

Ameritec

Fovea

Streaming Video Analyzer



- ◆ Fovea simulates hundreds of IPTV subscribers/Set Top Boxes (STBs) independently changing channels and watching video.
- ◆ Fovea GoldenEyes simultaneously monitor hundreds of IPTV and VoD streams in real-time, quantifying the Quality of Experience (QOE) per viewer.
- ◆ Fovea provides the industry's first Video Reception Index (VRI), a measurement that quantifies the effect of lost and corrupted video frames on the viewer.

Fovea presents the following measurements per viewer endpoint:

- ◆ MPEG Transport Stream (TS) packet metrics
- ◆ RFC 4445, RFC 3550 and ETSI TR 101 290
- ◆ Video I, P and B frame metrics and detail
- ◆ Perceptual Quality measurements
- ◆ Zap Times

Fovea's simple GUI interface increases productivity by enabling the user to configure a test within minutes.

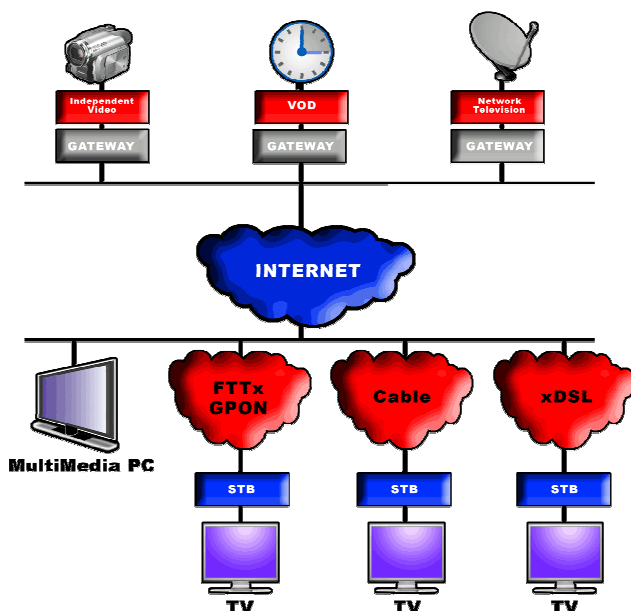
Fovea may be controlled remotely for integration into an automated test environment.

Just as audio Quality of Service (QoS) metrics were developed for voice communication's migration from traditional, fixed line networks to modern, internet-based networks, an identical need is occurring for video's migration to today's IPTV networks. It is no longer acceptable for a service provider to provide its customers with best-effort IP services. With competing suppliers offering IPTV services, only those suppliers providing the highest QoS/QoE will be able to minimize customer churn and meet the customers' expectations in terms of quality.

Ameritec's Fovea Streaming Video Analyzer is designed to measure the performance of today's IPTV networks. Fovea combines detailed packet-based metrics along with the industry's first Video Reception Index (VRI) that captures the user's experience in both lost or corrupted video frames and maximum corruption time. Hundreds of Fovea GoldenEyes can be configured to simulate hundreds of Set Top Box endpoints where video quality as well as video Zap Time is analyzed.

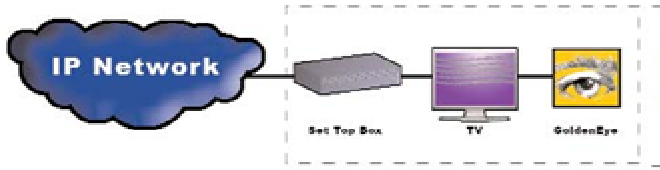
Each Fovea is equipped with the following capabilities:

- ◆ Two, 1GB Ethernet test ports
- ◆ Analysis of up to 500 MPEG Transport Streams
- ◆ Scriptable viewer actions
- ◆ TS packet statistics and ETSI TR 101290 information
- ◆ MDI (RFC 4445) and jitter (RFC 3550) measurements
- ◆ Video frame statistics, GOP structure information and VRI
- ◆ Comprehensive Zap Time measurements
- ◆ Perceptual Quality metrics (MOS-V)



Ameritec also offers a Fovea - Lite version of the product that supports up to 128 MPEG Transport streams over a single 1 GB Ethernet test port. The Fovea - Lite product offers the same suite of measurements as the full capacity Fovea unit, but at a reduced price point.

