

## E-Compact

Less energy. More power.

## HP-BB Series - EX9001

### High Efficiency UHF Broadband Transmitters

### ISDB-T Digital TV: 680 to 8400 Watts RMS



English

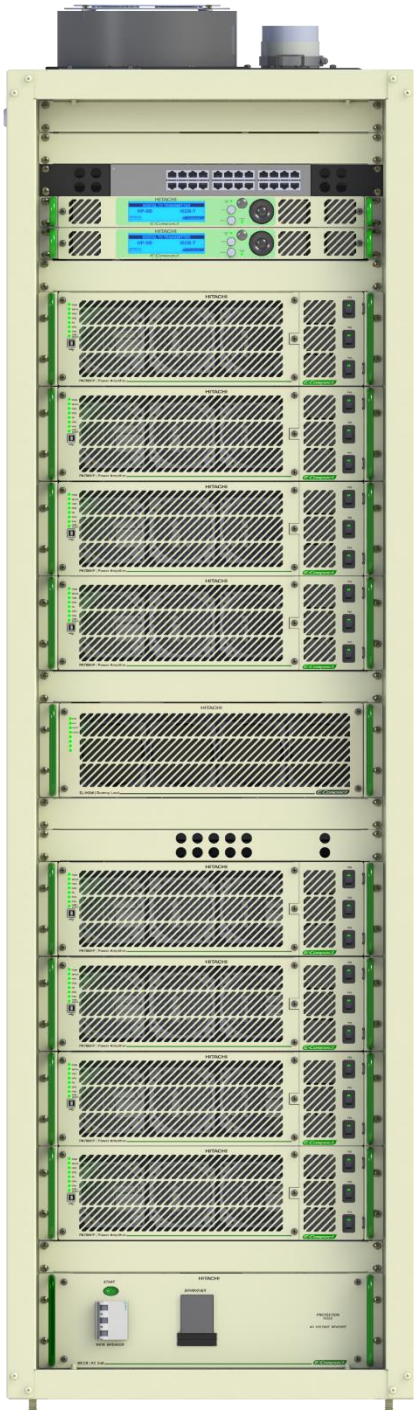
 ISDB-T Digital TV Standard	 High Efficiency	 Redundant Power Supply	 Smart Fan Control
 SFN	 BTS Decomp	 Remux	 Conditional Access
 Adaptive Linearization	 SoC Technology	 RoHS Compliant	 ISO 9001 Certified

## HP-BB Series

Family E-Compact of high-power UHF broadband digital TV transmitters. Fully solid-state, air-cooled, and featuring a standard 19" rack modular structure. Compact, high-density, and efficient, embedded with adaptive non-linear technology; allowing for imperceptible recovery of MER values in case of changes in equipment output power.

It offers the option of Dual Exciter, providing automatic redundancy to the equipment without the need for separate control module management. Broadband Power Drawer with Doherty topology, high performance, with up to 41% efficiency, featuring three built-in power supplies for warranty and high reliability against failures.

## Highlights



- ISDB-T EX9001 Exciter with System on Chip (SoC) technology.
- Measurement tools through the WEB interface. In a graphical environment, it provides visualization of measurements such as Intermodulation and MER, eliminating the need for expensive measurement equipment.
- Equipment control, including Power Drawers, executed by the Exciter, eliminating the need for external control units.
- Broadband Power Drawers with high-efficiency Doherty topology.
- Real-Time adaptive non-linear and linear pre-correction function.
- Parametrizable embedded BTS decompressor, allowing compatibility with other brands.
- Embedded remux, enabling signal adaptation according to transmission needs.
- Embedded satellite receiver, with optional licenses for Free to Air, IRDETO<sup>2</sup>, CONAX<sup>2</sup>, VERIMATRIX<sup>2</sup>, NAGRAVISION<sup>2</sup>, BISS-1, and BISS-E.
- Automatic control of fan speed, resulting in low noise levels, energy savings, and extended device lifespan.
- High reliability against failures. For the HP-BB line, 3 (three) power supplies for each Power Drawer. Balanced distribution of electrical network in a three-phase system.
- "Easy Maintenance" concept offering, among other features, Plug-In connection for Power Supplies and Power Drawers.
- Isolated RF<sup>3</sup> combiners allowing Hot Swap<sup>4</sup>.
- MCCB (Molded Case Circuit Breaker)<sup>3</sup>, AC distribution module with Surge Protection Device (SPD) – Optional surge protection devices.



