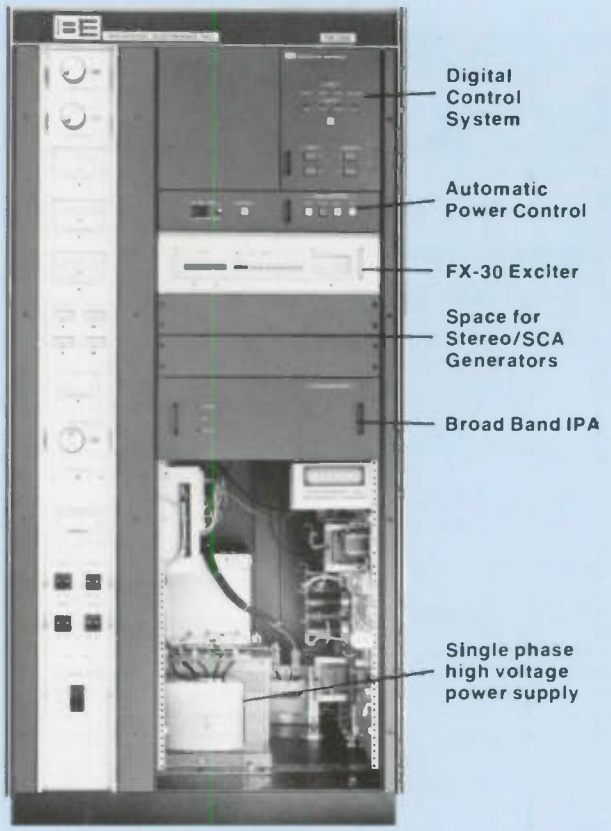
POWER SUPPLY — All power supplies in the FM-3.5A are self-contained in the transmitter cabinet. The transmitter operates from a 208/240V, 50/60Hz, single phase power system. Step-start minimizes peak inrush currents.

The transmitter can accommodate AC inputs from 196V to 252V. The plate transformer has 5 taps for this wide range of inputs.

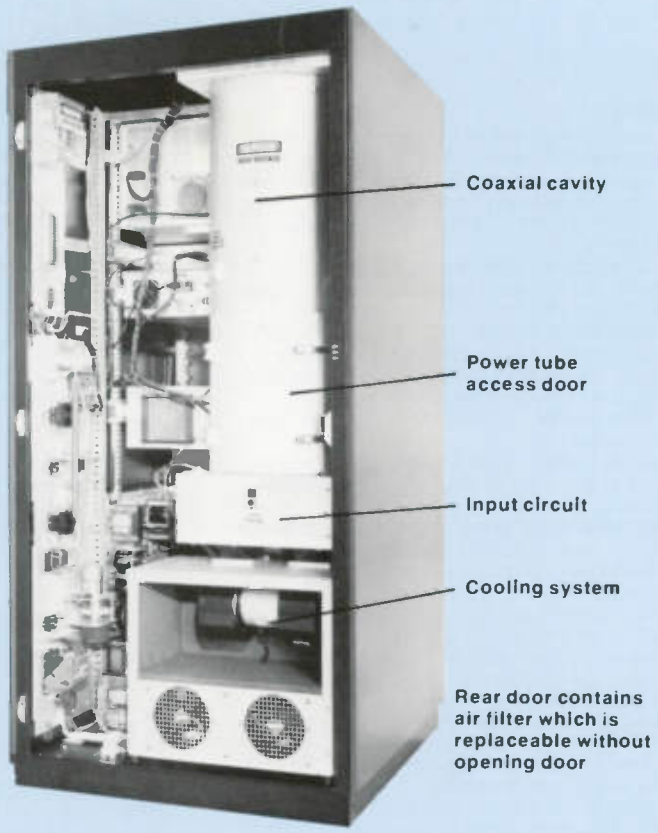


FLOOR PLAN BE MODEL FM-3.5A TRANSMITTER





Front view Model FM-3.5A Transmitter.



Rear view Model FM-3.5A Transmitter.

INNOVATIVE POWER AMPLIFIER — BE's new computer-optimized coaxial cavity employs a patented folded half-wave tank circuit. This unique design eliminates the high voltage blocking capacitors, high current shorting planes, and sliding contacts of conventional cavities. The result is exceptional reliability with lower maintenance costs.

Welded coaxial construction improves efficiency and reduces leakage radiation. A patented second harmonic suppressor is integral in this cavity, minimizing the generation of harmonic energy at the source. This yields higher PA efficiency without wasting fundamental frequency power. A separate low pass filter with directional couplers is located within the transmitter to insure compliance with FCC and DOC regulations and CCIR recommendations.

All PA adjustments have smooth-operating front panel controls with counters. A grounded bellows tunes the output while a grounded loop couples the antenna. Improved immunity to lightning is accomplished in the FM-3.5A transmitter in this manner.

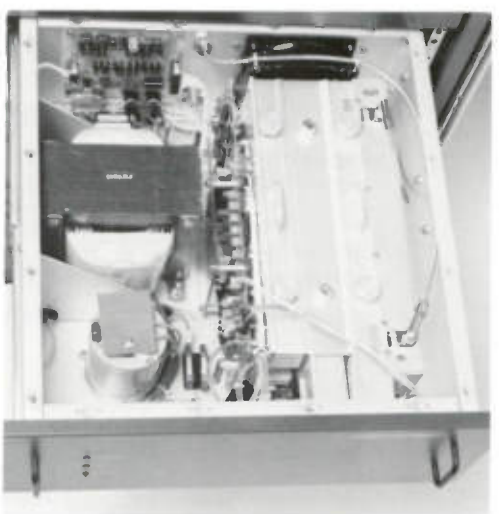
SIMPLIFIED INPUT CIRCUIT — A new PA input circuit matches the impedance between the IPA and the power tube grid over the entire FM band. This broadband printed circuit assembly maximizes bandwidth and stability, while eliminating the input loading control. A single grid tuning control is adjusted for maximum output. The entire transmitter can be retuned to a different frequency in a short time; no extra frequency determining components are required.

SOLID STATE IPA — A high efficiency solid state IPA assembly in the FM-3.5A is contained in a slide-out drawer for convenience in maintenance.

The broadband amplifier and regulator modules are easily removed—no de-soldering is necessary.

Both RF output transistors are automatically protected against output mismatch. The self-contained IPA unit can be operated directly into an antenna as a 250 watt transmitter during emergencies. The IPA power supply operates from 97 to 133 VAC, or 194 to 266 VAC.

Operational aids for the IPA include three front panel status indicators and availability of buffered rear panel metering.



Slide out solid state IPA assembly includes power supply and can be used as a 250 watt transmitter.

FM-3.5A, One Tube 1.5KW to 3.8KW FM Transmitter

TECHNICAL SPECIFICATIONS

GENERAL

POWER OUTPUT: 3.5kW (from 1.5kW to 3.8kW).
FREQUENCY RANGE: 87.5 to 108 MHz, tuned to specified operating frequency. Exciter programmable in 10kHz increments.
RF OUTPUT IMPEDANCE: 50 ohms (others on special request).
OUTPUT CONNECTOR: 1⅝" EIA flange.
VSWR: 2:1 maximum (will operate into higher VSWR with automatic power reduction).
FREQUENCY STABILITY: ±300Hz, 0° to 50°C, temperature compensated crystal oscillator.
TYPE OF MODULATION: Direct frequency modulation of carrier frequency.
MODULATION CAPABILITY: Greater than ±200 kHz.
MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.
EXCITER: Solid state, 30 watt output, Model FX-30; incorporates digitally programmed synthesizer (10kHz increments).
PRE-EMPHASIS: FCC 75uS, CCIR 50uS (where specified), or 25uS (Dolby).
ASYNCHRONOUS AM S/N RATIO: 55dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (no FM modulation present).
SYNCHRONOUS AM S/N RATIO: 40dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (FM modulation ± 75kHz @ 400Hz).
TUBE COMPLEMENT: 4CX3500A (1).
RF HARMONICS: Supression meets all FCC/DOC requirements and CCIR recommendations.
POWER SUPPLY RECTIFIERS: Silicon.

ELECTRICAL/MECHANICAL

AC INPUT POWER: 208/240V, 50/60Hz, single phase. (Taps for 196 to 252V). (Other voltages are available upon request).
POWER CONSUMPTION: 6.8kW @ 0.9PF @ 3.5kW output.
SIZE & WEIGHT: 34.5" W (87.63 cm) × 70" H (177.8 cm) × 37.25" D (94.61 cm). Weight 1050 lbs. (477 kg) unpacked; 1210 lbs. (550 kg.) packed.
CUBAGE: Net 53 cu. ft. (1.5 cu. m.) Packed 60 cu. ft. (2 cu. m.)
ALTITUDE: 7500 ft. @ 50 Hz/10,000 ft. @ 60 Hz.
AMBIENT TEMPERATURE RANGE: −10°C to +50°C.
FINISH: BE blue with anodized aluminum control center panel and anodized aluminum trim.

*MONAURAL OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode supression.
AUDIO INPUT LEVEL: +10 dBm nominal for ±75 kHz deviation @ 400 Hz.
AUDIO FREQUENCY RESPONSE: ±0.5 dB, 30 Hz to 15 kHz, selectable flat, 25, 50 or 75 microsecond pre-emphasis.
HARMONIC DISTORTION: 0.08% or less, 30 Hz to 15 kHz.
INTERMODULATION DISTORTION: 0.08% or less, 60 Hz/7 kHz, 4:1 ratio.
TRANSIENT IMD: 0.1% or less (square wave/sine wave).
FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 microsecond de-emphasis.

*WIDEBAND COMPOSITE OPERATION (Thru FM-3.5A using FX-30)

COMPOSITE INPUTS: 3 total, (1) unbalanced and (1) balanced plus front panel test. BNC connectors.
COMPOSITE INPUT IMPEDANCE: 10 k ohm, nominal, resistive.
COMPOSITE INPUT LEVEL: 3.5 VP-P nominal, for ±75 kHz deviation.
COMPOSITE FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical). Measured in a 30 Hz to 100 kHz bandwidth with 75 microsecond de-emphasis.
COMPOSITE HARMONIC DISTORTION: 0.08% or less (.04% typical).
COMPOSITE INTERMODULATION DISTORTION: 0.08% or less (.04% typical).
COMPOSITE TRANSIENT IMD: 0.1% or less (square wave/sinewave).
COMPOSITE AMPLITUDE RESPONSE: ±0.1 dB, 30 Hz to 53 kHz.
COMPOSITE PHASE RESPONSE: ±0.5° from linear phase, 30 Hz to 53 kHz.
COMPOSITE GROUP DELAY: 390 nanoseconds ±25 nanoseconds, 30 Hz to 53 kHz.
COMPOSITE SLEW RATE: 12 V/microsecond (symmetrical).

*STEREO OPERATION (Thru FM-3.5A using FS-30 Stereo Generator)

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, floating. (Adaptable to other impedances).
AUDIO INPUT LEVEL: +10 dBm, ±1 dB for 100% modulation @ 400 Hz. (Adaptable to other input levels).
AUDIO INPUT FILTER: 15 kHz LPF with delay equalization for minimum overshoot.
FREQUENCY RESPONSE: ±0.5 dB, 30-15,000 Hz, 75 usec pre-emphasis (flat, 25 or 50 usec pre-emphasis selectable).
TOTAL HARMONIC DISTORTION: 0.08% or less, 30-15,000 Hz.
INTERMODULATION DISTORTION: 0.08%, 60 Hz/7 kHz; 4:1 ratio.
TRANSIENT INTERMODULATION DISTORTION: 0.1% (Square wave/sine wave).
FM NOISE: 72 dB or better below 100% modulation @ 400 Hz, 75 usec de-emphasis.
STEREO SEPARATION: 45 dB or better; 30-15,000 Hz (sine wave).
DYNAMIC STEREO SEPARATION: 40 dB or better; 30-15,000 Hz (normal program content).
LINEAR CROSSTALK: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30-15,000 Hz, 45 dB minimum below 100% modulation.
NON-LINEAR CROSSTALK: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation.
38 kHz SUPPRESSION: 70 dB minimum below 100% modulation.
PILOT STABILITY: ±0.5 Hz, 0° to 50°C.
MODES: Stereo, Mono L+R, Mono (L) and Mono (R) remote controlled (See FS-30 data sheet for full details).

*SCA OPERATION (Thru FM-3.5A using FC-30 SCA Generator)

MODULATION: Direct FM
SUBCARRIER FREQUENCY: 67 kHz (39 to 95 kHz to order).
SUBCARRIER FREQUENCY STABILITY: ±0.5% (330 Hz @ 67 kHz), 0° - 50°C.
SUBCARRIER HARMONIC CONTENT: Less than 0.3%.
SUBCARRIER ENVELOPE DECAY: Greater than 100 msec. from 90% to 10% subcarrier levels.
MODULATION CAPABILITY: ±20% of subcarrier frequency.
AUDIO INPUT IMPEDANCE: 600 ohm balanced resistive.
DATA INPUT IMPEDANCE: 75 ohm unbalanced resistive DC coupled.
INPUT LEVELS: (Audio) Adjustable, +10 dBm to −10 dBm for ±6 kHz deviation @ 400 Hz. (Data) Adjustable, 1.0 to 4.0 V p-p for ±6 kHz deviation (D.C. coupled).
PREEMPHASIS: (Audio) 150 microseconds standard (75 usec with internal jumper). (Data) no pre-emphasis.
FREQUENCY RESPONSE: (Audio) ±0.5 dB, 10-10,000 Hz, exclusive of audio low-pass filter. (Data) ±0.5 dB, dc-10,000 Hz.
AUDIO LOW-PASS FILTER: Sixth order, −3 dB @ 4.3 kHz, standard (resistor changes for other values).
DATA LOW-PASS FILTER: Same as AF filter or may be bypassed.
TOTAL HARMONIC DISTORTION: Less than 0.5% throughout AF pass band.
INTERMODULATION DISTORTION: Less than 0.5%, 60Hz/7kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed). Typical 0.1%.
CROSSTALK, SCA TO STEREO: −60 dB or better below 100% modulation of left or right. 75 usec de-emphasis.
CROSSTALK, STEREO TO SCA: −50 dB or better below ±6 kHz deviation of SCA using 150 usec de-emphasis and FS-30 stereo generator.
FM NOISE: 72 dB below ±6 kHz deviation @ 400 Hz (150 usec de-emphasis).
AUTO MUTING LEVEL: Adjustable from 10 to 30 dB below program level.
AUTO MUTING DELAY: Adjustable, 0.5 to 10.0 seconds.
(See FC-30 data sheet for full details).

*Through FM-3.5A Transmitter using Model FX-30 Exciter, FS-30 Stereo Generator and FC-30 SCA Generator as applicable.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-3.5A	909-3500-200	FM-3.5A one tube 3.5kW FM broadcast transmitter for operation on one specified frequency between 87.5MHz and 108MHz and for 196-252 VAC, 60Hz, single phase power source.
FM-3.5A	909-3500-300	Same as above except for 50Hz single phase power source.
	243-3500	Spare 4CX3500A power tube for FM-3.5A.

Specifications subject to change without notice.

BROADCAST ELECTRONICS INC.
4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305 U.S.A., TELEX: 25-0142, CABLE: BROADCAST, PHONE: (217) 224-9600

B172 CP 7.5M 683

BROADCAST ELECTRONICS INC

FM-1.5A

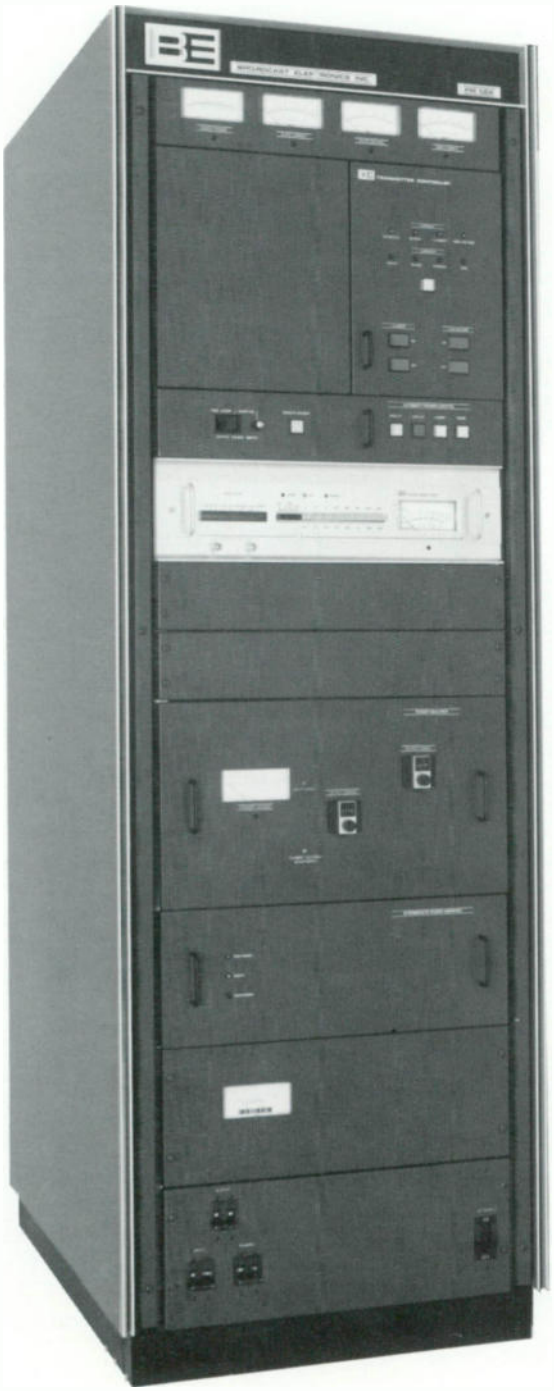
1500 Watt Single Tube Transmitter

The Worlds Most Advanced

The Optimum in Performance, Reliability and Efficiency.

FM-1.5A

One Tube FM Transmitter
500 to 1650 Watts



FEATURES

- One-tube transmitter
- Patented folded half-wave output cavity—no plate blocking capacitor or sliding contacts
- Broadband input matching network
- Advanced digital control system
- Optional microprocessor diagnostics
- Synthesized B/E FX-30 exciter
- Solid state broadband IPA
- Automatic Power Control with Proportional VSWR Foldback

Advanced Engineering

The one-tube FM-1.5A transmitter incorporates a patented unique folded half-wave cavity power amplifier, broadband solid state IPA, digitally programmed FX-30 ultra-linear exciter and a digital control system. With these innovative engineering advances Broadcast Electronics has produced a 1500 watt transmitter for optimum reliability and superb FM performance. and superb FM performance.

The entire transmitter is contained in a single low profile cabinet only 5'10" high (177.8 cm) with easy access to all components. Only five square feet of floor space are required. The air filter is in the full length back door and is replaceable while the transmitter is operating.

Single Tube Design

The FM-1.5A uses a single Eimac 3CX1500A7/8877 triode to provide 1.5KW power output on any frequency between 87.5 and 108MHz. The triode operates in a high-gain configuration and is cathode-driven by a solid state broadband IPA. The tube is conservatively operated at less than one half of its rated plate dissipation.

Installation and removal of the power tube can easily be accomplished from the front of the transmitter. The entire power amplifier is contained in a slide-out drawer for easy accessibility.

FM-1.5A Transmitter

Digital Control System

All transmitter control and status functions in the FM-1.5A are performed by a modular digital controller. This advanced controller monitors the transmitter operating parameters and determines what control actions are necessary.

Status indicators (a total of 7) appear on individual LED's. This gives the transmitter operator more information for use in troubleshooting and day-to-day transmitter operation.

Modular Control System Design

A modular design approach with ribbon cables and a card edge bus makes board removal quick and easy. CMOS logic is used because of its superior noise immunity. All remote control inputs and outputs are optically isolated for control cut protection.

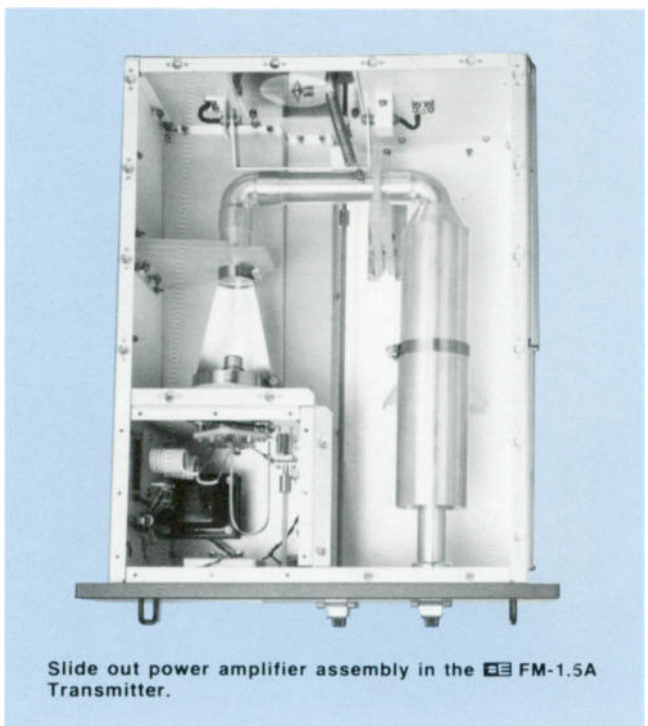
The modular design will accommodate plug-in circuitry for extensive diagnostics to be available as a future add-on option.

Remote Control

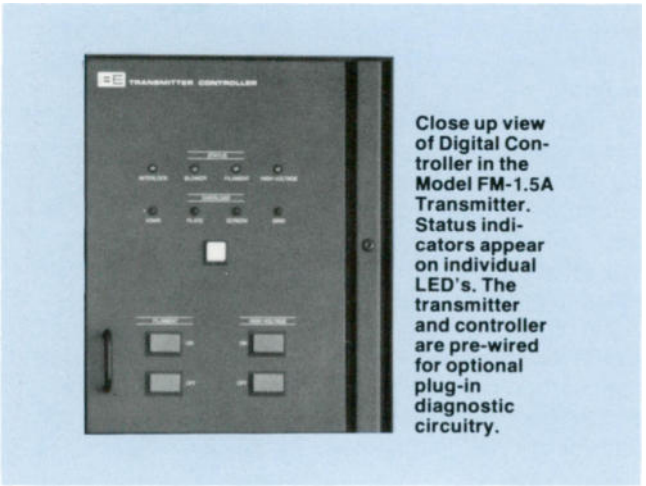
The FM-1.5A transmitter is designed so that all operating modes can be remotely controlled by momentary contact closures. The transmitter controller can interface directly with modern remote control and ATS systems.

Automatic AC Restart

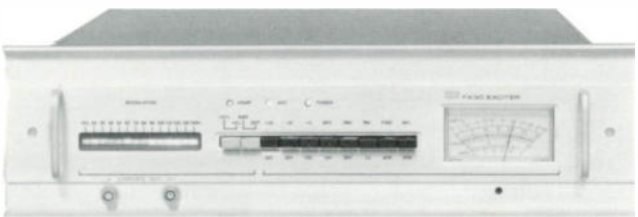
In the event of a momentary AC power failure, full operation is resumed immediately. If the AC power is lost for a more prolonged period, the transmitter automatically goes through the regular filament warm-up period before high voltage is applied.



Slide out power amplifier assembly in the FM-1.5A Transmitter.



Close up view of Digital Controller in the Model FM-1.5A Transmitter. Status indicators appear on individual LED's. The transmitter and controller are pre-wired for optional plug-in diagnostic circuitry.



Synthesized FX-30 Exciter

The B/E FM-1.5A transmitter features the FX-30 exciter. The FX-30 is digitally synthesized and programmable in 10kHz steps. A dual speed phase lock loop and stable 10MHz reference oscillator allows immediate on-frequency operation.

The ultra-linear modulated oscillator provides minimum intermodulation of the baseband stereo and SCA carriers. Harmonic and intermodulation distortion are less than 0.05%, and Transient Intermodulation Distortion (TIM) is less than 0.1%.

The solid state exciter is completely broadband and requires no tuning adjustments for a conservative 30 watt output.

The FX-30 is mounted on a slide out assembly making all components accessible for easy servicing.

The FX-30 accepts multiple wideband composite inputs as well as a 600 ohm balanced input. Whether used for wideband, stereo or monaural operation, the new Broadcast Electronics FX-30 exciter produces a distinctively clean and superb FM sound.

Optional Stereo/SCA Generator

The FM-1.5A transmitter has additional rack space so that B/E's FS-30 Stereo Generator and two FC-30 SCA Generators may be mounted directly below the FX-30 Exciter. These two B/E units are available as optional equipment.

Automatic Power Control

An advanced automatic power control system (APC) maintains constant RF output power regardless of fluctuations in primary AC line voltage or changes in the RF drive level. The regulated set point can be changed by remote control and is retained in a non-volatile digital memory.

An external signal can be used to switch the FM-1.5A into a separate "Preset Power" mode for minimal power consumption during an emergency.

A proportional VSWR foldback system protects the PA from overloads by automatically reducing output power to a safe operating level if the antenna system presents a mismatch, such as during icing conditions.

Each time the transmitter is activated a "soft-start" circuit automatically raises the power from a low level to the nominal operating level. At turn-on, this feature allows the transmitter to assume a safe operating level under high VSWR conditions without overloading.

Close up view of the Automatic Power Control System (APC). This is one of four slide out modules in the FM-1.5A Transmitter.

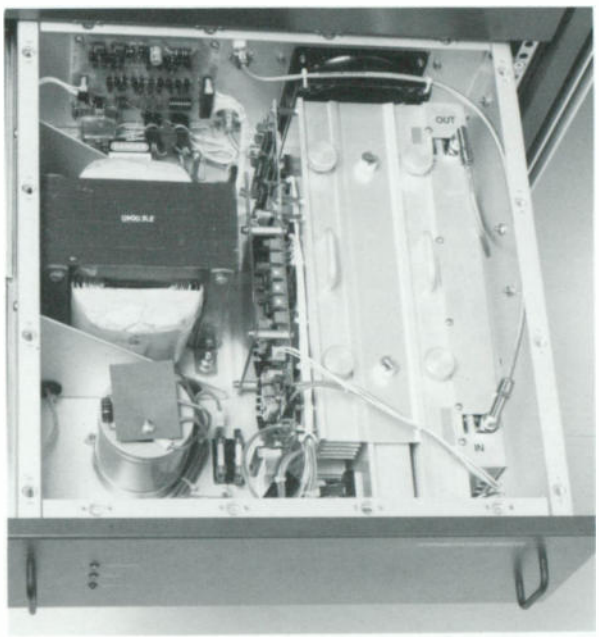
Solid State IPA

A high efficiency solid state IPA assembly in the FM-1.5A transmitter is contained in a slide-out drawer for convenience in maintenance.

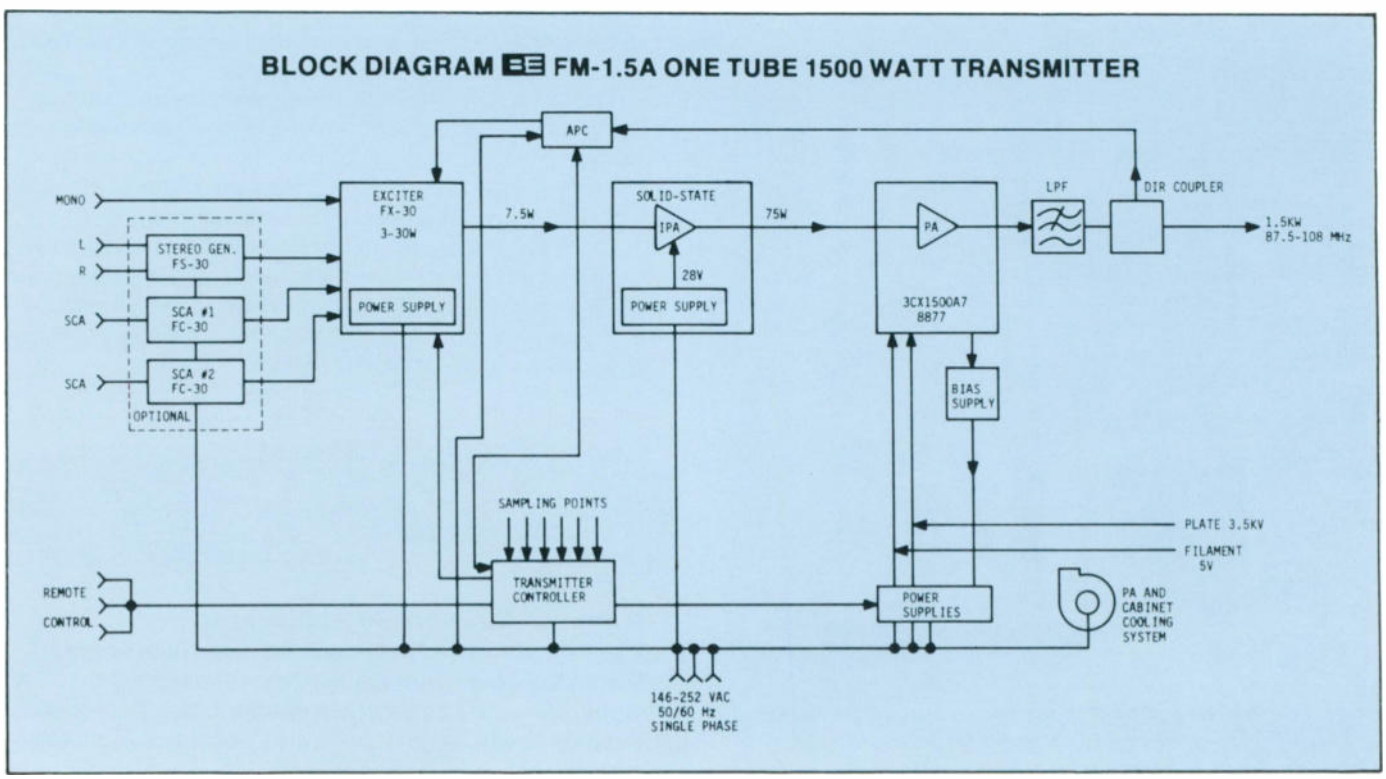
The broadband amplifier and regulator modules are easily removed—no de-soldering is necessary.

Both RF output transistors are automatically protected against output mismatch. The self-contained IPA unit can be operated directly into an an250 watt transmitter during emergencies. The IPA power supply operates from 97 to 133 VAC, or 194 to 266 VAC.

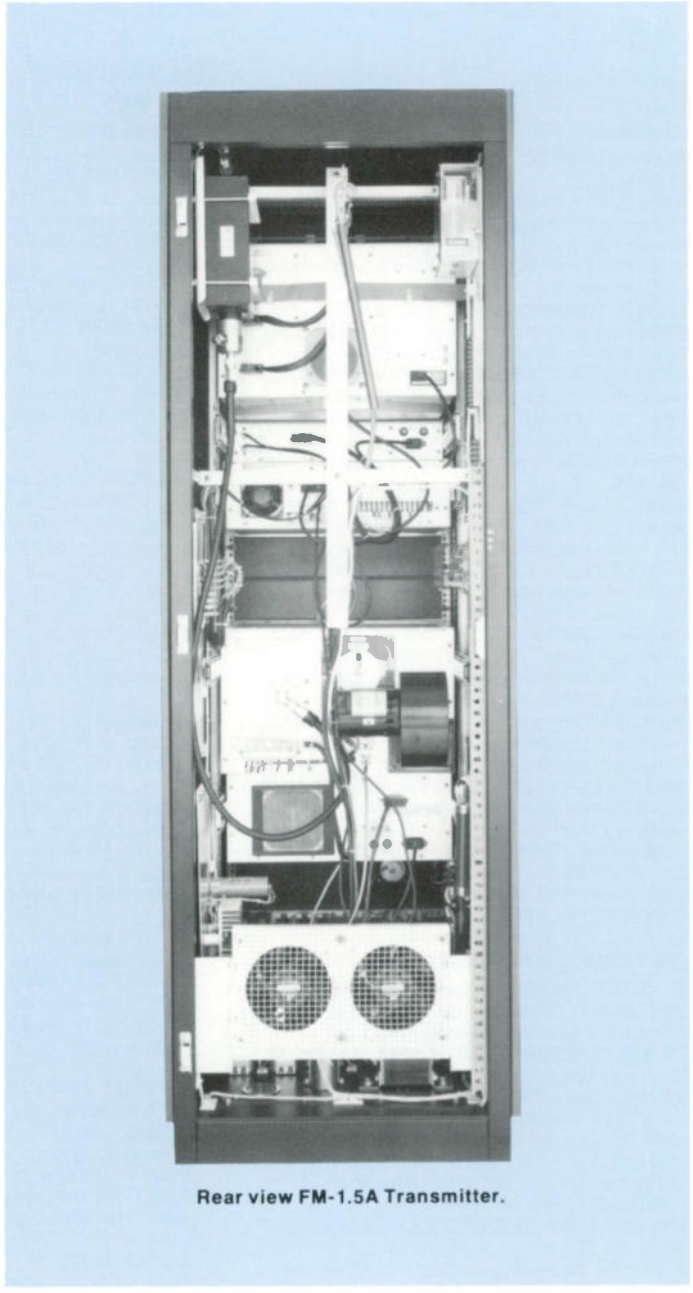
Operational aids for the IPA include three front panel status indicators and availability of buffered rear panel metering.



Slide out solid state IPA assembly includes power supply and can be used as 250 watt transmitter.



Front view of FM-1.5A Transmitter illustrates modular slide out construction.



Rear view FM-1.5A Transmitter.

Output Tube Reliability

B/E's one tube design provides a transmitter that can remain on the air despite adverse conditions such as lightning, output mismatch or operator error. Unlike solid state devices, an output tube can repeatedly withstand overloads without damage. In the Model FM-1.5A the ruggedness of a single tube output state is enhanced with a highly reliable PA cavity and automatic protective circuitry.

Simplified Input Circuit

A new PA input circuit matches the impedance between the IPA and the power tube over the entire FM band. This new broadband matching circuit maximizes bandwidth and stability, while eliminating the input loading control. A single cathode resonating control is adjusted for maximum power output.

Innovative Power Amplifier

A unique new cavity employs a patented folded half-wave tank circuit. This new cavity design eliminates the plate blocking capacitor and all sliding contacts. The result is exceptional reliability with lower maintenance costs. A patented second harmonic suppressor is integral in this cavity, minimizing the generation of harmonic energy at the source, without wasting fundamental frequency power. A separate low pass filter with directional couplers is located within the transmitter to insure compliance with FCC and DOC regulations and CCIR recommendations.

All PA adjustments have front panel controls with counters. A grounded bellows tunes the output while a grounded loop couples the antenna. Improved immunity to lightning is accomplished in the FM-1.5A in this manner.

