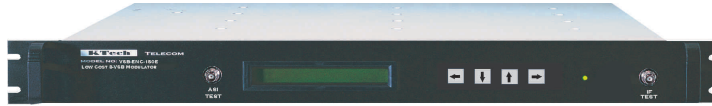


## **Application Note**

8-VSB Modulator  
Model Number: VSB-ENC-150E



## **Introduction**

This application note describes the VSB-ENC-150E 8-VSB Modulator and its applications.

## **Product Description**

The VSB-ENC-150E is an 8-VSB Modulator. The unit accepts either SMPTE-310M or DVB-ASI signals as its input, modulates it into an 8-VSB 44.0 MHz IF signal, and outputs an RF 8-VSB signal between the frequency range of 55 to 858 MHz.

The main features of the VSB-ENC-150E are as follows:

- 55 – 858 MHz Frequency Agile in 12.5 KHz steps
- Covers the UHF/VHF and CATV Frequency Range
- RF Power level adjustment from +50 dBmV to +62 dBmV
- Accepts SMPTE-310M or DVB-ASI Inputs
- RF, SMPTE-310M and (2) DVB-ASI Outputs
- Front Panel Test Points: 44.0 MHz IF Out and DVB-ASI Out
- PSIP VCT User Modification
  - Major Channel #
  - Minor Channel #
  - Station ID
  - Transport Stream ID
  - Channel Transport Stream ID
- Stores TX VCT User Modified Parameters
- Performs PCR Correction and Null Packet Insertion/Deletion with fixed output rate at 19.392 Mbps
- Bypass mode to skip PCR Correction and Null Packet Insertion
- Loss of Transport Stream Alarm
- RS232 and Front Panel Control
- 1U Rack Mountable

**Functional Block Diagram**

The signal flow through the VSB-ENC-150E is shown below in Figure 1.

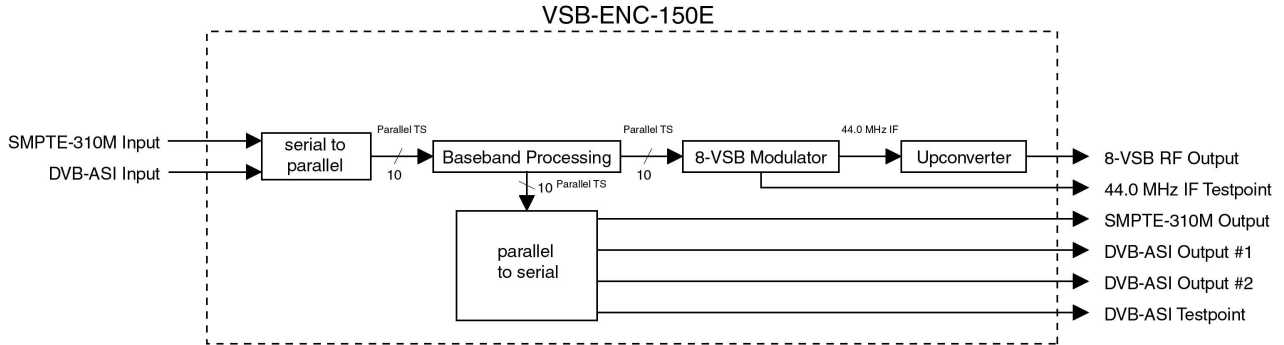


Figure 1: VSB-ENC-150E Functional Block Diagram

Serial to Parallel Conversion

The serial SMPTE-310M and DVB-ASI input signals need to be converted to parallel MPEG2 Transport Format before Baseband Processing. Note: The VSB-ENC-150E can accept any DVB-ASI signal that has a rate less than or equal to 19.392 Mbps.

Baseband Processing

The baseband processing includes the Null Packet Insertion or Removal, PCR Correction and PSIP Modification. The first step in the process is Null Packet Insertion or Removal. Note: Baseband Processing only occurs for DVB-ASI Inputs less than or equal to 45 Mbps. If SMPTE-310M and DVB-ASI outputs are desired, the DVB-ASI Input should not exceed 45 Mbps.

The Null Packet Insertion/Removal does the following:



Figure 2: Null Packet Insertion/Removal

When the MPEG2 Transport Stream is greater than 19.292 Mbps, the null packets in the stream are removed before entering the FIFO. When the MPEG2 Transport Stream output of the FIFO is less than 19.392 Mbps, null packets are inserted into the MPEG2 Transport Stream to bring the rate back up to 19.392 Mbps.

The second step is PCR Correction. The Program Clock Reference (PCR), embedded within the transport stream, is used to synchronize a receiver's clock with an encoder's clock. The original PCR values that were stamped into the stream by the original encoder will not be the correct PCR values for the receiver after null packets are inserted into or deleted from the stream. Therefore the PCR values need to be re-stamped so that the receiver will have the correct PCR values, thus avoiding PCR clock jitter at the receiver end.

The final step is the PSIP modification where the VCT's STID, Major & Minor Channel Numbers are modified within the stream.

