TV TRANSMITTER

ECUADRIVER 10U

The Ecuadriver 10U is a low power transmitter and Gap filler solution from Ecuadriver Line. In 1U rack module-19" std Ecuadriver 10U offers a digital power of 10-12Wrms (COFDM / ATSC), 20 Wps (Analog power).
(ATSC 3.0 READY, only software update needed)

The Ecuadriver 10U is a multi standard exciter for transmitter and Gap filler solution from Ecuadriver Line. In 1U rack module-19" std Ecuadriver is able to drive almost all transmitters and repeater with different standards analogue and digital worldwide. Based on a broad band modulator board (30MHz÷1GHz) it can deliver up to 30dBm to drive also high power transmitters with several amplification drawers., both in UHF, VHF BI and VHF BIII depending on final stage used. It is already successfully used to drive not only Ecuaroma transmitter but also third parties equipment. It works also as transmitter logic in Ecuaroma single driver multi amplifier transmitter.

Key facts:

- ***Multimode and multistandard***
- ***Transmitter / Repeater / Gap filler/ transcoder: all solution in one exciter***
- ***Software defined equipment: change from different mode and different standard allowed by soft key use***
- ***All inputs supported: TS/ASI/T2MI/ BTS /RF OFF air signal/SMPTE /Audio & Video /DVB-S2 etc***
- ***Single GBE, dual GBE, Electrical and optical GBE supported***
- ***Hitless switch between all inputs***
- ***Internal GPS receiver and high stability OCXO for SFN operation***
- ***Fully broad-band (30MHz ÷1GHz) modulator***
- ***Adaptive linear and non linear pre-correction provided***
- ***PAPR provided for better RF performances of the driven transmitter***
- ***AGC and ALC function supported to drive all type of external RF amplifier***
- ***FPGA most powerful processor developed***
- ***Easy to use: web graphic interface GUI response***

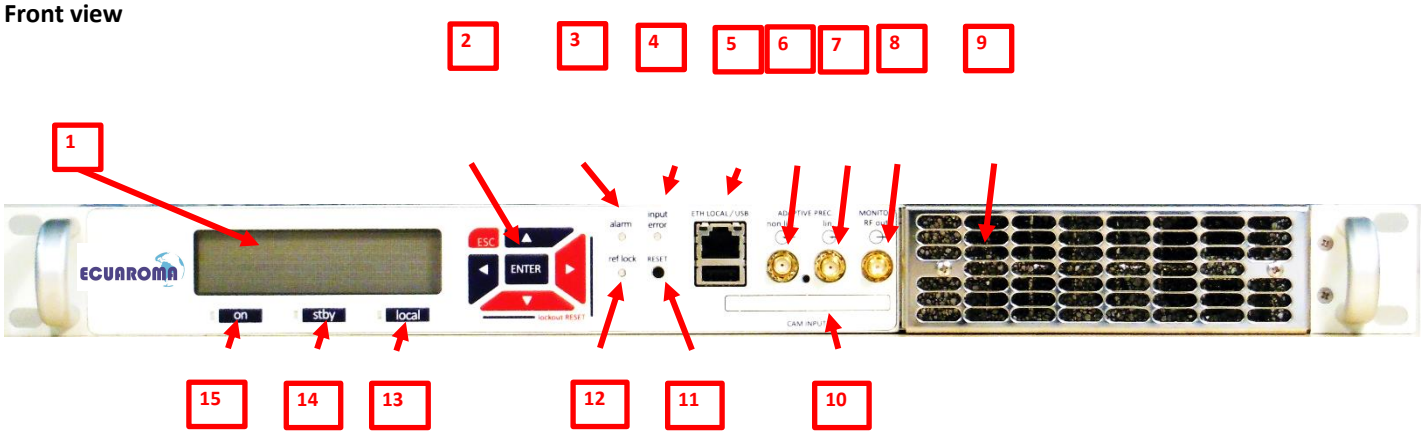
Ecuadriver line represents the state of the art of the RF transmitter technology. It's the unique investment exciter thanks to its capability to modulate in all Digital standard, TV and Radio as the TV analog too.
Ecuadriver platform allows the standard change via software, it's the perfect solution for broadcasters who are already in digital and need to take advantage of versatility in operation modes, configuration and performance, it's the perfect solution for broadcasters who are still working on the digital transition.
Ecuadriver can be an exciter, low power transmitter (UP to 200Wrms in 2RU), a regenerative transmitter, translator (integrated DVB-S2 receiver), Gap filler and Single Frequency Echo Canceller (perfect for Single Frequency Network), all in a single hardware.

