GRANITE SERIES

ISDB-T/TB PRODUCT CATALOG

TRN-U8D / TRN-2U8D / TRN-3U8D / TRN-4U8D / TRN-5U8D / TRN-6U8D / TRN-8U8D / TRN-10U8D

MEDIUM HIGH POWER AIR COOLED SOLID STATE UHF TV TRANSMITTER

The **Granite Series** – Like a rock

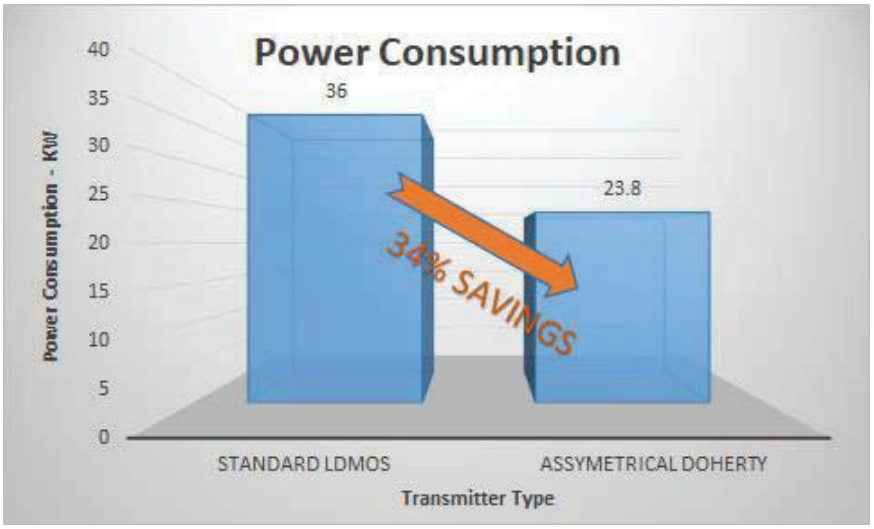
Introduction

The Anywave ***GRANITE*** series of Air Cooled UHF TV transmitters provides the broadcaster with the latest state-of-the-art digital transmitter design. The ***GRANITE*** series delivers the highest levels of performance and reliability without costing you extra.

They operate across all modulation standards including DVB-T/H, DVB-T, DVB-T2, ATSC, ATSC3.0, ISDB-T/B and DTMB. The ***GRANITE*** series incorporates the powerful correction capabilities of the ACT 5X+ or 9X digital exciter platforms.

Key Facts

- ✓ Multi-standard capability: DVB-T/H, DVB-T, DVB-T2, ATSC, ATSC3.0, ISDB-T, ISDB-TB (as per NBR 15601) and DTMB
- ✓ Transmitter efficiency up to 45% (amplifier efficiency > 50%)
- ✓ Implements latest state-of-the-art Asymmetrical Broadband Doherty Technology
- ✓ Optional Exciter Mux/Remux, BTS Generator & Decompressor (ISDB-T/TB)
- ✓ Modular for better reliability and ease of maintenance
- ✓ Optitune™ technology automatically optimizes performance and efficiency at any power level
- ✓ Redundant hot swappable Power Supply Units
- ✓ Simple and Efficient Front-to-Back Air Cooling with fan speed control and Graphene Enhanced Thermal Management technologies
- ✓ LCD Touch Screen Control System
- ✓ Direct & Reflected Power Monitoring
- ✓ Remote monitoring and control via Web Browser and SNMP
- ✓ Typical Overall MER 38dB
- ✓ Critical Mask Filter Option available for ISDB-TB
- ✓ Dual Exciter with Auto Switching Option



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General Overview

The MHPTV transmitter is easily configured to operate as a standard transmitter or as an RF translator. Innovative DDRF™ (Direct Digital RF) broadband automatic balancing technology achieves near perfect RF performance with shoulder levels exceeding -60 dB and out of band spurious also greater than -60 dB, all based on an ultra low noise floor.

Independent feedback for adaptive SWR optimization function maximizes emission signal quality after the transmitter band-pass filter (BPF). The system level AGC (Automatic Gain Control) function includes both RF and DC AGC feedback obtaining a stable output power and performance.

The transmitter includes a digital ultra-wideband phase noise processing technology that automatically detects and compensates phase noise to achieve unparalleled performance.