## Available Features

<b>System on Chip (SoC) Technology</b> The SoC hardware integrates various system elements into a single chip, allowing the embedding of high-processing-power software. This makes it a compact system with significant processing power and high reliability.	AVAILABLE
<b>Measurement Tool</b> MER, Intermodulation, Power, Temperature, and other measurements via WEB in a graphical environment. Enables the visualization of constellation and spectral density diagrams, among others, providing a cost-effective alternative for measuring these parameters.	AVAILABLE
<b>Remote Software Update</b> It is possible to update the equipment's software remotely through the WEB interface.	AVAILABLE
<b>MCCB (Molded Case Circuit Breaker)<sup>3</sup></b> AC distribution module from 8kW to 30kW composed of circuit breakers, In-Rush current limiting system, phase loss protection, overvoltage protection, undervoltage protection (<180VAC), auxiliary power supplies of +50VDC, +15VDC, and +8VDC, and a safety interlock input for cutting off equipment power supply.	INCLUSO
<b>"Easy Maintenance" Concept</b> Power supplies with plug-in connection, eliminating the need for cables and wiring and allowing for quick and secure replacement. Power supplies can be removed via the front panel of the Power Drawer.	AVAILABLE
<b>Embedded WEB Server</b> Remote access to transmitter settings and management is possible via PC or Smartphone through the Ethernet <sup>1</sup> port. It utilizes the PC or Smartphone's own browser, eliminating the need for driver or application installations.	AVAILABLE
<b>Adaptive Linear and Nonlinear Pre-Correction</b> Adaptive pre-correction applied due to changes in the transmitter's output power to imperceptibly recover MER and intermodulation values.	AVAILABLE
<b>BTS Decompression</b> Parametrizable BTS decompressor, embedded in the transmitter, eliminates the need for auxiliary equipment in the system and enables interoperability with other brands.	AVAILABLE
<b>Remux and Embedded Table Generator</b> Table generator embedded in the transmitter, with the ability to filter PIDs, insert static PSI/SI tables, parameterize TMCC, among other functionalities.	AVAILABLE
<b>Exciter Inputs/Outputs</b> Inputs: BTS/TS over IP, 2x ASI/310M, 1PPS, 10MHz, and GPS ANTENNA. Outputs: 2x ASI/310M, 1PPS, 10MHz, and Ethernet <sup>1</sup> RJ45. The BTS/TS over IP input can be converted to ASI and made available in the ASI/310M outputs without interfering with the modulated signal.	AVAILABLE
<b>Passive Elements</b> Mask filter, directional coupler with integrated FWD and REF signal samples, combined with a low-pass filter.	AVAILABLE
<b>Isolated RF Combiners<sup>3</sup> allowing Hot Swap<sup>4</sup>.</b>	AVAILABLE
<b>HITACHI 1200W Power Supply</b> Three 1200-watt power supplies per Power Drawer. Energy redundancy operation. Plug-in type Power Supplies ("Easy Maintenance" concept), eliminating the need for cables and wiring, and allowing quick and secure replacement. Balanced distribution of electrical network in a three-phase system.	INCLUSO
<b>Digital Manuals in English.</b>	AVAILABLE
<b>Dual Driver</b> Backup exciter, providing automatic redundancy without the need for management by a separate control module. Comes with a standard 19" rack Ethernet <sup>1</sup> switch.	OPTIONAL
<b>DPS (Surge Protection Devices)</b> Extra protection against overvoltage surges from the electrical network.	OPCIONAL
<b>ASI to IP Converter</b> Bidirectional Ethernet <sup>1</sup> port for TSolP streaming (input/output). The BTS/TS signal inserted into ASI or TUNER (SAT or UHF) inputs can be made available on the Streaming port (TSolP) without interfering with the currently modulated signal. This functionality is optional and enabled through a software license.	OPTIONAL
<b>TS Analyzer</b> Allows checking TS information such as PIDs, Continuity Package Error, Program Name, Bit Rate, among others.	OPTIONAL
<b>GPS Time Base</b> High-precision time base synchronization via GPS. High performance in SFN (Single Frequency Network) operation. Comes with an external GPS antenna and surge protector.	OPTIONAL
<b>VHF-BIII / UHF Tuner (Terrestrial Reception)</b> ISDB-T VHF-BIII / UHF receiver and demodulator for terrestrial signal retransmission. Comes with a 5 or 7-pole mechanical tuning filter, depending on the conditions of adjacent channels.	OPTIONAL
<b>SAT Tuner (Satellite Reception)</b> Banda L DVB-S/S2 compatible tuner for C and Ku-band LNB. Comes with a coaxial surge protector.	OPTIONAL
<b>CAS Tuner (Conditional Access Satellite Reception)</b> Banda L DVB-S/S2 compatible tuner for C and Ku-band LNB. Decrypts up to 04 simultaneous services and allows viewing of up to 08 services on the display. Comes with a coaxial surge protector.	OPTIONAL
<b>Decryption Licenses for CAS Tuner: IRDETO<sup>2</sup>, CONAX<sup>2</sup>, NAGRAVISION<sup>2</sup>, VERIMATRIX<sup>2</sup>, BISS-1, and BISS-E</b> Decryption licenses can be acquired individually or collectively, for new transmitters or for transmitters already in operation in the field. In some cases, it is possible to enable licenses remotely.	OPTIONAL
<b>Telemetry Remote via 4G Network</b> Remote monitoring of the transmitter using the 4G telephony network.	OPTIONAL
<b>Manuals in printed English.</b>	OPCIONAL