Ecuadriver already implements DVB-T/T2, ATSC /MH, ISDB-T/Tb, DAB, DTMB and all Analog standards.
Ecuadriver always embeds linear and non-linear pre-correction to optimize the global system performance. Pre-correction can be static, i.e. based on pre-stored tables, or adaptive, with real-time evaluation and compensation of possible distortions in the amplification.

Ecuadriver can be configured as managed remotely, using a dry contact, via SNMP commands, via TCP/IP or graphic user interface designed by us using whatever of the common web browsers.
Ecuadriver allows a total remote control of itself and its functionality by serial protocols or TCP/IP ports. Our platform can easily monitored / configured and updated using a LAN connection or a USB Key.

IMAGES

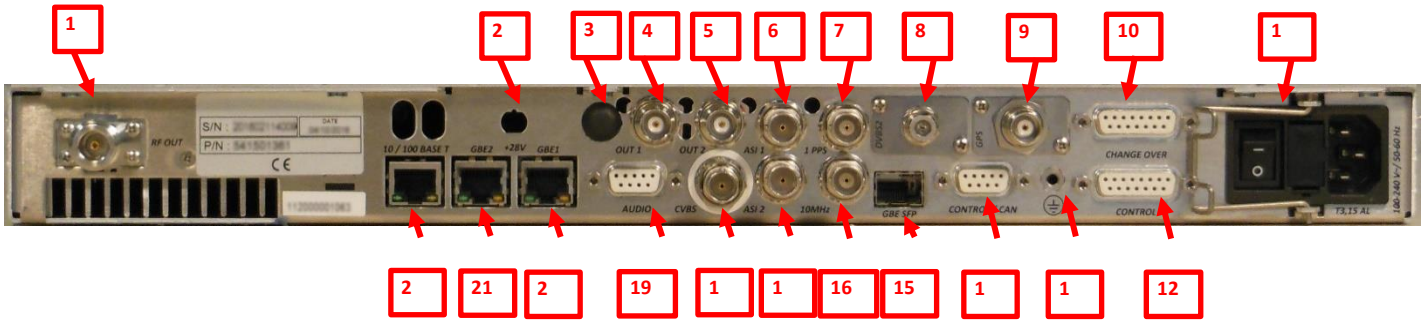
Front view



Rif.	Description
1	Display
2	Keyboard (allows navigation on display and settings change. Key combination allows lockout reset)
3	**Alarm** led
4	**Input error** led
5	**Ethernet** port for local monitoring and **USB** port for configuration load/ save and FW update
6	**Non linear** sense input for **adaptive pre-correction**
7	**Linear** sense input for **adaptive pre-correction**
8	**Monitoring** output

9	Fan protective grid and air filter. Trough removal of it Fan can be changed while driver operating
10	**Cam input** (if cam card is used for DVB-S2 descrambling)
11	**Reset** push button
12	**Ref lock** led (it is on if exciter is in SFN mode and external reference signal is bed or absent so holdover conditions trough internal OCXO is used for reference)
13	**Local** (remote) push button
14	**Stdby** push button
15	**On** push button

