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

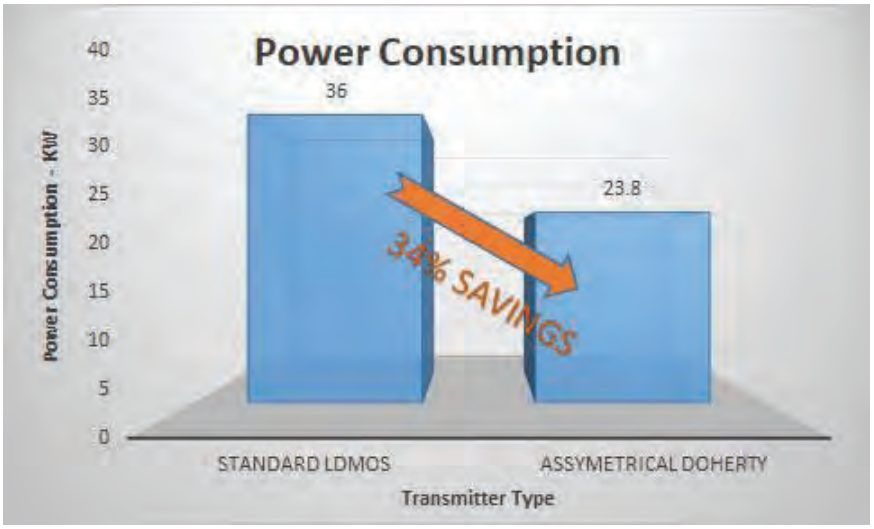
Introduction

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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COMMUNICATION TECHNOLOGIES

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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COMMUNICATION TECHNOLOGIES

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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COMMUNICATION TECHNOLOGIES

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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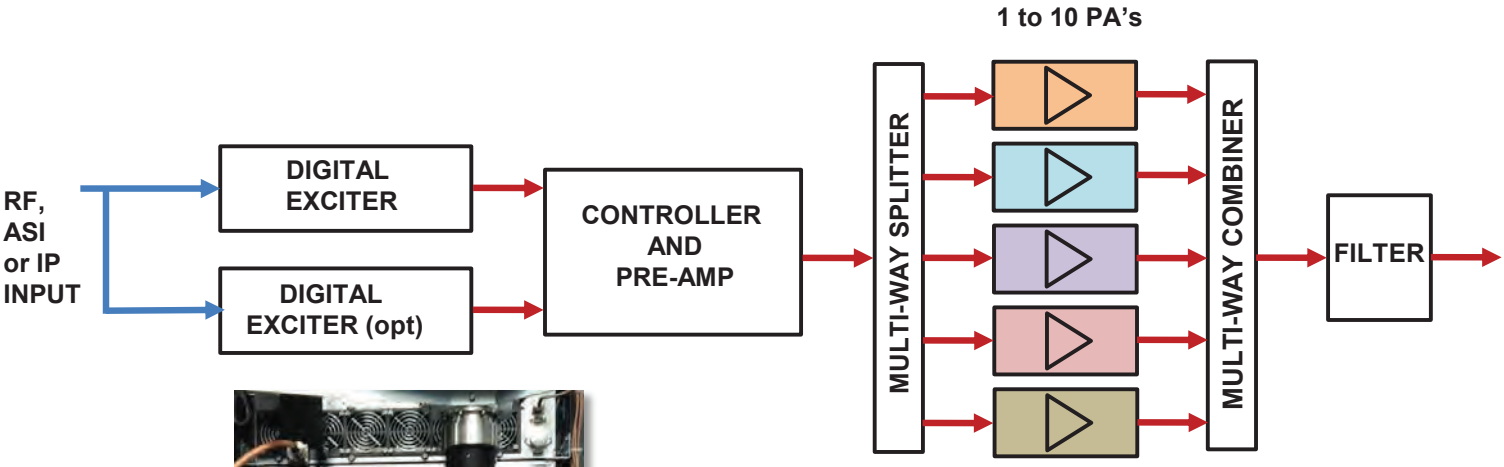
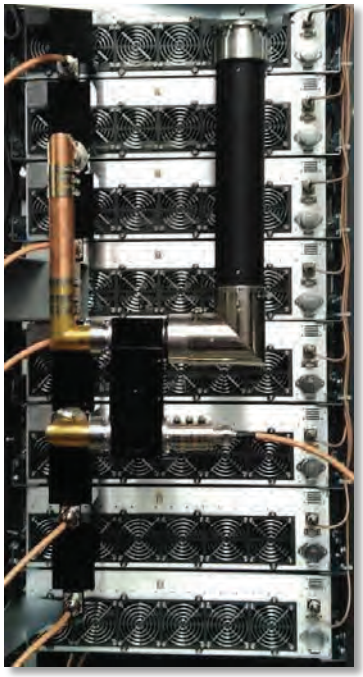
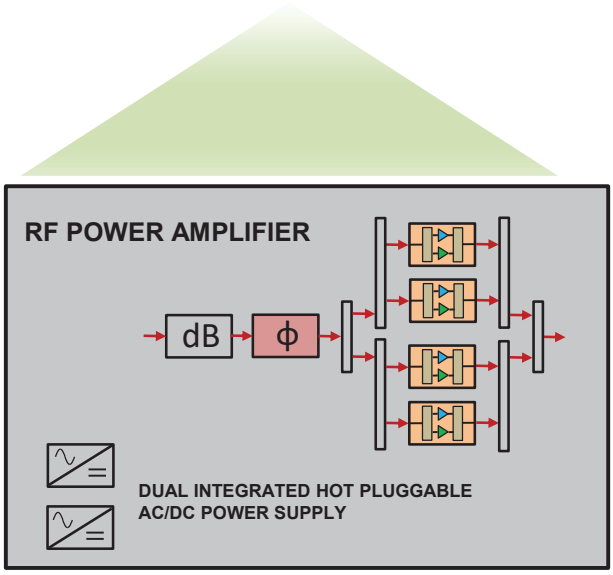
COMMUNICATION TECHNOLOGIES

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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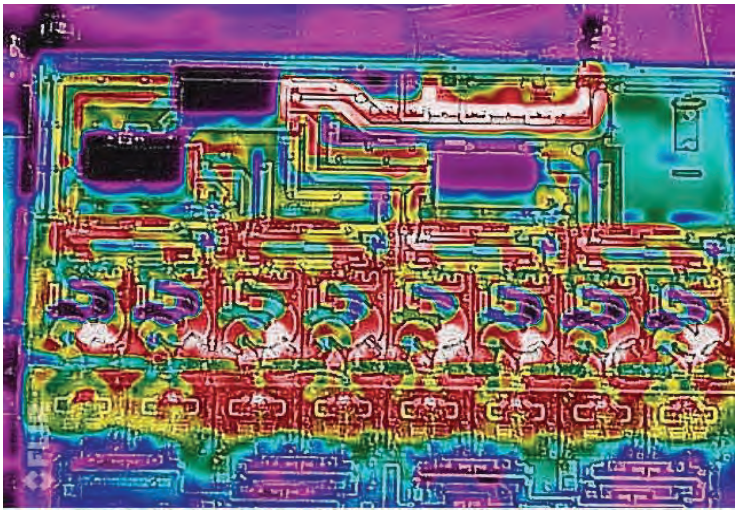
COMMUNICATION TECHNOLOGIES

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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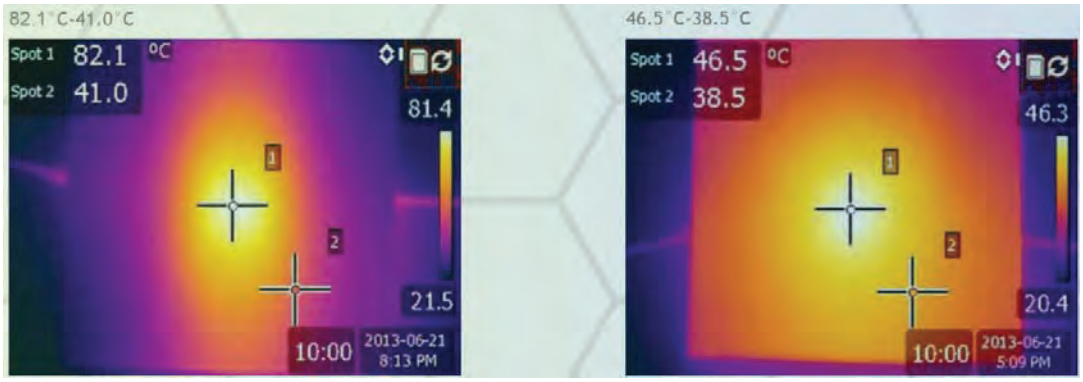
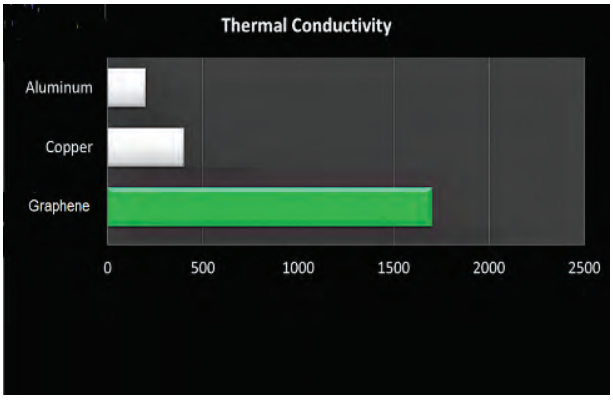
COMMUNICATION TECHNOLOGIES

