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The Agilent Technologies ATM Stream Processor (ASP) is a single slot module and provides users of the BSTS with a tool for testing the traffic management characteristics of next-generation ATM switches. The product is primarily focused on testing the key functions described in ATM Forum’s Traffic Management Version 4.0 specification. This specification is central to ATM traffic management compliance and interoperability.

The ASP is available in two models; low speed and high speed. The low speed ASP operates at rates up to 155 Mb/s and the high speed ASP at rates up to 622 Mb/s.

The ASP allows a variety of conforming and non-conforming traffic conditions to be simulated and analyzed.

The ATM Stream Processor offers extensive real-time Quality of Service (QoS) performance measurements (ITU-T I.356) using the industry-standard ITU-T O.191 technique.

Real-time summary statistics on eight VP/VCs are displayed on the Link Monitor, enabling measurement of bandwidth utilization and address information. Real-time AAL-5 statistics enable testing of early packet discard, partial packet discard and random early discard are provided on two connections.

If signalling, higher-layer protocol analysis and conformance testing are required, add the Agilent Technologies E4209B Cell Protocol Processor (CPP).

Some of the ATM-centric test scenarios supported by the ASP and companion products for the BSTS include:

- service category compliance
- switch fairness characterization
- congestion management control
- functional UPC conformance
- alarm and error handling
- alarm propagation and response
- switch transfer performance

For test engineers who also require Operations, Administration and Maintenance (OAM), the ATM Stream Processor can be used in association with the Agilent E6270A OAM Protocol Tester for a complete traffic management test solution.
Key Features

Compact Design

The low and high speed variants of the ATM Stream Processor only occupy a single slot of your Agilent BSTS. Add it to an existing system, or build a compact single port (1 Tx/1 Rx) real-time ATM analyzer with an ATM line interface.

Real-Time QoS Measurements

Many equipment manufacturers and service providers are insisting upon test equipment that is compliant to the industry-standard ITU-T 0.191 test methodology. This ensures that your QoS measurements are consistent with those of your partners and customers, and helps you to reliably benchmark the performance of your switch or network against those of your competitors.

The ATM Stream Processor employs the O.191 test cell to measure ATM QoS metrics such as cell loss, cell delay, and cell delay variation – in real-time on multiple channels.

Traffic Generation

To further test the limits of your system’s performance, you can easily select individual VP/VCs or multiple ranges of VP/VCs to cover up to 16,384 VP/VCs. Each VP/VC can carry a payload selected from a variety of available payload types.

Today’s ATM networks typically carry data traffic using the ATM Adaptation Layer 5 (AAL-5). To simulate live traffic and to test Frame Discard switch mechanisms, you can generate CBR, VBR-rt, VBR-nrt and UBR distributions carrying ATM and AAL-5 traffic.

PDU Sequences

Build PDUs and sequences of PDUs to simulate mixed traffic, or build higher-layer protocol PDUs, such as LANE packets, to test edge interworking devices. You can save your PDU and sequence libraries to disk so that your test plan can be easily restored and repeated.

The PDU libraries on the ASP are compatible with those of the Agilent E4209B Cell Protocol Processor (CPP).

Multi-rate Testing

You can take advantage of the real-time QoS and performance measurement capabilities over a variety of line rates from T1/E1 to OC-12c/STM-4.

The Agilent E1609A High Speed ASP can be used with any of the single slot BSTS ATM line interfaces, and the Agilent E1607A Low Speed ASP can be used with any ATM interface up to OC-3c/STM-1.
Multi-Channel Real-Time Statistics

ATM and AAL-5 statistics can be monitored in real-time on multiple channels. You can measure AAL-5 reassembly statistics – such as PDU counts and CRC-32 errors – to test Partial Frame Discard implementations.

The industry-standard ITU-T O.191 test cell is used to provide ATM layer performance measurements, including Cell Loss, Cell Transfer Delay and Cell Delay Variation. Because both transmit and receive statistics are available, you can count AAL-5 frames to check higher-layer performance metrics such as frame loss ratio and frame throughput.