FM-1.5A, One Tube 500 to 1650 Watt FM Transmitter

TECHNICAL SPECIFICATIONS

GENERAL

POWER OUTPUT: 1.5kW (from 500 watts to 1650 watts).
FREQUENCY RANGE: 87.5 to 108 MHz, tuned to specified operating frequency. Exciter programmable in 10kHz increments.
RF OUTPUT IMPEDANCE: 50 ohms (others on special request).
OUTPUT CONNECTOR: 7/8" EIA flange.
VSWR: 2:1 maximum (will operate into higher VSWR with automatic power reduction).
FREQUENCY STABILITY: ±300Hz, 0° to 50°C, temperature compensated crystal oscillator.
TYPE OF MODULATION: Direct frequency modulation of carrier frequency.
MODULATION CAPABILITY: Greater than ±200 kHz.
MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.
EXCITER: Solid state, 30 watt output, Model FX-30; incorporates digitally programmed synthesizer (10kHz increments).
PRE-EMPHASIS: FCC 75uS, CCIR 50uS (where specified), or 25uS (Dolby).
ASYNCHRONOUS AM S/N RATIO: 55dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (no FM modulation present).
SYNCHRONOUS AM S/N RATIO: 45dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (FM modulation ± 75kHz @ 400Hz).
TUBE COMPLEMENT: 3CX1500A7/8877.
RF HARMONICS: Supression meets all FCC/DOC requirements and CCIR recommendations.
POWER SUPPLY RECTIFIERS: Silicon.

ELECTRICAL/MECHANICAL

AC INPUT POWER: 208V/240V, 50/60Hz, single phase. (Taps for 196 to 252V). (Other voltages are available upon request).
POWER CONSUMPTION: 3.0kW @ .9pf @ 1500 watt output.
SIZE/WEIGHT/CUBAGE: 23.25" W × 70" H × 31.5" D (59 cm × 177.8 cm × 80.0 cm). Net weight 800 lbs; 31.5 cu. ft. Packed 925 lbs. 36 cu. ft. (420 kg; 1.1 cu. m).
ALTITUDE: 7500 ft. @ 50 Hz. (2286M). 10,000 ft. @ 60 Hz. (3048M).
AMBIENT TEMPERATURE RANGE: −10°C to +50°C.
FINISH: BE blue with anodized aluminum trim.

*MONAURAL OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode supression.
AUDIO INPUT LEVEL: +10 dBm nominal for ±75 kHz deviation @ 400 Hz.
AUDIO FREQUENCY RESPONSE: ±0.5 dB, 30 Hz to 15 kHz, selectable flat, 25, 50 or 75 microsecond pre-emphasis.
HARMONIC DISTORTION: 0.08% or less, 30 Hz to 15 kHz.
INTERMODULATION DISTORTION: 0.08% or less, 60 Hz/7 kHz, 4:1 ratio.
TRANSIENT IMD: 0.1% or less (square wave/sine wave).
FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 microsecond de-emphasis.

*WIDEBAND COMPOSITE OPERATION (Thru FM-1.5A using FX-30)

COMPOSITE INPUTS: 3 total, (1) unbalanced and (1) balanced plus front panel test. BNC connectors.
COMPOSITE INPUT IMPEDANCE: 10 k ohm, nominal, resistive.
COMPOSITE INPUT LEVEL: 3.5 VP-P nominal, for ±75 kHz deviation.
COMPOSITE FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical). Measured in a 30 Hz to 100 kHz bandwidth with 75 microsecond de-emphasis.
COMPOSITE HARMONIC DISTORTION: 0.08% or less (.04% typical).
COMPOSITE INTERMODULATION DISTORTION: 0.08% or less (.04% typical).
COMPOSITE TRANSIENT IMD: 0.1% or less (square wave/sinewave).
COMPOSITE AMPLITUDE RESPONSE: ±0.1 dB, 30 Hz to 53 kHz.
COMPOSITE PHASE RESPONSE: ±0.5° from linear phase, 30 Hz to 53 kHz.
COMPOSITE GROUP DELAY: 390 nanoseconds ±25 nanoseconds, 30 Hz to 53 kHz.
COMPOSITE SLEW RATE: 12 V/microsecond (symmetrical).

*STEREO OPERATION (Thru FM-1.5A using FS-30 Stereo Generator)

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, floating. (Adaptable to other impedances).
AUDIO INPUT LEVEL: +10 dBm, ±1 dB for 100% modulation @ 400 Hz. (Adaptable to other input levels).
AUDIO INPUT FILTER: 15 kHz LPF with delay equalization for minimum overshoot.
FREQUENCY RESPONSE: ±0.5 dB, 30-15,000 Hz, 75 usec pre-emphasis (flat, 25 or 50 usec pre-emphasis selectable).
TOTAL HARMONIC DISTORTION: 0.08% or less, 30-15,000 Hz.
INTERMODULATION DISTORTION: 0.08%, 60 Hz/7 kHz; 4:1 ratio.
TRANSIENT INTERMODULATION DISTORTION: 0.1% (Square wave/sine wave).
FM NOISE: 72 dB or better below 100% modulation @ 400 Hz, 75 usec de-emphasis.
STEREO SEPARATION: 45 dB or better; 30-15,000 Hz (sine wave).
DYNAMIC STEREO SEPARATION: 40 dB or better; 30-15,000 Hz (normal program content).
LINEAR CROSSTALK: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30-15,000 Hz, 45 dB minimum below 100% modulation.
NON-LINEAR CROSSTALK: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation.
38 kHz SUPPRESSION: 70 dB minimum below 100% modulation.
PILOT STABILITY: ±0.5 Hz, 0° to 50°C.
MODES: Stereo, Mono L+R, Mono (L) and Mono (R) remote controlled (See FS-30 data sheet for full details).

*SCA OPERATION (Thru FM-1.5A using FC-30 SCA Generator)

MODULATION: Direct FM
SUBCARRIER FREQUENCY: 67 kHz (39 to 95 kHz to order).
SUBCARRIER FREQUENCY STABILITY: +0.5% (330 Hz @ 67 kHz), 0° - 50°C.
SUBCARRIER HARMONIC CONTENT: Less than 0.3%.
SUBCARRIER ENVELOPE DECAY: Greater than 100 msec. from 90% to 10% subcarrier levels.
MODULATION CAPABILITY: ±20% of subcarrier frequency.
AUDIO INPUT IMPEDANCE: 600 ohm balanced resistive.
DATA INPUT IMPEDANCE: 75 ohm unbalanced resistive DC coupled.
INPUT LEVELS: (Audio) Adjustable, +10 dBm to −10 dBm for ±6 kHz deviation @ 400 Hz. (Data) Adjustable, 1.0 to 4.0 V p-p for ±6 kHz deviation (D.C. coupled).
PREEMPHASIS: (Audio) 150 microseconds standard (75 usec with internal jumper). (Data) no pre-emphasis.
FREQUENCY RESPONSE: (Audio) ±0.5 dB, 10-10,000 Hz, exclusive of audio low-pass filter. (Data) ±0.5 dB, dc-10,000 Hz.
AUDIO LOW-PASS FILTER: Sixth order, −3 dB @ 4.3 kHz, standard (resistor changes for other values).
DATA LOW-PASS FILTER: Same as AF filter or may be bypassed.
TOTAL HARMONIC DISTORTION: Less than 0.5% throughout AF pass band.
INTERMODULATION DISTORTION: Less than 0.5%, 60Hz/7kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed). Typical 0.1%.
CROSSTALK, SCA TO STEREO: −60 dB or better below 100% modulation of left or right. 75 usec de-emphasis.
CROSSTALK, STEREO TO SCA: −50 dB or better below ±6 kHz deviation of SCA using 150 usec de-emphasis and FS-30 stereo generator.
FM NOISE: 72 dB below ±6 kHz deviation @ 400 Hz (150 usec de-emphasis).
AUTO MUTING LEVEL: Adjustable from 10 to 30 dB below program level.
AUTO MUTING DELAY: Adjustable, 0.5 to 10.0 seconds.
(See FC-30 data sheet for full details).

*Through FM-1.5A Transmitter using Model FX-30 Exciter, FS-30 Stereo Generator and FC-30 SCA Generator as applicable.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-1.5A	909-1500-200	Model FM-1.5A one tube 1500 watt transmitter for operation on any one specified frequency 87.5MHz to 108MHz and for 208V./240V., single phase, 60Hz, power source.
FM-1.5A	909-1500-300	Same as above except for 208V./240V., 50Hz power source.
	243-8877	Spare 3CX1500A7/8877 power tube for FM-1.5A Transmitter.

Specifications subject to change without notice.

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4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305 U.S.A., TELEX: 25-0142, CABLE: BROADCAST, PHONE: (217) 224-9600

B171 CP 5M 384

BROADCAST ELECTRONICS INC.

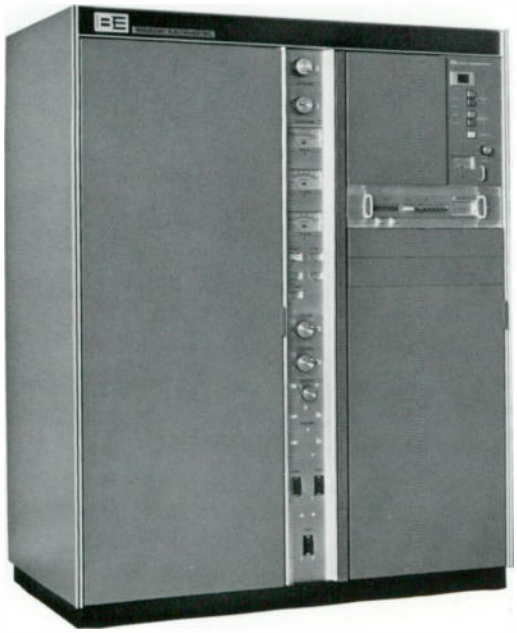
FM-30

10-30 kW Single Tube Transmitter

The World's Most Advanced!

The Optimum in Performance, Reliability and Efficiency

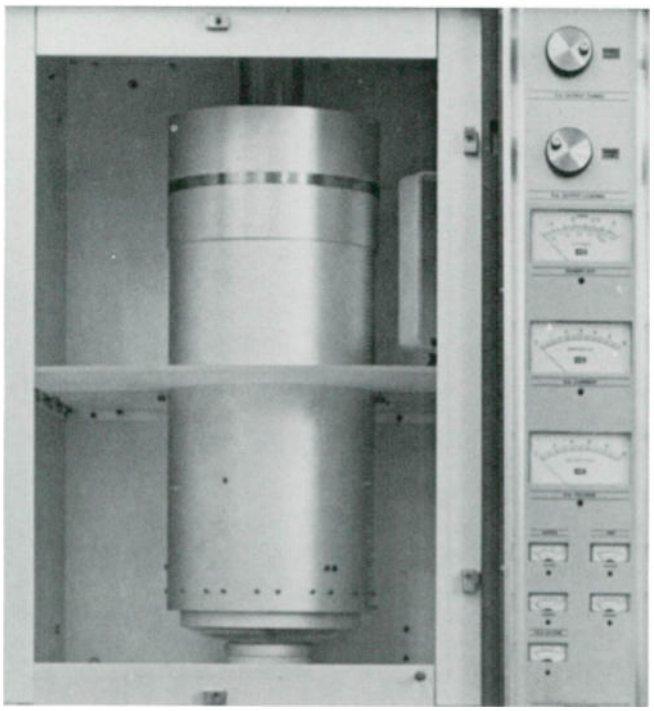
FM-30, One Tube 10-30 kW FM Transmitter



FEATURES

- *Folded half-wave output cavity — no plate blocking capacitor or sliding contacts
- Advanced digital control system provides 37 status, and diagnostic indications
- Thirteen meters including 4 multi-function meters
- Synthesized FX-30 exciter with extremely low distortion
- Conservative 30 kW output
- High efficiency for low operating cost
- Elegant styling
- FCC type accepted
- Canada DOC approval No. 131-531-138

** Patented*



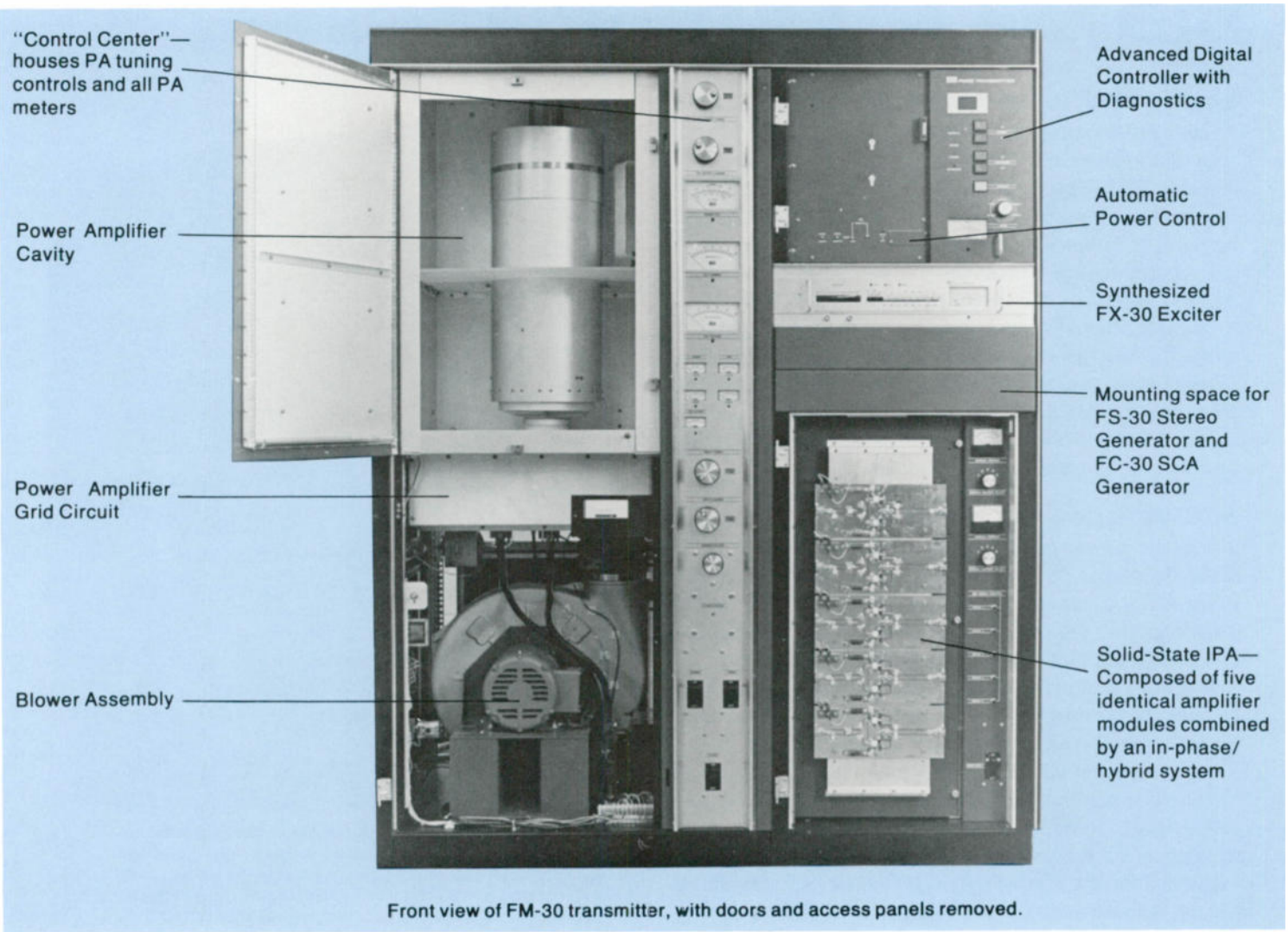
The Power Amplifier in the FM-30 transmitter employs a folded half-wave cavity, which eliminates the plate blocking capacitor and all sliding contacts the output circuit.

THE MODEL FM-30 TRANSMITTER — The single-tube FM-30 incorporates a unique *folded half-wave cavity power amplifier design, digitally programmed FX-30 ultra-linear exciter and an advanced digital control system. With these innovative engineering advances, Broadcast Electronics has produced a transmitter for optimum FM performance, reliability, diagnostic capability, and efficiency.

INNOVATIVE POWER AMPLIFIER DESIGN — Broadcast Electronics' experienced engineering group has created the first truly unique power amplifier design since the beginning of FM broadcasting. The new high power cavity employs a *half-wavelength folded tank circuit. This new cavity design eliminates the high voltage blocking capacitors, high current shorting planes, and sliding contacts of conventional cavities. The result is exceptional reliability with lower maintenance costs.

A patented second harmonic suppressor is integral in this cavity, minimizing the generation of harmonic energy at the source. This yields higher PA efficiency without wasting fundamental frequency power. An external low pass filter with directional couplers insures compliance with FCC and DOC regulations and CCIR recommendations.

All PA adjustments have smooth-operating front panel controls with counters. a grounded bellows tunes the output while a grounded loop couples the antenna. Improved immunity to lightning is accomplished in the FM-30 in this manner.



Front view of FM-30 transmitter, with doors and access panels removed.

EFFICIENT SINGLE TUBE DESIGN — The FM-30 uses a single, high gain Eimac 8990/4CX20,000A tetrode to provide 30 kW of RF power on any frequency between 87.5 and 108 MHz. The tetrode operates in a high-gain, grid-driven configuration.

High plate efficiency of the final amplifier at 30 kW output results in comparatively low power consumption. The FM-30 single tube design provides savings in both operating and maintenance costs. The 8990/4CX20,000A has lower operating and replacement cost than other triodes or tetrodes with similar power capability. Experience has proven this tube's long-life in the FM-30.

A completely new grid input circuit optimizes the impedance transformation between the solid-state IPA stage and the power tube grid. This novel design takes advantage of the true power gain capability of the Eimac 8990/4CX20,000A tetrode while providing maximum signal bandwidth. Installation and removal of the power tube, from the front of the transmitter, is a quick, simple procedure in the FM-30. Neutralization does not require re-adjustment, thanks to a broadband screen self-neutralizing technique.

SOLID-STATE IPA — The solid-state IPA assembly in the FM-30 transmitter is composed of five identical amplifier modules (one used as a driver for the other four) coupled together by a unique "in phase" system of hybrid combiners/splitters.

Failure of any one of the four output IPA modules will cause approximately a 15 percent power reduction, and in the event of two modules failing the transmitter will still provide more than 50% of rated output power.

Since all five modules in the IPA are identical, only one type of spare module is necessary, thus reducing maintenance costs. In addition, any one of the four amplifier modules can be used to replace the pre-driver module should the need ever arise. Individual module current and voltage is metered, as well as the combiner reject levels.

FM-30, One Tube 10-30 kW FM Transmitter

SOLID-STATE CONTROL/DIAGNOSTICS — Transmitter protection and control functions in the FM-30 transmitter use state-of-the-art CMOS logic circuitry. Extensive filtering on the input and output control lines, and high noise-immunity CMOS logic assures trouble-free operation. Automatic overload recycling and power failure restart assure a minimum of down time. Status indications appear on individual LED's.

In parallel with the controller is an extensive diagnostic system with a two-digit seven-segment LED display. The display is active at all times, constantly indicating the transmitter's condition. Diagnostic indications trace the cause of any problem to its source for quicker trouble shooting and faster corrective action.

AUTOMATIC POWER CONTROL — An advanced automatic power control (APC) system maintains constant RF output power regardless of fluctuations in primary AC line voltage or changes in the RF drive level. The regulated set point can be changed by remote control and is retained in a non-volatile memory.

An external signal can be used to switch the FM-30 into a separate "Preset Power" mode for minimal power consumption during an emergency.

A proportional VSWR foldback system protects the PA from overloads by automatically reducing output power to a safe operating level if the antenna system presents a mismatch, such as during icing conditions.

Each time the transmitter is activated a "soft-start" circuit automatically raises the power from zero to the nominal operating level. At turn-on, this feature allows the transmitter to assume a safe operating level under high VSWR conditions without overloading.

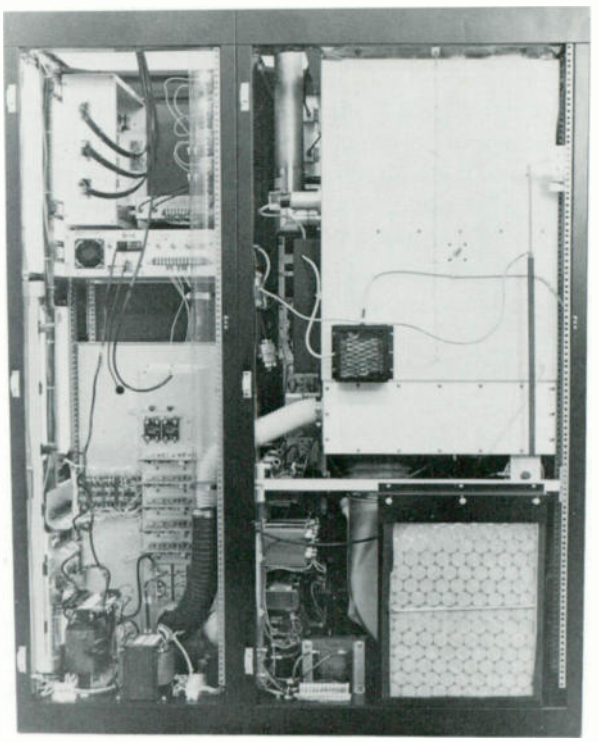
AUTOMATIC AC RESTART — In the event of a momentary AC power failure, full operation is resumed immediately. If the AC power is lost for a more prolonged period, the transmitter automatically goes through the regular filament warm-up period before high voltage is applied. Phase-loss detection is included in the FM-30.

REMOTE CONTROL — The FM-30 transmitter is designed so that all necessary operating functions can be remotely controlled through momentary contact closures. The control logic circuitry used in the transmitter can interface directly with most modern remote control and ATS systems.

COMPACT SIZE — The entire FM-30 transmitter, excluding the HV power supply, is contained in two low-profile cabinets only 5'10" (177. 8 cm) tall for easy access to components. Only 12½ square feet of floor space are required.

The blower air filter is replaceable while the transmitter is operating.

All transmitter control and status functions in the FM-30 transmitter are performed by a built-in digital controller (upper right part of photo). The advanced design Model FX-30 exciter is in the lower portion of the photo. Both units slide out for easy access.



Rear view of FM-30 transmitter, with doors removed.

HIGH VOLTAGE POWER SUPPLY — The HV plate supply of the FM-30 is contained in a separate transmitter-matching cabinet. This cabinet may be located next to the power amplifier cabinet, or located separately in the transmitter building. Step-start minimizes peak inrush currents for long component life.

The three phase plate transformer has multiple taps to accommodate a wide range of AC inputs. (from 195 V to 433 V, 50 Hz or 60 Hz as ordered).

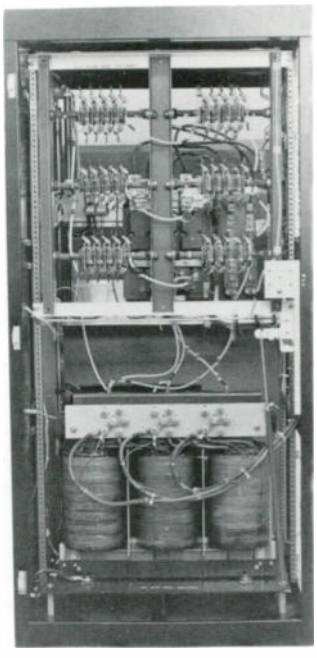
CONTROL CENTER — The convenient vertical "Control Center" is centrally located between the exciter/driver cabinet and the power amplifier. This operational control panel contains the PA tuning controls and all PA meters. Independent metering permits observation of all important PA parameters simultaneously. Three large 4.5 inch meters, one 3.5 inch meter and four 1.5 inch meters, are located on the vertical control center. An elapsed time indicator and a true RMS filament voltmeter are included in the FM-30. These meters can be removed from the front of the transmitter if maintenance is required.

The PA output power meter is conveniently located adjacent to the output loading and output tuning controls.

Three multi-function meters are used in the IPA stage, and the FX-30 exciter has its own built-in metering. There are a total of thirteen meters, including four multi-functional meters, giving the FM-30 Transmitter extensive metering capability.

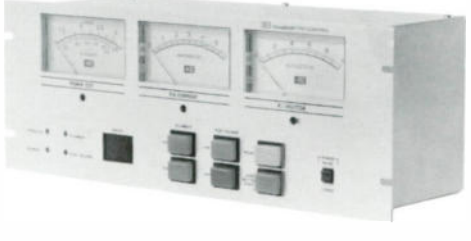
ELEGANT STYLING — The elegant styling of the FM-30 complements its outstanding electrical design. Housed in an attractive blue cabinet with anodized aluminum "Control Center" and exciter, the FM-30 will enhance the appearance of any broadcast station environment.

FM-30 TRANSMITTER ACCESSORIES — Accessories available for the FM-30 include the 909-0103 Extended Local Control Panel illustrated to the right. Factory installed options such as a 2 kW filament voltage regulator, 3 phase voltage metering, and others are available.



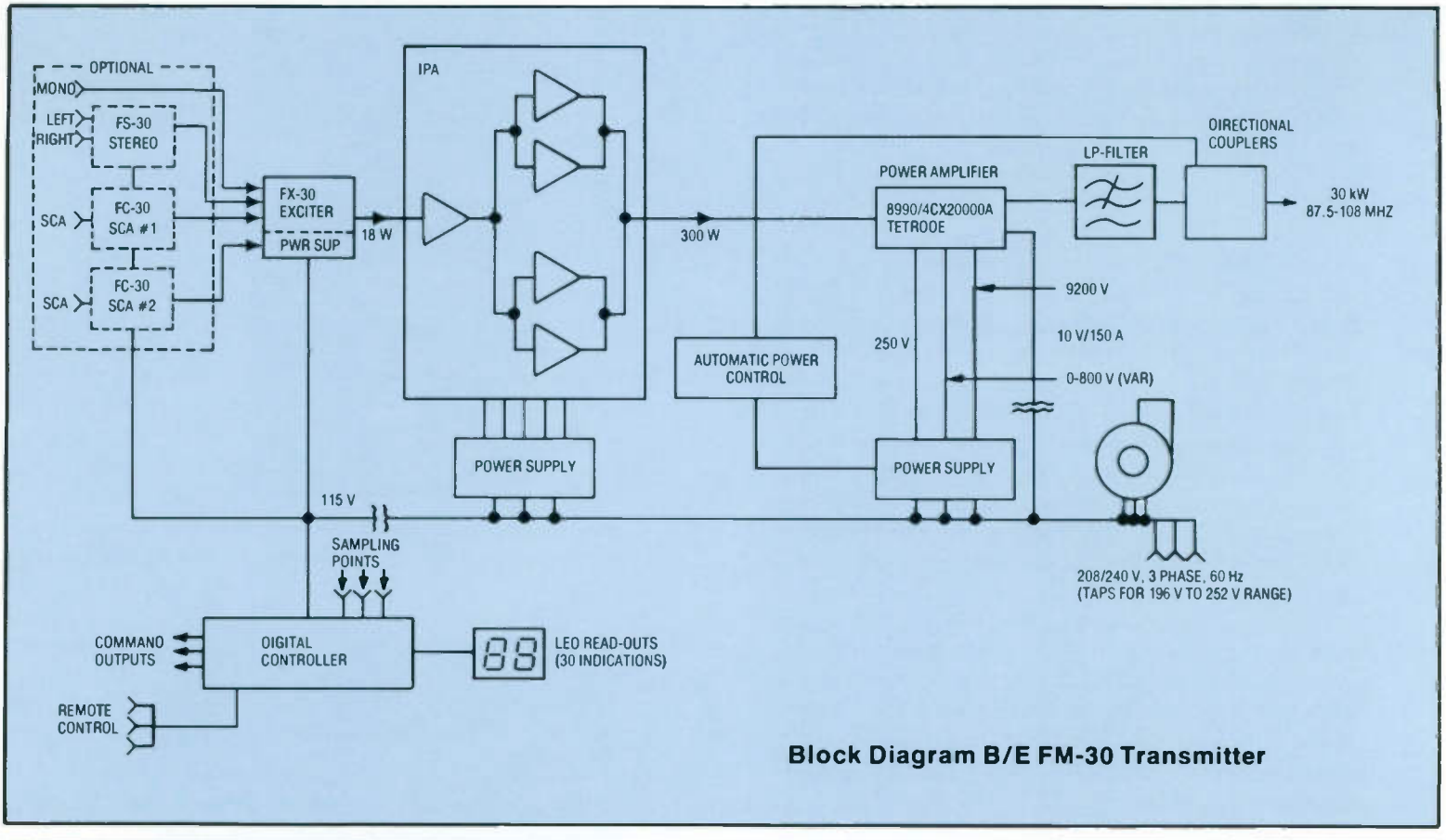
Rear view of HV Power Supply Cabinet with back door removed.

Vertical Control Center in FM-30 is located between exciter/driver cabinet and power amplifier.

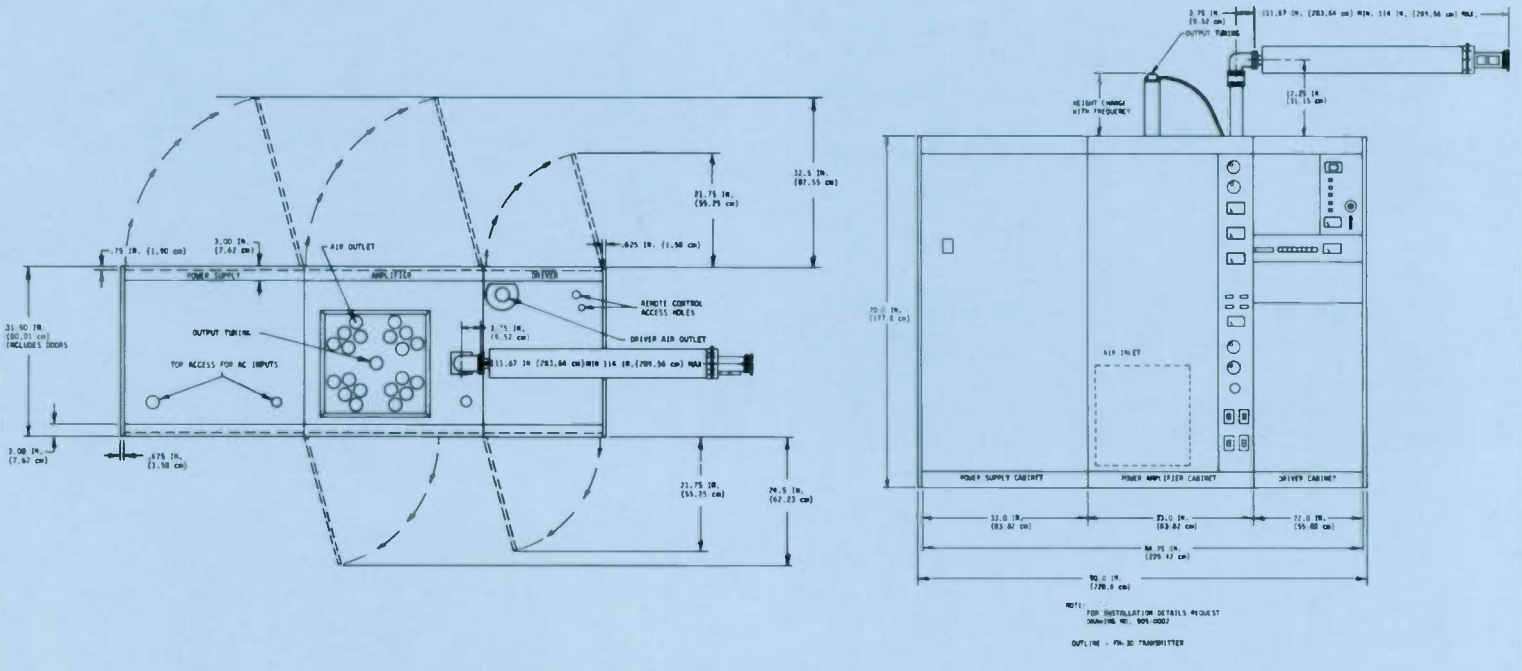


Front view Extended Local Control Panel (optional).

FM-30, One Tube 10-30 kW FM Transmitter

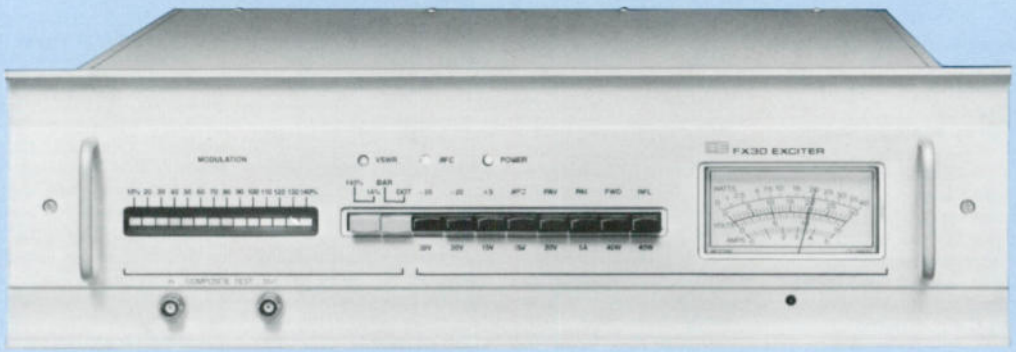


Block Diagram B/E FM-30 Transmitter



FLOOR PLAN B/E FM-30 TRANSMITTER (with Power Supply Cabinet)

The Model FX-30 Synthesized FM Exciter



SYNTHESIZED FX-30 EXCITER — The B/E FM-30 Transmitter incorporates the advanced-design Model FX-30 exciter, which is capable of 30 watts output. A digitally programmed frequency synthesizer permits frequency changes in 10 kHz increments without requiring new crystals. The temperature compensated reference oscillator allows immediate on-frequency operation of the exciter without oven warm-up. The 10 MHz reference frequency can be directly compared to worldwide frequency standards.

The FX-30 has extremely low harmonic and intermodulation distortion.

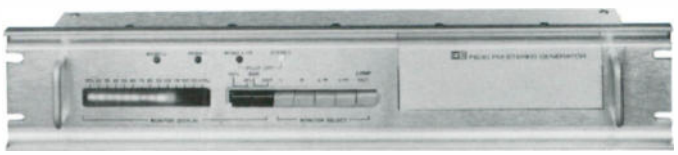
An ultra linear modulated oscillator provides minimum intermodulation of base band frequency components providing superior stereo and SCA performance.

POWER AMPLIFIER 30 WATTS — The FX-30's RF power amplifier is fully VSWR protected, even up to its 30 watt output rating. Automatic power control eliminates periodic adjustments. The broadband power amplifier has no tuning adjustments.

The FX-30 is mounted as a slide out assembly, with an easy to remove top cover allowing accessibility of all components. Full front panel metering, and internal diagnostic LED's give operating status at a glance.

Five audio and composite inputs are provided on the rear panel. The FX-30 accepts multiple wideband composite inputs as well as a 600 ohm balanced input. When used for wideband, stereo or monaural operation, B/E's FX-30 exciter produces a distinctively clean and superb FM sound.