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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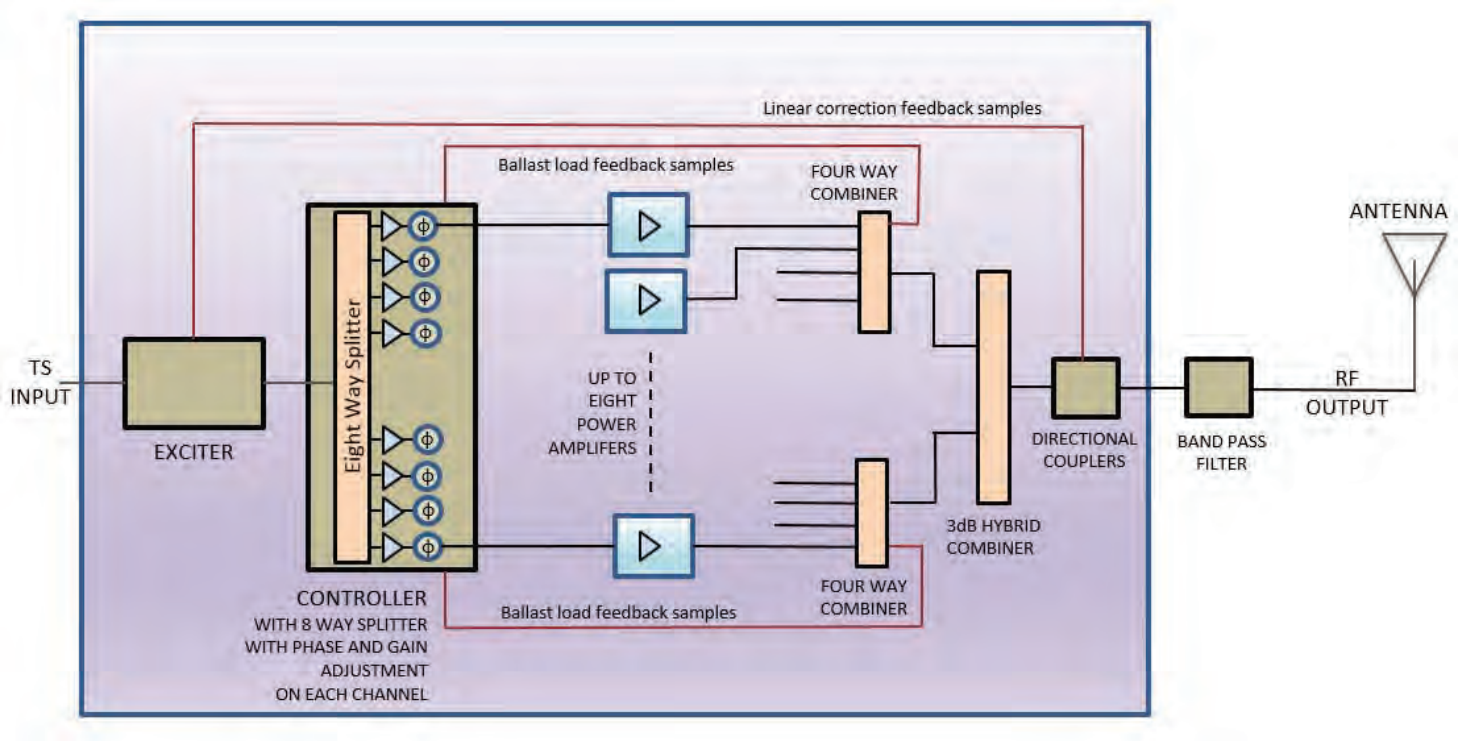
COMMUNICATION TECHNOLOGIES

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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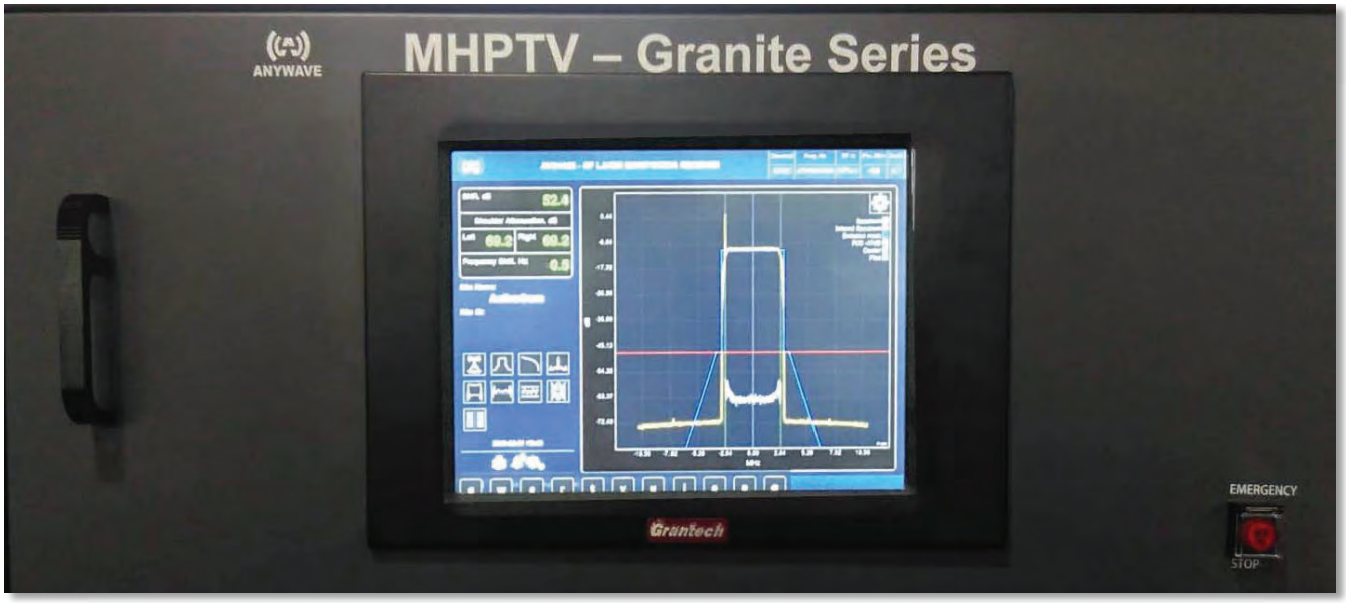
COMMUNICATION TECHNOLOGIES

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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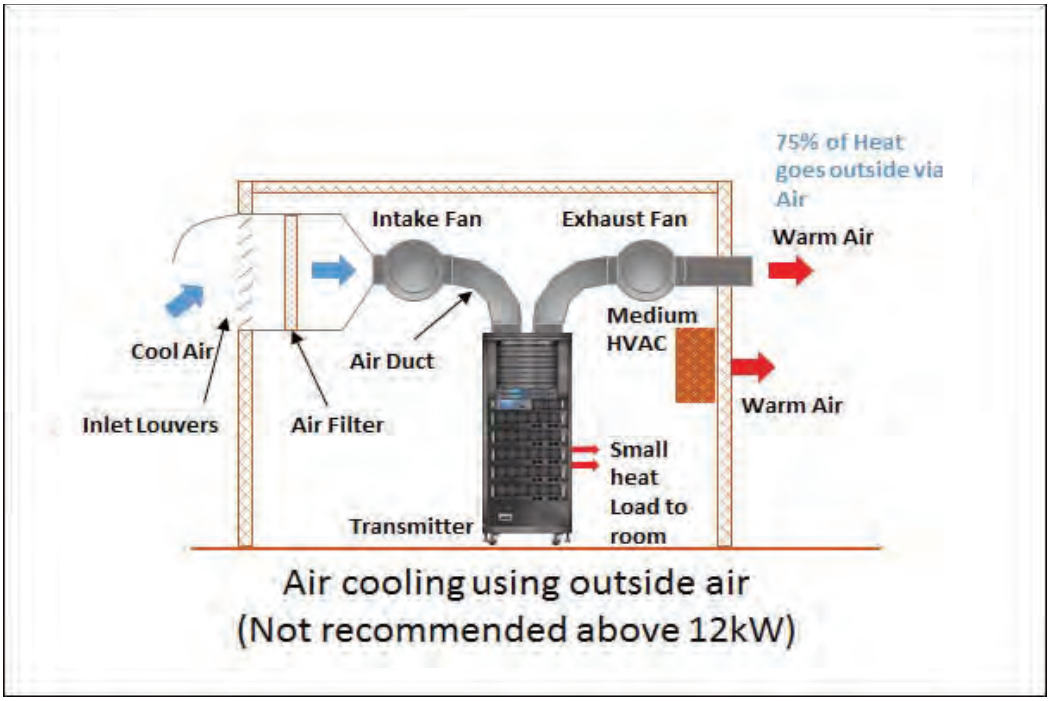
Easy installation and service

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.



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COMMUNICATION TECHNOLOGIES

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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COMMUNICATION TECHNOLOGIES

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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MARBLE SERIES

PRODUCT BROCHURE

LOW/MEDIUM POWER AIR COOLED SOLID STATE UHF/VHF TV TRANSLATOR / TRANSMITTER

Introduction

The new Anywave ***MARBLE*** series of Air Cooled UHF/VHF TV transmitters provides the broadcaster with the latest state-of-the-art digital transmitter design, which provides the highest level of performance available anywhere, yet in an extremely compact package. The power capability of these forced air cooled Solid State transmitters/translators ranges from 300W ATSC (240W OFDM) to 2200W ATSC (1760W OFDM) (power level before filter). They operate across all worldwide TV standards including ATSC, ATSC 3.0, DVB-T, DVB-T2, ISDB-T and DTMB. The ***MARBLE*** series incorporates the powerful correction capabilities of the ACT 5X+ or 9X digital exciter platforms. In addition, the products offer many unique features not available anywhere else in the industry.