Rear view



Rif.	Description
1	**RF out** (conn N faemale 50 Ohm)
2	**+28V** to supply an external I7O interface
3	**RF in** (here not used)
4	**OUT 1** port (can be ASI or 10MHz or RF sense output or ASI3 input for hierarchical mode or RF FWD sense in in ALC mode) BNC 50/75 Ohm
5	**OUT 2** port (can be ASI or 1PPS or ASI4 input for hierarchical mode or RF RW sense in in ALC mode) BNC 50/75 Ohm
6	**ASI 1** input (or T2MI or BTS depending on standard) BNC 75 Ohm
7	**1PPS** input BNC 50 Ohm
8	**DVB S2** connector F 75 Ohm
9	**GPS** input TNC 50 Ohm
10	**Changeover** connector for driver exchange in dual driver solutions (in case of stand alone or single driver solution it is closed

	by an interlock key)
11	Mains socket with mains switch fuse, cable holder and EMI filter
12	**Control** connector used to link driver to transmitter interface
13	Safety ground terminal
14	**Control Can** connector: can bus and external I/O interface
15	**GBE SFP** port (optical)
16	**10 MHz** input BNC 50 Ohm
17	**ASI 2** Input BNC 75 Ohm
18	**CVBS** Input BNC 75 Ohm (not used in only digital exciter)
19	**Audio** input (balanced) D-SUB port with 9 pin to be connected to a dual XLR 600Ohm balanced connector trough a cable adapter (not used in only digital exciter)
20	**GBE2** input (electrical RJ45) (optional)
21	**GBE2** input (electrical RJ45) (optional)
22	**10/100** Ethernet port for monitoring purpose trough SNMP / WEB pages

TECHNICAL FEATURES

RF frequency range (output)		**UHF Band IV & V (470MHz-860MHz)**	
RF	Output power	0W - 10W rms ISDB-Tb / 12W rms ATSC	20 W p.s.
	Spurious / Harmonics	EN 302-296-2	
	MER	>35 dB	n.a.
	Shoulders	>40 dB	n.a
Mains	Voltage	90 to 264 VAC @ 47 to 63 Hz (single phase - autorange p.s.)	
	Power consumption	140 W (60W modulator board, 80W amplifier and ancillaries)	
	Electrical efficiency	36 – 38%	
Cooling system /Air flow rate m3/h		forced air / 60 m3/h	
Size	Width/Height/ Depth	482 mm / 44 mm / 450 mm	
Weight		6 kg	
Number of drivers / one rack 36U		More than 10	
Feature		**Values**	
GENERAL MODULATION DATA			
Technology		Solid state (LDMOS)	
Frequency band:		VHF BI (44-88 MHz) VHF B III (174…230MHz) UHF 470… 862 MHz (Channel E21… 69)	
Television standard :		ATV: PAL B,G;I Digital: DVB-T / DVB-H DVB-T2, ATSC, ISDBT ISDB-Tb, DTMB	
Bandwidth:		8 MHz (5MHz, 6 MHz, 7 MHz available)	
Network mode:		Both MFN and SFN	
Hierarchical mode:		All	
Safety			
Product specification:		EN 302 304, ETS 300 744, TS 101 191 EN 302 755 (v1.3.1) TS 102 831, TS 102 773. ISDBT standard spec. DTMB standard spec	
Electromagnetic Compatibility (EMC)		:ETSI EN 301 489-1 & EN 301 489-14 latest revision	

Radio spectrum matters (RSM) with ext. RF filter:	ETSI EN 302 296 V1.2.1 latest revision ETSI EN 302 297 V1.1.1.
Safety standard:	EN 60215 (IEC 215) EN 60950