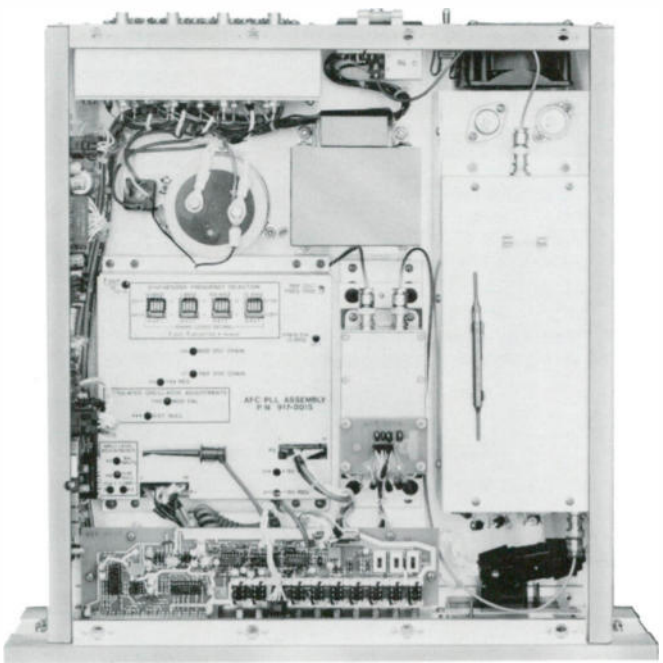
MODEL FS-30 STEREO GENERATOR



OPTIONAL STEREO/SCA GENERATOR — In the FM-30 Transmitter, rack mounting space is provided below the FX-30 Exciter to mount the FS-30 Stereo Generator and up to two FC-30 SCA Generators. These B/E units are available as optional equipment.

DIGITAL DESIGN — In the FS-30 Stereo Generator, a digital modulator and pilot generator offer absolute pilot phase stability without adjustment and eliminates troublesome distortion products. The result is a virtually perfect baseband that is an order of magnitude better than previous standards.

OTHER FEATURES — The FS-30 Stereo Generator includes linear, delay-equalized audio low pass filters for minimum overshoot without the use of clippers or other non-linear devices. Also standard in the FS-30 are a front panel LED peak-reading modulation status display, extensive RFI filtering, built-in composite output, equalization and remote control of mode switching.



Top view of the FX-30 Exciter with the cover removed. The FX-30 is mounted on slides for easy access to all sub assemblies, even while the unit is operating.

FM-30, One Tube 10-30 kW FM Transmitter

TECHNICAL SPECIFICATIONS

GENERAL

POWER OUTPUT: 30 kW (from 10 kW to 30 kW).
FREQUENCY RANGE: 87.5 to 108 MHz, tuned to specified operating frequency. Exciter programmable in 10 kHz increments.
RF OUTPUT IMPEDANCE: 50 ohms (others on special request).
OUTPUT CONNECTOR: 3⅛" EIA flange.
VSWR: 1.8:1 maximum (will operate into higher VSWR with automatic power reduction).
FREQUENCY STABILITY: ±300 Hz, 0° to 50°C, temperature compensated crystal oscillator.
TYPE OF MODULATION: Direct frequency modulation of carrier frequency.
MODULATION CAPABILITY: Greater than ±200 kHz.
MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.
EXCITER: Solid state, 30 watt output, Model FX-30; incorporates digitally programmed synthesizer (10 kHz increments).
PRE-EMPHASIS: FCC 75 us, CCIR 50 us (where specified), or 25 us (Dolby).
ASYNCHRONOUS AM S/N RATIO: 55 dB below reference carrier with 100% AM modulation @ 400 Hz, 75 microsecond de-emphasis. (no FM modulation present).
SYNCHRONOUS AM S/N RATIO: 40 dB below reference carrier with 100% AM modulation @ 400 Hz, 75 microsecond de-emphasis. (FM modulation ±75 kHz @ 400 Hz).
TUBE COMPLEMENT: 8990/4CX20,000A (1).
RF HARMONICS: Supression meets all FCC/DOC requirements and CCIR recommendations.
POWER SUPPLY RECTIFIERS: Silicon.

ELECTRICAL/MECHANICAL

AC INPUT POWER: 208 V WYE/240 V Delta 60 Hz, three phase. (Taps for 196 to 252 V). (Other voltages and line frequencies are available upon request).
POWER CONSUMPTION: 50 kW @ 30 kW output, 0.9 pf.
SIZE: Transmitter (excluding HV supply) 56.5" W (143.5 cm) × 70" H (177.8 cm) × 31.5" D (80.0 cm). HV power supply cabinet: 34.5" W (87.6 cm) × 70" H (177.8 cm) × 31.5" D (80.0 cm).
WEIGHT & CUBAGE: Transmitter (excluding HV supply): 1500 lbs. (682 kg); packed 1750 lbs. (795 kg.); 72 cu. ft. (2 cu. meters). HV Power Supply 1200 lbs. (545 kg); packed 1250 lbs. (568 kg); 44 cu. ft. (1.25 cu. meters).
ALTITUDE: 7500 feet.
AMBIENT TEMPERATURE RANGE: −10°C to +50°C.
FINISH: B/E blue with anodized aluminum control center panel and anodized aluminum trim.

*MONAURAL OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode supression.
AUDIO INPUT LEVEL: ±10 dBm nominal for ±75 kHz deviation @ 400 Hz.
AUDIO FREQUENCY RESPONSE: ±0.5 dB 30 Hz to 15 kHz, selectable flat, 25, 50 or 75 microsecond pre-emphasis.
HARMONIC DISTORTION: 0.08% or less 30 Hz to 15 kHz.
INTERMODULATION DISTORTION: 0.08% or less, 60 Hz/7 kHz, 4:1 ratio.
TRANSIENT IMD: 0.1% or less (square wave/sine wave).
FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 microsecond de-emphasis.

*WIDEBAND COMPOSITE OPERATION (Thru FM-30 using FX-30)

COMPOSITE INPUTS: Three total, (1) unbalanced and (1) balanced plus front panel test. BNC connectors.
COMPOSITE INPUT IMPEDANCE: 10k ohm, nominal, resistive.
COMPOSITE INPUT LEVEL: 3.5 V p-p nominal, for ±75 kHz deviation.
COMPOSITE FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical). Measured in a 30 Hz to 100 kHz bandwidth with 75 microsecond de-emphasis.
COMPOSITE HARMONIC DISTORTION: 0.08% or less (.04% typical).
COMPOSITE INTERMODULATION DISTORTION: 0.08% or less (.04% typical).
COMPOSITE TRANSIENT IMD: 0.1% or less (square wave/sinewave).
COMPOSITE AMPLITUDE RESPONSE: ±0.1 dB, 30 Hz to 53 kHz.
COMPOSITE PHASE RESPONSE: ±0.5° from linear phase 30 Hz to 53 kHz.
COMPOSITE GROUP DELAY: 390 nanoseconds ±25 nanoseconds, 30 Hz to 53 kHz.
COMPOSITE SLEW RATE: 12 V/microsecond (symmetrical).

*STEREO OPERATION (Thru FM-30 using FS-30 Stereo Generator)

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, floating. (Adaptable to other impedances).
AUDIO INPUT LEVEL: +10, ±1 dBm for 100% modulation @ 400 Hz. (Adaptable to other input levels).
AUDIO INPUT FILTER: 15 kHz LPF with delay equalization for minimum overshoot.
FREQUENCY RESPONSE: ±0.5 dB, 30-15,000 Hz, 75 usec pre-emphasis (flat, 25 or 50 usec pre-emphasis selectable).
TOTAL HARMONIC DISTORTION: 0.08% or less, 30-15,000 Hz.
INTERMODULATION DISTORTION: 0.08%, 60 Hz/7 kHz; 4:1 ratio.
TRANSIENT INTERMODULATION DISTORTION: 0.1% (Square wave/sine wave).
FM NOISE: 72 dB or better below 100% modulation @ 400 Hz, 75 usec de-emphasis.
STEREO SEPARATION: 45 dB or better; 30-15,000 Hz (sine wave).
DYNAMIC STEREO SEPARATION: 40 dB or better; 30-15,000 Hz (normal program content).
LINEAR CROSSTALK: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30-15,000 Hz, 45 dB minimum below 100% modulation.
NON-LINEAR CROSSTALK: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation.
38 kHz SUPPRESSION: 70 dB minimum below 100% modulation.
PILOT STABILITY: ±0.5 Hz, 0° to 50°C.
MODES: Stereo, Mono L+R, Mono (L) and Mono (R) remote controlled (See FS-30 data sheet for full details).

*SCA OPERATION (Thru FM-30 using FC-30 SCA Generator)

MODULATION: Direct FM
SUBCARRIER FREQUENCY: 67 kHz (39 to 95 kHz to order).
SUBCARRIER FREQUENCY STABILITY: ±0.5% (330 Hz @ 67 kHz) 0° - 50°C.
SUBCARRIER HARMONIC CONTENT: Less than 0.3%.
SUBCARRIER ENVELOPE DECAY: Greater than 100 msec. from 90% to 10% subcarrier levels.
MODULATION CAPABILITY: ±20% of subcarrier frequency.
AUDIO INPUT IMPEDANCE: 600 ohm balanced resistive.
DATA INPUT IMPEDANCE: 75 ohm unbalanced resistive DC coupled.
INPUT LEVELS: (Audio) Adjustable, +10 dBm to −10 dBm for ±6 kHz deviation @ 400 Hz. (Data) Adjustable, 1.0 to 4.0 V p-p for ±6 kHz deviation (D.C. coupled).
PREEMPHASIS: (Audio) 150 microseconds standard (75 usec with internal jumper). (Data) no pre-emphasis.
FREQUENCY RESPONSE: (Audio) ±0.5 dB 10-10,000 Hz, exclusive of audio low-pass filter. (Data) ±0.5 dB, dc-10,000 Hz.
AUDIO LOW-PASS FILTER: Sixth order, −3 dB @ 4.3 kHz, standard (resistor changes for other values).
DATA LOW-PASS FILTER: Same as AF filter or may be bypassed.
TOTAL HARMONIC DISTORTION: Less than 0.5% throughout AF pass band.
INTERMODULATION DISTORTION: Less than 0.5%, 60Hz/7kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed). Typical 0.1%.
CROSSTALK SCA TO STEREO: −60 dB or better below 100% modulation of left or right. 75 usec de-emphasis.
CROSSTALK STEREO TO SCA: −50 dB or better below ±6 kHz deviation of SCA using 150 usec de-emphasis and FS-30 stereo generator.
FM NOISE: 72 dB below ±6 kHz deviation @ 400 Hz (150 usec de-emphasis).
AUTO MUTING LEVEL: Adjustable from 10 to 30 dB below program level.
AUTO MUTING DELAY: Adjustable, 0.5 to 10.0 seconds.
(See FC-30 data sheet for full details).

***Through FM-30 Transmitter using Model FX-30 Exciter, FS-30 Stereo Generator and FC-30 SCA Generator as applicable.**

Specifications subject to change without notice.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-30	909-0001-1	FM-30, 30 kW FM transmitter, with remote HV power supply
FM-30	909-0001	FM-30, 30 kW FM transmitter, with HV power supply cabinet adjacent to PA and IPA/Exciter cabinets.
8990/4CX20000A	243-0001	Spare tube, for FM-30
Option	909-0073/74	Filament voltage regulator, 2 kV, with flushing fan, factory installed
Option	909-0103	Extended local control panel with metering for FM-30 operation
Option	830-0301	Rec. Semi-conductor and Rectifier Kit for FM-30 Transmitter (includes FX-30 spares)

BROADCAST ELECTRONICS INC
4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305 U.S.A., TELEX: 250142, CABLE: BROADCAST, PHONE (217) 224-9600

B142 CP 2M 784

BROADCAST ELECTRONICS INC.

FM-30

10-30 KW Single Tube Transmitter

The World's Most Advanced

The Optimum in Performance, Reliability and Efficiency

FM-30, One Tube 10-30KW FM Transmitter

MICROPROCESSOR CONTROL/DIAGNOSTICS — All transmitter control and status functions in the FM-30 are performed by a built-in microprocessor controller. This microprocessor controller is the "brain" that monitors the transmitter operating parameters and then determines what control actions are necessary.

By its continuous scanning action, the microprocessor controller provides diagnositc indications, on two seven segment LED displays. Status indications appear on individual LED's. This gives the transmitter operator more information for use in troubleshooting and day-to-day transmitter operation. The system is so simple that no "computer" experience is necessary to operate the FM-30.

Automatic recycling/overload protection is also provided in the FM-30.

AUTOMATIC POWER CONTROL — An advanced automatic power control system maintains constant RF output power regardless of fluctuations in primary AC line voltage or changes in the RF drive level. The regulated level can be changed by remote control and is retained after AC power failure.

A unique "VSWR foldback" system protects the PA by reducing output power to a safe operating level if the antenna system presents a mismatch, as during icing conditions.

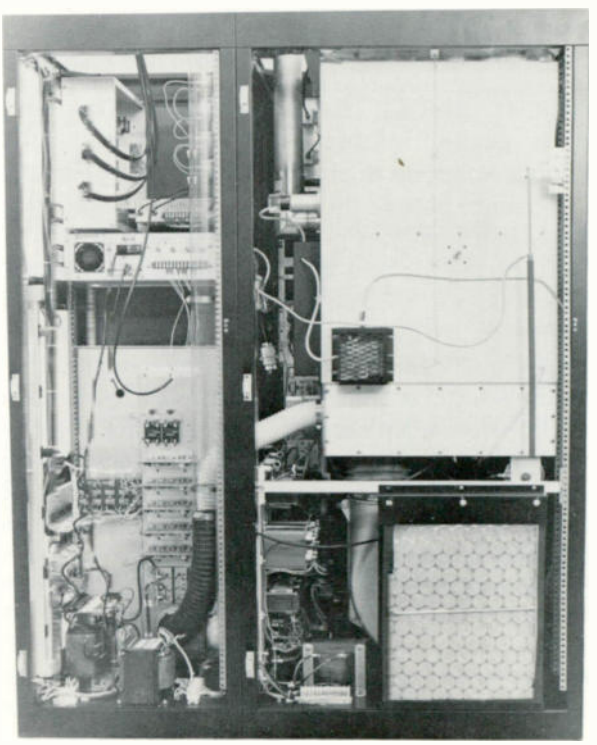
Each time the high voltage is activated a "soft-start" circuit automatically raises the screen voltage from zero to the nominal operating level. At turn-on, this feature allows the transmitter to assume a safe operating level under high VSWR conditions without overloading.

AUTOMATIC AC RESTART — In the event of a momentary AC power failure, full operation imediately. If the A.C. power is lost for a more prolonged period, the transmitter automatically goes through the regular filament warm-up period before high voltage is applied.

REMOTE CONTROL — The FM-30 transmitter is designed so that all necessary operating functions can be remote controlled. The control logic circuitry used in the transmitter can interface directly with most modern remote control and ATS systems.

COMPACT SIZE — The entire FM-30 transmitter, excluding the HV power supply, is contained in two low-profile cabinets only 5'10" tall (177. 8 cm) for easy access to components. Only 12½ square feet of floor space are required.

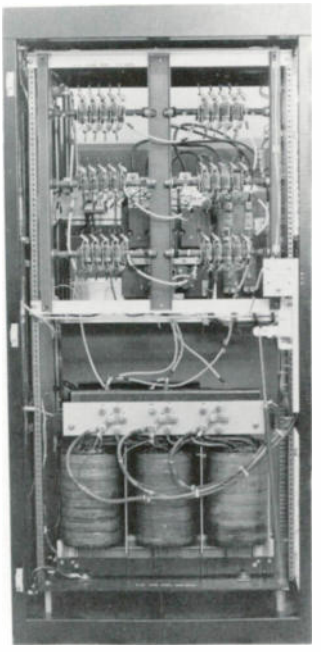
All transmitter control and status functions in the FM-30 transmitter are performed by a built-in microprocessor controller (upper right part of photo). The advanced design Model FX-30 exciter is in the lower portion of the photo. Both units slide out for easy access.



Rear view of FM-30 transmitter, with doors removed.

HIGH VOLTAGE POWER SUPPLY — The HV plate supply of the FM-30 is contained in a separate transmitter-matching cabinet. This cabinet may be located next to the power amplifier cabinet, or located separately almost anywhere in the transmitter building. Step-start minimizes peak in rush currents.

The plate transformer has multiple taps to accommodate a wide range of AC inputs. (from 195 N. to 433 N., 50 Hz or 60 Hz as ordered).



Rear view of HV Power Supply Cabinet with back door removed.

CONTROL CENTER — The convenient vertical "Control Center" is centrally located between the exciter/driver cabinet and the power amplifier. This operational control assembly houses the PA tuning controls and all PA meters. These meters can be easily removed from the front of the transmitter.

EXTENSIVE METERING — The FM-30 provides more metering and diagnostic indications than any other FM transmitter.

The power amplifier alone has 8 meters located in the vertical "Control Center" panel. All amplifier tuning controls are also conveniently arranged in the "Control Center".

Three individual multi-function meters are used in the IPA stage, and the FX-30 exciter has its own built-in metering. There are a total of 13 meters, including 4 multi-functional meters, giving the FM-30 Transmitter extensive metering capability.

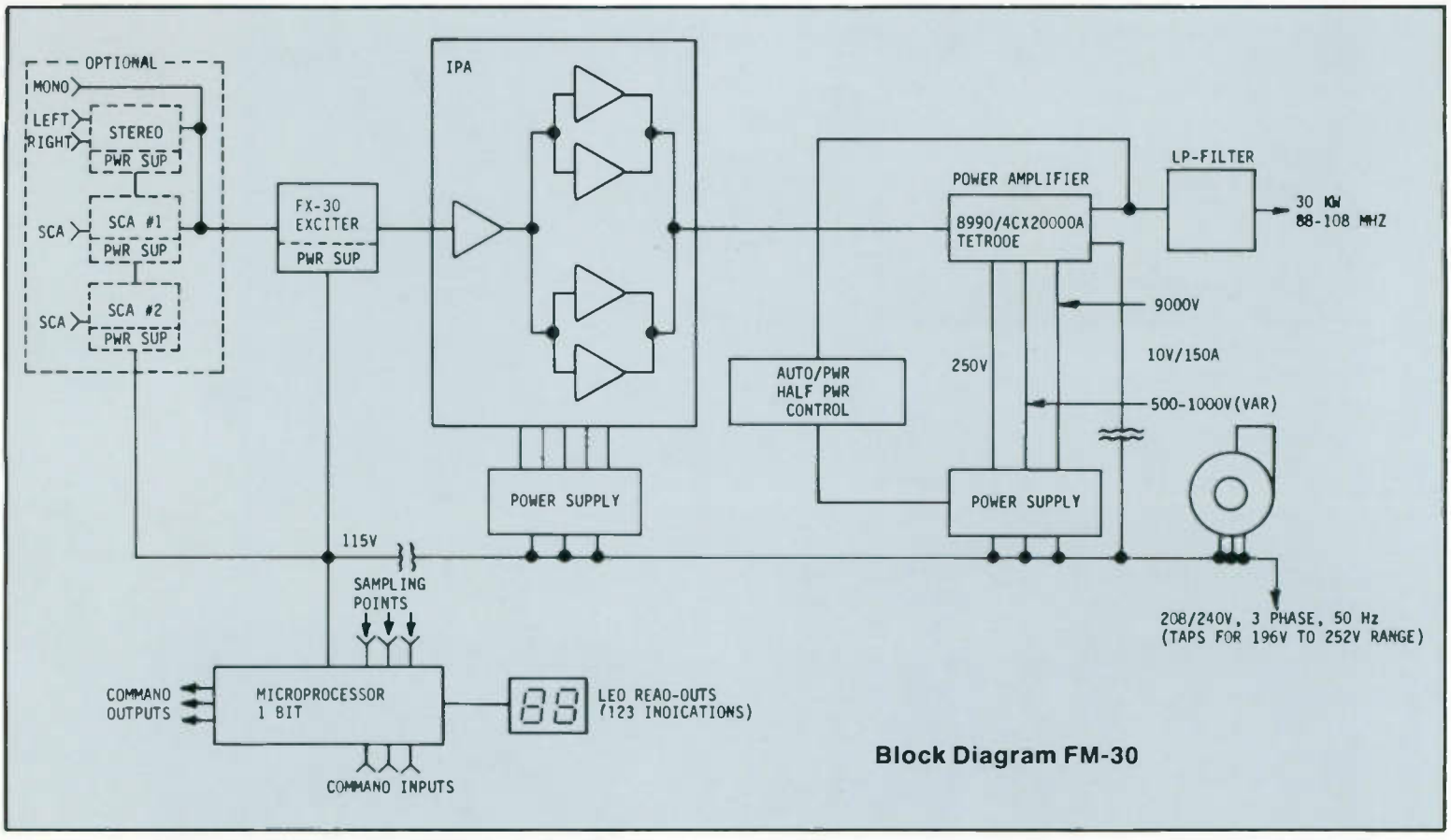
Vertical Control Center in FM-30 is located between exciter/driver cabinet and power amplifier.

ELEGANT STYLING — The elegant styling of the FM-30 complements its outstanding electrical design. Housed in an attractive BE blue cabinet with anodized aluminum "Control Center" and exciter, the FM-30 will enhance the appearance of any broadcast station environment.

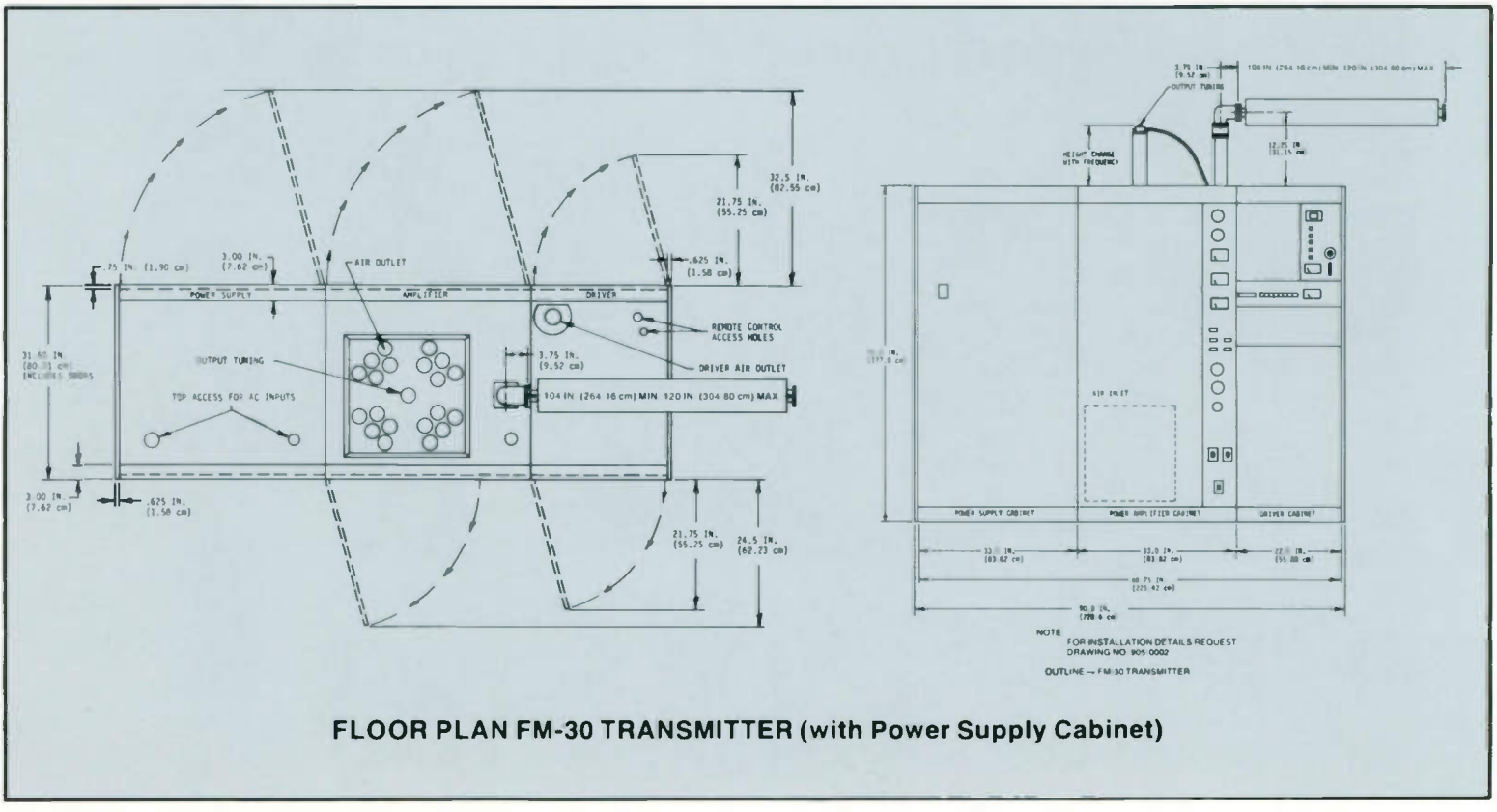
FM-30 TRANSMITTER ACCESSORIES — Accessories available for the FM-30 include the 909-0103 Extended Local Control Panel illustrated to the right. Factory installed options such as a 2 kW filament voltage regulator, 3 phase voltage metering, half power cutback, loss of phase detector, and others are available.

Front view Extended Local Control Panel (optional).

FM-30, One Tube 10-30KW FM Transmitter

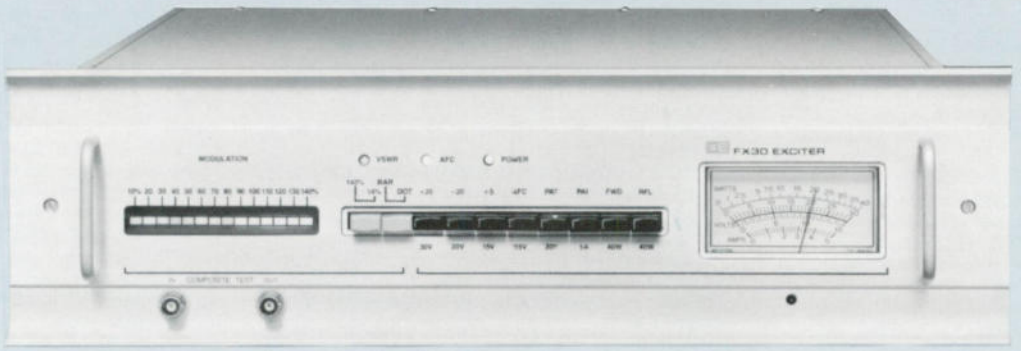


Block Diagram FM-30



FLOOR PLAN FM-30 TRANSMITTER (with Power Supply Cabinet)

The Model FX-30 Synthesized FM Exciter



SYNTHESIZED FX-30 EXCITER — The advanced-design Model FX-30 exciter is capable of more than 30 watts output. A digitally programmed frequency synthesizer permits field frequency changes in 10 KHz increments without requiring new crystals. The temperature compensated reference oscillator allows immediate on-frequency operation of the exciter without temperature controlled oven warm up. The reference frequency can be directly compared to worldwide frequency standards.

The FX-30 has extremely low distortion, with THD or IMD less than 0.05%, and it is the first FM exciter to specify Transient Intermodulation Distortion (TIM) at less than 0.1%.

An ultra linear modulated oscillator provides minimum intermodulation of base band frequency components providing superior stereo and SCA performance.

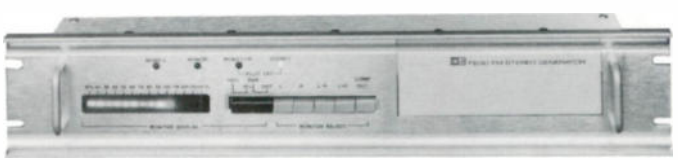
The solid-state FX-30 exciter is completely broad band and requires no tuning adjustments for a conservative 30 watt output.

Dual speed phase lock loop circuitry permits very fast lock up of the carrier frequency and greatly improved low frequency response. Automatic control circuits eliminate adjustments after initial setup. The exciter output is stabilized and fully protected.

The FX-30 is mounted on a slide out assembly making all components accessible for easy servicing and fits a standard 19" EIA width rack occupying only 5¼" of vertical rack space.

The FX-30 accepts multiple wideband composite inputs as well as a 600 ohm balanced input. When used for wideband, stereo or monaural operation, the new Broadcast Electronics FX-30 exciter produces a distinctively clean and superb FM sound.

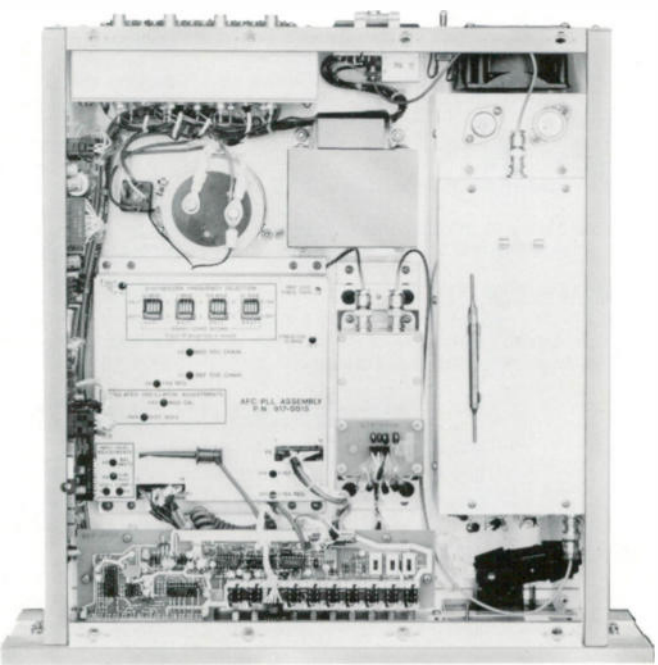
MODEL FS-30 STEREO GENERATOR



OPTIONAL STEREO/SCA GENERATOR — In the FM-30 Transmitter, rack mounting space is provided below the FX-30 Exciter to mount the FS-30 Stereo Generator and the FC-30 SCA Generator. These are available as optional units.

DIGITAL DESIGN — In the FS-30 Stereo Generator, the digital modulator and pilot generator offer absolute pilot phase stability without adjustment and eliminates troublesome distortion products. The result is a virtually perfect baseband that is an order of magnitude better than previous standards.

OTHER FEATURES — The FS-30 Stereo Generator includes linear, delay equalized audio low pass filters for minimum overshoot without the use of clippers or other non-linear devices. Front panel LED peak reading modulation status display; RFI protection; ready for remote control.



Top view of the FX-30 Exciter with the cover removed. The FX-30 is mounted on slides for easy access to all sub assemblies, even while the unit is operating.

FM-30, One Tube 10-30KW FM Transmitter

TECHNICAL SPECIFICATIONS

GENERAL

POWER OUTPUT: 30kW (from 10kW to 30kW).
FREQUENCY RANGE: 87.5 to 108 MHz, tuned to specified operating frequency. Exciter programmable in 10kHz increments.
RF OUTPUT IMPEDANCE: 50 ohms (others on special request).
OUTPUT CONNECTOR: 3⅛" EIA flange.
VSWR: 1.8:1 maximum (will operate into higher VSWR with automatic power reduction).
FREQUENCY STABILITY: ±300Hz, 0° to 50°C, temperature compensated crystal oscillator.
TYPE OF MODULATION: Direct frequency modulation of carrier frequency.
MODULATION CAPABILITY: Greater than ±200 kHz.
MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.
EXCITER: Solid state, 30 watt output, Model FX-30; incorporates digitally programmed synthesizer (10kHz increments).
PRE-EMPHASIS: FCC 75uS, CC1R 50uS (where specified), or 25uS (Dolby).
ASYNCHRONOUS AM S/N RATIO: 55dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (no FM modulation present).
SYNCHRONOUS AM S/N RATIO: 40dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (FM modulation + 75kHz @ 400Hz).
TUBE COMPLEMENT: 8990/4CX20000A (1).
RF HARMONICS: Supression meets all FCC/DOC requirements and CC1R recommendations.
POWER SUPPLY RECTIFIERS: Silicon.

ELECTRICAL/MECHANICAL

AC INPUT POWER: 208 WYE/240 Delta 60Hz, three phase. (Taps for 196 to 252V). (Other voltages and line frequencies are available upon request).
POWER CONSUMPTION: 50kW @ 30kW output.
SIZE: Transmitter (excluding HV supply) 56.5" W (143.5 cm) × 70" H (177.8 cm) × 31.5" D (80.0 cm). HV power supply cabinet: 34.5" W (87.6 cm) × 70" H (177.8 cm) × 31.5" D (80.0 cm).
WEIGHT & CUBAGE: Transmitter (excluding HV supply): 1500 lbs. (682 kg); packed 1750 lbs. (795 kg.); 72 cu. ft. (2 cu. meters). HV Power Supply 1200 lbs. (545 kg); packed 1250 lbs. (568 kg); 44 cu. ft. (1.25 cu. meters).
ALTITUDE: 7500 feet.
AMBIENT TEMPERATURE RANGE: −10°C to +50°C.
FINISH: BE blue with anodized aluminum control center panel and anodized aluminum trim.

*MONAURAL OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode supression.
AUDIO INPUT LEVEL: ±10 dBm nominal for ±75 kHz deviation @ 400 Hz.
AUDIO FREQUENCY RESPONSE: ±0.5 dB 30 Hz to 15 kHz, selectable flat, 25, 50 or 75 microsecond pre-emphasis.
HARMONIC DISTORTION: 0.08% or less 30 Hz to 15 kHz.
INTERMODULATION DISTORTION: 0.08% or less, 60 Hz/7 kHz 4:1 ratio.
TRANSIENT IMD: 0.1% or less (square wave/sine wave).
FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 microsecond de-emphasis.

*WIDEBAND COMPOSITE OPERATION (Thru FM-30 using FX-30)

COMPOSITE INPUTS: 3 total, (1) unbalanced and (1) balanced plus front panel test. BNC connectors.
COMPOSITE INPUT IMPEDANCE: 10 k ohm, nominal, resistive.
COMPOSITE INPUT LEVEL: 3.5 VP-P nominal, for ±75 kHz deviation.
COMPOSITIE FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical). Measured in a 30 Hz to 100 kHz bandwidth with 75 microsecond de-emphasis.
COMPOSITE HARMONIC DISTORTION: 0.08% or less (.04% typical).
COMPOSITE INTERMODULATION DISTORTION: 0.08% or less (.04% typical).
COMPOSITE TRANSIENT IMD: 0.1% or less (square wave/sinewave).
COMPOSITE AMPLITUDE RESPONSE: ±0.1 dB 30 Hz to 53 kHz.
COMPOSITE PHASE RESPONSE: ±0.5° from linear phase 30 Hz to 53 kHz.
COMPOSITE GROUP DELAY: 390 nanoseconds ±25 nanoseconds 30 Hz to 53 kHz.
COMPOSITE SLEW RATE: 12 V/microsecond (symmetrical).