Key Facts

- ✓ Multi-standard capability: ATSC, ATSC 3.0, DVB-T, DVB-T2, ISDB-T, DTMB, and analog
- ✓ Broadband – covers UHF from channel 14-36, VHF band I and band III also available
- ✓ Modular for better reliability and ease of maintenance
- ✓ Latest Power Amplifier LDMOS Technology – implements asymmetrical Doherty design (both UHF and band III VHF) for exceptional efficiency, ruggedness, and cool operation
- ✓ Industry-leading adaptive linear and non-linear correction – Anywave's own exciter
- ✓ Simple and Efficient Front-to-Back Air Cooling
- ✓ LCD Touch Screen Control System (available on higher power units)
- ✓ Remote control via Web Browser and SNMP

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FEATURES

- ✓ ATSC Transmitter or an RF Translator (every modulator includes an RF input and built-in receiver/demodulator)
- ✓ Full Band UHF or VHF Operation
- ✓ Powerful Adaptive Digital Pre-Correction (ADPC™). Anywave exciters are used by leading RF power transistor manufacturers to specify their device performance with superior results to other well known brands (ask us for details).
- ✓ Real time measurement and display of Receive Signal Strength (RSSI) and Received Signal to Noise Ratio (RSNR) in an RF Translator operation
- ✓ Real time measurement and display of the Transmit Signal Shoulder levels (IMD), the Transmitted Signal to Noise Ratio (TSNR) and the Transmitted Power Percentage (FWD %)
- ✓ Supports ATSC 1.0 and easily upgraded to ATSC 3.0

<u>Options</u>

- ✓ Performance and Quality Measurement (PQM) Graphical User Interface
- ✓ TSID/PSIP editor
- ✓ Static Picture Feature
- ✓ ASI Loop Thru
- ✓ Transport Stream over IP (TSoIP) input
- ✓ Built-in GPS receiver

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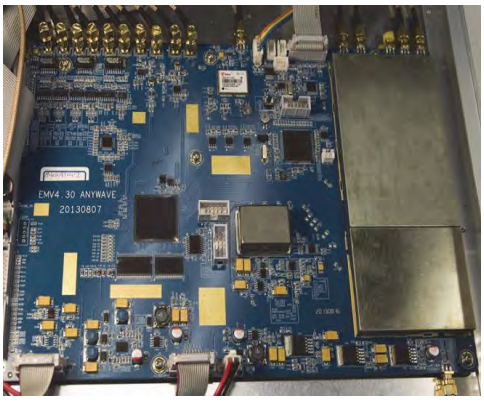
EXCITER CHASSIS & DISPLAY

The Anywave Exciter includes a back lit 40 x 2 LCD display. Multiple menus allow the real time measurements of transmitted and received frequency, output power level and input selection. The exciter/translator also measures and displays the key transmitter parameters of Intermodulation Distortion (IMD) often known as “shoulders” and the Signal to Noise Ratio (SNR) of the final transmitted signal output.

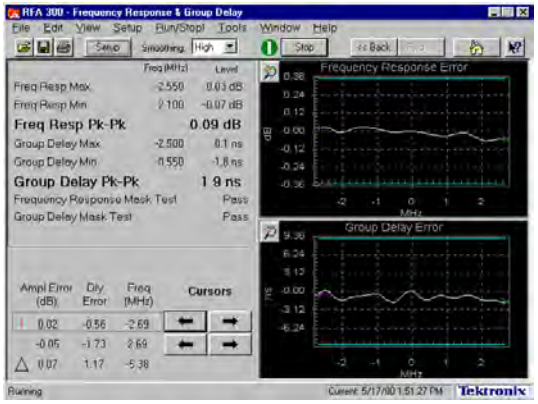
The main menu also includes a built-in power meter reading of the transmitter output power in percentage that can be easily calibrated from the front panel. The exciter also has an overheat alarm with its own temperature display, GPS information that includes the receivable satellites, clock accuracy and time.



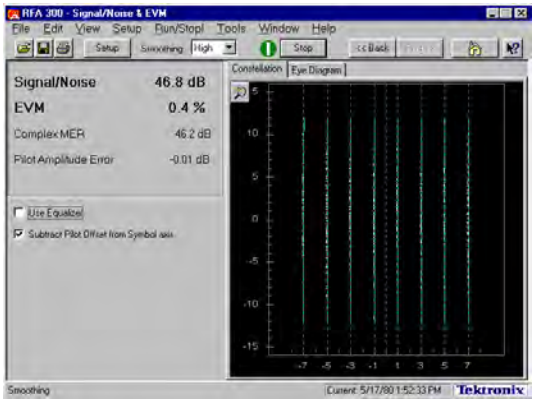
The exciter obtains very high reliability due to the integrated design; a single board containing both analog and digital circuits, stud type connectors for long term reliability, and no connector directly connected to chassis. The exciter includes a single rugged and shielded AC/DC power supply.

A solid chassis of just 1 RU, with a low profile all aluminum structure, solid construction, well grounded for excellent RF shielding and light weight at less than 10 LBS.

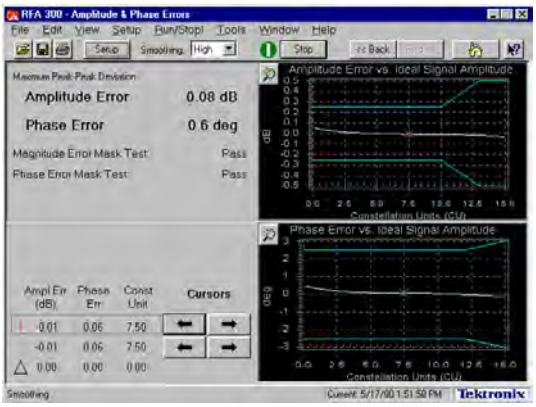
PERFORMANCE



Group Delay < 2 nS



SNR > 46dB



In-band flatness < ±0.08 dB
Phase Error < 0.7 degrees

Innovative DDRF™ (Direct Digital RF) broadband automatic balancing technology achieves near perfect RF performance with shoulder levels up to -55 dB and out of band spurious up to -60 dB, all based on an ultra low noise floor.

Powerful ADPC™ with linear and non-linear pre-correction obtaining up to 15 dB shoulder improvements, up to 10 dB MER (SNR) improvements and an in-band flatness of <±0.5 dB

Continuous measurement and display of SNR and IMD during correction.

Feedback Signal Strength (FSSI) detection and display with protections on too strong, too weak, and level varying feedback signals.

LDMOS transistors that are operated at their optimum bias characteristics providing the most linear output and hence reducing distortion.

Patented AIM™ (Adaptive Impedance Match) technology ensures impedance matching at RF Output, which realizes significant improvement in in band performance.

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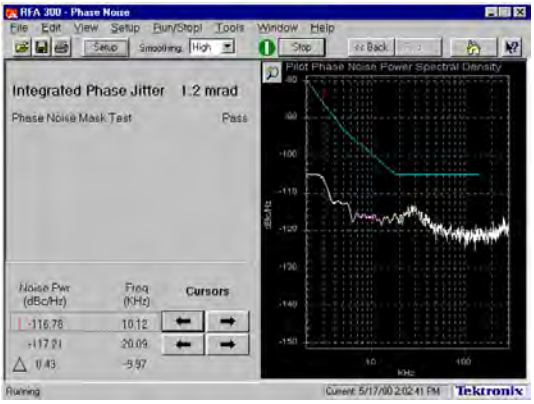
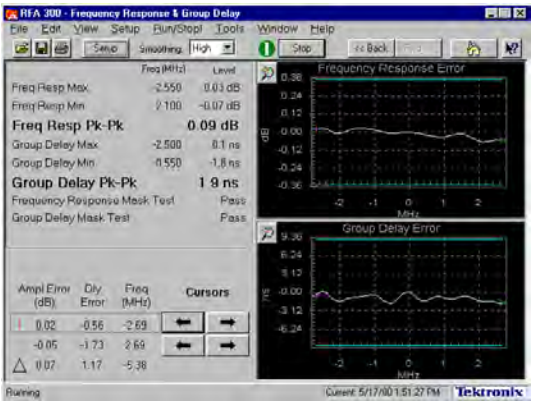
PERFORMANCE



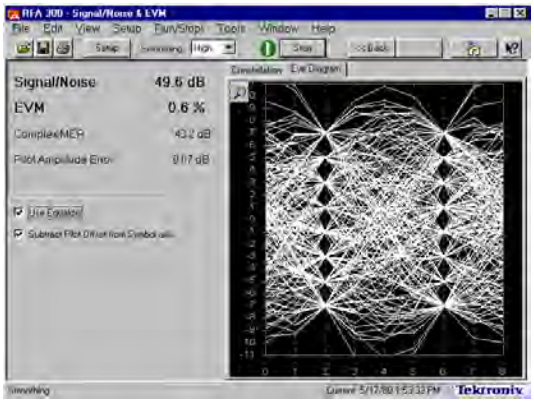
Phase Jitter < 110 dB @ 20KHc

Digital ultra-wideband phase noise processing technology automatically detects, tracks and compensates phase noise to achieve superior phase noise performance.



Frequency response flatness < 0.09dB

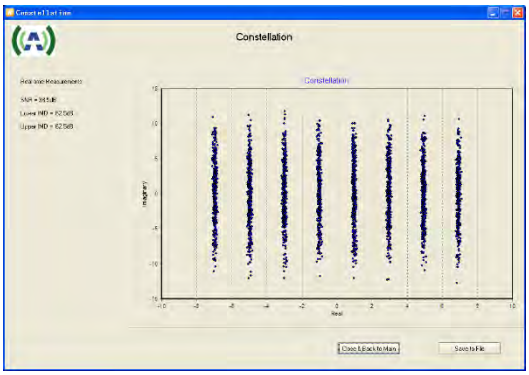
Independent feedback for adaptive SWR optimization function maximizes emission signal quality after the transmitter band-pass filters (BPF). System level AGC (Auto Gain Control) function includes both RF and DC AGC feedback obtaining a stable output power and performance.

