

Application Note

8VSB DTV Translator
Model Number: XTREME 2000 Series



INTRODUCTION

The XTREME 2000 SERIES is a cost effective DTV Translator designed to serve television broadcasters during the analog to digital transition. The DTV signal presents on/off like coverage. When the signal is present, a perfect HDTV signal is decoded by consumer set-top-box. But, when the signal power level is marginal, the picture may break-up, stutter, or become a dark picture. Under such condition where signal coverage is poor, the XTREME 2000 Series DTV Translator can provide additional signal coverage and provide higher quality of 8VSB signal in shadowed area – behind hills and mountains.

Key Benefits

- Additional 8VSB Signal Coverage
- Minimized investment in DTV Translator

FUNCTIONAL DESCRIPTION

This unit is a 19” rack equipped with all the equipment needed to receive, generate, test, and transmit an 8-VSB signal on an RF channel. The main features of the XTREME 2000 SERIES are as follows:

- Receives an off-air 8VSB signal at its RF input
- Provides all the necessary equipment to put your 8-VSB DTV signal on-air
- Includes the following equipment:

Model Number	Description
XTREME-1000 Option RF-yy	8-VSB Demodulator, 8-VSB Modulator with fixed Linear Pre-correction & RF Up-Conversion to channel number yy
Controller	Translator Controller with Digital Power Meter
VSB-AMP-50W	8-VSB 50 Watt Average RF Amplifier
BPF-UHF-CHXX	DTV Mask Filter

- Can be changed to a lower power output level
- Equipment is contained in a rugged black textured steel 19” portable cabinet with front and back panels
- Remote Control via RS232C
- 1 year parts and labor limited warranty

EQUIPMENT DESCRIPTIONS

XTREME-1000

This unit performs an 8VSB off-air reception and demodulation of the input signal. The demodulated signal is processed with RS error correction decoding; trellis decoding, equalization and digital matched filtering to clean up channel multipath and noise errors. An MPEG2 transport stream is generated and SMPTE-310M, DVB-ASI signals are generated as outputs. This unit also performs PSIP modification for Major Channel Number, Minor Channel Number, and Station ID. Thus, in case user needs to modify the PSIP information, this capability is included and turned on upon user's command.

After the demodulation is performed, an 8-VSB Modulator modulates the MPEG2 transport stream into an 8-VSB signal using a fixed linear pre-correction technique. The linear pre-corrector corrects degradations caused by filters and other linear distortions. Using a Vector Signal Analyzer (HP89441A), the unit will accept the equalizer tap values and pre-correct the linear distortions. The unit complies with the ATSC A53 specification for generation of an 8-VSB terrestrial signal.

VSB-AMP-50W

The VSB-AMP-50W is a 50W average digital amplifier and designed to meet power amplifier requirements for DTV Translator using LDMOS technology. All signal interface and control lines required by the FCC in Part 73 and 74 are provided. The RF amplifier is set for an RF channel at factory. Thus, users must specify VHF or UHF channel when ordering.

BPF-UHF-CHXX

The DTV Mask – Band Pass Filter removes spurious signals so that the final RF output meets FCC specifications. Figure 1 below shows the band pass characteristics of this 8-pole Cheychev filter.

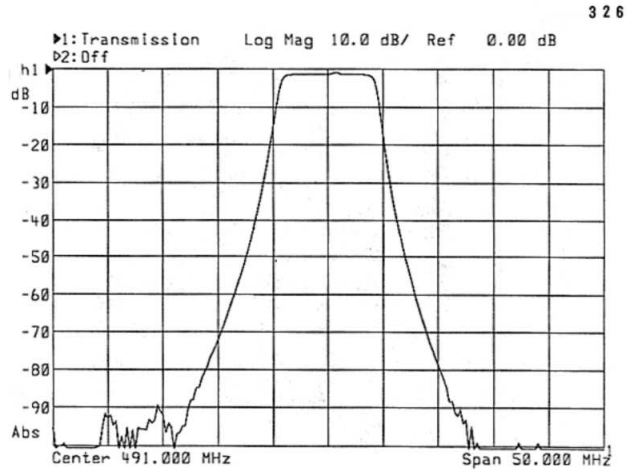


Figure 1: Band Pass Characteristics

The FCC Spectrum Mask is shown below in Figure 2 for reference.