*STEREO OPERATION (Thru FM-30 using FS-30 Stereo Generator)

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, floating. (Adaptable to other impedances).
AUDIO INPUT LEVEL: +10 dBm, ±1 dB for 100% modulation @ 400 Hz. (Adaptable to other input levels).
AUDIO INPUT FILTER: 15 kHz LPF with delay equalization for minimum overshoot.
FREQUENCY RESPONSE: ±0.5 dB. 30-15,000 Hz 75 usec pre emphasis (flat, 25 or 50 usec pre emphasis selectable).
TOTAL HARMONIC DISTORTION: .08% or less, 30-15,000 Hz.
INTERMODULATION DISTORTION: .08%, 60 Hz/7 kHz; 4:1 ratio.
TRANSIENT INTERMODULATION DISTORTION: 0.1% (Square wave/sine wave).
FM NOISE: 72 dB or better below 100% modulation @ 400 Hz, 75 usec de emphasis.
STEREO SEPARATION: 45 dB or better; 30-15,000 Hz (sine wave).
DYNAMIC STEREO SEPARATION: 40 dB or better; 30-15,000 Hz (normal program content).
LINEAR CROSSTALK: Maine to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30-15,000 Hz, 45 dB minimum below 100% modulation.
NON-LINEAR CROSSTALK: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation.
38 kHz SUPPRESSION: 70 dB minimum below 100% modulation.
PILOT STABILITY: ±0.5 Hz, 0° to 50°C.
MODES: Stereo, Mono L+R, Mono (L) and Mono (R) remote controlled (See FS-30 data sheet for full details).

*SCA OPERATION (Thru FM-30 using FC-30 SCA Generator)

MODULATION: Direct FM
SUBCARRIER FREQUENCY: 67 kHz (39 to 95 kHz to order).
SUBCARRIER FREQUENCY STABILITY: ±0.25% (168 Hz @ 67 kHz, 0° - 50°C.
SUBCARRIER HARMONIC CONTENT: Less than 0.5%.
SUBCARRIER ENVELOPE DECAY: Greater than 100 msec. from 90% to 10% subcarrier levels.
MODULATION CAPABILITY: ±20% of subcarrier frequency.
AUDIO INPUT IMPEDANCE: 600 ohm balanced resistive.
DATA INPUT IMPEDANCE: 75 ohm unbalanced resistive DC coupled.
INPUT LEVELS: (Audio) Adjustable, +10 dBm to −10 dBm for ±6 kHz deviation @ 400 Hz. (Data) Adjustable, 1.0 to 4.0 V p-p for ±6 kHz deviation (D.C. coupled).
PREEMPHASIS: (Audio) 150 useconds standard (75 usec with internal jumper). (Data) no pre-emphasis.
FREQUENCY RESPONSE: (Audio) ±0.5 dB 10-10,000 Hz exclusive of audio low-pass filter. (Data) ±0.5 dB, dc-10,000 Hz.
AUDIO LOW-PASS FILTER: Sixth order, −3 dB @ 4.3 kHz, standard (resistor changes for other values).
DATA LOW-PASS FILTER: Same as AF filter or may be bypassed.
TOTAL HARMONIC DISTORTION: Less than 0.5% throughout AF pass band.
INTERMODULATION DISTORTION: Less than 0.5% 60Hz/7kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed).
CROSSTALK SCA TO STEREO: −60 dB or better below 100% modulation of left or right. 75 usec de-emphasis.
CROSSTALK STEREO TO SCA: −50 dB or better below ±6 kHz deviation of SCA using 150 usec de-emphasis and FS-30 stereo generator.
FM NOISE: 65 dB, below ±6 kHz deviation @ 400 Hz (150 usec de-emphasis).
AUTO MUTING LEVEL: Adjustable from 10 to 30 dB below program level.
AUTO MUTING DELAY: Adjustable, 0.5 to 10.0 seconds.
(See FC-30 data sheet for full details).

***Through FM-30 Transmitter using Model FX-30 Exciter, FS-30 Stereo Generator and FC-30 SCA Generator as applicable.**

Specifications subject to change without notice.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-30	909-0001-1	FM-30, 30kW FM transmitter, with remote HV power supply
FM-30	909-0001	FM-30, 30kW FM transmitter, with HV power supply cabinet adjacent to PA and IPA/Exciter cabinets.
Option	909-0073	Spare tube, for FM-30
Option	909-0103	Filament voltage regulator, 2KV, with flushing fan, factory installed
8990/4CX20000A	243-0001	Extended local control panel with metering for FM-30 operation
Option	830-0301	Rec. Semi-conductor and Rectifier Kit for FM-30 Transmitter (includes FX-30 spares)

BROADCAST ELECTRONICS INC.
4100 N. 24th ST. • P.O. BOX 3606 • QUINCY, IL 62305 • PHONE 217/224-9600

BROADCAST
ELECTRONICS INC

FM-3.5A

3.5 KW Single Tube Transmitter

The Worlds Most Advanced

The Optimum in Performance, Reliability and Efficiency.

FM-3.5A, One Tube 3500 Watt FM Transmitter

FEATURES

- One-tube transmitter
- *Folded half-wave output cavity—no plate blocking capacitor or sliding contacts
- Broadband input matching network
- Solid state broadband IPA
- Advanced digital control system
- Optional microprocessor diagnostics
- Synthesized BE FX-30 exciter
- Automatic Power Control with Proportional VSWR Foldback
- Extensive metering, 10 meters

*Patented

TOTALLY NEW DESIGN — Through innovative engineering developments BE has introduced a totally new 3500 watt FM broadcast transmitter. The single tube model FM-3.5A incorporates a unique patented folded half-wave cavity power amplifier, digitally programmed FX-30 ultra linear exciter and a second generation digital control system. A new automatic power control system (APC), a simplified input circuit, and a computer optimized coaxial cavity set new standards of dependability. With the FM-3.5A, Broadcast Electronics has produced a transmitter for optimum reliability and superb FM performance.

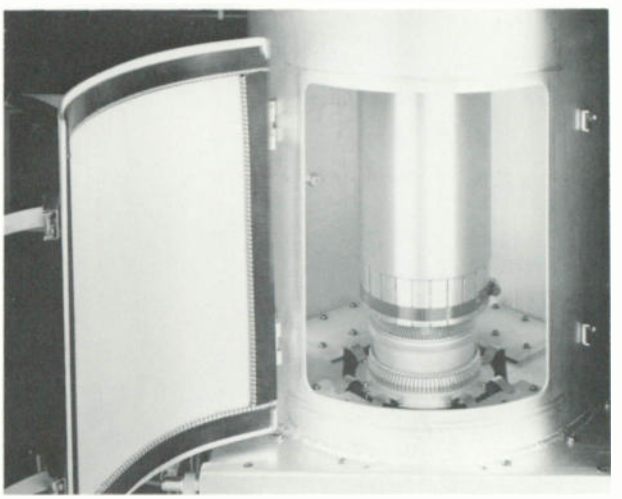
The entire 3500 watt transmitter is contained in a single low profile cabinet only 5'10" high (177.8 cm) with easy access to all components. Only 8.5 sq. feet ($0.8m^2$) of floor space is needed. The air filter is replaceable while the transmitter is operating.

SINGLE TUBE DESIGN — Achieving the utmost in reliability was the design philosophy behind the FM-3.5A. The one tube design provides a transmitter that can remain on the air despite adverse conditions such as lightning, output mismatch or operator error. Unlike solid state devices, an output tube can repeatedly withstand overloads without damage. In the FM-3.5A the ruggedness of a single tube output stage is enhanced with a highly reliable PA cavity and automatic protective circuitry.

Another advantage of this single tube design is its optimal bandpass characteristics which make it transparent for stereo modulation while it minimizes susceptance to intermodulation at multiple transmitter sites.

The totally new FM-3.5A transmitter uses a single Eimac 4CX3500A tetrode to provide over 3500 watts of RF power on any frequency between 87.5 and 108MHz. The 4CX3500A has lower operating and replacement cost than other tetrodes with similar power capability. It operates in a grounded cathode configuration, being grid-driven by a solid state broadband IPA.

Installation and removal of the power tube, from the rear of the transmitter, is a quick, simple procedure in this compact BE transmitter.



Computer optimized coaxial cavity employs BE's patented folded half wave tank circuit which eliminates the plate blocking capacitor and all sliding contacts in the output circuit.

FM-3.5A, One Tube 3500 Watt FM Transmitter

DIGITAL CONTROL SYSTEM — All transmitter control and status functions in the FM-3.5A are performed by a modular digital controller. This advanced controller monitors the transmitter operating parameters and determines what control actions are necessary.

Status indicators (a total of 8) appear on individual LED's. This gives the transmitter operator more information for use in troubleshooting and day-to-day transmitter operation.

MODULAR CONTROL SYSTEM DESIGN — A modular design approach with ribbon cables and a card edge bus makes board removal quick and easy. CMOS logic was chosen because of its superior noise immunity. All remote control inputs and outputs are optically isolated.

The modular design will accommodate plug-in circuitry for extensive diagnostics to be available as a future add-on option.

REMOTE CONTROL — The BE FM-3.5A transmitter is designed so that all operating modes can be remotely controlled by momentary contact closures. The transmitter controller can interface directly with modern remote control and ATS systems.

EXTENSIVE INDEPENDENT METERING — Independent metering permits observation of all important PA parameters simultaneously. Three large 4.5 inch meters, two 3.5 inch meters and four 1.5 inch meters are located on the vertical control center. An elapsed time indicator and a true RMS filament voltmeter are included.

The PA output power meter is conveniently located adjacent to the output loading and output tuning controls. The FX-30 exciter has its own built-in metering.

AUTOMATIC POWER CONTROL — An advanced automatic power control system (APC) maintains constant RF output power regardless of fluctuations in primary AC line voltage or changes in the RF drive level. The regulated set point can be changed by remote control and is retained in a non-volatile digital memory.

An external signal can be used to switch the FM-3.5A into a separate "Preset Power" mode for reduced power during an emergency.

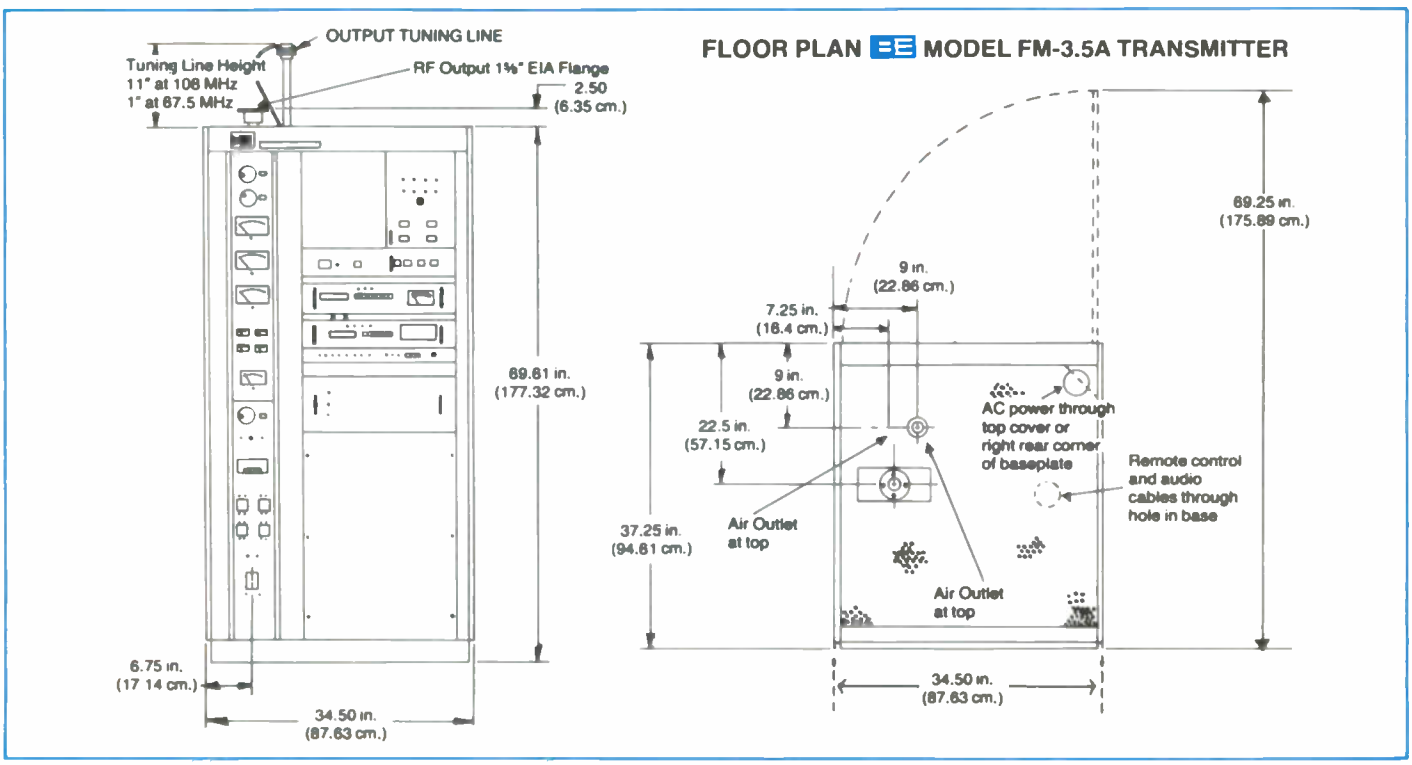
A proportional VSWR foldback system protects the PA from overloads by automatically reducing output power to a safe operating level if the antenna system presents a mismatch, such as during icing conditions.

Each time the transmitter is activated a "soft-start" circuit automatically raises the power from zero to the nominal operating level. At turn-on, this feature allows the transmitter to assume a safe operating level under high VSWR conditions without overloading.

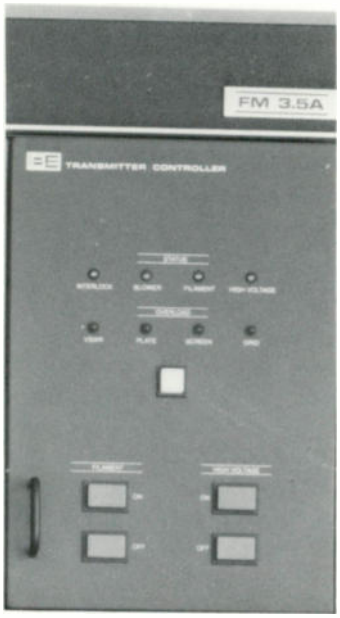
AUTOMATIC AC RESTART — In the event of a momentary AC power failure, full operation is resumed immediately. If the AC power is lost for a more prolonged period, the transmitter automatically goes through the regular filament warm-up period before high voltage is applied.

POWER SUPPLY — All power supplies in the FM-3.5A are self-contained in the transmitter cabinet. The transmitter operates from a 208/240V, 50/60Hz, single phase power system. Step-start minimizes peak inrush currents.

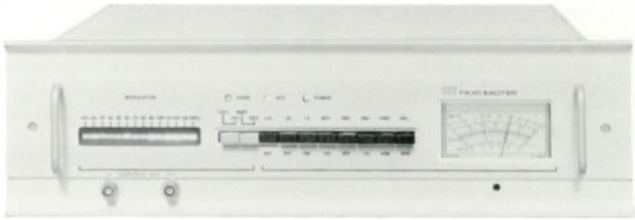
The transmitter can accommodate AC inputs from 196V to 252V. The plate transformer has 5 taps for this wide range of inputs.



FM-3.5A, One Tube 3500 Watt FM Transmitter



Close up view of Digital Controller in the Model FM-3.5A Transmitter. A total of eight status indicators appear on individual LED's. The transmitter and controller are pre-wired for optional plug-in diagnostic circuitry.



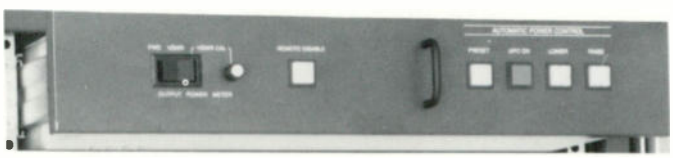
SYNTHESIZED FX-30 EXCITER — The BE FM-3.5A transmitter features the FX-30 exciter. The FX-30 is digitally synthesized, programmable in 10kHz steps. A dual speed phase lock loop and stable 10MHz reference oscillator allows immediate on-frequency operation.

The ultra-linear modulated oscillator provides minimum intermodulation of the baseband stereo and SCA carriers. Harmonic and intermodulation distortion are less than 0.05%, and Transient Intermodulation Distortion (TIM) is less than 0.1%.

This solid state exciter is completely broadband and requires no tuning adjustments for a conservative 30 watt output.

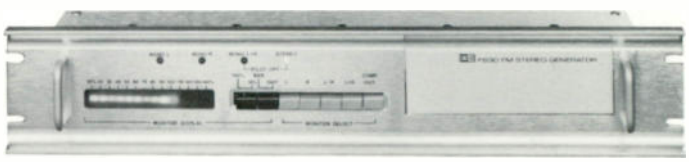
The FX-30 is mounted on a slide out assembly making all components accessible for easy servicing.

The FX-30 accepts multiple wideband composite inputs as well as a 600 ohm balanced input. When used for wideband, stereo or monaural operation, the new Broadcast Electronics FX-30 exciter produces a distinctively clean and superb FM sound.

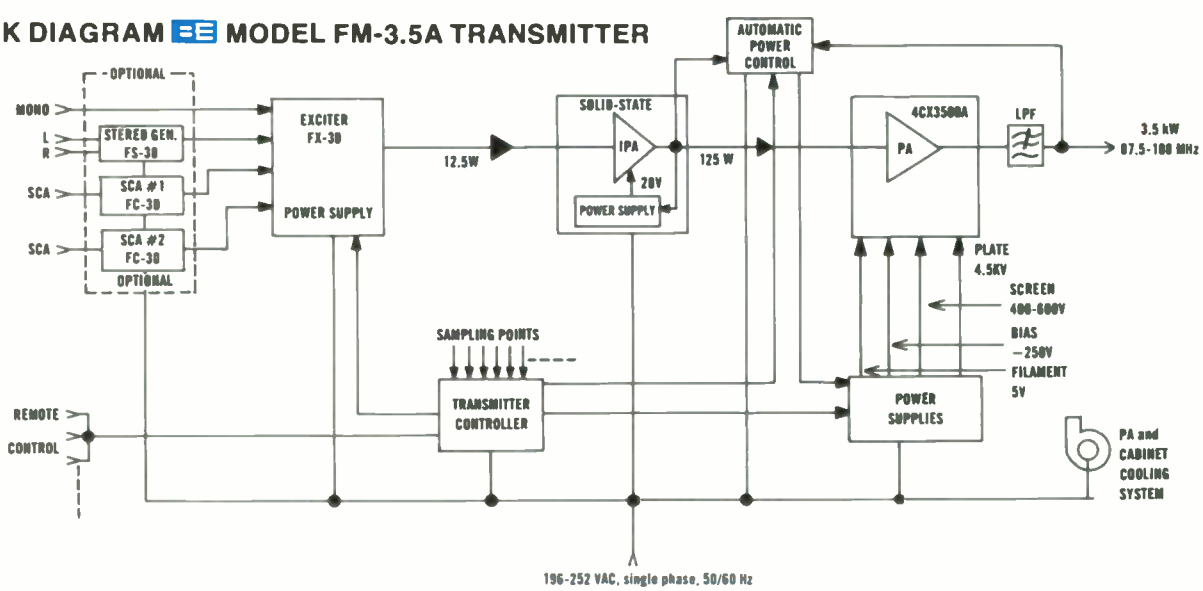


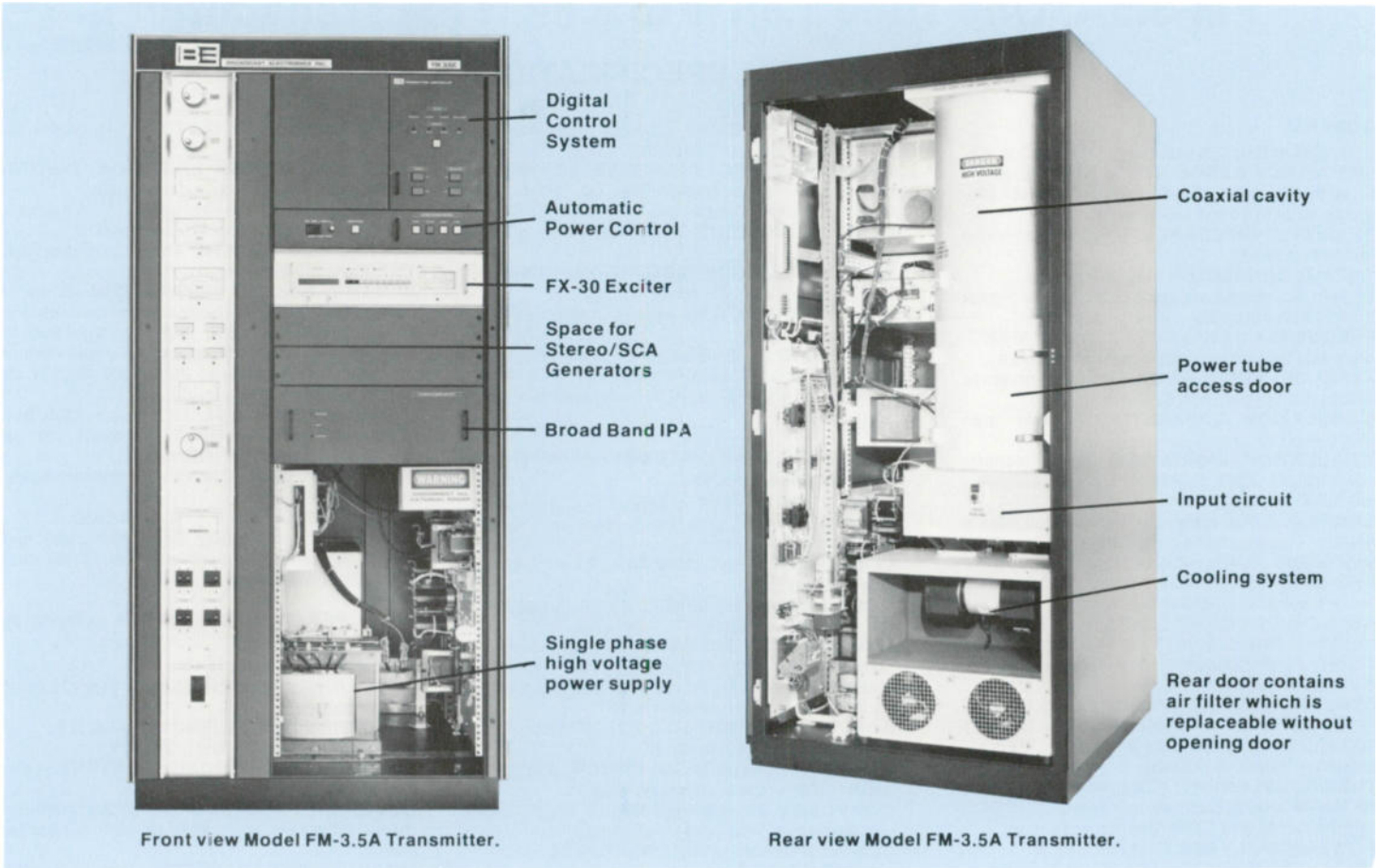
Close up view of the Automatic Power Control System (APC). This is one of three slide out modules in the FM-3.5A Transmitter.

OPTIONAL STEREO/SCA GENERATOR — The FM-3.5A transmitter has additional rack space so that the FS-30 Stereo Generator and the FC-30 SCA Generator may be mounted directly below the FX-30 Exciter. These two BE units are available as optional equipment.



BLOCK DIAGRAM BE MODEL FM-3.5A TRANSMITTER





Front view Model FM-3.5A Transmitter.

Rear view Model FM-3.5A Transmitter.

INNOVATIVE POWER AMPLIFIER — EE's new computer-optimized coaxial cavity employs a patented folded half-wave tank circuit. This unique design eliminates the high voltage blocking capacitors, high current shorting planes, and sliding contacts of conventional cavities. The result is exceptional reliability with lower maintenance costs.

Welded coaxial construction improves efficiency and reduces leakage radiation. A patented second harmonic suppressor is integral in this cavity, minimizing the generation of harmonic energy at the source. This yields higher PA efficiency without wasting fundamental frequency power. A separate low pass filter with directional couplers is located within the transmitter to insure compliance with FCC and DOC regulations and CCIR recommendations.

All PA adjustments have smooth-operating front panel controls with counters. A grounded bellows tunes the output while a grounded loop couples the antenna. Improved immunity to lightning is accomplished in the FM-3.5A transmitter in this manner.

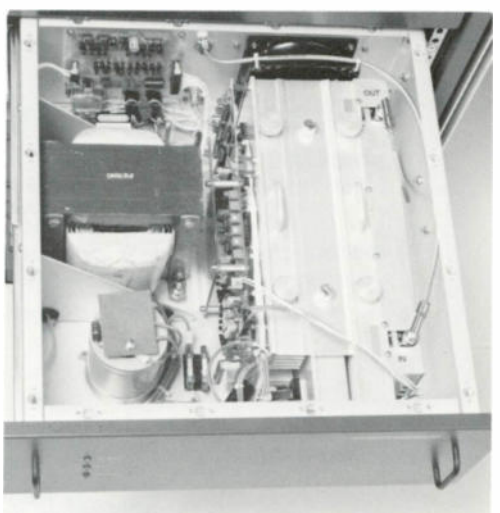
SIMPLIFIED INPUT CIRCUIT — A new PA input circuit matches the impedance between the IPA and the power tube grid over the entire FM band. This broadband printed circuit assembly maximizes bandwidth and stability, while eliminating the input loading control. A single grid tuning control is adjusted for maximum output. The entire transmitter can be retuned to a different frequency in a short time; no extra frequency determining components are required.

SOLID STATE IPA — A high efficiency solid state IPA assembly in the FM-3.5A is contained in a slide-out drawer for convenience in maintenance.

The broadband amplifier and regulator modules are easily removed—no de-soldering is necessary.

Both RF output transistors are automatically protected against output mismatch. The self-contained IPA unit can be operated directly into an antenna as a 250 watt transmitter during emergencies. The IPA power supply operates from 97 to 133 VAC, or 194 to 266 VAC.

Operational aids for the IPA include three front panel status indicators and availability of buffered rear panel metering.



Slide out solid state IPA assembly includes power supply and can be used as a 250 watt transmitter.

FM-3.5A, One Tube 1.5KW to 3.8KW FM Transmitter

TECHNICAL SPECIFICATIONS

GENERAL

POWER OUTPUT: 3.5kW (from 1.5kW to 3.8kW).
FREQUENCY RANGE: 87.5 to 108 MHz, tuned to specified operating frequency. Exciter programmable in 10kHz increments.
RF OUTPUT IMPEDANCE: 50 ohms (others on special request).
OUTPUT CONNECTOR: 1⅝" EIA flange.
VSWR: 2:1 maximum (will operate into higher VSWR with automatic power reduction).
FREQUENCY STABILITY: ±300Hz, 0° to 50°C, temperature compensated crystal oscillator.
TYPE OF MODULATION: Direct frequency modulation of carrier frequency.
MODULATION CAPABILITY: Greater than ±200 kHz.
MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.
EXCITER: Solid state, 30 watt output, Model FX-30; incorporates digitally programmed synthesizer (10kHz increments).
PRE-EMPHASIS: FCC 75uS, CCIR 50uS (where specified), or 25uS (Dolby).
ASYNCHRONOUS AM S/N RATIO: 55dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (no FM modulation present).
SYNCHRONOUS AM S/N RATIO: 40dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (FM modulation ± 75kHz @ 400Hz).
TUBE COMPLEMENT: 4CX3500A (1).
RF HARMONICS: Supression meets all FCC/DOC requirements and CCIR recommendations.
POWER SUPPLY RECTIFIERS: Silicon.

ELECTRICAL/MECHANICAL

AC INPUT POWER: 208/240V, 50/60Hz, single phase. (Taps for 196 to 252V). (Other voltages are available upon request).
POWER CONSUMPTION: 6.8kW @ 0.9PF @ 3.5kW output.
SIZE & WEIGHT: 34.5" W (87.63 cm) × 70" H (177.8 cm) × 37.25" D (94.61 cm). Weight 1050 lbs. (477 kg) unpacked; 1210 lbs. (550 kg.) packed.
CUBAGE: Net 53 cu. ft. (1.5 cu. m.) Packed 60 cu. ft. (2 cu. m.)
ALTITUDE: 7500 ft. @ 50 Hz/10,000 ft. @ 60 Hz.
AMBIENT TEMPERATURE RANGE: −10°C to +50°C.
FINISH: BE blue with anodized aluminum control center panel and anodized aluminum trim.

*MONAURAL OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode supression.
AUDIO INPUT LEVEL: +10 dBm nominal for ±75 kHz deviation @ 400 Hz.
AUDIO FREQUENCY RESPONSE: ±0.5 dB, 30 Hz to 15 kHz, selectable flat, 25, 50 or 75 microsecond pre-emphasis.
HARMONIC DISTORTION: 0.08% or less, 30 Hz to 15 kHz.
INTERMODULATION DISTORTION: 0.08% or less, 60 Hz/7 kHz, 4:1 ratio.
TRANSIENT IMD: 0.1% or less (square wave/sine wave).
FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 microsecond de-emphasis.

*WIDEBAND COMPOSITE OPERATION (Thru FM-3.5A using FX-30)

COMPOSITE INPUTS: 3 total, (1) unbalanced and (1) balanced plus front panel test. BNC connectors.
COMPOSITE INPUT IMPEDANCE: 10 k ohm, nominal, resistive.
COMPOSITE INPUT LEVEL: 3.5 VP-P nominal, for ±75 kHz deviation.
COMPOSITE FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical). Measured in a 30 Hz to 100 kHz bandwidth with 75 microsecond de-emphasis.
COMPOSITE HARMONIC DISTORTION: 0.08% or less (.04% typical).
COMPOSITE INTERMODULATION DISTORTION: 0.08% or less (.04% typical).
COMPOSITE TRANSIENT IMD: 0.1% or less (square wave/sinewave).
COMPOSITE AMPLITUDE RESPONSE: ±0.1 dB, 30 Hz to 53 kHz.
COMPOSITE PHASE RESPONSE: ±0.5° from linear phase, 30 Hz to 53 kHz.
COMPOSITE GROUP DELAY: 390 nanoseconds ±25 nanoseconds, 30 Hz to 53 kHz.
COMPOSITE SLEW RATE: 12 V/microsecond (symmetrical).

*STEREO OPERATION (Thru FM-3.5A using FS-30 Stereo Generator)

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, floating. (Adaptable to other impedances).
AUDIO INPUT LEVEL: +10 dBm, ±1 dB for 100% modulation @ 400 Hz. (Adaptable to other input levels).
AUDIO INPUT FILTER: 15 kHz LPF with delay equalization for minimum overshoot.
FREQUENCY RESPONSE: ±0.5 dB, 30-15,000 Hz, 75 usec pre-emphasis (flat, 25 or 50 usec pre-emphasis selectable).
TOTAL HARMONIC DISTORTION: 0.08% or less, 30-15,000 Hz.
INTERMODULATION DISTORTION: 0.08%, 60 Hz/7 kHz; 4:1 ratio.
TRANSIENT INTERMODULATION DISTORTION: 0.1% (Square wave/sine wave).
FM NOISE: 72 dB or better below 100% modulation @ 400 Hz, 75 usec de-emphasis.
STEREO SEPARATION: 45 dB or better; 30-15,000 Hz (sine wave).
DYNAMIC STEREO SEPARATION: 40 dB or better; 30-15,000 Hz (normal program content).
LINEAR CROSSTALK: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30-15,000 Hz, 45 dB minimum below 100% modulation.
NON-LINEAR CROSSTALK: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation.
38 kHz SUPPRESSION: 70 dB minimum below 100% modulation.
PILOT STABILITY: ±0.5 Hz, 0° to 50°C.
MODES: Stereo, Mono L+R, Mono (L) and Mono (R) remote controlled (See FS-30 data sheet for full details).

*SCA OPERATION (Thru FM-3.5A using FC-30 SCA Generator)

MODULATION: Direct FM
SUBCARRIER FREQUENCY: 67 kHz (39 to 95 kHz to order).
SUBCARRIER FREQUENCY STABILITY: ±0.5% (330 Hz @ 67 kHz), 0° - 50°C.
SUBCARRIER HARMONIC CONTENT: Less than 0.3%.
SUBCARRIER ENVELOPE DECAY: Greater than 100 msec. from 90% to 10% subcarrier levels.
MODULATION CAPABILITY: ±20% of subcarrier frequency.
AUDIO INPUT IMPEDANCE: 600 ohm balanced resistive.
DATA INPUT IMPEDANCE: 75 ohm unbalanced resistive DC coupled.
INPUT LEVELS: (Audio) Adjustable, +10 dBm to −10 dBm for ±6 kHz deviation @ 400 Hz. (Data) Adjustable, 1.0 to 4.0 V p-p for ±6 kHz deviation (D.C. coupled).
PREEMPHASIS: (Audio) 150 microseconds standard (75 usec with internal jumper). (Data) no pre-emphasis.
FREQUENCY RESPONSE: (Audio) ±0.5 dB, 10-10,000 Hz, exclusive of audio low-pass filter. (Data) ±0.5 dB, dc-10,000 Hz.
AUDIO LOW-PASS FILTER: Sixth order, −3 dB @ 4.3 kHz, standard (resistor changes for other values).
DATA LOW-PASS FILTER: Same as AF filter or may be bypassed.
TOTAL HARMONIC DISTORTION: Less than 0.5% throughout AF pass band.
INTERMODULATION DISTORTION: Less than 0.5%, 60Hz/7kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed). Typical 0.1%.
CROSSTALK, SCA TO STEREO: −60 dB or better below 100% modulation of left or right. 75 usec de-emphasis.
CROSSTALK, STEREO TO SCA: −50 dB or better below ±6 kHz deviation of SCA using 150 usec de-emphasis and FS-30 stereo generator.
FM NOISE: 72 dB below ±6 kHz deviation @ 400 Hz (150 usec de-emphasis).
AUTO MUTING LEVEL: Adjustable from 10 to 30 dB below program level.
AUTO MUTING DELAY: Adjustable, 0.5 to 10.0 seconds.
(See FC-30 data sheet for full details).

*Through FM-3.5A Transmitter using Model FX-30 Exciter, FS-30 Stereo Generator and FC-30 SCA Generator as applicable.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-3.5A	909-3500-200	FM-3.5A one tube 3.5kW FM broadcast transmitter for operation on one specified frequency between 87.5MHz and 108MHz and for 196-252 VAC, 60Hz, single phase power source.
FM-3.5A	909-3500-300	Same as above except for 50Hz single phase power source.
	243-3500	Spare 4CX3500A power tube for FM-3.5A.

