

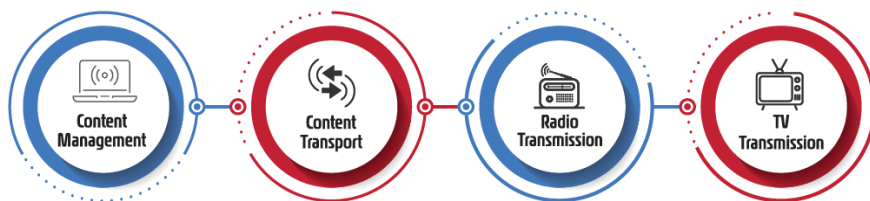


AMX Series Ultra Compact High Efficiency AM Transmitters

Overview

Broadcast Electronics has an over 67-year legacy of providing innovative technology to enable radio and TV broadcasters to deliver compelling content to their audiences and create revenue-generating business opportunities. Supporting global innovation and next-generation content delivery, Broadcast Electronics embodies a customer-first approach to the market from the company's headquarters in Quincy, Illinois in the United States.

Customer-focused solutions from Broadcast Electronics are built on four technological areas:



AudioVault is BE's award-winning suite of Content Management software enabling live and automated program creation and playout, news solutions, and digital logging as well as data management.

The Marti range enables content Transportation, powering audio contribution and distribution for point-to-point (STL) wireless connectivity.

Radio Transmission is the heart of Broadcast Electronics with multiple product lines to support AM and FM transmission. The BE STX line of HD Radio® ready FM transmitters provides superior sonic quality and low operating cost. The BE ETX analog FM transmitters deliver compact, efficiency in a redundancy-equipped package. The BE AMX line of transmitters provides rugged, reliable, energy-efficient peace of mind for your AM radio station.

Broadcast Electronics' complete line of **low and high-power TV transmitters** are designed around a software defined core exciter that can cover all the global analog and digital TV standards. With solutions covering UHF and VHF frequency bands and air-cooling configurations, BE can craft the right solution to meet your technical, budgetary, and operating requirements.



**BROADCAST
ELECTRONICS**

Broadcast Electronics is a global technology company dedicated to driving innovation in broadcast technology providing market leading solutions for software-based content management, Radio & Television transmission, and scientific applications of radio frequency devices.

Broadcast Electronics, has been providing high-tech solutions for broadcasters for more than 67 years in over 170 countries. All of our products and services come from a heritage of creativity and innovation unmatched in the industry, focused on developing innovative solutions for customers problems.



Every major innovation that shaped modern radio originated in Quincy, and it is here that BE products are designed, supported, and manufactured today.

Our facility in Quincy employs the latest instruments for research, new product design, prototype fabrication and testing.

We take advantage of the best practices of automated production, adding human attention to detail to ensure every product that leaves our factory meets or exceeds its published specifications.

AMX Transmitter Series

The Broadcast Electronics AMX is a next generation AM transmitter platform that is based around ultra-high efficiency, scalability, modularity, simplified maintenance, and significantly reduced footprint. AMX delivers a remarkable 5kW in a single 5 RU chassis for Analog, HD Radio® or DRM broadcasts. AMX is compact, lightweight and easily shippable via UPS or FedEx – an industry first drastically reducing shipping and logistics costs and simplifying installation and shrinking transmitter site space and costs.

Ultra Compact—High Efficiency—Modular Reliability

AMX is first to market with Silicon Carbide MOSFET RF Amplifier and modulator modules leveraging proven technology deployed in electric vehicle drives for nearly 10 years. Silicon Carbide has numerous advantages over conventional MOSFETs used in all prior AM transmitter designs such as: Increased voltage and current capability, reduced capacitance, and increased robustness. This breakthrough makes AMX far higher performance and more reliable than other technologies.

Redundant auto ranging power supplies allow for simple single or three phase power configurable at the transmitter. Automated wide range voltage adjustments provide for ultra-high quality audio and reliable operation even at very low power – no single point of failure transformers

Integrated standard MDCL – Modulation Dependent Carrier Level to take the energy savings to the next level. Continually adjustable up to 6 db of carrier reduction can lower energy consumption significantly with over 60% reduction in energy costs.

Wideband Power Amplifier, Exciter and Control System: AMX's exclusive modular harmonic filter makes field frequency changes a simple matter by replacing the harmonic filter and doing a quick calibration all in less than 30 minutes – ideal for multiple station emergency back ups.