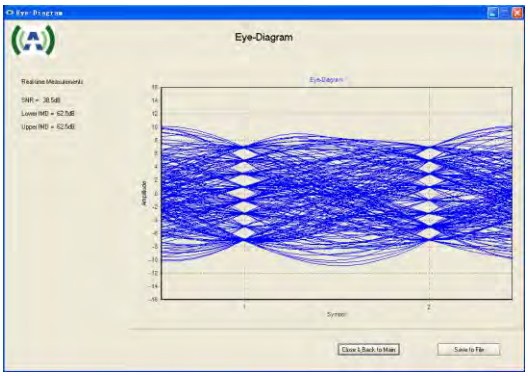


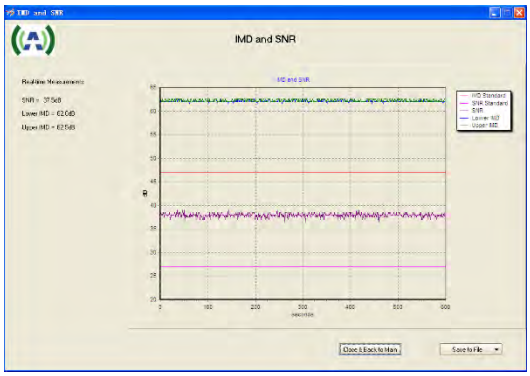
EVM < 0.7 %

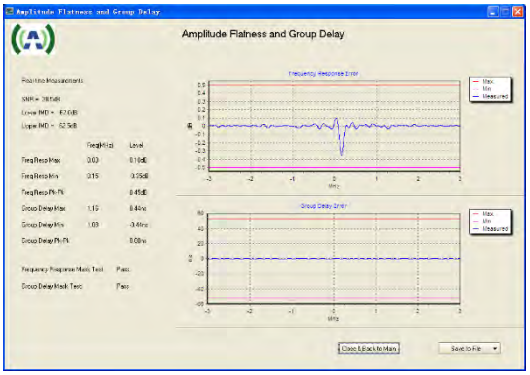
The transmitter includes a digital ultra-wideband noise processing technology that automatically detects and compensates phase noise to achieve unparalleled performance.

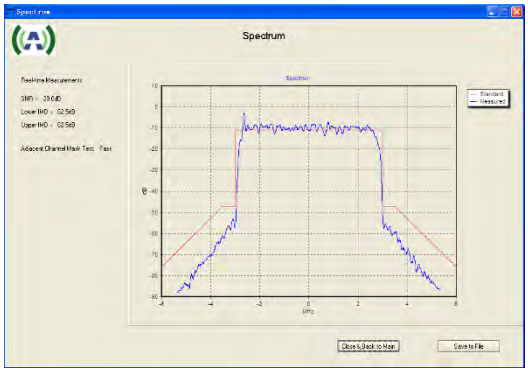
OPTION: PERFORMANCE AND QUALITY MONITORING OPTION







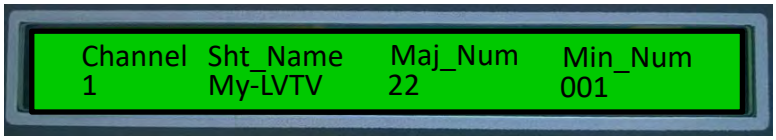


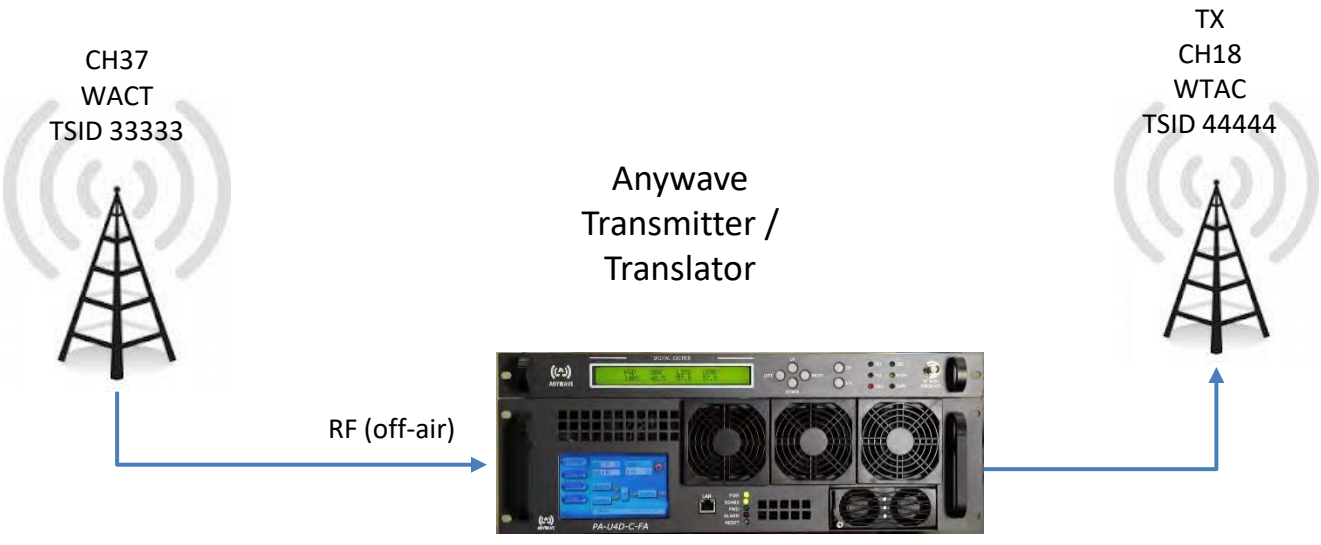


Constellation, “Eye” Diagram, Group Delay, Phase, Amplitude Frequency Response, SNR, Shoulders (IMD), Frequency Response Max/Min., Frequency Response Peak to Peak, Group Delay Max/Min. and Group Delay Mask Test

OPTION: PSIP & TSID EDIT OPTION

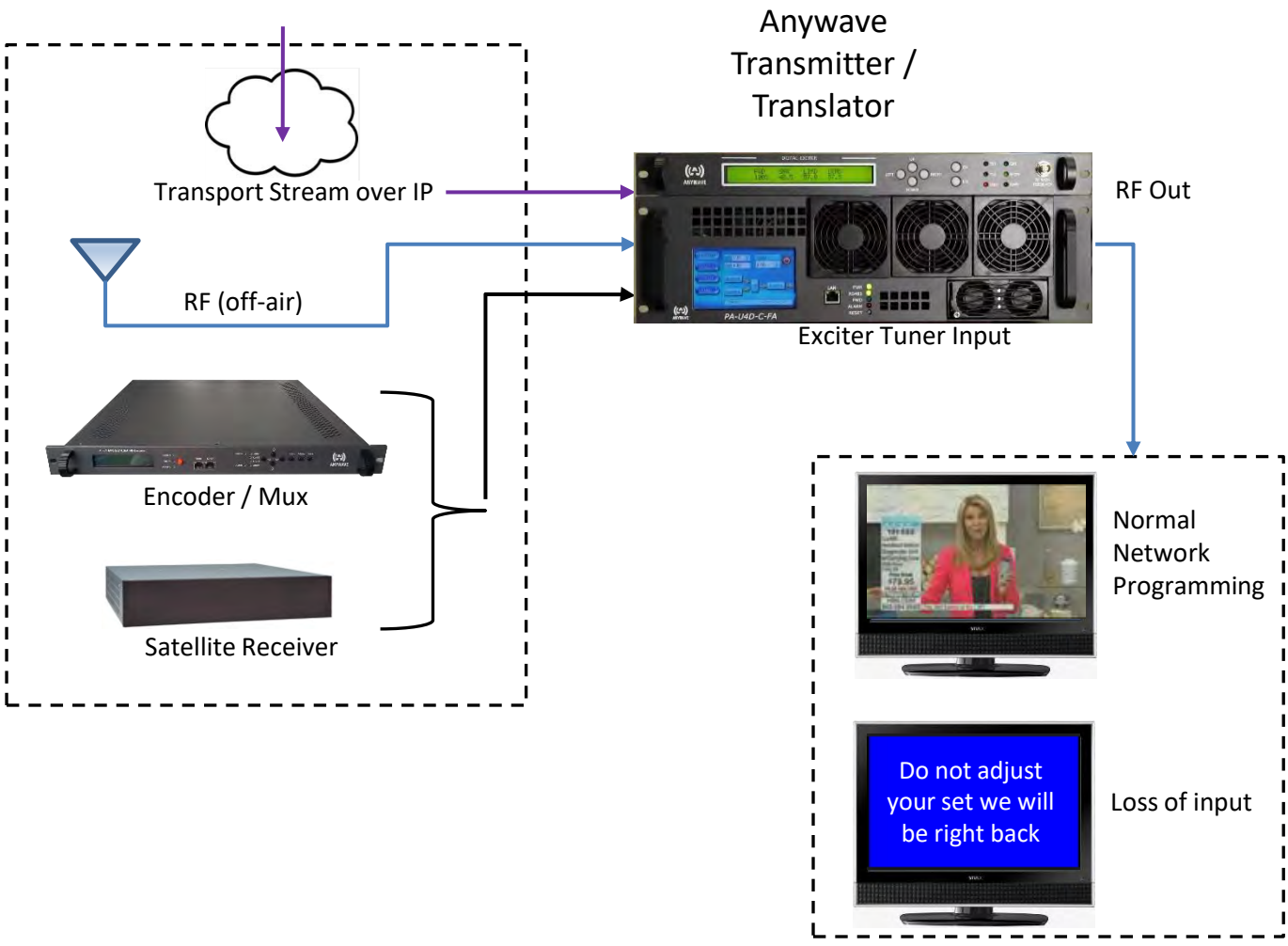
The translator has real time detection and display of the original TSID & PSIP information. If desired, the exciter/translator can modify the contents of the PSIP table including channel number, short name, major channel and minor channel and the TSID information of the input stream. It will pass through all Dynamic PSIP Guide information without damaging any data. The PSIP edit functions can be employed on the either the ASI (exciter) or the RF Tuner (translator) inputs.





