Broadcast Electronics

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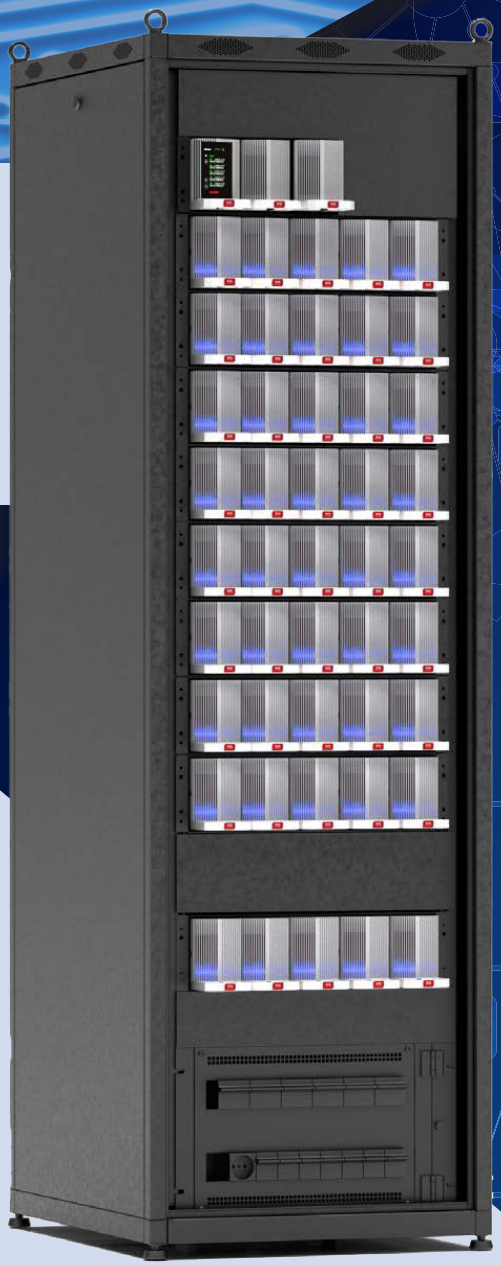
QUICK BLOCK
Transmitter System



Broadcast Electronics

ELENOS®
World Broadcast Experience

itelco
BROADCAST

PRO TELEVISION

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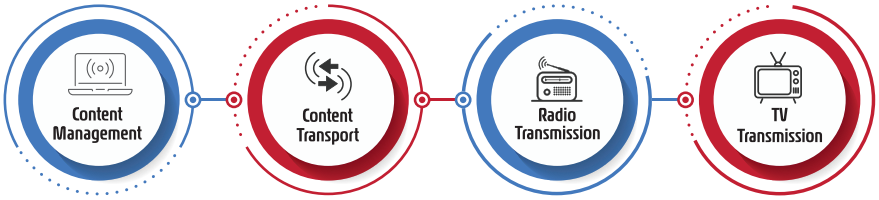
Overview

Broadcast Electronics has an over 65-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 technology 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. Elenos ETG/ET analog FM transmitters deliver compact, energy efficiency in a cost-effective package. The BE AM line of transmitters provides for 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 options for liquid and air-cooling configurations, BE can craft the right solution to meet your technical, budgetary and operating requirements.

Broadcast Electronics is proud to be part of The Elenos Group, a global technology company dedicated to driving innovation in broadcast technology. The Elenos Group provides market leading solutions for software-based content management, Radio & Television transmission, and scientific applications of radio frequency for advanced physics, biomedicine and aero-spatial development.

The Elenos Group has been providing high-tech solutions for broadcasters under the brands of Broadcast Electronics, Elenos, Itelco and Pro-Television for more than 65 years in over 170 countries. All of our products and services come from a heritage of creativity and innovation unmatched in the industry, in fact the groups

Founder and CEO, Leonardo Busi is hands-on every day developing innovative solutions for customers problems.