Multiple statistics can be graphed simultaneously and updated in real-time, allowing you to correlate statistics to help find the reason for a fault or performance degradation. Measurements can be reported as errored seconds, event counts, ratios, or bandwidths. Logging measurements to disk enables you to analyze many hours or days of test results.

Real-Time Frame Performance

ATM Quality of Service metrics are the basis for ATM traffic contracts. However, these metrics tell only half the story.

Most ATM networks carry a high proportion of data traffic. ATM switches use proprietary schemes – such as Early Frame Discard, Partial Frame Discard, Random Early Discard, and priority queuing – to maximize AAL-5 frame throughput when running near full capacity.

Compatibility

The ATM Stream Processor shares the BSTS’ 155 Mb/s cell bus. This gives simultaneous access to the Agilent E4209B Cell Protocol Processor (CPP) and other specialized modules.

ATM payload of up to 149.76 Mb/s can be transmitted from modules that share the 155 Mb/s cell bus. For example, you can generate a modulated ABR stream from the Agilent E6287A ABR Emulator and combine this with multiple CBR and VBR streams from the ASP, allowing real-time validation of the interaction amongst ABR, CBR and VBR traffic.

If two or more traffic streams are generated, it is possible for the sum of the peak bandwidths to exceed the link bandwidth. When this occurs and the traffic generator cannot satisfy all traffic profiles, you are warned by an alarm located on the ASP control panel. This is very important if you need deterministic and repeatable ATM traffic generation.

Received ATM traffic being monitored by the CPP can also be monitored by other modules that share the 155Mb/s cell bus such as the CPP. For example, using just 6 of the 8 ATM header pattern-match filters, you can select
- the signalling channel
- 3 other specified VP/VCs
- all VCs on 2 specified VPs

for CPP analysis. The header pattern-match filters can also be set to select all traffic on the link to be monitored by the CPP.

The 131,072 cell output buffer of the ASP generates ATM and AAL-5 traffic to fill the link.

Traffic Management

For today’s equipment manufacturers and service providers, the hardest problem to solve — but the one that offers the largest returns — is getting the greatest utilization from a transmission link, switch, or network, whilst meeting agreed QoS levels for all customers. The performance of a network at full or near-full capacity is determined by its congestion management, call admission control, and other traffic management techniques. This requires a broad range of tests to be performed, including:
- cell tagging and discard measurements across multiple VCs
- QoS measurements of different traffic classes
- testing priority queuing configurations, drop eligibility algorithms, and selective cell discard fairness during congestion
- sending incrementally longer AAL-5 traffic bursts to determine maximum frame burst size
- AAL-5 Early/Partial Frame Discard operation and Random Early Discard fairness
- measuring total switch capacity and examining switch response to multiple SVC connection attempts
- measuring bandwidth utilization and allocation to multiple traffic sources
An Application Programming Interface (API) is provided to enable the development of regression tests and automated test suites. Test programs can be built in the industry-standard environment of “C” and Unix. For remote system testing, scripts and user interfaces can be rapidly developed in Tcl/Tk.

Web-Based Online Documentation
All user documentation is provided online in a web-based format that can be accessed and searched using a web browser.

The ATM Stream Processor and existing BSTS tools

There are three key ATM test products available on the BSTS:
- ATM line interface (LIF) – T1/E1 through OC-12c/STM-4c
- Agilent E4209A/B Cell Protocol Processor (CPP)
- Agilent E1607A/E1609A ATM Stream Processor (ASP)

For access to the system under test, the ATM Line Interface (LIF) is used:
- access to the system under test
- physical layer stimulus/response tools for transmission engineers
- a companion module to the CPP and/or ASP

For SVCs and higher layer protocols, the Cell Protocol Processor (CPP) is used:
- a companion module to the ATM LIF
- focused on signalling and higher layer protocol testing
- limited to 155 Mb/s traffic generation and analysis
- support for signalling, conformance test and protocol analysis