OPTION: STATIC PICTURE FEATURE (SPF)

The Static Picture is displayed on loss of ASI or RF Tuner input. Upon the failure of all inputs it will continuously loop a fully compliant Transport Stream (TS). The option provides a viewer message instead of blue screen. Without SPF, if you lose input signal, you potentially lose customers. With SPF, this means you can legally stay on the air, even without an input signal.



OPTION: ASI LOOP THROUGH

If the Anywave exciter is operated in the translator mode (RF Tuner), an RF receiver antenna is connected to the RF Input port of the exciter and the exciter can then be tuned to any VHF or UHF incoming channel. The RF Tuner demodulates the signal down to an ASI baseband output, and can be configured to be connected not just to the modulator board inside the exciter, but also can be fed to the back of the exciter to the ASI output port. This allows a TV network to monitor the incoming signal on a ASI test system or ASI transport stream reader without additional demodulators.

OPTION: +10dB RF Output

The Anywave exciter has an output range of -25dBm (3 µW) to +5dBm (3.16 mW). If greater output power is required an external power amplifier can be obtained. However, if only a small amount of additional power is required, the exciter can be fitted with a larger output amplifier and can provide up to +15dBm (31.6mW).

OPTION: TSoIP

The TSoIP module inside the Anywave exciter/translator enables the Exciter to receive a transport stream through an IP network. The TSoIP module converts the IP stream to ASI and feeds the corresponding ASI stream back out the exciter rear panel TSoIP Out BNC connector.

Welcome to TS_NET interface!					
	IP	MASK	GATE	MUTI	MISC
Default	192.168.001.200	255.255.255.000	192.168.001.001	235.100.001.001	
Options	***.***.***.***	***.***.***.***	***.***.***.***	***.***.***.***	

OPTION: GPS

The Anywave exciter/translator can include a built in GPS receiver for SFN or MH deployment. It has the option of a built in powered antenna port, with antenna presence detection. The exciter provides the GPS reception status: number of satellites, clock accuracy etc. the TOD for distribution over satellite (delay > 1 s) and a 10 MHz and 1PPS input and output to feed a multiplexer: making it unnecessary to have a stand alone GPS for a multiplexer. Its frequency and 1PPS can be held for many hours even with complete GPS disruption.

KEY EXCITER SPECIFICATIONS

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}

Symbol Rate: 10.762238 MHz

MER: > 40 dB

Amplitude Flatness: < 0.5 dB

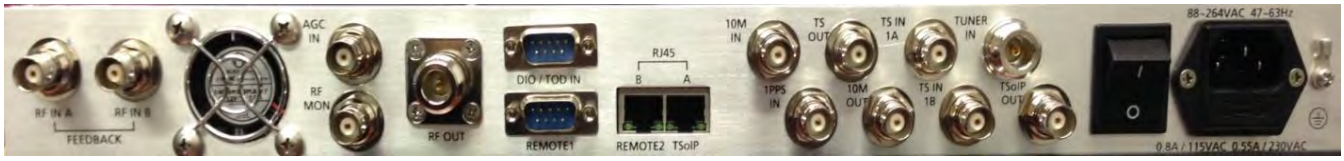
Shoulder Level: < -60 dB @ ± 500 KHz

Out of Band Spurious: < -60 dB

Pilot Amplitude Error: < ± 0.1 dB

Return Loss: > 15 dB

Phase Noise: < -107 dBc/Hz @ 20 kHz



Exciter Rear Panel

ANYWAVE

Marble Series Specifications

(Power ratings before bandpass filter)

MARBLE Series - UHF				
Standard	All (1)			
Output Power (RMS) ATSC	300	600	1200	2200
Output Power (RMS) COFDM	240	480	960	1760
Output Connector	"N"	"N"	7-16 DIN	7-16 DIN
Band	UHF			
Height (inches/mm)	3.5/89		5.3/133	6.13/156
Width (inches/mm)	19/480			
Depth (inches/mm)	19.0/482		21.33/542	26.54/674
Weight(LBS/Kg)	32/14.3	51/23.1	65/29.4	86/39
AC input frequency	50/60 Hz			
AC input voltage	120 VAC Single ϕ		240 VAC Single ϕ	
Consumption - W	750	1500	3000	5500
Current rating - A	6.3	12.5	12.5	22.9

(1) Standards include ATSC, ATSC 3,0, DVB-T, DVB-T2, ISDB-T, CMMB, and DTMB

MARBLE Series - VHF I			
Standard	All (1)		
Output Power (RMS) ATSC (2)	250/200	500/400	1000/800
Output Power (RMS) COFDM (2)	200/160	400/320	800/640
Output Connector	7-16 DIN	7-16 DIN	7-16 DIN
Band	VHF Band I		
Height (inches/mm)	8.7/222		
Width (inches/mm)	19/480		
Depth (inches/mm)	16.7/423		
Weight(LBS/Kg)	58/26.3	75/34	88/40
AC input frequency	50/60 Hz		
AC input voltage	240 VAC Single ϕ		
Consumption - W (2)	1140/910	2270/1820	4550/3640
Current rating - Max - A	4.8/3.8	9.5/7.6	19.0/15.2

(1) Standards include ATSC, ATSC 3,0, DVB-T, DVB-T2, ISDB-T, CMMB, and DTMB

(2) Power Levels CH2,3,4 / 5,6

ANYWAVE

Marble Series Specifications

(Power ratings before bandpass filter)

MARBLE Series - VHF III			
Standard	All (1)		
Output Power (RMS) ATSC	350	700	1400
Output Power (RMS) COFDM	280	560	1120
Output Connector	7-16 DIN	7-16 DIN	7-16 DIN
Band	VHF Band III		
Height (inches/mm)	8.7/222		
Width (inches/mm)	19/480		
Depth (inches/mm)	16.7/423		
Weight(LBS/Kg)	72/32.6	80/36.2	96/44
AC input frequency	50/60 Hz		
AC input voltage	240 VAC Single ϕ		
Consumption - W	880	1750	3500
Current rating - Max - A	3.7	7.3	14.6

(1) Standards include ATSC, ATSC 3,0, DVB-T, DVB-T2, ISDB-T, CMMB, and DTMB

Specification details subject to change without notice

Cost Effective 100%

Reliable 100%

Scalable 100%

Dependable 100%

www.anywavecom.net

Anywave Communication Technologies

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phase@phase.com.br - www.phase.com.br

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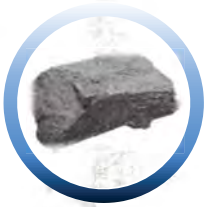


SLATE SERIES - ISDB-T/TB -PRODUCT BROCHURE

Models TRN-U1D - TRN-U2D - TRN-U4D - TRN-3U4D

LOW POWER AIR COOLED SOLID STATE UHF TV TRANSLATOR / TRANSMITTER

Introduction

The Anywave ***SLATE*** series of Air Cooled VHF/UHF TV transmitters provides the broadcaster with the latest state-of-the-art digital transmitter design, which provides the highest level of performance available anywhere. The power capability of these forced air cooled Solid State (50V LDMOS technology) transmitter/translator range is from 200W ATSC (160W OFDM) to 1000W ATSC (800W OFDM) (Power level before filter). They operate across all worldwide TV standards including DVB-T/H, DVB-T, DVB-T2, ATSC, ATSC3.0, ISDB-T, ISDB-TB and DTMB. The ***SLATE*** series incorporates the powerful correction capabilities of the ACT 5X+ or 9X digital exciter platforms. In addition, the products offer many unique features not available anywhere else in the industry.

Key Facts

- ✓ Multi-standard capability: Analog DVB-T/H, DVB-T, DVB-T2, ATSC, ATSC3.0, ISDB-T/B & DTMB
- ✓ Transmitter Efficiency up to 50% (amplifier efficiency > 55% at UHF)
- ✓ Broadband - All products fully broadband across their respective bands - UHF from channel 14-51
- ✓ Modular for better reliability and ease of maintenance
- ✓ Latest Power Amplifier LDMOS Technology – UHF uses latest asymmetrical Doherty designs for exceptional efficiency and cool operation
- ✓ Powerful Adaptive Linear and Non-Linear correction
- ✓ Simple and Efficient Front-to-Back Air Cooling
- ✓ LCD Touch Screen Control System (available on higher power units)
- ✓ Remote control via Web Browser and SNMP
- ✓ Options include SPF, PQM, PSIP EDIT, AND RF LOOP THRU
- ✓ Front Panel, SNMP & Web Support for Control & Monitoring
- ✓ Direct & Reflected Power Monitoring

ANYWAVE

FEATURES

- ✓ ATSC/ISDB-TB Transmitter or an RF Translator (every modulator includes an RF input and built-in receiver/demodulator)
- ✓ UHF Operation
- ✓ Powerful Adaptive Digital Pre-Correction (ADPC™). Anywave exciters are used by leading RF power transistor manufacturers to specify their device performance with superior results to other well known brands (ask us for details).
- ✓ Real time measurement and display of Receive Signal Strength (RSSI) and Received Signal to Noise Ratio (RSNR) in an RF Translator operation
- ✓ Real time measurement and display of the Transmit Signal Shoulder levels (IMD), the Transmitted Signal to Noise Ratio (TSNR) and the Transmitted Power Percentage (FWD %)
- ✓ SNMP & Log Support.
- ✓ Typical Overall MER 38 dB (ISDB-TB)

Options

- ✓ Performance & Quality Measurement (PQM) Graphical User Interface
- ✓ Mux/Remux, BTS Generator/Decompressor (ISDB-TB)
- ✓ Static Picture Feature
- ✓ ASI Loop Thru
- ✓ Transport Stream over IP (TSoIP) input
- ✓ Built-in GPS receiver
- ✓ Redundant Exciters
- ✓ Redundant Power Supplies
- ✓ ISDB-TB Version - NBR 15601 Compliant
- ✓ ISDB-TB Specific Optional Features

ANYWAVE

EXCITER CHASSIS & DISPLAY

The Anywave Exciter includes a back lit 40 x 2 LCD display. Multiple menus allow the real time measurements of transmitted and received frequency, output power level and input selection. The exciter/translator also measures and displays the key transmitter parameters of Intermodulation Distortion (IMD) often known as “shoulders” and the Signal to Noise Ratio (SNR) of the final transmitted signal output.

