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Agilent Technologies
Innovating the HP Way

Serial Cell Generator and Analyzer System HP E4859A

HEWLETT PACKARD

Product Overview

Product characteristics and ordering information

Characterize TDMA and other burst-mode transmitters and receivers during research and development

The HP E4859A serial cell generator and analyzer system is used in research and development to characterize the transmission performance of time division multiple access TDMA and other burst-mode transmitters and receivers. In order to optimize the performance and cost of transmission systems you can measure the error-performance of burst-mode cells with proprietary formats under different line bit rate, cell timing or cell length conditions.

In local access networks a cell-based time division multiplex technology is used to improve the upstream transmission bandwidth for interactive broadband services. These local access networks are passive optical networks (PON) and fiber to the curb (FTTC). Burst-mode transmission is also used in digital CATV, optical buses, LAN's, and military communication systems.

- error-performance analysis of burst-mode data
- up to 16 serial cell generators
- cells with mixed PRBS/ user-defined pattern
- variable cell length and cell timing
- bit rate 170 kbit/s to 250 Mbit/s (optional 660 Mbit/s)
- auto-adjust of cell transfer delays



Figure 1: the HP E4859A Serial Cell Generator and Analyzer System

HP E4859A serial cell generator and analyzer entry system

The entry system is made up of a single burst-mode serial cell generator, companion cell error analyzer, central clock source and sequencer. For configurations requiring multiple generators or analyzers, additional modules can be plugged into the unused slots of the entry system.

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Meeting test needs in research and development of TDMA and other burst-mode transmitters and receivers

Today the use of digital transmission techniques during the research and design of communication networks is very common. Cell based transmission, point-to-multipoint network topologies, and synchronous time division multiplexing are technologies which are being used in local access networks for future interactive broadband services. As a result the need for burst-mode transmitters and receivers is increasing. Typically they are used in:

- local access networks using TDMA technology, such as passive optical networks (PON), hybrid fibre coax (HFC) and fiber to the curb (FTTC)
- optical buses (airplanes, ships)
- MIL bus 3838
- digital satellite modem
- digital CATV transmission
- optical LANs
- military communication systems

The key to optimize the performance and cost of transmission links, while meeting tight project schedules, is to use flexible and reliable test equipment, which allows the efficient test of burst-mode transmitters and receivers.

The serial cell generator and analyzer is designed to characterize burst-mode transmitters and receivers. It provides:

- the emulation of all types of burst-mode data
- error performance analysis
- options for future upgrade
- convenient operation

Burst-mode transmission in a point-to multipoint network

You can use the serial cell generator and analyzer to emulate and analyze cells in a passive star, tree, bus or ring network topology, which employs a cell-based time division multiplexing.
Figure 2, shows an example for a point-to-multipoint network.

Bi-directional transmssion

In addition, the serial cell generator and analyzer can be set up so that you are able to reproduce bi-directional transmission for upstream and downstream signals in a point-to-multipoint network.

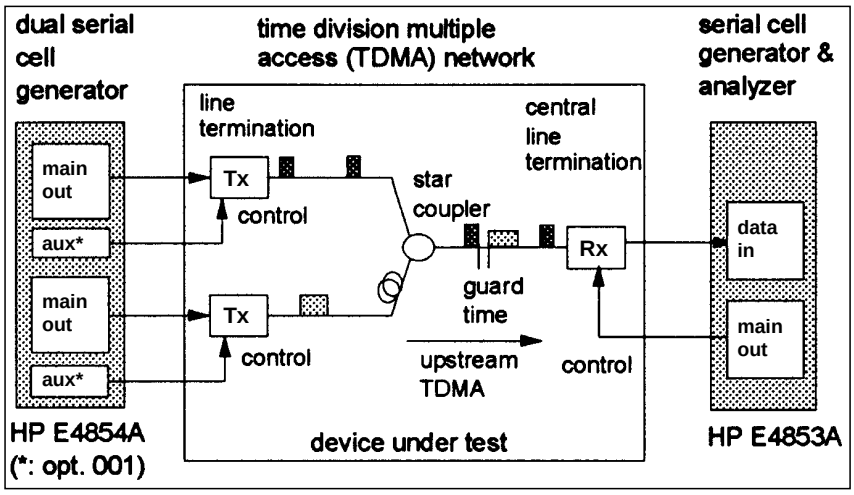


Figure 2: test set-up in a point-to-multipoint network (passive star with 2 branches) using TDMA for upstream transmission

