



- **6, 7 & 8 MHz channel bandwidths (user-selectable)**
- **2k, 4k & 8k modes**
- **Master and slave operation**
- **Hierarchical modes**
- **Frequency agility (1 Hz step)**
- **High MER**

DVB-T and DVB-H (*) Modulator MO-170 General overview

The **MO-170** is a general purpose **DVB-T/H 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/H 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/H transmission parameters.

When using hierarchy, the user has to choose which TS (HP or LP) the selected TS input is mapped 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/H specification for the modulation parameters in use. The input TS bit rate is adapted to the useful bit rate required by the DVB-T/H 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/H 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).

DVB-H only features are 4k carriers, two extra TPS signalling bits (time slicing and MPE-FEC), native/in-depth symbol interleaving and selectable transmitter cell ID.

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.

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 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 (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)

(*): DVB-H operation available as an option

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

Options

OP-170-E

Noise generator for C/N testing. Fixed and portable channel simulation in SFN/MFM networks.

OP-170-H

DVB-H signal generation option.

OP-170-P

+10 dBm output power.

SPECIFICATIONS	MO-170
Inputs 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)
Master or Slave mode <i>Master mode</i> <i>Slave mode</i>	Input TS bit rate strictly below the value given in the DVB-T/H specification. Packet stuffing for bit rate adaptation and PCR re-stamping are carried out automatically. Constant Input TS bit rate equal to the value en the DVB-T/H spacification (no stuffing).
IF Output Type Frequency range Spectrum polarity Power level (average) In-band amplitude ripple Out-of-band spectral characteristics ¹ @ \pm 3.805 MHz @ \pm 4.25 MHz @ \pm 5.25 MHz Level of harmonics and spurious MER	50 Ω BNC female connector 30 to 40 MHz in 1 Hz steps Selectable via front panel controls 0 dBm (fixed) < 0.2 dB 0 dBc -46 dBc (2k), -56 dBc (4k and 8k) -57 dBc \leq -60 dBc > 40 dB
RF Output Type Frequency range Spectrum polarity Power level (average) MER SSB Noise phase:	50 Ω N-type 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 (optional up to 0 dBm) > 35 dB \leq 87 dBc/Hz.@ 2 kHz
DVB-T/H parameters (*) IFFT size Symbol interleaving Guard intervals Code rates Constellations Hierarchical modes MFN operation Available Channel bandwidth	2k, 4k, 8k Native (DVB-T/H) or in-depth (DVB-H) 1/4, 1/8, 1/16, 1/32 1/2, 2/3, 3/4, 5/6, 7/8 QPSK, 16QAM, 64QAM 16QAM and 64QAM constellations with $\alpha = 1, 2$ or 4 6, 7 and 8 MHz (user selectable)
Options OP-170-E OP-170-H OP-170-P	Noise generator for C/N testing Fixed and portable channel simulation in SFN/MFM networks DVB-H signal generation option +10 dBm output power
Power supply Voltage Frequency	110 - 130 VAC; 200 - 250VAC 50 - 60 Hz
Mechanical features Dimensions	19" (W.) x 1.75" (H.) x 19" (D.)

¹ 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.