PUMA

FM RE-BROADCAST RECEIVER AND IP ENCODER *Rev 1.5*

HIGHLIGHTS

- High broadcast quality FM Tuner
- RF Frequency agile 87,5 – 108,0 MHz
- High invulnerability to strong RF fields
- Built-In RF, MPX, AUDIO and RDS monitoring system
- RDS decoder and data output in UECP format
- Audio over-IP streaming, IceCast2 Server, low bandwidth mode
- Embedded web server for worldwide consultation
- SNMP, HTTP web interface, FTP, NTP and email supported
- Double Ethernet ports and double USB interfaces
- Front LCD display and front panel headphone output

PRODUCT OVERVIEW

Whereas FM broadcaster requires cost effective solution to deliver and re broadcast FM content, Puma is cutting edge, most complete and innovative equipment on broadcast marketplace. Axel Technology with Puma set a new industry standard in hardware DSP-based radio equipment.

Puma is high quality frequency-agile FM Re-Broadcast receiver. In addition Puma provides RF-FM monitoring functionalities and an Audio-over-IP encoder in a single equipment.

Thanks to its internal digital-based DSP improved FM tuner, Puma returns a complete MPX signal from the received FM frequency. The MPX circuit optimization assures a high quality MPX signal that can be used to feed directly an FM transmitter or a different MPX signal path with unprecedented MPX performances

Internal tuner assures strong performances in FM reception, RF and MPX audio analysis and RDS data stream output. The monitoring made on the FM channels can be a basic RF analysis or an advanced RF, MPX and AUDIO measurement.

The monitoring made on the RF and MPX signal are:
Mono level, Pilot level, Audio and RDS levels are measured and kept always under control. All captured data during FM Channel monitoring can be sent to a Network Management System (such as Axel Technology's Ranger) or showed in a common password protected web page. Communication between Puma and Ranger NMS is SNMP v2C protocol. For all single parameter under monitoring, a threshold can be set. If one or more values rises out of range, alarms are delivered.

RF sensitivity of 20-30dBuV will be still available for the use as audio and RDS-UECP re-broadcaster. Once the RF signal is received, audio should be streamed from the transmitter site back to a remote logging system. The streamer input allows an internal selection between all inputs available: Tuner, External Analog In, External AES/EBU In.

Puma is also completed with "*External Input*" source: analog Left+Right input and Digital Left+Right in AES/EBU format. This audio input is continuously monitored: silence detection (Threshold/time and level), left and right presence, peak left, peak right. Rear-panel audio output always presents the audio decoded from Tuner and this setting is user definable while audio is available on Analog or AES/EBU format.

Puma provides a large variety of connection: double Ethernet port, USB and front panel headphone output, 4x GPIn opto coupled and 4x GPOut over relays. Rs232 serial port for RDS-UECP bridging and rebroadcasting purposes, and rear panel placed SD card to store or recall the complete equipment configuration.

RF antenna input is over BNC connector, a XLR balanced stereo analog input and output, AES/EBU input and output. MPX output is also over BNC connector. OS and data are loaded and stored over solid state memory as SD and flash RAM. Universal switching power supply to operate worldwide, 1 rack unit space in fan-less configuration.

PUMA MEASURES

Field	Type of measure	Puma measures	U.M
RF	4x RF Level Lower threshold	Measure, alarm via email/trap SNMP	dBµV
	2x Adjacent Channel L1 threshold		
	Alternative Channel - Worse	Measure	dBr
	Carrier precision	Measure	ppm
	Multi Path	Measure	%
MPX	Deviation Max	Measure, alarm via email/trap SNMP	kHz/dBr
	2x Pilot Lower level - 2 threshold level		
	MPX Power – ITU-R BS.412		
RDS Level	RDS Level Lower threshold		
	RDS Level Higher threshold		
AUDIO	Peak Left - Peak Right threshold	Measure, alarm via email/trap SNMP	dBr
	RMS Left - RMS Right threshold		
	Audio MPX deviation threshold	Measure, alarm via email/trap SNMP	kHz
	Audio MPX Silence detection threshold	Measure, alarm via email/trap SNMP	s
	Audio Left –Right Silence det. threshold		
	Streaming available	Audio streaming and Audio Spectrum analyzer	
RDS Data	AF-Complete Decoding + Visualization PS – 4 PS matching reference PI – 3 PI Code matching reference CT – Time offset DI – Decoder Information PTY – Program Type TP/TA – timeout TA M/S – Music Speech BLER – Block Error Rate TMC – AID – Group – Data EON Enhance Other Channel RT – RT+ data decoding LA – EG – ILS – LSN-PIN ODA TMC ODA RT+ ODA-1 ODA-2 SLC0 – SLC1 - SLC2 - SLC3 - SLC4 - SLC5 - SLC6 - SLC7	RDS Data decoding group, visualization and storage. Alarm generation in case of error, can be showed in a common web page or delivered via email. Interfacing with NMS allows equipment to deliver traps using SNMP protocol.	

PUMA WEB PAGE

PUMA FRONT-REAR DETAIL

Puma front panel shows in the first row frequency, RDS-PI code and main level for Stereo level and RDS level. The STATUS field indicates the condition (status) of the frequency under control. 6 leds are provided to give RF, MPX, AUDIO, RDS monitoring status condition immediately reported in front of Puma.