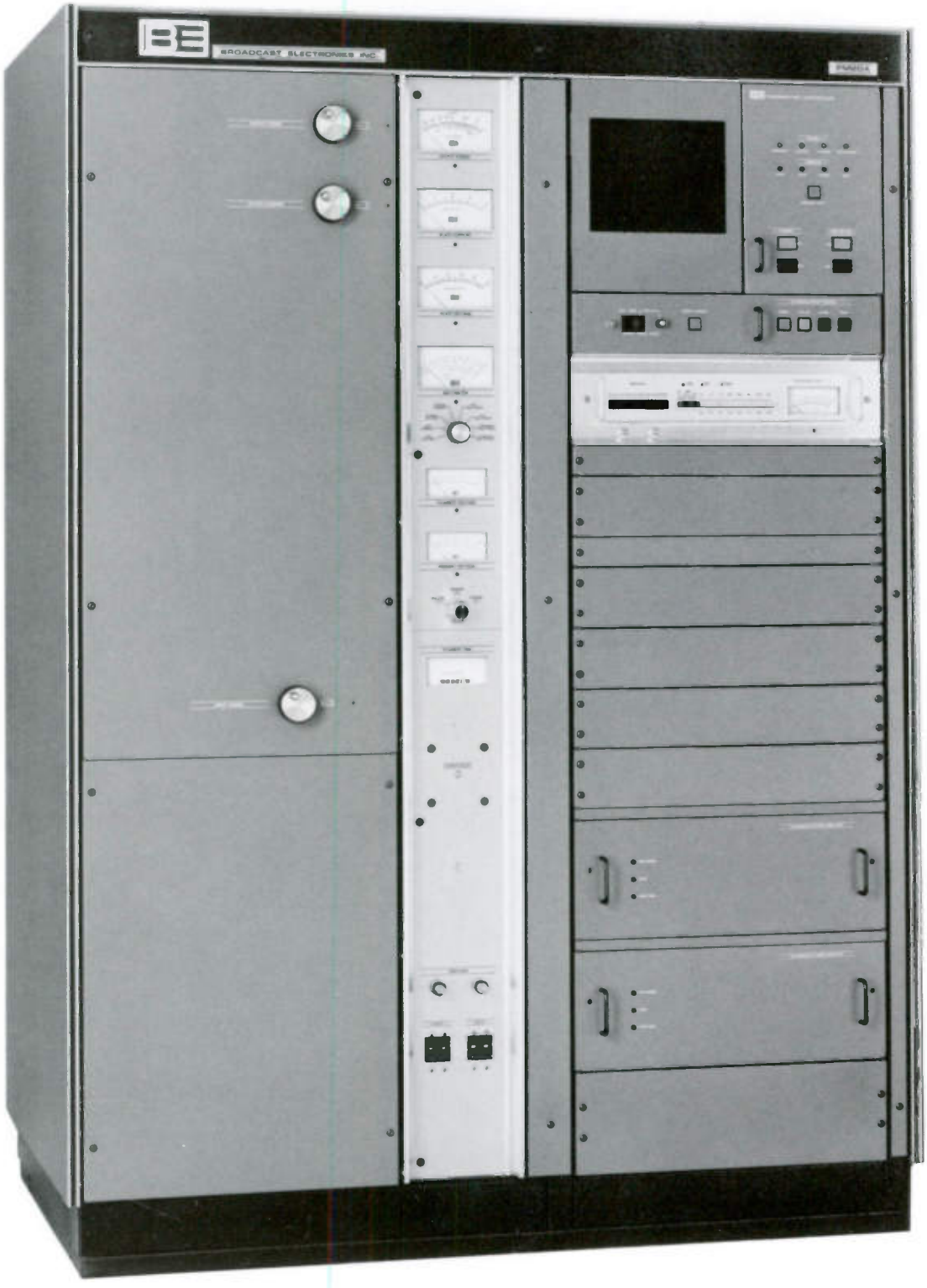
Specifications subject to change without notice.

BROADCAST ELECTRONICS INC.
4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305 U.S.A., TELEX: 25-0142, CABLE: BROADCAST, PHONE: (217) 224-9600

B172 CP 7.5M 683

FM 20A

Advanced Technology
20 kW SINGLE TUBE TRANSMITTER



Product Innovation and Reliability. . .
From the People Who Know Radio

20,000 Watt Single Tube FM Transmitter

The High Voltage Power Supply is contained in a separate matching cabinet. It may be located elsewhere in the transmitter building or adjacent to the PA.

Description

The single tube, Model FM-20A is a totally new 20,000 watt transmitter that incorporates all of the standard features found in B/E's FM transmitters, as well as new and innovative designs developed through years of intensive research and testing. The final result is a 20kW FM transmitter that will provide you with years of reliable service.

Features/Benefits

- Single tube design lowers replacement costs and improves overall bandwidth.
- Folded, half-wave output cavity eliminates plate blocking capacitors and sliding contacts for greater reliability.*
- Second harmonic suppressor minimizes harmonic energy without wasting RF power.*
- Typical 80% PA efficiency for long tube life and low AC power consumption.
- Proportional VSWR foldback with "soft start" assures safe operating conditions.
- Broadband Grid Input Matching Network produces superior stereo and SCA performance.*
- Industry standard FX-30 Exciter.
- Two broadband, solid-state IPA's eliminate tuning adjustments.
- Modular Automatic Power Control maintains constant RF output power.
- Hinged, front meter panel allows easy access and maintenance.

* Patented

This patented PA design was pioneered by B/E Engineers in 1980.

B/E engineers solved this problem by using a pulse modulated, vari-speed DC Servo Motor. The APC pulses the motor at high speed for large power changes and at a slow speed for minor power changes. The APC circuit regulates power output ±2%, for greater precision in locating the 100% power set point.

An external signal also can be used to switch the FM-20A into a separate "Preset" mode for lower power consumption during an emergency. This second power level is used if the standby AC Generator is not large enough to operate the transmitter at full output, or if the standby antenna does not have adequate power capability. The APC is mounted in a slide-out drawer with non-volatile memory maintained by a battery backup.

Automatic AC Restart

You can not afford to be off-the-air for any length of time. That is why B/E transmitters have an automatic AC restart feature, that does not require operator intervention.

In the event of a momentary AC power failure, the FM-20A immediately recycles and returns to the air. If power is lost for a prolonged period, the transmitter automatically performs filament warm-up before applying high voltage.

Control Center

The transmitter controller, common in all B/E "A" Series transmitters, uses solid state CMOS logic to provide reliable operation even in high RFI environments. All inputs and outputs are filtered and optically isolated for further protection from RFI.

A convenient and centrally located meter panel enables you to quickly observe all vital PA parameters and to make necessary adjustments. The FM-20A features eight meters, including two multi-function meters, to monitor the operation of your transmitter. The meter panel is hinged for easy access. Three-phase AC line metering is provided as a standard feature.

Options

Factory installed optional equipment for the FM-20A include:

- Microprocessor Video Diagnostic System (MVDS). Provides diagnostic capabilities and redundant, automatic transmitter control.
- An optional MVDS Remote Control package also is available.
- FS-30 Digital Stereo Generator Offers absolute pilot phase stability without distortion.
- FC-30 Digital Data Compatible SCA Generator.
- Filament Voltage Regulator.

Proven Reliability and Quality

Since 1980, B/E engineers have been writing the rules on FM transmitters. Field proven innovations introduced by B/E, including Automatic Power Control, Soft-Start, Single High Power Tube Design and proportional VSWR foldback, have become the standards in FM transmitters. Combine these with several new B/E exclusive, patented features, and you receive. . . ***Unsurpassed Product Reliability and Quality!***

Convenient hinged, front control panel features independent and multi-function metering of all PA parameters.

The optional Microprocessor Video Diagnostic System provides operational status, transmitter control and fault condition reports on a video display. A remote control package is available as an option to the system.

Most bandwidth problems in FM transmitters are located in the IPA and the input circuits coupling the IPA to the PA. This patented Power Amplifier circuit provides broadband matching between the IPA and the PA, with a single, front panel tuning control to bring the grid circuit to resonance.

This new design improves operating efficiency of the final power amplifier, while maximizing bandwidth for superior stereo and SCA performance.

Synthesized FX-30 Exciter

The FM-20A features the industry standard FX-30 Exciter. The FX-30 is noted for its extremely low harmonic and intermodulation distortion. An ultra-linear, modulated oscillator provides optimum signal to noise and minimum intermodulation of base band frequency components for superior stereo and SCA performance.

A digitally programmed synthesizer permits frequency changes in 10kHz increments without changing crystals.

Whether used for wideband, stereo or monaural operations, the FX-30 Exciter produces a distinctively clean FM sound. The FX-30, standard with every B/E transmitter, is mounted in a slide-out drawer for easy front access.

Broadband, Solid State IPA

Broadcast Electronics is the only major FM transmitter manufacturer that still designs and manufactures its own Intermediate Power RF Amplifier. This assures less costly parts replacement and better product availability than a transmitter built with critical RF assemblies manufactured by an outside vendor.

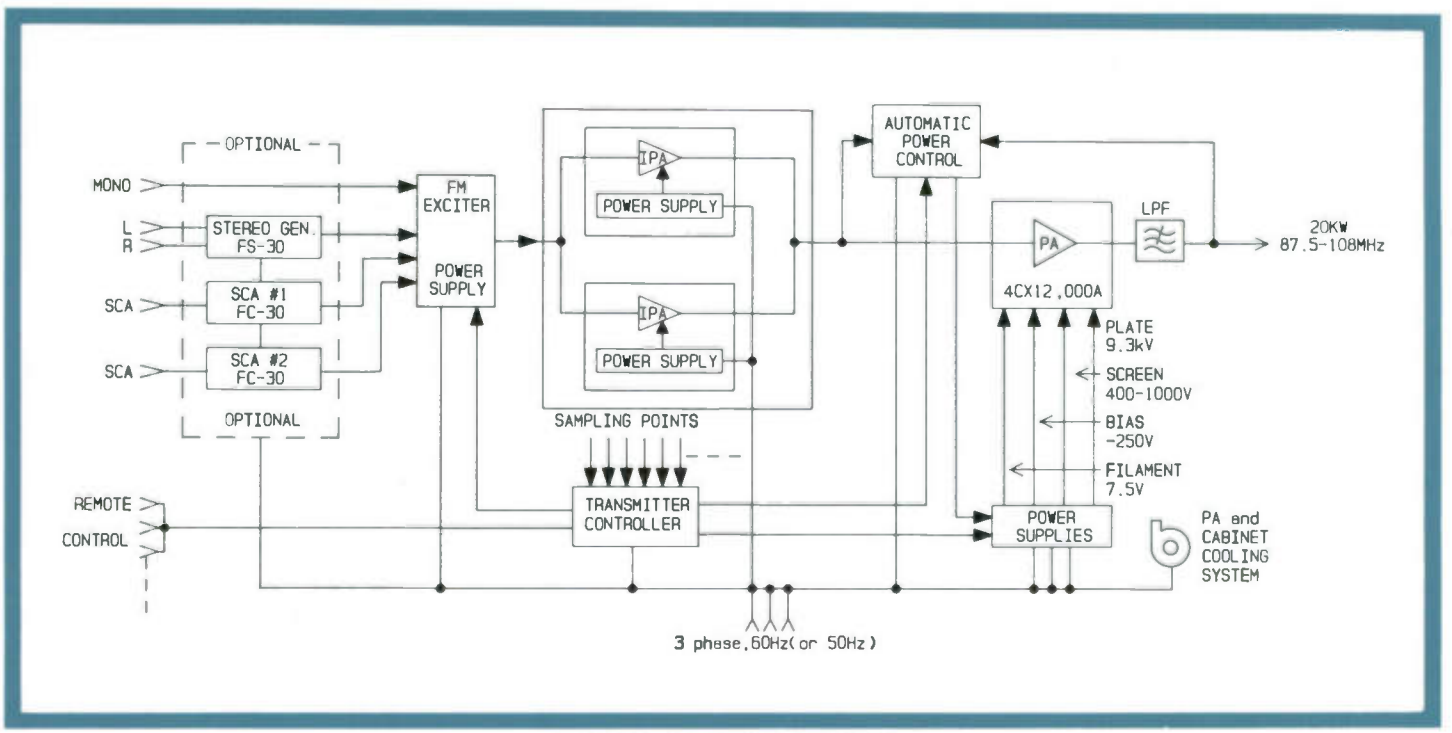
B/E incorporates a sophisticated proportional VSWR foldback design in their IPA. This protects the IPA from excessive heat, current or voltage by automatically reducing power to a safe operating level. The RF drive in other transmitters turns off completely in a mismatch condition.

The FM-20A uses two, solid state IPA's to provide redundant power to the final amplifier. To keep the IPA's in phase, B/E engineers developed a 90° strip-line hybrid splitter network and delay line system to equally feed the two IPA's. The outputs are then combined to drive the input of the PA stage. This in-phase combining assures that the two IPA's share the load equally under mismatched conditions.

Unlike competitive transmitters that rely on the main cooling blower and external power supply, B/E's IPA contains its own power supply and cooling system. If one IPA fails, the other can be bypassed or the Exciter can be fed directly to the Power Amplifier. They require no tuning and feature excellent stability under all operating conditions.

Automatic Power Control

An Automatic Power Control System (APC) maintains constant RF output power if fluctuations occur in line voltage or the RF drive level. This sophisticated proportional control system immediately corrects power variations without overshooting the digitally stored set point.



FM-20A BLOCK DIAGRAM

Operational Features

Single Tube Design

The FM-20A uses a single, high gain Eimac 4CX12000A/8989 tetrode tube to produce 20 kW of RF power. This innovative tube design yields a phenomenal 80% PA efficiency, which reduces operating costs by lowering your power consumption. It also produces higher gains than the tubes used in other 20kW FM transmitters.

Changing the tube is easily accomplished through a large door in the rear of the transmitter. B/E's broadband screen neutralizing technique eliminates the need to make adjustments even when tubes are changed.

Folded, Half-wave Output Cavity

This patented, folded half-wave cavity design, pioneered by B/E engineers, completely eliminates the troublesome and unreliable DC plate blocking capacitor and sliding contacts, still used in other FM transmitters. This unique design provides exceptional reliability and reduces your maintenance costs.

Second Harmonic Suppressor

A patented, Second Harmonic Suppressor is integrated into the folded half-wave cavity. This exclusive design minimizes second harmonic energy at the source without wasting RF power. This internal suppressor improves PA efficiency, while eliminating the need for bulky, external notch filters, used in other transmitters.

All PA adjustments are performed through smooth operating front panel controls equipped with counters. A grounded, beryllium copper bellows provides output tuning adjustments, while a grounded, silver-plated loop couples energy to the antenna. This careful attention to grounding improves immunity from lightning.

Proportional VSWR Foldback

Broadcast Electronics was the first to provide VSWR Foldback in their FM transmitters. Other manufacturers followed by imitating this innovative B/E design in their transmitters.

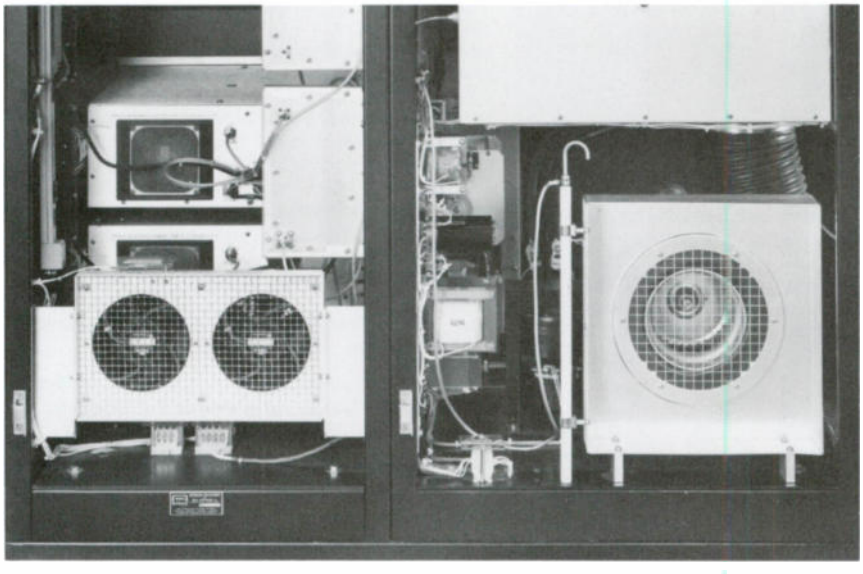
The FM-20A is protected by two levels of VSWR protection. In case of gradual changes in load conditions, such as ice build-up on the antenna, the proportional VSWR Foldback System protects the PA by automatically reducing output power to a safe operating level. Power is restored automatically when the condition clears.

If a sudden mismatch occurs, such as a short or open circuit in your antenna or transmission line, high voltage is automatically turned off. The transmitter will recycle and try to restart three times before shutting down.

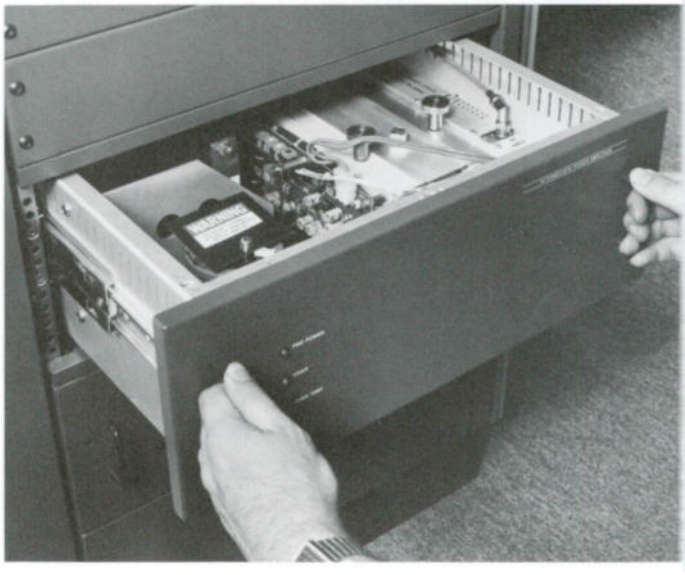
A "Soft Start" circuit is used to gradually increase power to a safe level. This exclusive B/E feature allows the transmitter to come up to a safe operating level under high VSWR conditions. The power supply features "Step Start" circuitry to minimize inrush current, which reduces stress on the power supply and the tube.

Broadband Input Matching Network

B/E engineers developed a new grid circuit configuration, designed to take advantage of the power gain capability of the Eimac tube, while maximizing signal bandwidth.



The FM-20A features an efficient and quiet air cooling system. Air filters are replaceable while the transmitter is operating.



The B/E manufactured IPA's are self contained with their own power supply and cooling system in an easy access, slide out drawer.

Technical Specifications

GENERAL:

Power Output: 20 kW (7.5 kW to 22.0 kW Maximum).
PA Efficiency: 78% (80% typical).
Frequency Range: 87.5 to 108 MHz, tuned to specific operating frequency. Exciter programmable in 10 kHz steps.
RF Output Impedance: 50 ohms (others on special request).
Output Connector: 3⅛ inch EIA flange.
VSWR: 1.8:1 maximum. (Will operate into higher VSWR with automatic power reduction).
Frequency Stability: ±300 Hz, 0 to 50° C.
Type Of Modulation: Direct frequency modulation of carrier frequency.
Modulation Capability: Greater than ±200 kHz.
Modulation Indication: Peak reading, color coded LED display with baseband overmodulation indicator.
Exciter: Solid state Model FX-30; incorporating a digitally programmed synthesizer. (10kHz increments).
Pre-emphasis: FCC 75 uS, CCIR 50 uS (where specified) or 25 uS (Dolby).
Asynchronous AM S/N Ratio: 55 dB below reference carrier with 100% AM modulation @ 400 Hz, 75 uS de-emphasis. (no FM modulation present).
Synchronous AM S/N Ratio: 45 dB below 20 kW reference carrier with 100% AM modulation @ 400 Hz (FM modulation ±75 kHz @ 400 Hz).
Tube Complement: (1) 8989/4CX12,000A.
RF Harmonics: Suppression meets all FCC/DOC requirements and CCIR recommendations.
Power Supply Rectifiers: Silicon.

ELECTRICAL/MECHANICAL:

AC Input Power: 208V WYE/240V Delta, 60 Hz, three phase. (Taps for 196 to 252V. Other voltages and line frequencies are available upon request.)
Primary Power Consumption: 30.0 kW @ 20 kW output, 0.94 pf.
Typical Overall Efficiency: 67% AC Line Input to RF Output (at 80% PA efficiency).
Size: Three cabinets - (1) 22"W × 30"D × 70"H
(1) 27"W × 30"D × 70"H
(1) 27"W × 30"D × 70"H
Altitude: 10,000 feet @ 60 Hz (3048 m), 7500 ft. @ 50 Hz (2286 m).
Ambient Temperature Range: −10° C to +50° C.
Finish: B/E blue with anodized aluminum control center panel and anodized aluminum trim.

MONAURAL OPERATION:

Audio Input Impedance: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode suppression.
Audio Input Level: +10 dBm nominal for ±75 kHz deviation @ 400 Hz.
Audio Frequency Response: ±0.5 dB, 30 Hz to 15 kHz, selectable flat, 25, 50, 75 microsecond pre-emphasis.
Harmonic Distortion: 0.08% or less (.04% typical).
Intermodulation Distortion: 0.08% or less, 60 Hz/ 7 kHz, 4:1 ratio.
Transient IMD: 0.1% or less (square wave/sine wave).
FN S/N Ratio: 72 dB below ±75 kHz deviation @ 400 Hz (75 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 uS de-emphasis.

***WIDEBAND COMPOSITE OPERATION:**

Composite Inputs: 3 total, (1) unbalanced and (1) balanced plus front panel test. All connectors BNC.
Composite Input Impedance: 10K ohm, nominal, resistive.
Composite Input Level: 3.5V p-p nominal, for ±75 kHz deviation.
Composite FM S/N Ratio: 72 dB below ±75 kHz deviation @ 400 Hz (75 dB typical) Measured in a 30 Hz to 100 kHz bandwidth with 75 uS de-emphasis.
Composite Harmonic Distortion: 0.08% or less (.04% typical).
Composite Intermodulation Distortion: 0.08% or less (.04% typical).
Composite Transient IMD: 0.1% or less (square wave/sine wave).
Composite Amplitude Response: ±0.1 dB, 30 Hz to 53 kHz.
Composite Phase Response: ±0.5 degrees from linear phase, 30 Hz to 53 kHz.
Composite Group Delay: 390 nanoseconds, ±25 nanoseconds 30 Hz to 53 kHz.
Composite Slew Rate: 12 V/microsecond (symmetrical).

***STEREO OPERATION:**

Audio Input Impedance: 600 ohms balanced, resistive, floating. (Adaptable to other impedances).
Audio Input Level: +10 dBm, ±1 dBm, for 100% modulation @ 400 Hz (Adaptable to other input levels).
Audio Input Filter: 15 kHz LPF with delay equalization for minimum overshoot.
Frequency Response: ±0.5 dB, 30 - 15,000 Hz, 75 uS pre-emphasis (flat, 25 or 50 uS pre-emphasis selectable).
Total Harmonic Distortion: 0.08% or less.
Intermodulation Distortion: 0.08%, 60 Hz/7 kHz; 4:1 ratio.
Transient Intermodulation Distortion: 0.1% (square wave/sine wave).
FM Noise: 72 dB or better below 100% modulation @ 400 Hz, 75 uS de-emphasis.
Stereo Separation: 45 dB or better; 30 - 15,000 Hz (sine wave).
Dynamic Stereo Separation: 40 dB or better; 30 - 15,000 Hz (normal program content).
Linear Crosstalk: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30 - 15,000 Hz, 45 dB minimum below 100% modulation.
Non-Linear Crosstalk: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation.
Pilot Stability: ±0.5 Hz, 0 to 50°C.
Modes: Stereo, Mono L+R, Mono (L) and Mono (R) remote controlled. (See FS-30 data sheet for full details).

***SCA OPERATION:**

Modulation: Direct FM.
Subcarrier Frequency: 67 kHz (39 to 95 kHz to order).
Subcarrier Frequency Stability: ±0.5% (330 Hz @ 67 kHz), 0 to 50°.
Subcarrier Harmonic Content: Less than 0.3%.
Subcarrier Envelope Decay: Greater than 100 msec. from 90% to 10% subcarrier levels.
Modulation Capability: ±20% of subcarrier frequency.
Audio Input Impedance: 600 ohm balanced, resistive.
Data Input Impedance: 75 ohm unbalanced, resistive, DC coupled.
Input Levels: (Audio) adjustable +10 dBm to −10 dBm for ±6 kHz deviation @ 400 Hz. (Data) adjustable 1.0 to 4.0V p-p for ±6 kHz deviation (DC coupled).
Pre-emphasis: (Audio) 150 microseconds standard (75 uS with internal jumper). (Data) no pre-emphasis.
Frequency Response: (Audio) ±0.5 dB, 10 - 10,000 Hz, exclusive of audio low pass filter. (Data) ±0.5 dB, DC - 10,000 Hz.
Audio Low Pass Filter: Sixth order, −3 dB @ 4.3 kHz, standard (resistor changes for other values).
Data Low Pass Filter: Same as AF filter or may be bypassed.
Total Harmonic Distortion: Less than 0.5% throughout AF pass band.
Intermodulation Distortion: Less than 0.5%, 60 Hz/7 kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed) Typically 0.1%.
Crosstalk, SCA to Stereo: −60 dB or better below 100% modulation of left or right. 75 uS de-emphasis.
Crosstalk, Stereo to SCA: −50 dB or better below ±6 kHz deviation of SCA using 150 uS de-emphasis and FS-30 Stereo Generator.
FM Noise: 72 dB below ±6 kHz deviation @ 400 Hz (150 uS de-emphasis).
Auto Muting Level: Adjustable from 10 to 30 dB below program level.
Auto Muting Delay: Adjustable, 0.5 to 10.0 seconds. (See FC-30 data sheet for full details).

*Based on the FM-20A Transmitter equipped with a FX-30 Exciter, FS-30 Stereo Generator and a FC-30 SCA Generator.

Specifications subject to change without notice.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-20A	909-0020-200	FM-20A Single Tube 20,000 watt FM broadcast transmitter complete with FX-30 exciter, Eimac 8989/4CX12,000A output tube, and low pass filter for operation from a 208V/240V, 60 Hz three phase power source. HV power supply cabinet in-line with PA cabinet.
FM-20A	909-0020-201	FM-20A Single Tube 20,000 watt FM broadcast transmitter same as 900-0020-200 except HV power supply cabinet is separate from PA cabinet.
FM-20A	909-0020-380	FM-20A Single Tube 20,000 watt FM broadcast transmitter same as 900-0020-200 (HV power supply in-line) except to operate from a 380/415V, 50 Hz, 3 phase power supply.
FM-20A	909-0020-381	FM-20A Single Tube 20,000 watt FM broadcast transmitter same as 909-0020-201 (HV power supply cabinet separate) except to operate from a 380/415V, 50 Hz, 3 phase power supply.
(Factory installed options)		
MVDS	909-0091-007	Optional Microprocessor Video Diagnostic System (MVDS), for use with FM-20A transmitter.
	909-0091	Optional MVDS Remote Control System.
	909-0112	Filament voltage regulator, 60 Hz.

BROADCAST ELECTRONICS INC
4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305–3606 U.S.A., PHONE (217) 224-9600, TELEX 250142, FAX (217) 224-9607

BROADCAST
ELECTRONICS INC

FM-1A

1000 Watt Single Tube Transmitter

FM-1A

One Tube FM Transmitter 250 to 1000 Watts

FEATURES

- Folded half-wave output cavity (no plate blocking capacitors or sliding contacts)*
- Broadband input circuit
- Single tube design
- Optional microprocessor video diagnostic system. (MVDS)
- Synthesized, low distortion exciter
- Advanced transmitter controller
- Automatic power control with proportional VSWR foldback
- FCC type notified

*patented

The Model FM-1A Transmitter

Elegant simplicity of design sets the FM-1A apart from any other FM transmitter. For example, the RF drive input to the single tube PA stage is provided directly from the ultra-dependable Model FX-30 Exciter. This simplified design eliminates all intervening stages and, as a result, provides greater overall reliability and ease of maintenance.

The FM-1A transmitter also includes many state of the art innovations such as a folded half-wave output cavity*, optional MVDS (Microprocessor Video Diagnostic System) and a modular Automatic Power Control. The entire 1,000 watt transmitter is contained in a single, low profile cabinet only 5'10" high (177.8 cm) with easy access to all components. Only five square feet of floor space is required.

FM-1A, One Tube 1000 Watt FM Transmitter

The Optional Microprocessor Video Diagnostic System (MVDS)

Features:

- Calculates efficiency, dissipation, and ERP
- Converts multiple meter readings to bar-graph or tabular display
- Automatically displays the location and nature of a malfunction
- Bar-graph display of PA parameters
- Automatic logging output capability
- Remote monitoring via modem, telco lines or SCA
- Operates independently of primary controller — cannot affect basic "on-air" support systems.

Broadcast Electronics' Microprocessor Video Diagnostic System (MVDS) is available as an add-on option to the FM-1A.

The optional MVDS keyboard and video monitor.

Versatile Keyboard Programming

The keyboard allows the customer to set time, select the desired CRT screen display, set or re-program the limits of the monitored parameters, and activate various system options.

Three display screens can be selected...

Primary Screen: The display includes date and time; plate, screen, and grid voltages and currents; calculated plate efficiency; exciter forward; reflected power; transmitter power output and calculated ERP. Parameters that exceed preset limits are displayed in reverse video. The condition of the transmitter and the diagnosis for that condition is displayed, along with the times and causes of carrier interruptions.

Linear Bar-Graph Screen: This display is useful for "peaking" or "nulling" various parameters during transmitter set-up, as well as for tuning optimum overall performance. It continuously and simultaneously provides both linear bar-graph and digital displays of PA forward/reflected powers, calculated plate efficiency, and plate, screen, and grid currents.

Customer Configuration Screen: This screen allows the user to establish and customize system options and "min/max" limits for the monitored parameters. An eight character password prevents system changes by unauthorized persons.

Improved On-Air Reliability

The addition of the MVDS to the FM-1A provides diagnostic system functions and automatic transmitter control, which enhances on-air reliability. The MVDS controls the transmitter by communicating through the primary transmitter controller. If the MVDS is disabled, control automatically returns to the primary controller without interrupting transmission. The MVDS option has it's own independent power supply. This prevents any MVDS failure from affecting the other transmitter systems - including the primary controller.

Logging By Printer

The normal display screen information may be logged on an inexpensive home computer printer. Logging may be initiated by simple keyboard command or may be programmed to occur automatically at periodic intervals. The normal display screens may be viewed remotely through the use of modems and terminals, via telephone line, or SCA subcarrier interconnection. Should an overload condition occur while an operator is not present, the "anticipatory logging" feature of the MVDS will capture vital diagnostic data milliseconds before the outage takes place. This data will be sent to the printer at the next available opportunity after normal transmitter operation is resumed. (or on demand via wire link)

Remote Video Monitoring

The display screen video information may be fed over coaxial cable to local composite video monitors over a distance of up to one thousand feet.

Optional Stereo/SCA Generators

In the FM-1A transmitter, rack mounting space is provided below the exciter to mount the model FS-30 Stereo Generator and up to two model FC-30 SCA Generators. These B/E units are available as accessory equipment.

FM-1A, One Tube 1000 Watt FM Transmitter

Automatic AC Restart

If AC power is lost for less than sixty seconds, the FM-1A will return to the air immediately. If AC power is lost for a more prolonged period, the FM-1A will automatically perform the regular filament warm-up (before applying high voltage) as soon as power is restored.

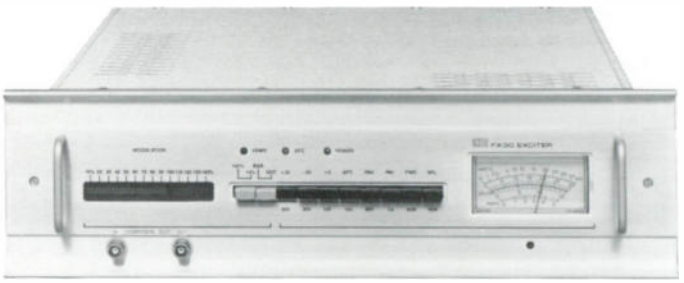
Remote Control

The FM-1A is designed for easy remote control through momentary contact closures. The control logic circuitry used in the transmitter can interface directly with most modern remote control and ATS systems.

Solid-State Control/Diagnostics

Transmitter protection and control functions in the FM-1A feature CMOS logic design. Seven LED diagnostic indicators provide transmitter status data in an easy to read display. With the FM-1A's extensive input/output control line filtering and optical isolation, trouble-free operation is assured - even in high RFI environments.

The MVDS (Microprocessor Video Diagnostic System) is available as an option for the FM-1A. MVDS is a "smart" diagnostic system designed to give extremely informative operational status and fault condition reports on an eye-level video display. See the MVDS section for a full explanation of this unique option.



Synthesized FX-30 Exciter

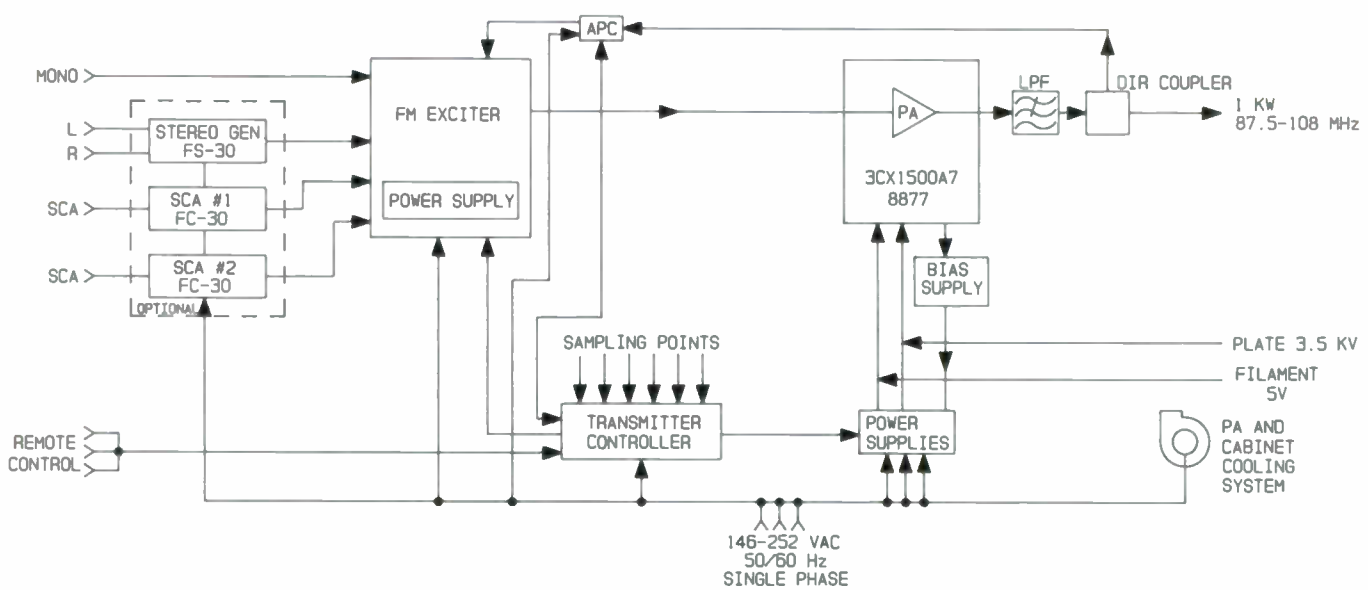
The B/E FM-1A transmitter incorporates the FX-30 Exciter. This exciter has extremely low harmonic and intermodulation distortion. An ultra-linear modulated oscillator provides minimum intermodulation of base band frequency components providing superior stereo and SCA performance.