For traffic generation and analysis, the ATM Stream Processor (ASP) is used:
- a companion module to the ATM LIF
- a standards based solution focused on traffic management testing
- full rate, multi-channel testing from 0 to 622 Mb/s (Agilent E1609A)
- real-time ATM QoS using industry-standard O.191 technique
- AAL-5 simulation and performance measurements
- support for protocol analysis

Configuring a system for full rate OC-12c/STM-4 testing

For full-rate 622 Mb/s physical and ATM layer testing, a minimal Agilent BSTS configuration consists of:
- E1618A 622 Mb/s Optical Line Interface
- E1609A 0-622 Mb/s ATM Stream Processor (ASP)
- either an E4200B Form-7 transportable or an E4210B Form-13 chassis

The E1609A High Speed ASP provides full-rate ATM and AAL-5 generation and analysis, to meet the need for real-time multi-stream, multi-profile, multi-channel performance measurement, and enables access to other dedicated modules.

If signalling and higher-layer protocol and conformance testing are required, simply add the E4209B Cell Protocol Processor.

Your local Agilent Technologies sales representative will help you select the best test system configuration to meet your needs.
Warranty & Support Options

Hardware

All BSTS hardware components are warranted for a period of 3 years. Products must be returned to an authorized Agilent Technologies service center for service.

Software

Agilent Technologies Broadband Series Test System software and firmware products are supplied on transportable media such as disk, CD or integrated circuits. The warranty covers physical defects in the media, and defective media is replaced at no charge during the warranty period. When installed in an Agilent Broadband Series Test System, the software/firmware media has the same warranty period as the product.

Product Numbers

- **E1607A Low Speed ASP**
  0-155 Mb/s ATM Stream Processor

- **E1609A High Speed ASP**
  0-622 Mb/s ATM Stream Processor

- **E4200/E4210B #040**
  622 Mb/s Real-Time ATM Analyzer Bundle (E1609A, E1618A)

- **E4200/E4210B #140**
  622 Mb/s Real-Time ATM Protocol Test Bundle (E4209B, E1609A, E1618A)

Operational Configuration

Valid Module Configurations

The E1607A 0-155 Mb/s ATM Stream Processor (ASP) and ATM line interface modules (up to OC-3c/STM-1) communicate via the 155 Mb/s BSTS cell bus. The E1609A 0-622 Mb/s ATM Stream Processor (ASP) and E1618A 622 Mb/s Optical Line Interface communicate via a high-speed 622 Mb/s cell bus.

The ASP provides access to the E4209B CPP and other modules on the low-speed 155 Mb/s cell bus. The number of consecutive modules that can operate on the low-speed 155 Mb/s cell bus is controlled by a formula specified in the Test System Manager.

Traffic generated from the CPP and other modules on the low-speed bus can be selected to take precedence over traffic generated from the ATM Stream Processor. This enables signalling, higher-layer, and variable-rate traffic to be generated from the CPP whilst using the ATM Stream Processor to fill the remaining link bandwidth.

The high-speed bundle shown below may be placed adjacent to additional high-speed bundles and to other modules, up to the limits of the chassis.

![Diagram](image)

The low-speed bundle shown below may be placed adjacent to additional low or high-speed bundles and to other modules.

![Diagram](image)
Transmit Functionality

155 Mb/s Cell Bus Interface

Insert Mode
- Specialized test modules (such as the E4208B Cell Protocol Processor) to the left of this module can insert cells into the generated traffic stream.
- Limited to the maximum bandwidth of the 155 Mb/s cell bus.
- Limited to the allowable configurations of the Test System Manager.

Pass-Through Mode
- Cells from the 155 Mb/s cell bus to the left of this module are passed unchanged to the 155 Mb/s cell bus to the right of this module.
- Enables surrounding modules to be used together, bypassing this module.

822 Mb/s Cell Bus Interface

Insert Mode
- High speed ASP generated cells are passed via the 822 Mb/s cell bus to the E1800 A 822 Mb/s Optical Line Interface, located on the right of the high speed ASP.
- Limited to the maximum bandwidth of the 822 Mb/s cell bus.