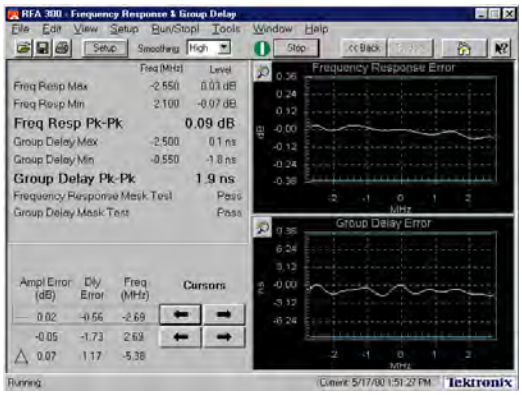
The main menu also includes a built-in power meter reading of the transmitter output power in percentage that can be easily calibrated from the front panel. The exciter also has an overheat alarm with its own temperature display, GPS information that includes the receivable satellites, clock accuracy and time.

The exciter obtains very high reliability due to the integrated design; a single board containing both analog and digital circuits, stud type connectors for long term reliability, and no connector directly connected to chassis. The exciter includes a single rugged and shielded AC/DC power supply.

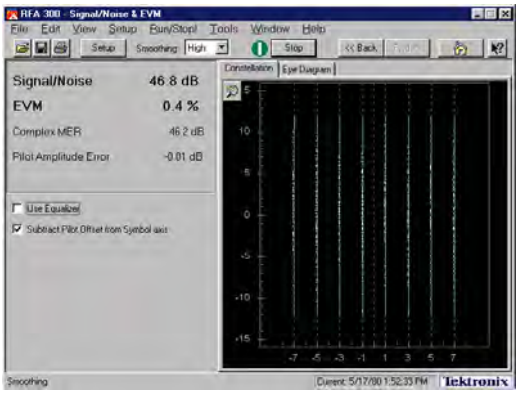
A solid chassis of just 1 RU, with a low profile all aluminum structure, solid construction, well grounded for excellent RF shielding and light weight at less than 10 LBS.

ANYWAVE

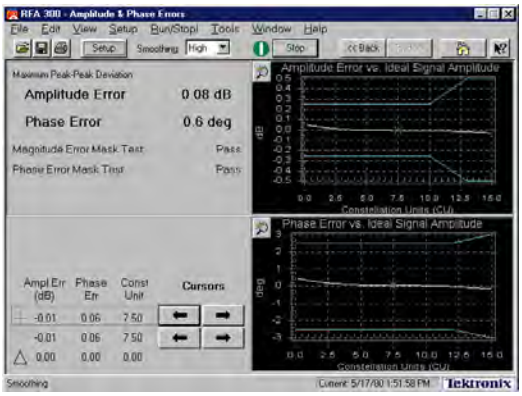
PERFORMANCE



Group Delay < 2 nS



SNR > 46dB



In-band flatness < ±0.08 dB
Phase Error < 0.7 degrees

Innovative DDRF™ (Direct Digital RF) broadband automatic balancing technology achieves near perfect RF performance with shoulder levels exceeding -55 dB and out of band spurious also greater than -60 dB, all based on an ultra low noise floor.

Powerful ADPC™ with linear and non-linear pre-correction obtaining up to 15 dB shoulder improvements, up to 10 dB MER (SNR) improvements and an in-band flatness of < ±0.5 dB

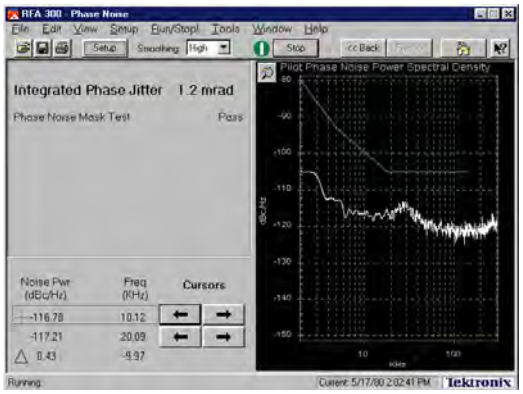
Continuous measurement and display of SNR and IMD during correction.

Feedback Signal Strength (FSSI) detection and display with protections on too strong, too weak, and level varying feedback signals.

LDMOS transistors that are operated at their optimum bias characteristics providing the most linear output and hence reducing distortion.

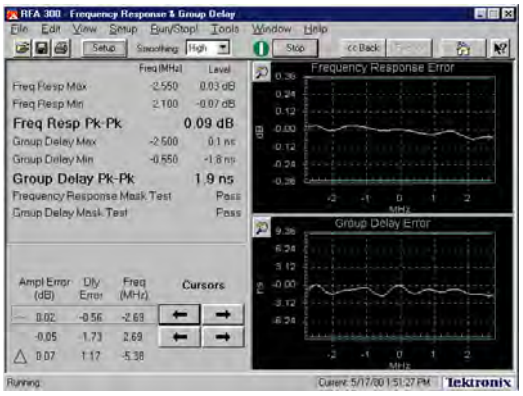
Patented AIM™ (Adaptive Impedance Match) technology ensures impedance matching at RF Output, which realizes significant improvement in in band performance.

PERFORMANCE



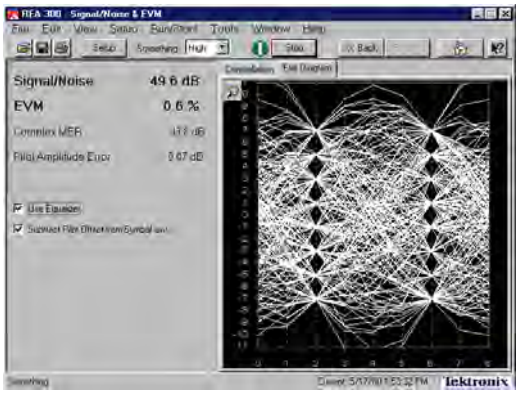
Phase Jitter < 110 dB @ 20KHc

Digital ultra-wideband phase noise processing technology automatically detects, tracks and compensates phase noise to achieve superior phase noise performance.



Frequency response flatness < 0.09dB

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

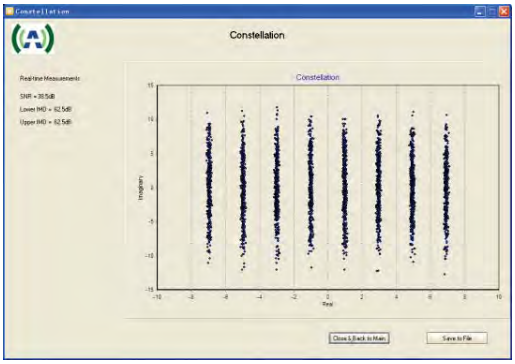


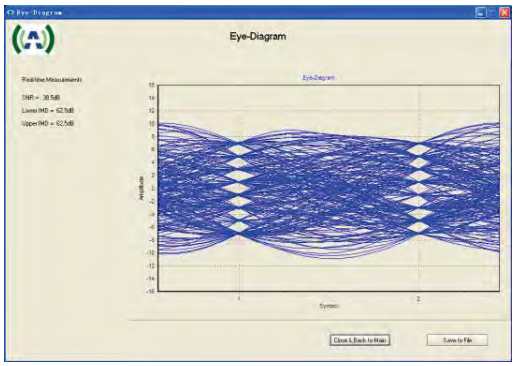
EVM < 0.7 %

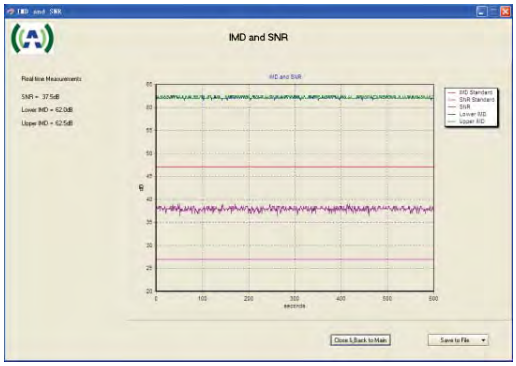
The transmitter includes a digital ultra-wideband noise processing technology that automatically detects and compensates phase noise to achieve unparalleled performance.