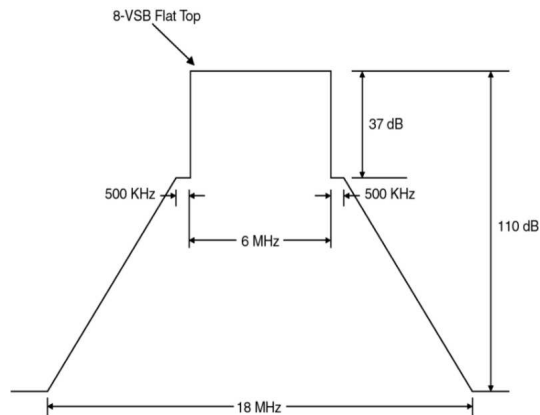
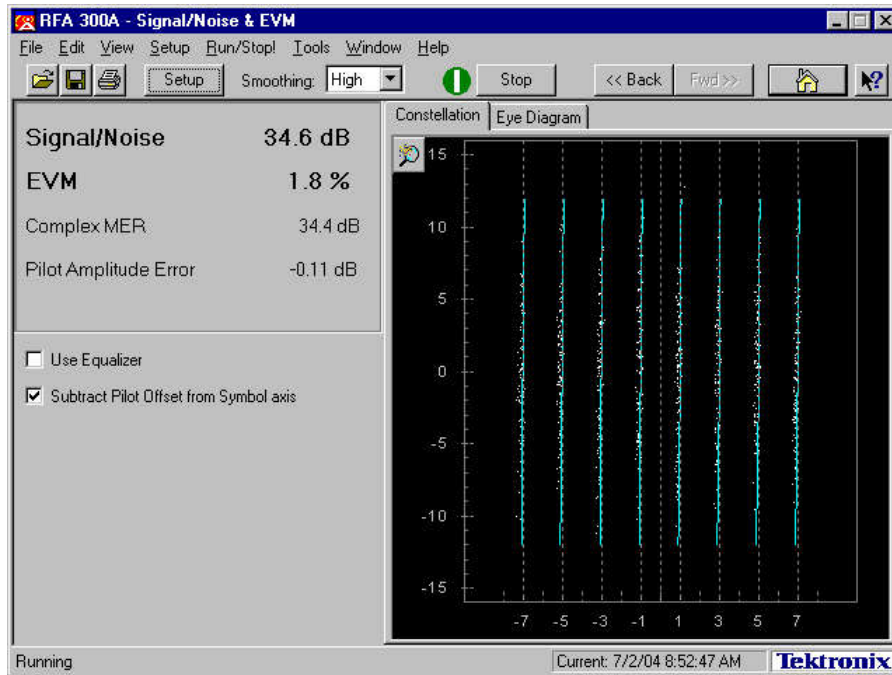