The exciter's RF power amplifier is fully VSWR protected, even up to its full output rating.

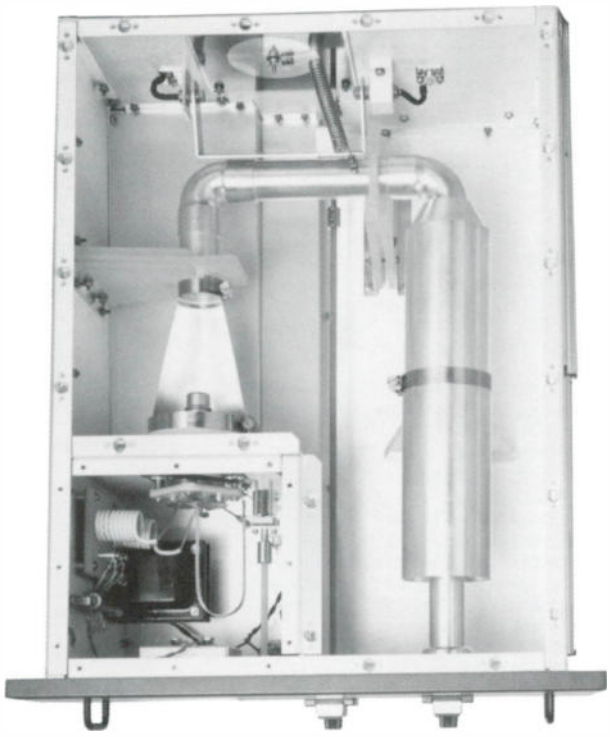
As the exciter is mounted in a slide-out drawer, there is easy accessibility to all components. Full front panel metering and internal diagnostic LED's provide complete information concerning the operating status of the unit.

Five audio and composite inputs are provided on the rear panel. The FX-30 Exciter accepts multiple wideband composite inputs as well as a 600 ohm balanced input.

BLOCK DIAGRAM B/E FM-1A ONE TUBE 1000 WATT TRANSMITTER



FM-1A, One Tube 1000 Watt FM Transmitter



Slide out power amplifier assembly in the B/E FM-1A Transmitter.

Efficient Single Tube Design

The FM-1A uses a single Eimac 3CX1500A7/8877 triode to produce 1 kW of RF power on any frequency between 87.5 and 108 MHz. The single tube design of the FM-1A assures the utmost in reliability. Unlike solid state devices, the 4CX1500A7 output tube can withstand repeated overloads without damage. The ruggedness of the FM-1A's output stage is enhanced further through an automatic VSWR foldback system.

A new input circuit design takes advantage of the power gain capability of the Eimac triode while providing maximum signal bandwidth. Installation or removal of the power tube can be performed from the front of the transmitter and is easily accomplished within minutes. Grounded grid operation of the final amplifier eliminates the need for neutralization.

Folded Half-wave Cavity Power Amplifier

The power amplifier section of the FM-1A employs a patented folded half-wave output cavity. This design innovation completely eliminates the troublesome plate blocking capacitors and sliding contacts found in other FM transmitters.

A patented second harmonic suppressor is also integrated into the folded half-wave cavity. An external low pass filter (with directional output couplers) ensures compliance with FCC, Canadian DOC, and CCIR recommendations.

All PA adjustments are performed through front panel controls with counters. A grounded bellows provides the fine tuning while a grounded loop couples to the antenna.

Automatic Power Control

An automatic power control (APC) system maintains constant RF output power within limited fluctuations of AC line voltage or RF drive level. The regulated set point can be changed by remote control and is retained in non-volatile memory. An external signal can be used to switch the FM-1A into a separate "Preset Power" mode for lower power consumption during emergencies. The FM-1A's sophisticated power control system provides fast correction of output power changes.

A proportional VSWR foldback system protects the PA by automatically reducing power to safe levels until the condition can be corrected. Each time the transmitter is activated, a "soft start" circuit gradually increases power from zero to nominal. This allows the FM-1A to assume a safe operating level under high VSWR conditions.

FM-1A, One Tube 1000 Watt FM Transmitter

TECHNICAL SPECIFICATIONS

GENERAL

POWER OUTPUT: 1 kW (from 250 watts to 1000 watts).
FREQUENCY RANGE: 87.5 to 108 MHz, tuned to specific operating frequency. Exciter programmable in 10 kHz steps.
RF OUTPUT IMPEDANCE: 50 ohms (others on special request).
OUTPUT CONNECTOR: 7/8" EIA flange.
VSWR: 2:1 maximum (will operate into higher VSWR with automatic power reduction).
FREQUENCY STABILITY: ±300Hz, 0° to 50°C.
TYPE OF MODULATION: Direct frequency modulation of carrier frequency.
MODULATION CAPABILITY: Greater than ±200kHz.
MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.
EXCITER: Solid state, 35 watt output, Model FX-30; incorporates digitally programmed synthesizer (10kHz increments).
PRE-EMPHASIS: FCC 75uS, CCIR 50uS (where specified), or 25uS (Dolby).
ASYNCHRONOUS AM S/N RATIO: 55dB below reference carrier with 100% AM modulation @ 400Hz, 75 uS de-emphasis. (no FM modulation present).
SYNCHRONOUS AM S/N RATIO: 45dB below 1 kW reference carrier with 100% AM modulation @ 400 Hz, 75 uS de-emphasis. (FM modulation ±75 kHz @ 400 Hz @ 1 kW output power).
TUBE COMPLEMENT: 3CX1500A7/8877.
RF HARMONICS: Suppression meets all FCC/DOC requirements and CCIR recommendations.
POWER SUPPLY RECTIFIERS: Silicon.

ELECTRICAL/MECHANICAL

AC INPUT POWER: 208/240 V, 60 Hz, single phase. (Taps for 196 to 252 V. Other voltages and line frequencies are available upon request).
POWER CONSUMPTION: 2 kW @ 1 kW output, 0.9 pf
OVERALL EFFICIENCY: Typically 50% (AC Line Input to RF Output).
SIZE: 23.3"W × 31.5"D × 70"H (59 W × 80 D × 177.8 H cm)
WEIGHT & CUBAGE: 760 lbs. unpacked; 885 lbs. packed 36 cu. ft.
ALTITUDE: 7500 ft. @ 50Hz. (2286 M). 10,000 ft. @ 60 Hz. (3048 M).
AMBIENT TEMPERATURE RANGE: −10°C to +50°C.
FINISH: BE blue with anodized aluminum control center panel and anodized aluminum trim.

*MONAURAL OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode suppression
AUDIO INPUT LEVEL: +10 dBm nominal for ±75 kHz deviation @ 400 Hz.
AUDIO FREQUENCY RESPONSE: ±0.5 dB, 30 Hz to 15 kHz, selectable flat, 25, 50 or 75 microsecond pre-emphasis.
HARMONIC DISTORTION: 0.08% or less (.04% typical)
INTERMODULATION DISTORTION: 0.08% or less, 60Hz/7kHz, 4:1 ratio.
TRANSIENT IMD: 0.1% or less (square wave/sine wave).
FM S/N RATIO: 72 dB below ±75 kHz deviation @ 400 Hz (78 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 uS de-emphasis.

*WIDEBAND COMPOSITE OPERATION

COMPOSITE INPUTS: 3 total, (1) unbalanced and (1) balanced plus front panel test. All connectors BNC.
COMPOSITE INPUT IMPEDANCE: 10K ohm, nominal, resistive.
COMPOSITE INPUT LEVEL: 3.5 V p-p nominal, for ±75 kHz deviation.
COMPOSITE FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical). Measured in a 30 Hz to 100 kHz bandwidth with 75 uS de-emphasis.
COMPOSITE HARMONIC DISTORTION: 0.08% or less (.04% typical).
COMPOSITE INTERMODULATION DISTORTION: 0.08% or less (.04% typical).
COMPOSITE TRANSIENT IMD: 0.1% or less (square wave/sinewave).
COMPOSITE AMPLITUDE RESPONSE: ±0.1 dB, 30 Hz to 53 kHz.
COMPOSITE PHASE RESPONSE: ±0.5° from linear phase, 30 Hz to 53 kHz
COMPOSITE GROUP DELAY: 390 nonoseconds ±25 nanoseconds, 30 Hz to 53 kHz.
COMPOSITE SLEW RATE: 12 V/microsecond (symmetrical).

*STEREO OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, floating. (Adaptable to other impedances).
AUDIO INPUT LEVEL: +10 dBm, ±1 dB for 100% modulation @ 400 Hz. (Adaptable to other input levels).
AUDIO INPUT FILTER: 15 kHz LPF with delay equalization for minimum overshoot.
FREQUENCY RESPONSE: ±0.5 dB, 30-15,000 Hz, 75 uS pre-emphasis (flat, 25 or 50 usec pre-emphasis selectable).
TOTAL HARMONIC DISTORTION: 0.08% or less.
INTERMODULATION DISTORTION: 0.08%, 60 Hz/7 kHz; 4:1 ratio.
TRANSIENT INTERMODULATION DISTORTION: 0.1% (Square wave/sine wave).
FM NOISE: 72 dB or better below 100% modulation @ 400 Hz, 75 uS de-emphasis.
STEREO SEPARATION: 45 dB or better; 30-15,000 Hz (sine wave).
DYNAMIC STEREO SEPARATION: 40 dB or better; 30-15,000 Hz (normal program content).
LINEAR CROSSTALK: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30-15,000 Hz, 45 dB minimum below 100% modulation.
NON-LINEAR CROSSTALK: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation.
38 kHz SUPPRESSION: 70 dB minimum below 100% modulation.
PILOT STABILITY: ±0.5 Hz, 0° to 50°C.
MODES: Stereo, Mono L+R, Mono (L) and Mono (R) remote controlled (See FS-30 data sheet for full details).

*SCA OPERATION

MODULATION: Direct FM.
SUBCARRIER FREQUENCY: 67 kHz (39 to 95 kHz to order).
SUBCARRIER FREQUENCY STABILITY: ±0.5% (330 Hz @ 67 kHz), 0° - 50°C.
SUBCARRIER HARMONIC CONTENT: Less than 0.3%.
SUBCARRIER ENVELOPE DECAY: Greater than 100 msec. from 90% to 10% subcarrier levels.
MODULATION CAPABILITY: ±20% of subcarrier frequency.
AUDIO INPUT IMPEDANCE: 600 ohm balanced, resistive.
DATA INPUT IMPEDANCE: 75 ohm unbalanced, resistive, DC coupled.
INPUT LEVELS: (Audio) Adjustable +10 dBm to −10 dBm for ±6 kHz deviation @ 400 Hz. (Data) Adjustable, 1.0 to 4.0 V p-p for ±6 kHz deviation (D.C. coupled).
PRE-EMPHASIS: (Audio) 150 microseconds standard (75 uS with internal jumper). (Data) no pre-emphasis.
FREQUENCY RESPONSE: (Audio) ±0.5 dB, 10-10,000 Hz, exclusive of audio low-pass filter. (Data) ±0.5 dB, DC-10,000 Hz.
AUDIO LOW-PASS FILTER: Sixth order, −3 dB @ 4.3 kHz, standard (resistor changes for other values).
DATA LOW PASS FILTER: Same as AF filter or may be bypassed.
TOTAL HARMONIC DISTORTION: Less than 0.5% throughout AF pass band.
INTERMODULATION DISTORTION: Less than 0.5%, 60 Hz/7 kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed). Typical 0.1%.
CROSSTALK, SCA TO STEREO: −60 dB or better below 100% modulation of left or right. 75 uS de-emphasis.
CROSSTALK, STEREO TO SCA: −50 dB or better below ±6 kHz deviation of SCA using 150 uS de-emphasis and FS-30 stereo generator.
FM NOISE: 72 dB below ±6 kHz deviation @ 400 Hz (150 uS de-emphasis).
AUTO MUTING LEVEL: Adjustable from 10 to 30 dB below program level.
AUTO MUTING DELAY: Adjustable, 0.5 to 10.0 seconds. (See FC-30 data sheet for full details).

*Through FM-1A Transmitter using Model FX-30 Exciter, FS-30 Stereo Generator, and model FC-30 SCA Generator as applicable.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-1A	909-1000-200	FM-1A single tube broadcast transmitter for operation on one specified frequency between 87.5 and 108 MHz. 208 V/240 V, 60 Hz single phase power source. Includes FM Exciter
FM-1A	909-1000-300	Same as above except for 50 Hz single phase power source
MVDS	909-0091-006	Optional Microprocessor Video Diagnostic System, factory installed in FM-1A transmitter. (Must be ordered with transmitter)
	243-8877	Spare 3CX1500A7/8877 power tube

Specifications subject to change without notice.

BROADCAST ELECTRONICS INC

4100 N. 24th ST., P. O. BOX 3606, QUINCY, IL 62305-3606 U.S.A., TELEX: 250142, FAX: (217) 224-9607, CABLE: BROADCAST, PHONE (217) 224-9600

CP 1.5M 388

BROADCAST ELECTRONICS INC.

FM-30

10-30 KW Single Tube Transmitter

The World's Most Advanced

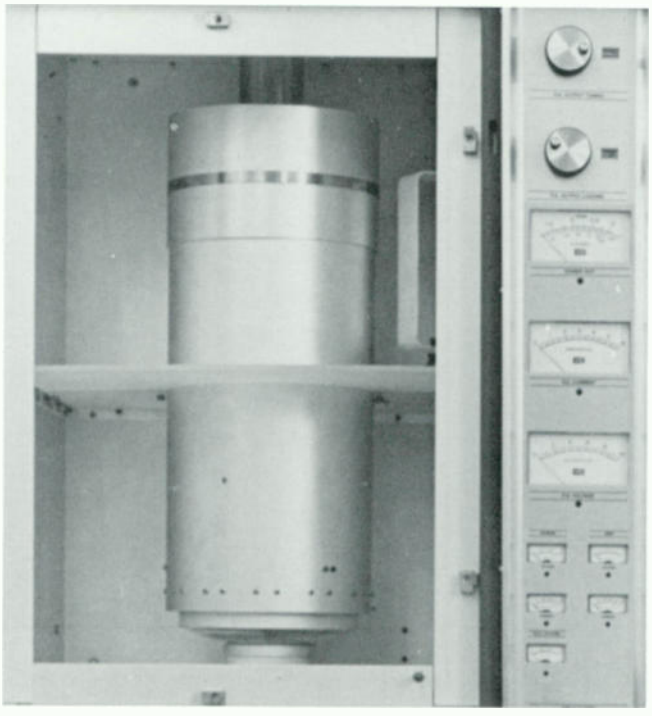
The Optimum in Performance, Reliability and Efficiency

FM-30, One Tube 10-30KW FM Transmitter

FEATURES

- **World's most powerful one-tube FM transmitter**
- ***Folded half-wave output cavity — no plate blocking capacitor or sliding contacts**
- **Microprocessor control provides 127 status and overload indications**
- **Thirteen meters including 4 multi-function meters**
- **Synthesized FX-30 exciter with extremely low distortion**
- **Conservative 30 kW output**
- **High efficiency for low operating cost**
- **Elegant styling**
- **FCC type accepted**
- **Canada DOC approval No. 131-531-138**

** Patented*



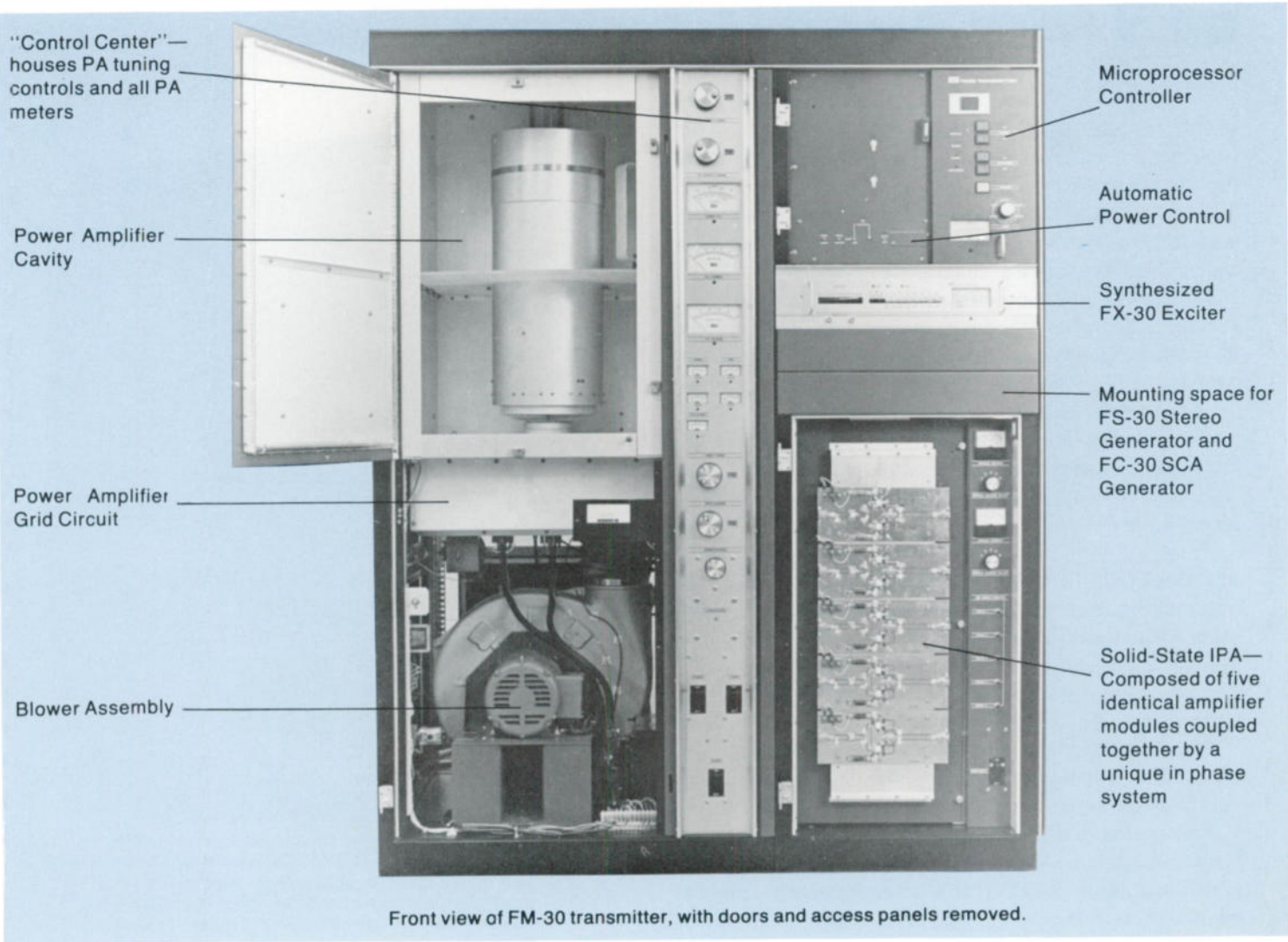
The Power Amplifier in the FM-30 transmitter employs a half-wavelength folded tank circuit, which eliminates the plate blocking capacitor and all sliding contacts in the output circuit.

THE NEW FM-30 TRANSMITTER — The single-tube FM-30 incorporates a unique *folded half-wave cavity power amplifier design, digitally programmed FX-30 ultra-linear exciter and, for the first time in a broadcast transmitter, a microprocessor based control system. With these innovative engineering advances, Broadcast Electronics has produced a transmitter for the optimum in FM performance, reliability, diagnostic capability, and efficiency.

INNOVATIVE POWER AMPLIFIER DESIGN — Broadcast Electronics' experienced engineering group has created the first truly unique power amplifier design since the beginning of FM broadcasting. The new high power cavity employs a *half-wavelength folded tank circuit. This new cavity design eliminates the blocking capacitor and all sliding contacts in the plate circuit. The result is much higher reliability, higher efficiency and lower maintenance costs.

The high gain amplifier has inherent second harmonic suppression with less power lost at the fundamental frequency, yielding higher PA efficiency. For the first time, it is possible to efficiently produce 30 kW of output power with a solid-state driver.

All PA tuning and loading adjustments are conveniently located front panel controls. The harmonic filter is located external to the transmitter.



Front view of FM-30 transmitter, with doors and access panels removed.

EFFICIENT SINGLE TUBE DESIGN — The FM-30 uses a single, efficient, high gain Eimac 8990/4CX20000A tetrode to provide 30 kW power output on any frequency between 87.5 and 108 MHz. The tetrode operates in a high-gain, grid-driven configuration.

Plate efficiency of the final amplifier approaches 80% at 30 kW output, resulting in comparatively low power consumption. The FM-30 single tube design provides savings in both operating and maintenance costs.

A completely new grid input circuit optimizes the impedance transformation between the solid-state driver and the power tube grid. This novel design takes advantage of the true power gain capability of the Eimac 8990/4CX20000A tetrode. Installation and removal of the power tube, from the front of the transmitter, is a quick, simple procedure in the FM-30.

SOLID-STATE IPA — The solid-state IPA assembly in the FM-30 transmitter is composed of five identical amplifier modules (one used as a driver for the other four) coupled together by a unique "in phase" system of hybrid combiners/splitters.

Failure of any one of the four output IPA modules will cause approximately a 15 percent power reduction, and in the event of two modules failing the transmitter will still provide more than 50% of rated output power.

Since all five modules in the IPA are identical, only one type of spare module is necessary, thus reducing maintenance costs. In addition, any one of the four amplifier modules could be used to replace the pre-driver module should the need ever arise.

FM-30, One Tube 10-30KW FM Transmitter

MICROPROCESSOR CONTROL/DIAGNOSTICS — All transmitter control and status functions in the FM-30 are performed by a built-in microprocessor controller. This microprocessor controller is the "brain" that monitors the transmitter operating parameters and then determines what control actions are necessary.

By its continuous scanning action, the microprocessor controller provides diagnositc indications, on two seven segment LED displays. Status indications appear on individual LED's. This gives the transmitter operator more information for use in troubleshooting and day-to-day transmitter operation. The system is so simple that no "computer" experience is necessary to operate the FM-30.

Automatic recycling/overload protection is also provided in the FM-30.

AUTOMATIC POWER CONTROL — An advanced automatic power control system (APC) maintains constant RF output power regardless of fluctuations in primary AC line voltage or changes in the RF drive level. The regulated set point can be changed by remote control and is retained in a non-volatile memory.

An external signal can be used to switch the FM-30 into a separate "Preset Power" mode for minimal power consumption during an emergency.

A proportional VSWR foldback system protects the PA from overloads by automatically reducing output power to a safe operating level if the antenna system presents a mismatch, such as during icing conditions.

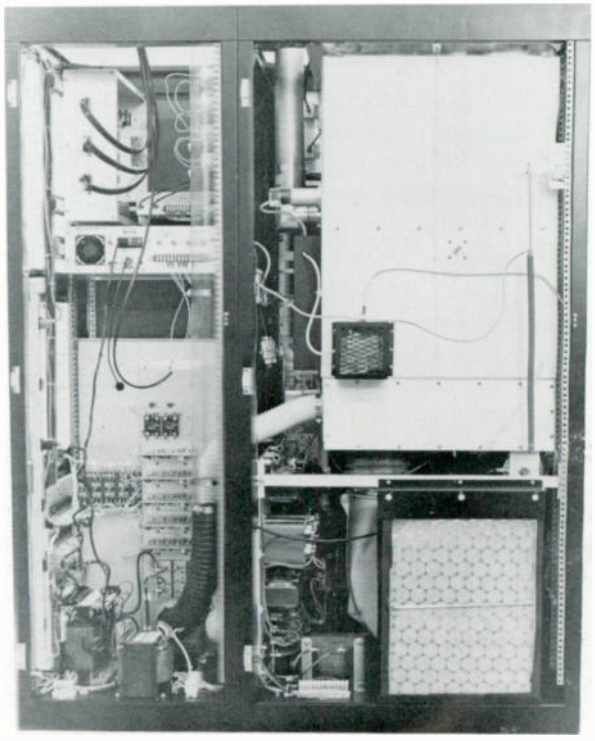
Each time the transmitter is activated a "soft-start" circuit automatically raises the power from zero to the nominal operating level. At turn-on, this feature allows the transmitter to assume a safe operating level under high VSWR conditions without overloading.

AUTOMATIC AC RESTART — In the event of a momentary AC power failure, full operation is resumed immediately. If the A.C. power is lost for a more prolonged period, the transmitter automatically goes through the regular filament warm-up period before high voltage is applied.

REMOTE CONTROL — The FM-30 transmitter is designed so that all necessary operating functions can be remote controlled. The control logic circuitry used in the transmitter can interface directly with most modern remote control and ATS systems.

COMPACT SIZE — The entire FM-30 transmitter, excluding the HV power supply, is contained in two low-profile cabinets only 5'10" tall (177. 8 cm) for easy access to components. Only 12½ square feet of floor space are required.

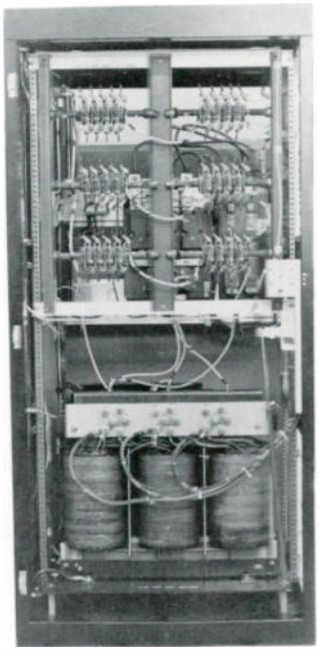
All transmitter control and status functions in the FM-30 transmitter are performed by a built-in microprocessor controller (upper right part of photo). The advanced design Model FX-30 exciter is in the lower portion of the photo. Both units slide out for easy access.



Rear view of FM-30 transmitter, with doors removed.

HIGH VOLTAGE POWER SUPPLY — The HV plate supply of the FM-30 is contained in a separate transmitter-matching cabinet. This cabinet may be located next to the power amplifier cabinet, or located separately almost anywhere in the transmitter building. Step-start minimizes peak inrush currents.

The plate transformer has multiple taps to accommodate a wide range of AC inputs. (from 195 V to 433 V, 50 Hz or 60 Hz as ordered).



Rear view of HV Power Supply Cabinet with back door removed.

CONTROL CENTER — The convenient vertical "Control Center" is centrally located between the exciter/driver cabinet and the power amplifier. This operational control assembly houses the PA tuning controls and all PA meters. These meters can be easily removed from the front of the transmitter.

EXTENSIVE METERING — The FM-30 provides more metering and diagnostic indications than any other FM transmitter.

The power amplifier alone has 8 meters located in the vertical "Control Center" panel. All amplifier tuning controls are also conveniently arranged in the "Control Center".

Three individual multi-function meters are used in the IPA stage, and the FX-30 exciter has its own built-in metering. There are a total of 13 meters, including 4 multi-functional meters, giving the FM-30 Transmitter extensive metering capability.

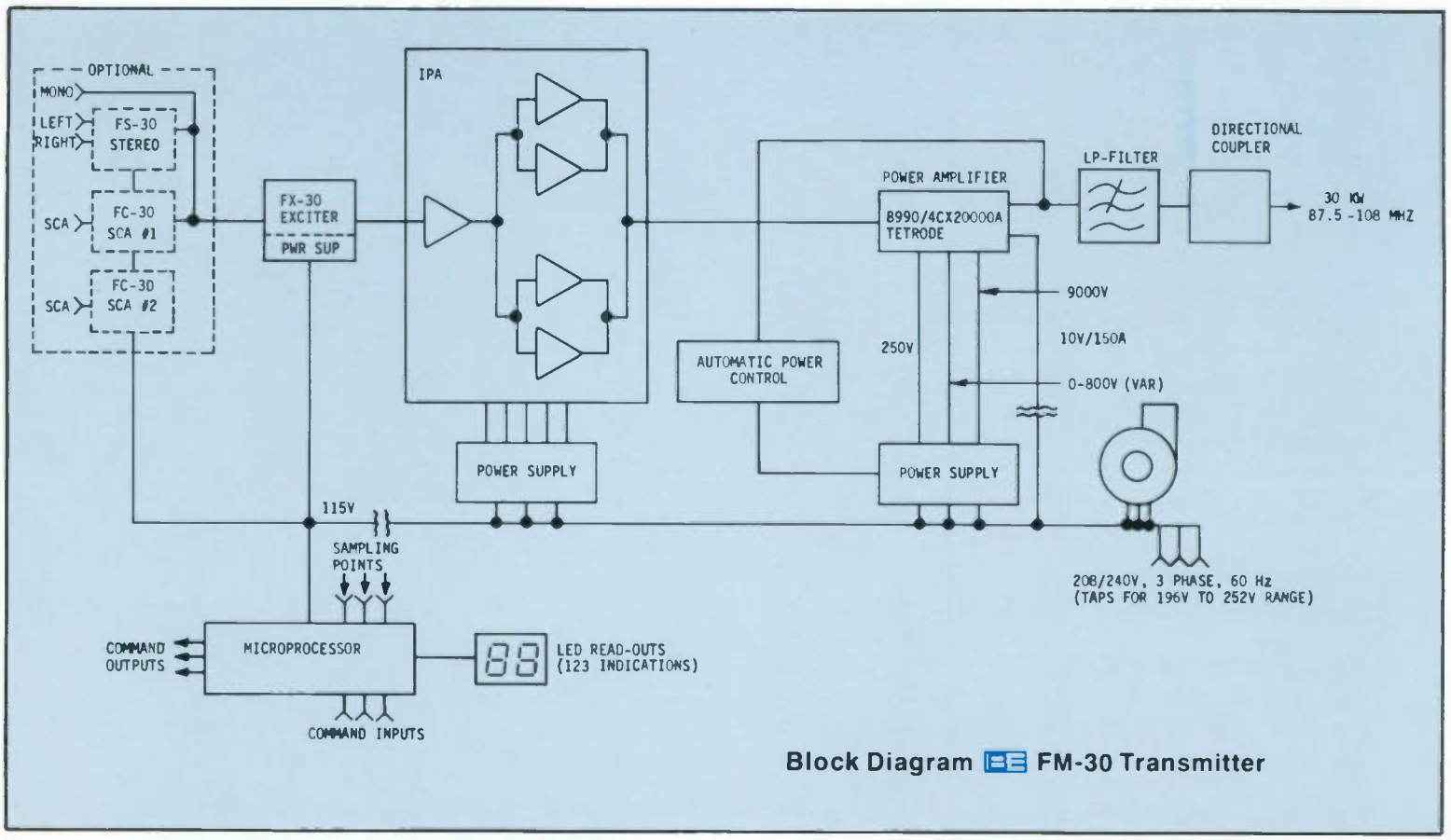
Vertical Control Center in FM-30 is located between exciter/driver cabinet and power amplifier.

ELEGANT STYLING — The elegant styling of the FM-30 complements its outstanding electrical design. Housed in an attractive BE blue cabinet with anodized aluminum "Control Center" and exciter, the FM-30 will enhance the appearance of any broadcast station environment.

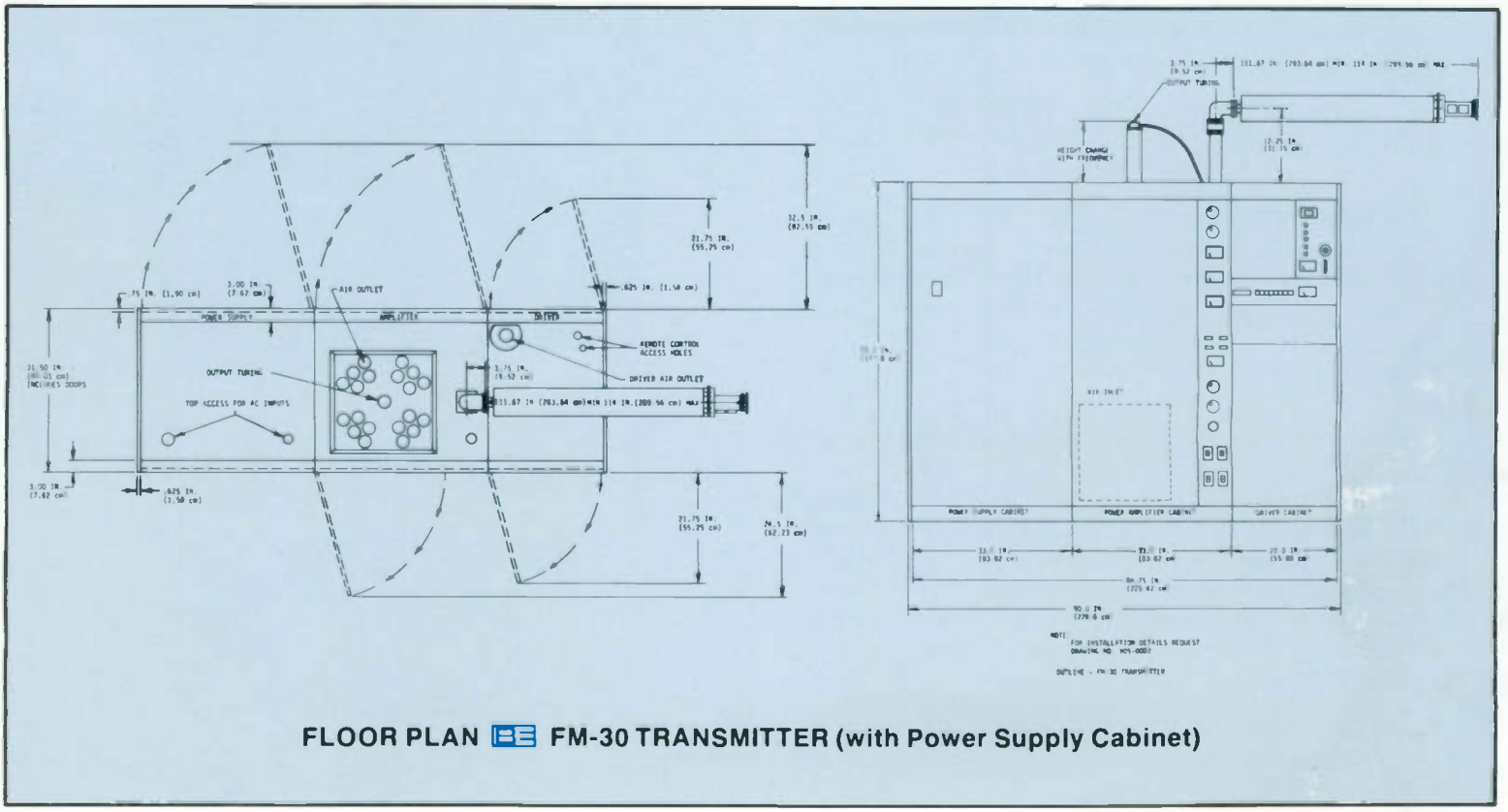
FM-30 TRANSMITTER ACCESSORIES — Accessories available for the FM-30 include the 909-0103 Extended Local Control Panel illustrated to the right. Factory installed options such as a 2 kW filament voltage regulator, 3 phase voltage metering, half power cutback, loss of phase detector, and others are available.

Front view Extended Local Control Panel (optional).