Link Control

Network Interface
- Select UNI or NNI.

Fill Cells
- Select idle or unassigned (default = idle).

155Mb/s Cell Bus Control

Control
- On: ATM cells from the 155 Mb/s cell bus (from modules such as the E4208B Cell Protocol Processor) are inserted into a generated traffic—fill cells on the bus are ignored.
- Off: Cells from the 155 Mb/s cell bus are ignored.

Bandwidth
- Cells from the 155 Mb/s cell bus can be inserted up to an ATM bandwidth of 149.76 Mb/s.

Distribution
- When the E1800 A High Speed ASP is generating cells, 1 in 4 cell opportunities are reserved for cells inserted from the 155 Mb/s cell bus.

Priority
- Select Highest or Lowest.
- In “Highest” mode, cell opportunities are assigned to ATM cells from the 155 Mb/s cell bus in preference to the module’s internal traffic generator.
- In “Lowest” mode, cell opportunities are assigned to ATM cells from the module’s internal traffic generator in preference to the 155 Mb/s cell bus.

Contingency
- If a cell from the internal traffic generator is blocked by the insertion of a cell from the 155 Mb/s cell bus, the blocked cell is queued and generated at the next available opportunity.
- If a cell from the 155 Mb/s cell bus is blocked by insertion of a cell from the internal traffic generator, the blocked cell is discarded.
- Traffic cannot be generated from the ATM line interface when generating from the ATM Stream Processor.

TrafficViewer displays the traffic inserted by the CPP and traffic generated by the ASP in a single screen.
ATM Stream Processor (ASP) Traffic Generator

A user-defined stream has the following properties:

- **Independent control**
- **User-selectable traffic profile**
- **User-selectable PDU Sequence, Test cell/frame, PRBS Pattern**
- **Can contain many channels (VP/VCs)**
- **User-selectable stream priority**

**Control**
- Select Internal Traffic Generator or On/Off
- On: A single burst of user cells is generated
- Off: Fill cells generated

**Number of Streams**

| Number of Streams | 8 |

**Stream Priority**

User selectable: 1 (highest) to 8 (lowest)

**Traffic Profiles**

- CBR, VBR-cont, VBR-rt, UBR
- Periodic Burst
- Single Burst

**Bandwidth Parameters**

- Resolution: 424 kbps or 1 cell/s
- Range (E1/2): 424 kbps to 144.78 Mbps
- Range (E3/4): 424 kbps to 560.04 Mbps
- 1 cell/s bandwidth step
- Burst length: 1 to 65,536 cells

**Scheduler Modes**

- Preserve SCR - in the case of contention between streams, the delayed stream is scheduled so as to preserve the long-term average SCR, possibly at the cost of exceeding the contracted SCR.
- Preserve PCR - in the case of contention between streams, the delayed stream is scheduled so as to ensure that the contracted PCR is never exceeded.

**Contention**

If the traffic profile of a cell stream from the internal traffic generator cannot be satisfied (for example, because of the insertion of cells from the 155 Mbps cell bus), the T GBS (Traffic Generator Not Satisfied) alarm is set.

**Number of Channels**

| Number of Channels | 1 to 10,000 channels, 1 to 2,048 per stream |

**Channel Selection**

- Select individual VP/VC
- Select range of VCs with one VPI
- Select range of VPIs with one VCI
- Select range of VPIs with range of VCs
- Select any combination of above
- Duplicate VP/VC selection permitted

**Channel Distribution**

- Stream bandwidth divided equally amongst selected channels
- Channel bandwidth = (Stream bandwidth / Number of channels in stream)

**Channel Assignment**

Within a single stream, a sequence of "Burst length" cells are transmitted on each channel in turn, repeats when all channels have been used.