Fovea Configuration



Emulates STBs that can each receive multiple video streams in either UDP or RTP/UDP packets

Each video stream is connected to a GoldenEye viewer to generate quality metrics

Each virtual STB supports:

- ◆ DHCP
- ◆ Individual MAC address
- ◆ Configurable IP address, VLAN ID and QnQ
- ◆ IGMP v2 and v3

Fovea Applications

Subscriber Behavior Simulation

Set Top Box Emulation

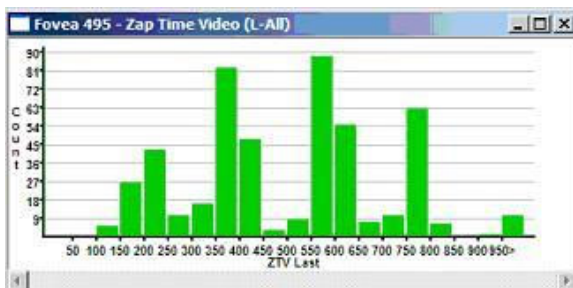
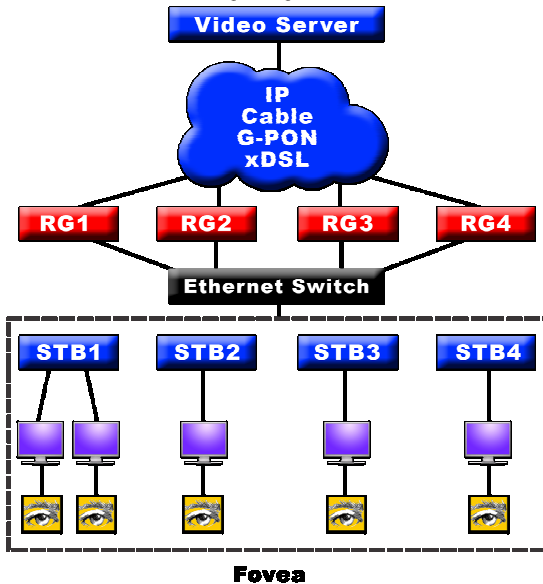
Access Network Testing

- ◆ FTTx/GPON
- ◆ xDSL
- ◆ Cable

Video Server & Transport Equipment Testing

Customer Premises Equipment Testing

Video Stream QoS/QoE Validation



Operation

The Fovea product is essentially one or more Set Top Boxes and an associated viewer, or GoldenEye. Up to 500 GoldenEyes can be configured for each Fovea unit, where it would be possible to emulate a single Set Top Box with 500 GoldenEyes monitoring 500 unique TS streams or 500 Set Top Boxes monitoring a single TS stream or any combination in between. The Fovea utilizes Ameritec's Conductor graphical user interface that allows for easy data capture along with the ability to graph various metrics over time. A third-party video tool, such as VLC or mplayer, can be used to allow the developer to watch a specific TS stream while performing measurements.

Scripting

The Fovea is controlled in the same manner that a user would control a Set Top Box with a remote. Commands include Wait, Watch and Surf. Wait indicates the amount of time the user performs an action or non-action. Watch selects a particular video stream in which the measurements will be performed. Surf commands the Fovea to surf a range of channels so that Zap Times can be calculated. Virtual STBs operate either synchronously or "randomly". "Random" actions may be reproduced thus allowing a failure mode to be recreated.

Measurements

Ameritec has incorporated into Fovea a comprehensive set of measurements designed to best depict the user's experience as it pertains to video quality. Utilizing a standards based approach, Ameritec has incorporated ETSI TR101290, Media Delivery Index (RFC4445) and RFC3550 measurements as well as perceptual quality metrics such as MOS-V for each of the TS streams configured, up to a maximum of 500 streams. Additionally, Fovea provides a Video Reception Index measurement that captures two critical components of a video quality problem: (1) the percentage of bad frames and (2) the duration of the longest video degradation in seconds. Fovea also measures Zap Times. Zap Times Join and Leave measure the IGMP response of the network. Zap Time Presentation measures the earliest possible time that video can be displayed to the viewer. Zap Time Video is another measure of the video display time that considers the jitter buffer characteristics of the individual STBs.