The front panel of the transmitter includes a user friendly graphical display for control and status monitoring including a real time measurement and display of the shoulder levels and SNR of the transmitted signal. This control interface provides a quick guide to the operation of the entire transmitter including a real-time temperature display, an over temperature alarm, and the individual voltage and current readings of all the amplifier transistors.

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1000W OFDM
(After Filter)

2000W OFDM
(After Filter)

The **Granite Series** – Like a rock

3000W OFDM
(After Filter)

4000W OFDM
(After Filter)

5000W OFDM
(After Filter)

Granite is a coarse-grained, quartz and feldspar-bearing igneous rock that is made up entirely of crystals. It forms from the slow crystallization of Magma* below the Earth's surface.

The Granite Series, - built to last.

* Magma is Anywave's new series of liquid cooled transmitters

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The **Granite Series** has the highest power density for any high power air cooled transmitter today.

6000W OFDM
(After Filter)

8000W OFDM
(After Filter)

10000W OFDM
(After Filter)
DUAL RACK DESIGN

The **Granite Series**
– Like a rock

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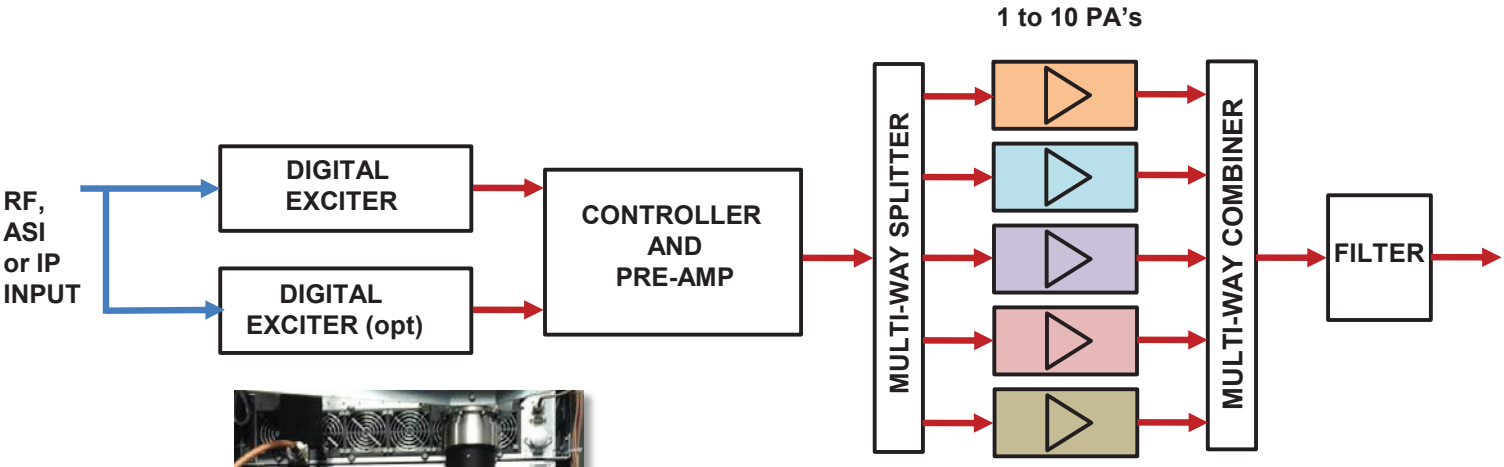
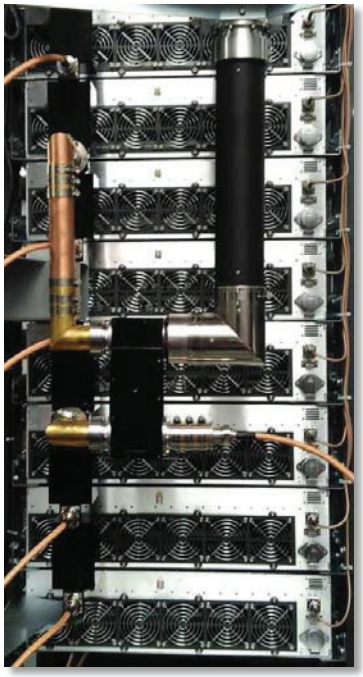
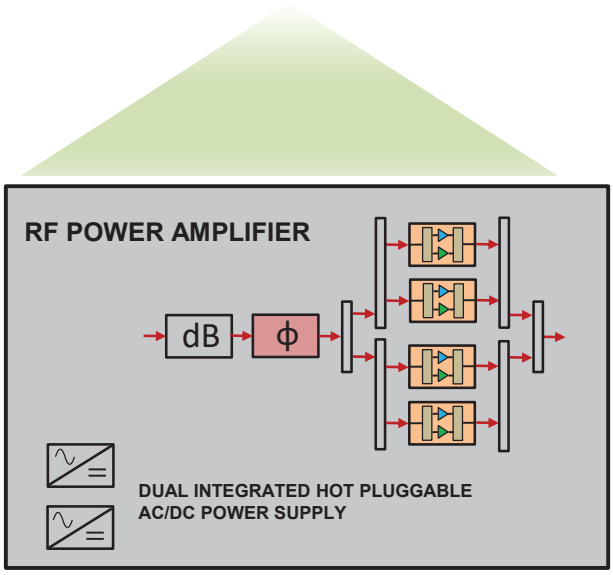
Transmitter Block Diagram