Orban® Audio Processing: BE and Orban teamed up to deliver the first integrated Orban Inside AM audio processor which provides a simple low-cost way to add world class Orban AM audio processing and HLS streaming input to any AMX transmitter.

Put these powerful capabilities to work for you

- Models from 3 kW to 5 kW
- 5 kW in 5 rack Units—ultra compact size and low weight
- Markets highest efficiency—delivers over 85% AC to RF Efficiency
- Full Digital Architecture
- MDCL+ included as standard for ultra low energy consumption
- Pluggable front access RF modules
- Pluggable front access power supplies
- Configurable single or three phase
- Front panel removable output network for fast frequency changes
- Shippable via UPS or Fed Ex for fast low cost delivery
- HD Radio & DRM operation
- Outstanding Audio performance
- Optional Orban® Inside for powerful cost effective audio processing
- HLS Streaming input via Orban
- Front panel modulation metering eliminates the need to purchase an outboard modulation monitor
- Electronically regulated power supplies avoid the need to purchase an external voltage regulator
- Seamless operations over a wide range of voltages and power stability
- Low noise super cooling system
- Run at maximum power up to 1.5:1 VSWR w/proportional foldback
- IP Connectivity with HTML5 GUI for anytime, anywhere access
- Comprehensive event log stores 500 events—simplifies troubleshooting

Photo: Scott Fybush—Fybush.com



Simple On-Air Serviceability

AMX Series transmitters are skillfully designed to provide easy on-air servicing and maintenance. The front panel removable RF amplifiers, power supplies and even the harmonic filter allows for simple removal and replacement with a new or repaired module. The AMX exciter and control modules are removable from the rear eliminating the need to remove the transmitter from the rack for extensive disassembly like other designs.

RF Amplifier Module—The Silicon Carbide Advantage

At the heart of every AMX Series transmitter is the integrated RF amplifier/ modulator module that features robust highly efficient silicon carbide transistors with innovative modulator design to provide robust & efficient analog, HD Radio and DRM operation.

New Silicon Carbide (SiC) MOSFETs are used for the PDM modulator and for the RF Amplifier. BE brings this breakthrough technology to AM transmitters after extensive deployment in demanding industrial and automotive applications for nearly 10 years. ***SiC MOSFETs have numerous advantages compared the Silicon MOSFETs used in all prior AM transmitter designs.***

Increased Voltage and Current Capability. The latest technology SiC MOSFETS used in AMX are far more capable than the 1990s technology Silicon MOSFETS. The additional capability allows for performance improvements without compromises. Amplifier power rating, DC to RF efficiency, voltage safety margin and peak power capability are all increased while transistor heat dissipation and operating temperature are reduced.

Reduced Capacitance. Power transistors have internal capacitances which negatively affect various performance aspects. For example, gate drive power, Incidental Phase Modulation (IPM) and PDM modulator linearity are all negatively affected by transistor capacitance. As a result, AMX has significantly improved performance over other designs by utilizing modern SiC transistors.

Improved Robustness. Silicon Carbide MOSFETs have greatly improved body diode reverse recovery characteristics (reduced reverse current and faster recovery time) when compared to Silicon MOSFETs. Additionally, SiC can operate at much higher temperatures and has much higher thermal conductivity than Silicon. These factors together greatly improve the ability of the amplifier to withstand severe events such as lightning and arcing.



Amplifier Safe Mode—Enhanced Amplifier Self Protection

AMX boasts an industry first Safe Mode to provide new enhanced self protection capabilities to protect the RF amplifier under adverse conditions. During severe events, the amplifier is placed into Safe Mode within 1 RF cycle by its internal control logic. The amplifier safe state places the RF class D bridge in a non-operational state. Due to the unique design of the gate drive circuitry, using no transformers, this state may be entered and exited gracefully and also may be maintained indefinitely when required. This is not possible with prior designs which use gate drive transformers to couple drive power to the transistors due to saturation of the gate drive transformer core preventing long time period gate drive pulses.

Safe Mode is very effective at preventing damage to the RF amplifier in even the most extreme events because:

- Further switching of all the transistors in the amplifier is prevented, where transistor switching events are the most damaging during extreme current and voltage excursions.
- Power flow is prevented from the power supply. By stopping power flow, the energy available to cause damage is reduced to the minimum possible value.
- By utilizing two transistors to apply a short circuit across the load terminal, the voltage across the transistors produced by load current is reduced to near zero making it very difficult to dissipate energy in the transistors. This keeps the transistors cool and safe from damage.

Safe Mode combined with the additional advantages of SiC, notably high thermal conductivity and temperature capability, virtually eliminates amplifier damage.