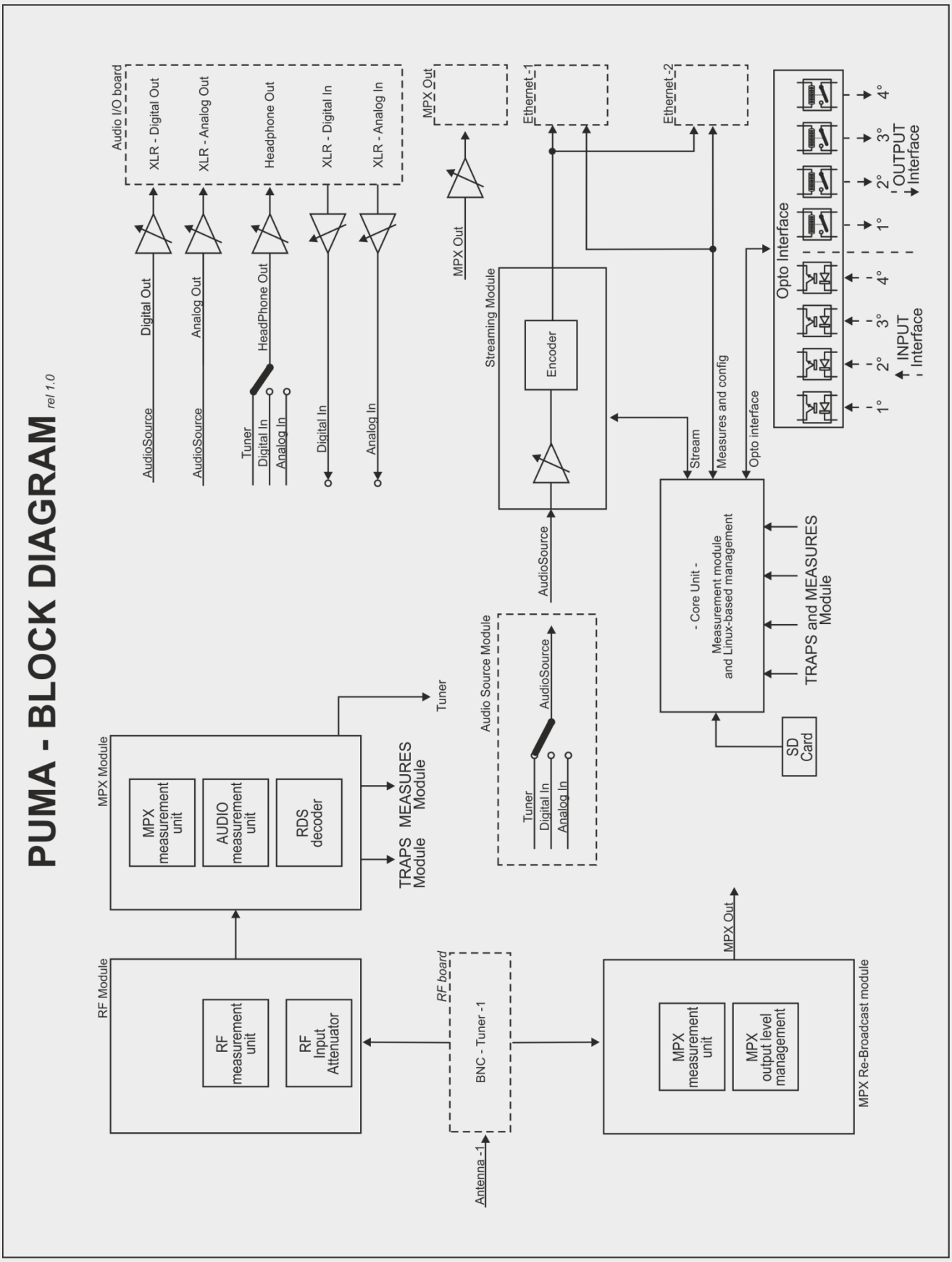
Front Panel:

- Left LCD display. Reporting information about RF,MPX and level.
- Navigation knob. By pressing the knob it's possible to enter and access menu.
- Front panel LED panel. Six alarm status panel about RF, MPX, Audio and Pilot/SCA levels.

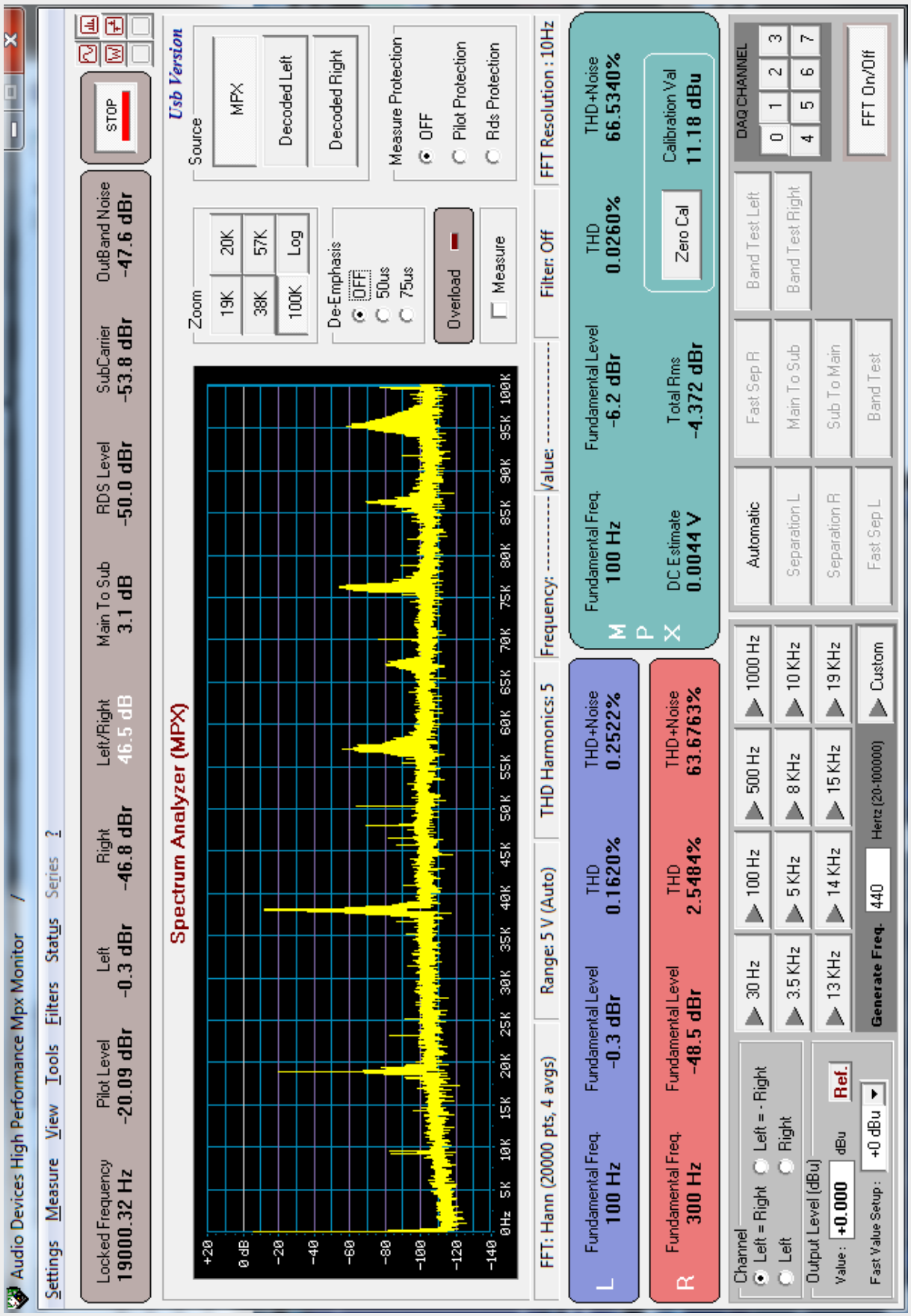
Rear Panel:

- Universal power supply 100Vac - 240Vac 50/60Hz internal,
- RF Antenna Input over BNC connector
- MPX Out over BNC connector
- Analog output over XLR balanced
- Analog Input over XLR balanced
- Digital AES/EBU Input over XLR balanced
- Digital AES/EBU Output over XLR balanced
- Double Ethernet LAN/WAN port
- Double USB A-type port
- SD Card slot
- GPIO and Serial interface

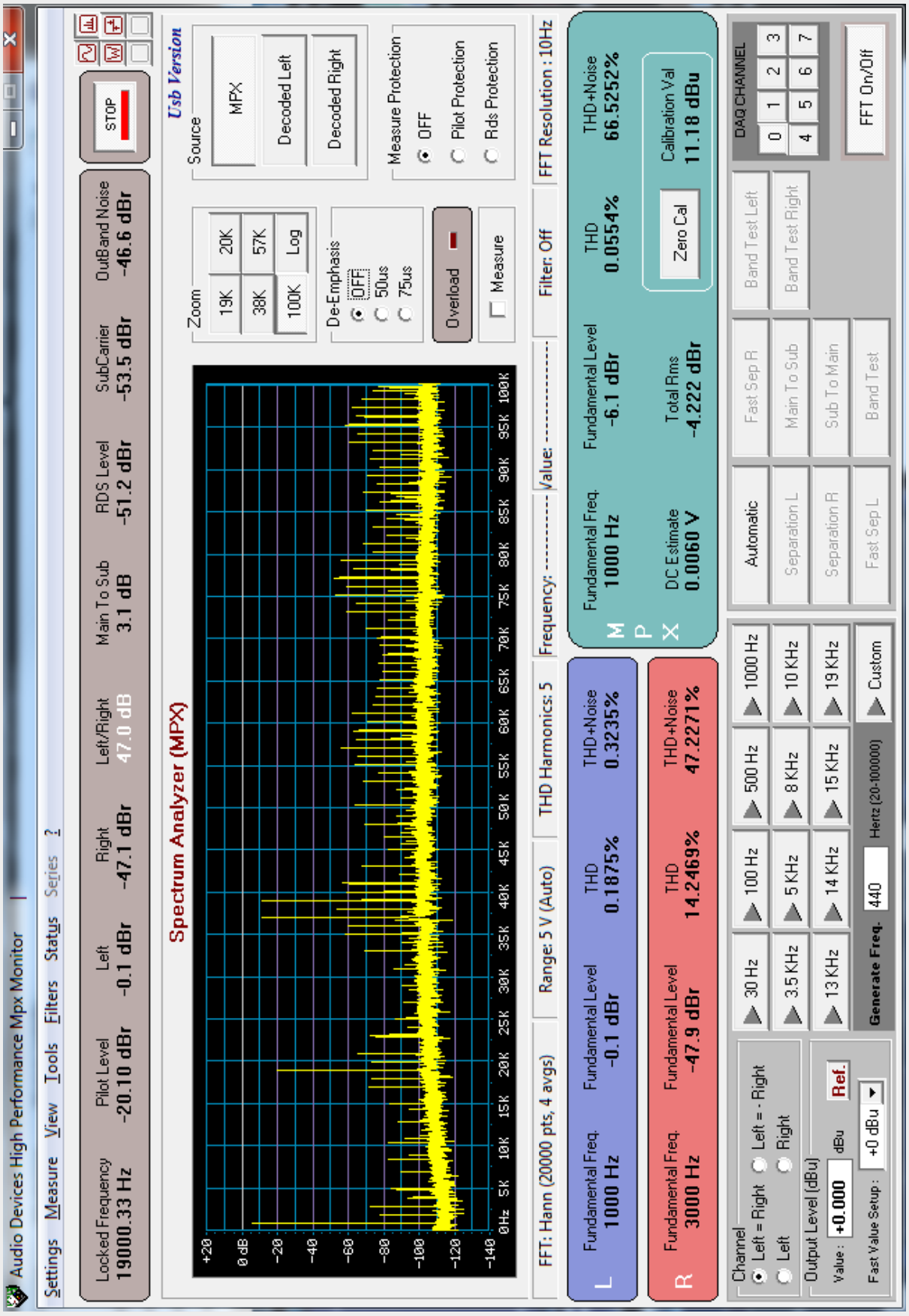
PUMA BLOCK DIAGRAM



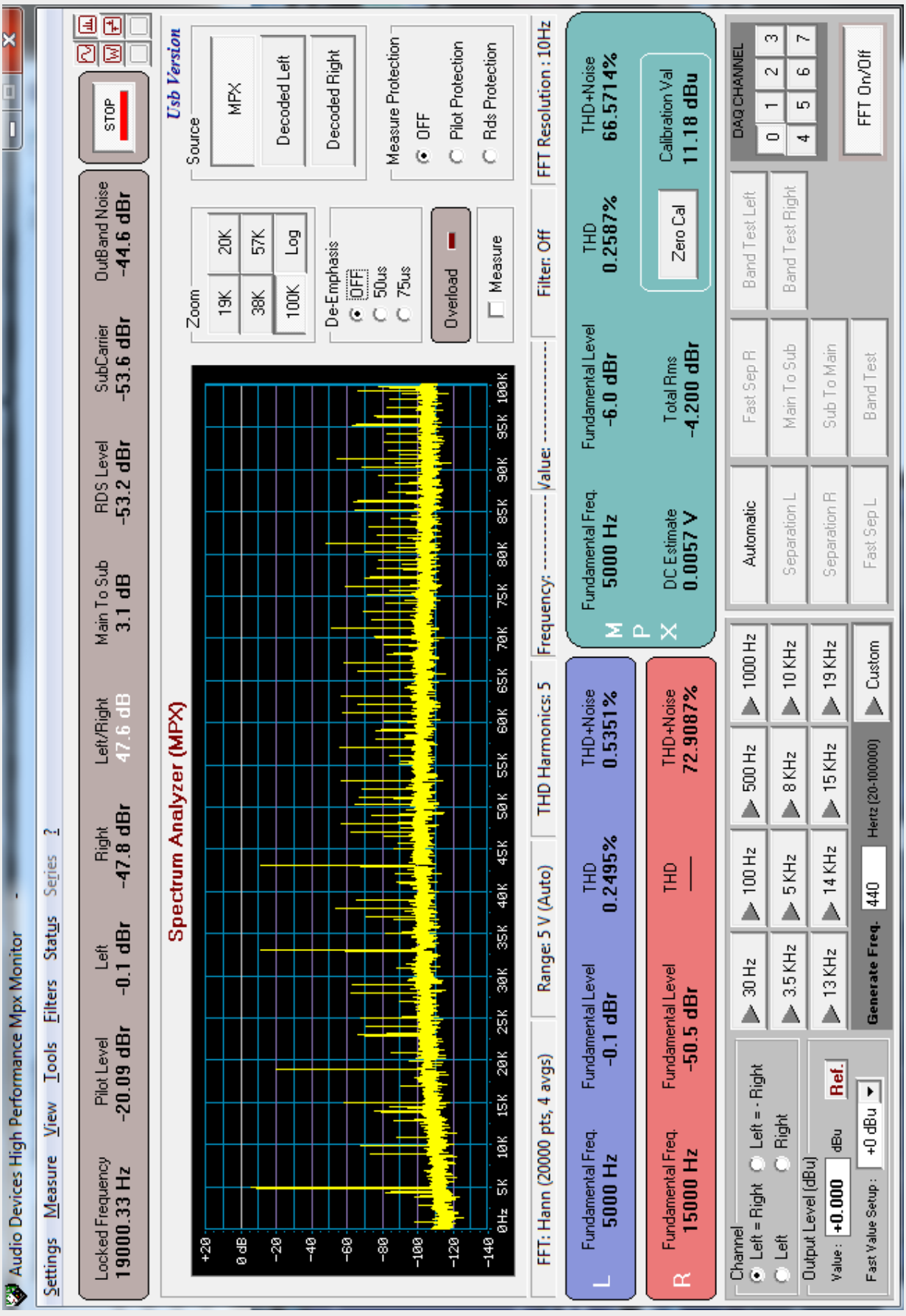
PUMA SEPARATION @ 100Hz



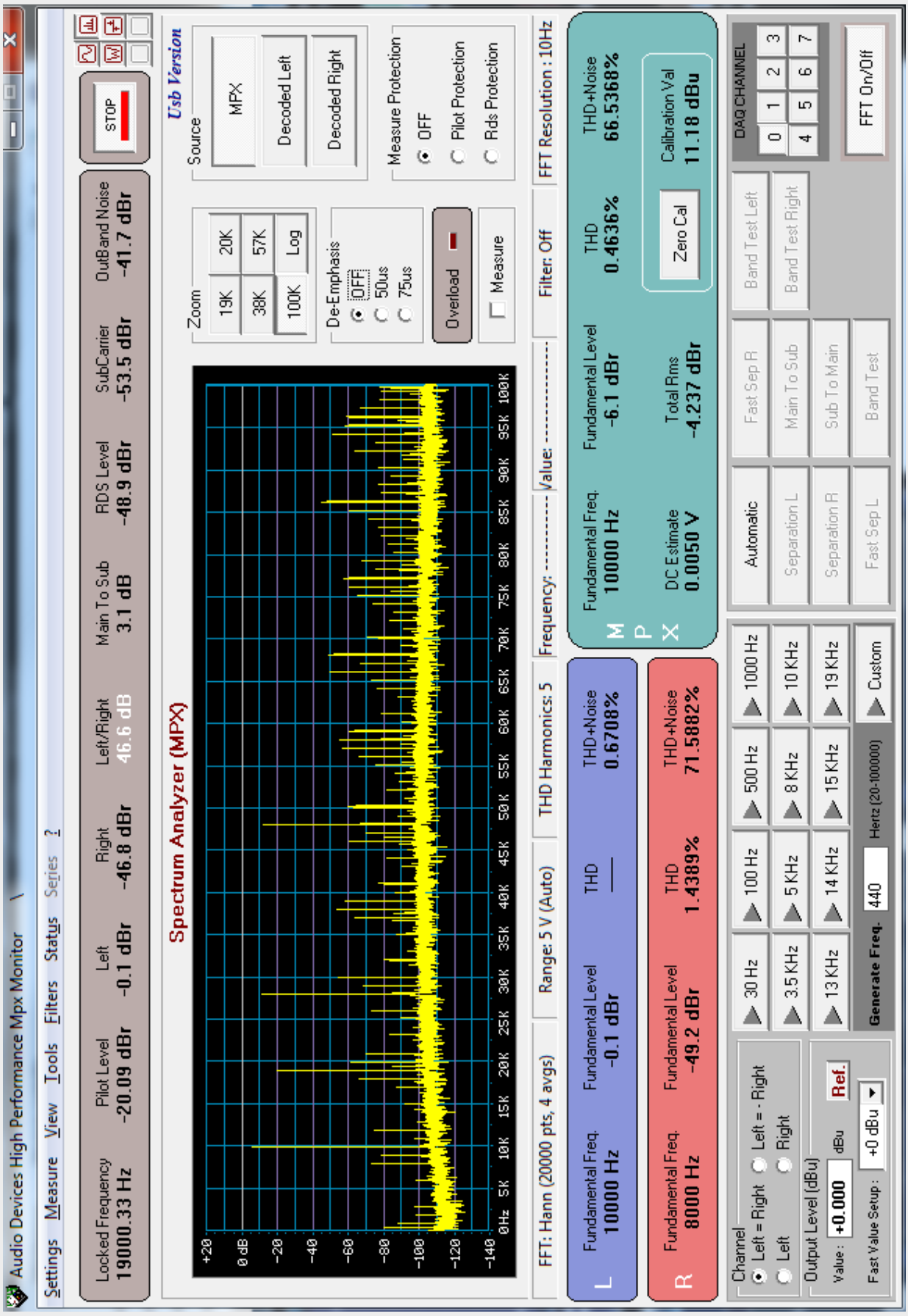
PUMA SEPARATION @ 1000Hz



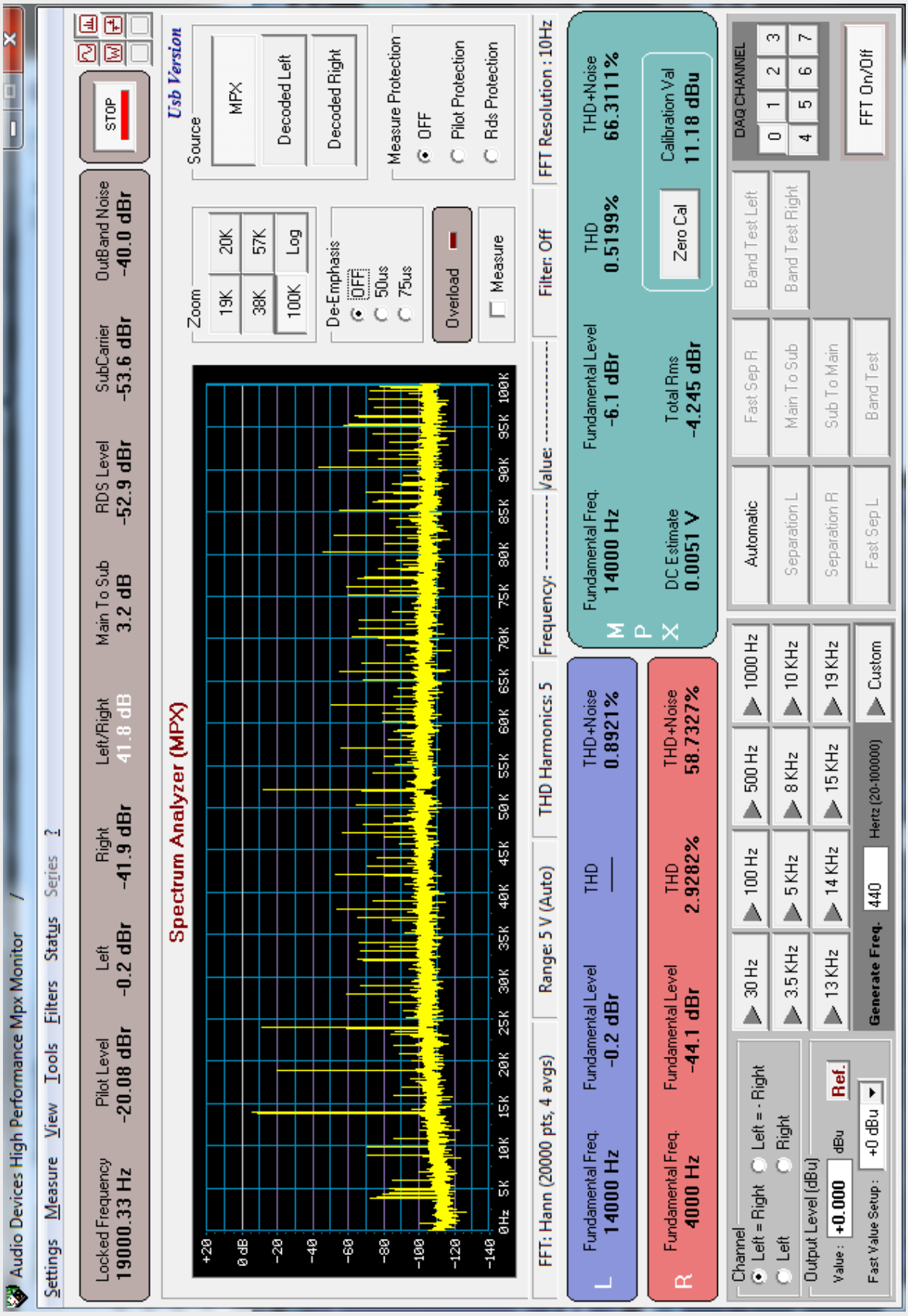
PUMA SEPARATION @ 5000Hz



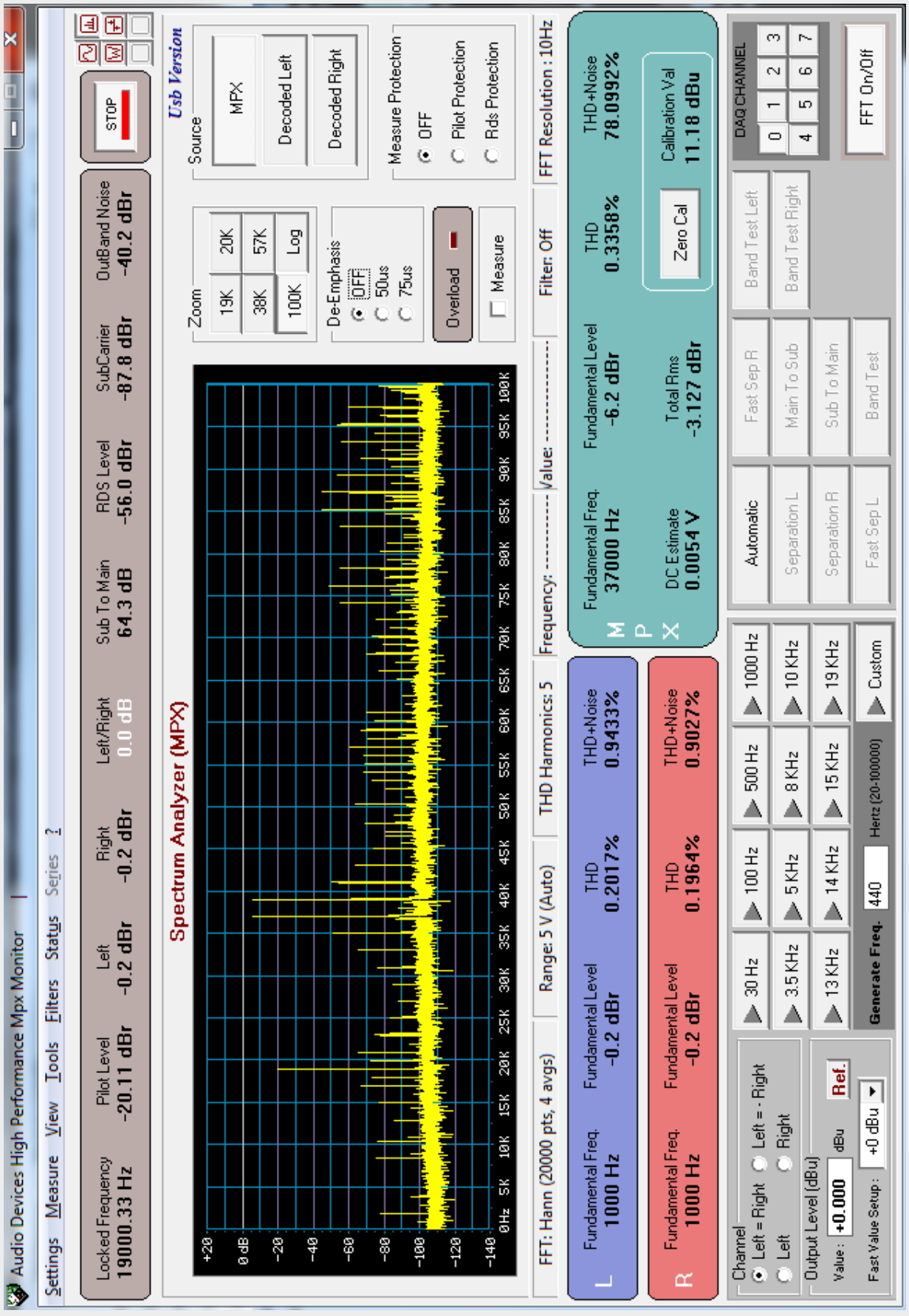