Highest Power Density

- Up to 8kW at the filter output in ISDB-TB - Single Rack
- 10kW at the filter output in ISDB-TB - Dual Rack

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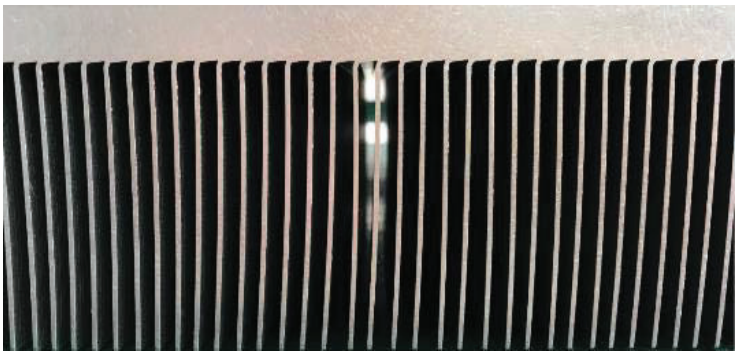
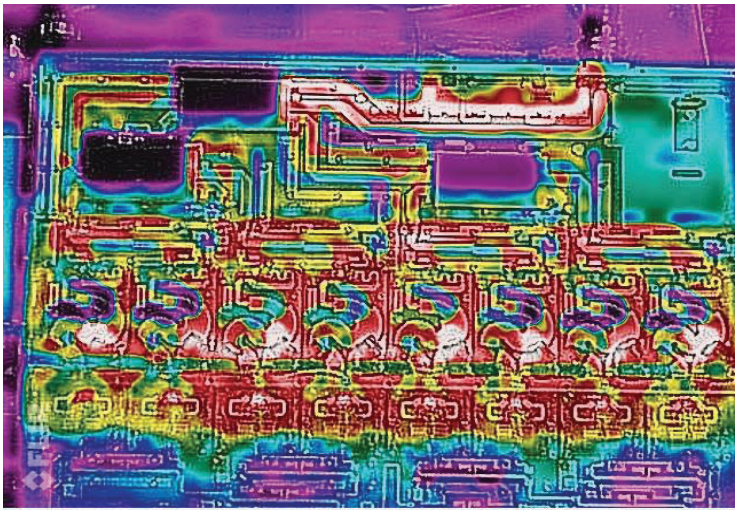
Superior PA Design





- Dual hot-swappable, easily replaceable high-capacity power supplies
- Individual variable speed control for each fan to user configurable target temperature
- Oversized single-piece heat-sink provides even heat distribution and enhanced heat transfer
- Eliminates critical hot-spots…designed to last