FM-30, One Tube 10-30KW FM Transmitter

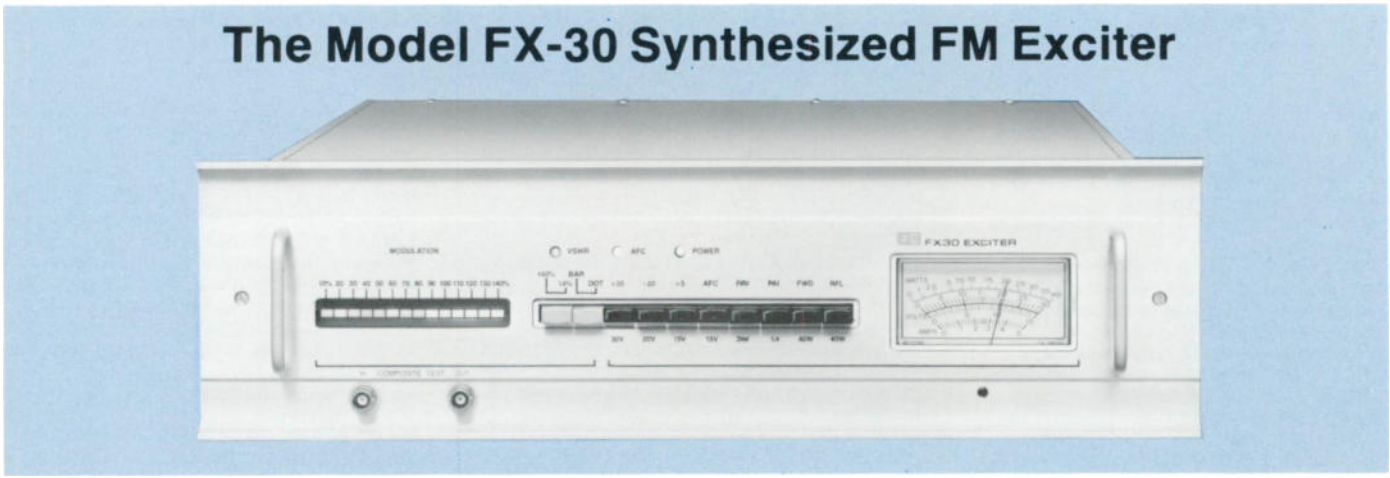


Block Diagram FM-30 Transmitter



FLOOR PLAN FM-30 TRANSMITTER (with Power Supply Cabinet)

The Model FX-30 Synthesized FM Exciter



SYNTHESIZED FX-30 EXCITER — The EE FM-30 Transmitter incorporates the advanced-design Model FX-30 exciter which is capable of more than 30 watts output. A digitally programmed frequency synthesizer permits field frequency changes in 10 KHz increments without requiring new crystals. The temperature compensated reference oscillator allows immediate on-frequency operation of the exciter without temperature controlled oven warm up. The reference frequency can be directly compared to worldwide frequency standards.

The FX-30 has extremely low distortion, with THD or IMD less than 0.05%, and it is the first FM exciter to specify Transient Intermodulation Distortion (TIM) at less than 0.1%.

An ultra linear modulated oscillator provides minimum intermodulation of base band frequency components providing superior stereo and SCA performance.

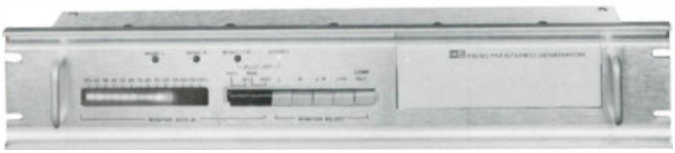
The solid-state FX-30 exciter is completely broad band and requires no tuning adjustments for a conservative 30 watt output.

Dual speed phase lock loop circuitry permits very fast lock up of the carrier frequency and greatly improved low frequency response. Automatic control eliminates periodic adjustments after initial setup. The exciter output is stabilized and fully protected.

The FX-30 is mounted as a slide out assembly making all components accessible for easy servicing and fits a standard 19" EIA width rack occupying only 5¼" of vertical rack space.

The FX-30 accepts multiple wideband composite inputs as well as a 600 ohm balanced input. When used for wideband, stereo or monaural operation, EE's FX-30 exciter produces a distinctively clean and superb FM sound.

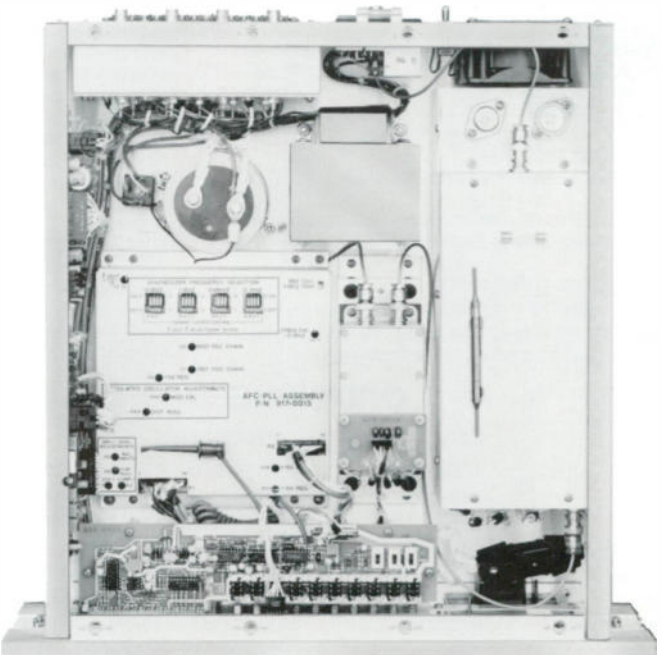
MODEL FS-30 STEREO GENERATOR



OPTIONAL STEREO/SCA GENERATOR — In the FM-30 Transmitter, rack mounting space is provided below the FX-30 Exciter to mount the FS-30 Stereo Generator and the FC-30 SCA Generator. These EE units are available as optional equipment.

DIGITAL DESIGN — In the FS-30 Stereo Generator, a digital modulator and pilot generator offer absolute pilot phase stability without adjustment and eliminates troublesome distortion products. The result is a virtually perfect baseband that is an order of magnitude better than previous standards.

OTHER FEATURES — The FS-30 Stereo Generator includes linear, delay equalized audio low pass filters for minimum overshoot without the use of clippers or other non-linear devices. Also standard in the FS-30 are front panel LED peak reading modulation status display, RFI protection and remote control capability.



Top view of the FX-30 Exciter with the cover removed. The FX-30 is mounted on slides for easy access to all sub assemblies, even while the unit is operating.

FM-30, One Tube 10-30KW FM Transmitter

TECHNICAL SPECIFICATIONS

GENERAL

POWER OUTPUT: 30kW (from 10kW to 30kW).
FREQUENCY RANGE: 87.5 to 108 MHz, tuned to specified operating frequency. Exciter programmable in 10kHz increments.
RF OUTPUT IMPEDANCE: 50 ohms (others on special request).
OUTPUT CONNECTOR: 3⅛" EIA flange.
VSWR: 1.8:1 maximum (will operate into higher VSWR with automatic power reduction).
FREQUENCY STABILITY: ±300Hz, 0° to 50°C, temperature compensated crystal oscillator.
TYPE OF MODULATION: Direct frequency modulation of carrier frequency.
MODULATION CAPABILITY: Greater than ±200 kHz.
MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.
EXCITER: Solid state, 30 watt output, Model FX-30; incorporates digitally programmed synthesizer (10kHz increments).
PRE-EMPHASIS: FCC 75uS, CCIR 50uS (where specified), or 25uS (Dolby).
ASYNCHRONOUS AM S/N RATIO: 55dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (no FM modulation present).
SYNCHRONOUS AM S/N RATIO: 40dB below reference carrier with 100% AM modulation @ 400Hz, 75 microsecond de-emphasis. (FM modulation ±75kHz @ 400Hz).
TUBE COMPLEMENT: 8990/4CX20000A (1).
RF HARMONICS: Supression meets all FCC/DOC requirements and CCIR recommendations.
POWER SUPPLY RECTIFIERS: Silicon.

ELECTRICAL/MECHANICAL

AC INPUT POWER: 208V WYE/240V Delta 60Hz, three phase. (Taps for 196 to 252V). (Other voltages and line frequencies are available upon request).
POWER CONSUMPTION: 50kW @ 30kW output.
SIZE: Transmitter (excluding HV supply) 56.5" W (143.5 cm) × 70" H (177.8 cm) × 31.5" D (80.0 cm). HV power supply cabinet: 34.5" W (87.6 cm) × 70" H (177.8 cm) × 31.5" D (80.0 cm).
WEIGHT & CUBAGE: Transmitter (excluding HV supply): 1500 lbs. (682 kg); packed 1750 lbs. (795 kg.); 72 cu. ft. (2 cu. meters). HV Power Supply 1200 lbs. (545 kg); packed 1250 lbs. (568 kg); 44 cu. ft. (1.25 cu. meters).
ALTITUDE: 7500 feet.
AMBIENT TEMPERATURE RANGE: −10°C to +50°C.
FINISH: BE blue with anodized aluminum control center panel and anodized aluminum trim.

*MONAURAL OPERATION

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode supression.
AUDIO INPUT LEVEL: ±10 dBm nominal for ±75 kHz deviation @ 400 Hz.
AUDIO FREQUENCY RESPONSE: ±0.5 dB 30 Hz to 15 kHz, selectable flat, 25, 50 or 75 microsecond pre-emphasis.
HARMONIC DISTORTION: 0.08% or less 30 Hz to 15 kHz.
INTERMODULATION DISTORTION: 0.08% or less, 60 Hz/7 kHz, 4:1 ratio.
TRANSIENT IMD: 0.1% or less (square wave/sine wave).
FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 microsecond de-emphasis.

*WIDEBAND COMPOSITE OPERATION (Thru FM-30 using FX-30)

COMPOSITE INPUTS: 3 total, (1) unbalanced and (1) balanced plus front panel test. BNC connectors.
COMPOSITE INPUT IMPEDANCE: 10 k ohm, nominal, resistive.
COMPOSITE INPUT LEVEL: 3.5 VP-P nominal, for ±75 kHz deviation.
COMPOSITE FM S/N RATIO: 75 dB below ±75 kHz deviation @ 400 Hz (78 dB typical). Measured in a 30 Hz to 100 kHz bandwidth with 75 microsecond de-emphasis.
COMPOSITE HARMONIC DISTORTION: 0.08% or less (.04% typical).
COMPOSITE INTERMODULATION DISTORTION: 0.08% or less (.04% typical).
COMPOSITE TRANSIENT IMD: 0.1% or less (square wave/sinewave).
COMPOSITE AMPLITUDE RESPONSE: ±0.1 dB, 30 Hz to 53 kHz.
COMPOSITE PHASE RESPONSE: ±0.5° from linear phase 30 Hz to 53 kHz.
COMPOSITE GROUP DELAY: 390 nanoseconds +25 nanoseconds, 30 Hz to 53 kHz.
COMPOSITE SLEW RATE: 12 V/microsecond (symmetrical).

*STEREO OPERATION (Thru FM-30 using FS-30 Stereo Generator)

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, floating. (Adaptable to other impedances).
AUDIO INPUT LEVEL: +10 dBm, ±1 dB for 100% modulation @ 400 Hz. (Adaptable to other input levels).
AUDIO INPUT FILTER: 15 kHz LPF with delay equalization for minimum overshoot.
FREQUENCY RESPONSE: ±0.5 dB, 30-15,000 Hz, 75 usec pre emphasis (flat, 25 or 50 usec pre-emphasis selectable).
TOTAL HARMONIC DISTORTION: 0.08% or less, 30-15,000 Hz.
INTERMODULATION DISTORTION: 0.08%, 60 Hz/7 kHz; 4:1 ratio.
TRANSIENT INTERMODULATION DISTORTION: 0.1% (Square wave/sine wave).
FM NOISE: 72 dB or better below 100% modulation @ 400 Hz, 75 usec de emphasis.
STEREO SEPARATION: 45 dB or better; 30-15,000 Hz (sine wave).
DYNAMIC STEREO SEPARATION: 40 dB or better; 30-15,000 Hz (normal program content).
LINEAR CROSSTALK: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30-15,000 Hz, 45 dB minimum below 100% modulation.
NON-LINEAR CROSSTALK: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation.
38 kHz SUPPRESSION: 70 dB minimum below 100% modulation.
PILOT STABILITY: ±0.5 Hz, 0° to 50°C.
MODES: Stereo, Mono L+R, Mono (L) and Mono (R) remote controlled (See FS-30 data sheet for full details).

*SCA OPERATION (Thru FM-30 using FC-30 SCA Generator)

MODULATION: Direct FM
SUBCARRIER FREQUENCY: 67 kHz (39 to 95 kHz to order).
SUBCARRIER FREQUENCY STABILITY: ±0.5% (330 Hz @ 67 kHz) 0° - 50°C.
SUBCARRIER HARMONIC CONTENT: Less than 0.3%.
SUBCARRIER ENVELOPE DECAY: Greater than 100 msec. from 90% to 10% subcarrier levels.
MODULATION CAPABILITY: ±20% of subcarrier frequency.
AUDIO INPUT IMPEDANCE: 600 ohm balanced resistive.
DATA INPUT IMPEDANCE: 75 ohm unbalanced resistive DC coupled.
INPUT LEVELS: (Audio) Adjustable, +10 dBm to −10 dBm for ±6 kHz deviation @ 400 Hz. (Data) Adjustable, 1.0 to 4.0 V p-p for ±6 kHz deviation (D.C. coupled).
PREEMPHASIS: (Audio) 150 microseconds standard (75 usec with internal jumper). (Data) no pre-emphasis.
FREQUENCY RESPONSE: (Audio) ±0.5 dB 10-10,000 Hz, exclusive of audio low-pass filter. (Data) ±0.5 dB, dc-10,000 Hz.
AUDIO LOW-PASS FILTER: Sixth order, −3 dB @ 4.3 kHz, standard (resistor changes for other values).
DATA LOW-PASS FILTER: Same as AF filter or may be bypassed.
TOTAL HARMONIC DISTORTION: Less than 0.5% throughout AF pass band.
INTERMODULATION DISTORTION: Less than 0.5%, 60Hz/7kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed). Typical 0.1%.
CROSSTALK SCA TO STEREO: −60 dB or better below 100% modulation of left or right. 75 usec de-emphasis.
CROSSTALK STEREO TO SCA: −50 dB or better below +6 kHz deviation of SCA using 150 usec de-emphasis and FS-30 stereo generator.
FM NOISE: 72 dB below ±6 kHz deviation @ 400 Hz (150 usec de-emphasis).
AUTO MUTING LEVEL: Adjustable from 10 to 30 dB below program level.
AUTO MUTING DELAY: Adjustable, 0.5 to 10.0 seconds.
(See FC-30 data sheet for full details).

***Through FM-30 Transmitter using Model FX-30 Exciter, FS-30 Stereo Generator and FC-30 SCA Generator as applicable.**

Specifications subject to change without notice.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-30	909-0001-1	FM-30, 30kW FM transmitter, with remote HV power supply
FM-30	909-0001	FM-30, 30kW FM transmitter, with HV power supply cabinet adjacent to PA and IPA/Exciter cabinets.
8990/4CX20000A	243-0001	Spare tube, for FM-30
Option	909-0073/74	Filament voltage regulator, 2KV, with flushing fan, factory installed
Option	909-0103	Extended local control panel with metering for FM-30 operation
Option	830-0301	Rec. Semi-conductor and Rectifier Kit for FM-30 Transmitter (includes FX-30 spares)

BROADCAST ELECTRONICS INC.
4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305 U.S.A., TELEX: 25-0142, CABLE: BROADCAST

B142CP2M583

FM-35A

BROADCAST ELECTRONICS INC.

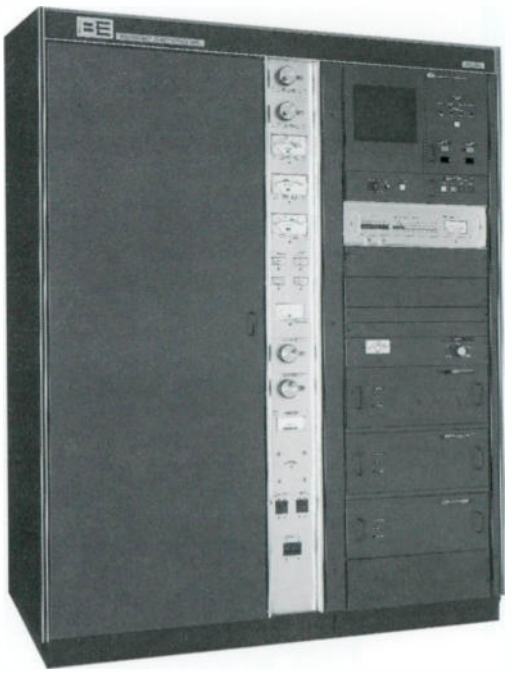
35,000 Watts Of Advanced Technology

FM-35A, 35,000 Watts Of Advanced Technology

FEATURES:

- Folded half-wave output cavity (no plate blocking capacitors or sliding contacts)*
- Single tube design
- Broadband solid-state IPA's
- Eleven meters including two multi-function meters
- Quiet operation
- Automatic proportional VSWR foldback
- Optional microprocessor video diagnostic system. (MVDS)
- Synthesized, low distortion FX-30 exciter
- Advanced transmitter controller
- High efficiency for low operating cost

* patented



The Power Amplifier in the FM-35A transmitter employs a folded half-wave cavity, which eliminates the plate blocking capacitor and all sliding contacts in the output circuit.

THE NEW MODEL FM-35A TRANSMITTER — Broadcast Electronics' FM-35A single tube, thirty-five kilowatt transmitter represents a true technological advancement in FM transmitter design. The FM-35A is a full featured transmitter including state of the art innovations such as the folded half-wave output cavity*, an optional MVDS (Microprocessor Video Diagnostic System), modular slide-out IPA's, a modular Automatic Power Control, and an extremely quiet air cooling system.

INNOVATIVE POWER AMPLIFIER DESIGN — The power amplifier section of the FM-35A employs a patented folded half-wave output cavity. This unique design innovation completely eliminates troublesome plate blocking capacitors and sliding contacts.

A patented second harmonic suppressor is also integrated into the folded half-wave cavity. An external low pass filter (with directional output couplers) ensures compliance with FCC, Canadian DOC, and CCIR recommendations.

All PA adjustments are performed through front panel controls with counters. A grounded bellows provides the fine tuning while a grounded loop couples to the antenna. This careful attention to grounding yields the added benefit of improved lightning immunity.

EFFICIENT SINGLE TUBE (4CX20,000C) DESIGN
The FM-35A uses a single high gain Eimac 4CX20,000C tetrode to produce 35 kW to 38 kW of RF power on any frequency between 87.5 and 108 MHz. The 4CX20,000C is fundamentally identical to the 4CX20,000A/8990 with the exception of its higher anode voltage rating. The 4CX20,000C features the highest emission capability and the largest physical size of ANY tube in the Eimac 20,000 family. This translates into longer operating life and overall durability in the FM-35A.

In addition, the high plate efficiency of the 4CX20,000C at the 35 kW output level results in surprisingly low power consumption. In fact, the 4CX20,000C has a lower overall cost of operation and maintenance than other triodes and tetrodes of the same power class.

A new grid circuit in the FM-35A design takes advantage of the power gain capability of the Eimac tetrode while providing maximum signal bandwidth. Installation or removal of the power tube can be performed from the front of the transmitter and is easily accomplished within minutes. With the FM-35A's broadband screen neutralizing technique, neutralization re-adjustment is normally unnecessary when changing tubes.

HIGH VOLTAGE POWER SUPPLY — The HV plate supply for the FM-35A is contained in a separate matching cabinet. The power supply may be positioned next to the power amplifier, or it may be located elsewhere within the transmitter building.

The three phase plate transformer has multiple taps to accommodate a wide range of AC inputs (195V to 433V, 50 or 60 Hz as ordered). The power supply also features "step-start" to minimize peak in-rush currents. Automatic loss-of-phase protection is also standard in the FM-35A.

CONTROL CENTER — The convenient vertical control center is centrally located between the exciter/driver cabinet and the power amplifier. This operational control panel contains the PA tuning controls and all PA meters. Independent metering allows observation of all important PA parameters at a glance. An elapsed time indicator and an "iron vane" true RMS filament voltmeter are included.

The PA output meter is conveniently located adjacent to the output loading and tuning controls. Separate metering monitors the IPA stage while the FX-30 has its own built-in metering. There are a total of eleven meters in the FM-35A including two multi-function meters.

FM-35A OPTIONS — Factory installed optional equipment available for the FM-35A include the Microprocessor Video Diagnostic System, filament voltage regulator, and three phase RMS voltage metering.

Front view of FM-35A with doors open and IPA drawers partially pulled out.

BROADBAND SOLID-STATE DRIVER/IPA — The output of the FX-30 exciter is boosted to about 70 watts by a solid-state Power FET pre-driver stage. A hybrid splitter network feeds two identical solid-state IPA modules, the outputs of which are combined to produce the drive level necessary to power the PA stage. (approximately 400 watts at the 35 kW level) Each of the IPA/Driver assembles are self contained and accessible through front access, slide-out drawers. LED indicators display forward power, VSWR, and overtemperature conditions. The IPA design is broadband, requires no tuning over the entire FM band, and features extreme stability under all operating conditions.

SOLID-STATE CONTROL/DIAGNOSTICS — Transmitter protection and control functions in the FM-35A use state-of-the-art CMOS logic. Great care has been taken to build in extensive input/output control line filtering and optical isolation for trouble-free operation — even in high RF level environments.

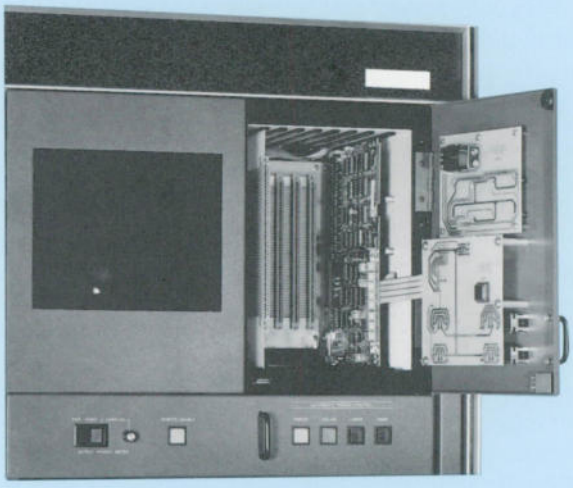
THE MVDS (Microprocessor Video Diagnostic System) is available as an option for the FM-35A. MVDS is a "smart" diagnostic system designed to give informative operational status and fault condition reports on an eye-level video display. See the MVDS section for a full explanation of this useful option.

FM-35A, One Tube 35 kW FM Transmitter

AUTOMATIC POWER CONTROL — An advanced automatic power control (APC) system maintains constant RF output power with limited fluctuations of AC line voltage or RF drive level. The regulated set point can be changed by remote control and is retained in non-volatile memory. In addition, an external signal can be used to switch the FM-35A into a separate "Preset Power" mode for lower power consumption during emergencies. A sophisticated proportional servo system provides fast correction of output power changes without overshoot. The entire APC system is mounted in slide-out drawers with non-volatile memory maintained by a battery backup.

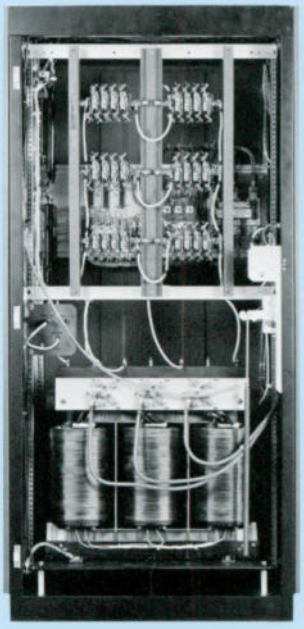
PROPORTIONAL VSWR FOLDBACK — A proportional VSWR foldback system protects the PA by automatically reducing power to safe levels until the mismatch condition can be corrected.

Each time the transmitter is activated, a "soft start" circuit gradually increases power from zero to nominal. This allows the FM-35A to assume a safe operating level under high VSWR conditions without overloading. This field proven proportional VSWR foldback system was originally pioneered by Broadcast Electronics in 1980.

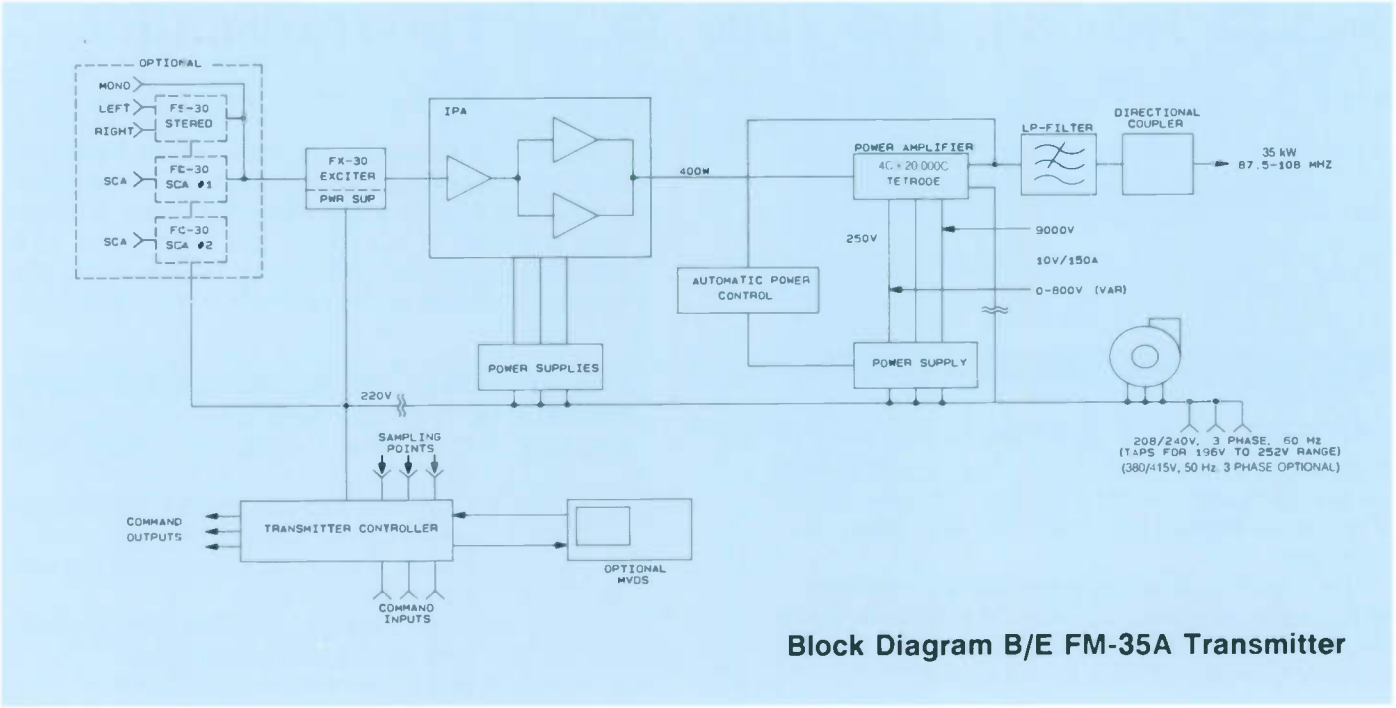


All transmitter control and status functions in the FM-35A transmitter are performed by a built-in digital controller (upper right part of photo).

Vertical Control Center in FM-35A is located between exciter/driver cabinet and power amplifier.



Rear view of HV power supply cabinet with back door removed.

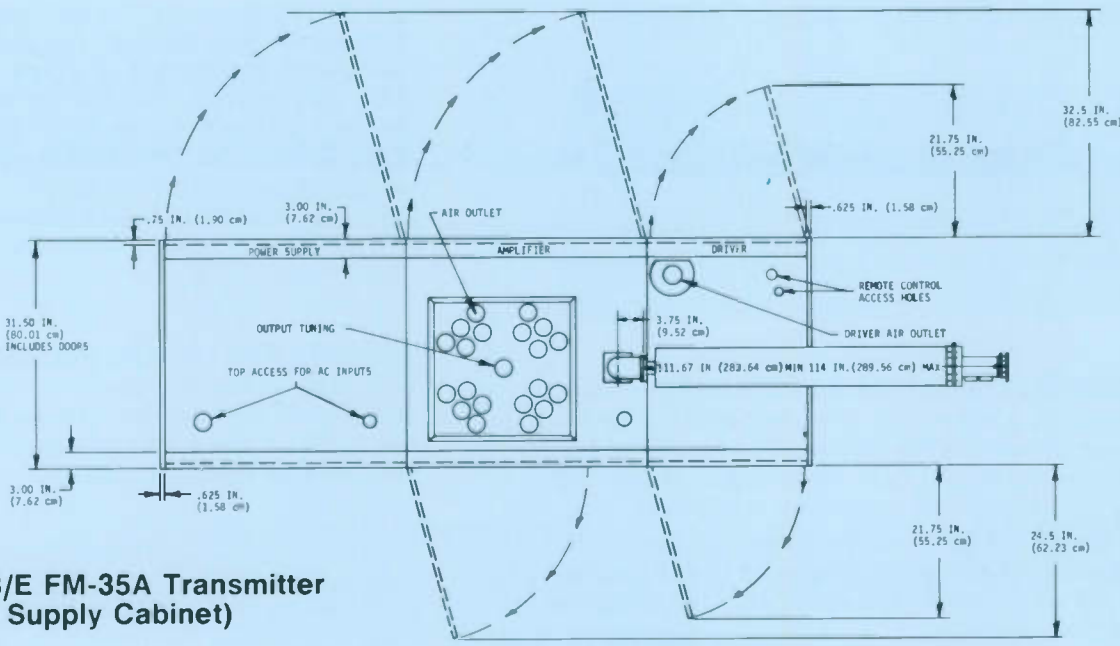


Block Diagram B/E FM-35A Transmitter

AUTOMATIC AC RESTART — In the event of a momentary (less than one second) AC power failure, the FM-35A will return to the air immediately. If AC power is lost for a more prolonged period, the FM-35A will automatically perform the regular filament warm-up before applying high voltage.

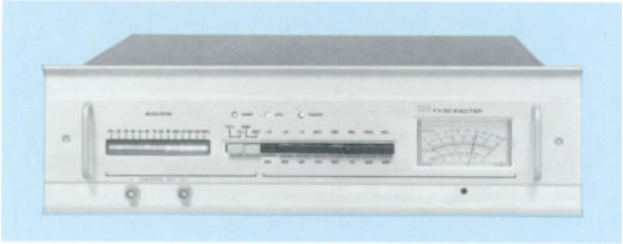
REMOTE CONTROL — The FM-35A is designed for easy remote control through momentary contact closures. The control logic circuitry used in the transmitter can interface directly with most modern remote control and ATS systems.

COMPACT SIZE/EFFICIENT AIR COOLING SYSTEM — The entire FM-35A transmitter, excluding the HV power supply, is contained in two low-profile cabinets. The blower and driver cabinet flushing fans feature air filters which are replaceable while the transmitter is operating. Positive cabinet pressure assures that only filtered air will enter the cabinet.



Floor Plan B/E FM-35A Transmitter (with Power Supply Cabinet)

FM-35A, One Tube 35 kW FM Transmitter



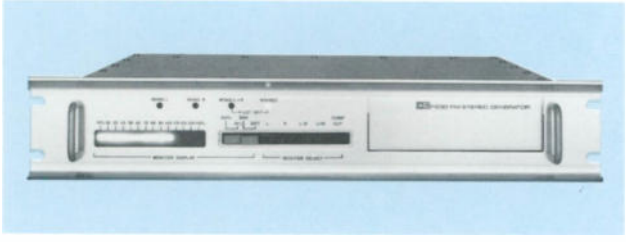
SYNTHESIZED FX-30 EXCITER — The FM-35A transmitter incorporates the highly acclaimed, advanced-design, model FX-30 exciter. The FX-30 features extremely low harmonic and intermodulation distortion.

The FX-30's ultra-linear modulated oscillator is specifically designed to provide minimum intermodulation of base band frequency components for superior stereo and SCA performance.

EXCITER POWER AMPLIFIER - 30 WATTS — The FX-30's RF power amplifier is fully VSWR protected, even up to its full output rating.

The FX-30 is mounted as a slide-out assembly with an easy to remove top cover allowing accessibility to all components. Full front panel metering and internal diagnostic LED's indicate the operating status of the unit.

Five audio and composite inputs are provided on the rear panel. The FX-30 accepts multiple wideband composite inputs as well as a 600 ohm balanced input. When used for stereo operation, the FX-30 produces a clean, dynamic FM sound.



OPTIONAL STEREO/SCA GENERATORS — Rack mounting space is provided below the FX-30 exciter to mount the model FS-30 Stereo Generator and up to two model FC-30 SCA Generators. These B/E units are available as accessory equipment.

In the FS-30 Stereo Generator, a digital modulator and pilot generator offer pilot phase stability without adjustments and eliminates troublesome distortion products.

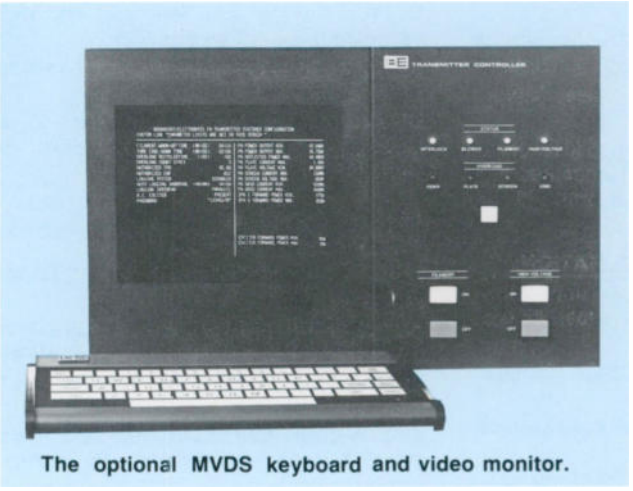
The FS-30 also includes linear, delay-equalized audio low pass filters for minimum overshoot without the use of clippers or other non-linear devices. Also standard in the FS-30 is a front panel LED peak-reading modulation display, built-in composite equalization, and remote control mode switching.

THE OPTIONAL MICROPROCESSOR VIDEO DIAGNOSTIC SYSTEM (MVDS) —

Features:
- Calculates efficiency, dissipation, and ERP
- Converts multiple meter readings to bar-graph or tabular display
- Preset limit violations clearly indicated in reverse video
- Automatically displays the location and nature of a malfunction
- Bar-graph display of PA/IPA parameters
- Automatic logging output capability
- Remote monitoring via modem, telco lines, or SCA
- Operates independently of primary controller — cannot affect basic "on-air" support systems.

IMPROVED ON-AIR RELIABILITY — The addition of the MVDS to the FM-35A provides not only the diagnostic system functions, but also redundant, automatic transmitter control which enhances overall on-air reliability. When the MVDS is selected to control the transmitter, it does so by communicating through the primary transmitter controller. If MVDS is disabled in any way, control automatically returns to the primary controller WITHOUT ANY INTERRUPTION IN TRANSMISSION. The MVDS option even has its own independent power supply. This prevents any catastrophic MVDS failure from affecting the other transmitter systems — including the primary controller.