The group leverages the technology innovation across all the brands to provide customer focused market leading solutions that enable the cost-effective management and delivery of content for radio and TV broadcasters. The Elenos Group operates across all regions of the globe and is headquartered in Ferrara Italy.

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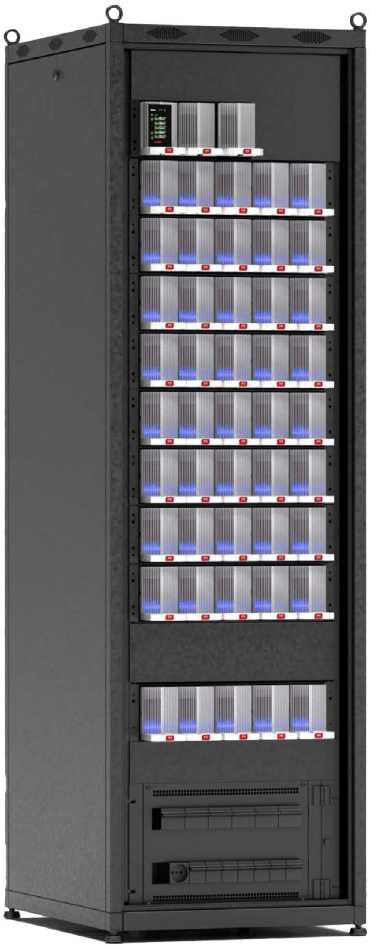
Quick Block - Transmitter System

General Description and Features



Quick Block is an innovative technology platform using Plug and Play modular "blocks" that can be combined to create transmitters across a wide range of powers and broadcast standards. With the same modules, programmed and customized as needed, you can create equipment such as Radio transmitters or TV transmitters of different powers and types.

Quick Block is an EASY TO USE, PLUG & PLAY product that offers extensive benefits to users from a logistical, technological, maintenance, and operating cost perspective.

Quick Block has been designed for the maximum reliability and uptime, simplifies and fast field repair, built-in redundancy, ease of stocking and replacing parts, and is designed with the flexibility to support continued technological updates over time.

Swapping out parts in the ultra-modular hot pluggable system is very simple and does not require specialized technicians, just turn it on and set the frequency and power.

Quick Block's integrated web-enabled diagnostics allows us to provide remote support to complement your technical team, and even deploy our resources to manage the technology if you want. – We simplify the management and field operations of your transmission network.

Quick Block can support all analog and digital Radio and TV standards such as DVB/T, DVB/T2, ATSC, ATSC3.0, ISDB/T and ISDB/TB, DAB, Chinese FM CDR (radio) and DTMB (TV).

It is not just a product, it is an innovative technological model, invented and patented by the Elenos group that enables new business models in an evolving global broadcast market.

Every Quick Block system is made up of a combination of only two primary modules: the modulator and the amplifier.

These functional blocks can make up any system:

- Low, medium, and high-power transmitters
- Multiple transmitters in a single rack
- Active and passive redundant systems
- N+1 redundant systems

The Quick Block architecture is very versatile and ideal for applications across single Radio and TV stations or multi-station networks.

Quick Block is the ideal solution for networks of any size, thanks to the construction philosophy, parts are simple and cost-effective to stock, and maintenance time is drastically reduced.

It will no longer be necessary to carry out complex troubleshooting as all subsystems are modular and hot pluggable with integrated diagnostics so restoring a failed system to full power is quick and easy.

The Quick Block design philosophy will drastically reduce the stock of parts needed to maintain each transmission site. In addition, future upgrades, or system changes, as well as migrations to different standards will be simplified providing the lowest total cost of ownership.

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Quick Block Driver/Exciter

- Multi-standard Modulator
- Redundant RF Driver
- Redundant Power Supply
- Built-In Control System
- Hot Plug slide-in connection
- Self-cooling
- Self-protection
- Communication Port
- RF Filters
- Color Touch Screen user interface

Quick Block Modulator FM Radio

Quick Block FM Radio transmitters can be equipped with two modulator technologies: High-performance analog FM with precise low-noise PLL or software-defined direct-to-channel digital synthesis modulators capable of supporting analog and digital formats such as HD Radio or DRM+. Both modulators can be configured with a multilevel redundancy.