Wide Range Regulated Power Supplies—a BE Exclusive

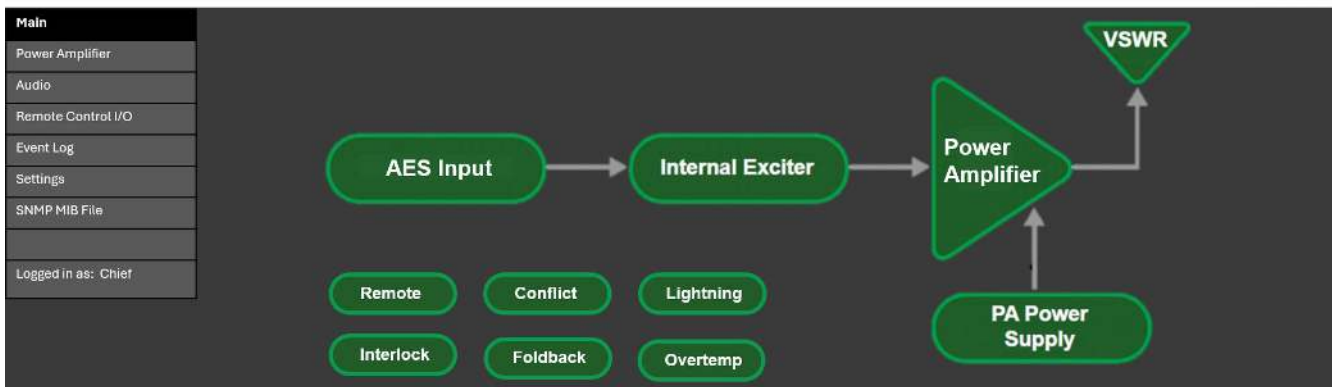
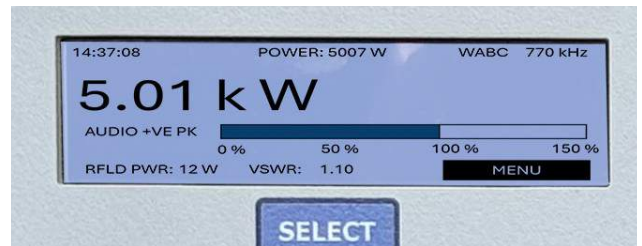
AMX Series transmitters use wide range independently regulated power supplies to power the Amplifier and Modulator functions in each transmitter. By using a regulated power supply only BE is able to provide great sounding audio at lower power levels, such as nighttime or critical hours when your station is required to reduce power. We will adjust the power supply—prior to the amplifier and modulator—to operate at very low power yet still delivering the best audio performance possible. Other designs use simple unregulated or narrow range supplies and make audio performance impairing adjustments to the modulators to operate at reduced power.

Advanced Monitor and Control Capability

The AMX is designed with extensive diagnostic, control and metering capabilities accessible from the front panel. The high resolution OLED display allows for an easy to read control center covering key aspects of the transmitter and provides parameter metering, status, fault log retention and a set-up/configuration menu.

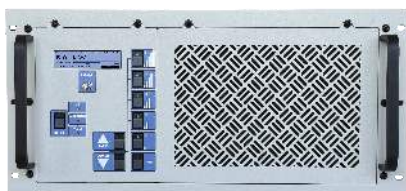
AMX features a powerful yet simple-to-use browser-based HTML-5 graphical user interface (GUI) for control and monitoring of the transmitter anywhere in the world. Extensive TCP/IP network connectivity via integrated RJ-45 connection allows the transmitter to be securely connected to any IP network. In addition to the web GUI, all monitoring and control are supported via traditional parallel connections, and a complete SNMPv3 MIB interface to make connection to your remote control system a snap.

The AMX controller also provides a comprehensive event log that captures all transmitter-related activities, operations, and faults storing the 500 most recent activities. This allows for detailed diagnostics and simplified routine maintenance.

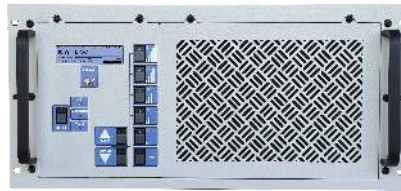


AMX Transmitters

AMX 3



AMX 5



AMX Scalable Architecture Delivers High Efficiency in a Ultra Compact Footprint

AMX transmitters represent the most advanced technology in terms of electrical efficiency, compactness, reduced weight, ease of use, and diagnostics. They have been designed to guarantee the maximum performance and operation while lowering operational costs through energy saving technology.