Less wasted heat equals lower operating costs

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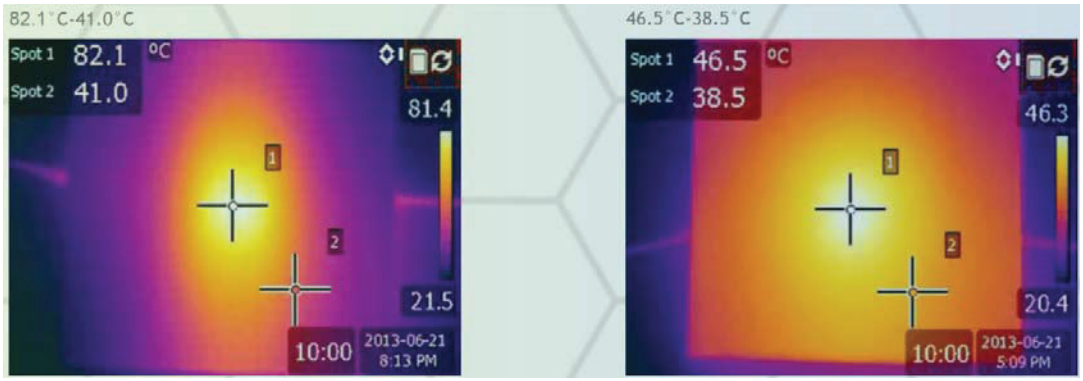
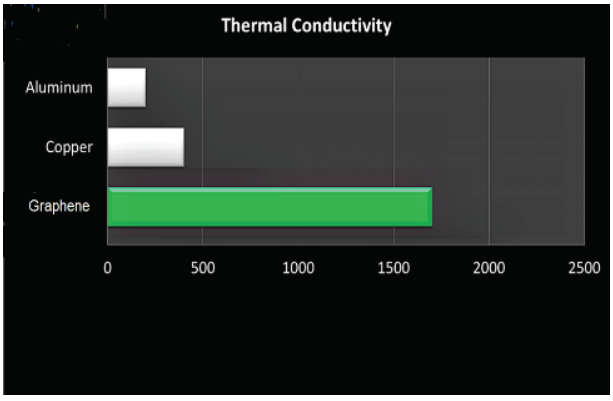
Graphene Enhanced Thermal Management Technology



Without Graphene With Graphene



- Graphene's heat conductivity is 4 times better than copper and 8 times better than aluminum
- Cooler operation means better performance, higher reliability, and longer life

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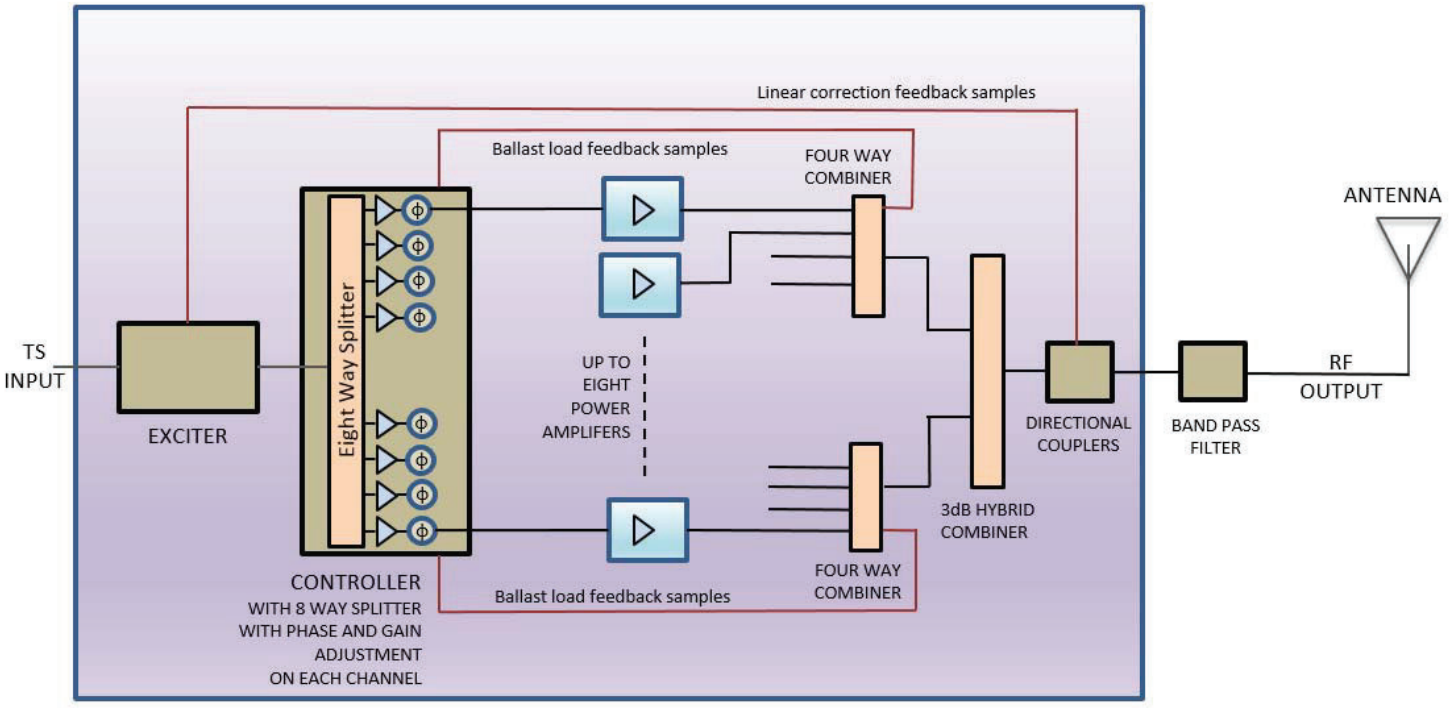
Optitune™ Technology