**Header Generation**

- **Interface**: UNI or NNI
- **GFC**: 0 to 0x7F (UNI mode only)
- **VPI**: 0 to 0xFF (UNI mode): 0 to 0x7FFF (NNI mode)
- **VCI**: 0 to 0x7FF
- **PTI**: 0 to 7
- **CLP**: 0 or 1

**PDU Payload Generation**

**Adaptation Layer**

AAL-0, AAL-5 CPCS

**ATM Cell layer**

- Cell type may be set to ATM, OAM, or RM
- Interface & Header fields defined by Channel Header Controls
- When set to "ATM" mode payload data may be set under control. New built-in pattern: user value, alternating FF 00, alternating AA 55, incrementing or Single-PRBS
- When set to OAM or RM modes an appropriate editor is enabled which allows specification of OAM and RM cell fields
- Cross-cell PRBS-23 insertion

**AAL-5 CPCS**

- Payload information length specified under control. Length may be set from 1 to 65535
- Payload data may be set under control. New built-in pattern: user value, alternating FF 00, alternating AA 55, incrementing or Single-PRBS
- Pad length may be specified by new error may be automatically calculated
- Pad octet may be set by the user
- CPCS trailer User-user indication, common part indicator may be specified under control
- CPCS trailer length and CRC-32 may be specified manually or may be automatically calculated

**Test cell description**

- Employs ITU-T O.111 test cell
- 32-bit timestamp insertion
- 32-bit sequence number
- CRC-16 generation
- Scrambler Mode: On or Off

**Test frame description**

- Test frames can be transmitted with specific frame sizes (cell length) [1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 1385]
- Employs O.111 cell sequence with the addition of an AAL-5 CRC-2 test insert for the last cell of the test frame (AAL-5 PDU)
PDU and PDU Sequence Builder
Channel contents may be built using the traffic generator dialog: PDUs (protocol data units) may be built at the ATM cell layer, adaptation layer (AAL-1, AAL-2, AAL-3/4, AAL-5) and service layer. PDUs may be transmitted individually or they may be linked to form complex sequences.

PDU Buffer
- 131,072 cells (shared across all traffic generator streams)

Licensing
- Access to higher layer PDUs and PDU Sequences is available to the ASP. Installation of the appropriate AAL test products and licenses is required before loading is attempted.

Channel Override
- Encoded PDUs and PDU sequences inherit VP/VCi from internal traffic generator setting

Traffic Generator Engine: PDUs and PDU Sequences can be developed quickly.

Receive Functionality

Receive Connection Filters
- Number of Connection Filters: 8

Pattern Match Fields per Filter
- GFC (UNI mode): single value or "any"
- VPI: single value or "any"
- VCI: single value or "any"
- PT: bit mask and bit value (3 bits)
- CLP: single value or "any"

Quick Fill Default Values
- All: VPI = "any"; VCI = "any"
- Signalling channel: VPI = 0, VCI = 5
- OAM F4 Segment: VPI = "any", VCI = 3
- OAM F4 End-End: VPI = "any", VCI = 4
- OAM F5 Segment: VPI = "any", VCI = "any", PT = 100
- OAM F5 End VPI = "any", VCI = "any", PT = 101

155 Mb/s Cell Bus Interface
- Output Mode
  - On: ATM cells from the main traffic stream that match the output filters are placed on the 155 Mb/s cell bus (for monitoring using modules such as the E4200 B Cell Protocol Processor)
  - Off: No cells are placed on the 155 Mb/s cell bus

Idle/Unassigned Fill Cell Filter
- On: Idle/Unassigned cells are never placed on the 155 Mb/s cell bus
- Off: All mixed cells, including Idle/Unassigned cells, are placed on the 155 Mb/s cell bus

155 Mb/s Cell Bus Control

Overflow Mode
- Select Continuous or Intermittent (default = Intermittent)

Link Control
- Select UNI or NNI

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ATM Stream Processor
E1607A/E1609A

| Actions | Output to any module to the left hand side of the ATM Stream Processor (i.e., CPP or OOF) from one to eight connections
|         | Monitoring two of the eight available connections individually. Refer to Remote Connection Monitor Measurements in a later section
|         | Capturing the eight connections at full line rate