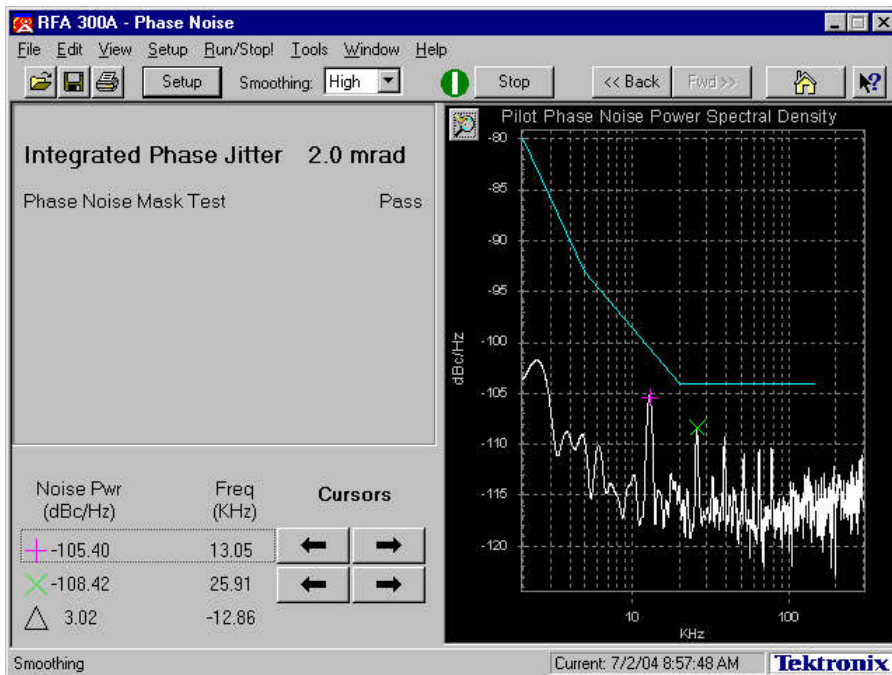
Figure 2: FCC Spectrum Mask

It should be noted that at the time the order is submitted, the channel number for the DTV mask/band pass filter must be specified.

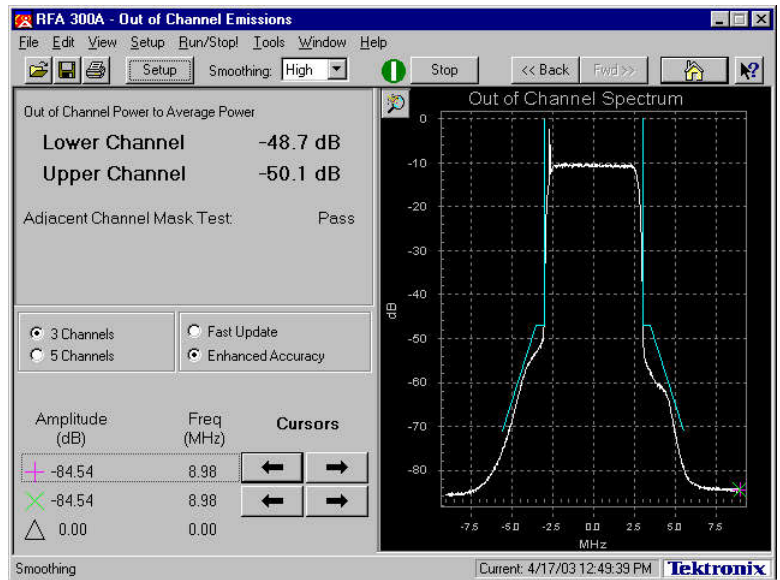
Performance Measurements



Signal Constellation



Phase Noise



Spectrum

APPLICATIONS

The XTREME-1000E can be used as a part of an 8VSB Digital Translator. In this configuration, KTech provides the complete Translator including RF up-converter, Power amplifier, and BPF. The translator has capabilities for users to download the pre-equalizer taps obtained from VSA (HP89441A) into the 8VSB Modulator FIR filter taps in the Xtreme-1000. By building the Power Amplifier and a temperature stable Band Pass Filter, this is a very cost effective solution to build a digital translator. The FIR tap values can be stored in a floppy disk and downloaded into XTREME-1000E by using a simple RS232 cable.