Modular Driver/Exciter

The Quick Block modulator is composed of a multi-level modular Hot Plug structure. Even on the single-driver version the modulator card can be replaced quickly by the front panel without the need of special tools or complex alignments.

Driver/Exciter 1+1 Cross Redundant

The Quick Block 1+1 system uses a double line of independent boards; a modulator and a pre-driver amplifier with an automatic switch that guarantees transmission even with a "second fault level".

Quick Block Amplifier

The Quick Block amplifier module is a complete hot-plug amplifier system complete with a high-efficiency RF amplifier, single phase 220-240V AC input power supply, cooling system, and integrated control unit.

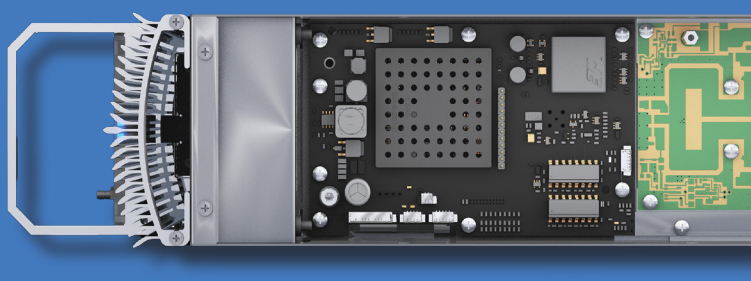
Quick Block features the latest LDMOS high-power high-efficiency RF devices, which when coupled with the Digital Adaptive Pre-correction delivers excellent performance and low operating costs for low and high-power systems.

All Quick Block modules are broadband for the intended band of service, simplifying spare parts stocking and facilitating quick frequency changes.

The powerful software-defined exciter option allows for support of multiple modulation types and standards all with a simple click of a mouse to seamlessly migrate from an analog to a digital.

Each Quick Block module includes:

- RF Amplifier
- Power Supply
- Power Measurement
- Built-In Control
- Hot Plug Slide-in connection
- Self-cooling
- Self-protection
- Communication Port
- RF Low Pass Filter
- Rapid Diagnostic Indications (LED multicolor, multifunction)



Advanced Monitor and Control Capabiility

Quick Block Transmitter System Remote Monitor and Control Features

Every Quick Block transmitter system includes a powerful yet simple-to-use browser-based HTML-5 graphical user interface 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. Integrated multiuser multilevel password protection ensures only authorized operation on your network.

Quick Block also supports the latest in SNMP V3 – (Simple Network Management Protocol) for easy connection with a wide array of powerful software network manager systems and popular transmitter remote controls. The entire transmission system can be controlled and monitored using the standard published MIB protocols.

Remote Monitor and Control interfaces supported include:

- Popular parallel interface to panels and legacy remote-control systems
- Automated Alarms and notifications via Email
- SNMP connectivity for alerts, monitoring, and control
- Web GUI via ethernet network connection RJ-45 (10/100Base-T) with TCP/IP protocol

Quick Block Delivers the Power of Digital Modulation

Quick Block leverages Elenos Group's ProTelevision direct-to-channel (DTC) software-defined exciter platform, enabling the ultimate in performance, stability, and durability. It features unparalleled signal processing power, flexible configurations to change from analog to digital with a press of a button, and advanced native IP connectivity capabilities.

Pretelevision's highly advanced adaptive precorrection technology operating in thousands of installations worldwide has proven its worth and provided Broadcasters with a reduction in OPEX cost due to the reduced power consumption and maximized coverage.