Output Buffer
The output buffer is used to buffer cells before they are placed on the 155 Mbps cell bus (for monitoring using specialized modules such as the E12006 Cell Protocol Processor). The buffer smooths short bursts of cells that exceed the maximum bandwidth of the cell bus, to reduce the likelihood of losing cells.

| Buffer Size | 131,072 cells
| Time to Fill Buffer | For input rates greater than 140.70 Mbps: 555.74 kbps input rate ≤ 140.70 Mbps input rate: 123.7 ms
| Time to Empty Full Buffer | 371.1 ms

Buffer Modes
- **Intermittent Mode**: Overflow cells are discarded (buffer operates as FIFO and will support CPP emulation applications)
- **Continuous Mode**: If buffer fills and overflows, it is locked from further input until it is empty (providing 123.7 ms snapshots of 131,072 consecutive cells) - used for protocol decoding higher-layer protocol PDUs

Overflow indication
- Drop Overflow (DOV) alarm measurement and front panel indication
- See Measurements and Electrical and Mechanical sections for more detail

Capture Buffer
The capture buffer is used to capture massive traffic for protocol analysis and post-processing.

| Buffer Size | 262,144 cells

| Idle/Unassigned Cell Filter | Idle/Unassigned cells are not saved in the capture buffer
| Attached: All received cells, including idle/unassigned cells, are saved in the capture buffer

Real-Time Measurements
Measurements are taken continuously in real-time, collected every 100 milliseconds and accumulated over the user-specified measurement period. Results from the most recent complete measurement period are retained.

Measurement System

| Result Types | Universal: Measurements since the start of the Measurement Period
|             | Latched: Measurements during most recently completed measurement period
|             | Last Second: Measurements during most recently completed 1-second period (dynamic update)

| Result Formats | Cells
|               | Seconds
|               | Ratios
|               | Bandwidth - units: bps, mbps, or PDU's

| Accuracy of Counts | +1% for counts < 1000
|                   | +0.1% for counts > 1000

| Accuracy of Ratios | ±0.2% for counts > 1000
|                   | ±1% for counts < 1000

| Accuracy of Bandwidth | ±1% count (cell or PDU) per measurement period
|                        | ±0.1% count (cell or PDU) per measurement period

| Measurement Period | Range: 1 second to 3 days
|                   | Resolution: 1 second

| Control | Start / Stop / Continuous
|        | Maximum user interface update period: 5 seconds

Transmit Link and Alarm Measurements

| Transmit Inserted Cell Bandwidth (bps) and cell/s | Mean bandwidth of ATM cells inserted from the cell bus
| Transmit Inserted Cell Count (cell/s) | Total cell count of ATM cells inserted from the cell bus
| Transmit ASP Cell Bandwidth (bps) and cell/s | Mean bandwidth of ATM cells transmitted from internal traffic generator
| Transmit ASP Cell Count (cell/s) | Total ATM cells transmitted from the ASP
| Transmit Total Generated Bandwidth (bps) and cell/s | Total measured bandwidth of ATM cells transmitted from cell bus and generated by the ASP
| Transmit Total Generated Cell Count (cell/s) | Total cell count of ATM cells inserted from cell bus and generated by the ASP
| Transmit Traffic Generator Not Satisfied (measured seconds) | Traffic generator not satisfied over measured seconds

Transmit Monitor Measurements

| Number of Monitored Streams | 1
| Number of Channels per Stream | 1 to 2,048
| Number of monitored channels per Stream | 1 to 2,048
| ATM Bandwidth (bps) | Aggregate mean bandwidth across all monitored channels
| ATM Cell Count (cell/s) | Total cell count of ATM cells generated by the ATM Stream Processor across all monitored channels
| CLP-Q/CLP-Q (cell/s) | Aggregate mean bandwidth of ATM cells with CLP-Q/CLP-Q (cell/s) across all monitored channels