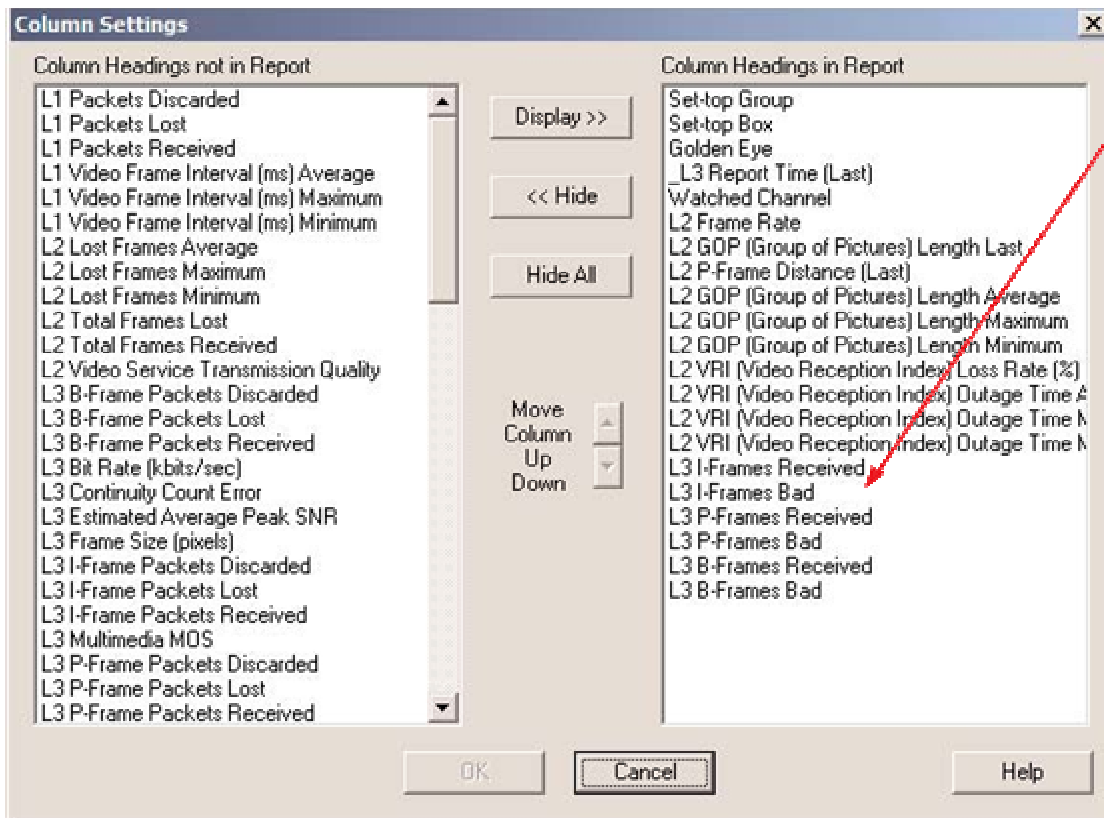
Graphs

Fovea provides the user with the ability to graph any metric over the duration of the test. The user may choose to graph the metric over all Fovea STBs, an STB group, an individual STB or an individual Golden Eye. If an anomaly is seen in the report data or in the graph, the user may change the scale to zoom in and pinpoint its time of occurrence. Any two measurements may be presented on the same graph to allow correlation of results. Multiple graphs may be viewed simultaneously, providing further comparison and analysis capabilities. Fovea graphs may be used to assess system performance in real-time or as a tool for post-analysis of the data.

Performance

Fovea is designed to support hundreds of TS streams using its 1 GB Ethernet interface. Due to the differences in compression, high definition vs. standard definition video, etc., the number of TS streams that can be monitored will vary depending on the characteristics of each TS stream. Common configurations include up to:

- ◆ 500 standard definition, MPEG-4 (H.264) streams
- ◆ 500 standard definition, MPEG-2 streams
- ◆ 250 high definition (HD), MPEG-4 (h.264) streams
- ◆ 125 high definition (HD), MPEG-2 streams



Customization of reports is possible by selecting fields from a comprehensive list of parameters.

Reports are generated that allow the user to sort on any measured parameter. Violations can be filtered to the top of the report so the user can quickly identify problematic channels. Current threshold violations are highlighted in red, while history violations are displayed in yellow.