Burst-mode transmission in a point-to-point link

The serial cell generator and analyzer can also be used to emulate and analyze burst-mode cells in a point-to-point link as shown in Figure 3.

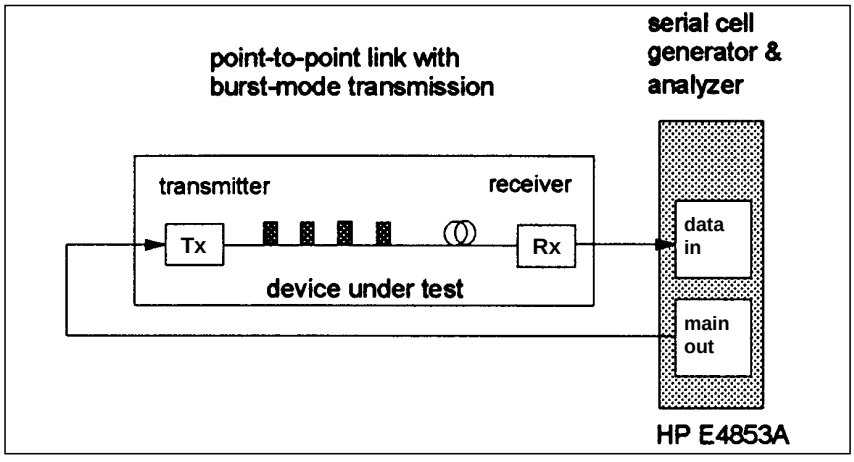


Figure 3: burst-mode transmission in a point-to-point link

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Emulate burst-mode data in a network

Multiple serial cell generators

Up to 16 serial cell generators can be set up to reproduce burst-mode data in a network. Each generator has independent delay and data resources. It can generate one cell, which is repeated periodically, once per frame, see Figure 4.

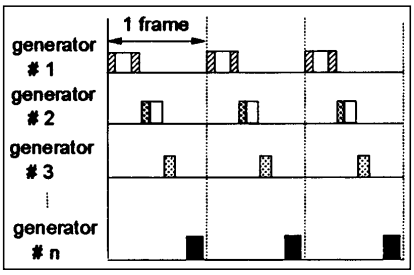


Figure 4: multiple serial cell generators can be set-up

Flexible cell editing

The serial cell generator provides not just pseudo-random bit sequences (PRBS), but also complex cells, which consist of mixed PRBS and user-defined pattern segments. See Figure 5. Therefore, proprietary cell formats with a preamble, delimiter, payload and other segments can be easily reproduced.

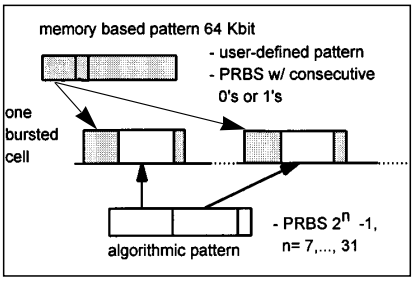


Figure 5: a cell consists of up to 28 segments of mixed PRBS and memory based patterns

Variable timing

The line bit rate and frame length can be varied over a wide range. This lets you find the margins of the physical layer design even for non-standardized transmission bit rates. HP offers bit rates ranging from 170 kbit/s to 250 Mbit/s, with option 660 the range is expanded to 660 Mbit/s. It is possible to vary the guardtime between cells which come from different generators. By doing so you can find the optimum guardtime and assure a save bit error rate without wasting transmission efficiency. The guardtime can be varied in fine steps, to check if the clock recovery circuit at the receiver side works properly even for odd guardtimes.