Parallel to Serial Conversion

After baseband processing, the parallel MPEG2 Transport Format is converted back to serial for SMPTE-310M or DVB-ASI Outputs. SMPTE-310M encoding also occurs here. Note: The DVB-ASI output will be at 19.392 Mbps.

8-VSB Modulator

The 8-VSB Modulator modulates the Parallel MPEG2 Transport Stream into an 8-VSB 44.0 MHz IF signal.

Upconverter

The Upconverter takes 44.0 MHz IF signal and converts it up to a higher frequency. It's RF output is frequency agile in 12.5 KHz steps over a range of 55 MHz to 858 MHz. These frequencies cover both the CATV and VHF/UHF bands.

**Front and Back Panel Descriptions**

The front panel of the VSB-ENC-150E is shown below in Figure 2.

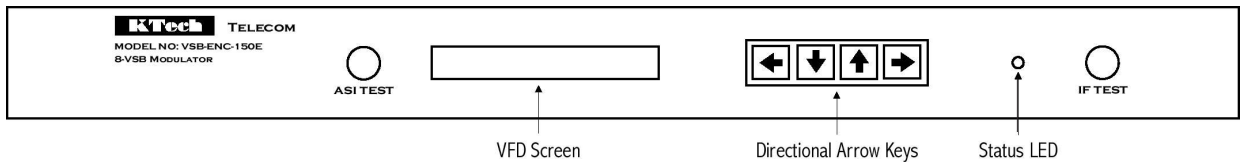


Figure 2: Front Panel of the VSB-ENC-150E

Signal	Connector
DVB-ASI Output Testpoint	BNC
44.0 MHz IF Output Testpoint	BNC

The back panel of the VSB-ENC-150E is shown below in Figure 3.

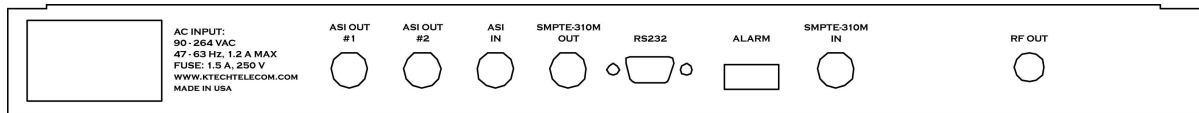


Figure 3: Back Panel of the VSB-ENC-150E

Signal	Connector
DVB-ASI Output #1	BNC
DVB-ASI Output #2	BNC
DVB-ASI Input	BNC
SMPTE-310M Output	BNC
RS232	DSUB 9 Socket
Alarm	3 terminal Phoenix
SMPTE-310M Input	BNC
RF Output	75Ω F

## Specifications

### General

Description	Range	Units
<b>AC Power</b>		
Frequency	47-63	Hz
Voltage	90-264	VAC
Current	1.2	Amp (max)
<b>Operating Conditions</b>		
Temperature	0-50	°C
Altitude	12,000	ft (max)
Humidity (non-condensing)	95	%
<b>Materials</b>		
Aluminum chassis		
<b>Weight</b>		
Net	10	lbs.
Gross (shipping)	13	lbs.
<b>Dimensions</b>		
Height	1.75	inches (1RU)
Width	19	inches
Depth	18	inches
<b>Cooling</b>		
Blower	Located on the left side towards the back of the unit	

### SMPTE310M Serial Interface (Baseband Data Input/Output)

Parameter	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 $\pm$ 2.8 ppm

### DVB-ASI Serial Interface (Baseband Data Input/Output)

Parameter	Specification	Comments
Connector	BNC	
Source Impedance	75 ohms	
Output Coupling	AC	AC inductively coupled
Transport Stream Bit Rate (input)	2.6 Mbps Min 45 Mbps Max	
Transport Stream Bit-Rate (output)	19.39265 Mbps	

### PSIP Update

Parameter	Specification	Comments
Station Identification	Up to seven letters	
Major Channel Number	# 02-69	
Minor Channel Number	# 0-9	
Transport Stream ID	0-65535	
Channel TSID	0-65535	

**RF Output**

<b>Description</b>	<b>Specification</b>	<b>Condition</b>
Frequency Range	55-858 MHz	band center
Frequency Step Size	12.5 KHz	
Frequency Accuracy	<±2 ppm	at 23°C
Frequency Stability	<±2 ppm	
Aging	<±1 ppm/year	
RF Output Level	+50 to +62 dBmV	
RF Output Level Step Size	1 dBmV	
Impedance	75 ohm	
Connector	F	
Spurious	-60 dBc	including harmonics
Return Loss	>16 dB	

**Ordering Information**

<b>Part Number</b>	<b>Description</b>
VSB-ENC-150E	8-VSB Modulator with RF Output

Additional Information at KTech Web Site: [www.ktechtelecom.com](http://www.ktechtelecom.com)  
For Pricing and Delivery information: [sales@ktechtelecom.com](mailto:sales@ktechtelecom.com)

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