Realtime Overview (Fovea 495 - 05/28/2009 10:15:32)

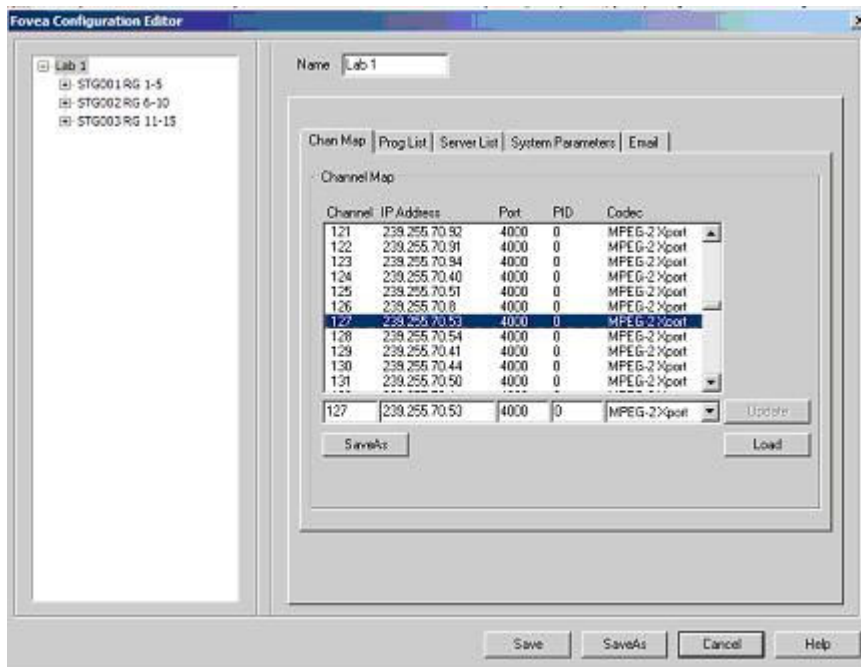
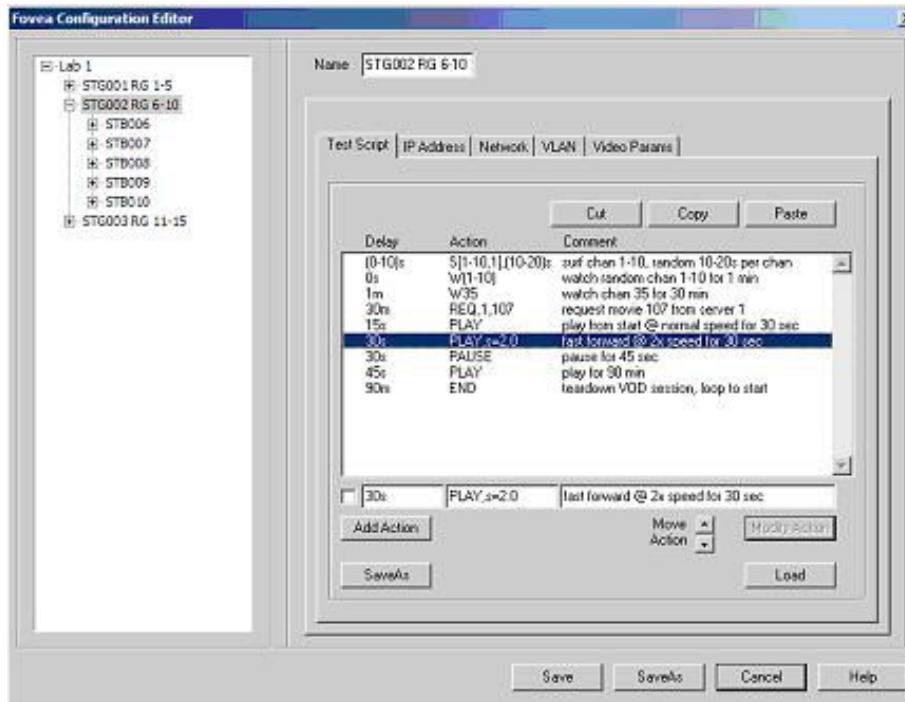
Report Columns Help

Report: Realtime Overview [Pause]