## General Features

- Exciter model EX9001 with System on Chip (SoC) technology.
- Mounting in a standard 19" Rack cabinet.
- Fully solid-state.
- 900 Watts RMS Doherty Power Drawers with LDMOS transistors.
- Air-cooled.
- Automatic restart in case of power outage.
- Operates in SFN (Single Frequency Network) and MFN (Multiple Frequency Network).
- Control firmware managing the entire equipment.
- Access to settings and parameter management via display interface on the Exciter's front panel or remotely via Ethernet<sup>1</sup> (WEB server or SNMP).
- Alarm indicator LEDs on the Exciter and Power Drawer front panels.
- Access to the list of current or past alarms via display interface on the Exciter's front panel or remotely via WEB interface.
- VSWR and Overpower protection via hardware and software, with automatic power reduction.
- Software protection against module temperature increase, with alarm signaling and power reduction.
- Automatic fan speed control.
- Automatic compensation of power transistor bias quiescent current based on temperature.
- AGING compensation adjustment for transistors via display on the Exciter's front panel.
- Automatic and programmable input switching in hold-on and hold-off modes.
- Power supply with Power Factor Correction (PFC) and soft start with In-Rush limitation.
- RF interconnections between equipment parts using rigid lines.

## Models and their specific features (EX9001 - ISDB-Tb)

	EC701HP-BB*	EC702HP-BB*	EC703HP-BB*	EC704HP-BB*	EC706HP-BB*	EC708HP-BB*	EC712HP-BB*	
Output power after the filter (W) <sup>5</sup>	680	1400	2100	2800	4200	5600	8400	
Output power before the filter (W) <sup>5</sup>	850	1720	2560	3420	5120	6830	10000	
AC power consumption (W) <sup>5</sup>	2340	4620	6900	9180	13740	18300	27420	
Thermal Dissipation (BTU/h) <sup>5</sup>	5664	10987	16378	21769	32552	43334	64899	
Efficiency after the filter (%) <sup>5</sup>	29,1	30,3	30,4	30,5	30,6	30,6	30,6	
Efficiency before the filter (%) <sup>5</sup>	36,3	37,2	37,1	37,2	37,3	37,3	36,5	
Power Drawers	1	2	3	4	6	8	12	
Number of Racks							1	2
Units in 19" Rack (RU)	8	25			40			
Width (mm)	570						1140	
Length (mm)	900	1100						
Weight (kg)	70	170	210	250	350	420	700	

\*Equipment also available with EX8001 exciter (consult specific catalogue).