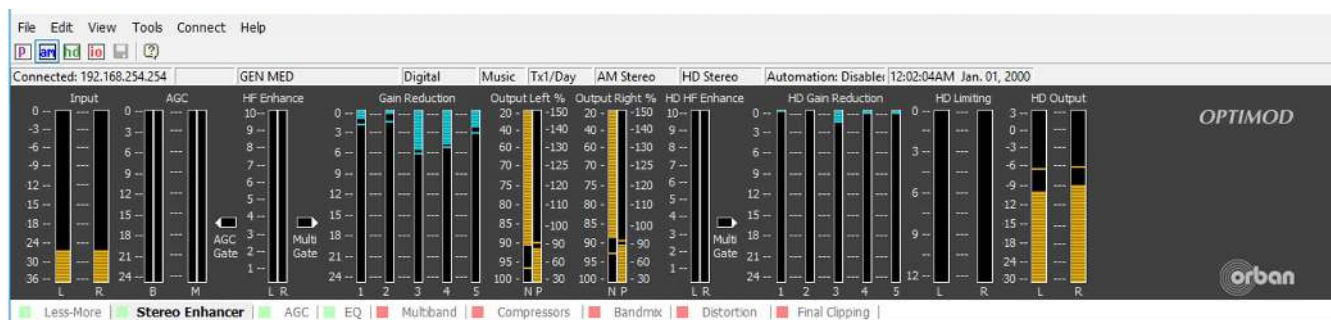
The Broadcast Electronics AMX transmitters achieve exceptionally high operational performance under extreme environmental conditions (high external temperatures, poorly adjusted antenna, fluctuations in the power source).

World Class Orban® AM Audio Processing—Maximize your coverage

BE and Orban collaborated to introduce the markets first integrated AM Orban Inside audio processor to provides a simple low-cost way to optionally add world class Orban AM audio processing to any AMX transmitter.



Orban Optimod software delivers a full suite of powerful audio processing tools to optimize your station sound and consistency: AGC, equalizer, five-band compressor/limiter, and peak limiter featuring Orban's exclusive multiband distortion-canceled clipper and overshoot compensator optimized for maximum modulation and enhanced coverage. All this power comes with extensive fac-



tory presets for any format all of which can be customized to your ear. Full control and scheduling via an HTML GUI including Orban's easy one-knob LESS-MORE control to simplify set up. Includes HLS streaming input for reliable IP based transport –STL.



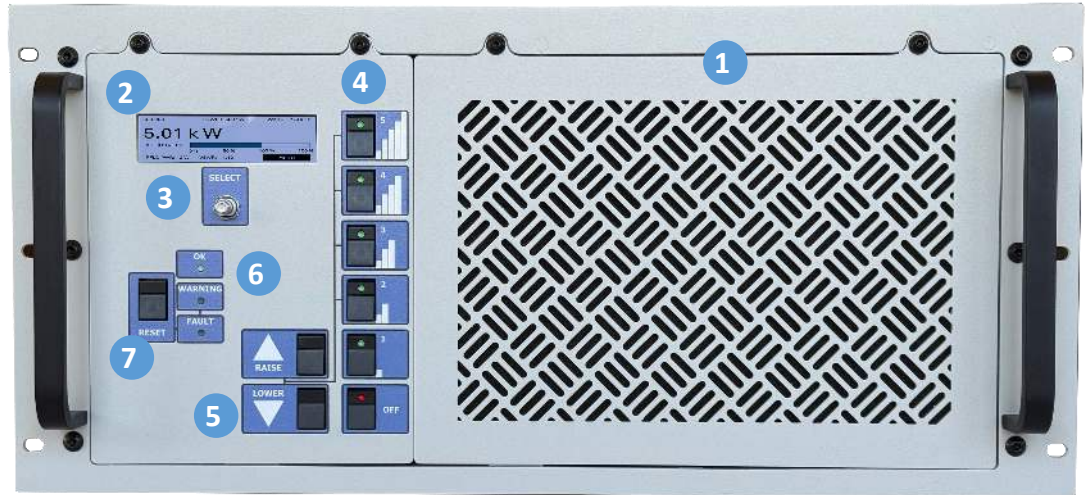
All BE AMX transmitters are designed with digital radio in mind, supporting both HD Radio and DRM operation. We provide the flexibility of changing transmission between analog only mode and analog+HD or DRM broadcasts.

Digital Ready – just add an external HD Radio or DRM signal generator when you are ready to make the change.