Set Top Group	Set Top Box	Golden Eye	Chan	Watch Time	Watch Atmpt	Watch Cmpl	Watch Fail	I-Pkt Jitter	Pkts Rcvd	Pkts Lost	Pkts Disc	MDI LR Avg	MDI DFv Avg	MDI DFr Avg	Ttl Frm Rcvd	Ttl Frm Crpt	VRI LR-F	VRI Deg Avg	MOS V	ZTJ Last	ZTP Last	ZTV Last	ZTL Last
					2,511	2,511								680,401	40								
STG003	STB001	GE001	1	10:55	3	3		13,540.00	1,022,606	7	0	0.00	46.91	41.50	16,350	1	0.01	0.04	4.38	8	793	630	
STG003	STB002	GE001	2	10:55	3	3		13,540.00	1,022,575	7	0	0.00	46.91	41.50	16,349	1	0.01	0.04	4.38	8	793	630	
STG003	STB003	GE001	3	10:55	3	3		13,540.00	1,022,692	7	0	0.00	46.91	41.50	16,351	1	0.01	0.04	4.83	8	793	630	
STG003	STB004	GE001	4	10:56	3	3		7,949.00	1,023,897	7	0	0.00	46.96	41.53	16,373	1	0.01	0.04	4.68	8	793	630	
STG003	STB005	GE001	5	10:56	3	3		13,540.00	1,023,107	7	0	0.00	46.91	41.50	16,358	1	0.01	0.04	4.83	8	793	630	
STG002	STB006	GE001	4	02	224	224		6,974.00	2,331	0	0	0.00	55.31	36.56	1,502	0	0.00	0.00	4.38	8	716	392	
STG002	STB007	GE001	5	15	225	225		8,713.00	16,843	0	0	0.00	69.72	59.64	1,501	0	0.00	0.00	4.38	9	512	189	
STG002	STB008	GE001	5	09	225	225		6,948.00	9,794	0	0	0.00	88.08	72.56	1,501	0	0.00	0.00	4.38	10	714	410	
STG002	STB009	GE001	2	02	222	222		7,350.00	2,796	0	0	0.00	55.31	36.56	1,502	0	0.00	0.00	4.38	8	716	392	
STG002	STB010	GE001	4	12	224	224		7,156.00	14,022	0	0	0.00	78.69	66.00	1,501	0	0.00	0.00	4.42	11	718	410	

Scripting language is clear and straight forward. Commands simulate a user selecting video channels similar to using a Set Top Box's remote control device.

Fovea can configure groups of Set Top Boxes or individual Set Top Boxes with unique scripts. This allows the developer to test the effects of synchronized channel changing to measure Zap Times or individual channel monitoring for video quality metrics.



A channel mapping function is provided to configure IP address, RTP/UDP packet selection, port, etc.

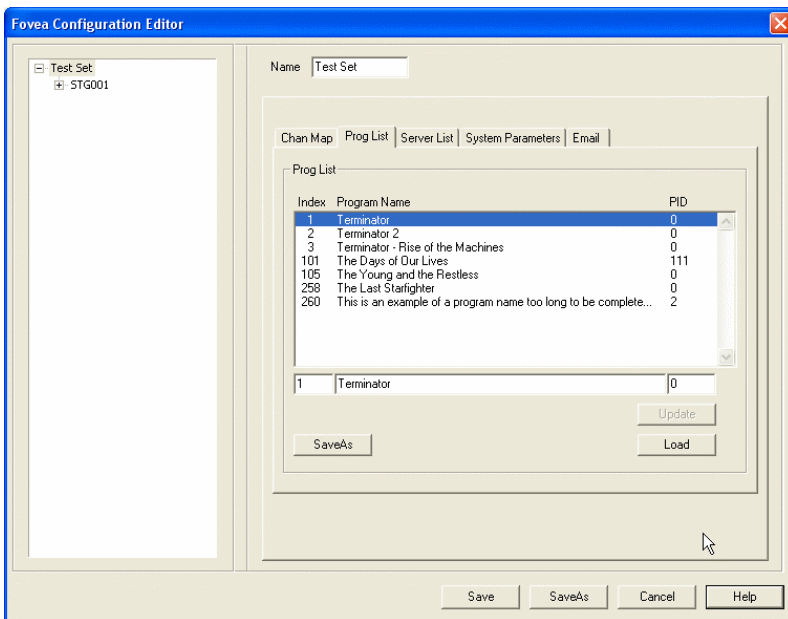
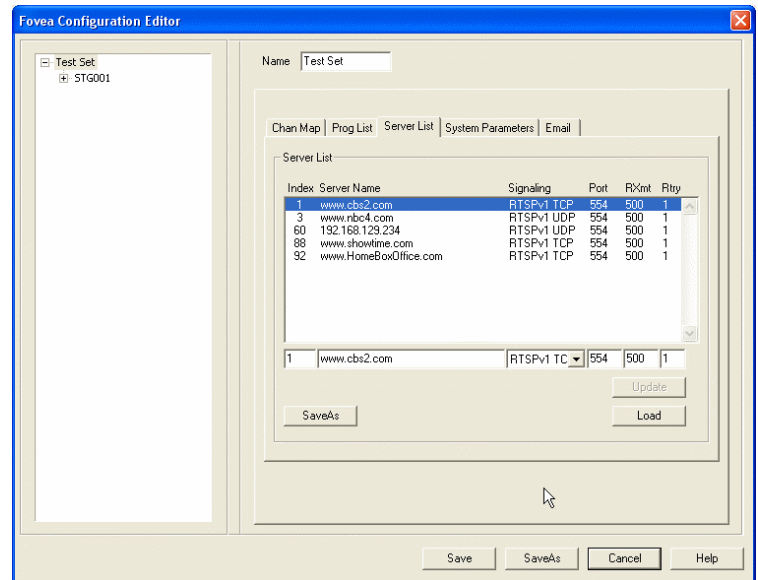
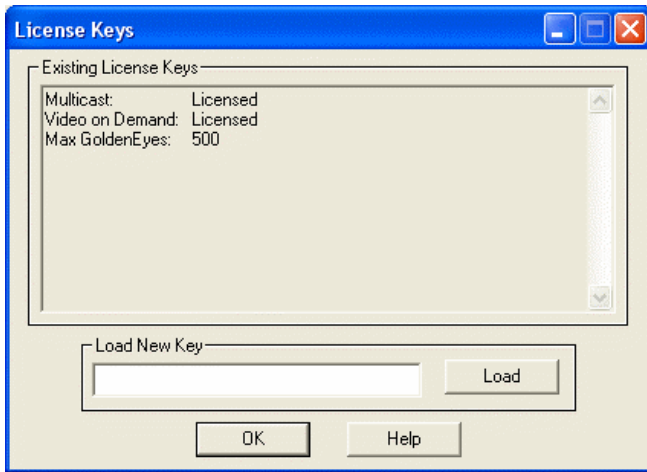
Video On Demand