## Transmission Spectrum Mask (Intermodulation) <sup>6</sup>

	Critical Mask	Subcritical Mask	Non-critical Mask
±3,15 MHz @ BW = 6 MHz	≥50 dB	≥43 dB	≥36 dB
±4,50 MHz @ BW = 6 MHz	≥67 dB	≥60 dB	≥53 dB
±9,00 MHz @ BW = 6 MHz	≥97 dB	≥90 dB	≥83 dB
±15,00 MHz @ BW = 6 MHz	≥97 dB	≥90 dB	≥83 dB

Transmission spectrum mask according to ABNT NBR 15601:2007

## Características Técnicas

RF	
<b>Standard</b>	ISDB-Tb
<b>Operation frequency</b>	470 MHz to 608 MHz (Canal 14 to Canal 36)  608 MHz to 698 MHz (Canal 37 to Canal 51)
<b>Bandwidth</b>	6 MHz / 8 MHz
<b>Minimum operating power</b>	1 % of rated power
<b>Pré-correction</b>	Adaptive Nonlinear Linear
<b>Typical MER</b>	Minimum ≥35 dB. Typical 38 dB (depends on channel, power, and transmitter efficiency)
<b>Out-of-channel spurs and harmonic distortions</b>	Better than -60 dBc
<b>Transmission Mask (Intermodulation) <sup>6</sup></b>	Critical Subcritical Non-critical
<b>Power stability</b>	±2 %
<b>RF output impedance</b>	50 Ω
<b>Output Connections <sup>7</sup></b>	EIA 1-5/8" @EC701HP-BB, EC702HP-BB, EC703HP-BB and EC704HP-BB  EIA 3-1/8" @EC706HP-BB, E708HP-BB and EC712HP-BB

ASI Inputs / Outputs	
<b>Quantity</b>	02 inputs, 02 Outputs
<b>Standard</b>	DVB-ASI 188 /204 BYTES
<b>Connectors</b>	BNC Female
<b>Impedance</b>	75 Ω

Input TSoIP	
<b>Standard</b>	IEEE802.3u 10 Base-T /100Base TX
<b>Connector</b>	RJ45
<b>Encapsulation</b>	UDP/RTP
<b>IP assignment</b>	Static
<b>Multicast</b>	IGMP v2

GPS antenna input (optional)	
<b>Connectors</b>	SMA Female
<b>Impedance</b>	50 Ω
<b>Accessories</b>	External antenna, cable and surge protector

UHF / VHF-BIII Tuner Input (optional)	
<b>Reception band</b>	UHF / VHF-BIII
<b>Standard</b>	ISDB-T
<b>Connectors</b>	SMA Female (Exciter) N Female (input UHF filter)
<b>Impedance</b>	50 Ω

Satellite tuner input (optional)	
<b>Reception band</b>	L band
<b>Polarization</b>	Vertical / Horizontal
<b>LNB voltage</b>	+13 V, +18 V
<b>Standard</b>	DVB-S / DVB-S2
<b>Connectors</b>	SMA Female (Exciter) F Female (connection w/ LNB)
<b>Impedance</b>	75 Ω
<b>Accessories</b>	surge protector

CAS tuner input (optional)	
<b>Reception band</b>	L band
<b>Polarization</b>	Vertical / Horizontal
<b>LNB voltage</b>	+13 V, +18 V
<b>Standard</b>	DVB-S / DVB-S2
<b>Connectors</b>	SMA Female (Exciter) F Female (connection w/ LNB)
<b>Impedance</b>	75 Ω
<b>Optional decryption licenses<sup>3</sup></b>	IRDETO <sup>2</sup> CONAX <sup>2</sup> NAGRAVISION <sup>2</sup> VERIMATRIX <sup>2</sup> BISS-1 BISS-E
<b>Accessories</b>	surge protector

10MHz external references - Input / output	
<b>Quantity</b>	01 input, 01 output
<b>Connector</b>	BNC Female
<b>Impedance</b>	50 Ω
<b>Input level</b>	0 a +10dBm
<b>Output Level</b>	+10 dBm