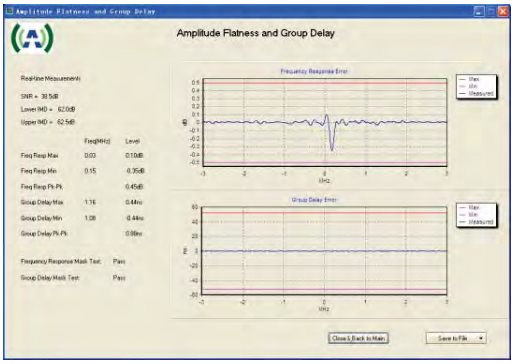
ANYWAVE

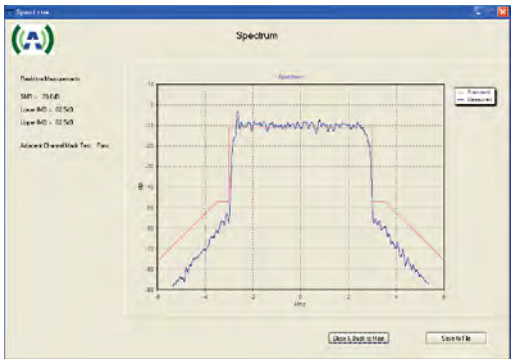
OPTION: PERFORMANCE AND QUALITY MONITORING OPTION







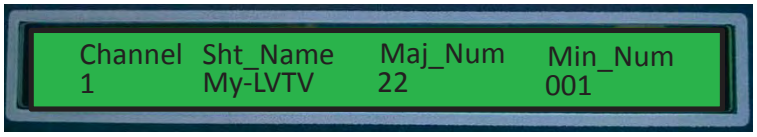


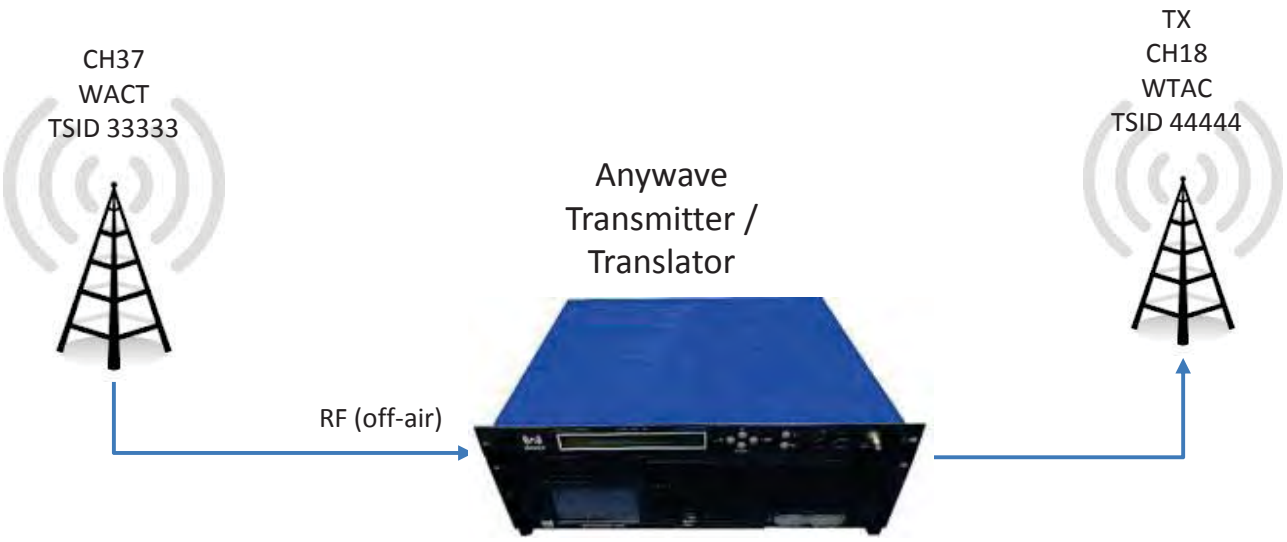


Constellation, “Eye” Diagram, Group Delay, Phase, Amplitude Frequency Response, SNR, Shoulders (IMD), Frequency Response Max/Min., Frequency Response Peak to Peak, Group Delay Max/Min. and Group Delay Mask Test

OPTION: PSIP & TSID EDIT OPTION

The translator has real time detection and display of the original TSID & PSIP information. If desired, the exciter/translator can modify the contents of the PSIP table including channel number, short name, major channel and minor channel and the TSID information of the input stream. It will pass through all Dynamic PSIP Guide information without damaging any data. The PSIP edit functions can be employed on the either the ASI (exciter) or the RF Tuner (translator) inputs.





OPTION: STATIC PICTURE FEATURE (SPF)

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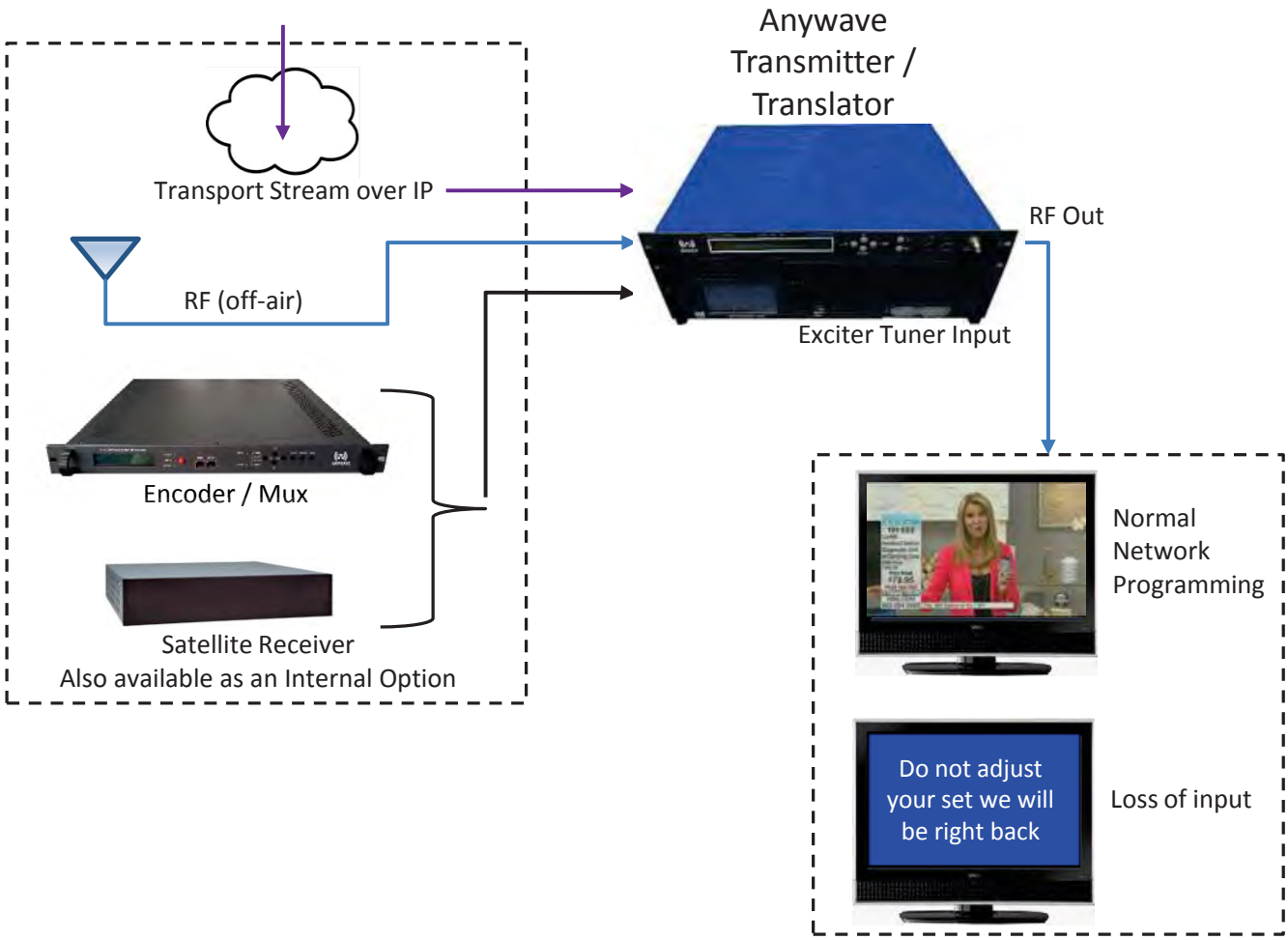


OPTION: ASI LOOP THROUGH

If the Anywave exciter is operated in the translator mode (RF Tuner), an RF receiver antenna is connected to the RF Input port of the exciter and the exciter can then be tuned to any VHF or UHF incoming channel. The RF Tuner demodulates the signal down to an ASI baseband output, and can be configured to be connected not just to the modulator board inside the exciter, but also can be fed to the back of the exciter to the ASI output port. This allows a TV network to monitor the incoming signal on a ASI test system or ASI transport stream reader without additional demodulators.

OPTION: +10dB RF Output

The Anywave exciter has an output range of -25dBm (3 µW) to +5dBm (3.16 mW). If greater output power is required an external power amplifier can be obtained. However, if only a small amount of additional power is required, the exciter can be fitted with a larger output amplifier and can provide up to +15dBm (31.6mW).

ANYWAVE

OPTION: TSoIP

The TSoIP module inside the Anywave exciter/translator enables the Exciter to receive a transport stream through an IP network. The TSoIP module converts the IP stream to ASI and feeds the corresponding ASI stream back out the exciter rear panel TSoIP Out BNC connector.

Welcome to TS_NET interface!					
	IP	MASK	GATE	MUTI	MISC
Default	192.168.001.200	255.255.255.000	192.168.001.001	235.100.001.001	
Options	***.***.***.***	***.***.***.***	***.***.***.***	***.***.***.***	

OPTION: GPS

The Anywave exciter/translator can include a built in GPS receiver for SFN or MH deployment. It has the option of a built in powered antenna port, with antenna presence detection. The exciter provides the GPS reception status: number of satellites, clock accuracy etc. the TOD for distribution over satellite (delay > 1 s) and a 10 MHz and 1PPS input and output to feed a multiplexer: making it unnecessary to have a stand alone GPS for a multiplexer. Its frequency and 1PPS can be held for many hours even with complete GPS disruption.

OPTIONS AVAILABLE FOR ISDB-TB (ABNT NBR 15601 STD)

- Internal Sat Receiver (DVB-S & DVB-S2 Inputs);
- Critical Spectrum Mask Filter
- BTS Input
- 188 & 204 Bytes Inputs
- ISDB-TB Local Mux, Remux & BTS Decompressor;
- SFN operation support.