DVB-T2 Modulator Features	
Input Interface	Multiple Transport Stream and Generic Stream Encapsulation (GSE)
Modes	Variable Coding & Modulation
Forward Error Correction (FEC)	LDPC + BCH
	1/2, 3/5, 2/3, 3/4, 4/5, 5/6 7/8 (1/3, 2/5 T2 lite)
Modulation	OFDM
Modulation Schemes	QPSK, 16QAM, 64QAM, 256QAM Rotated cosntellations
Guard Interval	1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
Discrete Fourier transform (DFT) size	1k, 2k, 4k, 8k, 16k, 32k
Scattered Pilots	1%, 2%, 4%, 8% of total
Continual Pilots	0.35% of total
Inner code rate	1/2, 3/5, 2/3, 3/4, 4/5, 5/6
DVB-T2 mode	System A and System B
L1 parameters	
Mode	single PLP, multiple PLP
PLP	Up to 8 (base configuration as factory set)
	Up to 256 (available)
T2 Lite	Supported also with hybrid mode T2/T2 Lite
Digital linearity corrector:for	
- Linear distorsions: (amplitutde & group delay)	Available manual / automatic/ contiunuous
- Non linear distorsions: (amplitude & phase)	Available manual / automatic/ contiunuous
Frequency agility:	available
Local control	
Display & front panel controls(driver & logic):	Graphic display + keyboard
Service interface (DSI)	10/100 Base-T, RS232
Remote control	
Serial	RS-485, D-Sub f. 9 poles, SNMP v2c
Parallel:	D-Sub f. 37 poles (extension required)
Connector / impedance (driver)	N female / 50 Ω
Driver output level adjustment :	0÷30 dBm in 0.1 dB steps
Shoulder level (@ max output) (driver):	-46 dB (typical value)
MER (@ max output) (driver):	-40 dB (typical value)
PAPR	available
Protection clipping	available
Harmonic emission (with external RF filter):	ETSI EN 302 296 V1.1.1
Spurious emission (with external RF filter):	ETSI EN 302 296 V1.1.1
Internal frequency reference (OCXO)	
Long term stability:	< ±1 · 10-7/ year
Frequency stability vs. environment::	< ±1 · 10-8 (-20 ÷ +70°C)
L.O phase noise mask:	ETSI TR 101 290 V1.2.1Annex E.4
Frequency offset :	±500 kHz in 1 Hz steps
Oscillator phase noise	1 KHz 90 dBc
	10 KHz 95 dBc
	20 KHz 100 dBc
BER(Bit Error Ratio) after Viterbi decoder	Better than 10-9
Equivalent noise degradation(END) [Measured in FEC=2/3 and constellation : 64 QAM mode]	Better than 0.5dB
ASI 1 – ASI 2 outputs (option):	BNC f. / 75Ω
10 MHz output (level – connector/imped.):	10 dBm (± 2dB) – BNC f. / 50Ω
10MHz monitor. Sckt (level – connector/imped.):	10 dBm (± 2dB) – SMA f. / 50Ω
1 PPS output (level – connector/imped.):	TTL – BNC f. / 50Ω
RF monitoring socket:	-15 dBm ± 2 dB – SMA f. / 50Ω
LO monitoring socket:	-5 dBm ± 2 dB – SMA f. / 50Ω
Inputs	2 or 4 × ASI or T2-MI, BNC, 75 Ω and 2 × GbE, RJ-45 (optional)
Coding and modulation	in line with EN 302755 V.1.1.1, for SFN in line with TS 102773 (T2-MI)
ASI 1 – ASI 2 inputs:	BNC female / 75 Ω
ASI 3 – ASI 4 inputs :	BNC female / 75 Ω
GBE inputs	2 x GBE pro MPEG4 Electrical / optical IR/RTP/UDP/IGMP/MULTICAST Supported

Transport packet :	188 o 204 bytes
ASI Input selection:	manual, automatic or automatic with preference
Switching between inputs	seamless
Bit rate adaptation:	available
Data input bit rate	Adjustable, SFN adapter including MIP decoder for automatic modulator configuration via data input , according to standard TS 101 191
External reference:	
10 MHz – input level:	GPS Receiver 0 ÷ 15 dBm, sinus