Additional control signals

No other digital generators are required to stimulate the devices, because the serial cell generator can also be used to provide control signals such as reset pulses, envelope signals, continuous and bursted clocks. Such signals are sometimes needed to turn the transmitter or receiver on/off, or to simply trigger other test equipment. The generator's main output or the optional auxiliary output (option 001) can be used to provide the control signals.

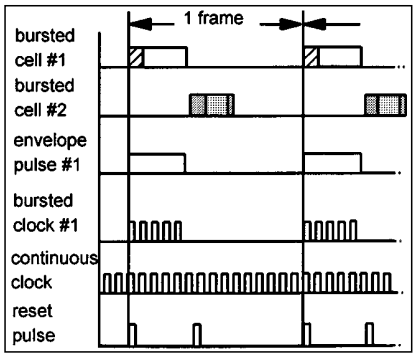


Figure 6: burst-mode cells and control signals can be generated

Analyze the error performance

Error performance analysis of individual cells

The serial cell analyzer measures the error performance of cells coming from one of the generators.
You can select individual cell segments for the measurement, while others are ignored. For example, it is possible to measure only the payload while overhead bits can be ignored. This proves helpful when optimizing the dependency between the overhead bits and bit error rate of the payload.

Synchronized generator and analyzer

In a point to multipoint network the cell transfer delays can be different for each path. The serial cell generator and analyzer system is convenient to operate, as it automatically compensates for the different cell transfer delays between transmitters and receiver. The auto-adjust procedure automatically measures the cell transfer delays between generator outputs and analyzer inputs.

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Key features

Bit rate: 170 kbit/s to 250 Mbit/s, optional 660 Mbit/s. NRZ format
Cell content: up to 28 segments of PRBS and/or user-defined pattern
User-defined pattern: 64 Kbit to 1024 Kbit memory per channel, dependent on bit rate
PRBS: 2^7-1 to 2^{31}-1
Control signals: envelope, bursted clock, continuous clock, reset pulse
Output amplitude: 0.3 V to 2.5 V, TTL, ECL, CMOS, PECL
Guardtime between cells: 0 to 24 ms, resolution 10 ps
Frame length: max. 24 ms
Auto-adjust: measures and compensates for cell transfer delays
Measurements: bit error count, bit error ratio, individual cell segments can be selected
Decision threshold voltage: -2.10 V to +5.10 V
Module size: VXI, C-size, 1 slot

System description

Central clock and sequencer
All generators and analyzers which are installed are controlled by the central clock and sequencer. Consequently, both the generators and analyzers use the same bit rate. The clock is generated either by an internal PLL, or can be taken from an external source. The central sequencer controls all generators and analyzers in order to repeat all signals periodically within one frame.

Generators
Each generator channel has it's own pattern memory and PRBS generator, in order to set up one cell.
The position of the cell within a frame can be varied for each generator independently. The generator can also be used to provide a control signal instead of a cell.

Analyzer
Each analyzer compares the received cells with the cells sent out by one of the generators. It provides the bit error rate and bit error count as a measurement result.

Synchronization
The cell transfer delay between generator output and analyzer input is measured during auto-adjust, but it can be also entered manually.
The sampling rate of the analyzer is the same as the line bit rate. The sampling point remains constant and is set to the middle of the eye opening to be found during auto-adjust. The sampling point's position can be varied manually within a range of ±1 bit period.