- Self-calibrating, automatic, adaptive phase and gain matching of all PA modules (up to 10 amplifier modules per rack)

- Automatically balances entire system in gain and phase within 10 minutes to achieve maximum output power (minimizes combiner losses) and optimal operating efficiency (minimizes operating costs)

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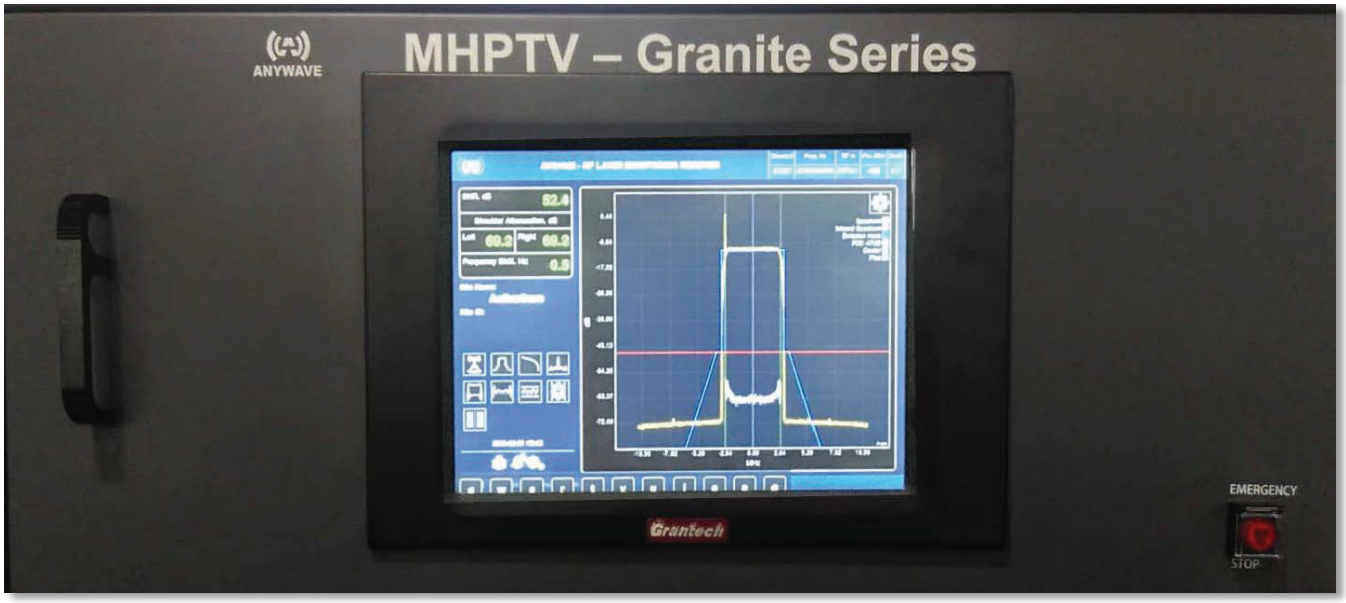
AVQ Monitoring



- Real time signal quality monitoring including spectrum, shoulders, constellation diagram, eye diagram, MER, frequency response, impulse response, group delay, CCDF, etc.
- Built-in performance monitoring eliminates the need for costly test equipment
- Upgradable to ATSC3.0