Opti-Power® is a ProTelevision Technologies´ proprietary solution developed to provide an increase in quality (MER), efficiency, and coverage of Radio and TV transmitters. Opti-Power consists of:

1) Enhanced Nonlinear Precorrection algorithm with DEEP MEMORY EFFECTS based on the Volterra polynomial series.
2) Adaptive PAPR clipper. These two adaptive mechanisms, allow achieving the maximum MER value on any transmitter system (FM, VHF, UHF, Class AB, Doherty, etc...) compared with other precorrection solutions on the market.

This MER extra increase can be used to enhance the overall efficiency of the transmitter system. In addition, ProTelevision Optipower will provide live measurements on the WEB Graphical User Interface: Shoulders, MER, PAPR, MER vs Carrier, and a Spectrum graphic on the channel transmitted (see picture above).

Main specifications for (Optipower) precorrection and feedback signals:
Connectors: SMA 50 ohm //Level: -10dBm to +10dBm // Return Loss > 20dB //Frequency: 30MHz to 860MHz.

System Architecture

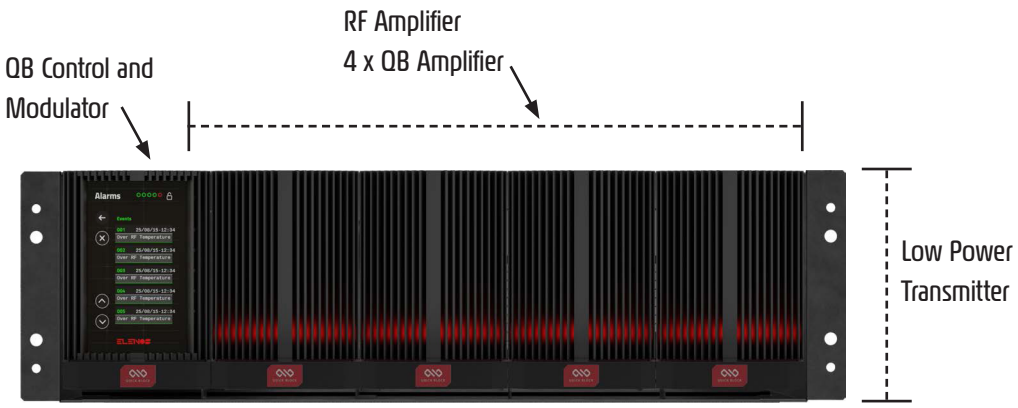
The Quick Block architecture can be configured to meet the requirements of any TV or Radio broadcast standard. It can facilitate all existing TV and radio system requirements, as well as new technologies as they evolve. Its flexibility and scalability are ideal to meet different system designs and requirements such as low-power, high-power, or N+1 systems.

The elements that compose the multiple configurations are the "fundamental QB modules" as follow:

- The "QB Amplifier" modules have a generic use defined only by their application frequency.
- The "QB Driver/CCU" modules have multiple applications even if dedicated to various modulation platforms such as both analog and digital radio or TV and cover all of today's modulation standards.
- The Hot Plug chassis, this frame is a mechanical and logic unit that defines the Quick Block application. Its interfaces are the connection to the outside world, and it combines the elements of the Quick Block Amplifier and Quick Block Driver/CCU to define the final product application. The dimensions of this frame are a standard wide of 19 rack mount and a height of 3 RU.
- Hot Plug Cabinet is a standard 19" rack that contains the Hot Plug chassis and constitutes the application for high-power systems, air or Liquid cooled systems.

Quick Block Compact Transmitters

This line is made up of a single Hot Plug chassis. It is equipped with a minimum of one Quick Block Driver/Exciter module and between one and four Quick Block Amplifier modules. Here are some examples of products in a single Chassis configuration:



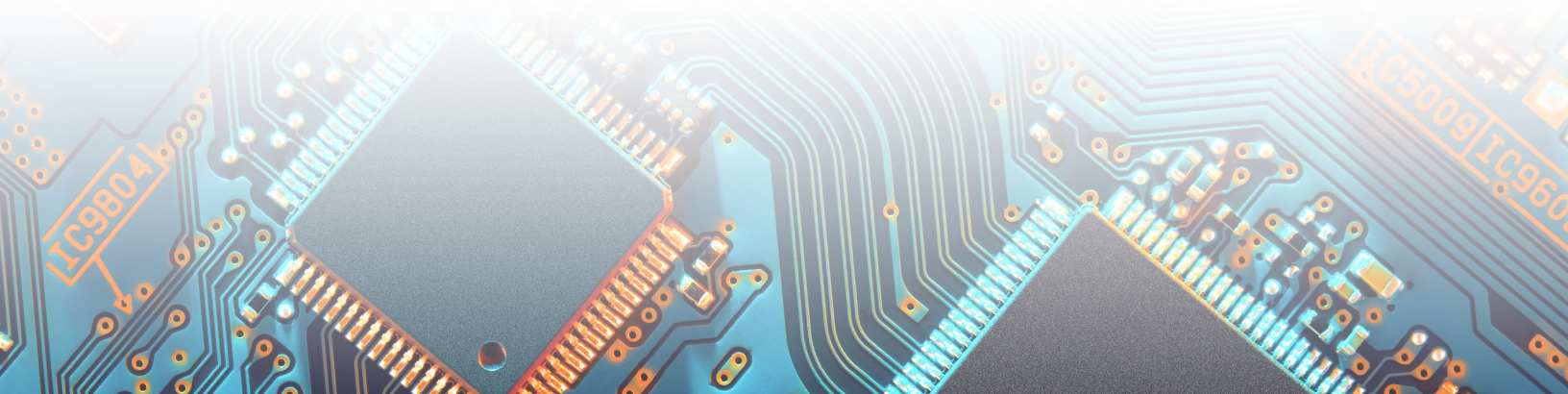
Model	Rated Power	Description
QBA03-DD1 FM	3.7 kW	3 Module Hot Plug FM Stereo Radio Transmitter
QBA04-DD1 FM	5 kW	4 Module Hot Plug FM Stereo Radio Transmitter
QBA09-DD1 FM	11 kW	9 Module Hot Plug FM Stereo Radio Transmitter
Dimension (HxWxD) 36 RU x 19" x 30"		

Product Example Compact Power

Quick Block Compact Transmitters

QBA04-DD1 FM

QBA09-DD1 FM



High Power Quick Block Transmitter Systems

QBA50-DD1 FM

Model	Rated Power	Description
QBA10-DD1 FM	12.5 kW	10 Module Hot Plug FM Stereo Radio Transmitter
QBA20-DD1 FM	25 kW	20 Module Hot Plug FM Stereo Radio Transmitter
QBA30-DD1 FM	37 kW	30 Module Hot Plug FM Stereo Radio Transmitter
QBA35-DD1 FM	43 kW	35 Module Hot Plug FM Stereo Radio Transmitter
QBA40-DD1 FM	50 kW	40 Module Hot Plug FM Stereo Radio Transmitter
QBA50-DD1 FM	62 kW	50 Module Hot Plug FM Stereo Radio Transmitter
Dimension (H x W x D) 72 RU x 19" x 43"		

Product Example Medium and High-Power Rack

Main Specifications

The quick block is not a product, but a technology platform that can be organized into many different products with multiple applications. One of its many features is its ability to use and adopt the latest version of electronic and mechanical components. The Quick Block technological platform defines an interface standard between the various modules and levels of the system, thus making the structure agile over time. For this reason, even if the specifications are constantly evolving Quick Block can still guarantee compatibility with future systems.