Feature		Values	
REPEATER		SFN gap-filler	MFN re-transmitter
F input	RFin frequency range	146 to 861 MHz	
	Input level	-10dBm to -60dBm	-20dBm to -70dBm (QEF reception)
	Input ret. loss	better than -16 dB	
	RF in connector	N female, 50 W (“N” / 50 ohms)	
Echo Canceller	residual echo suppression	up to more than 30 dB (30dB are obtained at 0dB input echo)	n.a.
Noise figure		max 10 dB	max 8 dB
immunity to other chan	N+1	OFDM/OFDM > 30 dB	
	others	OFDM/OFDM > 40 dB	
SATELLITE TRANSPOSER			
SatTV standard		DVB-S -- DVB-S2 - EN300421	
Frequency range		950 - 2150 MHz	
Signal level		-65 to -25 dBm	
Connector - Cond. Access		SMA f - CAM slot	
LNB control		available, through RF input PS, polarity / band selection: by standard 13/18VDC and 22kHz signalling	

ANALOG Modulator features	
Internal frequency	
IF	Direct modulation technique uesed
LO stability	better than 10-7Hz/year
Internal frequency reference	10MHz
Frequency stability vs environment	Better than ± 2,5x10-8 (-20÷+70°C)
LO stability with external GPS	better than 10-9Hz/year
Input nominal level of external reference	+4dBm ± 3dBm
Connector of external reference	SMA 50 Ω
Input characteristics	
Video input level	1Vpp ± 6dB 0.7V luminance 0.3V sync
Input impedance (video)	75 Ohm unbalanced BNC
Unwanted DC withstand voltage	6V (open circuit)
Max DC voltage superimposed on video signal	3V dc
S/N input	35dB min
Video input return loss (up to 5 MHz)	<-30dB
Input impedance (Audio)	600 Ohm balanced XLR (1 or 2)
Audio input level	6±6dBm (400Hz)
Audio input return loss	<-30dB
Output characteristics	
Nominal RF output impedance	50Ω
RF Monitor connector	SMA typ.
Output power stability	Better than 0.2 dB
Frequency accuracy	1 Hz
Unwanted emission	Better than -60dBc

Intermodulation products (out of band)	Better than -60dBc
Intermodulation products (in band)	<-60dbc typ.
Parastatic emission	Better than -90dB
RF Amplitude / frequency response	± 2 dB typ.
Group delay (without precorrection) Up to 4.8MHz	± 40ns
Group delay Up to 4.8MHz	Up to 4.5 MHz +40ns , 4.5-4.8MHz +80ns
Transient response. Overshot	Less than 10%
Tilt 50Hz	Less than 2%
Luminance bar Tilt 15 kHz	Less than 2%
Luminance to chrominance inequality gain (20Tpulse)	5%
Luminance to chrominance inequality Delay (20Tpulse)	2%
K factor	< 2 % (with 2T $\sin^2$ pulse)
2T / bar pulse ratio	± 5 % max
Luminance non linearity	4 % typ.
Differential gain	± 3% typ.
Differential gain max	± 5 %
Differential phase	± 3° Max
Power variation (black to white picture swap)	<±0.5dB (or 2%)
Phase noise	Standard figure complies
Chrominance / luminance gain	± 10%
Chrominance / luminance delay	< ± 40ns
Chrominance / luminance intermodulation	± 2%
Differential phase	± 3°
Video S/N (unweighted continuous))	>57dB
Video S/N (weighted) (CCIR 567)	>60dB
Amplitude frequency response (40Hz÷15KHz)	± 0.5dB
Pre-emphasis	50 µsec
ICPM	2° typ.
Harmonic distortion (THD)	< 0.3%
FM signal to noise (weighted)	>66 dB
FM signal to noise (unweighted)	>56 dB
AM signal to noise (weighted)	>55
AM signal to noise (unweighted)	>40
Other features	
Limiter of video signal bandwidth Circuit	Provided
AGC circuit	Provided In case of deep variation of input signal the driver turns into MGC mode
amplitude video signal Circuit	Provided
sync generator Circuit	Provided
sync regeneration Circuit	Provided
group delay adjustment Circuit	Provided
differential phase and gain Circuit	Provided
White limiter circuit	Provided
Clipping circuit	Provided
Saw filter	Provided