PUMA SEPARATION @ 10.000Hz



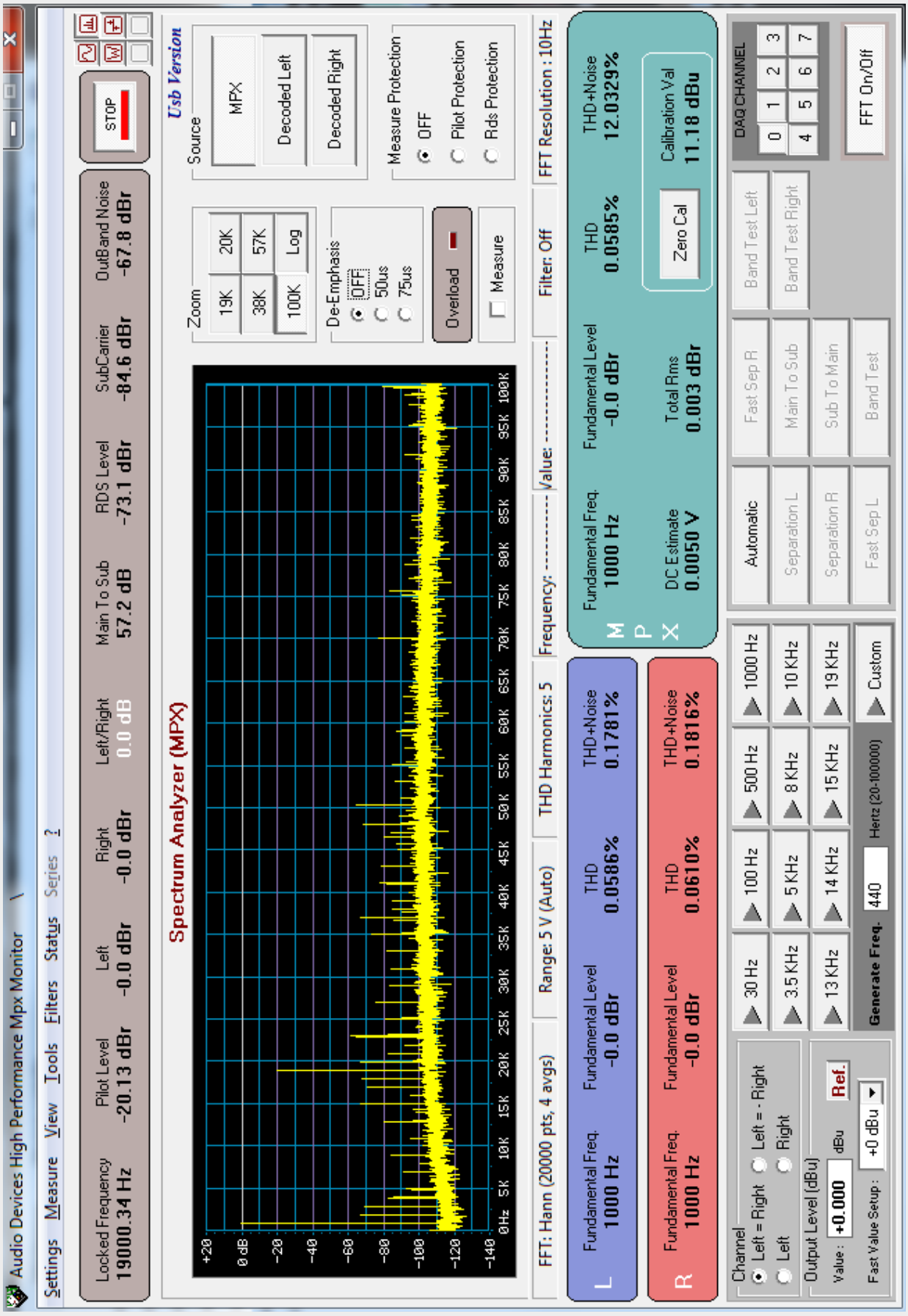
PUMA SEPARATION @ 14.000Hz



PUMA SubToMain



PUMA THD-MainToSub-1000 Hz



PUMA TECHNICAL SPECS

PARAMETER	**DESCRIPTION**
Main Power	100 Vac – 240 Vac 50/60 Hz internal, universal power supply
Power consumption	25 W
Power connector	IEC plug filter with internal fuse 2.0 AT
Headphone	Stereo Jack 6.3 mm
Safety and EMC	Compliant to CE laws
Working temperature	0° to 50° C (storage -5 to + 50 °C)
Housing Dimensions	19 inch x 1u x 240 mm (depth)
Weight	3.5 kg
RF TUNER	
Tuner frequency	87.5 MHz - 108.0 MHz
Tuner step	10 kHz
RF tuning stability	+/- 500 Hz
RF input sensitivity	20 to 120 dBµV