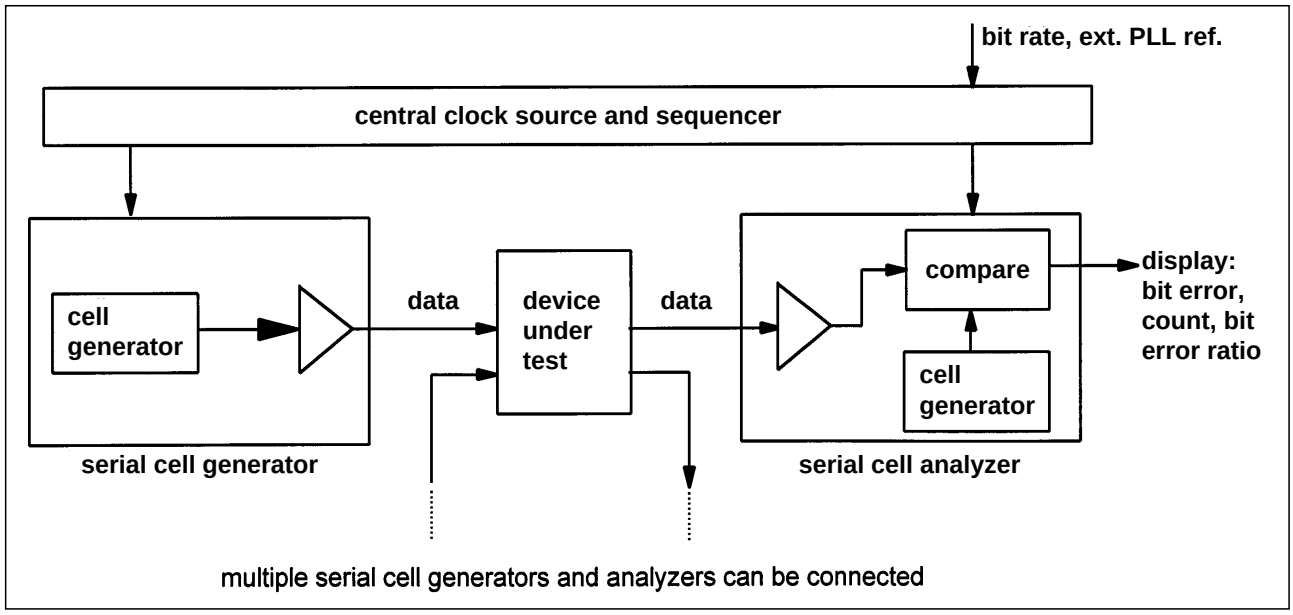


Figure 7: block diagram of the serial cell generator and analyzer system

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Easy to operate with a graphical user interface

All parameters at a glance

All important parameters are shown at glance when opening the windows of the graphical user interface. The user software includes the graphical user interface and is already pre-installed in the entry system.

Supports TDMA applications

The user interface supports point-to-multipoint networks with up to 16 branches and allows to emulate also time compression multiplex (TCM) or bi-directional trans-mission.
To assure convenient operation for TDMA applications, guardtimes between cells can be entered directly. Cell transfer delays are compensated for, and the analyzer's compare memory is loaded automatically with the data of the cells to be analyzed.

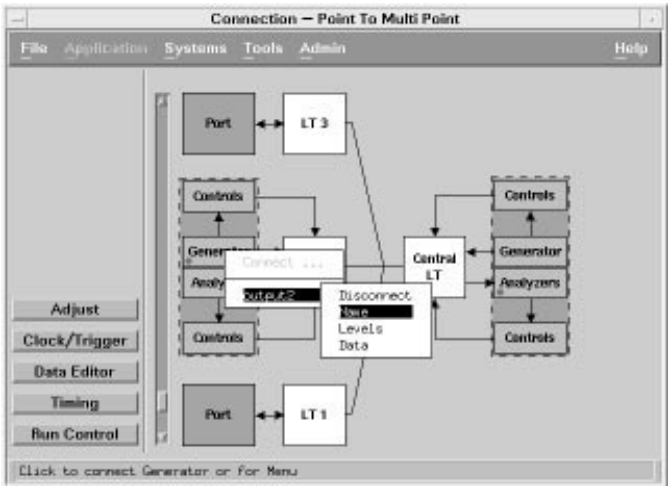


Figure 8: connection window of the graphical user interface

Connection window

A point-to-multipoint network with its line terminations is shown. To each line termination generator, analyzer, control signal resource are assigned here. Name, levels and cells can be set after clicking on the appropriat generator or analyzer. By clicking on the buttons or the left side, auto-adjust, clock/trigger, timing, data editor, and run control windows are opened.