1PPS external references - Input / output	
<b>Quantity</b>	1 input, 1 output
<b>Connectors</b>	Female BNC
<b>Impedance</b>	1 kΩ
<b>Input Level</b>	3.3V LVTTTL
<b>Output Level</b>	3.3V LVTTTL

Linearization inputs After F. / Before F.	
<b>After Filter Input</b>	Linear pre-correction
<b>Before Filter Input</b>	Nonlinear pre-correction
<b>Connector</b>	SMA Female
<b>Impedance</b>	50 Ω
<b>Input level</b>	-5 to +5 dBm

Local oscillator	
<b>Oscillator</b>	Synthesized by PLL
<b>Frequency stability</b>	±1 Hz (with Internal GPS) ±35 Hz (without Internal GPS)
<b>Phase noise</b>	≤-95 dBc/Hz @ 1 kHz

ISDB-T Modulation	
<b>Mode OFDM</b>	Mode 1: 2K (2048/3,96 KHz) Mode 2: 4K (4096/1,98 KHz) Mode 3: 8K (8192/0,99 KHz)
<b>Guard interval</b>	1/4, 1/8, 1/16, 1/32
<b>Partial reception</b>	Single segment for mobile devices (1-Sec)
<b>Hierarchical Transmission</b>	Support for 3 layers (A, B and C)
<b>Segments</b>	1 to 13
<b>Modulation</b>	QPSK, DQPSK, 16QAM, 64QAM
<b>FEC</b>	1/2, 2/3, 3/4, 5/6, 7/8
<b>Time Interleaving</b>	0, 1, 2, 4

Electrical characteristics	
<b>Electrical network compatible (Factory set)</b>	Single-phase 220 VAC (M220) Two-phase 220 VAC (B220) Three-phase 220 VAC (T220) Three-phase 380 VAC (T380)
<b>EC701HP-BB</b>	M220 / B220
<b>EC702HP-BB / EC703HP-BB / EC704HP-BB / EC706HP-BB / EC708HP-BB / EC712HP-BB</b>	M220 <sup>8</sup> / B220 <sup>8</sup> / T220 / T380
<b>AC input voltage</b>	AC input voltage: 180~254 VAC
<b>AC frequency</b>	AC frequency: 43~63 Hz
<b>Number of power supplies per Power Drawer</b>	Number of power supplies per Power Drawer: 03 HITACHI PSUs of 1200 W
<b>Power Factor Correction (PFC)</b>	Power Factor Correction (PFC): 0.95 (typical), 0.9 (minimum)

Interfaces	
<b>Local Equipment Control Interface</b>	Graphic display 256x64 pixels
<b>Signaling LEDs</b>	Navigation cursor keys
<b>Remote Access (Management)</b>	Alarm LEDs on the Exciter RJ45 connector

Operating Environment Characteristics	
<b>Operating altitude</b>	Up to 2500 meters <sup>5</sup> (8200 ft) <sup>5</sup> above sea level
<b>Environment temperature range</b>	0°C (32°F) to + 45°C (113°F) +25°C (77°F) recommended
<b>Environment humidity range</b>	0 to 95 % non-condensing
<b>Power amplifier cooling</b>	Forced ambient air, front-to-rear flow through high-volume integral fans

## Notes:

- <sup>1</sup> Ethernet is a trademark of Xerox Corporation.
- <sup>2</sup> Module with PCMCIA CAM slot (Irdeto, Conax, Nagravision, and Verimatrix systems), SMARTCARD, and CAM not included.
- <sup>3</sup> Except for the EC701HP-BB model.
- <sup>4</sup> Power Drawers can be removed or inserted with the Transmitter in operation, but the Power Drawer to be removed or inserted must have the AC key on its front panel in the OFF position.
- <sup>5</sup> Considering optimized channel and environmental conditions. May vary depending on channel frequency and operating conditions.
- <sup>6</sup> The transmission mask depends on the type of filter used.
- <sup>7</sup> Consult the factory for other types of output connections.
- <sup>8</sup> AC Power Supply Upon Request for EC708HP-BB and EC712HP-BB models.
- <sup>9</sup> Nominal power up to 2500m. Above 2500m, consult the factory.

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