RF input nominal level	80 to 100 dBµV
RF inputs main	2x BNC, with 50 Ohm unbalanced
Max frequency deviation	125 kHz
IF Filter bandwidth	34 kHz to 138 kHz – Manual or Automatic
Input RF level	30 dBµV – 120 dBµV with Internal attenuator
Bandscan carrier number	32 Channels
Bandscan time	Static Mode, Scan 2 s to 20 s and Smart Mode*
Selectivity at ± 120 kHz	>-3 dB
Selectivity at ± 200 kHz	>-40 dB
Selectivity at ± 300 kHz	>-50 dB
Selectivity at ± 400 kHz	>-65 dB
Image Rejection @ 22.5 kHz	70 dB
Adjacent channel rejection	63 - 65 dB
Alternate channel rejection	65 - 72 dB
THD @ dev=75 kHz	0.05 – 0.1 %
Mono (S+N)/N	75 dB typ – 68 dB min (No A-Weighting 30 Hz – 15 kHz)

RE BROADCASTED MPX	
Stereo MPX Separation	• 40 Hz – 43 dB • 100 Hz – 46 dB • 1 kHz – 47 dB • 5 kHz – 45 dB • 10 kHz – 43 dB • 15 kHz – 42 dB
Stereo (S+N)/N	• 66 dB @ 50 dBuV • 71 dB @ 75 dBuV
THD	• 400 Hz – 0.06%
MPX Level output	From – 3.0 to 13.0 0.1db/step
STEREO DECODERS	
Stereo (S+N)/N	• 61 dB Stereo/61 dB Mono @ 40 dBµV • 65 dB Stereo @ 50 dBµV • 80 dB Stereo @ 70 dBµV
Pilot 19kHz suppression	55 dB (Stereo modulation L = 1, R = 0,Deviation=67.5 kHz, pilot deviation=6.75 kHz)
Stereo THD+N	Measures @ 70 dBuV with 75 kHz deviation • 100 Hz - 0.055 % • 1 kHz - 0.061 % • 5 kHz - 0.19 % • 10 kHz - 0.46 %
Stereo separation	45 dB (Stereo modulation L = 1, R = 0,Deviation=67.5 kHz, pilot deviation=6.75 kHz) • 48 dB @ 400 Hz • 48 dB @ 1 kHz • 48 dB @ 5 kHz • 38 dB @ 10 kHz • 38 dB @ 14.7 kHz
RDS DECODER	
RDS Sensitivity	20 dBµV (dev f = 2 kHz, RDS BLER < 5%)
RDS Synchronization time	80 ms (dev f = 2 kHz RF input = 60 dBµV)
RDS PI Lock time	100 ms (dev f = 2 kHz RF input = 60 dBµV)
RDS data decoding and Streaming	RDS Level indication and deviation (voltage, kHz and dBr)
RDS Data decoding services	PS, PI, M/S, DI, TP, TA, AF, AF List Presence A/B Method, Scrolling PS, AF EON, RadioText, RadioText Plus, CT, PTY, PIN, IH, TMC, EWS, TDC . ODA generic services. RDS error detection with three shold adjustable