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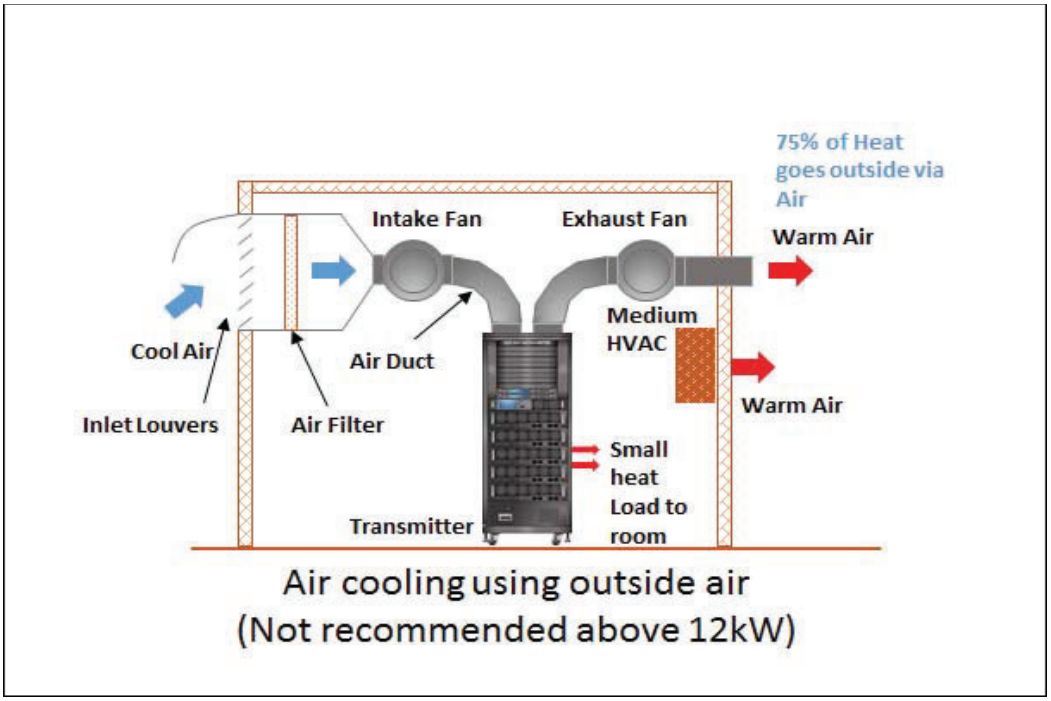
Easy installation and service

Installing or replacing a liquid cooled television transmitter often requires substantial construction work and expertise. In most cases it is necessary to install pipe work, flow meters, gate valves, heat exchangers, pumps, tanks, additional electrical conduit and electrical breakers. In comparison, the installation of an air cooled transmitter is far simpler. Once the RF system and electrical connections are in place, the air cooled system is typically ready to operate in a matter of hours rather than weeks. The initial cost of equipment and installation of a liquid cooled transmitter is higher than that of an air cooled system; in most situations 30% more.

Although liquid cooling has a marginally lower operating cost, the amount of time to pay-back the initial investment difference in most cases could be as much as 12 years. An Air cooled transmitter also has lower spares, replacement and maintenance costs. The new **Granite Series** air cooled transmitter from **Anywave** makes it possible to maintain with lesser qualified staff, achieve space savings and most importantly - significantly reduce initial capital expenses.



Air cooling using outside air
(Not recommended above 12kW)

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Exciter Specifications

Signal Inputs

- TS Inputs: 2 Transport Stream with loop out, DVB-ASI or TSoIP (BTS Option for ISDB-TB) 188 or 204 Bytes - Conn: BNC female 75 Ω
- Sat Input: DVB-S/S2 (Optional)
- RF Input: Freq: VHF or UHF Bandwidth: 6 MHz
  Connector: BNC female 50 Ω
  Level: -85 dBm ~ -15 dBm
  AWGN TOV: ≤ 16 dB (A/53 operation)
  Equalization Range (-1 µs ~ 0 µs): ≤ -2 dB
  Equalization Range (0 µs ~ 17 µs): ≤ -3 dB
  Adjacent Channel Rejection (N ± 1): > 30 dB

Signal Processing

- Bandwidth: 6 MHz
- Supported Mode: ATSC & ISDB-TB Versions
- Network Mode: MFN & SFN (Opt. for ISDB-TB)
- Local Mux, Remux (Option for ISDB-TB)
- BTS Decompressor (Option for ISDB-TB)