VERSATILE KEYBOARD PROGRAMMING — The keyboard allows the customer to set time, select the desired CRT screen display, set or re-program the limits of the monitored parameters, and activate various system options.



The optional MVDS keyboard and video monitor.

Three distinct display screens are keyboard selectable . . .

NORMAL DISPLAY: The normal display includes date and time; plate, screen, and grid voltages and currents; calculated plate efficiency; exciter/IPA forward and reflected power; IPA voltage/current; transmitter power output; and calculated ERP. Parameters that exceed preset limits are displayed in reverse video. A condition/diagnosis line displays the conditon of the transmitter and the diagnosis for that condition. It also displays the times and causes of carrier interruptions.

LINEAR BAR-GRAPH DISPLAY: The bar-graph display is especially useful for "peaking" or "nulling" various parameters during transmitter set-up as well as for tuning for optimum overall performance. It continuously and simultaneously provides both linear bar-graph and digital displays of PA forward/reflected powers; calculated plate efficiency; plate, screen, and grid currents; and IPA forward/reflected power.

CUSTOMER CONFIGURATION DISPLAY: The customer configuration screen allows the user to establish and customize system options and "min/max" limits for the monitored parameters. Access is by entry of an eight character password. This prevents system changes by unauthorized persons.

LOGGING BY PRINTER — The normal display screen information may be logged on an inexpensive home computer printer. Logging may be initiated by simple keyboard command or may be programmed to occur automatically at periodic intervals. The normal display screens may be viewed remotely through the use of modems and terminals, via telephone line, or SCA subcarrier interconnection. Should an overload condition occur while an operator is not present, the "anticipatory logging" feature of the MVDS will capture vital diagnostic data milliseconds before the outage takes place. This data will be sent to the printer at the next available opportunity after normal transmitter operation is resumed. (or on demand via wire link)

REMOTE VIDEO MONITORING — The display screen video information may be fed over coaxial cable to local composite video monitors over a distance of up to one thousand feet.

ORDERING INFORMATION

MODEL	STOCK NO.	DESCRIPTION
FM-35A	909-0035-200	FM-35A single tube broadcast transmitter for operation on one specified frequency between 87.5 and 108 MHz 208 V / 240 V, 60 Hz 3-wire three phase power source. HV power supply cabinet ATTACHED to PA cabinet. Includes FX-30 Exciter.
FM-35A	909-0035-380	Same as above except for 380/415 V, 50 Hz 3 phase.
FM-35A	909-0035-201	FM-35A single tube broadcast transmitter for operation on one specified frequency between 87.5 and 108 MHz. 208 V / 240 V, 60 Hz 3-wire three phase power source. REMOTE HV power supply cabinet. Includes FX-30 Exciter.
FM-35A	909-0035-381	Same as above except for 380/415 V, 50 Hz 3 phase.
Factory Installed Options:		
MVDS	909-0091-006	Optional Microprocessor Video Diagnostic System, factory installed in FM-35A transmitter. (Must be ordered with transmitter)
	909-0112	Optional filament voltage regulator (60 Hz) Factory Installed
	909-0113	Optional three phase AC voltmeter Factory Installed

TECHNICAL SPECIFICATIONS—MODEL FM-35A TRANSMITTER

GENERAL

POWER OUTPUT: 35 kW (10 kW to 38.5 kW)

FREQUENCY RANGE: 87.5 to 108 MHz., tuned to specific operating frequency. Exciter programmable in 10 kHz. steps.

RF OUTPUT IMPEDANCE: 50 ohms (others on special request)

OUTPUT CONNECTOR: 3 1/8 inch EIA flange

VSWR: 1.8:1 maximum. (will operate into higher VSWR with automatic power reduction.

FREQUENCY STABILITY: ±300 Hz., 0 to 50 Degrees C.

TYPE OF MODULATION: Direct frequency modulation of carrier frequency.

MODULATION CAPABILITY: Greater than ±200 kHz.

MODULATION INDICATION: Peak reading, color coded, LED display with baseband overmodulation indicator.

EXCITER: Solid state, 30 watt output, model FX-30; incorporating a digitally programmed synthesizer. (10 kHz. increments)

PRE-EMPHASIS: FCC 75 uS, CCIR 50 uS (where specified) or 25 uS (Dolby)

ASYNCHRONOUS AM S/N Ratio: 55 dB below reference carrier with 100% AM modulation @ 400 Hz., 75 uS de-emphasis. (no FM modulation present)

SYNCHRONOUS AM S/N RATIO: 45 dB below 35 kW reference carrier with 100% AM modulation @ 400 Hz., 75 uS de-emphasis. (FM modulation ± 75 kHz. @ 400 Hz.)

TUBE COMPLEMENT: (1) 4CX20,000C

RF HARMONICS: Suppression meets all FCC/DOC requirements and CCIR recommendations.

POWER SUPPLY RECTIFIERS: Silicon

ELECTRICAL/MECHANICAL

AC INPUT POWER: 208 V WYE/240 V Delta, 60 Hz, three phase. (Taps for 196 to 252 V. Other voltages and line frequencies are available upon request).

PRIMARY POWER CONSUMPTION: Typically 51 kW (@ .94 pf) at 35 kW RF output.

OVERALL EFFICIENCY: Typically 68% (AC line input to RF output).

SIZE: (Transmitter) 56.5″ W × 31.5″ D × 70″ H (143.5 W × 80 D × 177.8″ H cm) (Power Supply) 34.5″ W × 31.5″ D 70″ H (87.6 W × 80 D × 177.8 H cm).

WEIGHT & CUBAGE: (Transmitter) 1500 lbs. (682 Kg); packed 1750 lbs. (795 Kg) 72 cu. ft. (2 cu. meters) (HV Power Supply) 1750 lbs. (794 Kg); packed 1800 lbs. (816 Kg) 44 cu. ft. (1.25 cu. meters).

ALTITUDE: 10,000 ft. @ 60 Hz (3048 M).

AMBIENT TEMPERATURE RANGE: −10 degrees C to +50 degrees C.

SOUND LEVEL: 61 dB (A-weighted), 48 dB (SIL). (Ref. 0 dB = .0002 microbar) @ one meter front center.

*MONAURAL OPERATION:

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, adaptable to other impedances, 50 dB common mode suppression.

AUDIO INPUT LEVEL: +10 dBm nominal for ±75 kHz deviation @ 400 Hz.

AUDIO FREQUENCY RESPONSE: ±0.5 dB, 30 Hz to 15 kHz, selectable flat, 25, 50, 75 microsecond pre-emphasis.

HARMONIC DISTORTION: 0.08% or less (.04% typical)

INTERMODULATION DISTORTION: 0.08% or less, 60 Hz./7 kHz., 4:1 ratio (.04% typical)

TRANSIENT IMD: 0.1% or less (square wave/sine wave)

FM S/N RATIO: 72 dB below ± 75 kHz. deviation @ 400 Hz. (75 dB typical) measured in a 30 Hz to 15 kHz bandwidth with 75 uS de-emphasis

*WIDEBAND COMPOSITE OPERATION:

COMPOSITE INPUTS: 3 total, (1) unbalanced and (1) balanced plus front panel test. All connectors BNC

COMPOSITE INPUT IMPEDANCE: 10K ohm, nominal, resistive

COMPOSITE INPUT LEVEL: 3.5 V p-p nominal, for ± 75 kHz. deviation

COMPOSITE FM S/N RATIO: 72 dB below ± 75 kHz deviation @ 400 Hz. (75 dB typical) Measured in a 30 Hz. to 100 kHz. bandwidth with 75 uS de-emphasis

COMPOSITE HARMONIC DISTORTION: 0.08% or less (.04% typical)

COMPOSITE INTERMODULATION DISTORTION: 0.08% or less (.04% typical)

COMPOSITE TRANSIENT IMD: 0.1% or less (square wave/sine wave)

COMPOSITE AMPLITUDE RESPONSE: ± 0.1 dB, 30 Hz to 100 kHz

COMPOSITE PHASE RESPONSE: ± 0.5 degrees from linear phase, 30 Hz to 53 kHz

COMPOSITE GROUP DELAY: 390 nanoseconds, ± 25 nanoseconds 30 Hz to 53 kHz

COMPOSITE SLEW RATE: 12 V/microsecond (symmetrical)

*STEREO OPERATION:

AUDIO INPUT IMPEDANCE: 600 ohms balanced, resistive, floating. (Adaptable to other impedances)

AUDIO INPUT LEVEL: + 10 dBm, ± 1 dBm, for 100% modulation @ 400 Hz. (Adaptable to other input levels)

AUDIO INPUT FILTERS: 15 kHz LPF with delay equalization for minimum overshoot

FREQUENCY RESPONSE: ± 0.5 dB, 30 - 15,000 Hz, 75 uS pre-emphasis (flat, 25 or 50 uS pre-emphasis selectable)

TOTAL HARMONIC DISTORTION: 0.08% or less

INTERMODULATION DISTORTION: 0.08%, 60 Hz/7 kHz; 4:1 ratio

TRANSIENT INTERMODULATION DISTORTION: 0.1% (square wave/sine wave)

FM NOISE: 72 dB or better below 100% modulation @ 400 Hz, 75 uS de-emphasis

STEREO SEPARATION: 45 dB or better; 30 -15,000 Hz (sine wave)

DYNAMIC STEREO SEPARATION: 40 dB or better; 30 - 15,000 Hz (normal program content)

LINEAR CROSSTALK: Main to Sub/Sub to Main due to amplitude and phase matching of left and right channels, 30 - 15,000 Hz, 45 dB minimum below 100% modulation.

NON-LINEAR CROSSTALK: Main to Sub/Sub to Main due to distortion products. 70 dB minimum below 100% modulation.

PILOT STABILITY: ± 0.5 Hz, 0 to 50 degrees C.

MODES: Stereo, Mono L + R, Mono (L) and Mono (R) remote controlled. (See FS-30 data sheet for full details)

*SCA OPERATION:

MODULATION: Direct FM

SUBCARRIER FREQUENCY: 67 kHz (39 to 95 kHz to order)

SUBCARRIER FREQUENCY STABILITY: ± 0.5% (330 Hz @ 67 kHz), 0 to 50 degrees C.

SUBCARRIER HARMONIC CONTENT: Less than 0.3%

SUBCARRIER ENVELOPE DECAY: Greater than 100 msec. from 90% to 10% subcarrier levels.

MODULATION CAPABILITY: ± 20% of subcarrier frequency

AUDIO INPUT IMPEDANCE: 600 ohm balanced, resistive

DATA INPUT IMPEDANCE: 75 ohm unbalanced, resistive, DC coupled

INPUT LEVELS: (Audio) adjustable + 10 dBm to − 10 dBm for ±6 kHz deviation @ 400 Hz. (Data) adjustable 1.0 to 4.0 V p-p for ±6 kHz deviation (DC coupled)

PRE-EMPHASIS: (Audio) 150 microseconds standard (75 uS with internal jumper) (Data) no pre-emphasis

FREQUENCY RESPONSE: (Audio) ± 0.5 dB, 10 - 10,000 Hz, exclusive of audio low pass filter. (Data) ± 0.5 dB, DC - 10,000 Hz.

AUDIO LOW PASS FILTER: Sixth order, − 3 dB @ 4.3 kHz, standard (resistor changes for other values)

DATA LOW PASS FILTER: Same as AF filter or may be bypassed.

TOTAL HARMONIC DISTORTION: Less than 0.5% throughout AF pass band

INTERMODULATION DISTORTION: Less than 0.5%, 60 Hz/7 kHz; 1:1 ratio (audio pre-emphasis and LPF bypassed) typically 0.1%

CROSSTALK, SCA TO STEREO: − 60 dB or better below 100% modulation of left or right. 75 uS de-emphasis.

CROSSTALK, STEREO TO SCA: − 50 dB or better below ± 6 kHz deviation of SCA using 150 uS de-emphasis and FS-30 stereo generator

FM NOISE: 72 dB below ± 6 kHz deviation @ 400 Hz (150 uS de-emphasis)

AUTO MUTING LEVEL: Adjustable from 10 to 30 dB below program level

AUTO MUTING DELAY: Adjustable, 0.5 to 10.0 seconds
(See FC-30 data sheet for full details)

*** Through FM-35A Transmitter using model FX-30 Exciter, model FS-30 Stereo Generator, and model FC-30 SCA Generator as applicable**

Specifications subject to change without notice.

B 302 PEP 2.5K886

BROADCAST ELECTRONICS INC.
4100 N. 24th St., P.O. BOX 3606, QUINCY, IL 62305 U.S.A. TELEX: 250142, CABLE: BROADCAST, PHONE (217) 224-9600

FM TRANSMITTING EQUIPMENT

FM-300A
300 Watt
FM Transmitter

FEATURES

- **100% solid state**
- **Synthesized exciter, programmable in 10 kHz increments, 87.5 to 108 MHz**
- **Accepts monaural, stereo composite, and SCA audio or data**
- **Remote control interface through momentary contact closures**
- **194-266 VAC, 50/60 Hz, single phase operation**
- **Fully metered**

EQUIPMENT DESCRIPTION

The Broadcast Electronics Model FM-300A high-performance, solid state FM transmitter delivers 300 watts RF output power on a specific frequency in the 87.5 to 108 MHz range.

This 300 watt FM transmitter combines dual solid state power amplifiers driven by the FX-30 synthesized exciter which is the industry-acclaimed standard for the ultimate in signal fidelity and frequency stability. A low pass RF filter, housed within the transmitter cabinet enclosure, insures harmonic-free operation.

PA voltage and current, as well as RF forward/reflected power are monitored by easily-read, 3.5-inch front panel meters. Fully buffered DC samples of the meter readings are provided for remote metering purposes. The FM-300A transmitter (including Broadcast Electronics' FX30 Exciter), readily interfaces with most modern remote control systems through momentary contact closures to initiate the desired transmitter control functions. Remote control of power output is accomplished through the Broadcast Electronics FX-30 Exciter.

The Model FM-300A is completely self-contained in a cabinet enclosure with an overall height of 50-9/16 inches. Both the FX-30 exciter and the power amplifier are conveniently accessible for maintenance or servicing because of their pull out drawer construction. The transmitter control panel assembly is rail-mounted.

SPECIFICATIONS

RF Power Output:	90 to 300 watts
RF Frequency Range:	87.5 to 108 MHz
RF Output Impedance:	50 ohms, unbalanced
Output Connector:	Type "N" receptacle
Maximum VSWR:	1.2:1 (at full power)
Automatic VSWR Protection:	Greater than 1.8:1
AC Input Power:	194/266 Vac, 50/60 Hz, single phase
Modulation Capability:	±200 kHz, direct FM
Harmonic Distortion:	0.08% or less
IM Distortion:	0.08% or less, 60 Hz/7 kHz, 4:1
FM S/N Ratio:	72 dB below +75 kHz deviation
Audio Input:	600 ohms, balanced
Audio Input Level:	+10 dBm nominal for +75 kHz deviation @ 400 Hz.
Audio Response:	+0.5 dB, 30 Hz - 15 kHz. Selectable Flat, 25-, 50- or 75-usecond preemphasis.
Mechanical:	
Weight:	275 lbs. (124.7 kg)
Height:	50-9/16" (128.4 cm)
Width:	23-5/16" (59.2 cm)
Depth:	30¾" (78.1 cm)

Specifications subject to change without notice.

ORDERING INFORMATION

MODEL NO.	STOCK NO.	DESCRIPTION
FM-300A	909-0300-200	FM-300A, 300W Solid State FM Transmitter, Specify frequency. 194-266 Vac, 60 Hz, single phase power source.

FM TRANSMITTING EQUIPMENT

FM-300 M/A Main/Alternate Main 300 Watt FM Transmitter System

Transmitter Rack Layout and Component Identification

OVERALL SYSTEM CONTROLLER	Remote control and status indicators, rear panel barrier strip.
TRANSMITTER #1 CONTROL	DC samples provided for remote reading PA voltage, current, forward/reflected power.
FM EXCITER #1	B/E standard FX-30, 30 watt FM Exciter in pull out drawer.
PA-1A	Power amplifiers consist of broadband solid state amplifiers, 150 watts each, isolated and combined by a hybrid combiner to produce 300 watts of power. IPA is self contained with power supplies and regulators in pull out drawer.
PA-1B	
TRANSMITTER #2 CONTROL	Same as for transmitter #1
FM EXCITER #2	Same as for transmitter #1
PA-2A	Power amplifiers are same as for transmitter #1
PA-2B	
AC CONTROL PANEL	3 breakers, one for each transmitter, one for the automatic switching panel and blowers.

EQUIPMENT DESCRIPTION

Broadcast Electronics' Model FM-300 M/A transmitter system is composed of two 300 watt solid state FM transmitters designed to a fully redundant main/alternate main configuration for continuous operation on one specified frequency in the 87.5 MHz to 108 MHz FM broadcast band. The system consists of two FCC type accepted Model FM-300A transmitters. (See reverse side for FM-300A information).

A built-in 500 watt test load allows testing of the off-the-air transmitter for maintenance purposes. Two completely independent low pass filters, each rated for 1.7 kW power, are mounted within the transmitter.

The entire dual 300 watt transmitting system is housed in a single 72 inch cabinet. Each of the two exciters and all solid state power amplifiers are housed in pull out drawers for easy servicing.

The transmitter system control panel allows on-off control and automatic transfer switching. It will automatically select the alternate transmitter in the event of a failure of the operating transmitter, transfer the antenna to the operational transmitter and de-energize the faulty unit. The controller is easily adaptable to present day remote control systems. Each transmitter has its own control panel to operate and monitor the transmitter in the manual mode.

MODEL FM-300 M/A SPECIFICATIONS

RF Power Output:	90 to 300 watts
RF Frequency Range:	87.5 to 108 MHz, as ordered
RF Output Impedance:	50 ohms unbalanced
Output Connector:	Type "N" receptacle
Maximum VSWR:	1.2:1 (at full power)
AC Input Power:	194/266 VAC, 50/60 Hz, single phase
Modulation Capability:	Greater than ±200 kHz, direct FM
Harmonic Distortion:	0.08% or less
IM Distortion:	0.08% or less, 60 Hz/7 kHz, 4:1
FM S/N Ratio:	72 dB below +75 kHz deviation
Mechanical:	
Weight:	550 lbs. (271.7 kg)
Height:	78.56" (199.5 cm)
Width:	23.38" (59.4 cm)
Depth:	31.37" (78.11 cm)

ORDERING INFORMATION

MODEL NO.	STOCK NO.	DESCRIPTION
FM-300 M/A	**909-2300-200**	**FM-300 M/A, Main/Alternate Main 300 Watt FM Transmitter, specify frequency. 194/266 Vac, 60 Hz, single phase power source.**

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B182 CP 5C 1286

FM TRANSMITTING EQUIPMENT

FM-100
100 Watt
FM Transmitter

FEATURES

- 100% solid state
- Synthesized exciter, programmable in 10 kHz increments, 87.5 to 108 MHz
- Compact design, yet excellent pull out drawer access for maintenance and servicing of exciter and PA
- Accepts stereo composite and SCA audio or data
- Remote control interface through momentary contact closures
- 194-266 VAC, 50/60 Hz, single phase operation
- 524W maximum power consumption at 100W RF output level
- Fully metered

FM-100

EQUIPMENT DESCRIPTION

The Broadcast Electronics Model FM-100 high-performance, ultra-reliable, completely solid state FM transmitter delivers 100 watts RF output power on a specific frequency in the 87.5 to 108 MHz range.

This 100 watt FM transmitter employs a single solid state power amplifier driven by the FX-30 synthesized exciter which is the industry-acclaimed standard for the ultimate in signal fidelity and frequency stability. A low pass RF filter, housed within the transmitter cabinet enclosure, insures harmonic-free operation.

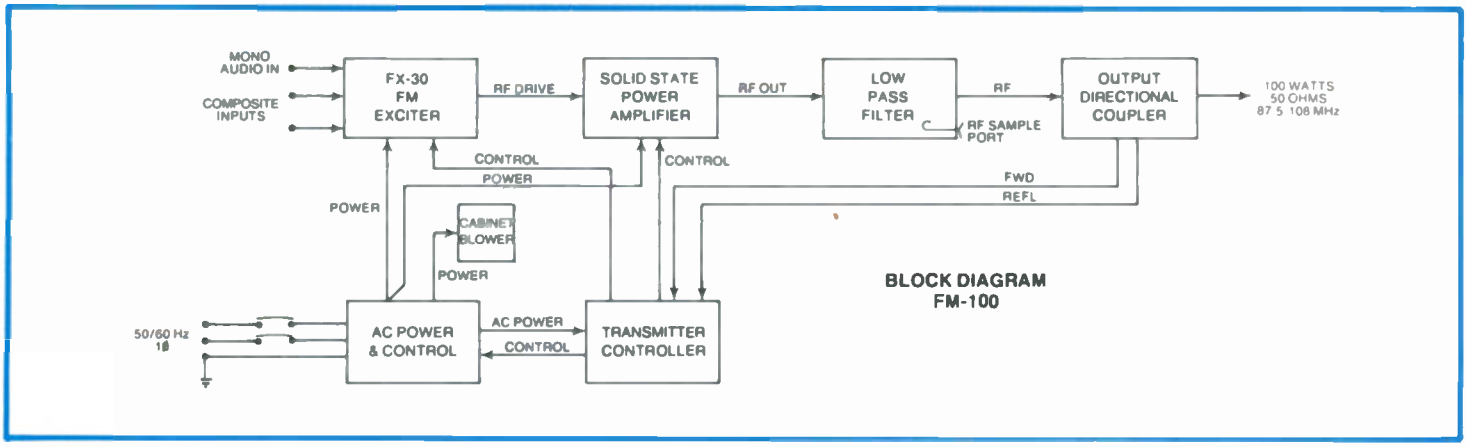
PA voltage and current, as well as RF forward/reflected power are monitored by easily-read, 3.5-inch front panel meters. DC samples of the meter readings are provided for remote metering purposes. The FM-100 transmitter readily interfaces with present day remote control systems through momentary contact closures to initiate the desired transmitter control functions.

The Model FM-100 is completely self-contained in a cabinet enclosure with an overall height of 36.5 inches. Both the FX-30 exciter and the power amplifier are conveniently accessible for maintenance or servicing because of their pull out drawer construction.

MODEL FM-100 TRANSMITTER SPECIFICATIONS

RF Power Output:	100 watts maximum
RF Frequency Range:	87.5 to 108 MHz
RF Output Impedance:	50 ohms, unbalanced
Output Connector:	Type "N" receptacle
Maximum VSWR:	1.2:1
AC Input Power:	194/266 Vac, 50/60 Hz, single phase
Power Consumption:	524W maximum at 100W output (60 Hz)
Modulation Capability:	±200 kHz, direct FM
Harmonic Distortion:	0.08% or less, 30 Hz - 15 kHz
IM Distortion:	0.08% or less, 60 Hz/7 kHz, 4:1
FM S/N Ratio:	72 dB below ±75 kHz deviation
Audio Input:	600 ohms, balanced
Audio Input Level:	+10 dBm nominal for +75 kHz deviation @ 400 Hz.
Audio Response:	±0.5 dB, 30 Hz - 15 kHz. Selectable Flat, 25-, 50- or 75-u second preemphasis.
Mechanical:	
Weight:	225 lbs. (102 kg)
Height:	36-9/16" (92.9 cm)
Width:	23-5/16" (59.2 cm)
Depth:	30¾" (78.1 cm)

Specifications subject to change without notice.



BLOCK DIAGRAM
FM-100

ORDERING INFORMATION

MODEL NO.	STOCK NO.	DESCRIPTION
FM-100	909-0100-200	FM-100, 100W Solid State FM Transmitter, Specify frequency. 194-266 Vac.

FM TRANSMITTING EQUIPMENT

FM-100 M/A Main/Alternate Main 100 Watt FM Transmitter System

OVERALL SYSTEM CONTROLLER — Remote control and status indicators, rear panel barrier strip.

TRANSMITTER #1 CONTROL

TRANSMITTER #2 CONTROL — DC samples provided for remote reading PA voltage, current, forward/reflected power.

FM EXCITER #1

FM EXCITER #2 — B/E standard FX-30, 30 watt FM Exciter in pull out drawer.

POWER AMPLIFIER #1

POWER AMPLIFIER #2 — Broadband solid-state, 100-watt power amplifier. Self-contained with power supply and regulator in pull out drawer.

AC CONTROL PANEL — 3 breakers, one for each transmitter, one for the automatic switching panel and blowers.

SYSTEM DESCRIPTION

Broadcast Electronics' Model FM-100 M/A transmitter system is composed of two 100 watt solid state FM transmitters designed to a fully redundant main/alternate main configuration for continuous operation on one specified frequency in the 87.5 MHz to 108 MHz FM broadcast band. The system consists of two Model FM-100 transmitters. (See reverse side for FM-100 information).

A built-in 150 watt test load allows testing of the off-the-air transmitter for maintenance purposes. Two completely independent low pass filters are mounted within the transmitter.

The entire dual 100 watt transmitting system is housed in a single 70 inch cabinet. Each of the two exciters and all solid state power amplifiers are constructed in pull out drawers for easy servicing.

The transmitter system control panel allows on-off control and automatic transfer switching. It will automatically select the alternate transmitter in the event of a failure of the operating transmitter, transfer the antenna to the operational transmitter and de-energize the faulty unit. The controller is easily adaptable to present day remote control systems. Each transmitter has its own control panel to operate and monitor that transmitter in the manual mode.

MODEL FM-100 M/A SPECIFICATIONS

RF Power Output:	100 watts
RF Frequency Range:	87.5 to 108 MHz, as ordered
RF Output Impedance:	50 ohms resistive
Output Connector:	Type "N" receptacle
Maximum VSWR:	1.2:1
AC Input Power:	194/266 VAC, 50-60 Hz, single phase
Power Consumption	524 watts maximum at 100 watts out. 1048W maximum with both transmitters operating at 100 watts (one into antenna, one into load).
Modulation Capability:	Greater than ±200 kHz, direct FM
Harmonic Distortion:	0.08% or less 30 Hz-15 kHz
IM Distortion:	0.08% or less, 60 Hz/7 kHz, 4:1
FM S/N Ratio:	72 dB below ±75 kHz deviation
Mechanical:	
Weight:	500 lbs. (226.8 kg)
Height:	69.8" (177.2 cm)
Width:	23.38" (59.2 cm)
Depth:	30.75" (78.11 cm)

ORDERING INFORMATION

MODEL NO.	STOCK NO.	DESCRIPTION
FM-100 M/A	909-2100-200	FM-100, 100-W Main and Alternate Main Transmitters, Specify frequency. 194-266 Vac.

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FM TRANSMITTING EQUIPMENT

FM-250
250 Watt
FM Transmitter

FEATURES

- 100 % solid state
- Synthesized exciter, programmable in 10 kHz increments, 87.5 to 108 MHz
- Compact design, yet excellent pull out drawer access for maintenance and servicing of exciter and PA
- Accepts stereo composite and SCA audio or data
- Remote control interface through momentary contact closures
- 194-266 Vac, 50/60 Hz, single phase operation
- 830W maximum power consumption at 250W RF output level
- Fully metered
- Automatic VSWR protection

FM-250

EQUIPMENT DESCRIPTION

The Broadcast Electronics Model FM-250 high-performance, ultra-reliable, completely solid state FM transmitter delivers 250 watts RF output power on a specific frequency in the 87.5 to 108 MHz range.

This new 250 watt FM transmitter employs a single solid state power amplifier driven by the FX-30 synthesized exciter which is the industry-acclaimed standard for the ultimate in signal fidelity and frequency stability. A low pass RF filter, housed within the transmitter cabinet enclosure, insures harmonic-free output.

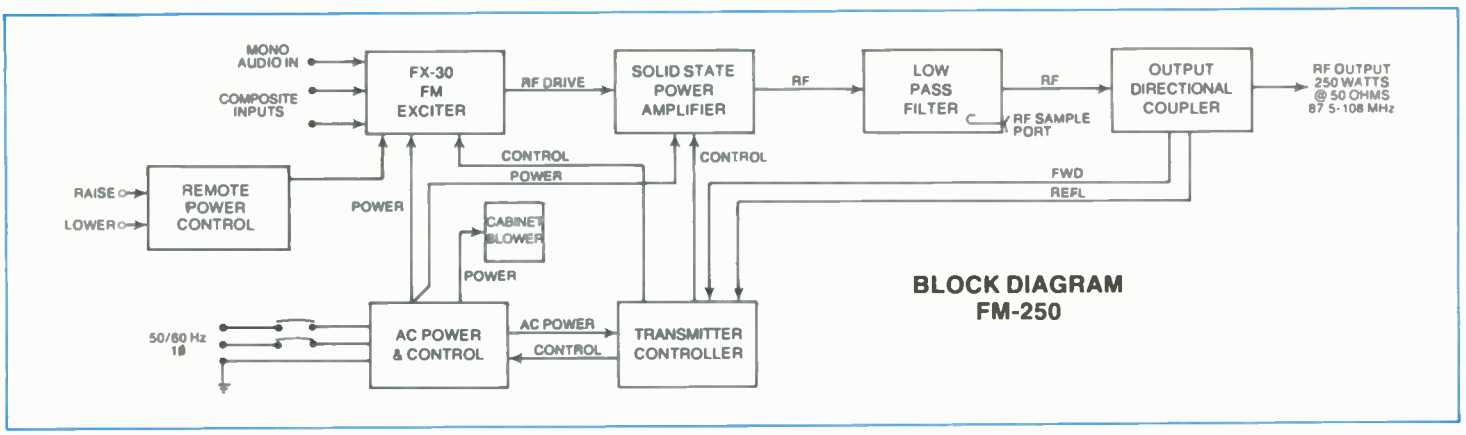
PA voltage and current, as well as RF forward/reflected power are monitored by easily-read, 3.5-inch front panel meters. Buffered DC samples of the meter readings are provided for remote metering purposes. The FM-250 transmitter, (including the Broadcast Electronics FX-30 Exciter), readily interfaces with remote control systems through momentary contact closures to initiate the desired transmitter control functions. Remote control of power output is accomplished through the Broadcast Electronics FX-30 Exciter.

The Model FM-250 is completely self-contained in a cabinet enclosure with an overall height of 36.5 inches. Both the FX-30 exciter and the power amplifier are conveniently accessible for maintenance or servicing because of their pull out drawer construction.

MODEL FM-250 TRANSMITTER SPECIFICATIONS

RF Power Output:	90 to 250 watts
RF Frequency Range:	87.5 to 108 MHz
RF Output Impedance:	50 ohms, unbalanced
Output Connector:	Type "N" receptacle
Maximum VSWR for Full Power:	1.1:1 (usable to 1.7:1)
AC Input Power:	194/266 Vac, 50/60 Hz, single phase
Power Consumption:	830W maximum at 250W output
Modulation Capability:	±200 kHz, direct FM
Harmonic Distortion:	0.08% or less
IM Distortion:	0.08% or less, 60 Hz/7 kHz, 4:1
FM S/N Ratio:	72 dB below ±75 kHz deviation
Mechanical:	
Weight:	225 lbs. (102 kg)
Height:	36-9/16" (92.9 cm)
Width:	23-5/16" (59.2 cm)
Depth:	30¾" (78.1 cm)
Audio Input:	600 ohms, balanced
Audio Input Level:	+10 dBm nominal for ±75 kHz deviation @ 400 Hz.
Audio Response:	±0.5 dB, 30 Hz - 15 kHz. Selectable Flat, 25-, 50- or 75-u second preemphasis.

Specifications subject to change without notice.



BLOCK DIAGRAM FM-250

ORDERING INFORMATION

MODEL NO.	STOCK NO.	DESCRIPTION
FM-250	909-0250-200	FM-250, 250-W Solid State FM Transmitter with FX-30 Exciter, Specify frequency. 194-266 Vac.
		Note: Model FM-250 Transmitter is supplied complete with Broadcast Electronics' Model FX-30 Exciter

FM TRANSMITTING EQUIPMENT

FM-250 M/A
Main/Alternate Main
250 Watt FM
Transmitter System

OVERALL SYSTEM CONTROLLER — Remote control and status indicators, rear panel barrier strip.

TRANSMITTER #1 CONTROL

TRANSMITTER #2 CONTROL — Buffered DC samples provided for remote reading PA voltage, current, forward/reflected power.

FM EXCITER #1

FM EXCITER #2 — B/E standard FX-30, 30 watt FM Exciter in pull out drawer.

POWER AMPLIFIER #1

POWER AMPLIFIER #2 — Broadband solid-state, 250-watt power amplifier. Self-contained with power supply and regulator in pull out drawer.

AC CONTROL PANEL — Three breakers, one for each transmitter, one for the automatic switching panel and blowers.

SYSTEM DESCRIPTION

Broadcast Electronics' Model FM-250 M/A transmitter system is composed of two 250 watt solid state FM transmitters designed to a fully redundant main/alternate main configuration for continuous operation on one specified frequency in the 87.5 MHz to 108 MHz FM broadcast band. The system consists of two FCC type accepted Model FM-250 transmitters. (See reverse side for FM-250 information). The FM-250 has automatic VSWR protection.

A built-in 500 watt test load allows testing of the off-the-air transmitter for maintenance purposes. Two completely independent low pass filters are mounted within the transmitter.

The entire dual 250 watt transmitting system is housed in a single 70 inch cabinet. Each of the two exciters and all solid state power amplifiers are constructed in pull out drawers for easy servicing.

The transmitter system control panel allows on-off control and automatic transfer switching. It will automatically select the alternate transmitter in the event of a failure of the operating transmitter, transfer the antenna to the operational transmitter and de-energize the faulty unit. The controller is easily adaptable to remote control systems. Remote control of power output is accomplished through the Broadcast Electronics FX-30 Exciter. Each transmitter has its own control panel to operate and monitor that transmitter in the manual mode.

MODEL FM-250 M/A SPECIFICATIONS

RF Power Output:	90 to 250 watts
RF Frequency Range:	87.5 to 108 MHz, as ordered
RF Output Impedance:	50 ohms resistive
Output Connector:	Type "N" receptacle
Maximum VSWR for Full Power:	1.1:1 (usable to 1.7:1)
AC Input Power:	200/245 Vac, 50-60 Hz, single phase
Power Consumption	830 watts maximum at 250 watts out. 1660W maximum with both transmitters operating at 250 watts (one into antenna, one into load).
Modulation Capability:	Greater than ±200 kHz, direct FM
Harmonic Distortion:	0.08% or less
IM Distortion:	0.08% or less, 60 Hz/7 kHz, 4:1
FM S/N Ratio:	72 dB below ±75 kHz deviation
Mechanical:	
Weight:	500 lbs. (166.5 kg)
Height:	69.8" (177.2 cm)
Width:	23.31" (59.4 cm)
Depth:	30.75" (78.11 cm)

ORDERING INFORMATION

MODEL NO.	STOCK NO.	DESCRIPTION
FM-250 M/A	909-2250-200	FM-250, 250-W Main and Alternate Main Transmitters, Specify frequency. 194-266 Vac.

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B175 CP 1K 986