RF MEASUREMENT MODULE	Ranges – Resolution - Precision
RF Level	0 – 80 dBµV (Resolution 1 dBµV, precision 2 dBµV) 82 – 120 dBµV (Resolution 2 dBµV, precision 5 dBµV)
Deviation	0-125 kHz (Resolution 1 kHz, precision 2 kHz)
Tuned Carrier Frequency Offset	0-250 ppm (Resolution 2 ppm, precision 5 ppm)
Multipath	0-100 %
Adjacent Channel RF Level	0 – 80 dBµV (Resolution 1 dBµV, precision 2 dBµV) (+-200kHz)
MPX MEASUREMENT MODULE	Ranges – Resolution - Precision
Pilot Level	0-20 kHz (Resolution 0.1 kHz, precision 0.2 kHz)
Rds Level	0-20 kHz (Resolution 0.1 kHz, precision 0.2 kHz)
Mpx Power ITU-R-BS412 (Estimated)	-20 dBr to + 12dBr (Resolution 0.1 dBr, precision +- 0.5 dBr)
Stereo	Valid Stereo signal detector
AUDIO MEASUREMENT MODULE	Ranges – Resolution – Precision
Left Quasi Peak	Programmable Attack Time from 0 mS to 2mS (Resolution 0.1 dB)
Right Quasi Peak	Programmable Attack Time from 0 mS to 2mS (Resolution 0.1 dB)
Audio Silence	Threshold -80 dB to 0 dB, Time: 1-120 Sec
Unbalanced Stereo Signal	Threshold -80 dB to 0 dB, Time: 1-120 Sec
AUDIO OUTPUT	
Available output on XLR	Tuner audio decoding. Same audio on Analog and AES/EBU
Audio frequency response	30 Hz—15 kHz, ± 0,3 dB
Phones (Front Panel)	Stereo jack 6.3 mm, 150 Ohm, 0.8 W
ANALOG OUTPUT MODULE	
D/A Conversion	24bit Sigma-Delta Conversion – 32 kHz Sample rate
Connectors	2x XLR, male - Electronically balanced
Output Level	-12.0 dBu to +14.0 dBu (0.1 dBu Step) – Max (+20 dBu)
Impedance Source	47 Ω
Load Impendance	600 Ω or greater
Distorsion	Less than 0.02% TDH+Noise (0.0dBu @ 1Khz)
Dynamic range	108 dB (110 dB A-weighted, 20Hz – 15kHz)
Sources	Streamer1_Source , Streamer2_Source
DIGITAL OUTPUT MODULE	
Connectors:	XLR, Male – Electronically balanced
Format	AES3/EBU
Sample rates	32 kHz
Resolution	24 bits
Operative Nominal level:	From 0.0 dBFs to -24dBFs (0.1 dBu step)
Dynamic Range:	125 dB (Typ), 122 dB (Min)
Distortion	less than 0.01% TDH+NOISE (-20dBFs @ 1Khz)
Freq response	20Hz-15kHz
Dynamic range	108 dB
Sources	FM Source
AUDIO INPUT	
Encoder Streaming Input source	User selectable between Tuner-1, Input Analog, Input AES/EBU

DIGITAL INPUT MODULE	
Connectors:	XLR, female – Electronically balanced
Format	AES3/EBU
Sample rates	32 kHz / 44.1 kHz / 48 kHz / 96 kHz with src and jitter correction
Operative Nominal level:	From 0.0 dBFs to -24dBFs (0.1 dBu step)
Dynamic Range:	125 dB (Typ)
Distortion	less than 0.01% TDH+Noise (-20dBFs@ 1Khz)
Input Modes:	Stereo, Mono (Left), Mono (Right), Mono (Left+Right)
ANALOG INPUT MODULE	
A/D Conversion	24bit Sigma-Delta Conversion – 32kHz sample rate
Connectors:	XLR, female - Electronically balanced
AD Clipping Point	+20.0dBu
Operative Nominal Level:	From –12.0dBu to +12.0dBu (0.1dBu Step)
Line Impedance	10 kΩ (Electronically balanced selectable) EMI–suppressed
Distortion:	less than 0.02% TDH+NOISE (0.0dBu @ 1Khz)
AD Dynamic Range:	108 dB RMS (110 dB A-weighted, 20Hz - 15kHz)
Input Modes:	Stereo, Mono (Left), Mono (Right), Mono (Left+Right)
AUDIO & RDS STREAMING MODULES	
Protocols	UDP/RTP, TCP/IP, IceCast2
Encoders	OGG-VORBIS
Interface	Ethernet Port 10/100 Mb/s
Bitrate	User select 24 kbps to 192 kbps
Sample Rates	32Ksamples/sec
RDS Streaming	Proprietary redundant protocol over UDP or RAW-TCP/IP
Administration	User right management

ORDERING INFORMATION

CODE#	MODEL	COMMERCIAL DESCRIPTION
A110170000	**PUMA**	FM Re-Broadcast receiver tuner with MPX Output. Real time measures on RF, MPX, Audio and RDS decoder with group sequence. HTTP, SNMP, FTP and XML protocol. Web server and audio streaming for monitor. Trap and email alarm. 2x LAN/USB and GPIO. Headphone output and universal power supply.
A110170000	**PUMA**	Tuner FM per MPX Re-broadcast. Misura in tempo reale di RF, MPX, Audio e decodifica dati RDS. Comunicazione HTTP, SNMP, FTP e XML. Gestione via pagina web e streaming audio per monitoring. Alert via trap ed email. 2x LAN/USB e GPIO. Uscita cuffia e alimentatore universale.
A110170000	**PUMA**	Tuner FM pour Re-diffusion MPX. Mesure en temps réel de RF, MPX, audio et décodage de données RDS. HTTP, SNMP, FTP et XML. Gestion via navigateur Web et streaming audio pour la surveillance. 2x LAN/USB, GPIO. Sortie casque et alimentation universelle.