RF Output

- Connector (RF Out): N-Type female 50 Ω
- Frequency: VHF/UHF in steps of 1 Hz, spectrum shifting up to ± 50 KHz
- Level: -25 dBm ~ +5 dBm in steps of 0.05 dB
- Level Stability: < ± 0.1 dB
- Frequency Stability: < 0.5 x 10^{-7} (with onboard 10MHz REF), or in accordance with the Ext. GPS accuracy
- Symbol Rate: 10.762238 MHz
- MER: > 40dB
- Amplitude Flatness: < ± 0.5 dB
- IMD Shoulder Level (± 500 kHz): < -60 dB
- Out of Band Spurious: < -60 dB
- Pilot Amplitude Error: < ± 0.1 dB
- Return Loss: > 15 dB
- Phase Noise (@20 kHz): < -107 dBc/Hz

Reference Clock (GP

Internal 10MHz

- Frequency Stability: < ± 0.05 ppm
- Aging: < ± 0.05 ppm/year
- Output level: 0 dBm ± 3 dB

External 10MHz

- Input Level: AC coupled V (p-p) > 300 mV
- Input Conn: BNC female 50 Ω External 1PPS
- Input Level & Conn: TTL - BNC female 50 Ω
- Internal GPS Receiver - Optional

- **Linear and Non-linear ADPC™**
- Dual Feedback Signal: BNC female 50 Ω
- Feedback level: -35 dBm ~ 0 dBm (suggested value: - 15 dBm ~ -5 dBm)
- Correction is Adaptive and Automatic: No additional instruments or manual operations needed
- Continuous measurement and display of SNR and IMD
- Correction of amplitude, phase and group delay
- Up to 10 dB of MER improvement
- Up to 15 dB of shoulder improvement
- In-band flatness: < ± 0.5 dB

Other

- Power Supply: 88 ~ 264 VAC, 50/60Hz
- Operating Temperature: 0° C ~ 50° C (+32°F~+122°F)
- Operating Humidity: ≤ 95%
- Size: 1 RU, 19” Wide

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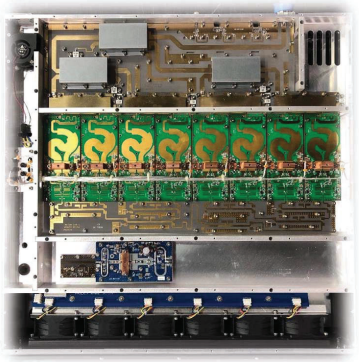
Power Requirements / Dimensions

MHPTV Series - UHF >> TRN-U8D / TRN-2U8D / TRN-3U8D / TRN-4U8D / TRN-5U8D / TRN-6U8D / TRN-8U8D							
Number of Amplifiers	1	2	3	4	5	6	8
Output Power (RMS) ATSC [1]	1400	2800	4200	5600	7000	8400	11200
Output Power (RMS) COFDM [1]	1200	2400	3600	4800	6000	7200	9600
Output Connector	1-5/8"					3-1/8"	
Height (inches/mm)	53.5/1358		70.6/1794			81.2/2063	
Width (inches/mm)	28.5/725						
Depth (inches/mm)	33.5/850		43.5/1100				
Weight(LBS/Kg)	400/182	520/236	700/318	810/367	920/418	1060/480	1280/580
AC input frequency	50/60 Hz						
AC input voltage	220/240 VAC Single ϕ (1, 2, or 3 PA) or 208/220 VAC Three ϕ						
Consumption - Max - kW	3.2	6.3	9.3	12.2	15.2	18.2	24
Current rating per ϕ - Max - A [2]	13.3/8.9	26.3/17.5	38.8/25.8	33.9	42.2	50.6	66.6

MHPTV Series - UHF >> TRN-10U8D (2 Rack Design)		
Number of Amplifiers	10	
Output Power (RMS) ATSC [1]	14000	
Output Power (RMS) COFDM [1]	12000	
Output Connector	3-1/8"	
Height (inches/mm)	81.2/2063	
Width (inches/mm)	2x 28.5/725	
Depth (inches/mm)	43.5/1100	
Weight(LBS/Kg)	1800/816	
AC input frequency	50/60 Hz	
AC input voltage	208/220 VAC Three ϕ	
Consumption - Max - kW	32	
Current rating per ϕ - Max - A [2]	85	

[1} Power measured before band pass filter - COFDM Spec apply to ISDB-TB

[2} 1,2,3 PA - Current rating is for 220/ 240 VAC Single ϕ or 208/220 VAC Three ϕ; 4,5,6,8 PA - Current rating is for 208 /220VAC Three ϕ



Cost Effective 100%

Reliable 100%

Scalable 100%

Dependable 100%

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