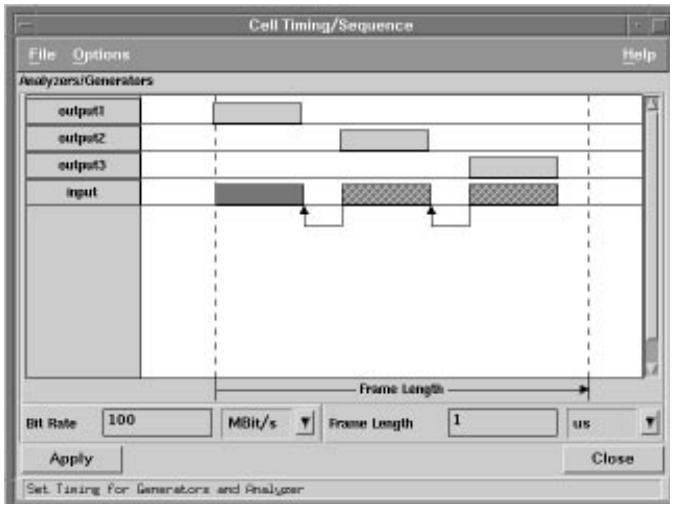


Figure 9: timing window of the graphical user interface

Cell timing sequence window

In this window one frame with all the bursted cells generated and received are shown. Bit rate and frame lenght are entered here. The guardtime can be entered by clicking on the arrows between the cells, the timing and signal type of the associated control signals can be edited by clicking directly on the cells.

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Upgradeable to tomorrow's needs with a modular system

Serial cell generator and analyzer entry system HP E4859A
The entry system comes pre-installed in a mainframe with controller and software. It is composed of one serial cell generator, a companion serial cell analyzer and a central clock source. The monitor, keyboard and mouse are not included in the shipment. For configurations which require multiple generators or analyzers additional modules should be specified when ordering. However, they can also be added at a later date.

The HP E4859A entry system can be used for configurations of up to 19 generators/ 1 analyzer, or 10 generators/ 10 analyzers, or any combination in between.



Figure 10: HP E4859A with one HP E4854A and peripherals

The HP E4859A entry system includes:
- one serial cell generator/ analyzer module HP E4853A
- a central clock module HP E4805A with option 001 1 Hz frequency resolution
- user software HP E4872A
- TDMA license-to-use HP E4856A
- VXI C-size power mainframe HP E1401B
- embedded controller with 32 MB HP E1497A #ANC
- embedded SCSI disk HP E4208B
- pre-installed HP-UX 9.x and SICL
- LAN transceiver, licenses, media, accessories, and user guides
- nine unused slots

Serial cell generator and analyzer modules HP E4854A and HP E4853A
For configurations which require multiple generators or analyzers these modules should be specified when ordering. They can also be added at a later date. Each module requires 1 slot.

Serial cell generator/analyzer module HP E4853A
Here one generator and one analyzer are provided.

Dual serial cell generator module HP E4854A
This module provides two generators.

Ordering information for the serial cell generator and analyzer

Entry system	HP E4859A
Modules:	
Dual serial cell generator module	HP E4854A
Serial cell generator/ analyzer module	HP E4853A
Options:	
Auxiliary output	#001
Bit rate 660 Mbit/s	#660
Commercial calibration	#UK6
Japanese Getting Started manual	#ABJ
Customer upgrade (of modules)	#010
1 year on-site warranty conversion	#W01
Software update support	+UAH

Monitor, keyboard, mouse have to be ordered separately.

Other recommended test equipment

Lightwave communications analyzer	HP 83475A
Digital communication analyzer	HP 83480A
Optical attenuator	HP 8156A

For more information

Technical data	5963-9924E
Configuration guide	5964-0004E

Note:
This document relates to user software rev. 1.1. As the user software is improved over time, additional features will be added. Therefore, the look of the window may alter slightly.

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Complementary literature:

Technical data
Pub No. 5963-9924E

Config. Guide
5964-0004E

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Hewlett-Packard
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Australia/New Zealand:
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