



- **6, 7 and 8 MHz channel bandwidths (user-selectable)**
- **2k & 8k modes**
- **Master and slave operation**
- **Hierarchical modes**
- **Frequency agility (1 Hz step)**
- **High MER**

### DVB-T Modulator MO-170 General overview

The **MO-170** is a general purpose **DVB-T modulator** contained in a 19" 1U chassis. The unit has three selectable MPEG-2 TS inputs (two serial ASI inputs and one parallel SPI input).

Either of these inputs can be used to modulate the COFDM signal in both **hierarchical** (one TS input) and **non-hierarchical** (two TS inputs) modes. An additional **test TS** can be generated internally in the modulator. This allows to generate compliant DVB-T signals even in the absence of a valid TS input.

In **slave** mode, the useful bit rate at the TS input to the COFDM modulator has to be the one defined in ETSI EN 300 744 for each choice of DVB-T transmission parameters. The modulator automatically synchronises its internal clock to the incoming TS packet rate.

The **slave** mode allows to use one TS input with constant bit rate in non-hierarchical modes. When using hierarchy, the user has to choose which TS (HP or LP) the selected TS input is mapped to. This is the stream the modulator actually synchronises to. The other hierarchical TS is generated internally as a PRBS test sequence.

In **master** mode, the **MO-170** is able to work with any incoming bit rate as long as this is strictly lower than the value given in the DVB-T specification for the modulation parameters in use. The input TS bit rate is adapted (bit rate adaptation) to the useful bit rate required by the DVB-T signal by stuffing the TS with NULL packets (packet stuffing). This stuffing process alters the sequence of PCR values embedded in the TS. These values have to be re-stamped for the resultant PCR jitter to remain within the limits specified by the DVB. In hierarchical modes, operating the MO-170 as master has the added advantage over the slave mode of being able to use any of the three TS inputs as the HP input, LP input or both.

The modulator can be configured to generate any of the transmission modes listed in the DVB-T specification. In hierarchical modes, the HP and LP streams can be encoded with different convolutional code rates. The channel bandwidth can be set by the user to 6, 7 or 8 MHz as required by the application. Several test modes are available in the **MO-170** (blanking of carriers, single tone output, test TS generation, CBER and VBER injection).

The operation of the **MO-170** is done via the front panel LCD display and controls. The modulator can be easily configured by navigating through the intuitive set of menus.

# DVB-T MODULATOR

## MO-170

### Test modes

- Blank a number of carriers (start index to stop index) within the COFDM ensemble. This allows to measure in-band intermodulation and quantisation noise.
- Generate the pilot carriers only (continual and TPS).
- Generate a single carrier at the central frequency whose peak level equals the average COFDM output power or is set to the maximum available. This is intended for signal level alignment.
- Test Transport Stream packet generation using PRBS sequences of length 15 or 23 embedded within NULL packets as specified in document ETSI TR 101 290.
- Test PRBS generation at the input to the mapper following the guidelines of document ETSI TR 101 290
- Bit error injection at the input to the constellation mapper (results in a non-zero CBER before the Viterbi decoder) or at the input to the convolutional encoder (results in a non-zero VBER before the Reed-Solomon decoder)

### Control interface

- Pushable rotary control on the front panel with navigation key and LCD display
- Two LEDs indicating the power and synchronisation status of the equipment
- RS232 DB9 male connector

SPECIFICATIONS	MO-170
<b>Inputs</b> MPEG-2 Transport Stream Input	Two DVB-ASI inputs, 75 Ω female BNC One DVB-SPI input, LVDS DB-25 TS packets of length 188 or 204 bytes (automatic detection) Constant average TS packet rate (no packet stuffing)
<b>Master or Slave mode</b> <i>Master mode</i>  <i>Slave mode</i>	Input TS bit rate strictly below the value given in the DVB-T specification. Packet stuffing for bit rate adaptation and PCR re-stamping are carried out automatically. Input TS bit rate constant and equal to the value given in the DVB-T document (no stuffing).
<b>IF Output</b> Type Frequency range Spectrum polarity Power level (average) In-band amplitude ripple Out-of-band spectral characteristics <sup>1</sup> @ ± 3.805 MHz @ ± 4.25 MHz @ ± 5.25 MHz Level of harmonics and spurious MER	50 Ω BNC female connector 35 - 37 MHz adjustable in 1 Hz steps Selectable via front panel controls -22 dBm (85 dBμV) fixed < 0.2 dB  0 dBc -43 dBc (2k), -48 dBc (8k) -56 dBc ≤ -55 dBc > 39 dB <sup>2</sup>
<b>RF Output</b> Type Frequency range Spectrum polarity Power level (average) Out-of-band spectral characteristics Level of harmonics and spurious: MER SSB Noise phase:	50 Ω BNC female connector Adjustable between 45 and 875 MHz in 1 Hz steps selectable via the front panel controls -22 to -82 dBm in 1 dB steps > 50 dB > 40 dB > 30 dB ≤ 87 dBc/Hz. @ 2 kHz
<b>DVB-T parameters</b> IFFT size Guard intervals 1/4, 1/8, 1/16, 1/32 Code rates 1/2, 2/3, 3/4, 5/6, 7/8 Constellations Hierarchical modes MFN operation Available Channel bandwidth	2k, 8k  QPSK, 16QAM, 64QAM 16QAM and 64QAM constellations with α = 1, 2 or 4  6, 7 and 8 MHz (user selectable)
<b>Power supply</b> Voltage Frequency 50 - 60 Hz	110 - 130 VAC; 200 - 250VAC
<b>Mechanical features</b> Dimensions	19" (W.) x 1.75" (H.) x 19" (D.)

<sup>1</sup> Frequencies referred to the central frequency for an 8 MHz channel. Average levels measured using a 10 kHz bandwidth are referred to the carriers located on either side of the spectrum.

<sup>2</sup> Value measured for 8 MHz channels. For 7 and 6 MHz channels the MER is 36.5 dB and 36 dB approximately.