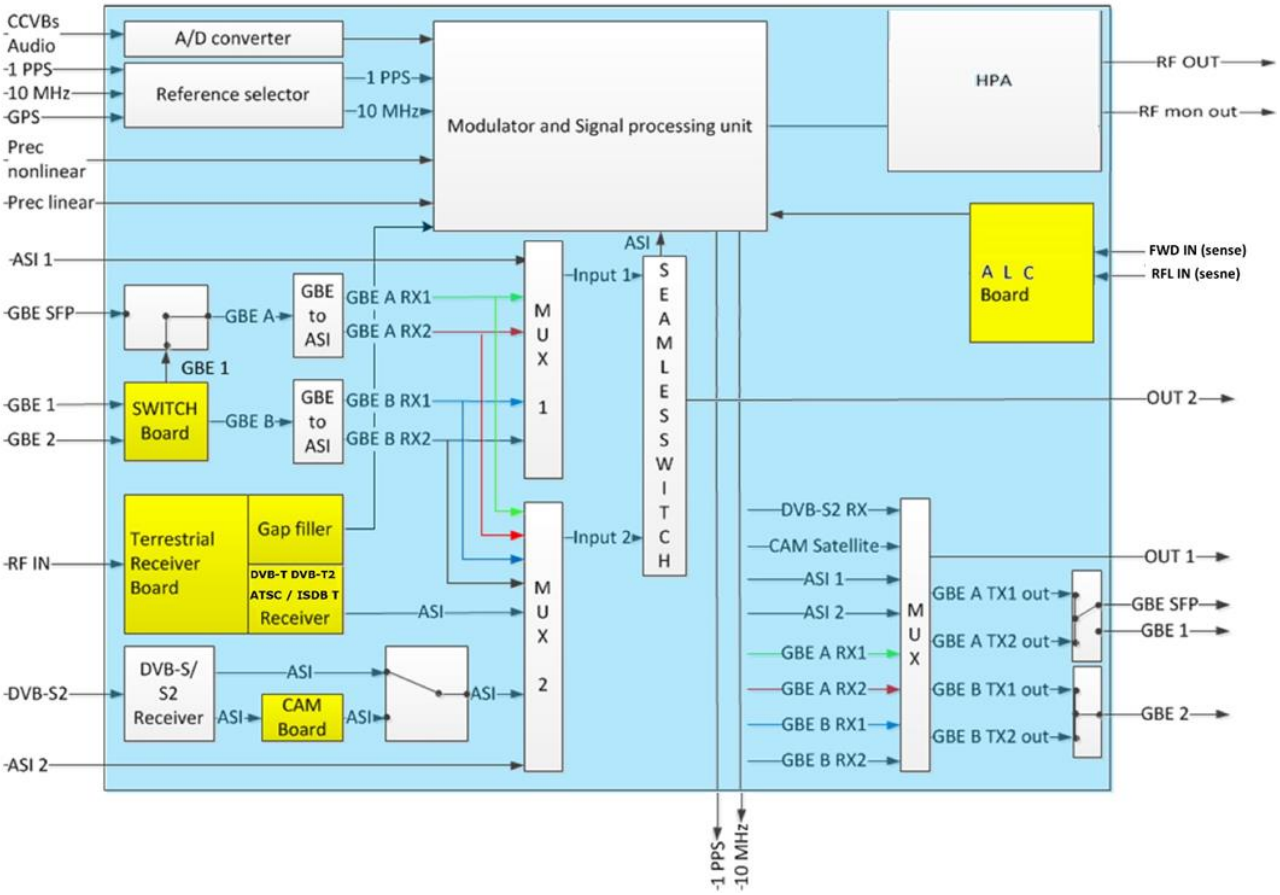
Group delay correction	Provided
Linear correction	Provided
ICPM corrector	Provided
Wide band design	Provided
Modular design	Provided
Over voltage / over current protection	Provided
Input overpower protection	Provided
Remote commands	Switch on Switch off
Remote signals (principal)	Loss of transmission Loss of power supply Local signalization Remote commands
Terminal for tele signaling	Open contacts (open >2MΩ, closed <2Ω) (relay switch 12V / 50mA)
Channel setting	Software: change channel local or remote Hardware: set intermediate filter and output filter
PA ALC	±0.5 dB for 3dB in input change
PA output power stability	Within 0.2 dB
Output power variation (black to white transmission)	±0.5dB