KEY EXCITER SPECIFICATIONS

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}

Symbol Rate: 10.762238 MHz

MER: > 40dB

Amplitude Flatness: < 0.5 dB

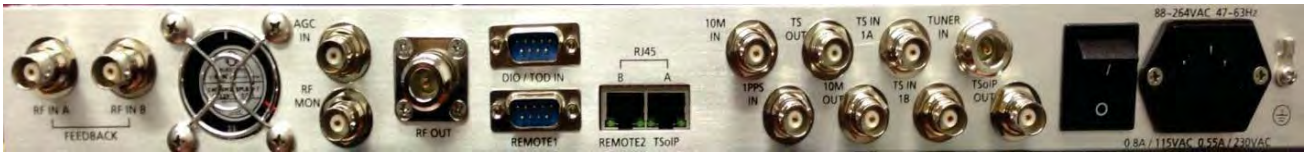
Shoulder Level: < -60 dB @ ± 500 KHz

Out of Band Spurious: < -60 dB

Pilot Amplitude Error: < ± 0.1 dB

Return Loss: > 15 dB

Phase Noise: < -107 dBc/Hz @ 20 kHz



Exciter Rear Panel

ANYWAVE

Slate TRN Series Specifications

Power ratings - COFDM Specs Apply to ISDB-T/TB

LPTV Series - UHF - Models TRN-U1D - TRN-U2D - TRN-U4D/TRN-3U4D			
Standard	ISDB-T/TB (COFDM)		
Output Power (RMS) Before Filter	180	360	750/2160
Output Power (RMS) After Filter	150	250	500/1500
Output Connector	"N"	"N"	7/8"/1+5/8"
Band	UHF		
Height (inches/mm)	3.5/89		5.3/133
Width (inches/mm)	19/480 (Ext. 595 mm)		
Depth (inches/mm) Weight(LBS/	23.1/587		24.7/627
Kg)	45/20.4	51/23.1	65/29.4
AC input frequency	50/60 Hz		
AC input voltage Consumption -	120/220 VAC Single ϕ		240 VAC Single ϕ
Max - W Current rating - Max - A	530	1000	1900/5700
	4.4	8.3	7.9/26

Cost Effective 100%

Reliable 100%

Scalable 100%

Dependable 100%

www.anywavecom.net

Anywave Communication Technologies

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phase@phase.com.br - www.phase.com.br

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PHASE

Specification details subject to change without notice

Slate-Sep-2021

ANYWAVE

MAGMA SERIES

PRODUCT SPECIFICATIONS

LIQUID COOLED SOLID STATE UHF TV TRANSMITTER

Introduction

The Anywave ***MAGMA*** series of Liquid Cooled TV transmitters provides the broadcaster with the greatest power density and highest operating efficiencies in digital transmitters today. The ***MAGMA*** series delivers a broadband solution with peak levels of performance and reliability. These Solid State transmitters range in output power from 6kW ATSC (4.8kW OFDM) to 150kW ATSC (120kW OFDM), with 25kW ATSC output from a single rack. They operate across all modulation standards including DVB-T/H, DVB-T, DVB-T2, ATSC, ATSC3.0, ISDB-T and DTMB. The ***MAGMA*** 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 and DTMB
- ✓ Transmitter efficiency up to 45% (amplifier efficiency > 50%)
- ✓ Implements latest state-of-the-art Asymmetrical Broadband Doherty Technology
- ✓ 16 x BLF888E (ultra high efficiency, Broadband) transistors provide power densities of 2.8kW (ATSC) per amplifier
- ✓ Modular for optimal flexibility and ease of maintenance
- ✓ Superior Liquid Cooling system incorporates Friction Stir Welded and Graphene Enhanced Thermal Management technologies
- ✓ Optitune™ technology automatically optimizes performance and efficiency at any power level
- ✓ Redundant hot swappable Power Supply Units
- ✓ Remote monitoring and control via Web Browser and SNMP

Power Requirements / Dimensions

HPTV Series - UHF							
Number of Amplifiers / rack	2	3	4	5	6	8	10
Output Power (RMS) ATSC (1)	5,900	8,890	11,900	14,200	17,000	22,650	28,300
Output Power (rms) ATSC (2)	5,000	7,500	10,000	12,500	15,000	20,000	25,000
Output Power (RMS) COFDM (1)	4,700	7,100	9,500	11,400	13,600	18,100	22,600
Outpur Power (rms) COFDM (2)	4,000	6,000	8,000	10,000	12,000	16,000	20,000
Output Connector	3-1/8"				4-1/16"		
Height (inches / mm)	78 / 2000						
Width (inches / mm)	30 / 765						
Depth (inches / mm)	43.3 / 1100						
AC Input Voltage (3)	380VAC WYE Three ϕ, 5-wire (L1,L2,L3,N,GND)						
AC Input Frequency	50 / 60 Hz						
Consumption - Max. - KW	12.5	18.8	25.0	31.3	37.5	50.0	62.5
Consumption - Typical - KW	11.4	17.2	22.9	28.6	34.3	45.8	57.2
Current Rating Per ϕ - Max. (A) (4)	19	28.5	38	47.5	57.1	76.1	95.1

(1) Power measured before Band Pass Filter

(2) Power measured after Band Pass Filter

(3) An appropriate external transfomrer may be required to connect to AC mains service

(4) Currents are based on 380VAC 3-phase current draw

Anywave Communication Technologies

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Website: www.anywavecom.net

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ANYWAVE

PHASE

TRO-15W-1 & TRO-50W-1
Single Channel Outdoor Transmitters – 15W & 50W
ISDB-TB Digital Terrestrial Television - Preliminary Spec

Anywave's Outdoor Digital Television Broadcast Transmitters complies with the ISDB-TB Brazilian ABNT DTTV transmission standard with variants available for operation in ATSC, DVB-T, DVB-T2 & CTTB/CMMB standards.

These Outdoor Transmitters allow easy external installation, mounted attached to the side of towers or poles, or walls.

TRO Series is configurable in Transmitter mode or Gap Filler mode.

The transmitter includes amplifier, exciter, GPS receiver, stream processing, channel filter and optional integrated SAT (DVB-S2) or UHF receivers.

This Series supports remote monitoring and controlling interfaces such as web browser and SNMP.

Main Specifications:

- RF Output Power:
  - Model TRO-15W-1 - 15W at the output of the channel filter;
  - Model TRO-50W-1 - 50W at the output of the channel filter
- Available with 6 & 8 pole channel filter alternatives
- Mains Voltage: 90 to 260VAC / 47 ~ 63Hz;
- Optional 48VDC input power
- Automatic Adaptative Pre-Correction processing;
- Support to SFN operation, with embedded GPS receiver;
- ISDB-TB Stream processing: Remux, Decompressor, BTS Gateway;
- Optional SAT (DVB-S2) or UHF integrated receivers
- Hugged Weatherproof Enclosure;
- Configuration through Web Browser;
- SNMP Monitoring.

Connectors:

- RF OUT: Type N female 50Ω;
- LAN: RJ45;
- SAT: Type N female 75Ω;.
- GPS: SMA female 50Ω;
- ASI IN: SMA female 75Ω;
- AC: 4-core aviation power supply.

Dimensions:
365mm x 300 mm x 340mm

Rev. 27/Nov/2020

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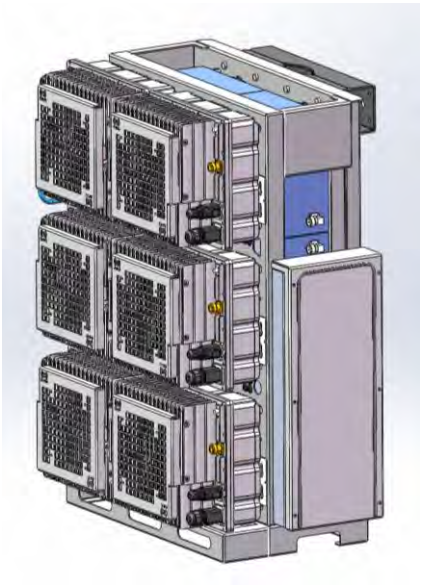
Transmissor ISDB-Tb Outdoor Multicanal

Especificação Preliminar



- Operação independente de 1 a 6 canais em UHF
- Único totalmente "OUTDOOR", montado diretamente na torre ou poste
- Versões de 20W ou 120W por canal (após o filtro)
- Fonte de alimentação DC e/ou AC, redundante.
- Combinador e filtros de máscara embutidos
- Possui IRD interno, descompressor de BTS universal, entradas ASI ou TSoIP
- GPS interno para SFN
- Opção de Gap filler
- Isolação galvânica com o módulo de recepção (conectados por fibra óptica)
- Fácil manutenção, com hot-swap para substituição de PAs e ventilação externa

Especificações Técnicas
Unidade de Transmissão

Especificações Mecânicas

- Dimensões: 722 (A) * 530 (L) * 400 (P) mm³
- Peso Líquido: 80 Kg

- Temperatura Ambiente de Operação: -10°C ~ +60°C
- Umidade: 20 % ~ 90 % (não condensada)
- Pressão Atmosférica: 86 kPa ~ 106 kPa

Especificações Elétricas

- Tensão de Alimentação: 90 ~ 300 VAC ou -36 ~ -60 VDC
- Freqüência: 47 ~ 63Hz
- Consumo de Energia: 1800W com potência máxima (6 x 120W de potência de saída após o filtro)
- Isolação galvânica entre a unidade de transmissão e a unidade de recepção (comunicação por fibra óptica)

Desempenho de RF

- Frequência: 473MHz ~ 794MHz
- VSWR ≤ 1.5
- Shoulder:≥ 30dBc (antes da pré-correção @ 120W)
- MER ≥ 35 dB

Recursos

- 6 entradas de sinal para amplificação simultânea
- Potência de Saída controlada individualmente até 20W ou 120W por canal após o filtro
- Formatos de entrada de sinal: RF, ASI (TS ou BTS), TSoIP
- Operação em gap filler (entrada de RF) opcional
- IRD interno para entrada em DVB-S/S2
- GPS interno para operação em SFN
- REMUX interno
- Descompressor de BTS universal
- Monitoramento e controle remoto por SNMP, independente para cada canal, com VLAN.
- Combinador e Filtro de máscara crítica embutido
- Fácil Manutenção – Módulos de potência e ventiladores externos de fácil substituição, com operação hot-swap

Anywave Communication Technologies Ltd.
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