AMX Front & Rear Panel

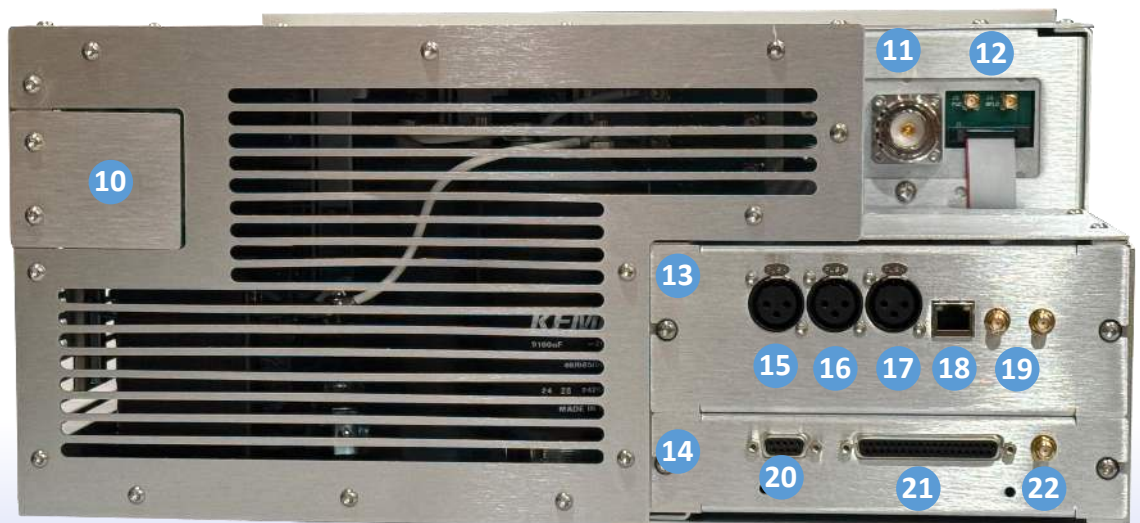
1. Module access with removable washable air filter
2. Graphic OLED display
3. Menu navigation and select
4. 5 Power level presets/off
5. Power Raise/Lower
6. LED Status indicators: OK, Warning, Fault



7. Fault Reset
8. Pluggable RF Module
9. Pluggable power supplies
10. AC power supply input
11. RF output connector (DIN 7-16 female)
12. Forward & Reflected power samples
13. Removable Digital Exciter
14. Removable Control interface



15. Main Analog input (XLR connector)
16. Main AES/EBU input (XLR connector)
17. Aux AES/EBU input (XLR connector)
18. LAN (RJ45) for management (Web server, SNMP, etc.)
19. 1pps, 10MHz external reference
20. Serial port
21. Remote Control—GPIO
22. RF Sample—Mod Monitor



Specifications

	AMX 3	AMX 5
Range (Output Power)	50 W to 3.4 kW	100W to 5.6 kW
Efficiency	85% at 3 kW carrier into 50 Ohm load	85% at 5 kW carrier into 50 Ohm load
VSWR	Nominal 1.5:1 at full carrier power; will operate into higher VSWR with automatic power reduction, open and short circuit protected	
RF Output Connector	7-16 DIN	7-16 DIN
AC Input Voltage	185—264Vac, single or three phase, 47 Hz to 63 Hz	185—264Vac, single or three phase, 47 Hz to 63 Hz
Power Factor	>0.95 at full load	>0.95at full load
Size (Unpacked)	19” W x 24” D x 8.75” H (48 x 60 x 22 cm)	19” W x 24” D x 8.75” H (48 x 60 x 22 cm)
Weight (Unpacked)	61 lbs (30 kg)	68 lbs (30.8 kg)
RF Specifications		
Impedance	50 Ohm	
Range (Frequency)	525 kHz to 1705 kHz, supplied on one frequency (synthesized), as ordered; accommodates 9 kHz or 10 kHz channel spacing	
RF Harmonies Suppression	Meets or exceeds FCC, DOC, & CCIR requirements, when preceded by external NRSC-1 compatible audio low pass filter(s)	
Type (Modulation)	Digital pulse width modulation	
Capabilities (Modulation)	>150% peak positive capability at rated nominal output power into 50 Ohm load	
Carrier Shift (Modulation)	<1% at 95% negative modulation at 1 kHz	
Regulatory	FCC; IC; CE; BETS-6; IEC 215 Safety	
Audio Specifications		
Modes	Analog, HD Radio & DRM	
Input	Analog (1) XLR, balanced, Digital (2) AES3 110 ohm	
Squarewave Overshoot	1% or less at 400 Hz, 50% single channel modulation with high-frequency boost disabled	
Squarewave Tilt	1% or less at 40 Hz, 1.5% or less at 20 Hz, measured with 90% negative modulation	
Intermod Distortion	1.2% or less 1:1 ratio, 1.7% or less 4:1 ratio. 60/7000 hz SMPTE standards with 85% modulation rated power	
S/N Radio	>65 dB below a reference level equivalent to 100% negative modulation in a 22 Hz to 10 kHz bandwidth, unweighted	
Environmental		
Temperature	0° to 50° C	
Altitude	10,000 ft (3,048 M) at 60 Hz; 7,500 ft (2,286 M) at 50 Hz	
Humidity	0% to 95% (non-condensing)	

