- **6, 7 & 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/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 specification for the modulation parameters in use. The input TS bit rate is adapted 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-TH 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.

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

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SPECIFICATIONS	MO-170
INPUTS	
MPEG-2 Transport Stream	Two DVB-ASI inputs, 75 Ω female BNC / One DVB-SPI input, LVDS DB-25 TS packets of length 188 or 204 bytes (auto-detection). Support for burst and continuous packet mode
Operating modes	
Master	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
Slave	Input TS bit rate constant and equal to the DVB-T document value (no stuffing). Tolerance ±0.1‰
IF OUTPUT	
Type	50 Ω BNC female connector
Frequency range	Variable between 31 and 36 MHz in steps of 1 Hz; fixed at 36 MHz when RF output is off
Spectrum polarity	Selectable via front panel controls Power level (average) 0 dBm (107 dBµV) fixed
Power level (average)	0 dBm (107 dBµV) fixed
In-band amplitude ripple	< 0.5 dB
In-band group delay ripple	<10 ns
Frequency stability	20 ppm
Out-of-band spectral characteristics[1]	
@ ± 3.805 MHz	0 dBc
@ ± 4.25 MHz	-39 dBc (2k), -47 dBc (8k)
@ ± 5.25 MHz	-52 dBc
Level of harmonics and spurious	≤ -50 dBc
MER[2]	> 40 dB
RF OUTPUT	
Type	50 Ω N-type female connector
Frequency range	Adjustable between 45 and 875 MHz in 1 Hz steps
Spectrum polarity	Selectable via front panel controls
Power level (average)	Approximately 80 dBµV with no attenuation. Variable attenuation of 0 to 60 dB in steps of 1 dB
Frequency stability	20 ppm
MER	> 32 dB
SSB phase noise	≤ -87 dBc/Hz @ 2 kHz
DVB-T PARAMETERS	
IFFT size	2k, 8k
Guard intervals	1/4, 1/8, 1/16, 1/32
Code rates	1/2, 2/3, 3/4, 5/6, 7/8
Constellations	QPSK, 16QAM, 64QAM
Hierarchical modes	16QAM and 64QAM constellations with constellation ratio α= 1, 2 or 4
MFN operation	Available
Channel bandwidth	6, 7 and 8 MHz (user selectable)
TEST MODES	
Carrier blanking	Blank a number of carriers (start index to stop index) within the COFDM ensemble. This allows to measure in-band intermodulation and quantisation noise
Pilot carriers	Generate the pilot carriers only (continual and TPS)
Single carrier	Generate a single carrier at the channel central frequency whose level equals the average COFDM output power or is set to the maximum available. This is intended for signal level alignment
TS packet generation	Internal generation of test TS using PRBS sequences of length 15 or 23 embedded within NULL packets as specified in document ETSI TR 101 290
PRBS generation	Map a PRBS sequence into constellation points following the guidelines of document ETSI TR 101 290
Bit error injection	Inject bit errors 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 after the Viterbi decoder).
RS-232C INTERFACE	
POWER SUPPLY	
Voltage	90 - 250 VAC (50 - 60 Hz)
Consumption	20 W
MECHANICAL FEATURES	
Dimensions	19" (W.) x 1.75" (H.) x 15" (D.) mm
Weight	6.3 kg
OPTIONS	
OP-170-E	White noise generator for C/N testing. Fixed and portable channel simulation in SFN/MFN networks.
OP-170-P	10 dBm amplifier.

[1] Frequencies are referred to the central frequency for an 8 MHz channel. Peak levels measured using a 10 kHz bandwidth are referred to the carriers located on either side of the spectrum. Values shown are the worst case and correspond to guard intervals of 1/32.

[2] Value measured in master mode. In slave mode, the MER is greater than 38 dB for 8 MHz channels, and around 35 dB for 7 and 6 MHz.

DESIGN AND SPECIFICATIONS SUBJECT TO CHANGES WITHOUT NOTICE

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