Application

Fovea's Video on Demand (VOD) application suite is targeted to meet the testing needs of the video server manufacturers. This VOD option provides the Fovea with the capability of emulating thousands of individual VOD sessions with support for separate IP and MAC addresses. Each session can take advantage of Fovea's unique and simple to use scripting language to provide for synchronized, distributed or random program and action (SETUP, TEARDOWN, PLAY, PAUSE, TRICKMODE) control allowing the testing of a wide range of load scenarios.

"Blind Eye" Feature

Create thousands of sessions using SETUP and TEARDOWN messages to test capacity limits. Video quality measurements are not performed using "Blind Eye" feature.



General Characteristics

User Interface	Windows XP, Vista based GUI Command line (SSH) test control with web based provisioning and reporting
Ethernet Port	One RJ45 connector and two LED indicators per network interface 100/1000 BaseT Complies with IEEE 802.3
Dimensions Power	17" Wide x 3.5" High x 16" Deep 90 – 264 VAC, 47 to 65 Hz
Weight	18.5 Pounds (40.7kg)
Interface Capacity	Two, 10/100/1000 BaseT Ethernet simultaneous monitoring of 500 streams Fovea – Lite offers 1 GB Ethernet simultaneous monitoring of 128 streams
VOD Capacity	Four, 1G interfaces Up to 1800 sessions supported over four, 1G interfaces

Measurements

Quality Metrics	VSPQ MOS-V EPSNR Video Reception Index (VRI) Packet – Packet Delay Variation (PPDV) Delay Factor Media Loss Rate TS Error State TS Sync Error Continuity Count Error Sync Byte Error Transport Error PCR Repetition Error PCR Discontinuity Error PTS Error
Jitter Statistics RFC3550	
Media Delivery Index RFC4445	
MPEG-2 Transport Stats ETSI TR101290	
MPEG-2 Packet Stats	Packets Received Packets Lost Packets Discarded % Packets Good
Video Frame Statistics	I, P, & B - frame packets received I, P, & B - frame packets lost I, P, & B - frame packets discarded Video Frames received Video Frames Bad I, P, & B – frames received I, P, & B – frames impaired % I, P, & B – frames Good GOP Detail Video Bit Rate Frame Rate Frame Size Video frame interval
Zap Time Statistics	Zap Time Leave, Drop, Join Zap Time Video Zap Time Presentation Watch Attempts, Completions, Failures
Jitter	Inter Packet Jitter (Min, Max, Avg.)
VoD	VoD RTSP Metrics VoD Responses

Ordering Information

Mainframe/Chassis/Test Set	
Fovea	Fovea Streaming Video Analyzer
Fovea – Lite	Fovea – L Streaming Video Analyzer
250564	Multicast Option for 500 Golden Eyes
250565	Unicast/VoD Option

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