MDCL+: Lower Energy Costs for AM Radio

MDCL+ Included Free with every AMX transmitter

Broadcast Electronics know that every broadcaster needs to carefully manage costs, and energy consumption is a big topic on everyone's mind. MDCL, or Modulation-Dependent Carrier Level, is a technology that allows AM radio stations to reduce their electricity consumption by dynamically adjusting the stations carrier power based on the audio content, saving energy without significantly impacting audio quality.

MDCL+ employs Modulation Dependent Carrier Level algorithms and **can save most AM radio stations 50% or more of their electricity costs.** A typical 10kW AM station operating 24 hours a day with an average electricity cost of 20 cents per Kilowatt/hour, the savings can be more than \$12,000 every year. Some locations (including Alaska and Hawaii) will have considerably higher power rates resulting in up to four times greater energy and cost savings.

Simple Upgrade for Existing Transmitters

MDCL+ is also available in a simple to install stand alone unit idea for upgrading existing BE and other late model solid state AM transmitters to help capture energy savings and reduced costs even if you are not adding a new transmitter. The small MDCL+ unit connects to any BE AM series transmitter with a few connections and a short calibration process so you can start saving today.



The AM carrier uses 66% of the transmitter power yet delivers no useful information!

Service and Support

We know that having the right support behind a product is every bit as important as the features and capabilities it delivers. At Broadcast Electronics we are committed to provide you with not only great products and software, but a dedicated team of service experts to help you keep your station running smoothly for years to come.

Training

Broadcast Electronics has long provided training programs for our products to educate and prepare users to operate and maintain them in the most effective possible manner. Training is offered for all styles of transmitters and Audio Vault systems, featuring a mix of instruction with hands-on operation and troubleshooting. Training programs can be crafted to meet your local needs, offered in our facility, at your location, or online. Many of our programs can provide SBE ongoing educational credits.

Warranty

You can rest assured that Broadcast Electronics stands behind its products and services to provide complete satisfaction.

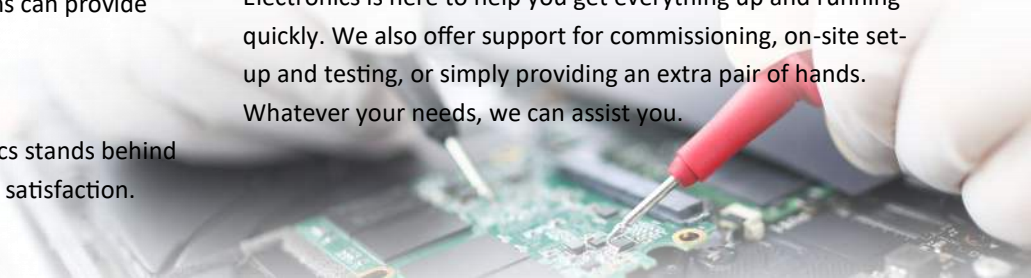
Our products offer a standard set of warranty services that exceed others in the industry.

Repair Service

As a leader in providing innovative products and solutions to broadcasters around the globe, Broadcast Electronics understands the need for long life and years of trouble-free service. You can feel secure that if disaster strikes and your products need service, we offer complete repair and refurbishment service to get you back on the air delivering your high-quality programming quickly.

On-Site Service and Installation

Whether you need assistance troubleshooting an existing transmitter or Audio Vault system or require a complete installation of a new one, the global service team at Broadcast Electronics is here to help you get everything up and running quickly. We also offer support for commissioning, on-site set-up and testing, or simply providing an extra pair of hands. Whatever your needs, we can assist you.





BROADCAST ELECTRONICS

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