DAB Standards	DAB, DAB+ (ref standards EN 300401, EN 302077-2, EN 300799) DTMB
Frequency range	170 to 240 Mhz
Supported standards	TS 102 428
DAB modes	I, II, III, IV
MER	Up to 36 dB
RF chennal Bandwith	1.536 MHz blocks
Delay compensation (static and dynamic)	time stamp level 5 max. 1 s, step size 100 ns
Operation	
Display, keypad and status LEDs	
Ethernet interface, RJ-45	
Parallel remote-control interface	
Input Ports	
ETI1 and ETI2 (BNC 75 Ohm)	
Aux ASI3 and ASI4 (BNC 75 Ohm)	
GBE (RJ 45 EDI / dual port available)	
IF DVB-S2 (F) (GSE Optional)	
RF (N) for repeater / gap filler	
GPS (N)	
10MHz (BNC)	
1pps (BNC)	
LAN (RJ45),On front and rear pannel (Tho different IP inputs slectables and configurables)	
Output Ports	
RF out (N)	
ASI out	
10 MHz out	
Advanced features (only for skilled)	

Hitless switching between two of the input signals
BER and CRC analysis for Hitless switching
Parameters configuration via ETI: ETI-all (Modulation parameters+ optionals from MNSC), EIT-Modulation (only modulation parameters), Local (for manual configuration)
Authomatic anaysis and check of ETI Input signal: NI(G703), NA5376(G704), NA5592(G704)
Measurenment and visualization of network delay parameters:
o network compensation delay
o Current total delay
o frame zero delay
Transmitter delay and delay offset comparison ,analysis and configuration (can be set with 100ns step)
jitter measurement over network compensation delay(Min and Max network Jitter delay)
Authomatic anaysis and check of SSTC Paramentes
o Sub channel ID
o Start address
o Type and protection level
o Number of CU
o Subchannel bitrate
Adaptive automatic pre-correction, both linear and non linear.
Can store and load up to 10 different pre-calibrated curves for an easy adaptation to external filtering
Adaptive pre-correctin can be set on-off and run one time, scheduled or continuous
MER measurement
Can measure and store up to 7 differnt configuration. This can be saved ant transferred to other items via USB key ofr via WEB /SNMP
Internal GPS high precision receiver for on board synchronization
High stability OCXO max ±10-7sec /year- temperature: max ±2.5 10-8 (-20° to 70°C), VCO tuning step: 1Hz
holdover function for loss of 10 MHz external signal or of GPS signal
Standard transmitter protection (over voltage, over current, over temperature, overload and similar), ROS protection with threshold level selectable
Standard and advanced Echo cancellation (for gap filler configuration)

Feature		Values
MONITORING		
RF Monitoring Connectors		FWD/REF: SMA female , 50 W, 2x RJ-45
Local Control		standard web browser
Remote Control	Netw. Mgmt.	web browser for TCP/IP/ SNMP agent - upgrade also through ASI TS (OTA)
	Direct signalling	IEC 60864-1 (option)
TIME & REFERENCE		
Built-in ref.	Frequency	10 MHz OCXO
	Stability	time: max $\pm 10^{-7}$ /year - temperature: max ±2.5 10^{-8} (-20° to 70°C)
Ext. ref.	Frequency	10 MHz - 1pps
	Level	1 V_{pp} (0.7 to 1.4 V)
VCO tuning step		1 Hz
ENVIRONMENTAL		
Operating temp. range		0° to 50°C*
Special coating		Available
Max rel. air humidity		95% @ 30°C, no condensation
Max altitude		4000 m a.s.l.
Safety		EN 60215 (IEC 215)

BLOCK DIAGRAM



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