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**ATM Stream Processor**

E1607A/E1609A

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**Receive Link and Alarm Measurements**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLP = D/CLP - 1 Cell Count (cells)</strong></td>
<td>Total count of ATM cells with CLP = D/CLP - 1 across all monitored channels</td>
</tr>
<tr>
<td><strong>CLP = D/CLP - 1 Ratio</strong></td>
<td>The ratio of CLP = D/CLP - 1 cells transmitted to the total cell count (CLP = D + 1) across all monitored channels</td>
</tr>
<tr>
<td><strong>PT - OK1 Bandwidth (bits/s and millicells)</strong></td>
<td>Aggregate mean bandwidth of ATM cells with PT - OK1 across all monitored channels</td>
</tr>
<tr>
<td><strong>PT - OK1 Cell Count (cells)</strong></td>
<td>Total cell count of ATM cells with PT - OK1 across all monitored channels</td>
</tr>
</tbody>
</table>

**Receive Connection Monitor Measurements**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Monitored Connections</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>Monitored Channels per Connection</strong></td>
<td>1 to 15,384 VC's</td>
</tr>
</tbody>
</table>

---

![Diagram](image)

**Frequency**

Calculating CTO and peak-to-peak cell delay variation (CDV)

---

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## ATM Stream Processor

**E1607A/E1609A**

### Electrical & Mechanical Specification

#### Electrical Interface

<table>
<thead>
<tr>
<th>External Trigger Input Rx</th>
<th>Connector Type: SMB bulkhead receptacle</th>
</tr>
</thead>
</table>
| Input Levels: TTL sink \( V_{IL} < -0.8\text{V},  
\( V_{IL} > -2.0\text{V} \) |
| Input Impedance: 50 ohm |

<table>
<thead>
<tr>
<th>External Trigger Input Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector Type: SMB bulkhead receptacle</td>
</tr>
</tbody>
</table>
| Output Levels: TTL source \( V_{OH} \leq -0.3\text{V},  
\( V_{OH} \geq -2.0\text{V} \) |
| Output Impedance: 50 ohm |

#### Dynamic Measurements

<table>
<thead>
<tr>
<th>Transmit Total Generated Bandwidth (b/s and cells/s)</th>
<th>Total mean bandwidth of ATM cells inserted from cell bus and generated by the internal traffic generator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmit ATM Cell Bandwidth (b/s and cells/s)</td>
<td>Mean bandwidth of ATM cells transmitted from intercell traffic generator</td>
</tr>
<tr>
<td>Inserted ATM Cell Bandwidth (b/s and cells/s)</td>
<td>Mean bandwidth of ATM cells inserted from the 155 Mbit/s cell bus</td>
</tr>
<tr>
<td>Remaining Available ATM Bandwidth (b/s and cells/s)</td>
<td>Remaining ATM bandwidth available to internal traffic generator</td>
</tr>
<tr>
<td>Receive ATM Cell Bandwidth (b/s and cells/s)</td>
<td>Bandwidth of ATM cells received (non-fill)</td>
</tr>
<tr>
<td>Filtered ATM Cell Bandwidth (b/s and cells/s)</td>
<td>Average bandwidth of cells (ATM or rate) matched by the output filters, averaged over last complete 1 second period</td>
</tr>
<tr>
<td>Connection Average Cell Bandwidth (b/s or cells/s)</td>
<td>Selected connection cell bandwidth averaged over last complete 1 second period; Available on up to 8 connections simultaneously</td>
</tr>
</tbody>
</table>

#### Environmental Operating Conditions

<table>
<thead>
<tr>
<th>Operating Temperature</th>
<th>( 0^\circ\text{C} ) to ( 45^\circ\text{C} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jitter transfer function maintained over the range ( 10^\circ\text{C} ) to ( 55^\circ\text{C} )</td>
<td></td>
</tr>
</tbody>
</table>

| Storage Temperature   | \( -40^\circ\text{C} \) to \( 70^\circ\text{C} \) |

| Humidity             | 0% to 95% relative humidity from \( 25^\circ\text{C} \) to \( 40^\circ\text{C} \) |
### Applicable Standards