RF SPECIFICATIONS	
Transmitter Type	Solid State VHF FM transmitter for analog FM, FM+HD Radio, and HD Radio only
Output Power	QB1 to QB50 – 500W to 72kW (Analog only)
Efficiency	Up to 76% AC to RF FM only; 72-74% typical
Modulation Type	Direct-to-channel (DTV) digitally (DTC version) generated FM or Phase Lock Loop (PLL version)
Modulator/Exciter	Universal technology for multi-standard broadcast. Integrated DTC or PPL exciter, including pre-amplifier (driver) for QB system
Modulation modes	FM Analog, FM+HD Radio at -10dB, 14dB, and -20dB injection levels, and HD-only
Modulation Capabilities	Up to 300kHz
Audio Inputs	AES, L&R analog, composite, SCA/ RBDS/RDS external generator input, SCA audio inputs (2)
Asynchronous AM S/N Ratio	Better than -60dB (-65dB Typical) referenced to average peak-to-peak carrier amplitude. 75uSec de-emphasis
Synchronous AM S/N Ratio	Better than 50dB referenced to average peak-to-peak carrier amplitude. 75kHz deviation @400Hz
Spurious and Harmonic	-80dB or better; low pass filter standard
AUDIO SPECIFICATIONS	
Amplitude Response	Composite/ AES: +/-0.03dB, 30 Hz to 53 kHz; +/- -0.1dB, 53kHz to 100kHz Analog L&R: +/-0.25, 30Hz to 53kHz
Total Harmonic Distortion + Noise	Composite: 0.005% or less @400Hz, 10-22kHz bandwidth, 75uSec deemphasis. AES/ Analog L/R Stereo: -0.01 typical @400 Hz, 10-22kHz bandwidth 75uSec deemphasis
Composite Intermodulation Distortion	0.13% SMPTE (60/7000 Hz, 1:1 ratio), DIM-B: 0.008% (14kHz)
S/N Ratio	Composite: 85dB below 100& modulation @400 Hz. AES/ Analog L&R Stereo: 80dB below 100% modulation @400Hz. Analog L/R: -70dB, 30Hz to 15kHz
Stereo Separation	AES: -74dB below 100% modulation @400Hz. Analog L/R: -70dB, 30Hz to 15kHz
MECHANICAL/PHYSICAL	
Dimensions	Width: All Standard 19" (48.26 cm) Height RU (Full Rack Unit): QB1-9 (optional 20U, 30U or 42U rack QB10 included rack 20U, or optional rack/cabinet 30U or 40U QB11-50 included rack/cabinet 40 U rack Depth: QB1-5 28.75" (73 cm) QB6-10 33.47" (85 cm) QB11-50 43.3" (standard 40 U rack/cabinet included 110 cm)
Weight of Quick Block modules	RF Amplifier: 10.4 LBS (4.7 kg) Modulator/CCU: 8.4 LBS (3.7 kg)
Weight of QB Systems	QB5 88.2 LBS (40kg) QB10 330.7 LBS (150 kg) QB20 771.6 LBS (350 kg) QB20 875 LBS (400kg) QB30 980 LBS (445 kg) QB40 1083 LBS (491 Kg) QB50 1187 LBS

MECHANICAL/PHYSICAL				
RF Output Connector	QB1-10 7-16 DIN QB11-20 1 5/8" EIA QB21-50 3 1/8" EIA			
ENVIRONMENTAL				
Temperature	23 degrees F (5 degrees C) to +122 degrees F (50 degrees C)			
Altitude	10,000 ft (3,048 M)			
Humidity	95% non-condensing @ (40 degrees C)			
ELECTRIC				
AC Input Voltage	200-264 VAC, single phase, or 308 VAC three phase, 47-63Hz.			
Disconnect Size	80°			
Cooling Air Requirements	Per Quick Block module 160 CFM (0.8M3/min)			
Heat Dissipation	Per Quick Block module 774 kW at 1.6 kW RF Output into 50 Ohm load			
BTU	Per Quick Block module 2641 BTU/H at 1.6kW RF Output into 50 Ohm load			
HD Radio(R) Power Ratings - kW	Analog	-20 dB	-14 dB	-10 dB
QB5	6	4.3	3.6	2.9
QB10	12	8.7	7.2	5.8
QB20	25	17	14	11
QB30	37	26	21	17
QB40	50	34	29	23
QB50	62	43	36	29

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