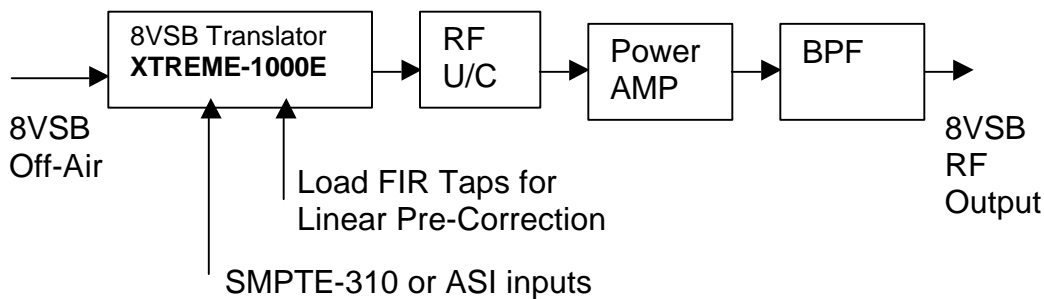


Figure 5: Application of the XTREME-1000E for 8VSB Digital Translator

The unit is also capable of accepting SMPTE-310M and ASI input signals upon front panel selection. Using the unit's proprietary Phase Noise correction capability, the unit is able to isolate its transmit phase noise from the received carrier. This allows translators implemented with XTREME-1000 to be hopped as many times as desired and not add carrier phase noise every time the system is repeated.

SPECIFICATIONS (subject to change without notice)

General Specifications

	Specification	Comments
AC Power		
Voltage	220V	
Frequency	50/60 Hz	
Current	10A Max	5A typical @ 25°C
Operating Conditions		
Temperature	0?-50°C	
Altitude	12,000 ft	Max
Humidity	95%	Non-condensing
Cooling	Individual Fans	Forced Convection
Weight		
Net	700 lbs.	
Gross	850 lbs.	Shipping weight
Cabinet Dimensions		
Height	55"	
Width	22"	
Depth	29.5"	
Panel Space	49"	
Cabinet Materials & Features		
Panels & Frame	Black Textured Steel	
Door	Standard Locking	
Power	6 outlet power strip with 6 ft. power cord	UL Approved
Rails	4	@ front and rear panels
Blower	Positive Pressure Airflow System	
Casters	Ball bearing swivel, locking wheels	
Bottom Panel	8.5" diameter opening	for cables and cords

50W Average Amplifier

	Specification	Comments
RF Performance		
Frequency	470-815 MHz	covered in 4 bands
Power Output	50 Watts	average power
Load Mismatch	10:1 VSWR	at all phases, circular protected
Drive Level	-10 dBm	nominal
AC Power		
Voltage	220 VAC	
Frequency	50/60 Hz	
Current	10A Max	
Connectors		
AC	I/O type N pin	
	3-wire twist lock	

Modulator

	Specification	Comments
Mode		8-VSB
Compliance	ATSC Spec	Per ATSC A53 Document
IF Output Specification		
Center Frequency	44.0 MHz	
Pilot Location	Right Hand Side	
Phase Noise	-105 dBc @20KHz	
Roll-off	11.5%	
Impedance	50 ohms	
Power	-18 dBm	Nominal
Spurs	Better than -50 dBc	
Band Attenuation	-50 dB @ ? 3MHz	
In-Band SNR	37 dB	Typical
Pre-correction		
Linear distortion	500 nsec	Group Delay
	8 dB	magnitude tilt

SMPTE-310M Serial Interface (Baseband Data Input/Output)

	Specification	Comments
Connector	BNC	
Source Impedance	75 ohms	
Output Coupling	AC	AC inductively coupled
Signal Overshoot	<10%	
Data Format	Biphase Mark Coding	
Transport Stream Bit Rate	19.39265 Mbps	Raw serial data rate ? 2.8 ppm

Demodulator (Xtreme-1000)

	Specification	Comments
Mode		8-VSB Terrestrial
Equalizer Span	-5.9? S to +40? S	
Data Rate	19.392658 Mbps	
AdjacentChannel Rejection		TBD
Co-channel Rejection		TBD
SNR Threshold	15dB	

PSIP Update (Xtreme-1000)

	Specification	Comments
Virtual Channel Table (VCT)	Major Channel Number Minor Channel Number Station Identification	Front panel adjustment

Ordering Information

Part Number	Description
XTREME 2000 SERIES	50W Average DTV Translator

Additional Information at KTech Web Site: www.ktechtelecom.com
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