<table>
<thead>
<tr>
<th>Category</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM Forum TMA 4.0</td>
<td>Traffic Management Specification Version 4.0</td>
</tr>
<tr>
<td>ITU-T I.357</td>
<td>B-ISDN Shrinkage Test for Connection Availability 9/1986</td>
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<tr>
<td>ITU-T L.150</td>
<td>B-ISDN Asynchronous Transfer Mode Characteristics 9/1993</td>
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<tr>
<td>Performance Testing</td>
<td>ATM Forum Performance Testing (Draft Specification)</td>
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## Acronyms

<table>
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<tr>
<th>Acronym</th>
<th>Definition</th>
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<tr>
<td>AAL-5</td>
<td>ATM Adaptation Layer 5</td>
</tr>
<tr>
<td>ABR</td>
<td>Available Bit Rate</td>
</tr>
<tr>
<td>ASP</td>
<td>Agilent E1607/E1609A ATM Stream Processor</td>
</tr>
<tr>
<td>ATM</td>
<td>Asynchronous Transfer Mode</td>
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<tr>
<td>BSTS</td>
<td>Agilent Broadband Series Test System</td>
</tr>
<tr>
<td>BW</td>
<td>Bandwidth</td>
</tr>
<tr>
<td>CLP</td>
<td>Cell Loss Priority</td>
</tr>
<tr>
<td>CPP</td>
<td>Agilent E4209B Cell Protocol Processor</td>
</tr>
<tr>
<td>CRC</td>
<td>Cyclic Redundancy Check</td>
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<tr>
<td>DOVL</td>
<td>Drop Overflow</td>
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<tr>
<td>GFC</td>
<td>Generic Cell Rate Algorithm</td>
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<tr>
<td>LED</td>
<td>Light Emitting Diode</td>
</tr>
<tr>
<td>OAM</td>
<td>Operations, Administration and Maintenance</td>
</tr>
<tr>
<td>OC-12c</td>
<td>Optical Carrier Level 12 Signal Concatenated</td>
</tr>
<tr>
<td>OPT</td>
<td>Agilent E6270A OAM Protocol Tester</td>
</tr>
<tr>
<td>PDU</td>
<td>Protocol Data Unit</td>
</tr>
<tr>
<td>PRBS</td>
<td>Pseudo Random Binary Sequence</td>
</tr>
<tr>
<td>PTI</td>
<td>Payload Type Identifier</td>
</tr>
<tr>
<td>PVC</td>
<td>Permanent Virtual Circuit</td>
</tr>
<tr>
<td>QoS</td>
<td>Quality of Service</td>
</tr>
<tr>
<td>Rx</td>
<td>Receive</td>
</tr>
<tr>
<td>SDH</td>
<td>Synchronous Digital Hierarchy</td>
</tr>
<tr>
<td>SMB</td>
<td>Subminiature Type B</td>
</tr>
<tr>
<td>SONET</td>
<td>Synchronous Optical Network</td>
</tr>
<tr>
<td>STM</td>
<td>Synchronous Transfer Mode</td>
</tr>
<tr>
<td>SVC</td>
<td>Switched Virtual Circuit</td>
</tr>
<tr>
<td>Tcl</td>
<td>Tool Command Language</td>
</tr>
<tr>
<td>Tk</td>
<td>Graphical User Interface Toolkit for Tcl</td>
</tr>
<tr>
<td>TGNS</td>
<td>Traffic Generator Not Satisfied</td>
</tr>
<tr>
<td>Tx</td>
<td>Transmit</td>
</tr>
<tr>
<td>UNI</td>
<td>User Network Interface</td>
</tr>
<tr>
<td>VBR</td>
<td>Variable Bit Rate</td>
</tr>
<tr>
<td>VC</td>
<td>Virtual Circuit</td>
</tr>
<tr>
<td>VCI</td>
<td>Virtual Circuit Identifier</td>
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<tr>
<td>VP</td>
<td>Virtual Path</td>
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<tr>
<td>VPI</td>
<td>Virtual Path Identifier</td>
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<td>UBR</td>
<td>Unspecified Bit Rate</td>
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